14 ETWS

14.1 ETWS reception in RRC_IDLE state / Duplicate detection

14.1.1 Test Purpose (TP)

(1)

```
with { UE in RRC_IDLE state and follow the reception of Paging message with etws-Indication }
ensure that {
  when { UE start to acquire ETWS message from SIB10 and SIB11 }
    then { UE successfully received the ETWS message and activated the "User Alerting" popup display
}
             }
```

14.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.2.2.4, 5.2.2.17, 5.2.2.18, 5.3.2.3; TS 23.041 clause 9.1.2.

[TS 36.331, clause 5.2.2.4]

The UE shall:

…

1> if the UE is ETWS capable:

2> upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:

3> discard any previously buffered *warningMessageSegment*;

3> clear, if any, the current values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*;

2> when the UE acquires *SystemInformationBlockType1* following ETWS indication, upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType10* is present:

4> start acquiring *SystemInformationBlockType10* immediately;

3> if *schedulingInfoList* indicates that *SystemInformationBlockType11* is present:

4> start acquiring *SystemInformationBlockType11* immediately;

NOTE 2: UEs shall start acquiring SystemInformationBlockType10 and SystemInformationBlockType11 as described above even when systemInfoValueTag in SystemInformationBlockType1 has not changed.

[TS 36.331, clause 5.2.2.17]

Upon receiving *SystemInformationBlockType10*, the UE shall:

1> forward the received *warningType*, *warningSecurityInfo* (if present), *messageIdentifier* and *serialNumber* to upper layers;

[TS 36.331, clause 5.2.2.18]

Upon receiving *SystemInformationBlockType11*, the UE shall:

1> if there is no current value for *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*; or

1> if either the received value of *messageIdentifier* or of s*erialNumber* or of both are different from the current values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*:

2> use the received values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11* as the current values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*;

2> discard any previously buffered *warningMessageSegment*;

2> if all segments of a warning message have been received:

3> assemble the *warningMessage* from the received *warningMessageSegment*;

3> forward the received *warningMessage*, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

3> stop reception of SystemInformationBlockType11;

3> discard the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

2> else:

3> store the received *warningMessageSegment*;

3> continue reception of *SystemInformationBlockType11*;

1> else if all segments of a warning message have been received:

2> assemble the *warningMessage* from the received *warningMessageSegment*;

2> forward the received complete *warningMessage*, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

2> stop reception of *SystemInformationBlockType11*;

2> discard the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

1> else:

2> store the received *warningMessageSegment*;

2> continue reception of SystemInformationBlockType11;

[TS 36.331, clause 5.3.2.3]

Upon receiving the *Paging* message, the UE shall:

…

1> if the *etws-Indication* is included and the UE is ETWS capable:

2> re-acquire *SystemInformationBlockType1* immediately, i.e., without waiting until the next system information modification period boundary;

2> if the *schedulingInfoList* indicates that *SystemInformationBlockType10* is present:

3> acquire *SystemInformationBlockType10*;

2> if the *schedulingInfoList* indicates that *SystemInformationBlockType11* is present:

3> acquire SystemInformationBlockType11;

[TS 23.041, clause 9.1.2]

...

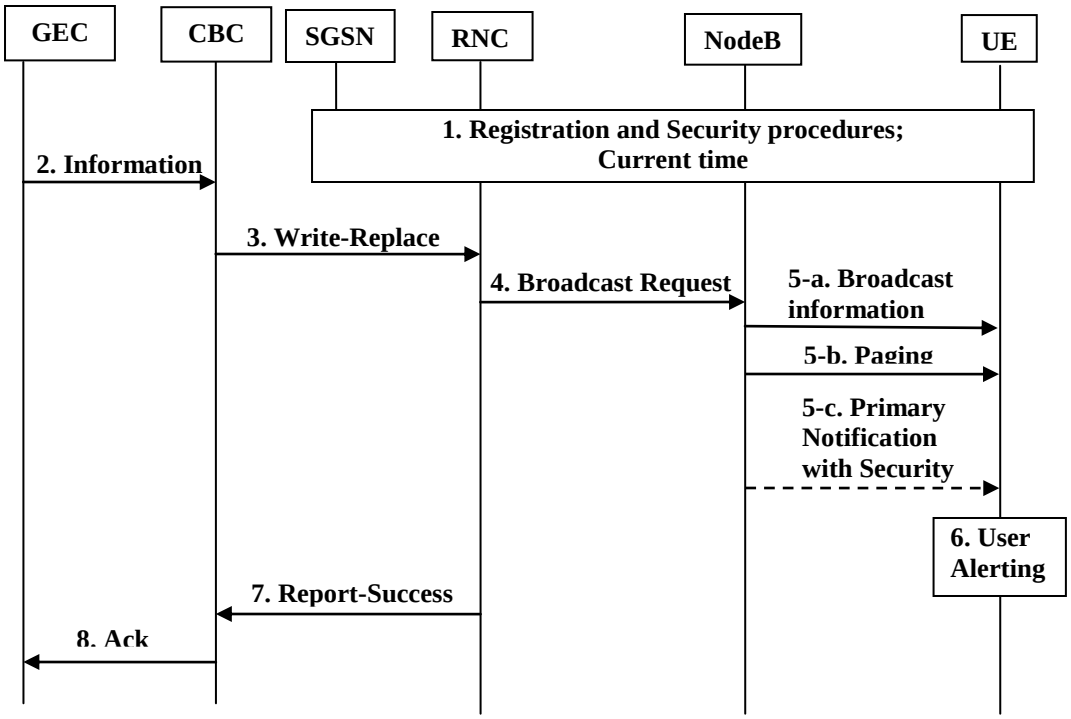

Figure 4b

...

6. The UE alert the user immediately, using "warning type" value,

   - upon the reception of the paging message, if the UE has been configured to receive ETWS warnings over the paging message, and the UE has authenticated the core network of the NodeB it is camped on, or

   - if the UE has not been configured to receive ETWS warnings over the paging message, and it received the optional primary notification and security checks based on "timestamp" and "digital signature" for this notification passed.

NOTE: If the UE received the ETWS warnings over the paging and also received the optional primary notification, it will silently discard the optional primary notification.

NOTE: When the "warning type" is 'test', the UE silently discards the paging message, and the optional primary notification, and do not perform the reception of the broadcast message described below. However, the UE specially designed for testing purposes may perform user alerting described above and proceed to the reception of the broadcast message described below

NOTE: If the UE has been configured to receive ETWS warnings over paging message but it has not authenticated the core network of the NodeB it is camped on, the UE does not receive the paging message and the optional primary notification, and do not perform the reception of the broadcast message described below.

Upon the reception of the paging message, whether the UE is configured to receive ETWS warnings over paging message or not, the UE activates the reception of the broadcast messages containing the "warning message" as the secondary notification, as follows:

- If both the "digital signature" and "timestamp" are present in the "warning message" and security checks fail, then the UE notifies the user of this fact and stops the user alerting.

- If both the "digital signature" and "timestamp" are present and security checks pass, then the UE indicates the contents of the "warning message" to the user along with an indication that the message has been authenticated.

- In other cases, the UE indicates the contents of the "warning message" to the user along with an indication that the message has not been authenticated.

Unless both the "digital signature" and "timestamp" are present and the security checks pass, the UE shall ignore the message, return to normal idle mode, and ignore paging messages with the "ETWS indication" for the next [X] seconds.

NOTE: Repetition period [X] is subject to regulatory requirements.

The UE shall consider a message duplicated if the combination of "message identifier" and "serial number" matches that of the previous message received from the same PLMN. The UE shall ignore messages detected as duplicated. If both the "digital signature" and "timestamp" are present, the UE shall perform security check before duplicate message detection. Duplicate message detection shall be performed independently for primary and secondary notifications.

7. The RNC node sends a BMC REPORT-SUCCESS to the CBC in response to Write-Replace.

8. CBC sends acknowledgement message to CBE.

14.1.3 Test description

14.1.3.1 Pre-test conditions

System Simulator:

- Cell 1

UE:

None.

Preamble:

- The UE is in state Registered, Idle mode (state 2) according to [18].

14.1.3.2 Test procedure sequence

Table 14.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message	-	-
1	The SS include an ETWS message with new *messageIdentifier* and *serialNumber* in *SystemInformationBlockType10* and *SystemInformationBlockType11* and transmit a *Paging* message including *etws-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
2	Check: Does the UE indicate the contents of the "warning message" to the user, and alert or activate alerting the user (NOTE 2)?	-	-	1	P
3	The SS wait for 10s.	-	-	-	-
4	The SS include an ETWS message with same *messageIdentifier* and *serialNumber* in *SystemInformationBlockType10* and *SystemInformationBlockType11* and transmit a *Paging* message including *etws-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
5	Check: Does the UE indicate the contents of the "warning message" to the user, or alert or activate alerting the user. (NOTE 2)?	-	-	1	F
NOTE 1: *SystemInformationBlockType11* contain 3 segments. NOTE 2: The data indication and user alerting are the UE implementation issues.					

14.1.3.3 Specific message contents

Table 14.1.3.3-1: *SystemInformationBlockType1* for Cell 1 (all steps, Table 14.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 8 in TS 36.508 section 4.4.3.1	SIB2, SIB3, SIB10 and SIB11 are transmitted	
}			

Table 14.1.3.3-1A: *SystemInformationBlockType1-BR-r13* for Cell 1 (all steps when UE under test is CAT M1, Table 14.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3A			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1-BR-r13 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 8 in TS 36.508 section 4.4.3.1	SIB2, SIB3, SIB10 and SIB11 are transmitted	
}			

Table 14.1.3.3-2: Void

Table 14.1.3.3-3: Void

Table 14.1.3.3-4: Void

Table 14.1.3.3-5: Void

Table 14.1.3.3-6: *Paging* (step 1 and step 4, Table 14.1.3.2-1)

Derivation Path: 36.508 Table 4.6.1-7			
Information Element	**Value/remark**	**Comment**	**Condition**
Paging ::= SEQUENCE {			
pagingRecordList	Not present		
systemInfoModification	Not present		
etws-Indication	true		
nonCriticalExtension SEQUENCE {}	Not present		
}			

14.2 ETWS reception in RRC_CONNECTED state / Duplicate detection

14.2.1 Test Purpose (TP)

(1)

```
with { UE in RRC_CONNECTED state and follow the reception of Paging message with etws-Indication }
ensure that {
  when { UE start to acquire ETWS message from SIB10 and SIB11 }
    then { UE successfully received the ETWS message and activated the "User Alerting" popup display
}
             }
```

14.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.2.2.4, 5.2.2.17, 5.2.2.18, 5.3.2.3; TS 23.041 clause 9.1.2.

[TS 36.331, clause 5.2.2.4]

The UE shall:

…

1> if the UE is ETWS capable:

2> upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:

3> discard any previously buffered *warningMessageSegment*;

3> clear, if any, the current values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*;

2> when the UE acquires *SystemInformationBlockType1* following ETWS indication, upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType10* is present:

4> start acquiring *SystemInformationBlockType10* immediately;

3> if *schedulingInfoList* indicates that *SystemInformationBlockType11* is present:

4> start acquiring *SystemInformationBlockType11* immediately;

NOTE 2: UEs shall start acquiring SystemInformationBlockType10 and SystemInformationBlockType11 as described above even when systemInfoValueTag in SystemInformationBlockType1 has not changed.

[TS 36.331, clause 5.2.2.17]

Upon receiving *SystemInformationBlockType10*, the UE shall:

1> forward the received *warningType*, *warningSecurityInfo* (if present), *messageIdentifier* and *serialNumber* to upper layers;

[TS 36.331, clause 5.2.2.18]

Upon receiving *SystemInformationBlockType11*, the UE shall:

1> if there is no current value for *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*; or

1> if either the received value of *messageIdentifier* or of s*erialNumber* or of both is different from the current values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11*:

2> use the received values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType11* as the current values of messageIdentifier and *serialNumber* for *SystemInformationBlockType11*;

2> discard any previously buffered *warningMessageSegment*;

2> if all segments of a warning message have been received:

3> assemble the *warningMessage* from the received *warningMessageSegment*;

3> forward the received *warningMessage*, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

3> stop reception of SystemInformationBlockType11;

3> discard the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

2> else:

3> store the received *warningMessageSegment*;

3> continue reception of *SystemInformationBlockType11*;

1> else if all segments of a warning message have been received:

2> assemble the *warningMessage* from the received *warningMessageSegment*;

2> forward the received complete *warningMessage*, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

2> stop reception of *SystemInformationBlockType11*;

2> discard the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

1> else:

2> store the received *warningMessageSegment*;

2> continue reception of SystemInformationBlockType11;

[TS 36.331, clause 5.3.2.3]

Upon receiving the *Paging* message, the UE shall:

…

1> if the *etws-Indication* is included and the UE is ETWS capable:

2> re-acquire *SystemInformationBlockType1* immediately, i.e., without waiting until the next system information modification period boundary;

2> if the *schedulingInfoList* indicates that *SystemInformationBlockType10* is present:

3> acquire *SystemInformationBlockType10*;

2> if the *schedulingInfoList* indicates that *SystemInformationBlockType11* is present:

3> acquire SystemInformationBlockType11;

[TS 23.041, clause 9.1.2]

...

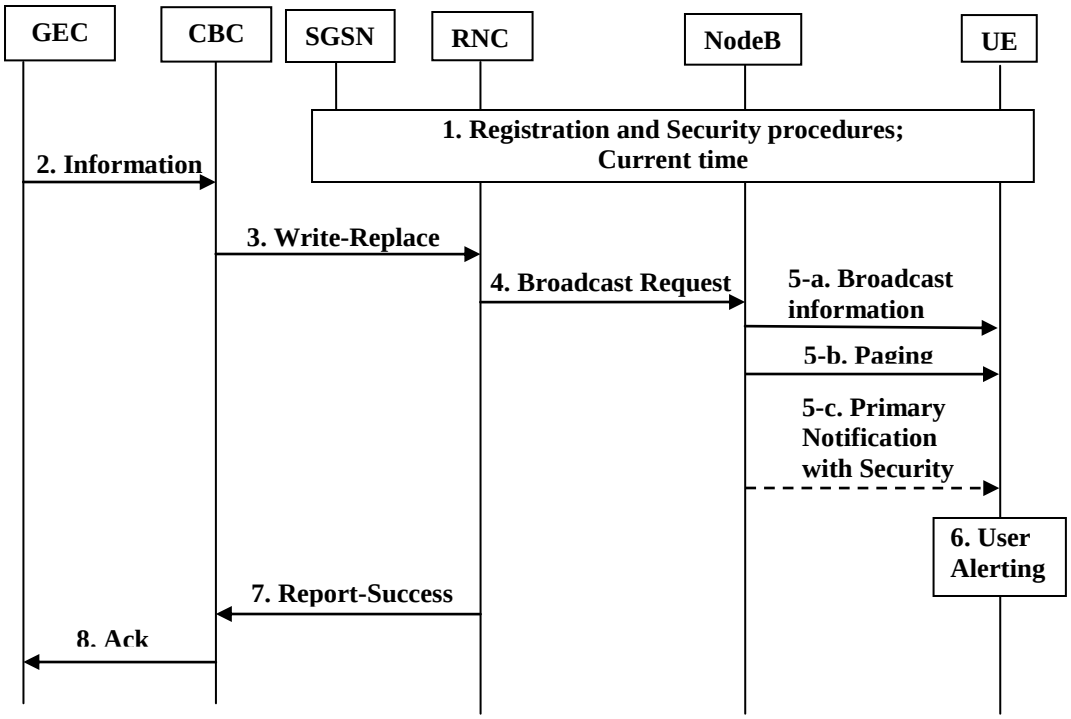

Figure 4b

...

6. The UE alert the user immediately, using "warning type" value,

   - upon the reception of the paging message, if the UE has been configured to receive ETWS warnings over the paging message, and the UE has authenticated the core network of the NodeB it is camped on, or

   - if the UE has not been configured to receive ETWS warnings over the paging message, and it received the optional primary notification and security checks based on "timestamp" and "digital signature" for this notification passed.

NOTE: If the UE received the ETWS warnings over the paging and also received the optional primary notification, it will silently discard the optional primary notification.

NOTE: When the "warning type" is 'test', the UE silently discards the paging message, and the optional primary notification, and do not perform the reception of the broadcast message described below. However, the UE specially designed for testing purposes may perform user alerting described above and proceed to the reception of the broadcast message described below

NOTE: If the UE has been configured to receive ETWS warnings over paging message but it has not authenticated the core network of the NodeB it is camped on, the UE does not receive the paging message and the optional primary notification, and do not perform the reception of the broadcast message described below.

Upon the reception of the paging message, whether the UE is configured to receive ETWS warnings over paging message or not, the UE activates the reception of the broadcast messages containing the "warning message" as the secondary notification, as follows:

- If both the "digital signature" and "timestamp" are present in the "warning message" and security checks fail, then the UE notifies the user of this fact and stops the user alerting.

- If both the "digital signature" and "timestamp" are present and security checks pass, then the UE indicates the contents of the "warning message" to the user along with an indication that the message has been authenticated.

- In other cases, the UE indicates the contents of the "warning message" to the user along with an indication that the message has not been authenticated.

Unless both the "digital signature" and "timestamp" are present and the security checks pass, the UE shall ignore the message, return to normal idle mode, and ignore paging messages with the "ETWS indication" for the next [X] seconds.

NOTE: Repetition period [X] is subject to regulatory requirements.

The UE shall consider a message duplicated if the combination of "message identifier" and "serial number" matches that of the previous message received from the same PLMN. The UE shall ignore messages detected as duplicated. If both the "digital signature" and "timestamp" are present, the UE shall perform security check before duplicate message detection. Duplicate message detection shall be performed independently for primary and secondary notifications.

7. The RNC node sends a BMC REPORT-SUCCESS to the CBC in response to Write-Replace.

8. CBC sends acknowledgement message to CBE.

14.2.3 Test description

14.2.3.1 Pre-test conditions

System Simulator:

- Cell 1

UE:

None.

Preamble:

- The UE is in state Generic RB Established (state 3) according to [18].

14.2.3.2 Test procedure sequence

Table 14.2.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message	-	-
1	The SS include an ETWS message with new *messageIdentifier* and *serialNumber* in *SystemInformationBlockType10* and *SystemInformationBlockType11* and transmit a *Paging* message including *etws-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
2	Check: Does the UE indicate the contents of the "warning message" to the user, and alert or activate alerting the user (NOTE 2)?	-	-	1	P
3	The SS wait for 10s.	-	-	-	-
4	The SS include an ETWS message with same *messageIdentifier* and *serialNumber* in *SystemInformationBlockType10* and *SystemInformationBlockType11* and transmit a *Paging* message including *etws-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
5	Check: Does the UE indicate the contents of the "warning message" to the user, or alert or activate alerting the user (NOTE 2)?	-	-	1	F
NOTE 1: *SystemInformationBlockType11* contain 3 segments. NOTE 2: The data indication and user alerting are the UE implementation issues.					

14.2.3.3 Specific message contents

Table 14.2.3.3-1: *SystemInformationBlockType1* for Cell 1 (all steps, Table 14.2.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 8 in TS 36.508 section 4.4.3.1	SIB2, SIB3, SIB10 and SIB11 are transmitted	
}			

Table 14.2.3.3-1A: *SystemInformationBlockType1-BR-r13* for Cell 1 (all steps when UE under test is CAT M1, Table 14.2.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3A			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1-BR-r13 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 8 in TS 36.508 section 4.4.3.1	SIB2, SIB3, SIB10 and SIB11 are transmitted	
}			

Table 14.2.3.3-2: Void

Table 14.2.3.3-3: Void

Table 14.2.3.3-4: Void

Table 14.2.3.3-5: Void

Table 14.2.3.3-6: *Paging* (step 1 and step 4, Table 14.2.3.2-1)

Derivation Path: 36.508 Table 4.6.1-7			
Information Element	**Value/remark**	**Comment**	**Condition**
Paging ::= SEQUENCE {			
pagingRecordList	Not present		
systemInfoModification	Not present		
etws-Indication	true		
nonCriticalExtension SEQUENCE {}	Not present		
}			

14.3 Void

15 Mobility management based on DSMIPv6 (Dual-Stack Mobile IPv6)

15.1 Discovery of the home agent via DNS

15.1.1 Test Purpose (TP)

(1)

```
with { UE has acquired an IP address and UE is configured with a DNS server address and UE is
configured with the HA-APN Network Identifier }
ensure that {
  when { UE is configured to discover IP address of Home Agent via DNS }
    then { UE transmits a DNS Query with QNAME set to FQDN of the Home Agent }
           }
```

15.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clauses 5.1.2.1.1 and 5.1.2.1.2.

[TS 24.303, clause 5.1.2.1.1]

The first procedure the UE needs to perform for DSMIPv6 initial attach is the discovery of the node acting as the HA.

The UE can discover the IP addresses of the HA in one of the four following ways:

- via DNS;
- via attach procedure for 3GPP access or trusted non-3GPP access (if supported) based on protocol configuration options;
- via IKEv2 during tunnel setup to ePDG for untrusted non-3GPP accesses;
- via DHCPv6.

If the UE does not obtain the IP addresses of the HA via PCO during the 3GPP or trusted non-3GPP (if supported) attach or via IKEv2 signalling, it shall follow either the procedures described in subclause 5.1.2.1.5 or the procedures described in subclause 5.1.2.1.2. The UE may be configured to perform both procedures in parallel or one of the two procedures only in case the other failed.

[TS 24.303, clause 5.1.2.1.2]

A UE performing Home Agent discovery based on DNS shall support the implementation of standard DNS mechanisms.

The UE shall perform DNS Lookup by Home Agent Name as specified in IETF RFC 5026 [10].The QNAME shall be set to the requested HA-APN. The HA-APN shall be constructed as specified in 3GPP TS 23.003 [17]. If a HA has both an IPv4 and an IPv6 address, the corresponding DNS record should be configured with both 'AAAA' and 'A' records. Accordingly the UE should perform one DNS lookup procedure to retrieve both 'AAAA' and 'A' records. The DNS server replies with one 'AAAA' and one 'A' record.

15.1.3 Test description

15.1.3.1 Pre-test conditions

System Simulator:

- Cell 1.

UE:

- The UE is configured to discover the Home Agent address via DNS.
- The UE is configured with a DNS server address.
- The UE is configured with the HA-APN Network Identifier.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IP address.

15.1.3.2 Test procedure sequence

Table 15.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE transmits a DNS Query message with QNAME set to FQDN of the Home Agent (derived from HA-APN Network Identifier and PLMN information).	-->	DNS Query	1	P
2	The SS transmits a DNS Response message with the IPv6 and IPv4 addresses of the Home Agent.	<--	DNS Response	-	-

15.1.3.3 Specific message contents

Table 15.1.3.3-1: Message DNS Query (step 1, Table 15.1.3.2-1)

Field	Value/remark	Comment	Condition
QR=	'0'	query	
OPCODE=	'0000'	QUERY	
QNAME=	Fully Qualified Domain Name of the Home Agent	Derived from HA-APN Network Identifier and PLMN information as per TS 23.003 clause 21.2	
QTYPE=	A	This is the query for the IPv4 address	
QCLASS=	IN		
QNAME=	Fully Qualified Domain Name of the Home Agent	Derived from HA-APN Network Identifier and PLMN information as per TS 23.003 clause 21.2	
QTYPE=	AAAA	This is the query for the IPv6 address	
QCLASS=	IN		

Table 15.1.3.3-2: Message DNS Response (step 2, Table 15.1.3.2-1)

Information Element	Value/remark	Comment	Condition
QR=	'1'	response	
OPCODE=	'0000'	QUERY	
QNAME=	Same as received in DNS Query		
QTYPE=	A		
QCLASS=	IN		
QNAME=	Same as received in DNS Query		
QTYPE=	AAAA		
QCLASS=	IN		
RR {			
NAME	Same as received in DNS Query		
TYPE	A		
CLASS	IN		
RDATA	IPv4 address of HA		
}			
RR {			
NAME	Same as received in DNS Query		
TYPE	AAAA		
CLASS	IN		
RDATA	IPv6 address of HA		
}			

15.2 Discovery of the Home Agent via DHCP

15.2.1 Test Purpose (TP)

(1)

```
with { UE has acquired an IP address and UE is configured with the HA-APN Network Identifier }
ensure that {
  when { UE is configured to discover IP address of Home Agent via DHCP }
    then { UE transmits a DHCP Information-Request with Home Network Identifier Option containing
the FQDN of the Home Agent}
           }
```

15.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clauses 5.1.2.1.1 and 5.1.2.1.5.

[TS 24.303, clause 5.1.2.1.1]

The first procedure the UE needs to perform for DSMIPv6 initial attach is the discovery of the node acting as the HA.

The UE can discover the IP addresses of the HA in one of the four following ways:

- via DNS;
- via attach procedure for 3GPP access or trusted non-3GPP access (if supported) based on protocol configuration options;
- via IKEv2 during tunnel setup to ePDG for untrusted non-3GPP accesses;
- via DHCPv6.

If the UE does not obtain the IP addresses of the HA via PCO during the 3GPP or trusted non-3GPP (if supported) attach or via IKEv2 signalling, it shall follow either the procedures described in subclause 5.1.2.1.5 or the procedures described in subclause 5.1.2.1.2. The UE may be configured to perform both procedures in parallel or one of the two procedures only in case the other failed.

[TS 24.303, clause 5.1.2.1.5]

The HA address discovery via DHCPv6 is possible in the following cases:

- in 3GPP access, or
- in trusted non-3GPP access, when a DHCPv6 relay exists in the trusted non-3GPP access and the PDN GW is the DHCPv6 server, or
- in trusted non-3GPP access, when the DHCPv6 server is in the trusted non-3GPP access and it has the HA addressee information from static configuration, or received via STa reference point as specified in 3GPP TS 29.273 [20].

A UE performing HA discovery based on DHCPv6 shall support the implementation of stateless DHCPv6 as specified in IETF RFC 3736 [13] and the DHCPv6 options as specified in draft-ietf-mip6-hiopt [12].

In order to discover the address of the HA the UE shall send an Information-Request message including the Home Network Identifier Option.

In order to connect to a HA for a specific target PDN, the UE shall set the id-type to 1 and include the desired HA-APN in the Home Network Identifier field.

The HA information is provided to the UE within a Home Network Information Option as described in draft-ietf-mip6-hiopt [12]. This option shall include either the available HA addresses (both the IPv6 address and the IPv4 address of the HA, if available) or the HA FQDN. In the latter case the UE shall perform a DNS Lookup by Home Agent Name as specified in IETF RFC 5026 [10]. The QNAME shall be set to the received HA FQDN.

If a HA has both an IPv4 and an IPv6 address, the corresponding DNS record should be configured with both 'AAAA' and 'A' records. Accordingly the UE should perform one DNS lookup procedure to retrieve both 'AAAA' and 'A' records. The DNS server replies with one 'AAAA' and one 'A' record.

15.2.3 Test description

15.2.3.1 Pre-test conditions

System Simulator:

- Cell 1.

UE:

- The UE is configured to discover the address of the Home Agent via DHCPv6.
- The UE is configured with the HA-APN Network Identifier.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IPv6 address.

15.2.3.2 Test procedure sequence

Table 15.2.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Check: Does the UE transmit a DHCP Information-Request including a Home Network Information Option?	-->	DHCP Information-Request	1	P
2	The SS transmits a DHCP Reply message including a Home Network Information Option.	<--	DHCP Reply message	-	-

15.2.3.3 Specific message contents

Table 15.2.3.3-1: DHCP Information-Request (step 1, Table 15.2.3.2-1)

Field	Value/remark	Comment	Condition
msg-type	‘00001011’B	Information-Request	
Transaction- id	Set by UE		
option-code	‘0000000000000001’B	Option Client ID	
DUID	Set by UE		
option-code	‘0000000000000110’B	Option ORO	
Requested-option-code-1	FFS	Home Network Identifier Option	
Id-type	‘00000001’B	Target network identity present	
Sub-opt-code	‘00000001’B	Home network identifier	
Home Network Parameter	Fully Qualified Domain Name	Derived from HA-APN Network Identifier and PLMN information as per TS 23.003 clause 21.2	

Table 15.2.3.3-2: DHCP Reply message (step 2, Table 15.2.3.2-2)

Field	Value/remark	Comment	Condition
msg-type	‘00000111’B	Reply	
Transaction- id	Set as the same value of Transaction-id in step 1		
option-code	‘0000000000000001’B	Option Client ID	
DUID	Set as the DUID of the client received in step 1		
option-code	‘0000000000000010’B	Option Server ID	
DUID	Set by SS		
Home Network Identifier Option	FFS	Home Network Identifier Option	
Id-type	‘00000001’B	Target network identity present	
Sub-opt-code	‘00000001’B	Home network identifier	
Home Network Parameter	Fully Qualified Domain Name	Derived from HA-APN Network Identifier and PLMN information as per TS 23.003 clause 21.2	
Sub-opt-code	‘00000011’B	IPv6 address	
Home Network Parameter	IPv6 address of the Home Agent		
Sub-opt-code	‘00000100’B	IPv4 address (optional value)	
Home Network Parameter	IPv4 address of the Home Agent		

15.3 Void

15.4 Security association establishment with Home Agent reallocation procedure

15.4.1 Test Purpose (TP)

(1)

```
with { UE has acquired an IP address }
ensure that {
  when { UE has acquired the IP address of the Home Agent }
    then { UE transmits an IKE_SA_INIT message addressed to the Home Agent to initiate security
association establishment }
            }
```

(2)

```
with { UE has transmitted an IKE_SA_INIT message addressed to the Home Agent to initiate security
association establishment }
ensure that {
  when { UE receives an IKE_SA_INIT response message }
    then { UE transmits an IKE_AUTH Request message containing the configuration payload
MIP6_HOME_PREFIX to receive the prefix to use for Home Address configuration }
            }
```

(3)

```
with { UE has transmitted an IKE_AUTH Request message containing the configuration payload
MIP6_HOME_PREFIX to receive the prefix to use for Home Address configuration }
ensure that {
  when { UE receives an IKE_AUTH Response message including an EAP-Request/AKA Challenge }
    then { UE transmits an IKE_AUTH Request message containing the correct EAP-Response/AKA-
Challenge }
            }
```

(4)

```
with { UE has transmitted an IKE_AUTH Request message containing an EAP-Response/AKA-Challenge }
ensure that {
  when { UE receives an IKE_AUTH Response message including EAP-Success }
    then { UE transmits an IKE_AUTH Request message with Authentication payload }
            }
```

(5)

```
with { UE has transmitted an IKE_AUTH Request message with Authentication payload }
ensure that {
  when { UE receives an IKE_AUTH Response message with Notify payload with a  REDIRECT attribute
containing the HOME AGENT address to connect to }
    then { UE transmits an IKE_SA_INIT message addressed to the Home Agent whose address was
received in the Notify Payload to initiate security association establishment }
            }
```

15.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clauses 5.1.2.2 and 5.1.3.1.

[TS 24.303, clause 5.1.2.2]

The UE shall support the IKEv2 protocol (see IETF RFC 4306 [14]) for negotiating the IPsec security association to secure DSMIPv6 signalling and shall support EAP over IKEv2 as described in IETF RFC 4306 [14] to perform authentication with an AAA server. In a case an additional authentication and authorization of the IPSec security association is needed with an external AAA server, then the additional authentication steps during the IKEv2 exchange shall be supported as specified in IETF RFC 4739 [23] and described in 3GPP TS 33.234 [24].

The UE shall support IPsec ESP (see IETF RFC 4303 [11]) in order to provide authentication of Binding Update and Binding Acknowledgement messages as specified in IETF RFC 4877 [4]. The UE shall support multiple authentication exchanges in the IKEv2 protocol as specified in IETF RFC 4739 [23] in order to support authentication with an external AAA server. The UE shall support the redirect mechanism as defined in draft-ietf-ipsecme-ikev2-redirect [30].

The UE shall initiate the security association establishment procedure by sending the IKE_SA_INIT request message defined in IETF RFC 4306 [14] to the HA. The UE shall indicate support for the HA reallocation by including a REDIRECT_SUPPORTED payload in the IKE_SA_INIT request as specified in draft-ietf-ipsecme-ikev2-redirect [30]. On receipt of an IKE_SA_INIT response, the UE shall send an IKE_AUTH request message including the MN-NAI in the IDi payload and the Access Point Name (APN) of the target PDN the UE wants to connect to in the IDr payload. The APN shall be formatted as defined in 3GPP TS 23.003 [17]. The username part of the MN-NAI included in "IDi" payload may be an IMSI, pseudonym or re-authentication ID. The UE shall include in the IDi payload the same MN-NAI it includes in the EAP-Response/Identity within the EAP-AKA exchange.

In the very first EAP-Response/Identity within the IKEv2 exchange the UE shall include a NAI whose username is derived from IMSI. In subsequent exchanges the UE should use pseudonyms and re-authentication identities provided by the 3GPP AAA server as specified in IETF RFC 4187 [26].

NOTE: Fast re-authentication mechanism is optional, and therefore is an implementation option in the UE and operator configuration issue (i.e. it also depends on whether the AAA server sent a re-authentication ID during previous EAP authentication) whether to use it during security association establishment.

EAP-AKA over IKEv2 shall be used to authenticate UE in the IKE_AUTH exchange, while public key signature based authentication with certificates shall be used to authenticate the HA.

…

During the IKEv2 exchange, the UE shall request the allocation of an IPv6 home prefix through the Configuration Payload in the IKE_AUTH. Since in EPS a unique IPv6 prefix is assigned to the UE, the UE shall include a MIP6_HOME_PREFIX attribute in the CFG_REQUEST message as described in IETF RFC 5026 [10]. In addition the UE may include the INTERNAL_IP6_DNS attribute in the CFG_REQUEST as described in IETF RFC 4306 [14] to request the DNS server IPv6 address of the PLMN it is connecting to via DSMIPv6. In the same way the UE may include the INTERNAL_IP4_DNS attribute in the CFG_REQUEST to request the IPv4 address of the DNS server.

The UE shall then auto-configure a Home Address from the IPv6 prefix received from the HA and shall run a CREATE_CHILD_SA exchange to create the security association for the new Home Address. In the CREATE_CHILD_SA exchange the UE shall include the Home Address and the appropriate selectors in the TSi (Traffic Selector-initiator) payload to negotiate the IPsec security association for protecting the Binding Update and Binding Acknowledgement messages as specified in IETF RFC 4877 [4].

[TS 24.303, clause 5.1.3.1]

The HA shall support the IKEv2 protocol (see IETF RFC 4306 [14]) for negotiating the IPsec security association to secure DSMIPv6 signalling and shall support EAP over IKEv2 as described in IETF RFC 4306 [14] to perform UE authentication with an AAA server. If an additional authentication and authorization of the IPSec security association were needed with an external AAA server, then the additional authentication steps during the IKEv2 exchange shall be supported as specified in IETF RFC 4739 [23] and defined in 3GPP TS 33.234 [24]. The HA shall support IPsec ESP (see IETF RFC 4303 [11]) in order to provide authentication of Binding Update and Binding Acknowledgement messages as specified in IETF RFC 4877 [4]. The HA shall support multiple authentication exchanges in the IKEv2 protocol as specified in IETF RFC 4739 [23] in order to support authentication with an external AAA server.

The HA shall complete the IKE_SA_INIT exchange as specified in IETF RFC 4306 [14]. The HA shall include in the IDr the same value included by the UE in the IDr payload of the request.

Upon successful authorization and authentication, the HA shall accept the security association establishment request by sending the IKE_AUTH response message with the CFG_REPLY payload including the IPv6 Home Network Prefix allocated to the UE in the MIP6_HOME_PREFIX attribute. This prefix information shall include the prefix length as specified in IETF RFC 5026 [10]. If the UE included the INTERNAL_IP6_DNS or the INTERNAL_IP4_DNS in the CFG_REQUEST, the HA shall include the same attribute in the CFG_REPLY including zero or more DNS server addresses as specified in IETF RFC 4306 [14]

If the 3GPP AAA server triggers the HA to perform a HA reallocation procedure as specified in 3GPP TS 33.402 [18], the HA learns the IP address of the target HA as specified in 3GPP TS 29.273 [20]. The HA shall provide to the UE the target HA IP address in the REDIRECT payload during IKE_AUTH exchange as specified in 3GPP TS 33.402 [18]. The encoding of the REDIRECT payload in the IKE_AUTH response message is specified in draft-ietf-ipsecme-ikev2-redirect [30]. The HA shall not assign an IPv6 prefix to the UE in the IKE_AUTH exchange. The HA shall remove the states of the IKEv2 security association with the UE after receiving an IKEv2 Informational message with a DELETE payload from the UE.

15.4.3 Test description

15.4.3.1 Pre-test conditions

System Simulator:

- Cell 1.

UE:

None.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IP address.
- The UE has discovered the IP address of the Home Agent (either via DNS, DHCPv6, IKEv2 signalling or during Attach Procedure via PCO).

15.4.3.2 Test procedure sequence

Table 15.4.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Check: Does the UE transmit an IKE_SA_INIT message addressed to the Home Agent?	-->	IKE_SA_INIT	1	P
2	The SS transmits an IKE_SA_INIT message.	<--	IKE_SA_INIT	-	-
3	Check: Does the UE transmit an IKE_AUTH Request message containing the configuration payload MIP6_HOME_PREFIX, a MN-NAI derived from UE IMSI in the IDi field and an APN in the IDr field?	-->	IKE_AUTH Request	2	P
4	The SS transmits an IKE_AUTH Response message including an EAP-Request/AKA-Challenge.	<--	IKE_AUTH Response	-	-
5	Check: Does the UE transmit an IKE_AUTH Request message including the EAP-Response/AKA-Challenge?	-->	IKE_AUTH Request	3	P
6	The SS transmits an IKE_AUTH Response message including EAP-Success.	<--	IKE_AUTH Response	-	-
7	Check: Does the UE transmit an IKE_AUTH Request message with Authentication payload?	-->	IKE_AUTH Request	4	P
8	The SS transmits an IKE_AUTH Response message with Notify payload containing REDIRECT attribute with the Home Agent to be used	<--	IKE_AUTH Response	-	-
9	Check: Does the UE transmit an IKE_SA_INIT message addressed to the Home Agent whose address was provided in the REDIRECT Notify payload?	-->	IKE_SA_INIT	5	P

15.4.3.3 Specific message contents

Table 15.4.3.3-1: Message IKE_SA_INIT (step 1, Table 15.4.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Set by the UE		
Responder's IKE_SA SPI	0	First message in IKE_SA_INIT exchange	
Next Payload	'00100001'B	SA	
Exchange Type	'00100010'B	IKE_SA_INIT	
Security Association Payload			
Next Payload	'00100010'B	KE	
More proposal	'00000010'B		
Proposal #	'00000001'B	First cryptographic suite (section 6.5 of TS 33.234)	
Protocol ID	'00000001'B	IKE	
SPI size	'00000000'B		
Number of transforms	'00000010'B		
More transform	'00000011'B	This is the transform for confidentiality	
Transform type	'00000001'B	Encryption	
Transform ID	'00000011'B	3DES in CBC mode (ENCR_3DES)	
More transform	'00000011'B	This is the transform for prf	
Transform type	'00000010'B	PRF	
Transform ID	'00000010'B	PRF_HMAC_SHA 1 (HMAC-SHA1)	
More transform	'00000011'B	This is the transform for integrity	
Transform type	'00000011'B	Integrity	
Transform ID	'00000010'B	HMAC-SHA1-96 (AUTH_HMAC_S HA1_96)	
Last transform	'00000000'B	This is the transform for DH	
Transform type	'00000100'B	DH	
Transform ID	'00000010'B	Diffie-Hellman group 2 (1024-bit MODP)	
Last proposal	'00000000'B		
Proposal #	'00000010'B	Second cryptographic suite (section 6.5 of TS 33.234)	
Protocol ID	'00000001'B	IKE	
SPI size	'00000000'B		
Number of transforms	'00000010'B		
More transform	'00000011'B	This is the transform for confidentiality	
Transform type	'00000001'B	Encryption	
Transform ID	'00001011'B	AES with 128-bit keys in CBC mode (ENCR_AES_CB C)	
More transform	'00000011'B	This is the transform for prf	
Transform type	'00000010'B	PRF	

Transform ID	‘00000100’B	PRF_AES128_XCBC_ AES-XCBC-PRF-128	
More transform	‘00000011’B	This is the transform for integrity	
Transform type	‘00000011’B	Integrity	
Transform ID	‘00000101’B	AES-XCBC-MAC-96 (AUTH_ AES-XCBC -96)	
Last transform	‘00000000’B	This is the transform for DH	
Transform type	‘00000100’B	DH	
Transform ID	‘00000010’B	Diffie-Hellman group 2 (1024-bit MODP)	
Key Exchange Payload			
Next Payload	‘00101000’B	Nonce	
DH Group #	‘0000000000000010’B	DH group 2	
Key Exchange data	Set by the UE		
Nonce Payload			
Next Payload	‘00101001’B	Notify (REDIRECT_SUPPORTED)	
Nonce data	Random number set by the UE		
REDIRECT_SUPPORTED Notify Payload			
Next Payload	‘00000000’B	No Next Payload	
Protocol ID	‘00000000’B	Notification is not specific to a particular security association	
SPI size	‘00000000’B	SPI field not present	
Notify Message Type	'0100000000010110'B	REDIRECT_SUPPORTED	

Table 15.4.3.3-2: Message IKE_SA_INIT (step 2, Table 15.4.3.2-1)

Information Element	Value/remark	Comment	Condition
IKE Header			
Initiator’s IKE_SA SPI	Same as that set by the UE in IKE_SA_INIT as Step 1		
Responder’s IKE_SA SPI	Set by the SS		
Next Payload	‘00100001’B	SA	
Exchange Type	‘00100010’B	IKE_SA_INIT	
Security Association Payload			
Next Payload	’00100010’B	KE	
Proposal	One of the 2 proposals included in IKE_SA_INIT at Step 1		
Key Exchange Payload			
Next payload	‘00 101000’B	Nonce	
DH Group #	‘0000000000000010’B	DH group 2	
Key Exchange data	Set by the SS		
Nonce Payload			
Next t payload	‘00000000’B	No Next Payload	
Nonce data	Set by the SS		

Table 15.4.3.3-3: Message IKE_AUTH Request (step 3, Table 15.4.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00100011'B	IDi	
Initialization Vector	Random value set by the UE		
Encrypted IKE Payloads			
Identification – Initiator Payload			
Next Payload	'00101111'B	CP	
ID Type	00000010B		
ID	Set to MN-NAI		
Configuration Payload			
Next Payload	'00100001'B	SA	
CFG Type	'00000001'B	Request	
Configuration Attribute	'00010000'B	MIP6_HOME_PREFIX attribute	
Length	'0000000000000000'B		
Security Association Payload			
Next Payload	'00101100'B	TSi	
Proposals	Any set of allowed values		
Traffic Selector – Initiator Payload			
Next Payload	'00101100'B	TSr	
Traffic selector data	Any allowed set of values		
Traffic Selector – Responder Payload			
Next Payload	'00100100'B	IDr	
Traffic selector data	Any allowed set of values		
Identification – Responder Payload			
Next Payload	'00000000'B	No Next Payload	
ID Type	'00000010'B		
ID	APN		
Padding	Set by the UE	Fields from Encrypted payload	
Pad Length	Set by the UE	Fields from Encrypted payload	
Integrity checksum data	Set by the UE	Fields from Encrypted payload	

Table 15.4.3.3-4: Message IKE_AUTH Response (step 4, Table 15.4.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00100100'B	IDr	
Initialization Vector	Set by the SS		
Encrypted IKE Payloads			
Identification – Responder Payload			
Next Payload	'00100101'B	CERT	
ID Type	'00000010'B		
ID	APN		
Certificate Payload			
Next Payload	'00110000'B	EAP	
Cert encoding	'00000100'B	X.509 certificate - signature	
Certificate data	Set by the SS	DER encoded X.509 certificate	
Extensible Authentication Payload			
Next Payload	'00000000'B	No Next Payload	
Code	'00000001'B	Request	
Type	'00010111'B	AKA	
Subtype		AKA-Challenge	
Attribute type	'00000001'B	AT_RAND	
AT_RAND	An arbitrarily selected 128 bits value		
Attribute Type	'00000010'B	AT_AUTN	
AT_AUTN	See TS 24.301 [28] subclause 9.9.3.2		
Padding	Set by the SS	Fields from Encryption payload	
Pad Length	Set by the SS	Fields from Encryption payload	
Integrity checksum data	Set by the SS	Fields from Encryption payload	

Table 15.4.3.3-5: Message IKE_AUTH Request (step 5, Table 15.4.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00110000'B	EAP	
Initialization Vector	Random value set by the UE		
Encrypted IKE Payloads			
Extensible Authentication Payload			
Next Payload	'00000000'B	No Next Payload	
Code	'00000010'B	Response	
Type	'00010111'B	AKA	
Subtype		AKA-Challenge	
Attribute type	'00000011'B	AT_RES	
AT_RES	See TS 24.301 [28] subclause 9.9.3.4		
Padding	Set by the UE	Fields from Encryption payload	
Pad Length	Set by the UE	Fields from Encryption payload	
Integrity checksum data	Set by the UE	Fields from Encryption payload	

Table 15.4.3.3-6: Message IKE_AUTH Response (step 6, Table 15.4.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00110000'B	EAP	
Initialization Vector	Set by the SS		
Encrypted IKE Payloads			
Extensible Authentication Payload			
Next Payload	'00000000'B	No Next Payload	
Code	'00000011'B	Success	
Padding	Set by the SS	Fields from Encryption payload	
Pad Length	Set by the SS	Fields from Encryption payload	
Integrity checksum data	Set by the SS	Fields from Encryption payload	

Table 15.4.3.3-7: Message IKE_AUTH Request (step 7, Table 15.4.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'	IKE_AUTH	
Encrypted Payload			
Next Payload	'00100111'B	AUTH	
Initialization Vector	Random value set by the UE		
Encrypted IKE Payloads			
Authentication Payload			
Next Payload	'00000000'B	No Next Payload	
Auth Method	'00000010'B	Shared Key Integrity code	
Auth Data	derived from the MSK obtained from AKA exchange	RFC 4306 defines the function to derive this key (section 2.15)	
Padding	Set by the UE	Fields from Encryption payload	
Pad Length	Set by the UE	Fields from Encryption payload	
Integrity checksum data	Set by the UE	Fields from Encryption payload	

Table 15.4.3.3-8: Message IKE_AUTH Response (step 8, Table 15.4.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00100111'B	AUTH	
Initialization Vector	Set by the SS		
Encrypted IKE Payloads			
Authentication Payload			
Next Payload	'00101001'B	Notify	
Auth Method	'00000010'B	Shared Key Integrity code	
Auth Data	derived from the MSK obtained from AKA exchange	RFC 4306 defines the function to derive this key (section 2.15)	
Notify Payload			
Next Payload	'00100001'B	SA	
Protocol ID	'00000000'B	Notification is not specific to a particular security association	
SPI Size	'00000000'B	SPI field not present	
Notify Message Type Length	'0100000000010111'B	REDIRECT	
GW Ident Type	'00000101'B		
New Responder GW Identity	IPv6 address of the HA to relocate		
GW Ident Type	'00000001'B		
New Responder GW Identity	IPv4 address of the HA to relocate	Optional	
Security Association Payload			
Next Payload	'00101101'	TSi	
Proposal	One of the 2 proposals included in IKE_AUTH Request at Step 3		
Traffic Selector – Initiator Payload			
Next Payload	'00101100'B	TSr	
Traffic Selector data	Any allowed set of values		
Traffic Selector – Responder Payload			
Next Payload	'00000000'B	No Next Payload	
Traffic Selector data	Any allowed set of values		
Padding	Set by the SS	Fields from Encryption payload	
Pad Length	Set by the SS	Fields from Encryption payload	
Integrity checksum data	Set by the SS	Fields from Encryption payload	

Table 15.4.3.3-910: Message IKE_SA_INIT (step 109, Table 15.4.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Set by the UE		
Responder's IKE_SA SPI	0	First message in IKE_SA_INIT exchange	
Next Payload	'00100001'B	SA	
Exchange Type	'00100010'B	IKE_SA_INIT	
Security Association Payload			
Next Payload	'00100010'B	KE	
More proposal	'00000010'B		
Proposal #	'00000001'B	First cryptographic suite (section 6.5 of TS 33.234)	
Protocol ID	'00000001'B	IKE	
SPI size	'00000000'B		
Number of transforms	'00000010'B		
More transform	'00000011'B	This is the transform for confidentiality	
Transform type	'00000001'B	Encryption	
Transform ID	'00000011'B	3DES in CBC mode (ENCR_3DES)	
More transform	'00000011'B	This is the transform for prf	
Transform type	'00000010'B	PRF	
Transform ID	'00000010'B	PRF_HMAC_SHA 1 (HMAC-SHA1)	
More transform	'00000011'B	This is the transform for integrity	
Transform type	'00000011'B	Integrity	
Transform ID	'00000010'B	HMAC-SHA1-96 (AUTH_HMAC_S HA1_96)	
Last transform	'00000000'B	This is the transform for DH	
Transform type	'00000100'B	DH	
Transform ID	'00000010'B	Diffie-Hellman group 2 (1024-bit MODP)	
Last proposal	'00000000'B		
Proposal #	'00000010'B	Second cryptographic suite (section 6.5 of TS 33.234)	
Protocol ID	'00000001'B	IKE	
SPI size	'00000000'B		
Number of transforms	'00000010'B		
More transform	'00000011'B	This is the transform for confidentiality	
Transform type	'00000001'B	Encryption	
Transform ID	'00001011'B	AES with 128-bit keys in CBC mode (ENCR_AES_CB C)	
More transform	'00000011'B	This is the transform for prf	
Transform type	'00000010'B	PRF	
Transform ID	'00000100'B	PRF_AES128_XC BC_ AES-XCBC-	

		PRF-128	
More transform	‘00000011’B	This is the transform for integrity	
Transform type	‘00000011’B	Integrity	
Transform ID	‘00000101’B	AES-XCBC-MAC-96 (AUTH_ AES-XCBC -96)	
Last transform	‘00000000’B	This is the transform for DH	
Transform type	‘00000100’B	DH	
Transform ID	‘00000010’B	Diffie-Hellman group 2 (1024-bit MODP)	
Key Exchange Payload			
Next Payload	‘00101000’B	Nonce	
DH Group #	‘0000000000000010’B	DH group 2	
Key Exchange data	Set by the UE		
Nonce Payload			
Next Payload	‘00101001’B	Notify (REDIRECT_SUPPORTED)	
Nonce data	Random number set by the UE		
REDIRECT_SUPPORTED Notify Payload			
Next Payload	‘00101001’B	Notify (REDIRECT_FROM)	
Protocol ID	‘00000000’B	Notification is not specific to a particular security association	
SPI size	‘00000000’B	SPI field not present	
Notify Message Type	'0100000000010110'B	REDIRECT_SUPPORTED	
Notify Payload			
Next Payload	‘00000000’B	No next payload	
Protocol ID	‘00000000’B	Notification is not specific to a particular security association	
SPI Size	‘00000000’B	SPI field not present	
Notify Message Type	‘0100000000011000’B	REDIRECT_From	
GW Ident Type	Any allowed value (IPv6 or IPv4 or HA FQDN)	Set depending on how the UE has discovered the HA in the preamble	
New Responder GW Identity	Depends on GW Ident type		

15.5 Security association establishment without home agent reallocation procedure

15.5.1 Test Purpose (TP)

(1)

```
with { UE has acquired an IP address }
ensure that {
  when { UE has acquired the IP address of the Home Agent }
    then { UE transmits an IKE_SA_INIT message addressed to the Home Agent to initiate security
association establishment }
            }
```

(2)

```
with { UE has transmitted an IKE_SA_INIT message addressed to the Home Agent to initiate security
association establishment }
ensure that {
  when { UE receives an IKE_SA_INIT response message }
    then { UE transmits an IKE_AUTH Request message containing the configuration payload
MIP6_HOME_PREFIX to receive the prefix to use for Home Address configuration }
            }
```

(3)

```
with { UE has transmitted an IKE_AUTH Request message containing the configuration payload
MIP6_HOME_PREFIX to receive the prefix to use for Home Address configuration }
ensure that {
  when { UE receives an IKE_AUTH Response message including an EAP-Request/AKA Challenge }
    then { UE transmits an IKE_AUTH Request message containing the correct EAP-Response/AKA-
Challenge }
            }
```

(4)

```
with { UE has transmitted an IKE_AUTH Request message containing an EAP-Response/AKA-Challenge }
ensure that {
  when { UE receives an IKE_AUTH Response message including EAP-Success }
    then { UE transmits an IKE_AUTH Request message with Authentication payload }
            }
```

(5)

```
with { UE has transmitted an IKE_AUTH Request message with Authentication payload }
ensure that {
  when { UE receives an IKE_AUTH Response message with configuration payload MIP6_HOME_PREFIX
containing the Home Network Prefix HNP associated to the UE }
    then { UE transmits a CREATE_CHILD_SA  Request  message including traffic selectors fields (TSi
and TSr) that contain the parameters identifying the Binding Update (BU)/Binding Acknowledgments
(BA)  messages }
            }
```

15.5.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clause 5.1.2.2.

[TS 24.303, clause 5.1.2.2]

The UE shall support the IKEv2 protocol (see IETF RFC 4306 [14]) for negotiating the IPsec security association to secure DSMIPv6 signalling and shall support EAP over IKEv2 as described in IETF RFC 4306 [14] to perform authentication with an AAA server. In a case an additional authentication and authorization of the IPSec security association is needed with an external AAA server, then the additional authentication steps during the IKEv2 exchange shall be supported as specified in IETF RFC 4739 [23] and described in 3GPP TS 33.234 [24].

The UE shall support IPsec ESP (see IETF RFC 4303 [11]) in order to provide authentication of Binding Update and Binding Acknowledgement messages as specified in IETF RFC 4877 [4]. The UE shall support multiple authentication exchanges in the IKEv2 protocol as specified in IETF RFC 4739 [23] in order to support authentication with an external AAA server. The UE shall support the redirect mechanism as defined in draft-ietf-ipsecme-ikev2-redirect [30].

The UE shall initiate the security association establishment procedure by sending the IKE_SA_INIT request message defined in IETF RFC 4306 [14] to the HA. The UE shall indicate support for the HA reallocation by including a REDIRECT_SUPPORTED payload in the IKE_SA_INIT request as specified in draft-ietf-ipsecme-ikev2-redirect [30]. On receipt of an IKE_SA_INIT response, the UE shall send an IKE_AUTH request message including the MN-NAI in the IDi payload and the Access Point Name (APN) of the target PDN the UE wants to connect to in the IDr payload. The APN shall be formatted as defined in 3GPP TS 23.003 [17]. The username part of the MN-NAI included in "IDi" payload may be an IMSI, pseudonym or re-authentication ID. The UE shall include in the IDi payload the same MN-NAI it includes in the EAP-Response/Identity within the EAP-AKA exchange.

In the very first EAP-Response/Identity within the IKEv2 exchange the UE shall include a NAI whose username is derived from IMSI. In subsequent exchanges the UE should use pseudonyms and re-authentication identities provided by the 3GPP AAA server as specified in IETF RFC 4187 [26].

NOTE: Fast re-authentication mechanism is optional, and therefore is an implementation option in the UE and operator configuration issue (i.e. it also depends on whether the AAA server sent a re-authentication ID during previous EAP authentication) whether to use it during security association establishment.

EAP-AKA over IKEv2 shall be used to authenticate UE in the IKE_AUTH exchange, while public key signature based authentication with certificates shall be used to authenticate the HA.

…

During the IKEv2 exchange, the UE shall request the allocation of an IPv6 home prefix through the Configuration Payload in the IKE_AUTH. Since in EPS a unique IPv6 prefix is assigned to the UE, the UE shall include a MIP6_HOME_PREFIX attribute in the CFG_REQUEST message as described in IETF RFC 5026 [10]. In addition the UE may include the INTERNAL_IP6_DNS attribute in the CFG_REQUEST as described in IETF RFC 4306 [14] to request the DNS server IPv6 address of the PLMN it is connecting to via DSMIPv6. In the same way the UE may include the INTERNAL_IP4_DNS attribute in the CFG_REQUEST to request the IPv4 address of the DNS server.

The UE shall then auto-configure a Home Address from the IPv6 prefix received from the HA and shall run a CREATE_CHILD_SA exchange to create the security association for the new Home Address. In the CREATE_CHILD_SA exchange the UE shall include the Home Address and the appropriate selectors in the TSi (Traffic Selector-initiator) payload to negotiate the IPsec security association for protecting the Binding Update and Binding Acknowledgement messages as specified in IETF RFC 4877 [4].

15.5.3 Test description

15.5.3.1 Pre-test conditions

System Simulator:

- Cell 1.

UE:

None.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IP address.
- The UE has discovered the IP address of the Home Agent (either via DNS, DHCPv6, IKEv2 signalling or during Attach Procedure via PCO).

15.5.3.2 Test procedure sequence

Table 15.5.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Check: Does the UE transmit an IKE_SA_INIT message addressed to the Home Agent?	-->	IKE_SA_INIT	1	P
2	The SS transmits an IKE_SA_INIT message.	<--	IKE_SA_INIT	-	-
3	Check: Does the UE transmit an IKE_AUTH Request message containing the configuration payload MIP6_HOME_PREFIX, a MN-NAI derived from UE IMSI in the IDi field and an APN in the IDr field?	-->	IKE_AUTH Request	2	P
4	The SS transmits an IKE_AUTH Response message including an EAP-Request/AKA-Challenge.	<--	IKE_AUTH Response	-	-
5	Check: Does the UE transmit an IKE_AUTH Request message including the EAP-Response/AKA-Challenge?	-->	IKE_AUTH Request	3	P
6	The SS transmits an IKE_AUTH Response message including EAP-Success.	<--	IKE_AUTH Response	-	-
7	Check: Does the UE transmit an IKE_AUTH Request message with Authentication payload?	-->	IKE_AUTH Request	4	P
8	The SS transmits an IKE_AUTH Response message with configuration payload MIP6_HOME_PREFIX containing the Home Network Prefix HNP associated to the UE.	<--	IKE_AUTH Response	-	-
9	Check: Does the UE transmit a CREATE_CHILD_SA Request message including traffic selectors' fields (TSi and TSr) that contain the parameters identifying the Binding Update (BU) / Binding Acknowledgments (BA) messages?	-->	CREATE_CHILD_SA Request	5	P
10	The SS transmits a CREATE_CHILD_SA Response message.	<--	CREATE_CHILD_SA Response	-	-

15.5.3.3 Specific message contents

Table 15.5.3.3-1: Message IKE_SA_INIT (step 1, Table 15.5.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Set by the UE		
Responder's IKE_SA SPI	0	First message in IKE_SA_INIT exchange	
Next Payload	'00100001'B	SA	
Exchange Type	'00100010'B	IKE_SA_INIT	
Security Association Payload			
Next Payload	'00100010'B	KE	
More proposal	'00000010'B		
Proposal #	'00000001'B	First cryptographic suite (section 6.5 of TS 33.234)	
Protocol ID	'00000001'B	IKE	
SPI size	'00000000'B		
Number of transforms	'00000010'B		
More transform	'00000011'B	This is the transform for confidentiality	
Transform type	'00000001'B	Encryption	
Transform ID	'00000011'B	3DES in CBC mode (ENCR_3DES)	
More transform	'00000011'B	This is the transform for prf	
Transform type	'00000010'B	PRF	
Transform ID	'00000010'B	PRF_HMAC_SHA 1 (HMAC-SHA1)	
More transform	'00000011'B	This is the transform for integrity	
Transform type	'00000011'B	Integrity	
Transform ID	'00000010'B	HMAC-SHA1-96 (AUTH_HMAC_S HA1_96)	
Last transform	'00000000'B	This is the transform for DH	
Transform type	'00000100'B	DH	
Transform ID	'00000010'B	Diffie-Hellman group 2 (1024-bit MODP)	
Last proposal	'00000000'B		
Proposal #	'00000010'B	Second cryptographic suite (section 6.5 of TS 33.234)	
Protocol ID	'00000001'B	IKE	
SPI size	'00000000'B		
Number of transforms	'00000010'B		
More transform	'00000011'B	This is the transform for confidentiality	
Transform type	'00000001'B	Encryption	
Transform ID	'00001011'B	AES with 128-bit keys in CBC mode (ENCR_AES_CB C)	
More transform	'00000011'B	This is the transform for prf	
Transform type	'00000010'B	PRF	

Transform ID	‘00000100’B	PRF_AES128_XCBC_ AES-XCBC-PRF-128	
More transform	‘00000011’B	This is the transform for integrity	
Transform type	‘00000011’B	Integrity	
Transform ID	‘00000101’B	AES-XCBC-MAC-96 (AUTH_ AES-XCBC -96)	
Last transform	‘00000000’B	This is the transform for DH	
Transform type	‘00000100’B	DH	
Transform ID	‘00000010’B	Diffie-Hellman group 2 (1024-bit MODP)	
Key Exchange Payload			
Next Payload	‘00101000’B	Nonce	
DH Group #	‘0000000000000010’B	DH group 2	
Key Exchange data	Set by the UE		
Nonce Payload			
Next Payload	‘00101001’B	Notify (REDIRECT_SUPPORTED)	
Nonce data	Random number set by the UE		
REDIRECT_SUPPORTED Notify Payload			
Next Payload	‘00000000’B	No Next Payload	
Protocol ID	‘00000000’B	Notification is not specific to a particular security association	
SPI size	‘00000000’B	SPI field not present	
Notify Message Type	'0100000000010110'B	REDIRECT_SUPPORTED	

Table 15.5.3.3-2: Message IKE_SA_INIT (step 2, Table 15.5.3.2-1)

Information Element	Value/remark	Comment	Condition
IKE Header			
Initiator’s IKE_SA SPI	Same as that set by the UE in IKE_SA_INIT as Step 1		
Responder’s IKE_SA SPI	Set by the SS		
Next Payload	‘00100001’B	SA	
Exchange Type	‘00100010’B	IKE_SA_INIT	
Security Association Payload			
Next Payload	’00100010’B	KE	
Proposal	One of the 2 proposals included in IKE_SA_INIT at Step 1		
Key Exchange Payload			
Next payload	‘00 101000’B	Nonce	
DH Group #	‘0000000000000010’B	DH group 2	
Key Exchange data	Set by the SS		
Nonce Payload			
Next t payload	‘00000000’B	No Next Payload	
Nonce data	Set by the SS		

Table 15.5.3.3-3: Message IKE_AUTH Request (step 3, Table 15.5.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00100011'B	IDi	
Initialization Vector	Random value set by the UE		
Encrypted IKE Payloads			
Identification – Initiator Payload			
Next Payload	'00101111'B	CP	
ID Type	00000010B		
ID	Set to MN-NAI		
Configuration Payload			
Next Payload	'00100001'B	SA	
CFG Type	'00000001'B	Request	
Configuration Attribute	'00010000'B	MIP6_HOME_PREFIX attribute	
Length	'0000000000000000'B		
Security Association Payload			
Next Payload	'00101100'B	TSi	
Proposals	Any set of allowed values		
Traffic Selector – Initiator Payload			
Next Payload	'00101100'B	TSr	
Traffic selector data	Any allowed set of values		
Traffic Selector – Responder Payload			
Next Payload	'00100100'B	IDr	
Traffic selector data	Any allowed set of values		
Identification – Responder Payload			
Next Payload	'00000000'B	No Next Payload	
ID Type	'00000010'B		
ID	APN		
Padding	Set by the UE	Fields from Encrypted payload	
Pad Length	Set by the UE	Fields from Encrypted payload	
Integrity checksum data	Set by the UE	Fields from Encrypted payload	

Table 15.5.3.3-4: Message IKE_AUTH Response (step 4, Table 15.5.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00100100'B	IDr	
Initialization Vector	Set by the SS		
Encrypted IKE Payloads			
Identification – Responder Payload			
Next Payload	'00100101'B	CERT	
ID Type	'00000010'B		
ID	APN		
Certificate Payload			
Next Payload	'00110000'B	EAP	
Cert encoding	'00000100'B	X.509 certificate - signature	
Certificate data	Set by the SS	DER encoded X.509 certificate	
Extensible Authentication Payload			
Next Payload	'00000000'B	No Next Payload	
Code	'00000001'B	Request	
Type	'00010111'B	AKA	
Subtype		AKA-Challenge	
Attribute type	'00000001'B	AT_RAND	
AT_RAND	An arbitrarily selected 128 bits value		
Attribute Type	'00000010'B	AT_AUTN	
AT_AUTN	See TS 24.301 [28] subclause 9.9.3.2		
Padding	Set by the SS	Fields from Encryption payload	
Pad Length	Set by the SS	Fields from Encryption payload	
Integrity checksum data	Set by the SS	Fields from Encryption payload	

Table 15.5.3.3-5: Message IKE_AUTH Request (step 5, Table 15.5.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00110000'B	EAP	
Initialization Vector	Random value set by the UE		
Encrypted IKE Payloads			
Extensible Authentication Payload			
Next Payload	'00000000'B	No Next Payload	
Code	'00000010'B	Response	
Type	'00010111'B	AKA	
Subtype		AKA-Challenge	
Attribute type	'00000011'B	AT_RES	
AT_RES	See TS 24.301 [28] subclause 9.9.3.4		
Padding	Set by the UE	Fields from Encryption payload	
Pad Length	Set by the UE	Fields from Encryption payload	
Integrity checksum data	Set by the UE	Fields from Encryption payload	

Table 15.5.3.3-6: Message IKE_AUTH Response (step 6, Table 15.5.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00110000'B	EAP	
Initialization Vector	Set by the SS		
Encrypted IKE Payloads			
Extensible Authentication Payload			
Next Payload	'00000000'B	No Next Payload	
Code	'00000011'B	Success	
Padding	Set by the SS	Fields from Encryption payload	
Pad Length	Set by the SS	Fields from Encryption payload	
Integrity checksum data	Set by the SS	Fields from Encryption payload	

Table 15.5.3.3-7: Message IKE_AUTH Request (step 7, Table 15.5.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'	IKE_AUTH	
Encrypted Payload			
Next Payload	'00100111'B	AUTH	
Initialization Vector	Random value set by the UE		
Encrypted IKE Payloads			
Authentication Payload			
Next Payload	'00000000'B	No Next Payload	
Auth Method	'00000010'B	Shared Key Integrity code	
Auth Data	derived from the MSK obtained from AKA exchange	RFC 4306 defines the function to derive this key (section 2.15)	
Padding	Set by the UE	Fields from Encryption payload	
Pad Length	Set by the UE	Fields from Encryption payload	
Integrity checksum data	Set by the UE	Fields from Encryption payload	

Table 15.5.3.3-8: Message IKE_AUTH Response (step 8, Table 15.5.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00100011'B	IKE_AUTH	
Encrypted Payload			
Next Payload	'00100111'B	AUTH	
Initialization Vector	Set by the SS		
Encrypted IKE Payloads			
Authentication Payload			
Next Payload	'00101111'B	CP	
Auth Method	'00000010'B	Shared Key Integrity code	
Auth Data	derived from the MSK obtained from AKA exchange	RFC 4306 defines the function to derive this key (section 2.15)	
Configuration Payload			
Next Payload	'00100001'B	SA	
CFG Type	'00000010'B	Reply	
Configuration Attribute	'00010000'B	MIP6_HOME_PREFIX attribute	
Length	'0000000000010101'B		
Prefix lifetime	Any allowed value		
Home Prefix	IPv6 prefix – 16 bytes		
Prefix length	'10000000'B	Prefix length must be 64	
Security Association Payload			
Next Payload	'00101101'	TSi	
Proposal	One of the 2 proposals included in IKE_AUTH Request at Step 3		
Traffic Selector – Initiator Payload			
Next Payload	'00101100'B	TSr	
Traffic Selector data	Any allowed set of values		
Traffic Selector – Responder Payload			
Next Payload	'00000000'B	No Next Payload	
Traffic Selector data	Any allowed set of values		
Padding	Set by the SS	Fields from Encryption payload	
Pad Length	Set by the SS	Fields from Encryption payload	
Integrity checksum data	Set by the SS	Fields from Encryption payload	

Table 15.5.3.3-9: Message CREATE_CHILD_SA Request (step 9, Table 15.5.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00 100100'B	CREATE_CHILD_SA	
Encrypted Payload			
Next Payload	'00100001'B	SA	
Initialization Vector	Random value set by the UE		
Encrypted IKE Payloads			
Security Association Payload			
Next Payload	'00101000'B	Ni	
More proposal	'00000010'B		
Proposal #	'00000001'B	First cryptographic suite (section 6.6 of TS 33.234)	
Protocol ID	'00000011'B	ESP	
SPI size	'00000100'B		
# of transforms	'00000010'B		
SPI	Set by the UE		
More transform	'00000011'B	This is the transform for confidentiality	
Transform type	'00000001'B	Encryption	
Transform ID	'00000011'B	3DES in CBC mode (ENCR_3DES)	
Last transform	'00000000'B	This is the transform for integrity	
Transform type	'00000011'B	Integrity	
Transform attribute ID	'00000010'B	HMAC-SHA1-96 (AUTH_HMAC_SHA1_96)	
Last proposal	'00000000'B		
Proposal #	'00000010'B	Second cryptographic suite (section 6.6 of TS 33.234)	
Protocol ID	'00000011'B	ESP	
SPI size	'00000100'B		
# of transforms	'00000010'B		
SPI	Set by the UE		
More transform	'00000011'B	This is the transform for confidentiality	
Transform type	'00000001'B	Encryption	
Transform ID	'00001011'B	AES with 128-bit keys in CBC mode (ENCR_AES_CBC)	
Last transform	'00000000'B	This is the transform for integrity	
Transform type	'00000011'B	Integrity	
Transform ID	'00000101'B	AES-XCBC-MAC-96 (AUTH_ AES-XCBC -96)	
Nonce Payload			

Next Payload	‘00101100’B	TSi	
Nonce data	Random number set by the UE		
Traffic Selector – Initiator Payload			
Next Payload	‘00101101’B	TSr	
Traffic Selector data	Any set of values containing the traffic selector of the CREATE_CHILD_SA Response at Step 10		
Traffic Selector – Responder Payload			
Next Payload	‘00101001’B	Notify (Use transport mode)	
Traffic Selector data	Any set of values containing the traffic selector of the CREATE_CHILD_SA Response at Step 10		
Use transport mode Notify Payload			
Next payload	‘00101001’B	Notify (Use transport mode)	
Protocol ID	‘00000011’B	ESP	
SPI size	‘00000100’B		
Notify Message Type	‘1000000000000111’B	Use transport mode	
SPI	Same as that set by the UE in SA proposal #1		
Use transport mode Notify Payload			
Next payload	‘00000000’B	No Next Payload	
Protocol ID	‘00000011’B	ESP	
SPI size	‘00000100’B		
Notify Message Type	‘1000000000000111’B	Use transport mode	
SPI	Same as that set by the UE in SA proposal #1		
Padding	Set by the UE	Fields from Encryption payload	
Pad Length	Set by the UE	Fields from Encryption payload	
Integrity checksum data	Set by the UE	Fields from Encryption payload	

Table 15.5.3.3-10: Message CREATE_CHILD_SA Response (step 10, Table 15.5.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 1		
Responder's IKE_SA SPI	Same as that set by the SS at Step 2		
Next Payload	'00101110'B	E	
Exchange Type	'00 100100'B	CREATE_CHILD_ SA	
Encrypted Payload			
Next Payload	'00100001'	SA	
Initialization Vector	Set by the SS		
Encrypted IKE Payloads			
Security Association Payload			
Next Payload	'00101000'B	Nr	
Last proposal	'00000000'B		
Proposal #	One of the 2 proposals included in the CREATE_CHILD_SA Request at Step 9		
Protocol ID	'00000011'B	ESP	
SPI size	'00000100'B		
SPI	Set by the SS		
First transform	'00000011'B	This is the transform for confidentiality	
Transform type	'00000001'B	Encryption	
Transform attribute type	The corresponding value of the chosen proposal		
Last transform	'00000000'B	This is the transform for integrity	
Transform type	'00000011'B	Integrity	
Transform attribute type	The corresponding value of the chosen proposal		
Nonce Payload			
Next Payload	'00101100'B	TSi	
Nonce data	Set by the SS		
Traffic Selector – Initiator Payload			
Next Payload	'00101101'B	TSr	
Number of traffic selectors	'00000010'B		
TS type	'00001000'B	IPv6 range	
IP protocol	'10000111B	Mobility header	
Start port	'0000010100000000'B	BU	
End port	'0000010100000000'B	BU	
Starting-address	HoA address derived from HNP		
Ending address	HoA address derived from HNP		
TS type	'00001000'B	IPv6 range	
IP protocol	'10000111B	Mobility header	
Start port	'0000011000000000'B	BA	
End port	'0000011000000000'B	BA	
Starting-address	HoA address derived from HNP		
Ending address	HoA address derived from HNP		
Traffic Selector – Responder Payload			
Next Payload	'00101001'B	Notify (Use transport mode)	
Number of traffic selectors	'00000010'B		
Ts type	'00001000'B	IPv6 range	
IP protocol	'10000111B	Mobility header	
Start port	'0000010100000000'B	BU	

End port	‘0000010100000000’B	BU	
Starting-address	HA address		
Ending address	HA address		
TS type	‘00001000’B	IPv6 range	
IP protocol	‘10000111’B	Mobility header	
Start port	‘0000011000000000’B	BA	
End port	‘0000011000000000’B	BA	
Starting-address	HA address		
Ending address	HA address		
Use transport mode Notify Payload			
Next Payload	‘00000000’B		
Protocol ID	‘00000011’B	ESP	
SPI size	Set by the SS		
Notify Message Type	‘1000000000000111’B	Use transport mode	
SPI	Same as that set by the SS in the accepted SA proposal		
Padding	Set by the SS	Fields from Encryption payload	
Pad Length	Set by the SS	Fields from Encryption payload	
Integrity checksum data	Set by the SS	Fields from Encryption payload	

15.6 Registration of a new IPv6 CoA (Binding Update/Acknowledgment procedure in IPv6 network)

15.6.1 Test Purpose (TP)

(1)

```
with { UE has established a security association with the Home Agent and received the IPv6 Home
Address }
ensure that {
  when { UE receives a Router Advertisement containing an IPv6 prefix different from the Home
Network Prefix assigned to the UE during the preamble and different from the prefixes contained in
the UE's Prefix list }
    then { UE transmits a Binding Update message in order to register it Home Address and Care-of-
Address at the Home Agent }
            }
```

15.6.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clauses 5.1.2.3, 5.1.2.4, and 5.2.2.3.

[TS 24.303, clause 5.1.2.3]

The DSMIPv6 Home Link Detection Function is used by the UE to detect if an access interface is on the home link for a PDN from a DSMIPv6 perspective. The Home Link Detection function shall be performed before sending DSMIPv6 Binding Update via the same access interface.

To perform the Home Link Detection procedure, the UE shall compare the assigned Home Network Prefix for a PDN with the IPv6 prefix or prefixes included in the Prefix Information Option in the Router Advertisements received on the local link. The Home Network Prefix can be assigned in a 3GPP access via PCO, as specified in 3GPP TS 24.301 [15], or via IKEv2 as specified in subclause 5.1.2.2. If there is a match between the Home Network Prefix and one of the local prefixes, the UE is attached on the home link over the respective access interface and shall not send a Binding Update to the HA unless the UE currently has a valid DSMIPv6 Binding Update list entry. If the UE has a valid DSMIPv6 Binding Update list entry, the UE shall proceed to perform the action specified in subclause 5.2.2.4. If there is not any match, the UE shall proceed as specified in subclause 5.1.2.4.

NOTE: The UE does not need to run IKEv2 for home link detection if the Home Network prefix is dynamically received in a PCO Information Element.

[TS 24.303, clause 5.1.2.4]

After establishing the security association and obtaining the IPv6 Home Address, the UE shall send a Binding Update message as specified in IETF RFC 3775 [6] and IETF RFC 5555 [2] in order to register its Home Address and Care-of Address at the HA, if it detects it is in the foreign network.

If both IPv4 and IPv6 Care-of Address are received at the foreign network, the UE shall first attempt to use the IPv6 Care-of Address for its binding registration. The UE shall not register both IPv4 and IPv6 Care-of Address to it's HA.

If IPv6 Care-of Address is used for initial binding registration, the UE shall send the Binding Update message to the IPv6 address of the HA. In this Binding Update message the H (home registration) and A (acknowledge) bits shall be set. If the UE needs an IPv4 Home Address, the UE shall include the 0.0.0.0 address in the IPv4 Home Address option to request a dynamic IPv4 Home Address.

When IPv6 Care-of Address is used for initial binding registration, the Alternate Care-of Address option shall be used by the UE to carry the Care-of Address inside a Mobility Header which is protected by ESP. If this option is present, the address included in this option is the same address present in the source address of the IPv6 packet.

If IPv4 Care-of Address is used for initial binding registration, the UE shall send the Binding Update as follows (see IETF RFC 5555 [2]):

- The IPv6 packet, with the IPv6 Home Address as the Source Address field of the IPv6 header, shall be encapsulated in UDP.
- The UE shall include the IPv4 Care-of Address as the Source Address field of the IPv4 header and the HA IPv4 address as the Destination Address field of the IPv4 header.
- The UE shall include the IPv4 Care-of Address option containing the IPv4 Care-of Address.
- The UE shall set the H (home registration) and A (acknowledge) flags.
- The UE shall set the F (UDP encapsulation required) flag to 0.
- The UE shall set the R (Mobile Router Flag) flag to 1.
- If the UE needs an IPv4 Home Address, the UE shall include an IPv4 Home Address option with the 0.0.0.0 address in the Binding Update message, as defined in IETF RFC 5555 [2].

When the UE receives the Binding Acknowledgement from the HA, it shall validate it based on the rules described in IETF RFC 3775 [6] and IETF RFC 5555 [2]. If the Binding Acknowledgement contains the successful status code 0 ("Binding Update Accepted"), the UE shall create an entry for the registered Home Address in its Binding Update List and may start sending packets containing its IPv6 Home Address or other IPv6 addresses auto-configured from the assigned home network prefix.

If the Binding Acknowledgement contains a value of 128, the UE may re-send the BU as specified in IETF RFC 3775 [6]. If the Binding Acknowledgement contains a value from 129 to 133 as specified in IETF RFC 3775 [6] or a value from 140 to 143 as specified in IETF RFC 3963 [29], the UE shall not send the BU to the HA and should discover another HA.

If the Binding Acknowledgment contains an IPv4 Address Acknowledgement option with status code value from 0 to 127 (indicating success), the UE shall create two entries in its Binding Update List, one for the IPv6 Home Address and another for the IPv4 Home Address. If the Binding Acknowledgement contains an IPv4 Address Acknowledgment option with status code indicating error (i.e. 128 or higher), the UE shall create an entry only for the IPv6 HoA in its binding update list. Moreover, if the status code is 129 ("Administratively prohibited") or 132 ("Dynamic IPv4 home address assignment not available"), the UE shall not re-send the Binding Update and it shall use only the IPv6 HoA. If the Binding Acknowledgement contains an IPv4 Address Acknowledgement option with status 128 ("Failure, reason unspecified"), 130 ("Incorrect IPv4 home address"), 131 ("Invalid IPv4 address") or 133 ("Prefix allocation unauthorized") it shall re-send the Binding Update including the 0.0.0.0 address in the IPv4 Home Address option. If the Binding Acknowledgement does not contain an IPv4 Address Acknowledgment option, the UE shall create an entry only for the IPv6 HoA in its binding update list.

NOTE: The value to be used to identify the IPv4 address acknowledgement option in the mobility header is 30;

The UE may then send data traffic either with the IPv6 Home Address or with the IPv4 Home Address. If the UE is located on an IP6-enabled link, it shall send IPv6 packets as described in IETF RFC 3775 [6]; IPv4 traffic shall be encapsulated in IPv6 packets as described in IETF RFC 5555 [2]. If the UE is located on an IPv4-only link and the Binding Acknowledgement contains the NAT detection option with the F flag set, the UE shall send IPv6 and IPv4 packets following the vanilla UDP encapsulation rules specified in IETF RFC 5555 [2]. Otherwise the UE shall send IPv6 and IPv4 packets encapsulated in IPv4 as specified in IETF RFC 5555 [2].

Once the DSMIPv6 tunnel is established, the UE may build a DHCPv4 or DHCPv6 message as described in IETF RFC 4039 [26] or IETF RFC 3736 [13] respectively and send it via the DSMIPv6 tunnel as described in IETF RFC 3775 [6] in order to retrieve additional parameters, e.g. Vendor-specific options.

[TS 24.303, clause 5.2.2.3]

If the access network supports IPv6, as soon as the UE has received via a Router Advertisement at least an IPv6 prefix which is not present in its Prefix List, the UE shall perform the Home Link detection as specified in subclause 5.1.2.3.

If the UE detects it is not attached to the home link, the UE shall send a Binding Update to the HA including the newly configured IP address as the Care-of Address in the Source IP address of the packet and optionally in the Alternate Care-of Address Option [6]. The UE build the Binding Update message as specified in IETF RFC 3775 [6].

If the UE has been assigned also an IPv4 Home Address and wants to update also the binding for it, the UE shall include the IPv4 Home Address option including the assigned IPv4 Home Address in the same Binding Update message.

If the UE has been assigned also an IPv4 Home Address and wants to release it, the UE shall not include any IPv4 Home Address option in the same Binding Update.

If the UE does not have an IPv4 Home Address but wants to configure one, the UE shall include the IPv4 Home Address option with the 0.0.0.0 address as specified in subclause 5.1.2.4.

If the access network supports only IPv4, as soon as the UE has configured an IPv4 Care-of Address which is different from the previous Care-of Address, the UE shall send a Binding Update tunnelled in UDP as specified in draft-ietf-mext-nemo-v4traversal [2]. The UE shall set the F flag to "0". The UE shall set the R flag to "1".

Independent of an IPv6 or IPv4 access network the UE shall set the Key Management Capability (K) bit in the Binding Update message.

15.6.3 Test description

15.6.3.1 Pre-test conditions

System Simulator:

- Cell 1.

UE:

- The UE's Prefix List has been cleared.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IPv6 address.
- The UE has established a security association with the Home Agent and obtained an IPv6 Home Address, by executing the steps in test case 15.5 with the following exception: the IPv6 home prefix assigned to the UE by the SS shall be the same as the prefix used during IP address acquisition by the UE.

15.6.3.2 Test procedure sequence

Table 15.6.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS broadcasts a Router Advertisement with a Prefix Information Option containing an IPv6 prefix different from the Home Network Prefix assigned to the UE during the preamble.	-	-	-	-
2	Check: Does the UE transmit a Binding Update with its IPv6 CoA in the IP Source Address field of the IP Header and the IPv6 Home Agent address in the IP destination Address field of the IP header?	-->	Binding Update	1	P
3	The SS transmits a Binding Acknowledgement accepting the Binding Update.	<--	Binding Acknowledgement	-	-

15.6.3.3 Specific message contents

Table 15.6.3.3-1: Router Advertisement (step 1, Table 15.6.3.2-1)

Derivation path: 36.508, Table 4.7C.2-1			
Field	**Value/remark**	**Comment**	**Condition**
Prefix	IPv6 prefix different from the Home Network Prefix assigned to the UE during the preamble		

15.7 Registration of a new IPv4 CoA (Binding Update/Acknowledgment procedure in IPv4 network)

15.7.1 Test Purpose (TP)

(1)

```
with { UE has established a security association with the Home Agent and received the IPv6 Home
Address }
ensure that {
  when { UE is connected to a network supporting IPv4 only}
    then { UE transmits a Binding Update message in order to register its Home Address and Care-of-
Address at the Home Agent }
           }
```

15.7.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clauses 5.1.2.3, 5.1.2.4, and 5.2.2.3.

[TS 24.303, clause 5.1.2.3]

The DSMIPv6 Home Link Detection Function is used by the UE to detect if an access interface is on the home link for a PDN from a DSMIPv6 perspective. The Home Link Detection function shall be performed before sending DSMIPv6 Binding Update via the same access interface.

To perform the Home Link Detection procedure, the UE shall compare the assigned Home Network Prefix for a PDN with the IPv6 prefix or prefixes included in the Prefix Information Option in the Router Advertisements received on the local link. The Home Network Prefix can be assigned in a 3GPP access via PCO, as specified in 3GPP TS 24.301 [15], or via IKEv2 as specified in subclause 5.1.2.2. If there is a match between the Home Network Prefix and one of the local prefixes, the UE is attached on the home link over the respective access interface and shall not send a Binding Update to the HA unless the UE currently has a valid DSMIPv6 Binding Update list entry. If the UE has a valid DSMIPv6 Binding Update list entry, the UE shall proceed to perform the action specified in subclause 5.2.2.4. If there is not any match, the UE shall proceed as specified in subclause 5.1.2.4.

NOTE: The UE does not need to run IKEv2 for home link detection if the Home Network prefix is dynamically received in a PCO Information Element.

[TS 24.303, clause 5.1.2.4]

After establishing the security association and obtaining the IPv6 Home Address, the UE shall send a Binding Update message as specified in IETF RFC 3775 [6] and IETF RFC 5555 [2] in order to register its Home Address and Care-of Address at the HA, if it detects it is in the foreign network.

If both IPv4 and IPv6 Care-of Address are received at the foreign network, the UE shall first attempt to use the IPv6 Care-of Address for its binding registration. The UE shall not register both IPv4 and IPv6 Care-of Address to it's HA.

If IPv6 Care-of Address is used for initial binding registration, the UE shall send the Binding Update message to the IPv6 address of the HA. In this Binding Update message the H (home registration) and A (acknowledge) bits shall be set. If the UE needs an IPv4 Home Address, the UE shall include the 0.0.0.0 address in the IPv4 Home Address option to request a dynamic IPv4 Home Address.

When IPv6 Care-of Address is used for initial binding registration, the Alternate Care-of Address option shall be used by the UE to carry the Care-of Address inside a Mobility Header which is protected by ESP. If this option is present, the address included in this option is the same address present in the source address of the IPv6 packet.

If IPv4 Care-of Address is used for initial binding registration, the UE shall send the Binding Update as follows (see IETF RFC 5555 [2]):

- The IPv6 packet, with the IPv6 Home Address as the Source Address field of the IPv6 header, shall be encapsulated in UDP.
- The UE shall include the IPv4 Care-of Address as the Source Address field of the IPv4 header and the HA IPv4 address as the Destination Address field of the IPv4 header.
- The UE shall include the IPv4 Care-of Address option containing the IPv4 Care-of Address.
- The UE shall set the H (home registration) and A (acknowledge) flags.
- The UE shall set the F (UDP encapsulation required) flag to 0.
- The UE shall set the R (Mobile Router Flag) flag to 1.
- If the UE needs an IPv4 Home Address, the UE shall include an IPv4 Home Address option with the 0.0.0.0 address in the Binding Update message, as defined in IETF RFC 5555 [2].

When the UE receives the Binding Acknowledgement from the HA, it shall validate it based on the rules described in IETF RFC 3775 [6] and IETF RFC 5555 [2]. If the Binding Acknowledgement contains the successful status code 0 ("Binding Update Accepted"), the UE shall create an entry for the registered Home Address in its Binding Update List and may start sending packets containing its IPv6 Home Address or other IPv6 addresses auto-configured from the assigned home network prefix.

If the Binding Acknowledgement contains a value of 128, the UE may re-send the BU as specified in IETF RFC 3775 [6]. If the Binding Acknowledgement contains a value from 129 to 133 as specified in IETF RFC 3775 [6] or a value from 140 to 143 as specified in IETF RFC 3963 [29], the UE shall not send the BU to the HA and should discover another HA.

If the Binding Acknowledgment contains an IPv4 Address Acknowledgement option with status code value from 0 to 127 (indicating success), the UE shall create two entries in its Binding Update List, one for the IPv6 Home Address and another for the IPv4 Home Address. If the Binding Acknowledgement contains an IPv4 Address Acknowledgment option with status code indicating error (i.e. 128 or higher), the UE shall create an entry only for the IPv6 HoA in its binding update list. Moreover, if the status code is 129 ("Administratively prohibited") or 132 ("Dynamic IPv4 home address assignment not available"), the UE shall not re-send the Binding Update and it shall use only the IPv6 HoA. If the Binding Acknowledgement contains an IPv4 Address Acknowledgement option with status 128 ("Failure, reason unspecified"), 130 ("Incorrect IPv4 home address"), 131 ("Invalid IPv4 address") or 133 ("Prefix allocation unauthorized") it shall re-send the Binding Update including the 0.0.0.0 address in the IPv4 Home Address option. If the Binding Acknowledgement does not contain an IPv4 Address Acknowledgment option, the UE shall create an entry only for the IPv6 HoA in its binding update list.

NOTE: The value to be used to identify the IPv4 address acknowledgement option in the mobility header is 30;

The UE may then send data traffic either with the IPv6 Home Address or with the IPv4 Home Address. If the UE is located on an IP6-enabled link, it shall send IPv6 packets as described in IETF RFC 3775 [6]; IPv4 traffic shall be encapsulated in IPv6 packets as described in IETF RFC 5555 [2]. If the UE is located on an IPv4-only link and the Binding Acknowledgement contains the NAT detection option with the F flag set, the UE shall send IPv6 and IPv4 packets following the vanilla UDP encapsulation rules specified in IETF RFC 5555 [2]. Otherwise the UE shall send IPv6 and IPv4 packets encapsulated in IPv4 as specified in IETF RFC 5555 [2].

Once the DSMIPv6 tunnel is established, the UE may build a DHCPv4 or DHCPv6 message as described in IETF RFC 4039 [26] or IETF RFC 3736 [13] respectively and send it via the DSMIPv6 tunnel as described in IETF RFC 3775 [6] in order to retrieve additional parameters, e.g. Vendor-specific options.

[TS 24.303, clause 5.2.2.3]

If the access network supports IPv6, as soon as the UE has received via a Router Advertisement at least an IPv6 prefix which is not present in its Prefix List, the UE shall perform the Home Link detection as specified in subclause 5.1.2.3.

If the UE detects it is not attached to the home link, the UE shall send a Binding Update to the HA including the newly configured IP address as the Care-of Address in the Source IP address of the packet and optionally in the Alternate Care-of Address Option [6]. The UE build the Binding Update message as specified in IETF RFC 3775 [6].

If the UE has been assigned also an IPv4 Home Address and wants to update also the binding for it, the UE shall include the IPv4 Home Address option including the assigned IPv4 Home Address in the same Binding Update message.

If the UE has been assigned also an IPv4 Home Address and wants to release it, the UE shall not include any IPv4 Home Address option in the same Binding Update.

If the UE does not have an IPv4 Home Address but wants to configure one, the UE shall include the IPv4 Home Address option with the 0.0.0.0 address as specified in subclause 5.1.2.4.

If the access network supports only IPv4, as soon as the UE has configured an IPv4 Care-of Address which is different from the previous Care-of Address, the UE shall send a Binding Update tunnelled in UDP as specified in draft-ietf-mext-nemo-v4traversal [2]. The UE shall set the F flag to "0". The UE shall set the R flag to "1".

Independent of an IPv6 or IPv4 access network the UE shall set the Key Management Capability (K) bit in the Binding Update message.

15.7.3 Test description

15.7.3.1 Pre-test conditions

System Simulator:

- Cell 1.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IPv4 address.
- The UE has established a security association with the Home Agent and obtained an IPv6 Home Address, by executing the steps in test case 15.5.

15.7.3.2 Test procedure sequence

Table 15.7.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Check: Does the UE transmit a Binding Update with its IPv4 CoA in the IP Source Address field of the IP Header and the Binding Update encapsulated in an UDP header?	-->	Binding Update	1	P
2	The SS transmits a Binding Acknowledgement accepting the Binding Update.	<--	Binding Acknowledgement	-	-

15.7.3.3 Specific message contents

None.

15.8 Re-registration of IPv6 CoA

15.8.1 Test Purpose (TP)

(1)

```
with { UE has established a security association with the Home Agent and received the IPv6 Home
Address and registered its IPv6 Home Address and IPv6 Care-of-Address at the Home Agent }
ensure that {
  when { registration of its Care-of-Address is about the expire }
    then { UE initiates the re-registration procedure to extend lifetime of the registration of its
Care-of-Address }
            }
```

15.8.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clause 5.3.2.

[TS 24.303, clause 5.3.2]

As specified in IETF RFC 3775 [6], if the UE wants to extend the validity of an existing binding at the HA, the UE shall send a new Binding Update to the HA before the expiration of the lifetime indicated in the received Binding Acknowledgement, even if it is not changing its primary Care-of Address. This Binding Update is usually referred as periodic Binding Update.

The UE shall follow the rules described in IETF RC 3775 [6], IETF RFC 5555 [2] and in subclause 5.1.2.4 to send a periodic Binding Update and handle the associated Binding Acknowledgement. As the UE has not performed any handover, the UE shall confirm the already registered Care of Address and shall indicate the desired lifetime value. In a periodic Binding Update the UE may request an IPv4 Home Address.

15.8.3 Test description

15.8.3.1 Pre-test conditions

System Simulator:

- Cell 1.

UE:

- The UE's Prefix List has been cleared.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IPv6 address.

- The UE has established a security association with the Home Agent and obtained an IPv6 Home Address, by executing the steps in test case 15.5 with the following exception: the IPv6 home prefix assigned to the UE by the SS shall be the same as the prefix used during IP address acquisition by the UE.

15.8.3.2 Test procedure sequence

Table 15.8.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1-3	Steps 1 to 3 of test case 15.6 are performed on Cell 1. NOTE: The UE transmits an initial Binding Update to register its IPv6 Home Address and IPv6 Care-of-Address at the Home Agent. The SS accepts the Binding Update by transmitting a Binding Acknowledgement with a Lifetime set to 10 min.	-	-	-	-
4	Check: Does the UE transmit a Binding Update with its IPv6 CoA in the IP Source Address field of the IP Header and the IPv6 Home Agent address in the IP Destination Address field of the IP header within 10 min of Step 3?	-->	Binding Update	1	P
5	The SS transmits a Binding Acknowledgement accepting the Binding Update.	<--	Binding Acknowledgement	-	-

15.8.3.3 Specific message contents

None.

15.9 Re-registration of IPv4 CoA

15.9.1 Test Purpose (TP)

(1)

```
with { UE has established a security association with the Home Agent and received the IPv6 Home
Address and registered its IPv6 Home Address and IPv4 Care-of-Address at the Home Agent }
ensure that {
  when { registration of its Care-of-Address is about the expire }
    then { UE initiates the re-registration procedure to extend lifetime of the registration of its
Care-of-Address }
            }
```

15.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clause 5.3.2.

[TS 24.303, clause 5.3.2]

As specified in IETF RFC 3775 [6], if the UE wants to extend the validity of an existing binding at the HA, the UE shall send a new Binding Update to the HA before the expiration of the lifetime indicated in the received Binding Acknowledgement, even if it is not changing its primary Care-of Address. This Binding Update is usually referred as periodic Binding Update.

The UE shall follow the rules described in IETF RC 3775 [6], IETF RFC 5555 [2] and in subclause 5.1.2.4 to send a periodic Binding Update and handle the associated Binding Acknowledgement. As the UE has not performed any handover, the UE shall confirm the already registered Care of Address and shall indicate the desired lifetime value. In a periodic Binding Update the UE may request an IPv4 Home Address.

15.9.3 Test description

15.9.3.1 Pre-test conditions

System Simulator:

- Cell 1.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IPv4 address.
- The UE has established a security association with the Home Agent and obtained an IPv6 Home Address, by executing the steps in test case 15.5.

15.9.3.2 Test procedure sequence

Table 15.9.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1-2	Steps 1 to 2 of test case 15.7 are performed on Cell 1. NOTE: The UE transmits an initial Binding Update to register its IPv6 Home Address and IPv4 Care-of-Address at the Home Agent. The SS accepts the Binding Update by transmitting a Binding Acknowledgement with a Lifetime set to 10 min.	-	-	-	-
3	Check: Does the UE transmit a Binding Update with its IPv4 CoA in the IP Source Address field of the IP Header and the IPv4 Home Agent address in the IP destination Address field of the IP header within 10 min of Step 2?	-->	Binding Update	1	P
4	The SS transmits a Binding Acknowledgement accepting the Binding Update.	<--	Binding Acknowledgement	-	-

15.9.3.3 Specific message contents

None.

15.10 Return to home link

15.10.1 Test Purpose (TP)

(1)

```
with { UE has established a security association with the Home Agent and received the IPv6 Home
Address and registered its IPv6 Home Address and IPv6 Care-of-Address at the Home Agent }
ensure that {
  when { UE detects it is attached to the home link }
    then { UE transmits a Binding Update message with the lifetime field set to "0" }
           }
```

15.10.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clause 5.2.2.4.

[TS 24.303, clause 5.2.2.4]

If the access network supports IPv6, as soon as the UE has received via a Router Advertisement message at least an IPv6 prefix which is not present in its Prefix List, the UE shall perform the Home Link detection as specified in subclause 5.1.2.3 to detect if the UE is attaching to the home link. If the UE detects it is attached to the home link and there is a valid DSMIPv6 Binding Update list entry at the UE, the UE shall send a Binding Update with the Lifetime

field set to "0" in order to remove the binding at the HA, as specified in IETF RFC 3775 [6]. If an IPv4 home address was assigned to the UE, as an optimization the UE may not include the IPv4 home address option as the binding for the IPv4 home address will be removed by the HA. Independent of an IPv6 or IPv4 access network the UE shall set the Key Management Capability (K) bit in the de-registration Binding Update message. The UE may preserve the IKEv2 session in order to avoid re-establishing the session when the next handover occurs. If there is not a safe assumption that the UE will remain in the home link (e.g. switching off the non-3GPP radio interface in case of a dual radio terminal), the UE should preserve the IKEv2 session.

15.10.3 Test description

15.10.3.1 Pre-test conditions

System Simulator:

- Cell 1.

UE:

None.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IPv6 address.
- The UE has established a security association with the Home Agent and obtained an IPv6 Home Address, by executing the steps in test case 15.5 with the following exception: the IPv6 home prefix assigned to the UE by the SS shall be the same as the prefix used during IP address acquisition by the UE.
- The UE has registered its IPv6 Home Address and its Care-of-Address (acquired IPv6 address) at the Home Agent, by executing the steps in test case 15.6.

15.10.3.2 Test procedure sequence

Table 15.10.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS broadcasts a Router Advertisement with a Prefix Information Option containing an IPv6 prefix matching the Home Network Prefix assigned to the UE during the preamble.	-	-	-	-
2	Check: Does the UE transmit a Binding Update message with the lifetime field set to “0”?	-->	Binding Update	1	P
3	The SS transmits a Binding Acknowledgement accepting the Binding Update with the lifetime field set to “0”.	<--	Binding Acknowledgement	-	-

15.10.3.3 Specific message contents

Table 15.10.3.3-1: Router Advertisement (step 1, Table 15.10.3.2-1)

Derivation path: 36.508 table 4.7C.2-1			
Field	**Value/remark**	**Comment**	**Condition**
Prefix	IPv6 prefix equal to Home Network Prefix assigned to the UE during preamble		

Table 15.10.3.3-2: Binding Update (step 2, Table 15.10.3.2-1)

Derivation path: 36.508 table 4.7C.2-2			
Information Element	**Value/remark**	**Comment**	**Condition**
Lifetime	'0000000000000000'B		

Table 15.10.3.3-3: Binding Acknowledgement (step 3, Table 15.10.3.2-1)

Derivation path: 36.508 table 4.7C.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
Lifetime	'0000000000000000'B		

15.11 Dual-Stack Mobile IPv6 detach in IPv6 network

15.11.1 Test Purpose (TP)

(1)

```
with { UE has established a security association with the Home Agent and received the IPv6 Home
Address and registered its IPv6 Home Address and IPv6 Care-of-Address at the Home Agent }
ensure that {
  when { UE receives a Binding Revocation Indication message from the HA }
    then { UE transmits a Binding Revocation Acknowledgement message with the status field set to
'Success' }
            }
```

(2)

```
with { UE has received a Binding Revocation Indication message from the HA }
ensure that {
  when { UE has transmitted a Binding Revocation Acknowledgement message with the status field set
to 'Success' }
    then { UE transmits an IKEv2 INFORMATIONAL message containing a DELETE payload to remove the
Ipsec security association associated with the DSMIPv6 registration }
            }
```

15.11.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clauses 5.4.2.1 and 5.4.2.2.

[TS 24.303, clauses 5.4.2.1]

Upon receiving a Binding Revocation Indication (BRI) message according to draft-ietf-mext-binding-revocation [19] from the HA, the UE first shall perform the required validity checks on the BRI according to draft-ietf-mext-binding-revocation [19].

The UE shall send a Binding Revocation Acknowledgement (BRA) as specified in draft-ietf-mext-binding-revocation [19]. In this message the UE shall set the status field to 'Success' to reflect that it has received the BRI message. The BRA message may be tunnelled in UDP or IPv4 as specified in subclause 5.1.2.4 for Binding Update messages.

The UE then shall remove the entry identified in the BRI as deregistered from its binding update list and shall use the procedures defined in IETF RFC 4306 [14] to remove the IPsec security associations associated with the DSMIPv6 registration as described in subclause 5.4.2.2.

[TS 24.303, clause 5.4.2.2]

To detach from a specific PDN to which it is connected through a DSMIPv6 session, the UE shall send a Binding Update with the Lifetime field set to 0 as specified in IETF RFC 3775 [6].

The UE shall use the procedures defined in the IKEv2 protocol in IETF RFC 4306 [14] to remove the IPsec security associations associated with the DSMIPv6 registration. The UE shall close the security associations associated with the DSMIPv6 registration and instruct the HA to do the same by sending the INFORMATIONAL request message

including a DELETE payload. The Protocol ID in the DELETE payload shall be set to "1" (IKE) to indicate that all IPsec ESP security associations that were negotiated within the IKEv2 exchange shall be deleted.

15.11.3 Test description

15.11.3.1 Pre-test conditions

System Simulator:

- Cell 1.

UE:

None.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IPv6 address.
- The UE has established a security association with the Home Agent and obtained an IPv6 Home Address, by executing the steps in test case 15.5 with the following exception: the IPv6 home prefix assigned to the UE by the SS shall be the same as the prefix used during IP address acquisition by the UE.
- The UE has registered its IPv6 Home Address and its Care-of-Address (acquired IPv6 address) at the Home Agent, by executing the steps in test case 15.6.

15.11.3.2 Test procedure sequence

Table 15.11.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a Binding Revocation Indication message to the UE.	<--	Binding Revocation Indication	-	-
2	Check: Does the UE transmit a Binding Revocation Acknowledgement message with the status field set to 'Success'?	-->	Binding Revocation Acknowledgement	1	P
3	Check: Does the UE transmit an IKEv2 INFORMATIONAL message containing a DELETE payload?	-->	IKEv2 INFORMATIONAL	2	P
4	The SS transmits an IKEv2 INFORMATIONAL message containing a DELETE payload back to the UE.	<--	IKEv2 INFORMATIONAL	-	-

15.11.3.3 Specific message contents

Table 15.11.3.3-1: IKEv2 INFORMATIONAL (step 3, Table 15.11.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	The one identifying the UE in the SA set up during the preamble		
Responder's IKE_SA SPI	The one identifying the HA in the SA set up during the preamble		
Next Payload	'00101110'B	E	
Exchange Type	'00100101'B	INFORMATIONAL	
Encrypted Payload			
Next Payload	'00101010'B	DELETE	
Delete Payload			
Next Payload	'00000000'B	No Next Payload	
Protocol ID	'00000001'B	IKE SA	
Padding	Set by the UE	Fields from Encryption payload	
Pad Length	Set by the UE	Fields from Encryption payload	
Integrity checksum data	Set by the UE	Fields from Encryption payload	

Table 15.11.3.3-2: IKEv2 INFORMATIONAL (step 4, Table 15.11.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 3		
Responder's IKE_SA SPI	Same as that set by the SS at Step 3		
Next Payload	'00101110'B	E	
Exchange Type	'00100101'B	INFORMATIONAL	
Encrypted Payload			
Next Payload	'00101010'B	DELETE	
Delete Payload			
Next Payload	'00000000'B	No Next Payload	
Protocol ID	'00000001'B	IKE SA	
Padding	Set by the SS	Fields from Encryption payload	
Pad Length	Set by the SS	Fields from Encryption payload	
Integrity checksum data	Set by the SS	Fields from Encryption payload	

15.12 Dual-Stack Mobile IPv6 detach in IPv4 network

15.12.1 Test Purpose (TP)

(1)

```
with { UE has established a security association with the Home Agent and received the IPv6 Home
Address and registered its IPv6 Home Address and IPv4 Care-of-Address at the Home Agent }
ensure that {
  when { UE receives a Binding Revocation Indication message from the HA with the A flag set }
```

```
    then { UE transmits a Binding Revocation Acknowledgement message with the status field set to
'Success' }
            }
```

(2)

```
with { UE has received a Binding Revocation Indication message from the HA with the A flag set }
ensure that {
  when { UE has transmitted a Binding Revocation Acknowledgement message with the status field set
to 'Success' }
    then { UE transmits an IKEv2 INFORMATIONAL message containing a DELETE payload to remove the
Ipsec security association associated with the DSMIPv6 registration }
            }
```

15.12.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.303, clauses 5.4.2.1 and 5.4.2.2.

[TS 24.303, clauses 5.4.2.1]

Upon receiving a Binding Revocation Indication (BRI) message according to draft-ietf-mext-binding-revocation [19] from the HA, the UE first shall perform the required validity checks on the BRI according to draft-ietf-mext-binding-revocation [19].

If the A (Acknowledge) flag is set in the BRI message, the UE shall send a Binding Revocation Acknowledgement (BRA) as specified in draft-ietf-mext-binding-revocation [19]. In this message the UE shall set the status field to 'Success' to reflect that it has received the BRI message. The BRA message may be tunnelled in UDP or IPv4 as specified in subclause 5.1.2.4 for Binding Update messages.

The UE then shall remove the entry identified in the BRI as deregistered from its binding update list and shall use the procedures defined in IETF RFC 4306 [14] to remove the IPsec security associations associated with the DSMIPv6 registration as described in subclause 5.4.2.2.

[TS 24.303, clause 5.4.2.2]

The UE shall use the procedures defined in the IKEv2 protocol in IETF RFC 4306 [14] to remove the IPsec security associations associated with the DSMIPv6 registration. The UE shall close the security associations associated with the DSMIPv6 registration and instruct the HA to do the same by sending the INFORMATIONAL request message including a DELETE payload. The Protocol ID in the DELETE payload shall be set to "1" (IKE) to indicate that all IPsec ESP security associations that were negotiated within the IKEv2 exchange shall be deleted.

15.12.3 Test description

15.12.3.1 Pre-test conditions

System Simulator:

- Cell 1.

UE:

None.

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].
- The UE has acquired an IPv4 address.
- The UE has established a security association with the Home Agent and obtained an IPv6 Home Address, by executing the steps in test case 15.5.
- The UE has registered its IPv6 Home Address and its Care-of-Address (acquired IPv4 address) at the Home Agent, by executing the steps in test case 15.7.

15.12.3.2 Test procedure sequence

Table 15.12.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a Binding Revocation Indication message with the A flag set to the UE.	<--	Binding Revocation Indication	-	-
2	Check: Does the UE transmit a Binding Revocation Acknowledgement message with the status field set to 'Success'?	-->	Binding Revocation Acknowledgement	1	P
3	Check: Does the UE transmit an IKEv2 INFORMATIONAL message containing a DELETE payload?	-->	IKEv2 INFORMATIONAL	2	P
4	The SS transmits an IKEv2 INFORMATIONAL message containing a DELETE payload back to the UE.	<--	IKEv2 INFORMATIONAL	-	-

15.12.3.3 Specific message contents

Table 15.12.3.3-1: IKE_INFORMATIONAL (step 3, Table 15.12.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	The one identifying UE in the SA set up during the preamble		
Responder's IKE_SA SPI	The one identifying the HA in the SA set up during the preamble		
Next Payload	'00101110'B	E	
Exchange Type	'00100101'B	INFORMATIONAL	
Encrypted Payload			
Next Payload	'00101010'B	DELETE	
Delete Payload			
Next Payload	'00000000'B	No next payload	
Protocol ID	'00000001'B	IKE SA	
Padding	Set by UE	Fields from Encryption payload	
Pad Length	Set by UE	Fields from Encryption payload	
Integrity checksum data	Set by UE	Fields from Encryption payload	

Table 15.12.3.3-2: IKE_INFORMATIONAL (step 4, Table 15.12.3.2-1)

Field	Value/remark	Comment	Condition
IKE Header			
Initiator's IKE_SA SPI	Same as that set by the UE at Step 3		
Responder's IKE_SA SPI	Same as that set by the SS at Step 3		
Next Payload	'00101110'B	E	
Exchange Type	'00100101'B	INFORMATIONAL	
Encrypted Payload			
Next Payload	'00101010'B	DELETE	
Delete Payload			
Next Payload	'00000000'B	No next payload	
Protocol ID	'00000001'B	IKE SA	
Padding	Set by the SS	Fields from Encryption payload	
Pad Length	Set by the SS	Fields from Encryption payload	
Integrity checksum data	Set by the SS	Fields from Encryption payload	

16 Home (e)NB related

16.1 UE Idle Mode Operations

16.1.1 Cell Selection and Reselection

16.1.1.1 Void

16.1.1.2 Void

17 MBMS in LTE

17.1 MCCH Information Acquisition

17.1.1 MCCH information acquisition/ UE is switched on

17.1.1.1 Test Purpose (TP)

(1)

```
with { UE in switched off state and interested to receive MBMS services }
ensure that {
  when { UE is switched on }
    then { acquire the MBSFNAreaConfiguration message at the next repetition period }
          }
```

17.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8.2.2 and 5.8.2.3.

[TS 36.331, clause 5.8.2.2]

A UE interested to receive MBMS services shall apply the MCCH information acquisition procedure upon entering the corresponding MBSFN area (e.g. upon power on, following UE mobility) and upon receiving a notification that the

MCCH information has changed. A UE that is receiving an MBMS service shall apply the MCCH information acquisition procedure to acquire the MCCH, that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the MCCH information acquisition procedure overwrites any stored MCCH information, i.e. delta configuration is not applicable for MCCH information and the UE discontinues using a field if it is absent in MCCH information unless explicitly specified otherwise.

[TS 36.331, clause 5.5.2.3]

An MBMS capable UE shall:

1> if the UE enters an MBSFN area:

2> acquire the *MBSFNAreaConfiguration* message at the next repetition period;

17.1.1.3 Test description

17.1.1.3.1 Pre-test conditions

System Simulator:

- Cell 1
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cells
- MBSFNAreaConfiguration as defined in TS 36.508[18] table 4.6.1-4A is transmitted on MCCH

UE:

- E-UTRAN UE supporting MBMS services.

Preamble:

- UE is in state Switched OFF (state 1).
- Before being switched off the UE is made interested in receiving MBMS service in the PLMN of Cell 1 with MBMS Service ID 0.

NOTE: AT Commands for eMBMS service activation specified in TS 27.007 [xx] cannot be used as TP1 cannot be achieved.

17.1.1.3.2 Test procedure sequence

Table 17.1.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE is switched on.	-	-	-	-
2	The generic procedure described in TS 36.508 subclause 4.5.2A.3 is performed on Cell 1 to activate the UE test mode.	-		-	-
3	Void	-	-	-	-
4	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message	-	-	-	-
5	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 activating UE test loop Mode C	-	-	-	-
-	Exception; Step 6 is repeated 5 times	-	-	-	-
6	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period	<--	MBMS Packets.	-	-
7	Void	-	-	-	-
8	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
9	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
10	Check: Is the number of reported MBMS Packets received on the MTCH in step 9 greater than zero?	-	-	1	P

17.1.1.3.3 Specific message contents

Table 17.1.1.3.3-1: *SystemInformationBlockType2* for Cell 1 (preamble and all steps, Table 17.1.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.1.1.3.3-2: ACTIVATE TEST MODE **(step 2, Table 17.1.1.3.2-1)**

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C

Table 17.1.1.3.3-3: CLOSE UE TEST LOOP (step 5, Table 17.1.1.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

17.1.2 MCCH information acquisition/ cell reselection to a cell in a new MBSFN area

17.1.2.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state and interested to receive MBMS services }
ensure that {
  when { UE reselects to a cell in a new MBSFN area }
    then { UE shall acquire the MBSFNAreaConfiguration message at the next repetition period }
           }
```

17.1.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8.2.2 and 5.8.2.3.

[TS 36.331, clause 5.8.2.2]

A UE interested to receive MBMS services shall apply the MCCH information acquisition procedure upon entering the corresponding MBSFN area (e.g. upon power on, following UE mobility) and upon receiving a notification that the MCCH information has changed. A UE that is receiving an MBMS service shall apply the MCCH information acquisition procedure to acquire the MCCH, that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the MCCH information acquisition procedure overwrites any stored MCCH information, i.e. delta configuration is not applicable for MCCH information and the UE discontinues using a field if it is absent in MCCH information unless explicitly specified otherwise.

[TS 36.331, clause 5.5.2.3]

An MBMS capable UE shall:

…

1> if the UE enters an MBSFN area:

2> acquire the *MBSFNAreaConfiguration* message at the next repetition period;

…

17.1.2.3 Test description

17.1.2.3.1 Pre-test conditions

System Simulator:

- Cell 1 and Cell 11 which belong to different MBSFN areas.
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cells
- MBSFNAreaConfiguration as defined in TS 36.508[18] table 4.6.1-4A is transmitted on MCCH in Cell 1
- MBSFNAreaConfiguration as defined in table 17.1.2.3.3-4 is transmitted on MCCH in Cell 11

UE:

- E-UTRAN UE supporting MBMS services

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE C.
- The UE is made interested in receiving MBMS service in the PLMN of Cell 11 with MBMS Service ID 1.

NOTE: AT Commands for eMBMS service activation specified in TS 27.007 [58] cannot be used as TP cannot be achieved.

17.1.2.3.2 Test procedure sequence

Table 17.1.2.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1", and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.1.2.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 11	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-79	The power level values are assigned to satisfy $R_{Cell\ 1} < R_{Cell\ 11}$.

Table 17.1.2.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS changes Cell 11 level according to the row "T1" in table 17.1.2.3.2-1.	-	-	-	-
2	The UE executes the generic test procedure described in TS 36.508 subclause 6.4.2.7 and UE shall camp on E-UTRA Cell 11. NOTE: The UE performs a TAU procedure and the RRC connection is released.	-	-	-	-
3	Void	-			
4	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message		-	-	-
5	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 11 activating UE test loop Mode C.	-	-	-	-
-	Exception: Step 6 is repeated 5 times	-	-	-	-
6	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period	<--	MBMS Packets.	-	-
7	Void	-	-	-	-
8	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message to set UE to Mode C.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
9	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
10	Check: Is the number of reported MBMS Packets received on the MTCH in step 9 greater than zero?	-	-	1	P

17.1.2.3.3 Specific message contents

Table 17.1.2.3.3-1: *SystemInformationBlockType2* for Cells 1 and 11 (preamble and all steps, Table 17.1.2.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.1.2.3.3-1a: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C.

Table 17.1.2.3.3-2: CLOSE UE TEST LOOP (step 5, Table 17.1.2.3.2-2)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C			
Information Element	**Value/remark**	**Comment**	**Condition**
UE test loop mode C LB setup		MTCH ID	
MBSFN area identity	0 0 0 0 0 0 0 1	1, same value as broadcasted in the default *SystemInformationBlockType13* on Cell 11 (Table 17.1.2.3.3-3)	

Table 17.1.2.3.3-3: *SystemInformationBlockType13* (preamble and all steps Cell 11, Table 17.1.2.3.2-2*)*

Derivation Path: 36.508 Table 4.4.3.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFN-AreaInfo-r9 SEQUENCE (SIZE(1..maxMBSFN-Area)) OF SEQUENCE {			
mbsfn-AreaId-r9	1		
}			

Table 17.1.2.3.3-4: *MBSFNAreaConfiguration* (preamble and all steps Cell 11, Table 17.1.2.3.2-2*)*

Derivation Path: 36.508 Table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
dataMCS-r9	14		
}			
mbms-SessionInfoList-r9 SEQUENCE (SIZE (0..maxSessionPerPMCH)) OF SEQUENCE {			
MBMS-SessionInfo-r9 SEQUENCE {			
tmgi-r9 SEQUENCE {			
serviceId-r9	'000001'		
}			
}			
}			
}			

17.1.3 MCCH information acquisition/ UE handover to a cell in a new MBSFN area

17.1.3.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC CONNECTED state and interested to receive MBMS services }
ensure that {
  when { UE handovers to a cell in a new MBSFN area }
    then { UE should acquire the MBSFNAreaConfiguration message at the next repetition period }
          }
```

17.1.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8.2.2 and 5.8.2.3.

[TS 36.331, clause 5.8.2.2]

A UE interested to receive MBMS services shall apply the MCCH information acquisition procedure upon entering the corresponding MBSFN area (e.g. upon power on, following UE mobility) and upon receiving a notification that the MCCH information has changed. A UE that is receiving an MBMS service shall apply the MCCH information acquisition procedure to acquire the MCCH that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the MCCH information acquisition procedure overwrites any stored MCCH information, i.e. delta configuration is not applicable for MCCH information and the UE discontinues using a field if it is absent in MCCH information unless explicitly specified otherwise.

[TS 36.331, clause 5.5.2.3]

An MBMS capable UE shall:

…

1> if the UE enters an MBSFN area:

2> acquire the *MBSFNAreaConfiguration* message at the next repetition period;

…

17.1.3.3 Test description

17.1.3.3.1 Pre-test conditions

System Simulator:

- Cell 1 and Cell 2 which belong to different MBSFN areas.
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cells.
- MBSFNAreaConfiguration as defined in TS 36.508[18] table 4.6.1-4A is transmitted on MCCH in Cell 1.
- MBSFNAreaConfiguration as defined in table 17.1.3.3.3-1ab is transmitted on MCCH in Cell 2

UE:

- E-UTRAN UE supporting MBMS services

Preamble:

- UE is in state Generic RB Established, Test Mode Activated (state 3A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE C.
- The UE is made interested in receiving MBMS service in the PLMN of Cell 2 with MBMS Service ID 1.

NOTE: AT Commands for eMBMS service activation specified in TS 27.007 [58] cannot be used as TP cannot be achieved.

17.1.3.3.2 Test procedure sequence

Table 17.1.3.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1", and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.1.3.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 4 (M4) satisfy exit condition for event A3 (M4 < M1) (NOTE 1).
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-79	The power level values are such that measurement results for Cell 1 (M1) and Cell 4 (M4) satisfy entry condition for event A3 (M4 > M1) (NOTE 1).

Table 17.1.3.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits an *RRCConnectionReconfiguration* message to setup intra frequency measurement on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
2	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of intra frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
3	The SS changes Cell 1, Cell 2 parameters according to the row "T1" in table 17.1.3.3.2-1.	-	-	-	-
4	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 2.	-->	*MeasurementReport*	-	-
5	The SS transmits an *RRCConnectionReconfiguration* message to order the UE to perform intra frequency handover to Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
6	UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2	-->	*RRCConnectionReconfigurationComplete*	-	-
7	Void	-	-	-	-
8	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message		-		
8A	The generic procedures described in TS 36.508 subclause 4.5.4.3 are performed on Cell 2 activating UE test loop Mode C.	-	-	-	-
-	Exception: Step 9 is repeated 5 times	-	-	-	-
9	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period	<--	MBMS Packets.	-	-
10	Void	-	-	-	-
11	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message to set UE to Mode C.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
12	UE responds with UE TEST LOOP MODE 3 MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
13	Check: Is the number of reported MBMS Packets received on the MTCH in step 12 greater than zero?	-	-	1	P

17.1.3.3.3 Specific message contents

Table 17.1.3.3.3-1: *SystemInformationBlockType2* for Cells 1 and 2 (preamble and all steps, Table 17.1.3.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.1.3.3.3-1a: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C.

Table 17.1.3.3.3-1aa: *SystemInformationBlockType13* (preamble and all steps Cell 2, Table 17.1.3.3.2-2*)*

Derivation Path: 36.508 Table 4.4.3.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFN-AreaInfo-r9 SEQUENCE (SIZE(1..maxMBSFN-Area)) OF SEQUENCE {			
mbsfn-AreaId-r9	1		
}			

Table 17.1.3.3.3-1ab: *MBSFNAreaConfiguration* (preamble and all steps Cell 2, Table 17.1.3.3.2-2*)*

Derivation Path: 36.508 Table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
dataMCS-r9	1		
}			
mbms-SessionInfoList-r9 SEQUENCE (SIZE (0..maxSessionPerPMCH)) OF SEQUENCE {			
MBMS-SessionInfo-r9 SEQUENCE {			
tmgi-r9 SEQUENCE {			
serviceId-r9	'000001'		
}			
}			
}			
}			

Table 17.1.3.3.3-2: Void

Table 17.1.3.3.3-1b: CLOSE UE TEST LOOP (step 8A, Table 17.1.3.3.2-2)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C.			
Information Element	**Value/remark**	**Comment**	**Condition**
UE test loop mode C LB setup		MTCH ID	
MBSFN area identity	0 0 0 0 0 0 0 1	1, same value as broadcasted in the default *SystemInformationBlockType13* on Cell 2 (Table 17.1.3.3.3-1aa)	

Table 17.1.3.3.3-2: *RRCConnectionReconfiguration* (step 1, Table 17.1.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS

Table 17.1.3.3.3-3: *MeasConfig* (Table 17.1.3.3.3-2)

Derivation Path: 36.508, Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f1		
}			
}			
}			

Condition	**Explanation**
Band > 64	If band > 64 is selected

Table 17.1.3.3.3-4: *MeasurementReport* (step 4, Table 17.1.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultServCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 2		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			
}			

Table 17.1.3.3.3-5: *RRCConnectionReconfiguration* (step 5, Table 17.1.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition HO

Table 17.1.3.3.3-6: *MobilityControlInfo* (step 5, Table 17.1.3.3.2-5)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 2		
carrierFreq	Not present		
}			

17.1.4 MCCH information acquisition/ UE is receiving an MBMS service

17.1.4.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state }
ensure that {
  when { UE is receiving an MBMS service }
    then { UE shall start acquiring the MBSFNAreaConfiguration message that corresponds with the
service that is being received, from the beginning of each modification period }
            }
```

17.1.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8.2.2 and 5.8.2.3.

[TS 36.331, clause 5.8.2.2]

A UE interested to receive MBMS services shall apply the MCCH information acquisition procedure upon entering the corresponding MBSFN area (e.g. upon power on, following UE mobility) and upon receiving a notification that the MCCH information has changed. A UE that is receiving an MBMS service shall apply the MCCH information acquisition procedure to acquire the MCCH that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the MCCH information acquisition procedure overwrites any stored MCCH information, i.e. delta configuration is not applicable for MCCH information and the UE discontinues using a field if it is absent in MCCH information unless explicitly specified otherwise.

[TS 36.331, clause 5.5.2.3]

An MBMS capable UE shall:

…

1> if the UE is receiving an MBMS service:

2> start acquiring the *MBSFNAreaConfiguration* message, that corresponds with the service that is being received, from the beginning of each modification period;

17.1.4.3 Test description

17.1.4.3.1 Pre-test conditions

System Simulator:

- Cell 1
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cells
- MBSFNAreaConfiguration as defined in TS 36.508[18] table 4.6.1-4A is transmitted on MCCH

UE:

- E-UTRAN UE supporting MBMS services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE C.
- The UE is made interested in receiving MBMS service in the PLMN of Cell 1 with MBMS Service ID 0.

17.1.4.3.2 Test procedure sequence

Table 17.1.4.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS transmits *MBSFNAreaConfiguration* message	<--	*MBSFNAreaConfiguration*	-	-
2	Wait for a period equal to the MCCH modification period for the UE to receive *MBSFNAreaConfiguration* message	-	-	-	-
2A	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 closing UE test loop Mode C	-	-	-	-
-	Exception: Step 3 is repeated 5 times	-	-	-	-
3	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period	-	MBMS Packets.	-	-
4	Void	-	-	-	-
4A	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
4B	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
4C	The SS transmits an *RRCConnectionRelease* message to release RRC connection and move to RRC_IDLE.	<--	RRC: RRCConnectionRelease	-	-
5	SS transmits an updated system information [contents different from preamble]	-	-	-	-
6	SS transmits *MBSFNAreaConfiguration* message at the beginning of next modification period MPa.	<--	*MBSFNAreaConfiguration*	-	-
7	Wait until the start of the next modification period MPa for the duration of one repetition period for the UE to receive *MBSFNAreaConfiguration* message	-	-	-	-
8	Void	-	-	-	-
-	Exception: Step 9 is repeated 2 times	-	-	-	-
9	The SS transmits 5 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000100' in the first MAC PDU of the MCH Scheduling Period	<--	MBMS Packets.	-	-
10	Void	-	-	-	-
10A	Steps 2 to 7 of the generic procedure described in TS 36.508 subclause 4.5.3A.3 are performed on Cell 1	-	-	-	-
10B	The SS transmits an *RRCConnectionReconfiguration* message to configure data radio bearer(s) associated with the existing EPS bearer context	<--	RRC: *RRCConnectionReconfiguration*	-	-
10C	The UE transmits an RRCConnectionReconfigurationComplete message	-->	RRC: *RRCConnectionReconfigurationComplete*	-	-
11	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
12	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
13	Check: Is the number of reported MBMS Packets received on the MTCH in step 12 greater than the value reported in step 4B?	-	-	1	P

Note:	The checking of UE received MBMS packets in steps 4B and 12 is to verify that MBMS reception is ongoing before and after the MBMS area configuration change in step 6.

17.1.4.3.3 Specific message contents

Table 17.1.4.3.3-1: *SystemInformationBlockType2* for Cell 1 (preamble)

Derivation Path: 36.508 table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
mbsfn-SubframeConfiguration SEQUENCE {			
radioframeAllocationPeriod	n4		
radioframeAllocationOffset	1		FDD
	0		TDD
subframeAllocation CHOICE{			
oneFrame	'110000'		FDD
	'010010'		TDD
}			
}			
}			

Table 17.1.4.3.3-1a: ACTIVATE TEST MODE **(preamble)**

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C.

Table 17.1.4.3.3-2: *SystemInformationBlockType2* for Cell 1 (step 5, Table 17.1.4.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.			
Information Element	**Value/remark**	**Comment**	**Condition**

Table 17.1.4.3.3-3: *MBSFNAreaConfiguration* (step 6, Table 17.1.4.3.2-1)

Derivation Path: 36.508 table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
commonSF-AllocPeriod-r9	rf32		
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
sf-AllocEnd-r9	7		
dataMCS-r9	1		
mch-SchedulingPeriod-r9	rf32		
}			
}			
}			
}			

Table 17.1.4.3.3-4: CLOSE UE TEST LOOP (step 2A, Table 17.1.4.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

Table 17.1.4.3.3-5: RRCConnectionReconfiguration (step 10B, Table 17.1.4.3.2-1)

Derivation Path: 36.508 Table 4.6.1-8, condition SRB2-DRB(2, 0)			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			

rrcConnectionReconfiguration-r8 SEQUENCE {			
dedicatedInfoNASList SEQUENCE (SIZE(1..maxDRB)) OF	Not present		
}			
}			
}			
}			

17.1.5 MCCH information acquisition/ UE is not receiving MBMS data

17.1.5.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state and interested to receive MBMS services }
ensure that {
  when { UE is not receiving an MBMS service and receives MCCH information change notification }
    then { UE shall start acquiring the MBSFNAreaConfiguration message from the beginning of the
modification period following the one in which the change notification was received }
            }
```

17.1.5.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8.2.2 and 5.8.2.3.

[TS 36.331, clause 5.8.2.2]

A UE interested to receive MBMS services shall apply the MCCH information acquisition procedure upon entering the corresponding MBSFN area (e.g. upon power on, following UE mobility) and upon receiving a notification that the MCCH information has changed. A UE that is receiving an MBMS service shall apply the MCCH information acquisition procedure to acquire the MCCH that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the MCCH information acquisition procedure overwrites any stored MCCH information, i.e. delta configuration is not applicable for MCCH information and the UE discontinues using a field if it is absent in MCCH information unless explicitly specified otherwise.

[TS 36.331, clause 5.5.2.3]

An MBMS capable UE shall:

1> if the procedure is triggered by a MCCH information change notification:

2> start acquiring the *MBSFNAreaConfiguration* message from the beginning of the modification period following the one in which the change notification was received;

NOTE 1: The UE continues using the previously received MCCH information until the new MCCH information has been acquired.

17.1.5.3 Test description

17.1.5.3.1 Pre-test conditions

System Simulator:

- Cell 1 belongs to MBSFN area
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1
- MBSFNAreaConfiguration as defined in Table 17.1.5.3.3-1b is transmitted on MCCH in Cell 1

UE:

- E-UTRAN UE supporting MBMS services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE C.

The UE is made interested in receiving MBMS service in the PLMN of Cell 1 with MBMS Service ID 0.

17.1.5.3.2 Test procedure sequence

Table 17.1.5.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS transmits MCCH information change notification in modification period MPa.	-	(MCCH information change notification)	-	-
1A	SS transmits the updated *MBSFNAreaConfiguration* message from the beginning of next modification period (MPa+1).	<--	*MBSFNAreaConfiguration*	-	-
2	Wait for a period equal to the MCCH modification period for the UE to receive *MBSFNAreaConfiguration* message from the beginning of the modification period (MPa+1)	-	-	-	-
3	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 to close UE test loop	-	-	-	-
-	Exception: Step 4 is repeated 2 times	-	-	-	-
4	The SS transmits 8 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000111' in the first MAC PDU of the MCH Scheduling Period	<--	MBMS Packets	-	-
5	Void	-	-	-	-
6	Void	-	-	-	-
7	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
8	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
9	Check: Is the number of reported MBMS Packets received on the MTCH in step 8 greater than zero?	-	-	1	P

17.1.5.3.3 Specific message contents

Table 17.1.5.3.3-1: *SystemInformationBlockType2* for Cell 1 (preamble and all steps, Table 17.1.5.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.1.5.3.3-1a: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C.

Table 17.1.5.3.3-1b: *MBSFNAreaConfiguration* (preamble)

Derivation Path: 36.508 table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
commonSF-AllocPeriod-r9	rf32		
pmch-InfoList-r9 SEQUENCE {}		No entry	
}			
}			

Table 17.1.5.3.3-2: *MBSFNAreaConfiguration* (steps 1A, Table 17.1.5.3.2-2)

Derivation Path: 36.508 table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
commonSF-AllocPeriod-r9	rf32		
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
sf-AllocEnd-r9	7		
dataMCS-r9	0		
mch-SchedulingPeriod-r9	rf32		
}			
}			
}			
}			

Table 17.1.5.3.3-3: CLOSE UE TEST LOOP (step 3, Table 17.1.5.3.2-2)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

17.2 MBMS Data Reception

17.2.1 UE Acquire the MBMS data based on the SIB13 and MCCH message /MCCH and MTCH are on the same MCH

17.2.1.1 Test Purpose (TP)

(1)

```
with { UE receiving an MBMS service }
ensure that {
  when { UE receives a MAC PDU on MCH, multiplexing both MCCH and MTCH RLC PDU's }
    then { UE successfully de-multiplexes the MCCH and MTCH data}
            }
```

17.2.1.2 Conformance requirements

References:

The conformance requirements covered in the present TC are specified in: TS 36.321, clause 5, 12, 6.1.2, 6.1.3.7 and 6.2.1.

[TS 36.321, clause 5.12]

MCH transmission may occur in subframes configured by upper layer for MCCH or MTCH transmission. For each such subframe, upper layer indicates if *signallingMCS* or *dataMCS* applies. The transmission of an MCH occurs in a set of subframes known as the MCH subframe allocation (MSA), defined by *PMCH-Config*. An MCH Scheduling

Information MAC control element is included at the beginning of the MCH scheduling period in the first subframe of each MSA to indicate the position of each MTCH and unused subframes on the MCH. The UE shall assume that the first scheduled MTCH starts immediately after the MCCH or the MCH Scheduling Information MAC control element if the MCCH is not present, and the other scheduled MTCH(s) start at the earliest in the subframe where the previous MTCH stops. When the UE needs to receive MCH, the UE shall:

- attempt to decode the TB on the MCH;
- if a TB on the MCH has been successfully decoded:
  - demultiplex the MAC PDU and deliver the MAC SDU(s) to upper layers.

[TS 36.321, clause 6.1.2]

A MAC PDU consists of a MAC header, zero or more MAC Service Data Units (MAC SDU), zero, or more MAC control elements, and optionally padding; as described in Figure 6.1.2-3.

Both the MAC header and the MAC SDUs are of variable sizes.

A MAC PDU header consists of one or more MAC PDU subheaders; each subheader corresponds to either a MAC SDU, a MAC control element or padding.

A MAC PDU subheader consists of the six header fields R/R/E/LCID/F/L but for the last subheader in the MAC PDU and for fixed sized MAC control elements. The last subheader in the MAC PDU and subheaders for fixed sized MAC control elements consist solely of the four header fields R/R/E/LCID. A MAC PDU subheader corresponding to padding consists of the four header fields R/R/E/LCID.

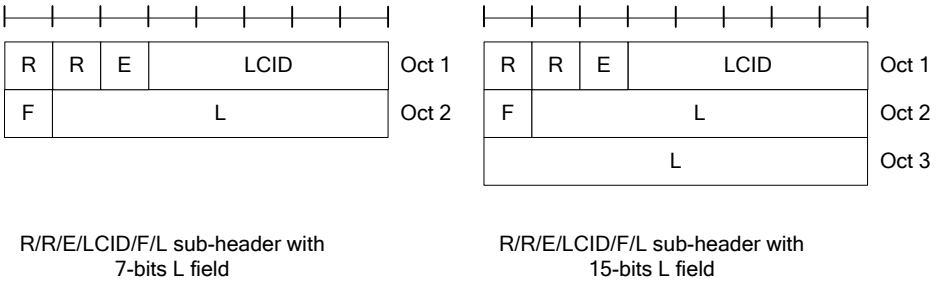

Figure 6.1.2-1: R/R/E/LCID/F/L MAC subheader

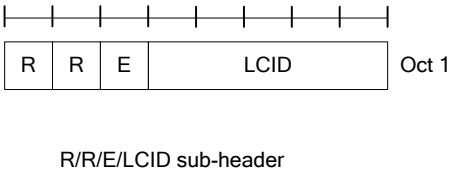

Figure 6.1.2-2: R/R/E/LCID MAC subheader

MAC PDU subheaders have the same order as the corresponding MAC SDUs, MAC control elements and padding.

MAC control elements are always placed before any MAC SDU.

Padding occurs at the end of the MAC PDU, except when single-byte or two-byte padding is required. Padding may have any value and the UE shall ignore it. When padding is performed at the end of the MAC PDU, zero or more padding bytes are allowed.

When single-byte or two-byte padding is required, one or two MAC PDU subheaders corresponding to padding are placed at the beginning of the MAC PDU before any other MAC PDU subheader.

A maximum of one MAC PDU can be transmitted per TB per UE. A maximum of one MCH MAC PDU can be transmitted per TTI.

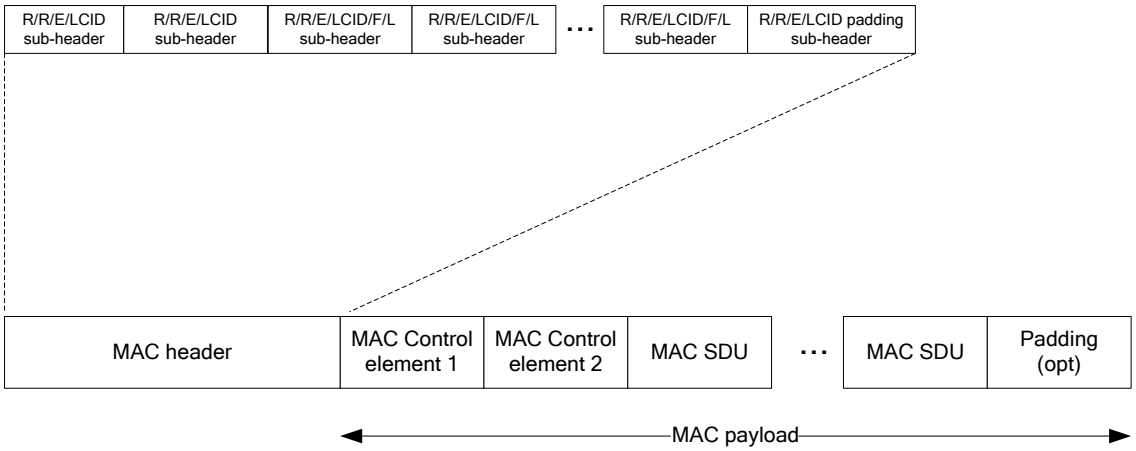

Figure 6.1.2-3: Example of MAC PDU consisting of MAC header, MAC control elements, MAC SDUs and padding

[TS 36.321, clause 6.1.3.7]

The MCH Scheduling Information MAC Control Element illustrated in Figure 6.1.3.7-1 is identified by a MAC PDU subheader with LCID as specified in Table 6.2.1-4. This control element has a variable size. For each MTCH the fields below are included:

- LCID: this field indicates the Logical Channel ID of the MTCH. The length of the field is 5 bits;
- Stop MTCH: this field indicates the ordinal number of the subframe within the MCH scheduling period where the corresponding MTCH stops. The length of the field is 11 bits. The special Stop MTCH value 2047 indicates that the corresponding MTCH is not scheduled. The value range 2043 to 2046 is reserved.

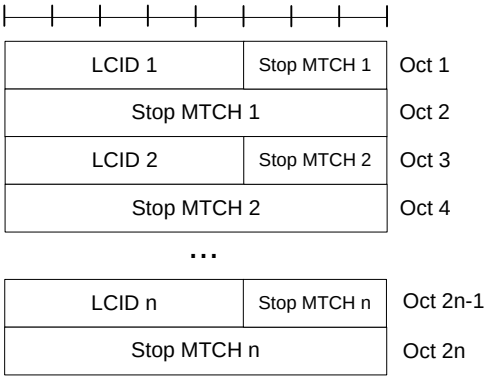

Figure 6.1.3.7-1: MCH Scheduling Information MAC control element

[TS 36.321, clause 6.2.1]

The MAC header is of variable size and consists of the following fields:

- LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC control element or padding as described in tables 6.2.1-1, 6.2.1-2 and 6.2.1-4 for the DL-SCH, UL-SCH and MCH respectively. There is one LCID field for each MAC SDU, MAC control element or padding included in the MAC PDU. In addition to that, one or two additional LCID fields are included in the MAC PDU, when single-byte or two-byte padding is required but cannot be achieved by padding at the end of the MAC PDU. The LCID field size is 5 bits;

- L: The Length field indicates the length of the corresponding MAC SDU or variable-sized MAC control element in bytes. There is one L field per MAC PDU subheader except for the last subheader and subheaders corresponding to fixed-sized MAC control elements. The size of the L field is indicated by the F field;

- F: The Format field indicates the size of the Length field as indicated in table 6.2.1-3. There is one F field per MAC PDU subheader except for the last subheader and subheaders corresponding to fixed-sized MAC control elements. The size of the F field is 1 bit. If the size of the MAC SDU or variable-sized MAC control element is less than 128 bytes, the value of the F field is set to 0, otherwise it is set to 1;

- E: The Extension field is a flag indicating if more fields are present in the MAC header or not. The E field is set to "1" to indicate another set of at least R/R/E/LCID fields. The E field is set to "0" to indicate that either a MAC SDU, a MAC control element or padding starts at the next byte;

- R: Reserved bit, set to "0".

The MAC header and subheaders are octet aligned.

...

Table 6.2.1-4 Values of LCID for MCH

Index	LCID values
00000	MCCH (see note)
00001-11100	MTCH
11101	Reserved
11110	MCH Scheduling Information
11111	Padding
NOTE: If there is no MCCH on MCH, an MTCH could use this value.	

17.2.1.3 Test description

17.2.1.3.1 Pre-test conditions

System Simulator:

- Cell 1

- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used

- MBSFNAreaConfiguration as defined in TS 36.508[18] table 4.6.1-4A is transmitted on MCCH in Cell 1.

UE:

- none

Preamble:

- The UE is in state Loopback Activated (state 4) according to [18], with the UE TEST LOOP MODE C.

- The UE is made interested in receiving MBMS service in the PLMN of Cell 1 with MBMS Service ID 0.

17.2.1.3.2 Test procedure sequence

Table 17.2.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	In the current MCCH modification period SS transmits MCCH Modification notification for notification indicator 0	-	MCCH Modification notification	-	-
2	In frame number SFN Mod 512 =1(FDD)/0(TDD) ; i.e. start of next MCCH modification period, the SS transmits a valid MAC PDU including 'MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '11111111111' andMCCH RLC PDU(carrying *MBSFNAreaConfiguration)*	<--	MAC PDU (MCH Scheduling Information MAC Control Element: LCID='00001', Stop MTCH= '11111111111', MCCH RLC PDU)	-	-
-	Exception; Step 3 is repeated 15 times	-	-	-	-
3	In frame with SFN Mod 32 =1(FDD)/0(TDD), the SS transmits MCH MAC PDU containing MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000000',MCCH RLC PDU (carrying *MBSFNAreaConfiguration)* and MTCH RLC PDU carrying 1 MBMS packet.	<--	MAC PDU (MCH Scheduling Information MAC Control Element: LCID='00001', Stop MTCH= '00000000000',MCCH RLC PDU and MTCH RLC PDU)	-	-
4	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
5	Check: Does the UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE with number of reported MBMS Packets received on the MTCH is greater than zero?	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	1	P
Note 1: The Imcs used in steps 2 and 3 is signallingMCS-r9. Note 2: The subframe number for steps 2 and 3 is determined by subframeAllocation which is 1 (FDD)/ 8 (TDD).					

17.2.1.3.3 Specific message contents

Table 17.2.1.3.3-1: *SystemInformationBlockType2* for Cell 1 (preamble)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.2.1.3.3-1a: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C

Table 17.2.1.3.3-1b: CLOSE UE TEST LOOP (preamble)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

Table 17.2.1.3.3-3: *MBSFNAreaConfiguration* (steps 2 and 3, Table 17.2.1.3.2-1)

Derivation Path: 36.508 table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
commonSF-AllocPeriod-r9	rf32		
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
sf-AllocEnd-r9	7		
dataMCS-r9	0		
mch-SchedulingPeriod-r9	rf32	E-UTRAN configures *mch-SchedulingPeriod* of the (P)MCH listed first in *PMCH-InfoList* to be smaller than or equal to *mcch-RepetitionPeriod.*	
}			
}			
}			
}			

17.2.2 UE Acquire the MBMS data based on the SIB13 and MCCH message /MCCH and MTCH are on different MCHs

17.2.2.1 Test Purpose (TP)

(1)

```
with { UE receiving an MBMS service }
ensure that {
  when { UE receives a MAC PDU on MCH, containing  MCCH PDU's }
    then { UE succesfully de-multiplexes the MCCH data}
  when { UE receives a MAC PDU on MCH, containing  MTCH PDU's }
    then { UE succesfully de-multiplexes the MTCH data}

           }
```

17.2.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.321, clause 5.12, 6.1.2, 6.1.3.7 and 6.2.1.

[TS 36.321, clause 5.12]

MCH transmission may occur in subframes configured by upper layer for MCCH or MTCH transmission. For each such subframe, upper layer indicates if *signallingMCS* or *dataMCS* applies. The transmission of an MCH occurs in a set of subframes known as the MCH subframe allocation (MSA), defined by *PMCH-Config*. An MCH Scheduling Information MAC control element is included at the beginning of the MCH scheduling period in the first subframe of each MSA to indicate the position of each MTCH and unused subframes on the MCH. The UE shall assume that the first scheduled MTCH starts immediately after the MCCH or the MCH Scheduling Information MAC control element if the MCCH is not present, and the other scheduled MTCH(s) start at the earliest in the subframe where the previous MTCH stops. When the UE needs to receive MCH, the UE shall:

- attempt to decode the TB on the MCH;
- if a TB on the MCH has been successfully decoded:
  - demultiplex the MAC PDU and deliver the MAC SDU(s) to upper layers.

[TS 36.321, clause 6.1.2]

A MAC PDU consists of a MAC header, zero or more MAC Service Data Units (MAC SDU), zero, or more MAC control elements, and optionally padding; as described in Figure 6.1.2-3.

Both the MAC header and the MAC SDUs are of variable sizes.

A MAC PDU header consists of one or more MAC PDU subheaders; each subheader corresponds to either a MAC SDU, a MAC control element or padding.

A MAC PDU subheader consists of the six header fields R/R/E/LCID/F/L but for the last subheader in the MAC PDU and for fixed sized MAC control elements. The last subheader in the MAC PDU and subheaders for fixed sized MAC control elements consist solely of the four header fields R/R/E/LCID. A MAC PDU subheader corresponding to padding consists of the four header fields R/R/E/LCID.

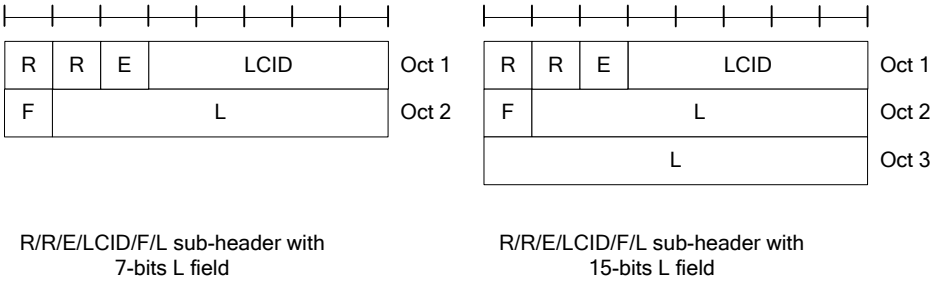

Figure 6.1.2-1: R/R/E/LCID/F/L MAC subheader

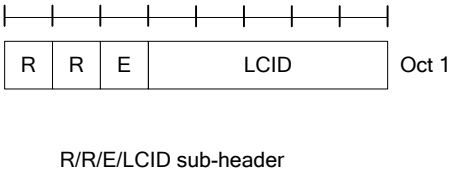

Figure 6.1.2-2: R/R/E/LCID MAC subheader

MAC PDU subheaders have the same order as the corresponding MAC SDUs, MAC control elements and padding.

MAC control elements are always placed before any MAC SDU.

Padding occurs at the end of the MAC PDU, except when single-byte or two-byte padding is required. Padding may have any value and the UE shall ignore it. When padding is performed at the end of the MAC PDU, zero or more padding bytes are allowed.

When single-byte or two-byte padding is required, one or two MAC PDU subheaders corresponding to padding are placed at the beginning of the MAC PDU before any other MAC PDU subheader.

A maximum of one MAC PDU can be transmitted per TB per UE. A maximum of one MCH MAC PDU can be transmitted per TTI.

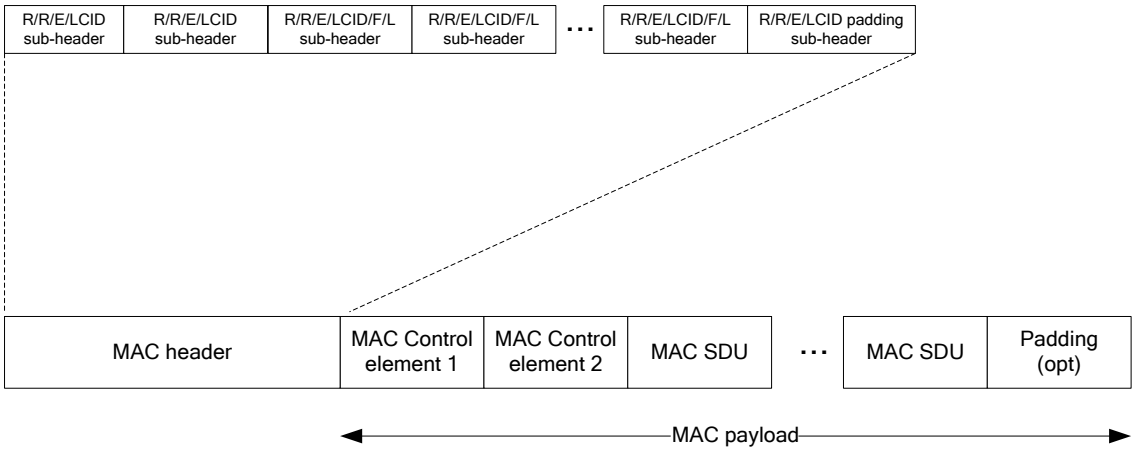

Figure 6.1.2-3: Example of MAC PDU consisting of MAC header, MAC control elements, MAC SDUs and padding

[TS 36.321, clause 6.1.3.7]

The MCH Scheduling Information MAC Control Element illustrated in Figure 6.1.3.7-1 is identified by a MAC PDU subheader with LCID as specified in Table 6.2.1-4. This control element has a variable size. For each MTCH the fields below are included:

- LCID: this field indicates the Logical Channel ID of the MTCH. The length of the field is 5 bits;
- Stop MTCH: this field indicates the ordinal number of the subframe within the MCH scheduling period where the corresponding MTCH stops. The length of the field is 11 bits. The special Stop MTCH value 2047 indicates that the corresponding MTCH is not scheduled. The value range 2043 to 2046 is reserved.

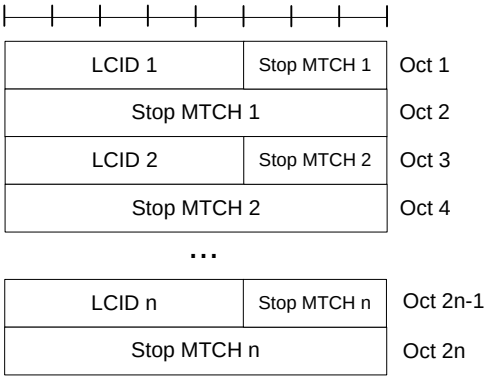

Figure 6.1.3.7-1: MCH Scheduling Information MAC control element

[TS 36.321, clause 6.2.1]

The MAC header is of variable size and consists of the following fields:

- LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC control element or padding as described in tables 6.2.1-1, 6.2.1-2 and 6.2.1-4 for the DL-SCH, UL-SCH and MCH respectively. There is one LCID field for each MAC SDU, MAC control element or padding included in the MAC PDU. In addition to that, one or two additional LCID fields are included in the MAC PDU, when single-byte or two-byte padding is required but cannot be achieved by padding at the end of the MAC PDU. The LCID field size is 5 bits;

- L: The Length field indicates the length of the corresponding MAC SDU or variable-sized MAC control element in bytes. There is one L field per MAC PDU subheader except for the last subheader and subheaders corresponding to fixed-sized MAC control elements. The size of the L field is indicated by the F field;

- F: The Format field indicates the size of the Length field as indicated in table 6.2.1-3. There is one F field per MAC PDU subheader except for the last subheader and subheaders corresponding to fixed-sized MAC control elements. The size of the F field is 1 bit. If the size of the MAC SDU or variable-sized MAC control element is less than 128 bytes, the value of the F field is set to 0, otherwise it is set to 1;

- E: The Extension field is a flag indicating if more fields are present in the MAC header or not. The E field is set to "1" to indicate another set of at least R/R/E/LCID fields. The E field is set to "0" to indicate that either a MAC SDU, a MAC control element or padding starts at the next byte;

- R: Reserved bit, set to "0".

The MAC header and subheaders are octet aligned.

...

Table 6.2.1-4 Values of LCID for MCH

Index	LCID values
00000	MCCH (see note)
00001-11100	MTCH
11101	Reserved
11110	MCH Scheduling Information
11111	Padding
NOTE: If there is no MCCH on MCH, an MTCH could use this value.	

17.2.2.3 Test description

17.2.2.3.1 Pre-test conditions

System Simulator:

- Cell 1

- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used

- MBSFNAreaConfiguration as defined in TS 36.508[18] table 4.6.1-4A is transmitted on MCCH in Cell 1.

UE:

- none

Preamble:

- The UE is in state Loopback Activated (state 4) according to [18], with the UE TEST LOOP MODE C.

- The UE is made interested in receiving MBMS service in the PLMN of Cell 1 with MBMS Service ID 0.

17.2.2.3.2 Test procedure sequence

Table 17.2.2.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	In the current MCCH modification period SS transmits MCCH Modification notification for notification indicator 0	-	MCCH Modification notification	-	-
2	In frame number SFN Mod 512 =1(FDD)/0(TDD) ; i.e. start of next MCCH modification period, the SS transmits a valid MAC PDU including 'MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '11111111111' and MCCH RLC PDU(carrying *MBSFNAreaConfiguration)*	<--	MAC PDU (MCH Scheduling Information MAC Control Element: LCID='00001', Stop MTCH= '11111111111', MCCH RLC PDU)	-	-
-	Exception; Steps 3 and 4 are repeated 15 times	-	-	-	-
3	In frame with SFN MOD 32 =1(FDD)/0(TDD), the SS transmits MCH MAC PDU containing MCH Scheduling Information MAC Control Element: LCID='00001', Stop MTCH= '00000000001', and MCCH RLC PDU(carrying *MBSFNAreaConfiguration)*	<--	MAC PDU (MCH Scheduling Information MAC Control Element: LCID='00001', Stop MTCH= '00000000001', MCCH RLC PDU)	-	-
4	In frame with SFN MOD 32 =5 (FDD)/4 (TDD) the SS transmits MCH MCCH PDU containing MTCH RLC PDUcarrying 1 MBMS packet	<--	MAC PDU (MTCH RLC PDU)	-	-
5	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
6	Check: Does the UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE with number of reported MBMS Packets received on the MTCH is greater than zero?	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	1	P
Note 1: The Imcs used in steps 2 and 3 is signallingMCS-r9 and that in step 4 is dataMCS-r9. Note 2: The subframe number for steps 2,3 and 4 is determined by subframeAllocation which is 1 (FDD)/ 9 (TDD).					

17.2.2.3.3 Specific message contents

Table 17.2.2.3.3-1: *SystemInformationBlockType2* for Cell 1 (preamble)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS

Table 17.2.2.3.3-1a: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C.

Table 17.2.2.3.3-1b: CLOSE UE TEST LOOP (preamble)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

Table 17.2.2.3.3-3: *MBSFNAreaConfiguration* (steps 2 and 3, Table 17.2.2.3.2-1)

Derivation Path: 36.508 table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
commonSF-AllocPeriod-r9	rf16		
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
sf-AllocEnd-r9	3		
dataMCS-r9	0		
mch-SchedulingPeriod-r9	rf32	E-UTRAN configures *mch-SchedulingPeriod* of the (P)MCH listed first in *PMCH-InfoList* to be smaller than or equal to *mcch-RepetitionPeriod.*	
}			
}			
}			
}			

17.2.3 UE receives the MBMS data when this data is in the beginning of the MSP

17.2.3.1 Test Purpose (TP)

(1)

```
with { UE receiving an MBMS service }
ensure that {
  when { UE receives a MAC PDU on MCH, containing  MTCH PDU's at the start of MCH scheduling period}
    then { UE successfully de-multiplexes the MTCH data}
            }
```

17.2.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.321, clause 5.12, 6.1.2, 6.1.3.7 and 6.2.1.

[TS 36.321, clause 5.12]

MCH transmission may occur in subframes configured by upper layer for MCCH or MTCH transmission. For each such subframe, upper layer indicates if *signallingMCS* or *dataMCS* applies. The transmission of an MCH occurs in a set of subframes known as the MCH subframe allocation (MSA), defined by *PMCH-Config*. An MCH Scheduling Information MAC control element is included at the beginning of the MCH scheduling period in the first subframe of each MSA to indicate the position of each MTCH and unused subframes on the MCH. The UE shall assume that the first scheduled MTCH starts immediately after the MCCH or the MCH Scheduling Information MAC control element if the MCCH is not present, and the other scheduled MTCH(s) start at the earliest in the subframe where the previous MTCH stops. When the UE needs to receive MCH, the UE shall:

- attempt to decode the TB on the MCH;
- if a TB on the MCH has been successfully decoded:
  - demultiplex the MAC PDU and deliver the MAC SDU(s) to upper layers.

[TS 36.321, clause 6.1.2]

A MAC PDU consists of a MAC header, zero or more MAC Service Data Units (MAC SDU), zero, or more MAC control elements, and optionally padding; as described in Figure 6.1.2-3.

Both the MAC header and the MAC SDUs are of variable sizes.

A MAC PDU header consists of one or more MAC PDU subheaders; each subheader corresponds to either a MAC SDU, a MAC control element or padding.

A MAC PDU subheader consists of the six header fields R/R/E/LCID/F/L but for the last subheader in the MAC PDU and for fixed sized MAC control elements. The last subheader in the MAC PDU and subheaders for fixed sized MAC control elements consist solely of the four header fields R/R/E/LCID. A MAC PDU subheader corresponding to padding consists of the four header fields R/R/E/LCID.

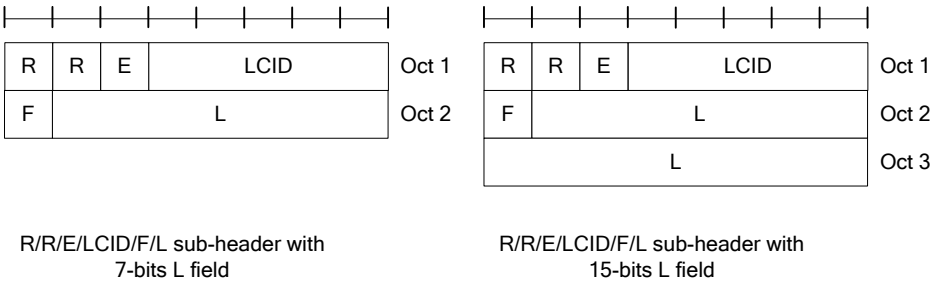

Figure 6.1.2-1: R/R/E/LCID/F/L MAC subheader

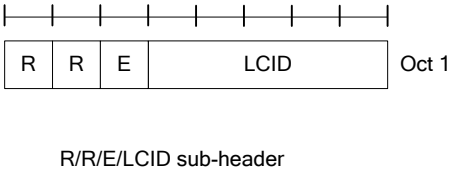

Figure 6.1.2-2: R/R/E/LCID MAC subheader

MAC PDU subheaders have the same order as the corresponding MAC SDUs, MAC control elements and padding.

MAC control elements are always placed before any MAC SDU.

Padding occurs at the end of the MAC PDU, except when single-byte or two-byte padding is required. Padding may have any value and the UE shall ignore it. When padding is performed at the end of the MAC PDU, zero or more padding bytes are allowed.

When single-byte or two-byte padding is required, one or two MAC PDU subheaders corresponding to padding are placed at the beginning of the MAC PDU before any other MAC PDU subheader.

A maximum of one MAC PDU can be transmitted per TB per UE. A maximum of one MCH MAC PDU can be transmitted per TTI.

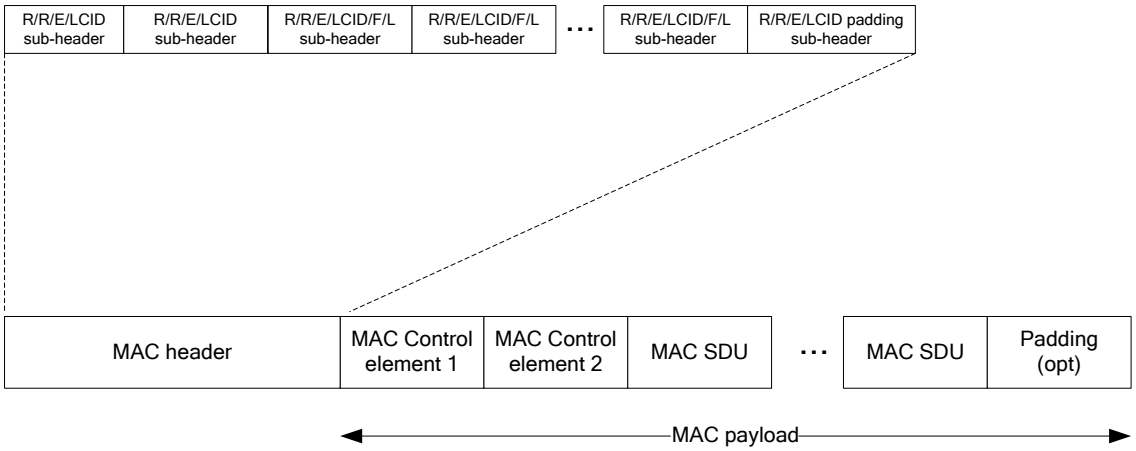

Figure 6.1.2-3: Example of MAC PDU consisting of MAC header, MAC control elements, MAC SDUs and padding

[TS 36.321, clause 6.1.3.7]

The MCH Scheduling Information MAC Control Element illustrated in Figure 6.1.3.7-1 is identified by a MAC PDU subheader with LCID as specified in Table 6.2.1-4. This control element has a variable size. For each MTCH the fields below are included:

- LCID: this field indicates the Logical Channel ID of the MTCH. The length of the field is 5 bits;
- Stop MTCH: this field indicates the ordinal number of the subframe within the MCH scheduling period where the corresponding MTCH stops. The length of the field is 11 bits. The special Stop MTCH value 2047 indicates that the corresponding MTCH is not scheduled. The value range 2043 to 2046 is reserved.

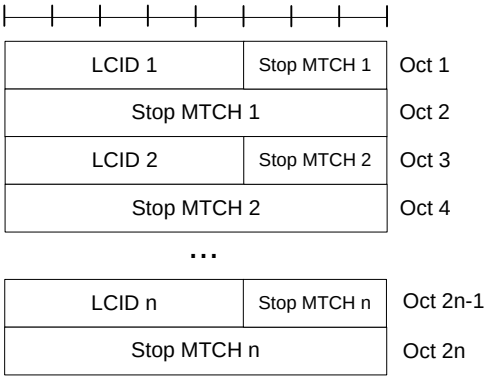

Figure 6.1.3.7-1: MCH Scheduling Information MAC control element

[TS 36.321, clause 6.2.1]

The MAC header is of variable size and consists of the following fields:

- LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC control element or padding as described in tables 6.2.1-1, 6.2.1-2 and 6.2.1-4 for the DL-SCH, UL-SCH and MCH respectively. There is one LCID field for each MAC SDU, MAC control element or padding included in the MAC PDU. In addition to that, one or two additional LCID fields are included in the MAC PDU, when single-byte or two-byte padding is required but cannot be achieved by padding at the end of the MAC PDU. The LCID field size is 5 bits;

- L: The Length field indicates the length of the corresponding MAC SDU or variable-sized MAC control element in bytes. There is one L field per MAC PDU subheader except for the last subheader and subheaders corresponding to fixed-sized MAC control elements. The size of the L field is indicated by the F field;

- F: The Format field indicates the size of the Length field as indicated in table 6.2.1-3. There is one F field per MAC PDU subheader except for the last subheader and subheaders corresponding to fixed-sized MAC control elements. The size of the F field is 1 bit. If the size of the MAC SDU or variable-sized MAC control element is less than 128 bytes, the value of the F field is set to 0, otherwise it is set to 1;

- E: The Extension field is a flag indicating if more fields are present in the MAC header or not. The E field is set to "1" to indicate another set of at least R/R/E/LCID fields. The E field is set to "0" to indicate that either a MAC SDU, a MAC control element or padding starts at the next byte;

- R: Reserved bit, set to "0".

The MAC header and subheaders are octet aligned.

...

Table 6.2.1-4: Values of LCID for MCH

Index	LCID values
00000	MCCH (see note)
00001-11100	MTCH
11101	Reserved
11110	MCH Scheduling Information
11111	Padding
NOTE: If there is no MCCH on MCH, an MTCH could use this value.	

17.2.3.3 Test description

17.2.3.3.1 Pre-test conditions

System Simulator:

- Cell 1

- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used.

- MBSFNAreaConfiguration as defined in TS 36.508[18] table 4.6.1-4A is transmitted on MCCH in Cell 1.

UE:

- none

Preamble:

- The UE is in state Loopback Activated (state 4) according to [18], with the UE TEST LOOP MODE C.

- The UE is made interested in receiving MBMS service in the PLMN of Cell 1 with MBMS Service ID 0.

17.2.3.3.2 Test procedure sequence

Table 17.2.3.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	In the current MCCH modification period SS transmits MCCH Modification notification for notification indicator 0	-	MCCH Modification notification	-	-
2	In frame number SFN Mod 512 =1(FDD)/0(TDD) ; i.e. start of next MCCH modification period, the SS transmits a valid MAC PDU including 'MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '11111111111' , MCCH RLC PDU(carrying *MBSFNAreaConfiguration)*	<--	MAC PDU (MCH Scheduling Information MAC Control Element: LCID='00001', Stop MTCH= '11111111111', MCCH RLC PDU)	-	-
-	Exception; Steps 3 and 4 are repeated 8 times	-	-	-	-
3	In frame with SFN MOD 32 is not =1(FDD)/0(TDD) and SFN MOD 16 =1(FDD)/0(TDD), the SS transmits MCH MAC PDU containing 'MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000000' and MTCH RLC PDU carrying 1 MBMS packet	<--	MAC PDU (MCH Scheduling Information MAC Control Element: LCID='00001', Stop MTCH= '00000000000', MTCH RLC PDU)	-	-
4	In frame with SFN MOD 32 =1(FDD)/0(TDD) the SS transmits MCH MCCH PDU containing 'MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000000', MCCH RLC PDU(carrying *MBSFNAreaConfiguration)* and MTCH RLC PDU carrying 1 MBMS packet	<--	MAC PDU (MCH Scheduling Information MAC Control Element: LCID='00001', Stop MTCH= '00000000000', MCCH RLC PDU, MTCH RLC PDU)	-	-
5	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
6	Check: Does the UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE with number of reported MBMS Packets received on the MTCH is greater than zero?	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	1	P
Note 1: The Imcs used in steps 2 ,3 and 4 is signallingMCS-r9. Note 2: The subframe number for steps 2,3 and 4 is determined by subframeAllocation which is 1 (FDD)/ 8 (TDD).					

17.2.3.3.3 Specific message contents

Table 17.2.3.3.3-1: *SystemInformationBlockType2* for Cell 1 (preamble)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS

Table 17.2.3.3.3-1a: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C

Table 17.2.3.3.3-1b: CLOSE UE TEST LOOP (preamble)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

Table 17.2.3.3.3-3: *MBSFNAreaConfiguration* (steps 2 and 4, Table 17.2.3.3.2-1)

Derivation Path: 36.508 table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
commonSF-AllocPeriod-r9	rf16		
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
sf-AllocEnd-r9	3		
dataMCS-r9	0		
mch-SchedulingPeriod-r9	rf16		
}			
}			
}			
}			

17.2.4 Reception of PDCCH DCI format 0 and PHICH in MBSFN subframes

17.2.4.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC_CONNECTED state and in a subframe configured as MBSFN subframe}
ensure that {
  when { UE receives a PDCCH DCI format 0 }
    then { UE performs uplink data transmission as per DCI format 0 received }
            }
```

(2)

```
with { UE in E-UTRAN RRC_CONNECTED state and in a subframe configured as MBSFN subframe}
ensure that {
  when { UE receives a PHICH for an uplink data transmission made}
    then { UE acts upon the PHICH information }
            }
```

17.2.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.211 clause 6.1.1, 6.7, TS 36.331 clause 5.2.2.9 and TS 36.213 clause 8.3.

[TS 36.211, clause 6.1.1]

A subset of the downlink subframes in a radio frame on a carrier supporting PDSCH transmission can be configured as MBSFN subframes by higher layers. Each MBSFN subframe is divided into a non-MBSFN region and an MBSFN region.

- The non-MBSFN region spans the first one or two OFDM symbols in an MBSFN subframe where the length of the non-MBSFN region is given by Table 6.7-1. Transmission in the non-MBSFN region shall use the same cyclic prefix length as used for subframe 0.

- The MBSFN region in an MBSFN subframe is defined as the OFDM symbols not used for the non-MBSFN region.

[TS 36.211, clause 6.7]

The physical control format indicator channel carries information about the number of OFDM symbols used for transmission of PDCCHs in a subframe. The set of OFDM symbols possible to use for PDCCH in a subframe is given by Table 6.7-1.

Table 6.7-1: Number of OFDM symbols used for PDCCH

Subframe	Number of OFDM symbols for PDCCH when $N_{RB}^{DL} > 10$	Number of OFDM symbols for PDCCH when $N_{RB}^{DL} \leq 10$
Subframe 1 and 6 for frame structure type 2	1, 2	2
MBSFN subframes on a carrier supporting PDSCH, configured with 1 or 2 cell-specific antenna ports	1, 2	2
MBSFN subframes on a carrier supporting PDSCH, configured with 4 cell-specific antenna ports	2	2
Subframes on a carrier not supporting PDSCH	0	0
Non-MBSFN subframes (except subframe 6 for frame structure type 2) configured with positioning reference signals	1, 2, 3	2, 3
All other cases	1, 2, 3	2, 3, 4

The PCFICH shall be transmitted when the number of OFDM symbols for PDCCH is greater than zero.

[TS 36.331, clause 5.2.2.9]

Upon receiving *SystemInformationBlockType2*, the UE shall:

...

1> if the *mbsfn-SubframeConfigList* is included:

2> consider that no other DL assignments occur in the MBSFN subframes indicated in the *mbsfn-SubframeConfigList*:

[TS 36.213, clause 8.3]

For Frame Structure type 1, an ACK/NACK received on the PHICH assigned to a UE in subframe *i* is associated with the PUSCH transmission in subframe *i*-4.

For Frame Structure type 2 UL/DL configuration 1-6, an ACK/NACK received on the PHICH assigned to a UE in subframe *i* is associated with the PUSCH transmission in the subframe *i-k* as indicated by the following table 8.3-1.

For Frame Structure type 2 UL/DL configuration 0, an ACK/NACK received on the PHICH in the resource corresponding to $I_{PHICH} = 0$, as defined in Section 9.1.2, assigned to a UE in subframe *i* is associated with the PUSCH transmission in the subframe *i-k* as indicated by the following table 8.3-1. If, for Frame Structure type 2 UL/DL configuration 0, an ACK/NACK received on the PHICH in the resource corresponding to $I_{PHICH} = 1$, as defined in Section 9.1.2, assigned to a UE in subframe *i* is associated with the PUSCH transmission in the subframe *i*-6.

Table 8.3-1: *k* for TDD configurations 0-6

TDD UL/DL Configuration	DL subframe number *i*									
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
0	7	4				7	4			
1		4			6		4			6
2				6					6	
3	6								6	6
4									6	6
5									6	
6	6	4				7	4			6

The physical layer in the UE shall deliver indications to the higher layers as follows:

For downlink subframe *i*, if a transport block was transmitted in the associated PUSCH subframe then:

- if ACK is decoded on the PHICH in subframe *i*, ACK shall be delivered to the higher layers;
- else NACK shall be delivered to the higher layers.

17.2.4.3 Test description

17.2.4.3.1 Pre-test conditions

System Simulator:

- Cell 1
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used.

UE:

None.

Preamble:

- The generic procedure to get the UE in state Loopback Activated (state 4) according to [18] with UE TEST LOOP MODE A, is executed with parameters as specified in the generic procedure except that BSR and PHR sending is disabled.
- The loop back size is set in such a way that one RLC SDU in DL shall result in 1 RLC SDU's in UL.
- No UL Grant is allocated; PUCCH is in synchronised state for sending Scheduling Requests.

17.2.4.3.2 Test procedure sequence

Table 17.2.4.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a Paging message in a paging occasion including a *systemInfoModification.*	<--	Paging	-	-
2	From the beginning of the next modification period the SS transmits a modified *SystemInformationBlockType2* and *SystemInformationBlockType13* as specified.	-	-	-	-
2A	Wait 13 s for UE to receive the modified system information (Note).	-	-	-	-
3	The SS Transmits a valid MAC PDU containing RLC PDU	<--	MAC PDU	-	-
4	The SS is configured for Uplink Grant Allocation Type 3. The SS allocates an UL Grant (DCI format 0) in SFN x, sub frame 8 (FDD)/9(TDD).	<--	Uplink Grant	-	-
5	Check: Does the UE transmit a MAC PDU including one RLC SDU, as per grant in step 4?	-->	MAC PDU	1	P
6	The SS transmits a NACK corresponding to MAC PDU in step 5 in SFN x+1, sub frame 6 (FDD)/9(TDD).	<--	HARQ NACK	-	-
7	Check: Does the UE retransmit the MAC PDU?	-->	MAC PDU	2	P
8	The SS transmits a NACK corresponding to MAC PDU in step 7 in SFN x+2, sub frame 4 (FDD)/ SFN x+2, sub frame 9(TDD).	<--	HARQ NACK	-	-
9	The UE retransmit the MAC PDU.	-->	MAC PDU	-	-
10	The SS transmits an ACK corresponding to MAC PDU in step 9 in SFN x+3, sub frame 2 (FDD)/ SFN x+3, sub frame 9(TDD).	<--	HARQ ACK	-	-
11	Check: Does the UE retransmit the MAC PDU ?	-->	MAC PDU	2	F
12	The SS transmits a Paging message in a paging occasion including a *systemInfoModification.*	<--	Paging	-	-
13	From the beginning of the next modification period the SS transmits a default*SystemInformationBlockType2* and *SystemInformationBlockType13* as in TS 36.508, table 4.4.3.3-1 and table 4.4.3.3-13 respectively.	-	-	-	-
14	Wait 13 s for UE to receive the modified system information (Note)	-	-	-	-
Note: Minimum delay 12,8 sec. = 2.5 * BCCH modification period (512 rf) to ensure UE detected modified SIB2.					

17.2.4.3.3 Specific message contents

Table 17.2.4.3.3-1: *SystemInformationBlockType2* for Cell 1 (preamble)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS

Table 17.2.4.3.3-2: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE A.

Table 17.2.4.3.3-3: CLOSE UE TEST LOOP (preamble)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE A

Table 17.2.4.3.3-4: *SystemInformationBlockType2* for Cell 1 (step 2, Table 17.2.4.3.2-3)

Derivation Path: 36.508 table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
mbsfn-SubframeConfiguration SEQUENCE {			
radioframeAllocationPeriod	n1		
radioframeAllocationOffset	0		
subframeAllocation CHOICE{			
oneFrame	'010101'	corresponds to subframes 2, 6 and 8	FDD
oneFrame	'000010'	corresponds to subframe 9	TDD
}			
}			
}			

Table 17.2.4.3.3-5: *SystemInformationBlockType13* for Cell 1 (step 2)

Derivation Path: 36.331 clause 6.3.1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType13 ::= SEQUENCE {			
mbsfn-AreaInfoList-r9 SEQUENCE (SIZE(1..maxMBSFN-Area)) OF SEQUENCE {			
mcch-Config-r9 SEQUENCE {			
sf-AllocInfo-r9	'010101'B		FDD
	'000010'B		TDD
}			
}			
}			

17.3 MBMS Counting Procedure

17.3.1 MBMS Counting / UE not receiving MBMS service

17.3.1.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state}
ensure that {
  when { UE is not in MBSFN area, enters another cell in MBSFN area, SS sends MBMSCountingRequest
message and UE is interested to receive at least one of the services received in MBMSCountingRequest
message }
    then { UE shall start acquiring the MBMSCountingRequest message from the beginning of the
repetition period and send MBMSCountingResponse message }
            }
```

(2)

```
with { UE in E-UTRA RRC_Connected state }
ensure that {
  when { UE is not receiving an MBMS service, receives MCCH information change notification, SS
sends MBMSCountingRequest message and UE is interested to receive at least one of the services
received in the MBMSCountingRequest message }
    then { UE shall start acquiring the MBMSCountingRequest message from the beginning of the
modification period following the one in which the change notification was received and send
MBMSCountingResponse message }
            }
```

17.3.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331 clause 5.8.2.3, 5.8.4.1, 5.8.4.2 and 5.8.4.3.

[TS 36.331 clause 5.8.2.3]

An MBMS capable UE shall:

1> if the procedure is triggered by an MCCH information change notification:

2> start acquiring the *MBSFNAreaConfiguration* message and the *MBMSCountingRequest* message if present, from the beginning of the modification period following the one in which the change notification was received;

NOTE 1: The UE continues using the previously received MCCH information until the new MCCH information has been acquired.

1> if the UE enters an MBSFN area:

2> acquire the *MBSFNAreaConfiguration* message and the *MBMSCountingRequest* message if present, at the next repetition period;

1> if the UE is receiving an MBMS service:

2> start acquiring the *MBSFNAreaConfiguration* message and the *MBMSCountingRequest* message if present, that both concern the MBSFN area of the service that is being received, from the beginning of each modification period;

[TS 36.331 clause 5.8.4.1]

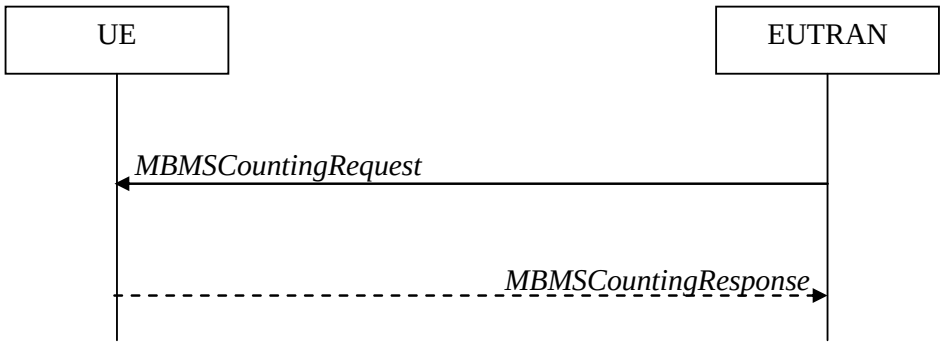

Figure 5.8.4.1-1: MBMS Counting procedure

The MBMS Counting procedure is used by the E-UTRAN to count the number of RRC_CONNECTED mode UEs which are receiving via an MRB or interested to receive via an MRB the specified MBMS services.

The UE determines interest in an MBMS service, that is identified by the TMGI, by interaction with upper layers.

[TS 36.331 clause 5.8.4.2]

E-UTRAN initiates the procedure by sending an *MBMSCountingRequest* message.

[TS 36.331 clause 5.8.4.3]

Upon receiving the *MBMSCountingRequest* message, the UE in RRC_CONNECTED mode shall:

1> if the UE is receiving via an MRB or interested to receive via an MRB at least one of the services in the received *countingRequestList:*

2> if more than one entry is included in the *mbsfn-AreaInfoList* received in *SystemInformationBlockType13:*

3> include the *mbsfn-AreaIndex* in the *MBMSCountingResponse* message and set it to the index of the entry in the *mbsfn-AreaInfoList* within the received *SystemInformationBlockType13* that corresponds with the MBSFN area used to transfer the received *MBMSCountingRequest* message;

2> for each MBMS service included in the received *countingRequestList*:

3> if the UE is receiving via an MRB or interested to receive via an MRB this MBMS service:

4> include an entry in the *countingResponseList* within the *MBMSCountingResponse* message with *countingResponseService* set it to the index of the entry in the *countingRequestList* within the received *MBMSCountingRequest* that corresponds with the MBMS service the UE is receiving or interested to receive;

2> submit the *MBMSCountingResponse* message to lower layers for transmission upon which the procedure ends;

NOTE 1: UEs that are receiving an MBMS User Service [56] by means of a Unicast Bearer Service [57] (i.e. via a DRB), but are interested to receive the concerned MBMS User Service [56] via an MBMS Bearer Service (i.e. via an MRB), respond to the counting request.

NOTE 2: The UE treats the *MBMSCountingRequest* messages received in each modification period independently. In the unlikely case E-UTRAN would repeat an *MBMSCountingRequest* (i.e. including the same services) in a subsequent modification period, the UE responds again.

17.3.1.3 Test description

17.3.1.3.1 Pre-test conditions

System Simulator:

- Cell 1 does not belong to any MBSFN areas
- Cell 2 belongs to an MBSFN area
- System information combination 1 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 2
- MBSFNAreaConfiguration as defined in TS 36.508[18] table 17.3.1.3.3-1a is transmitted on MCCH in Cell 2

UE:

- None.

Preamble:

- The UE is in state Generic RB Established (state 3) according to [18] on Cell 1.
- The UE is made interested in receiving MBMS service in the PLMN of Cell 2 with MBMS Service ID 0.

NOTE 1: This test case use the default message for MBMSCountingRequest in [18] which includes MBMS service with MBMS Service ID 0 in the CountingRequestList.

NOTE 2: AT Commands for eMBMS service activation specified in TS 27.007 [58] cannot be used as TP cannot be achieved.

17.3.1.3.2 Test procedure sequence

Table 17.3.1.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while column marked "T1"is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.3.1.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	
T1	Cell-specific RS EPRE	dBm/15k Hz	-91	-85	The power level values are assigned to satisfy $R_{Cell\ 1} < R_{Cell\ 2}$.

Table 17.3.1.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS changes Cell 1 and Cell 2 level according to the row "T1" in table 17.3.1.3.2-1.	-	-	-	-
2	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform handover to Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
3	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2	-->	*RRCConnectionReconfigurationComplete*	-	-
3A	SS transmits MCCH information change notification	-	-	-	-
4	The SS sends *MBSFNAreaConfiguration* message and *MBMSCountingRequest* message in the next MCCH modification period after the sending of MCCH information change notification in step 3A	<--	*MBSFNAreaConfiguration* *MBMSCountingRequest*	-	-
5	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message and *MBMSCountingRequest* message	-	-	-	-
6	Void	-	-	-	-
7	Check: Does the UE send *MBMSCountingResponse* message?	-->	*MBMSCountingResponse*	1	P
8	The SS transmits MCCH information change notification	-	-	-	-
9	The SS transmits *MBSFNAreaConfiguration* message and *MBMSCountingRequest* message in the next MCCH modification period after the sending of MCCH information change notification in step 8	<--	*MBSFNAreaConfiguration* *MBMSCountingRequest*	-	-
10	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message and *MBMSCountingRequest* message	-	-	-	-
11	Void	-	-	-	-
12	Check: Does the UE send *MBMSCountingResponse* message?	-->	*MBMSCountingResponse*	2	P

17.3.1.3.3 Specific message contents

Table 17.3.1.3.3-1: *SystemInformationBlockType2* for Cell 2 (preamble and all steps, Table 17.3.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.3.1.3.3-1a: *MBSFNAreaConfiguration* Cell 2 (preamble and all steps)

Derivation Path: 36.508 table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
commonSF-AllocPeriod-r9	rf32		
pmch-InfoList-r9 SEQUENCE {}		No entry	
}			
}			

Table 17.3.1.3.3-2: *RRCConnectionReconfiguration* (step 2, Table 17.3.1.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition HO

Table 17.3.1.3.3-3: *MobilityControlInfo* (Table 17.3.1.3.3-2)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 2		
carrierFreq	Not present		
}			

Table 17.3.1.3.3-4: *MBSFNAreaConfiguration* (steps 4 and 9, Table 17.3.1.3.2-2)

Derivation Path: 36.508 table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
commonSF-AllocPeriod-r9	rf32		
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
sf-AllocEnd-r9	7		
dataMCS-r9	0		
mch-SchedulingPeriod-r9	rf32	E-UTRAN configures *mch-SchedulingPeriod* of the (P)MCH listed first in *PMCH-InfoList* to be smaller than or equal to *mcch-RepetitionPeriod.*	
}			
}			
}			
}			

17.3.2 MBMS Counting / UE receiving MBMS service

17.3.2.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state}
ensure that {
```

when { UE is in MBSFN area, enters another cell in MBSFN area, SS sends *MBMSCountingRequest* message and UE is interested to receive at least one of the services received in *MBMSCountingRequest* message }
then { UE shall start acquiring the *MBMSCountingRequest* message from the beginning of the repetition period and send *MBMSCountingResponse* message with the *countingResponseService-r10* set to the corresponding entry of *serviceId-r9* in the received *MBMSCountingRequest* and the *mbsfn_AreaIndex_r10* set as the number of *mbsfn-AreaInfoList* received in *SystemInformationBlockType13* }
}

(2)

with { UE in E-UTRA RRC_Connected state }
ensure that {
when { UE is receiving an MBMS service, receives MCCH information change notification, SS sends *MBMSCountingRequest* message and UE is interested to receive at least one of the services received in the *MBMSCountingRequest* message }
then { UE shall start acquiring the *MBMSCountingRequest* message from the beginning of the modification period following the one in which the change notification was received and send *MBMSCountingResponse* message with the *countingResponseService-r10* set to the corresponding entry of *serviceId-r9* in the received *MBMSCountingRequest* and the *mbsfn_AreaIndex_r10* set as the number of *mbsfn-AreaInfoList* received in *SystemInformationBlockType13* }
}

17.3.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331 clause 5.8.2.3, 5.8.4.1, 5.8.4.2 and 5.8.4.3.

[TS 36.331 clause 5.8.2.3]

An MBMS capable UE shall:

1> if the procedure is triggered by an MCCH information change notification:

2> start acquiring the *MBSFNAreaConfiguration* message and the *MBMSCountingRequest* message if present, from the beginning of the modification period following the one in which the change notification was received;

NOTE 1: The UE continues using the previously received MCCH information until the new MCCH information has been acquired.

1> if the UE enters an MBSFN area:

2> acquire the *MBSFNAreaConfiguration* message and the *MBMSCountingRequest* message if present, at the next repetition period;

1> if the UE is receiving an MBMS service:

2> start acquiring the *MBSFNAreaConfiguration* message and the *MBMSCountingRequest* message if present, that both concern the MBSFN area of the service that is being received, from the beginning of each modification period;

[TS 36.331 clause 5.8.4.1]

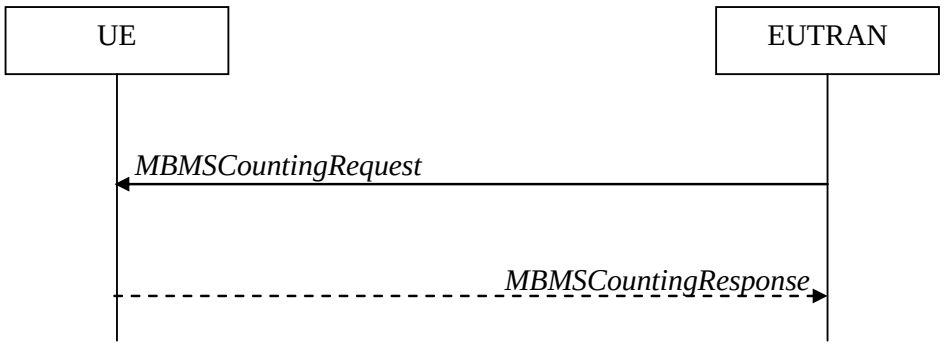

Figure 5.8.4.1-1: MBMS Counting procedure

The MBMS Counting procedure is used by the E-UTRAN to count the number of RRC_CONNECTED mode UEs which are receiving via an MRB or interested to receive via an MRB the specified MBMS services.

The UE determines interest in an MBMS service that is identified by the TMGI, by interaction with upper layers.

[TS 36.331 clause 5.8.4.2]

E-UTRAN initiates the procedure by sending an *MBMSCountingRequest* message.

[TS 36.331 clause 5.8.4.3]

Upon receiving the *MBMSCountingRequest* message, the UE in RRC_CONNECTED mode shall:

1> if the UE is receiving via an MRB or interested to receive via an MRB at least one of the services in the received *countingRequestList:*

2> if more than one entry is included in the *mbsfn-AreaInfoList* received in *SystemInformationBlockType13:*

3> include the *mbsfn-AreaIndex* in the *MBMSCountingResponse* message and set it to the index of the entry in the *mbsfn-AreaInfoList* within the received *SystemInformationBlockType13* that corresponds with the MBSFN area used to transfer the received *MBMSCountingRequest* message;

2> for each MBMS service included in the received *countingRequestList*:

3> if the UE is receiving via an MRB or interested to receive via an MRB this MBMS service:

4> include an entry in the *countingResponseList* within the *MBMSCountingResponse* message with *countingResponseService* set it to the index of the entry in the *countingRequestList* within the received *MBMSCountingRequest* that corresponds with the MBMS service the UE is receiving or interested to receive;

2> submit the *MBMSCountingResponse* message to lower layers for transmission upon which the procedure ends;

NOTE 1: UEs that are receiving an MBMS User Service [56] by means of a Unicast Bearer Service [57] (i.e. via a DRB), but are interested to receive the concerned MBMS User Service [56] via an MBMS Bearer Service (i.e. via an MRB), respond to the counting request.

NOTE 2: The UE treats the *MBMSCountingRequest* messages received in each modification period independently. In the unlikely case E-UTRAN would repeat an *MBMSCountingRequest* (i.e. including the same services) in a subsequent modification period, the UE responds again.

17.3.2.3 Test description

17.3.2.3.1 Pre-test conditions

System Simulator:

- Cell 1 belongs to an MBSFN area
- Cell 2 belongs to another MBSFN area
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 2
- MBSFNAreaConfiguration as defined in TS 36.508[18] table 4.6.1-4A is transmitted on MCCH in Cell 1 & 2

UE:

- None.

Preamble:

- The UE is in state Generic RB Established (state 3A) on Cell 1 according to [18].

- The UE is made interested in receiving MBMS service in the PLMN of Cell 2 with MBMS Service ID 1.

NOTE: AT Commands for eMBMS service activation specified in TS 27.007 [58] cannot be used as TP cannot be achieved.

17.3.2.3.2 Test procedure sequence

Table 17.3.2.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1", and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.3.2.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	
T1	Cell-specific RS EPRE	dBm/15k Hz	-91	-85	The power level values are assigned to satisfy $R_{Cell\ 1} < R_{Cell\ 2}$.

Table 17.3.2.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS changes Cell 1 and Cell 2 level according to the row "T1" in table 17.3.1.3.2-1.	-	-	-	-
2	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform handover to Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
3	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2?	-->	*RRCConnectionReconfigurationComplete*	-	-
3A	SS transmits MCCH information change notification	-	-	-	-
4	SS sends *MBSFNAreaConfiguration* message and *MBMSCountingRequest* message in the next MCCH modification period after the sending of MCCH information change notification in step 3A	<--	*MBSFNAreaConfiguration* *MBMSCountingRequest*	-	-
5	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message and *MBMSCountingRequest* message	-	-	-	-
6	Void	-	-	-	-
7	Check: Does UE send *MBMSCountingResponse* message?	-->	*MBMSCountingResponse*	1	P
7A	The generic procedures described in TS 36.508 subclause 4.5.4.3 is performed on Cell 2 closing UE test loop Mode C	-	-	-	-
7B	The SS transmits 8 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID=’00001’, Stop MTCH= ‘00000000111’ in the first MAC PDU of the MCH Scheduling Period	<--	MBMS Packets	-	-
7C	Void	-	-	-	-
7C 1	The SS waits 6 seconds for the MBMS counter check procedure to start, and during this time allows reception of *MBMSCountingResponse* which may occur on each MCCH modification period.	-	-	-	-
7D	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
7E	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
7F	Check: Is the number of reported MBMS Packets received on the MTCH greater than zero? Note: This verifies that UE is receiving the MBMS data	-	-	2	P
8	SS transmits MCCH information change notification	-	-	-	-
9	SS transmits *MBSFNAreaConfiguration* message and *MBMSCountingRequest* message in the next MCCH modification period after the sending of MCCH information change notification in step 8	<--	*MBSFNAreaConfiguration* *MBMSCountingRequest*	-	-
10	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message and *MBMSCountingRequest* message	-	-	-	-
11	Void	-	-	-	-
12	Check: Does UE send *MBMSCountingResponse* message?	-->	*MBMSCountingResponse*	2	P

17.3.2.3.3 Specific message contents

Table 17.3.2.3.3-1: *SystemInformationBlockType* 1 &*2* for Cell 2 (preamble and all steps, Table 17.3.2.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.3.2.3.3-1a: *SystemInformationBlockType13* (preamble and all steps Cell 2*)*

Derivation Path: 36.508 Table 4.4.3.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFN-AreaInfo-r9 SEQUENCE (SIZE(1..maxMBSFN-Area)) OF SEQUENCE {			
mbsfn-AreaId-r9	1		
}			

17.3.2.3.3-1b: *MBSFNAreaConfiguration* (preamble and all steps Cell 2*)*

Derivation Path: 36.508 table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
mbms-SessionInfoList-r9 SEQUENCE (SIZE (0..maxSessionPerPMCH)) OF SEQUENCE {			
MBMS-SessionInfo-r9 SEQUENCE {			
serviceId-r9	'000000'O		
}			
}			
}			

Table 17.3.2.3.3-2: *MBSFNAreaConfiguration* (steps 4 and 9, Table 17.3.2.3.2-2)

Derivation Path:. table 17.3.2.3.3-1b			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
commonSF-AllocPeriod-r9	rf32		
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
sf-AllocEnd-r9	7		
dataMCS-r9	0		
mch-SchedulingPeriod-r9	rf32	E-UTRAN configures *mch-SchedulingPeriod* of the (P)MCH listed first in *PMCH-InfoList* to be smaller than or equal to *mcch-RepetitionPeriod.*	
}			
}			
}			
}			

Table 17.3.2.3.3-4: *MBMSCountingResponse* (step 7 and step 12, Table 17.3.2.3.2-2*)*

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-4AB			
Information Element	**Value/remark**	**Comment**	**Condition**
MBMSCountingResponse-r10 ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
CountingResponse-r10 SEQUENCE (SIZE (1.. maxServiceCount)) OF SEQUENCE {			
mbsfn_AreaIndex_r10	Not present	MBSFN Area Index (TS 36.331 clause 5.8.4.3)	
countingResponseList-r10 SEQUENCE {			
countingResponseService-r10	'0'	Corresponding the entry of MBMS service ID list	
}			
}			
}			
}			
}			

Table 17.3.2.3.3-3: *MBMSCountingRequest* (step 4 and step 9, Table 17.3.2.3.2-2*)*

Derivation Path: 36.508 Table 4.6.1-4AA			
Information Element	**Value/remark**	**Comment**	**Condition**
MBMSCountingRequest-r10 ::= SEQUENCE {			
CountingRequestList-r10 SEQUENCE (SIZE (1.. maxServiceCount)) OF SEQUENCE {			
tmgi-r10 SEQUENCE {			
serviceId-r9	'000001'O	MBMS service ID (TS 24.008 clause 10.5.6.13), OCTET STRING (SIZE (3))	
}			
}			
}			

17.4 MBMS Service Continuity

The following general assumptions are used for the MBMS service continuity test cases:

- The MBMS service the UE is interested in receiving is active during the whole test execution.
- The test cases do not make any assumptions on which method is used by the UE under test to be configured with necessary USD information. For information about User Service Discovery/Announcement methods for MBMS services see [50] TS 26.346 subclause 5.2.
- To enable testing of the MBMS service continuity feature it is expected that a UE supporting MBMS service continuity; and the UE has received SIB15 indicating availability of a MBMS service on one or more frequencies; and the UE is interested in receiving or is receiving the MBMS service:
  - when in IDLE mode under the conditions specified in the test cases: the UE prioritizes the frequencies providing the MBMS service and if the serving cell is not providing the MBMS service performs inter-frequency cell re-selection to a suitable neighbour cell of the prioritized frequency even if the serving cell is better;
  - when in RRC connected mode under the conditions specified in the test cases: the UE initiates a MBMS interest indication procedure to indicate that the UE is interested in receiving the MBMS service on the frequency.

17.4.1 Cell reselection to intra-frequency cell to continue MBMS service reception

17.4.1.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state with ongoing MBMS reception on a cell broadcasting SIB15
indicating the MBMS SAI associated with the ongoing MBMS service for the frequency of the cell}
ensure that {
  when { an intra-frequency neighbour cell providing the MBMS service and an inter-frequency
neighbour cell not providing the MBMS service becomes better than the serving cell }
    then { UE performs cell reselection to the intra-frequency cell even if the inter-frequency cell
is better and continues MBMS reception }
            }
```

17.4.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.304, clause 5.2.4.1 and TS 36.331, clause 5.2.2.4. Unless otherwise stated these are Rel-11 requirements.

[TS 36.304 clause 5.2.4.1]

Absolute priorities of different E-UTRAN frequencies or inter-RAT frequencies may be provided to the UE in the system information, in the *RRCConnectionRelease* message, or by inheriting from another RAT at inter-RAT cell (re)selection. In the case of system information, an E-UTRAN frequency or inter-RAT frequency may be listed without providing a priority (i.e. the field *cellReselectionPriority* is absent for that frequency). If priorities are provided in dedicated signalling, the UE shall ignore all the priorities provided in system information. If UE is in *camped on any cell* state, UE shall only apply the priorities provided by system information from current cell, and the UE preserves priorities provided by dedicated signalling and *deprioritisationReq* received in *RRCConnectionReject* unless specified otherwise. When the UE in *camped normally* state, has only dedicated priorities other than for the current frequency, the UE shall consider the current frequency to be the lowest priority frequency (i.e. lower than the eight network configured values). While the UE is camped on a suitable CSG cell, the UE shall always consider the current frequency to be the highest priority frequency (i.e. higher than the eight network configured values), irrespective of any other priority value allocated to this frequency. If the UE is capable of MBMS Service Continuity and receiving or interested to receive an MBMS service and can only receive this MBMS service while camping on a frequency on which it is provided, the UE may consider that frequency to be the highest priority during the MBMS session [2] as long as the reselected cell is broadcasting SIB13 and as long as:

- SIB15 of the serving cell indicates for that frequency one or more MBMS SAIs included in the MBMS User Service Description (USD) [22] of this service; or
- SIB15 is not broadcast in the serving cell and that frequency is included in the USD of this service.

If the UE is not capable of MBMS Service Continuity but has knowledge on which frequency an MBMS service of interest is provided, it may consider that frequency to be the highest priority during the MBMS session [2] as long as the reselected cell is broadcasting SIB13.

NOTE: The UE considers that the MBMS session is ongoing using the session start and end times as provided by upper layers in the USD i.e. the UE does not verify if the session is indicated on MCCH.

….

[TS 36.331 clause 5.2.2.4]

The UE shall:

….

1> if the UE is interested to receive MBMS services:

2> if *schedulingInfoList* indicates that *SystemInformationBlockType13* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType13*;

2> if the UE is capable of MBMS Service Continuity:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType15* is present and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType15;

….

17.4.1.3 Test description

17.4.1.3.1 Pre-test conditions

System Simulator:

- 3 E-UTRA cells with the same PLMN. Cell 1 and Cell 11 are intra-frequency cells. Cell 3 is inter-frequency cell to Cell 1 and Cell 11. Cell 1 "Serving cell", Cell 11 and Cell 3 are "Non-suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.
- Cell 1 and Cell 11 are part of the same MBSFN area
- *MBSFNAreaConfiguration* message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 1 and Cell 11.
- System information combination 16 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 1 and Cell 11.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 3.

UE:

- The UE is configured to receive MBMS services.

Preamble:

- The UE is in state Loopback Activated (state 4) according to [18] in Cell 1(serving cell), with the UE TEST LOOP MODE C.
- The UE is made interested in receiving a MBMS service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-IntraFreq list on Cell 1 and Cell 11.
- The UE is made aware that the MBMS service is active.

17.4.1.3.2 Test procedure sequence

Table 17.4.1.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while row marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.4.1.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 11	Cell 3	Remark
T0	Cell-specific RS EPRE (FDD)	dBm/15k Hz	-85	-91	-91	
	Cell-specific RS EPRE (TDD)	dBm/15k Hz	-85	-89	-89	
T1	Cell-specific RS EPRE (FDD)	dBm/15k Hz	-91	-85	-79	The power level values are assigned to satisfy $R_{Cell\ 1} < R_{Cell\ 11} < R_{Cell\ 3}$
	Cell-specific RS EPRE (TDD)	dBm/15k Hz	-89	-85	-79	

Table 17.4.1.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
0A	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 11.	<--	*Paging*	-	-
0B	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* (according to System information combination 20 as defined in TS 36.508[18] clause 4.4.3.1) on Cell 1 and Cell 11 including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
-	The following messages are to be observed on Cell 1 unless explicitly stated otherwise.	-	-	-	-
0C	UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
1	The SS transmits an *RRCConnectionRelease* message to release RRC connection and move to RRC_IDLE.	<--	RRC: *RRCConnectionRelease*	-	-
-	EXCEPTION: Step 2 is repeated 5 times.	-	-	-	-
2	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
3	Void	-	-	-	-
-	EXCEPTION: In parallel to the events described in steps 3A, 4 and 5, the steps described in Table 17.4.1.3.2-3 may take place, depending on the UE implementation.	-	-	-	-
3A	Generic test procedure Generic Radio Bearer Establishment as described in TS 36.508 subclause 4.5.3 is executed.	-	-	-	-
4	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
5	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
6	Check: Is the number of reported MBMS Packets received on the MTCH in step 5 greater than zero? (Note: This verifies that MBMS reception is active in the UE in RRC_IDLE mode on Cell 1 before the cell re-selection to Cell 11)	-	-	1	P
6A	The SS transmits an *RRCConnectionRelease* message to release RRC connection and move to RRC_IDLE.	<--	RRC: *RRCConnectionRelease*		
7	The SS changes Cell 1, Cell 11 and Cell 3 levels according to the row "T1" in table 17.4.1.3.2-1.	-	-	-	-
-	The following messages are to be observed on Cell 11 unless explicitly stated otherwise.	-	-	-	-
-	EXCEPTION: In parallel to the events described in step 8, the steps described in Table 17.4.1.3.2-3 may takeplace, depending on the UE implementation.	-	-	-	-
8	The UE executes the generic test procedure described in TS 36.508 subclause 6.4.2.7 and UE should camp on E-UTRA Cell 11. NOTE: The UE performs a TAU procedure and the RRC connection is released.	-	-	-	-
9	Void	-	-	-	-
10	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message		-	-	-

-	EXECPTION: Step 11 is repeated 5 times.	-	-	-	-
11	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
12	Void	-	-	-	-
-	EXCEPTION: In parallel to the events described in steps 12A, 13 and 14, the steps described in Table 17.4.1.3.2-3 may takeplace, depending on the UE implementation.	-	-	-	-
12A	Generic test procedure Generic Radio Bearer Establishment as described in TS 36.508 subclause 4.5.3 is executed.	-	-		
13	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
14	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
15	Check: Is the number of reported MBMS Packets received on the MTCH in step 14 greater than the number of reported in step 5? (Note: This verifies that UE has selected Cell 11 providing the MBMS service and continue MBMS reception)	-	-	1	P

Table 17.4.1.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-

17.4.1.3.3 Specific message contents

Table 17.4.1.3.3-1: *SystemInformationBlockType2* for Cells 1 and 11 (preamble and all steps, Table 17.4.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.1.3.3-1A: *SystemInformationBlockType3* for Cells 1 and 11 (Preamble and all steps)

Derivation Path: 36.508, Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
neighCellConfig	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			
}			

Table 17.4.1.3.3-1B: *SystemInformationBlockType5* for Cell 1 and 11 (Preamble and all steps)

Derivation Path: 36.508, Table 4.4.3.3-4			
Information Element	Value/remark	Comment	Condition
SystemInformationBlockType5 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {			
neighCellConfig[n]	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			
}			

Table 17.4.1.3.3-2: *SystemInformationBlockType15* for Cells 1 and 11 (Step 0B and subsequent steps, Table 17.4.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_intraFreq.

Table 17.4.1.3.3-3: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C.

Table 17.4.1.3.3-4: CLOSE UE TEST LOOP (preamble)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

17.4.1a Cell reselection to intra-frequency cell to continue MBMS service reception / Single Frequency operation (inter-band neighbouring cell)

17.4.1a.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state with ongoing MBMS reception on a cell broadcasting SIB15
indicating the MBMS SAI associated with the ongoing MBMS service for the frequency of the cell}
ensure that {
  when { an intra-frequency neighbour cell providing the MBMS service and an inter-band neighbour
cell not providing the MBMS service becomes better than the serving cell }
    then { UE performs cell reselection to the intra-frequency cell even if the inter-band cell is
better and continues MBMS reception }
            }
```

17.4.1a.2 Conformance requirements

Same as test case 17.4.1.

17.4.1a.3 Test description

17.4.1a.3.1 Pre-test conditions

Same as test case 17.4.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

17.4.1a.3.2 Test procedure sequence

Same as test case 17.4.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

17.4.1a.3.3 Specific message contents

Same as test case 17.4.1.

17.4.2 Cell reselection to inter- frequency cell to start MBMS service reception

17.4.2.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state on a cell broadcasting SIB15 and interested to receive a MBMS
service}
ensure that {
  when { SIB15 indicates that the MBMS service is available on a frequency of an inter-frequency
neighbour cell }
    then { UE performs cell reselection to the inter-frequency neighbour cell even if the serving
cell is better and starts MBMS reception }
            }
```

17.4.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.304, clause 5.2.4.1 and TS 36.331, clause 5.2.2.4. Unless otherwise stated these are Rel-11 requirements.

[TS 36.304 clause 5.2.4.1]

Absolute priorities of different E-UTRAN frequencies or inter-RAT frequencies may be provided to the UE in the system information, in the *RRCConnectionRelease* message, or by inheriting from another RAT at inter-RAT cell (re)selection. In the case of system information, an E-UTRAN frequency or inter-RAT frequency may be listed without providing a priority (i.e. the field *cellReselectionPriority* is absent for that frequency). If priorities are provided in dedicated signalling, the UE shall ignore all the priorities provided in system information. If UE is in *camped on any cell* state, UE shall only apply the priorities provided by system information from current cell, and the UE preserves priorities provided by dedicated signalling and *deprioritisationReq* received in *RRCConnectionReject* unless specified otherwise. When the UE in *camped normally* state, has only dedicated priorities other than for the current frequency, the UE shall consider the current frequency to be the lowest priority frequency (i.e. lower than the eight network configured values). While the UE is camped on a suitable CSG cell, the UE shall always consider the current frequency to be the highest priority frequency (i.e. higher than the eight network configured values), irrespective of any other priority value allocated to this frequency. If the UE is capable of MBMS Service Continuity and receiving or interested to receive an MBMS service and can only receive this MBMS service while camping on a frequency on which it is provided, the UE may consider that frequency to be the highest priority during the MBMS session [2] as long as the reselected cell is broadcasting SIB13 and as long as:

- SIB15 of the serving cell indicates for that frequency one or more MBMS SAIs included in the MBMS User Service Description (USD) [22] of this service; or

- SIB15 is not broadcast in the serving cell and that frequency is included in the USD of this service.

If the UE is not capable of MBMS Service Continuity but has knowledge on which frequency an MBMS service of interest is provided, it may consider that frequency to be the highest priority during the MBMS session [2] as long as the reselected cell is broadcasting SIB13.

NOTE: The UE considers that the MBMS session is ongoing using the session start and end times as provided by upper layers in the USD i.e. the UE does not verify if the session is indicated on MCCH.

…

[TS 36.331 clause 5.2.2.4]

The UE shall:

…

1> if the UE is interested to receive MBMS services:

2> if *schedulingInfoList* indicates that *SystemInformationBlockType13* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType13*;

2> if the UE is capable of MBMS Service Continuity:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType15* is present and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType15;

…

17.4.2.3 Test description

17.4.2.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN. Cell 1 and Cell 23 are inter-frequency cells. Cell 1 is "Serving cell" and Cell 23 is "Non-suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.
- *MBSFNAreaConfiguration* message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 23.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 1.
- System information combination 16 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 23.

UE:

- The UE is configured to receive MBMS services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE C.

17.4.2.3.2 Test procedure sequence

Table 17.4.2.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble.

Table 17.4.2.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 23	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-91	The power level values are assigned to satisfy $R_{Cell\ 23} < R_{Cell\ 1}$.

Table 17.4.2.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
0A	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 23.	<--	*Paging*	-	-
0B	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to system information combination 18 on Cell 1 and according to system information combination 20 on Cell 23 including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1. Note: System information combination 18 and 20 is defined in TS 36.508[18] clause 4.4.3.1.	<--	*SystemInformationBlockType15*	-	-
0C	Wait 13 s for UE to receive modified system information (Note 1).	-	-	-	-
0D	The UE is made interested in receiving a MBMS service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-InterFreq list on Cell 1 and Cell 23 (Note 2).	-	-	-	-
0E	The UE is made aware that the MBMS service is active (Note 2).	-	-	-	-
-	EXCEPTION: the behaviour in table 17.4.2.3.2-3 runs in parallel with steps 1 to 3 below.	-	-	-	-
1	The UE executes the generic test procedure described in TS 36.508 subclause 6.4.2.7 and UE should camp on E-UTRA Cell 23. NOTE: The UE performs a TAU procedure and the RRC connection is released.	-	-	-	-
2	Void	-	-	-	-
3	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message	-	-	-	-
-	EXCEPTION: In parallel to the events described in step 4,The steps described in Table 17.4.2.3.2-3 may takeplace, depending on the UE implementation.	-	-	-	-
4	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 23 activating UE test loop Mode C.	-	-	-	-
4A	The SS transmits an *RRCConnectionRelease* message to release RRC connection and move to RRC_IDLE.	<--	RRC: *RRCConnectionRelease*	-	-
-	Exception; Step 5 is repeated 5 times	-	-	-	-
5	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
6	Void	-	-	-	-
-	EXCEPTION: In parallel to the events described in steps 6A, 7 and 8, the steps described in Table 17.4.2.3.2-3 may takeplace, depending on the UE implementation.	-	-	-	-
6A	Generic test procedure Generic Radio Bearer Establishment as described in TS 36.508 subclause 4.5.3 is executed.	-	-	-	-
7	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
8	UE responds with UE TEST LOOP MODE C	-->	UE TEST LOOP MODE C MBMS	-	-

	MBMS PACKET COUNTER RESPONSE.		PACKET COUNTER RESPONSE		
9	Check: Is the number of reported MBMS Packets received on the MTCH in step 8 greater than zero? (Note: This verifies that UE has selected Cell 23 providing the MBMS service and starts MBMS reception)	-	-	1	P
Note 1: Minimum delay 12,8 sec. = 2.5 * BCCH modification period (512 rf) to ensure UE detected SIB update. Note 2: The request may be performed by MMI or AT command.					

Table 17.4.2.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-

17.4.2.3.3 Specific message contents

Table 17.4.2.3.3-1: *SystemInformationBlockType2* for Cell 23 (preamble and all steps, Table 17.4.2.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.2.3.3-2: *SystemInformationBlockType15* for Cell 1 (Step 0B and later steps preamble and all steps, Table 17.4.2.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_interFreq.			
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 23, see table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	

Table 17.4.2.3.3-3: *SystemInformationBlockType15* for Cell 23 (Step 0B and later steps preamble and all steps, Table 17.4.2.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_intraFreq.

Table 17.4.2.3.3-4: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C.

Table 17.4.2.3.3-5: CLOSE UE TEST LOOP (step 4, Table 17.4.2.3.2-2)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

17.4.2a Cell reselection to inter- band cell to start MBMS service reception

17.4.2a.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state on a cell broadcasting SIB15 and interested to receive a MBMS
service}
ensure that {
  when { SIB15 indicates that the MBMS service is available on a frequency of a neighbour cell on a
different frequency band }
    then { UE performs cell reselection to the neighbour cell on the different frequency band even
if the serving cell is better and starts MBMS reception }
            }
```

17.4.2a.2 Conformance requirements

Same as test case 17.4.2.

17.4.2a.3 Test description

17.4.2a.3.1 Pre-test conditions

Same as test case 17.4.2 with the following differences:

- Cells configuration: Cell 10 replaces Cell 23 with TA# set to TAI-2.

NOTE: TA# of Cell 10 shall be different from Cell 1 (TAI-1) to trigger TAU procedure in step 1 in Table 17.4.2.3.2-2.

17.4.2a.3.2 Test procedure sequence

Same as test case 17.4.2 with the following differences:

- Cells configuration: Cell 10 replaces Cell 23

17.4.2a.3.3 Specific message contents

Same as test case 17.4.2 with the following differences:

- Cells configuration: Cell 10 replaces Cell 23

17.4.3 Handover to inter-frequency cell to start MBMS service reception

17.4.3.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state AND on a cell broadcasting SIB15 and interested to receive a
MBMS service }
ensure that {
  when { SIB15 indicates that the MBMS service is available on a frequency of an inter-frequency
neighbour cell }
    then { UE transmits a MBMSInterestIndication message indicating interest in MBMS reception on
the frequency }
            }
```

(2)

```
with { UE in E-UTRA RRC_Connected state AND having transmitted a MBMSInterestIndication message
indicating interest in MBMS reception on a frequency of an inter-frequency neighbour cell }
ensure that {
  when { 1s after the UE has transmitted the MBMSInterestIndication message the UE receives
RRCConnectionReconfiguration message including a mobilityControlInfo indicating a the E-UTRA
frequency of the inter-frequency neighbour cell }
    then { UE performs inter-frequency handover and starts MBMS reception }
            }
```

17.4.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331 clause 5.3.5.4, 5.8.5.2, 5.8.5.3, 5.8.5.4. Unless otherwise stated these are Rel-11 requirements.

[TS 36.331 clause 5.3.5.4]

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission;

1> if MAC successfully completes the random access procedure:

….

2> if *SystemInformationBlockType15* is broadcast by the PCell:

3> if the UE has transmitted a *MBMSInterestIndication* message during the last 1 second preceding reception of the *RRCConnectionReconfiguration* message including *mobilityControlInfo*:

4> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

4> determine the set of MBMS frequencies of interest in accordance with 5.8.5.3;

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

2> the procedure ends;

[TS 36.331 clause 5.8.5.2]

An MBMS capable UE in RRC_CONNECTED may initiate the procedure in several cases including upon successful connection establishment, upon entering or leaving the service area, upon session start or stop, upon change of interest, upon change of priority between MBMS reception and unicast reception or upon change to a PCell broadcasting *SystemInformationBlockType15*.

Upon initiating the procedure, the UE shall:

1> if *SystemInformationBlockType15* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

2> if the UE did not transmit an *MBMSInterestIndication* message since last entering RRC_CONNECTED state; or

2> if since the last time the UE transmitted an *MBMSInterestIndication* message, the UE connected to a PCell not broadcasting *SystemInformationBlockType15*:

3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

2> else:

3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, has changed since the last transmission of the *MBMSInterestIndication* message; or

3> if the prioritisation of reception of all indicated MBMS frequencies compared to reception of any of the established unicast bearers has changed since the last transmission of the *MBMSInterestIndication* message:

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

NOTE: The UE may send an *MBMSInterestIndication* even when it is able to receive the MBMS services it is interested in i.e. to avoid that the network allocates a configuration inhibiting MBMS reception.

[TS 36.331 clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB for the concerned session. I.e. the UE does not verify if the session is indicated on MCCH.

2> the UE is capable of simultaneously receiving the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 3: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 4: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 5: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

[TS 36.331 clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1* (for serving frequency), if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15* (for neighbouring frequencies);

NOTE 1: The EARFCN included in *mbms-FreqList* is merely used to indicate a physical frequency the UE is interested to receive i.e. the UE may not support the band corresponding to the included EARFCN (but it does support at least one of the bands indicated in system information for the concerned physical frequency).

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

17.4.3.3 Test description

17.4.3.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN belonging to same MBSFN area. Cell 1 and Cell 3 are inter-frequency cells. Cell 1 is "Serving cell" and Cell 3 is "Suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.

- *MBSFNAreaConfiguration* message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 1 and Cell 3.

- System information combination 16 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1 and Cell 3.

UE:

- The UE is configured to receive MBMS services.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE C on Cell 1 according to [18].

17.4.3.3.2 Test procedure sequence

Table 17.4.3.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T0", and "T1" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.4.3.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 3 (M3) satisfy exit condition for event A3 (M3 < M1).
T1	Cell-specific RS EPRE	dBm/15kHz	-85	-79	The power level values are such that measurement results for Cell 1 (M1) and Cell 3 (M3) satisfy entry condition for event A3 (M3 > M1).

Table 17.4.3.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
00	The UE is made interested in receiving a MBMS service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-InterFreq list on Cell 1 and Cell 3. (Note 1).	-	-	-	-
00A	The UE is made aware that the MBMS service is active (Note 1).	-	-	-	-
0	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 3.	<--	*Paging*	-	-
1	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to System information combination 20 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 and Cell 3. *SystemInformationBlockType15* on Cell 1 is including mbms-SAI-InterFreq list for the frequency of Cell 3 indicating MBMS SAI=1. *SystemInformationBlockType15* on Cell 3 is including mbms-SAI-IntraFreq list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
2	Check: Does the UE transmit *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	1	P
2A	The SS waits for 1s.				
3	The SS transmits an *RRCConnectionReconfiguration* message to setup inter frequency measurement on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
4	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of inter frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
5	The SS changes Cell 1 and Cell 3 level according to the row "T1" in table 17.4.3.3.2-1.	-	-	-	-
6	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 3.	-->	*MeasurementReport*		
7	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform inter-frequency handover to Cell 3.	<--	*RRCConnectionReconfiguration*	-	-
8	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 3?	-->	*RRCConnectionReconfigurationComplete*	-	-
-	Exception; Step 9 is repeated 5 times	-	-	-	-
9	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
10	Void	-	-	-	-
11	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
12	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
13	Check: Is the number of reported MBMS Packets received on the MTCH in step12 greater than zero?	-	-	2	P
Note 1: The request may be performed by MMI or AT command.					

17.4.3.3.3 Specific message contents

Table 17.4.3.3.3-0: Conditions for specific message contents in Tables 17.4.3.3.3-1B, 17.4.3.3.3-6 and 17.4.3.3.3-9

Condition	Explanation
Band > 64	If band > 64 is selected

Table 17.4.3.3.3-1: *SystemInformationBlockType2* for Cells 1 and 3 (Preamble and all steps, Table 17.4.3.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.3.3.3-1A: *SystemInformationBlockType3* for Cells 1 and 3 (Preamble and all steps, Table 17.4.3.3.2-2)

Derivation Path: 36.508, Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
neighCellConfig	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			
}			

Table 17.4.3.3.3-1B: *SystemInformationBlockType5* for Cell 1 and Cell 3 (Preamble and all steps, Table 17.4.3.3.2-2)

Derivation Path: 36.508, Table 4.4.3.3-4			
Information Element	Value/remark	Comment	Condition
SystemInformationBlockType5 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {			
neighCellConfig[n]	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			
}			

Table 17.4.3.3.3-2: *SystemInformationBlockType15* for Cell 1 (step 1 and all subsequent steps, Table 17.4.3.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_interFreq.			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	2	1 entry INTEGER (0..65535)	
mbms-SAI-InterFreqList-r11 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry	*n* denotes the index of the entry	
dl-CarrierFreq-r11	Downlink EARFCN of Cell 3, see table 6.3.1.2-1.		
}			
mbms-SAI-List-r11[*1*] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	INTEGER (0..65535)	
}			

Table 17.4.3.3.3-3: *SystemInformationBlockType15* for Cell 3 (step 1 and all subsequent steps, Table 17.4.3.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_interFreq.			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	
mbms-SAI-InterFreqList-r11 SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry	*n* denotes the index of the entry	
dl-CarrierFreq-r11	Downlink EARFCN of Cell 1, see table 6.3.1.2-1.		
}			
mbms-SAI-List-r11[*1*] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	2	INTEGER (0..65535)	
}			

Table 17.4.3.3.3-4: *MBMSInterestIndication* (step 2, Table 17.4.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4C			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 3	INTEGER (0..maxEARFCN2)	
}			
}			

Table 17.4.3.3.3-5: *RRCConnectionReconfiguration* (step 3, Table 17.4.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS

Table 17.4.3.3.3-6: *MeasConfig* (Table 17.4.3.3.3-3)

Derivation Path: 36.508, Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	2 entries		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)	Cell 1	
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
measObjectId[2]	IdMeasObject-f2		
measObject[2]	MeasObjectEUTRA-GENERIC(f2)	Cell 3	
measObject[2]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f2		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 1		
}			
measObjectEUTRA-v9e0[2] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 3		
}			
}			
}			

Table 17.4.3.3.3-6A: *MeasObjectEUTRA-GENERIC*(f1/f2) (Table 17.4.3.3.3-3)

Derivation Path: 36.508, Table 4.6.6-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectEUTRA-GENERIC(Freq) ::= SEQUENCE {			
neighbourCellConfig	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			

Table 17.4.3.3.3-7: *MeasurementReport* (step 6, Table 17.4.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 3		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			
}			

Table 17.4.3.3.3-8: *RRCConnectionReconfiguration* (step 7, Table 17.4.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition HO

Table 17.4.3.3.3-9: *MobilityControlInfo* (Table 17.4.3.3.3-6)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 3		
carrierFreq SEQUENCE {			
dl-CarrierFreq	Same downlink EARFCN as used for Cell 3		
}			
carrierFreq	Not present		Band > 64
carrierFreq-v9e0 SEQUENCE {			Band > 64
dl-CarrierFreq-v9e0	Same downlink EARFCN as used for Cell 3.		
}			
}			

17.4.3a Handover to inter-band cell to start MBMS service reception

17.4.3a.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state AND on a cell broadcasting SIB15 and interested to receive a
MBMS service }
ensure that {
```

```
  when { SIB15 indicates that the MBMS service is available on a frequency of a neighbour cell on a
different frequency band }
    then { UE transmits a MBMSInterestIndication message indicating interest in MBMS reception on
the frequency }
            }
```

(2)

```
with { UE in E-UTRA RRC_Connected state AND having transmitted a MBMSInterestIndication message
indicating interest in MBMS reception on a frequency of a neighbour cell on a different frequency
band }
ensure that {
  when { UE receives RRCConnectionReconfiguration message including a mobilityControlInfo indicating
a the E-UTRA frequency of the inter-frequency neighbour cell }
    then { UE performs inter-band handover and starts MBMS reception }
            }
```

17.4.3a.2 Conformance requirements

Same as test case 17.4.3.

17.4.3a.3 Test description

17.4.3a.3.1 Pre-test conditions

Same as test case 17.4.3 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

17.4.3a.3.2 Test procedure sequence

Same as test case 17.4.3 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

17.4.3a.3.3 Specific message contents

Same as test case 17.4.3 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

17.4.4 Handover to intra-frequency cell to continue MBMS service reception

17.4.4.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state AND is receiving MBMS service }
ensure that {
  when { UE receives RRCConnectionReconfiguration message including a mobilityControlInfo for intra
frequency neighbour cell providing MBMS service }
    then { UE performs intra frequency handover and continues to receive MBMS service }
            }
```

17.4.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.306 clause 4.3.5.2. Unless otherwise stated these are Rel-11 requirements.

[TS 36.306 clause 4.3.5.2]

This field defines the carrier aggregation, MIMO and MBMS reception capabilities supported by the UE for configurations with inter-band, intra-band non-contiguous, intra-band contiguous carrier aggregation and without carrier aggregation. For each band in a band combination the UE provides the supported CA bandwidth classes and the corresponding MIMO capabilities for downlink. The UE also has to provide the supported uplink CA bandwidth class and the corresponding MIMO capability for at least one band in the band combination. A MIMO capability applies to all carriers of a bandwidth class of a band in a band combination.

In all non-CA band combinations the UE shall indicate a bandwidth class supporting the maximum channel bandwidth defined for the band.

In all non-CA band combinations the UE shall indicate at least the number of layers for spatial multiplexing according to the UE's Rel-8/9 category (Cat. 1-5). If the UE provides a Rel-10 category (Cat. 6-8) it shall indicate at least the number of layers according to that category for at least one band combination. In all other band combinations a UE indicating a category between 2 and 8 shall indicate support for at least 2 layers for downlink spatial multiplexing for all bands. The indicated number of layers for spatial multiplexing may exceed the number of layers required according to the category indicated by the UE. The carrier aggregation and MIMO capabilities indicated for at least one band combination shall meet the processing requirements defined by the physical layer parameter values in the UE category (i.e., maximum number of DL-SCH/UL-SCH transport block bits received/transmitted within a TTI, maximum number of bits of a DL-SCH/UL-SCH transport block received/transmitted within a TTI, and total number of soft channel bits for downlink).

The UE supporting MBMS procedures shall support MBMS reception on any serving cell and on any cell that may be additionally configured as serving cell according to this field.

17.4.4.3 Test description

17.4.4.3.1 Pre-test conditions

System Simulator:

- Cell 1 and Cell 2 are on the same E-UTRA frequency and belongs to same MBSFN area.
- *MBSFNAreaConfiguration* message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 1 and Cell 2.
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1 and Cell 2.

UE:

- The UE is configured to receive MBMS services.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE C on Cell 1 according to [18].
- The UE is made interested in receiving a MBMS service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-IntraFreq list on Cell 1 and Cell 2.
- The UE is made aware that the MBMS service is active.

17.4.4.3.2 Test procedure sequence

Table 17.4.4.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T0", and "T1" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.4.4.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy exit condition for event A3 (M2 < M1).
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-79	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M2 > M1).

Table 17.4.4.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 2.	<--	*Paging*	-	-
1A	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to System information combination 19 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 and Cell 2..	<--	*SystemInformationBlockType15*	-	-
1B	The UE transmits *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
-	Exception; Step 2 is repeated 5 times	-	-	-	-
2	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
3	Void	-	-	-	-
4	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
5	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
6	Check: Is the number of reported MBMS Packets received on the MTCH in step5 greater than zero? (NOTE 1)	-	-	1	P
7	The SS transmits an *RRCConnectionReconfiguration* message to setup intra frequency measurement on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
8	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of intra frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
9	The SS changes Cell 1 and Cell 2 level according to the row "T1" in table 17.4.3.3.2-1.	-	-	-	-
10	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 2.	-->	*MeasurementReport*		
11	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform intra-frequency handover to Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
12	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2?	-->	*RRCConnectionReconfigurationComplete*	-	-
-	Exception; Step 13 is repeated 5 times	-	-	-	-
13	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
14	Void	-	-	-	-
15	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
16	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
17	Check: Is the number of reported MBMS Packets received on the MTCH in step16 greater than the number of MBMS Packets reported in step5? (NOTE 2)	-	-	1	P
NOTE 1: This verifies that UE is receiving active MBMS reception on Cell 1 before Intra-frequency handover to Cell 2.					

NOTE 2: This verifies that UE has performed intra-frequency handover to Cell 2 providing the MBMS service and continue MBMS reception.

17.4.4.3.3 Specific message contents

Table 17.4.4.3.3-1: *SystemInformationBlockType2* for Cells 1 and 2 (Preamble and all steps, Table 17.4.4.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.4.3.3-1A: *SystemInformationBlockType3* for Cells 1 and 2 (Preamble and all steps)

Derivation Path: 36.508, Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
neighCellConfig	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			
}			

Table 17.4.4.3.3-2: *SystemInformationBlockType15* for Cells 1 and 2 (step 1A and all subsequent steps, Table 17.4.4.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_intraFreq.

Table 17.4.4.3.3-3: *RRCConnectionReconfiguration* (step 7, Table 17.4.4.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS

Table 17.4.4.3.3-4: *MeasConfig* (Table 17.4.4.3.3-3)

Derivation Path: 36.508, Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 ::= SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		Band > 64
carrierFreq-v9e0[1]	Same downlink EARFCN as used for f1		
}			
}			

Condition	Explanation
Band > 64	If band > 64 is selected

Table 17.4.4.3.3-4A: *MeasObjectEUTRA-GENERIC*(f1) (Table 17.4.4.3.3-4)

Derivation Path: 36.508, Table 4.6.6-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectEUTRA-GENERIC(Freq) ::= SEQUENCE {			
neighbourCellConfig	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			

Table 17.4.4.3.3-5: *MeasurementReport* (step 10, Table 17.4.4.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 2		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			
}			

Table 17.4.4.3.3-6: *RRCConnectionReconfiguration* (step 12, Table 17.4.4.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition HO

Table 17.4.4.3.3-7: *MobilityControlInfo* (Table 17.4.4.3.3-6)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 2		
carrierFreq	Not present		
}			

17.4.5 Conditional retransmission of MBMS Interest Indication after handover

17.4.5.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state AND SystemInformationBlockType15 have been acquired by the
UE on the Pcell AND the UE has transmitted a MBMSInterestIndication message on the Pcell }
ensure that {
  when { UE receives a RRCConnectionReconfiguration message including mobilityControlInfo less than
1 second after the last transmission of an MBMSInterestIndication message AND UE has completed the
intra frequency handover procedure }
    then { UE should re-transmit a MBMSInterestIndication message }
           }
```

17.4.5.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331 clause 5.8.5.3, 5.3.5.4, and 5.8.5.4. Unless otherwise stated these are Rel-11 requirements.

[TS 36.331 clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB for the concerned session. I.e. the UE does not verify if the session is indicated on MCCH.

2> the UE is capable of simultaneously receiving the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 3: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 4: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

[TS 36.331 clause 5.3.5.4]

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

….

1> if MAC successfully completes the random access procedure:

….

2> if *SystemInformationBlockType15* is broadcast by the PCell:

3> if the UE has transmitted a *MBMSInterestIndication* message during the last 1 second preceding reception of the *RRCConnectionReconfiguration* message including *mobilityControlInfo*:

4> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

4> determine the set of MBMS frequencies of interest in accordance with 5.8.5.3;

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

[TS 36.331 clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest;

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

NOTE: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

17.4.5.3 Test description

17.4.5.3.1 Pre-test conditions

System Simulator:

- Cell 1 and Cell 2 are intra-frequency cells and belongs to same MBSFN area.
- *MBSFNAreaConfiguration* message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 1 and Cell 2.
- System information combination 19 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1 and Cell 2.

UE:

- The UE is configured to receive MBMS services.

Preamble:

- UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].

17.4.5.3.2 Test procedure sequence

Table 17.4.5.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T0", and "T1" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.4.5.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy exit condition for event A3 (M2 < M1).
T1	Cell-specific RS EPRE	dBm/15kHz	-85	-79	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M2 > M1).

Table 17.4.5.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Wait for a period equal to the MCCH repetition period for the UE to receive MBSFNAreaConfiguration message.	-	-	-	-
2	The generic procedures described in TS 36.508 sub clause 4.5.3.3 are performed on Cell 1..	-	-	-	-
3	The SS transmits an *RRCConnectionReconfiguration* message to setup intra frequency measurement on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
4	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of intra frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
5	The SS changes Cell 1 and Cell 2 level according to the row "T1" in table 17.4.5.3.2-1.	-	-	-	-
6	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 2.	-->	*MeasurementReport*		
7	The UE is made interested in receiving MBMS service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-IntraFreq list on Cell 1 and Cell 2 (Note 1)	-	-	-	-
7A	The UE is made aware that the MBMS service is active (Note 1).	-	-	-	-
8	Check: Does the UE transmit *MBMSInterestIndication* message?	-->	*MBMSInterestIndication*	1	P
9 - 10	Void	-	-		
-	EXCEPTION: the behaviour in table 17.4.5.3.2-3 runs in parallel with step 11 below.	-	-	-	-
11	Check: Does the UE transmit *MBMSInterestIndication* message?	-->	*MBMSInterestIndication*	1	P
Note 1: The request may be performed by MMI or AT command.					

Table 17.4.5.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS transmits an *RRCConnectionReconfiguration* message message on Cell 1 to order the UE to perform intra-frequency handover to Cell 2 less than [600ms] after reception of the *MBMSInterestIndication* message in step 8 of Table 17.4.5.3.2-2	<--	*RRCConnectionReconfiguration*	-	-
2	UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationtComplete*	-	-

17.4.5.3.3 Specific message contents

Table 17.4.5.3.3-1: *SystemInformationBlockType2* for Cells 1 and 2 (Preamble and all steps, Table 17.4.5.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.5.3.3-1A: *SystemInformationBlockType3* for Cells 1 and 2 (Preamble and all steps, Table 17.4.5.3.2-2)

Derivation Path: 36.508, Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
neighCellConfig	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			
}			

Table 17.4.5.3.3-2: *SystemInformationBlockType15* for Cells 1 and 2 (Preamble and all steps, Table 17.4.5.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_intraFreq.

Table 17.4.5.3.3-3: *RRCConnectionReconfiguration* (step 2, Table 17.4.5.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS

Table 17.4.5.3.3-4: *MeasConfig* (Table 17.4.5.3.3-3)

Derivation Path: 36.508, Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f1		
}			
}			
}			

Condition	Explanation
Band > 64	If band > 64 is selected

Table 17.4.5.3.3-4A: *MeasObjectEUTRA-GENERIC*(f1) (Table 17.4.5.3.3-4)

Derivation Path: 36.508, Table 4.6.6-2			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasObjectEUTRA-GENERIC(Freq) ::= SEQUENCE {			
neighbourCellConfig	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			

Table 17.4.5.3.3-5: *MeasurementReport* (step 6, Table 17.4.5.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 2		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			
}			

Table 17.4.5.3.3-6: *MBMSInterestIndication* (step 8 & 11, Table 17.4.5.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
interestIndication-r11 OF SEQUENCE {			
mbms-FreqList-r11[*n*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 2		
mbms-Priority-r11	Not present		
lateNonCriticalExtension	Not present		
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			

Table 17.4.5.3.3-7: *RRCConnectionReconfiguration* (step 1, Table 17.4.5.3.2-3)

Derivation Path: 36.508, Table 4.6.1-8, condition HO

Table 17.4.5.3.3-8: *MobilityControlInfo* (Table 17.4.5.3.3-7)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 2		
carrierFreq	Not present		
}			

17.4.6 MBMS Interest Indication retransmission after returning from cell not broadcasting SIB15

17.4.6.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state AND is receiving MBMS service and having transmitted a
MBMSInterestIndication message }
ensure that {
  when { UE performs handover to a Pcell not broadcasting SystemInformationBlockType15 followed by a
handover to a Pcell broadcasting SystemInformationBlockType15 }
    then { UE transmits a MBMSInterestIndication message }
          }
```

17.4.6.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331 clauses 5.8.5.2, 5.8.5.3 and 5.8.5.4. Unless otherwise stated these are Rel-11 requirements.

[TS 36.331 clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB for the concerned session. I.e. the UE does not verify if the session is indicated on MCCH.

2> the UE is capable of simultaneously receiving the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 3: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 4: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

[TS 36.331 clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest;

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

NOTE: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

17.4.6.3 Test description

17.4.6.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN, Cell 1 and Cell 2 are intra-frequency cells. Cell 1 is a MBMS cell and Cell 2 is a non-MBMS cell.
- *MBSFNAreaConfiguration* message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 1.
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1.
- System information combination 1 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 2.

UE:

- The UE is configured to receive MBMS services.

Preamble:

- UE is in state Generic RB Established (state 3) on Cell 1 according to [18].
- The UE is made interested in receiving a MBMS service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-IntraFreq list on Cell 1.
- The UE is made aware that the MBMS service is active.

NOTE: AT Commands for eMBMS service activation specified in TS 27.007 [58] cannot be used as TP cannot be achieved.

17.4.6.3.2 Test procedure sequence

Table 17.4.6.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T0","T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.4.6.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy exit condition for event A3 (M1 > M2).
T1	Cell-specific RS EPRE	dBm/15kHz	-91	-85	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M2 > M1).
T2	Cell-specific RS EPRE	dBm/15kHz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M1 > M2).

Table 17.4.6.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
0	The SS transmits a *Paging* message including a *systemInfoModification* for Cell 1.	<--	*Paging*	-	-
1	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to System information combination 19 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
2	Check: Does the UE transmit *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	1	P
3	The SS transmits an *RRCConnectionReconfiguration* message to setup intra- frequency measurement.	<--	*RRCConnectionReconfiguration*	-	-
4	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of intra-frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
5	The SS changes Cell 1 and Cell 2 level according to the row "T1" in table 17.4.6.3.2-1.	-	-	-	-
6	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 2.	-->	*MeasurementReport*		
7	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform intra-frequency handover to Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
8	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2	-->	*RRCConnectionReconfigurationComplete*	-	-
9	The SS transmits an *RRCConnectionReconfiguration* message to setup intra frequency measurement on Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
10	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2 to confirm the setup of intra frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
11	The SS changes Cell 1 and Cell 2 levels according to the row "T2" in table 17.4.6.3.2-1.	-	-	-	-
12	The UE transmits a *MeasurementReport* message to report event A3 on Cell 2 with the measured RSRP, RSRQ value for Cell 1.	-->	*MeasurementReport*	-	-
13	Void	-	-		
14	Void	-	-		
-	EXCEPTION: the behaviour in table 17.4.6.3.2-3 runs in parallel with step 15 below.	-	-	-	-
15	Check: Does the UE transmit *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	2	P

Table 17.4.6.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS transmits an *RRCConnectionReconfiguration* message on Cell 2 to order the UE to perform intra-frequency handover to Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
2	UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationtComplete*	-	-

17.4.6.3.3 Specific message contents

Table 17.4.6.3.3-1: *SystemInformationBlockType2* for Cells 1 (Preamble and all steps, Table 17.4.6.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.6.3.3-1a: *SystemInformationBlockType15* for Cell 1 (Step 1 and all the subsequent steps, Table 17.4.6.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_intraFreq.

Table 17.4.6.3.3-2: *RRCConnectionReconfiguration* (step 3 and 9, Table 17.4.6.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS

Table 17.4.6.3.3-3: *MeasConfig* (step 3 and 9, Table 17.4.4.3.3-3)

Derivation Path: 36.508, Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f 1		
}			
}			
}			

Condition	Explanation
Band > 64	If band > 64 is selected

Table 17.4.6.3.3-4: *MeasurementReport* (step 6, Table 17.4.6.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 2		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			

Table 17.4.6.3.3-5: *MeasurementReport* (step 12, Table 17.4.6.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultServCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 1		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			

Table 17.4.6.3.3-6: *MBMSInterestIndication* (step 2 and 15, Table 17.4.6.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
interestIndication-r11 OF SEQUENCE {			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	EARFCN of Cell 1		
}			
}			
}			

17.4.7 MBMS Interest Indication after Radio Link Failure

17.4.7.1 Test Purpose (TP)

(1)

```
with { UE in RRC_CONNECTED }
ensure that {
  when { the UE detects a radio link failure less than 1 second after the last transmission of an
MBMSInterestIndication message }
   then { the UE transmits a MBMSInterestIndication message }
            }
```

17.4.7.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.3.7.5, 5.8.5.3 and 5.8.5.4. Unless otherwise stated these are Rel-11 requirements.

[TS 36.331, clause 5.3.7.5]

1> if *SystemInformationBlockType15* is broadcast by the PCell:

2> if the UE has transmitted an *MBMSInterestIndication* message during the last 1 second preceding detection of radio link failure:

3> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

3> determine the set of MBMS frequencies of interest in accordance with 5.8.5.3;

3> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB for the concerned session. I.e. the UE does not verify if the session is indicated on MCCH.

2> the UE is capable of simultaneously receiving the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 3: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 4: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 5: Within this section, the term frequency does not indicate a physical frequency but covers the associated band(s), noting that additional bands may be indicated in *SystemInformationBlockType1* (serving frequency) or *SystemInformationBlockType15* (neighbouring frequencies).

[TS 36.331, clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1*, if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15*;

NOTE 1: The *mbms-FreqList* merely indicates the physical frequencies the UE is interested to receive and does not imply the UE supports the associated band.

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

17.4.7.3 Test description

17.4.7.3.1 Pre-test conditions

System Simulator:

- 2 cells on the same E-UTRA frequency and with the same PLMN.
- The 2 cells are part of the same MBSFN area.
- *MBSFNAreaConfiguration* message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 1 and Cell 2.
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 1 and Cell 2.

UE:

- The UE is configured to receive MBMS services

Preamble:

- The UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].

17.4.7.3.2 Test procedure sequence

Table 17.4.7.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while the row marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the text of the column "Procedure" in Table 17.4.7.3.2-2.

Table 17.4.7.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-115
T1	Cell-specific RS EPRE	dBm/15kHz	“Off”	-85
Power level “Off” is defined in TS 36.508 Table 6.2.2.1-1.				

Table 17.4.7.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
0A	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 2.	<--	*Paging*	-	-
0B	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to System information combination 19 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 and Cell 2 including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
0C	Wait 13 s for UE to receive modified system information (Note 1).	-	-	-	-
0D	The UE is made interested in receiving a MBMS service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-InterFreq list on Cell 1 and Cell 2 (Note 2).	-	-	-	-
0E	The UE is made aware that the MBMS service is active (Note 2).	-	-	-	-
1-1D	Steps 1 to 5 of the generic radio bearer establishment procedure (TS 36.508 4.5.3.3-1) are executed.	-	-	-	-
-	EXCEPTION: In parallel to the events described in step 1E, the steps specified in Table 17.4.7.3.2-3 take place.	-	-	-	-
1E	Wait 2s until UE transmits MBMSInterestIndication	-	-	-	-
1F-1J	Steps 6 to 9 of the generic radio bearer establishment procedure TS 36.508, section 4.5.3.3-1 are executed.	-	-	-	-
2	Void	-	-	-	-
3	SS re-adjusts the cell-specific reference signal level according to row "T1" in table 17.4.7.3.2-1.	-	-	-	-
-	The following messages are to be observed on Cell 2 unless explicitly stated otherwise.	-	-	-	-
4	UE transmits *RRCConnectionReestablishmentRequest* message.	-->	*RRCConnectionReestablishment Request*	-	-
5	SS transmits *RRCConnectionReestablishment* message.	<--	*RRCConnectionReestablishment*	-	-
6	UE transmits *RRCConnectionReestablishmentComplete* message.	-->	*RRCConnectionReestablishment Complete*	-	-
-	EXCEPTION: the behaviour in table 17.4.7.3.2-4 runs in parallel with step 9 below.	-	-	-	-
7	Void	-	-	-	-
8	Void	-	-	-	-
9	Check: Does the UE transmit *MBMSInterestIndication* message?	-->	*MBMSInterestIndication*	1	P
Note 1: Minimum delay 12,8 sec. = 2.5 * BCCH modification period (512 rf) to ensure UE detected SIB update. Note 2: The request may be performed by MMI or AT command.					

Table 17.4.7.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
-	EXCEPTION: Step 1a describes a behaviour which depends on the UE implementation	-	-	-	-
1a	UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-

Table 17.4.7.3.2-4: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS transmits an *RRCConnectionReconfiguration* message to resume existing radio bearer.	<--	*RRCConnectionReconfiguration*	-	-
2	UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationtComplete*	-	-

17.4.7.3.3 Specific message contents

Table 17.4.7.3.3-1: *SystemInformationBlockType2* for Cells 1 and 2 (preamble and all steps, Table 17.4.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.7.3.3-1A: *SystemInformationBlockType3* for Cells 1 and 2 (Preamble and all steps)

Derivation Path: 36.508, Table 4.4.3.3-2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType3 ::= SEQUENCE {			
intraFreqCellReselectionInfo SEQUENCE {			
neighCellConfig	'10'B	The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise	
}			
}			

Table 17.4.7.3.3-2: *SystemInformationBlockType15* for Cells 1 and 2 (Step 0B and subsequent steps, Table 17.4.2.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_intraFreq.

Table 17.4.7.3.3-3: *MBMSInterestIndication* (steps 1a, Table 17.4.7.3.2-3 and 9, Table 17.4.7.3.2-2)

Derivation Path: 36.508 Table 4.6.1-4AC			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
interestIndication-r11 OF SEQUENCE {			
mbms-FreqList-r11[1] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	EARFCN of Cell 1	1 entry	
}			
}			
}			

Table 17.4.7.3.3-4: SystemInformationBlockType2 for Cell 1 (preamble and all steps, Table 17.4.7.3.2-2)

Derivation path: 36.508 table 4.4.3.3-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
ue-TimersAndConstants SEQUENCE {			
t310	ms200		
}			
}			

Table 17.4.7.3.3-5: RRCConnectionReconfiguration (step 1, Table 17.4.7.3.2-2; Step 8, 36.508 Table 4.5.3.3-1 and step 1, Table 17.4.7.3.2-4)

Derivation Path: 36.508 table 4.6.1-8, condition SRB2-DRB(1, 0)			
Information Element	**Value/Remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
RadioResourceConfigDedicated SEQUENCE {			
mac-MainConfig CHOICE {			
drx-Config	Not present		NOT pc_FeatrGrp_5
drx-Config CHOICE {			pc_FeatrGrp_5
setup SEQUENCE {			
onDurationTimer	Psf2		
drx-InactivityTimer	Psf100		
drx-RetransmissionTimer	sf16		
longDRX-CycleStartOffset CHOICE {			
sf40	4		
}			
shortDRX	Not present		
}			
}			
}			
}			
}			
}			
}			

17.4.8 Continued MBMS service reception after E-UTRAN release of unicast bearer

17.4.8.1 Test Purpose (TP)

(1)

```
with { UE in RRC Connected state on a MBMS cell and is prioritising MBMS service over unicast data }
ensure that {
 when { UE receives the SystemInformationBlockType15 message broadcasted on the MBMS cell }
    then { UE transmits a MBMSInterestIndication message including the mbms-Priority IE indicating
that UE prioritises reception of MBMS frequencies above reception of any of the unicast bearers }
            }
```

(2)

```
with { UE in E-UTRA RRC_Connected state with a unicast bearer configured AND is receiving MBMS
service }
ensure that {
 when { UE receives a RRCConnectionReconfiguration message to release the unicast bearer }
    then { UE accepts the release of the unicast bearer and continues to receive MBMS service }
            }
```

17.4.8.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331 clause 5.8.5.4. Unless otherwise stated these are Rel-11 requirements.

[TS 36.331 clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1*, if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15*;

NOTE 1: The *mbms-FreqList* merely indicates the physical frequencies the UE is interested to receive and does not imply the UE supports the associated band.

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

17.4.8.3 Test description

17.4.8.3.1 Pre-test conditions

System Simulator:

- Cell 1 "Serving cell", as defined in TS 36.508 Table 6.2.2.1-1.
- *MBSFNAreaConfiguration* message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 1.
- System information combination 15 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1.

UE:

- The UE is configured to receive MBMS services.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE C on Cell 1 according to [18].
- The UE has one dedicated EPS bearer (DRB2) established.
- The UE is made interested in receiving MBMS service with MBMS Service ID=0 in the PLMN associated with the MBMS SAI (1) broadcasted in SIB15 on Cell 1.
- The UE is configured to prioritise reception of MBMS frequencies above reception of any unicast bearers.
- The UE is made aware that the MBMS service is active.

17.4.8.3.2 Test procedure sequence

Table 17.4.8.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for cell1.	<--	*Paging*	-	-
-	EXCEPTION: the behaviour in table 17.4.8.3.2-2 runs in parallel with steps 3 to 7 below.	-	-	-	-
2	From the beginning of the next modification period the SS transmits *SystemInformationBlockType15* according to system information combination 19 as defined in TS 36.508[18] clause 4.4.3.1 including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
3	UE transmits *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
4	Wait for a period equal to the MCCH repetition period for the UE to receive MBSFNAreaConfiguration message.	-	-	-	-
5	Void	-	-	-	-
-	Exception; Step 6 is repeated 5 times	-	-	-	-
6	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
7	Void	-	-.	-	-
8	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
9	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
10	Check: Is the number of reported MBMS Packets received on the MTCH in step 9 greater than zero?	-	-	2	P
11	The SS transmits an *RRCConnectionReconfiguration* message to release the unicast bearer (DRB2 that established during preamble) due to congestion on the MBMS carrier(s)	<--	*RRCConnectionReconfiguration*	-	-
12	The UE transmits an *RRCConnectionReconfigurationComplete* message to confirm the release.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	Exception; Step 13 is repeated 5 times	-	-	-	-
13	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
14	Void	-	-	-	-
15	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
16	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
17	Check: Does the number of reported MBMS Packets received on the MTCH is greater than the number of MBMS Packets reported in step10?	-	-	2	P

Table 17.4.8.3.2-2: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Check: Does UE transmit a *MBMSInterestIndication* message including the *mbms-Priority IE* set to True?	-->	*MBMSInterestIndication*	1	P

17.4.8.3.3 Specific message contents

Table 17.4.8.3.3-1: *SystemInformationBlockType2* for Cells 1 (Preamble and all steps, Table 17.4.8.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.8.3.3-2: *RRCConnectionReconfiguration* (step 11, Table 17.4.8.3.2-1)

Derivation Path: 36.508, Table 4.6.1-8, condition DRB-REL

Table 17.4.8.3.3-3: *MBMSInterestIndication* (step 1, Table 17.4.8.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4C			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
interestIndication-r11 OF SEQUENCE {			
mbms-Priority-r11	true	ENUMERATED {true}	
}			
}			
}			

17.4.9 CA / Start MBMS reception on Non-Serving Cell / Continue MBMS reception on SCell after SCell addition

17.4.9.1 CA / Start MBMS reception on Non-Serving Cell / Continue MBMS reception on SCell after SCell addition / Intra-band Contiguous CA

17.4.9.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC CONNECTED state on a cell broadcasting SIB15 and interested to receive a
MBMS service}
ensure that {
  when { SIB15 indicates that the MBMS service is available on a frequency on an inter-frequency
neighbour cell within the UE signalled supportedBandCombination capabilities }
    then { UE starts MBMS reception on the Non-Serving neighbour cell }
            }
```

(2)

```
with { UE in E-UTRA RRC_CONNECTED state with ongoing MBMS reception on a Non-Serving neighbour cell
}
ensure that {
  when { UE receives an RRCConnectionReconfiguration message containing sCellToAddModList with a
SCell addition of the Non-Serving cell with ongoing MBMS reception and UE adds the new SCell,
configures lower layers to consider the SCell to be in deactivated state and sends an
RRCConnectionReconfigurationComplete message }
    then { UE continues MBMS reception on the new SCell }
            }
```

17.4.9.1.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 36.306, clause 4.3.5.2 and TS 36.331, clause 5.8.5.3. Unless otherwise stated these are Rel-11 requirements.

[TS 36.306, clause 4.3.5.2]

This field defines the carrier aggregation, MIMO and MBMS reception capabilities supported by the UE for configurations with inter-band, intra-band non-contiguous, intra-band contiguous carrier aggregation and without carrier aggregation. For each band in a band combination the UE provides the supported CA bandwidth classes and the corresponding MIMO capabilities for downlink. The UE also has to provide the supported uplink CA bandwidth class and the corresponding MIMO capability for at least one band in the band combination. A MIMO capability applies to all carriers of a bandwidth class of a band in a band combination.

...

The UE supporting MBMS procedures shall support MBMS reception on any serving cell and on any cell that may be additionally configured as serving cell according to this field. The UE shall apply the system information acquisition and change monitoring procedure relevant for MBMS operation for these cells.

The UE indicating more than one frequency in the *MBMSInterestIndication* message as specified in [5] shall support simultaneous reception of MBMS on the indicated frequencies when the frequencies of the configured serving cells and the indicated frequencies belong to at least one band combination.

...

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB for the concerned session. I.e. the UE does not verify if the session is indicated on MCCH.

2> the UE is capable of simultaneously receiving the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 3: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 4: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 5: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

17.4.9.1.3 Test Description

17.4.9.1.3.1 Pre-test conditions

System Simulator:

- Cell 1 is the PCell, Cell3 is the SCell to be added.
- Cell 3 is an Inactive SCell according to [18] cl. 6.3.4.
- MBSFNAreaConfiguration message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 3.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 1.
- System information combination 16 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 3.

UE:

- The UE is configured to receive MBMS services.
- The UE has in the signalled IE “supportedBandCombination” indicated support of the CA configuration for the frequencies of Cell 1 and Cell 3.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE C on Cell 1 according to [18].
- The UE is made interested in receiving a MBMS service with MBMS Service ID=0associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-InterFreq list on Cell 1 and Cell 3 (indicating that the MBMS service is available on the frequency of Cell 3).

1- The UE is made aware that the MBMS service is active.

7.4.9.1.3.2 Test procedure sequence

Table 17.4.9.1.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while the configuration marked "T1" and "T2" are applied at the point indicated in the Main behaviour description in Table 17.4.9.1.3.2-2.

Table 17.4.9.1.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-79	Off	The power level values are such that camping on Cell 1 is guarantee.
T1	Cell-specific RS EPRE	dBm/15k Hz	-79	-85	The power level values are such that measurement results for Cell 1 (M1) and Cell 3 (M3) satisfy entry condition for event A3 (M3 > M1).

Table 17.4.9.1.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to setup inter Frequency measurement.	<--	*RRCConnectionReconfiguration*	-	-
2	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1.	-->	*RRCConnectionReconfigurationComplete*	-	-
3	The SS changes Cell 3 parameters according to the row "T1" in table 17.4.9.1.3.2-1.	-	-	-	-
4	The UE transmits a *MeasurementReport* message on Cell 1 to report event A3 with the measured RSRP, RSRQ value for Cell 3.	-->	*MeasurementReport*	-	-
4A	The SS transmits a Paging message including a systemInfoModification for Cell1.	<--	*Paging*	-	-
5	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to system information combination 18 on Cell 1 and according to system information combination 20 on Cell 3 including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1. Note: System information combination 18 and 20 are defined in TS 36.508[18] clause 4.4.3.1	<--	*SystemInformationBlockType15*	-	-
6	The UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
7	SS waits 2 seconds to allow UE to read the necessary system and MCCH information; and to receive *MBSFNAreaConfiguration* message on the non-serving cell.	-	-	-	-
-	Exception; Step 8 is repeated 5 times	-	-	-	-
8	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID=’00001’, Stop MTCH= ‘00000000001’ in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
9	Void	-	-	-	-
10	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message on Cell 1.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
11	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
12	Check: Is the number of reported MBMS Packets received on the MTCH in step 12 greater than zero? (Note: This verifies that UE has received MBMS packets on the Non-Serving Cell 3 providing the MBMS service and started MBMS reception)	-	-	1	P
13	The SS transmits an *RRCConnectionReconfiguration* message containing an *sCellToAddModList* with SCell Cell 3 addition.	<--	*RRCConnectionReconfiguration*	-	-
14	The UE transmits an *RRCConnectionReconfigurationComplete* message	-->	*RRCConnectionReconfigurationComplete*	-	-
-	Exception; Step 15 is repeated 5 times	-	-	-	-
15	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID=’00001’, Stop MTCH= ‘00000000001’ in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-

16	Void	-	-	-	-
17	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message on Cell 1	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
18	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
19	Check: Is the number of reported MBMS Packets received on the MTCH in step 19 greater than the number reported in step 12? (Note: This verifies that UE continue to receive MBMS packets on Cell 3 after being added as SCell)	-	-	2	P

17.4.9.1.3.3 Specific message contents

Table 17.4.9.1.3.3-0: Conditions for specific message contents in Tables 17.4.9.1.3.3-5, 17.4.9.1.3.3-10, 17.4.9.1.3.3-11 and 17.4.9.1.3.3-12

Condition	Explanation
Uplink_CA	The UE supports carrier aggregation in UL under the test band.
Band > 64	If band > 64 is selected

Table 17.4.9.1.3.3-1: *SystemInformationBlockType2* for Cell 3 (preamble and all steps, Table 17.4.9.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.9.1.3.3-2: *SystemInformationBlockType15* for Cell 1 (from step 5 and all subsequent steps, Table 17.4.9.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_interFreq.			
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 3, see table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	

Table 17.4.9.1.3.3-3: *SystemInformationBlockType15* for Cell 3 (from step 5 and all subsequent steps, Table 17.4.9.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_intraFreq.

Table 17.4.9.1.3.3-4: *RRCConnectionReconfiguration* (step 1, Table 17.4.9.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8 with condition MEAS

Table 17.4.9.1.3.3-5: *MeasConfig* (Table 17.4.9.1.3.3-4)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-1, condition INTER-FREQ			
Information Element	**Value/Remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	2 entries		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)	Cell 1	
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
measObjectId[2]	IdMeasObject-f2		
measObject[2]	MeasObjectEUTRA-GENERIC(f2)	Cell 3	
measObject[2]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfig-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f2		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	2 entries		Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 1		
}			
measObjectEUTRA-v9e0[2] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 3		
}			
}			
}			

Table 17.4.9.1.3.3-6: *ReportConfig-A3* (step 1, Table 17.4.9.1.3.2-2)

Derivation Path: 36.508 clause 4.6.6 table 4.6.6-6			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigEUTRA-A3 ::= SEQUENCE {			
triggerType CHOICE {			
event SEQUENCE {			
eventId CHOICE {			
eventA SEQUENCE {			
a3-Offset	-24 (-12 dB)		
reportOnLeave	TRUE		
}			
}			
}			
}			
}			

Table 17.4.9.1.3.3-7: *MeasurementReport* (step 4, Table 17.4.9.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
measurementReport-r8 SEQUENCE {			
measResults ::= SEQUENCE {			
measId	1		
measResultPCell ::= SEQUENCE {		Report Cell 1	
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {		Report Cell 3	
physCellId [1]	physicalCellId of Cell 3		
cgi-Info [1] SEQUENCE {}	Not present		
measResult [1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
additionalSI-Info-r9 SEQUENCE {}	Not present		
}			
}			
}			
measResultForECID-r9 SEQUENCE {}	Not present		
locationInfo-r10 SEQUENCE {}	Not present		
measResultServFreqList-r10 SEQUENCE {}	Not present		
}			
}			
}			
}			
}			

Table 17.4.9.1.3.3-8: *MBMSInterestIndication* (step 6, Table 17.4.9.1.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4C			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 3	INTEGER (0..maxEARFCN2)	
}			
}			

Table 17.4.9.1.3.3-9: *RRCConnectionReconfiguration* (step 13, Table 17.4.9.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10	Not present		
sCellToAddModList-r10	SCellToAddMod-r10-f2-Add	SCell addition for Cell 3	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 17.4.9.1.3.3-10: SCellToAddMod-r10-f2-Add (Table 17.4.9.1.3.3-9)

Derivation Path: 36.508 clause 4.6.1 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SEQUENCE {	1 entry		
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 3		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 3		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 3		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f2		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f2		
}			

Table 17.4.9.1.3.3-11: *RadioResourceConfigCommonSCell-r10-f2* (Table 17.4.9.1.3.3-9)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 3		
}			
mbsfn-SubframeConfigList-r10	present		
Ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 3	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 3		
}			
}			
}			

Table 17.4.9.1.3.3-11A: mbsfn-SubframeConfigList-r10 (Table 17.4.9.1.3.3-11)

Derivation Path: 36.331 clause 6.3.7			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFN-SubframeConfig SEQUENCE {			
radioframeAllocationPeriod	n4		
radioframeAllocationOffset	1		FDD
	0		TDD
subframeAllocation CHOICE{			
oneFrame	'100000'		FDD
	'000010'		TDD
}			
}			

Table 17.4.9.1.3.3-12: *RadioResourceConfigDedicatedSCell-r10-f2* (Table 17.4.9.1.3.3-9)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

17.4.9.2 CA / Start MBMS reception on Non-Serving Cell / Continue MBMS reception on SCell after SCell addition / Inter-band CA

17.4.9.2.1 Test Purpose (TP)

Same as TC 17.4.9.1 but applied to Inter-band CA case.

17.4.9.2.2 Conformance requirements

Same as TC 17.4.9.1.

17.4.9.2.3 Test description

17.4.9.2.3.1 Pre-test conditions

Same as test case 17.4.9.1 with the following differences:

- Cell configuration: Cell 10 replaces Cell 3

17.4.9.2.3.2 Test procedure sequence

Same as test case 17.4.9.1 with the following differences:

- Cell configuration: Cell 10 replaces Cell 3.

17.4.9.2.3.3 Specific message contents

Same as test case 17.4.9.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.
- Specific message content of *MeasConfig* in Table 17.4.9.2.3.3-1 replaces content in Table 17.4.9.1.3.3-5.

Table 17.4.9.2.3.3-1: *MeasConfig* (Table 17.4.9.1.3.3-4)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-1, condition INTER-FREQ			
Information Element	**Value/Remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	2 entries		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)	Cell 1	
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
measObjectId[2]	IdMeasObject-f5		
measObject[2]	MeasObjectEUTRA-GENERIC(f5)	Cell 10	
measObject[2]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfig-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f5		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 1		
}			
measObjectEUTRA-v9e0[2] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 10		
}			
}			
}			

Condition	Explanation
Band > 64	If band > 64 is selected

17.4.10 CA / Start MBMS reception on SCell / Continue MBMS reception on Non-Serving after SCell release

17.4.10.1 CA / Start MBMS reception on SCell / Continue MBMS reception on Non-Serving after SCell release / Intra-band Contiguous CA

17.4.10.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC CONNECTED state with PCell and SCell activate and both broadcasting SIB15
and UE is interested to receive a MBMS service}
ensure that {
  when { SIB15 indicates that the MBMS service is available on the frequency of the SCell }
    then { UE starts MBMS reception on the Scell }
            }
```

(2)

```
with { UE in E-UTRA RRC_CONNECTED state with active PCell and SCell and ongoing MBMS reception on
the SCell }
ensure that {
  when { UE receives an RRCConnectionReconfiguration message containing sCellToReleaseList with a
sCellIndex equalling to the current UE SCell configuration with ongoing MBMS reception and UE
releases the SCell and sends an RRCConnectionReconfigurationComplete message }
    then { UE continues MBMS reception on the former SCell (now Non-Serving cell) }
           }
```

17.4.10.1.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 36.306, clause 4.3.5.2 and TS 36.331, clause 5.8.5.3. Unless otherwise stated these are Rel-11 requirements.

[TS 36.306, clause 4.3.5.2]

This field defines the carrier aggregation, MIMO and MBMS reception capabilities supported by the UE for configurations with inter-band, intra-band non-contiguous, intra-band contiguous carrier aggregation and without carrier aggregation. For each band in a band combination the UE provides the supported CA bandwidth classes and the corresponding MIMO capabilities for downlink. The UE also has to provide the supported uplink CA bandwidth class and the corresponding MIMO capability for at least one band in the band combination. A MIMO capability applies to all carriers of a bandwidth class of a band in a band combination.

...

The UE supporting MBMS procedures shall support MBMS reception on any serving cell and on any cell that may be additionally configured as serving cell according to this field. The UE shall apply the system information acquisition and change monitoring procedure relevant for MBMS operation for these cells.

The UE indicating more than one frequency in the *MBMSInterestIndication* message as specified in [5] shall support simultaneous reception of MBMS on the indicated frequencies when the frequencies of the configured serving cells and the indicated frequencies belong to at least one band combination.

...

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB for the concerned session. I.e. the UE does not verify if the session is indicated on MCCH.

2> the UE is capable of simultaneously receiving the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 3: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 4: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 5: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

17.4.10.1.3 Test Description

17.4.10.1.3.1 Pre-test conditions

System Simulator:

- Cell 1 is the PCell, Cell3 is the SCell to be added.
- Cell 3 is an Inactive SCell according to [18] cl. 6.3.4.
- MBSFNAreaConfiguration message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 3.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 1.
- System information combination 16 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 3.

UE:

- The UE is configured to receive MBMS services.
- The UE has in the signalled IE “supportedBandCombination” indicated support of the CA configuration for the frequencies of Cell 3.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE C on Cell 1 according to [18].
- The UE is made interested in receiving a MBMS service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-InterFreq list on Cell 1 and Cell 3 (indicating that the MBMS service is available on the frequency of Cell 3).
- The UE is made aware that the MBMS service is active.

17.4.10.1.3.2 Test procedure sequence

Table 17.4.10.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	The SS transmits an *RRCConnectionReconfiguration* message containing a *sCellToAddModList* with Cell 3 as SCell addition.	<--	*RRCConnectionReconfiguration*	-	-
2	The UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
2A	The SS transmits a Paging message including a systemInfoModification for Cell1.	<--	*Paging*	-	-
3	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to system information combination 18 on Cell 1 and according to system information combination 20 on Cell 3 including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
4	The UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
5	Wait for a period equal to the MCCH repetition period for the UE to receive *MBSFNAreaConfiguration* message	-	-	-	-
-	Exception; Step 6 is repeated 5 times	-	-	-	-
6	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
7	Void.	-	-	-	-
8	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message on Cell 1.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
9	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
10	Check: Is the number of reported MBMS Packets received on the MTCH in step 9 greater than zero? (Note: This verifies that UE has received MBMS packets on the SCell providing the MBMS service and started MBMS reception)	-	-	1	P
11	The SS transmits an *RRCConnectionReconfiguration* message containing a *sCellToReleaseList* with SCell release of Cell 3.	<--	*RRCConnectionReconfiguration*	-	-
12	The UE transmits an *RRCConnectionReconfigurationComplete* message	-->	*RRCConnectionReconfigurationComplete*	-	-
-	Exception; Step 13 is repeated 5 times	-	-	-	-
13	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
14	Void	-	-	-	-
15	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message on Cell 1.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
16	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
17	Check: Is the number of reported MBMS	-	-	2	P

	Packets received on the MTCH in step 16 greater than the number reported in step 9? (Note: This verifies that UE continue to receive MBMS packets on Cell 3 after being released as SCell and becoming a Non-Serving cell)				

17.4.10.1.3.3 Specific message contents

Table 17.4.10.1.3.3-0: Conditions for specific message contents in Tables 17.4.10.1.3.3-6, 17.4.10.1.3.3-7, 17.4.10.1.3.3-10 and 17.4.10.1.3.3-11

Condition	Explanation
Uplink_CA	The UE supports carrier aggregation in UL under the test band.

Table 17.4.10.1.3.3-1: *SystemInformationBlockType2* for Cell 3 (preamble and all steps, Table 17.4.10.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.10.1.3.3-2: *SystemInformationBlockType15* for Cell 1 (from step 3 and all subsequent steps, Table 17.4.10.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_interFreq.			
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 3, see table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	

Table 17.4.10.1.3.3-3: *SystemInformationBlockType15* for Cell 3 (from step 3 and all subsequent steps, Table 17.4.10.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_intraFreq.

Table 17.4.10.1.3.3-4: *RRCConnectionReconfiguration* (step 1, Table 17.4.10.1.3.2-1)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10	Not present		
sCellToAddModList-r10	SCellToAddMod-r10-f2-Add	SCell addition for Cell 3	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 17.4.10.1.3.3-5: SCellToAddMod-r10-f2-Add (Table 17.4.10.1.3.3-4)

Derivation Path: 36.508 clause 4.6.1 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SEQUENCE {	1 entry		
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 3		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 3		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 3		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f2		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f2		
}			

Table 17.4.10.1.3.3-6: *RadioResourceConfigCommonSCell-r10-f2* (Table 17.4.10.1.3.3-4)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 3		
}			
mbsfn-SubframeConfigList-r10	present		
Ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 3	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 3		
}			
}			
}			

Table 17.4.10.1.3.3-6A: mbsfn-SubframeConfigList-r10 (Table 17.4.10.1.3.3-6)

Derivation Path: 36.331 clause 6.3.7			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFN-SubframeConfig SEQUENCE {			
radioframeAllocationPeriod	n4		
radioframeAllocationOffset	1		FDD
	0		TDD
subframeAllocation CHOICE{			
oneFrame	'100000'		FDD
	'000010'		TDD
}			
}			

Table 17.4.10.1.3.3-7: *RadioResourceConfigDedicatedSCell-r10-f2* (Table 17.4.10.1.3.3-4)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

Table 17.4.10.1.3.3-8: *MBMSInterestIndication* (step 4, Table 17.4.10.1.3.2-1)

Derivation Path: 36.508, Table 4.6.1-4C			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 3	INTEGER (0..maxEARFCN2)	
}			
}			

Table 17.4.10.1.3.3-9: *RRCConnectionReconfiguration* (step 11, Table 17.4.10.1.3.2-1)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10 SEQUENCE (SIZE (1..maxSCell-r10) OF SEQUENCE {	1 entry		
sCellIndex-r10[1]	1	SCell release for Cell 3	
}			
sCellToAddModList-r10	Not present		
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 17.4.10.1.3.3-10: *RadioResourceConfigCommonSCell-r10-f2-SIchange* (Table 17.4.10.1.3.3-9)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 3		
antennaInfoCommon-r10 SEQUENCE {			
antennaPortsCount	an1		
}			
}			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 3	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 3		
}			
}			
}			

17.4.10.2 CA / Start MBMS reception on SCell / Continue MBMS reception on Non-Serving after SCell release / Inter-band CA

17.4.10.2.1 Test Purpose (TP)

Same as TC 17.4.10.1 but applied to Inter-band CA case.

17.4.10.2.2 Conformance requirements

Same as TC 17.4.10.1.

17.4.10.2.3 Test description

17.4.10.2.3.1 Pre-test conditions

Same as test case 17.4.10.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

17.4.10.2.3.2 Test procedure sequence

Same as test case 17.4.10.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

17.4.10.2.3.3 Specific message contents

Same as test case 17.4.10.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

17.4.11 CA / Start MBMS reception on PCell / Continue MBMS reception after swap of SCell and PCell

17.4.11.1 CA / Start MBMS reception on PCell / Continue MBMS reception after swap of SCell and PCell / Intra-band Contiguous CA

17.4.11.1.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC CONNECTED state with PCell and SCell activate and both broadcasting SIB15
and UE is interested to receive a MBMS service}
ensure that {
  when { SIB15 indicates that the MBMS service is available on the frequency of the PCell }
    then { UE starts MBMS reception on the Pcell }
            }
```

(2)

```
with { UE in E-UTRA RRC_CONNECTED state with active PCell and SCell and ongoing MBMS reception on
the PCell }
ensure that {
  when { UE receives an RRCConnectionReconfiguration message to reconfigure the SCell as PCell and
the PCell as SCell and sends an RRCConnectionReconfigurationComplete message }
    then { UE continues MBMS reception on the new SCell  }
            }
```

(3)

```
with { UE in E-UTRA RRC_CONNECTED state with active PCell and SCell and ongoing MBMS reception on
the SCell }
ensure that {
  when { UE receives an RRCConnectionReconfiguration message to reconfigure the SCell as PCell and
the PCell as SCell and sends an RRCConnectionReconfigurationComplete message }
    then { UE continues MBMS reception on the new PCell  }
            }
```

17.4.11.1.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 36.306, clause 4.3.5.2 and TS 36.331, clause 5.8.5.3. Unless otherwise stated these are Rel-11 requirements.

[TS 36.306, clause 4.3.5.2]

This field defines the carrier aggregation, MIMO and MBMS reception capabilities supported by the UE for configurations with inter-band, intra-band non-contiguous, intra-band contiguous carrier aggregation and without carrier aggregation. For each band in a band combination the UE provides the supported CA bandwidth classes and the corresponding MIMO capabilities for downlink. The UE also has to provide the supported uplink CA bandwidth class and the corresponding MIMO capability for at least one band in the band combination. A MIMO capability applies to all carriers of a bandwidth class of a band in a band combination.

...

The UE supporting MBMS procedures shall support MBMS reception on any serving cell and on any cell that may be additionally configured as serving cell according to this field. The UE shall apply the system information acquisition and change monitoring procedure relevant for MBMS operation for these cells.

The UE indicating more than one frequency in the *MBMSInterestIndication* message as specified in [5] shall support simultaneous reception of MBMS on the indicated frequencies when the frequencies of the configured serving cells and the indicated frequencies belong to at least one band combination.

...

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB for the concerned session. I.e. the UE does not verify if the session is indicated on MCCH.

2> the UE is capable of simultaneously receiving the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 3: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 4: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 5: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

17.4.11.1.3 Test Description

17.4.11.1.3.1 Pre-test conditions

System Simulator:

- Cell 1 is the PCell, Cell3 is the SCell to be added.
- Cell 3 is an Inactive SCell according to [18] cl. 6.3.4.
- MBSFNAreaConfiguration message as defined in TS 36.508 [18] Table 4.6.1-4A is transmitted on Cell 3.
- System information combination 16 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 1.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 3.

UE:

- The UE is configured to receive MBMS services.
- The UE has in the signalled IE “supportedBandCombination” indicated support of the CA configuration for the frequencies of Cell 1.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE C on Cell 1 according to [18].
- The UE is made interested in receiving a MBMS service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-InterFreq list on Cell 1 and Cell 3 (indicating that the MBMS service is available on the frequency of Cell 3).

- The UE is made aware that the MBMS service is active.

17.4.11.1.3.2 Test procedure sequence

Table 8.3.1.2.3.2-1 illustrates the downlink power levels to be applied for Cell 1 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 17.4.11.1.3.2-1: Power levels

	Parameter	Unit	Cell 1	Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15 kHz	-70	-96	Power level for Cell 1 is such that *Ms* > *Thresh* + *Hys*
T1			-96	-70	Power level for Cell 1 is such that entry condition for event A2 is satisfied *Ms* + *Hys* < *Thresh*
T2			-70	-96	Power level for Cell 3 is such that exit condition for event A2 is satisfied *Ms* > *Thresh* + *Hys*
Note: The total tolerance used is the sum of downlink signal level uncertainty (TS 36.508 clause 6.2.2.1) and absolute UE measurement accuracy (TS 36.133 clause 9).					

Table 17.4.11.1.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	The SS transmits an *RRCConnectionReconfiguration* message containing a *sCellToAddModList* with Cell 3 as SCell addition on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
2	The UE transmits an *RRCConnectionReconfigurationComplete* message	-->	*RRCConnectionReconfigurationComplete*	-	-
2A	The SS transmits a Paging message including a systemInfoModification for Cell1.	<--	*Paging*	-	-
3	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to system information combination 20 on Cell 1 and according to system information combination 18 on Cell 3. Note: System information combination 18 and 20 are defined in TS 36.508[18] clause 4.4.3.1	<--	*SystemInformationBlockType15*	-	-
4	The UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
5	Wait for a period equal to the MCCH modification period for the UE to receive *MBSFNAreaConfiguration* message	-	-	-	-
-	Exception; Step 6 is repeated 5 times	-	-	-	-
6	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets	-	-
7	Void	-	-	-	-
8	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message on Cell 1.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
9	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
10	Check: Is the number of reported MBMS Packets received on the MTCH in step 9 greater than zero? (Note: This verifies that UE has received MBMS packets on the PCell providing the MBMS service and started MBMS reception)	-	-	1	P
11	SS transmits an *RRCConnectionReconfiguration* message including *measConfig* to setup intra LTE measurement and reporting for event A2 on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
12	The UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
13	SS re-adjusts the cell-specific reference signal level according to row "T1" in table 17.4.11.1.3.2-1.	-	-	-	-
14	UE transmits a *MeasurementReport* message to report event A2 for Cell 1	-->	*MeasurementReport*	-	-
15	The SS transmits an *RRCConnectionReconfiguration* message containing to reconfigure the PCell as SCell and the SCell as PCell	<--	*RRCConnectionReconfiguration*	-	-
16	The UE transmits an *RRCConnectionReconfigurationComplete* message	-->	*RRCConnectionReconfigurationComplete*	-	-
16	Wait for a period equal to the MCCH	-	-	-	-

A	modification period for the UE to receive *MBSFNAreaConfiguration* message on SCell (Cell 1)				
-	Exception; Step 17 is repeated 5 times	-	-	-	-
17	The SS transmits 2 MBMS Packets on the MTCH in the next MCH Scheduling Period, with MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' in the first MAC PDU of the MCH Scheduling Period.	<--	MBMS Packets.	-	-
18	Void	-	-	-	-
19	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message on Cell 3.	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
20	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
21	Check: Is the number of reported MBMS Packets received on the MTCH in step 16 greater than the number reported in step 9? (Note: This verifies that UE continue to receive MBMS packets on Cell 1 after being reconfigured as SCell)	-	-	2	P
22	SS transmits an *RRCConnectionReconfiguration* message on Cell 3 including *measConfig* to setup intra LTE measurement and reporting for event A2 on Cell 3.	<--	*RRCConnectionReconfiguration*	-	-
23	The UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
24	SS re-adjusts the cell-specific reference signal level according to row "T2" in table 17.4.11.1.3.2-1.	-	-	-	-
25	UE transmits a *MeasurementReport* message to report event A2 for Cell 3	-->	*MeasurementReport*	-	-
26	The SS transmits an *RRCConnectionReconfiguration* message containing to reconfigure the PCell as SCell and the SCell as PCell	<--	*RRCConnectionReconfiguration*	-	-
27	The UE transmits an RRCConnectionReconfigurationComplete message	-->	RRCConnectionReconfigurationComplete	-	-
27A	Wait for a period equal to the MCCH modification period for the UE to receive *MBSFNAreaConfiguration* message on PCell (Cell 1)	-	-	-	-
28	The SS transmits a valid MAC PDU including 'MCH Scheduling Information MAC Control Element with LCID='00001', Stop MTCH= '00000000001' on Cell 1	<--	MAC PDU (MCH Scheduling Information MAC Control Element: LCID='00001', Stop MTCH= '00000000001')	-	-
29	The SS transmits 10 MBMS Packets on the MTCH on Cell 1.	<--	MBMS Packets.	-	-
30	The SS transmits an UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST message on Cell 1	<--	UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST	-	-
31	UE responds with UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE	-	-
32	Check: Is the number of reported MBMS Packets received on the MTCH in step 31 greater than the number reported in step 20? (Note: This verifies that UE continues to receive MBMS packets on Cell 1 after being reconfigured as PCell)	-	-	3	P

17.4.11.1.3.3 Specific message contents

Table 17.4.11.1.3.3-0: Conditions for specific message contents in Tables 17.4.11.1.3.3-5, 17.4.11.1.3.3-6, 17.4.11.1.3.3-7, 17.4.11.1.3.3-10, 17.4.11.1.3.3-14, 17.4.11.1.3.3-15, 17.4.11.1.3.3-16, 17.4.11.1.3.3-19, 17.4.11.1.3.3-24, 17.4.11.1.3.3-25, 17.4.11.1.3.3-26 and 17.4.11.1.3.3-27

Condition	Explanation
Uplink_CA	The UE supports carrier aggregation in UL under the test band.
Band > 64	If band > 64 is selected

Table 17.4.11.1.3.3-1: *SystemInformationBlockType2* for Cell 3 (preamble and all steps, Table 17.4.11.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-1, condition MBMS.

Table 17.4.11.1,3.3-2: *SystemInformationBlockType15* for Cell 1 (from step 3 and all subsequent steps, Table 17.4.11.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_intraFreq.

Table 17.4.11.1.3.3-3: *SystemInformationBlockType15* for Cell 3 (from step 3 and all subsequent steps, Table 17.4.11.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition MBMS_interFreq.			
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 1, see table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	

Table 17.4.11.1.3.3-4: *RRCConnectionReconfiguration* (step 1, Table 17.4.11.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10	Not present		
sCellToAddModList-r10	SCellToAddMod-r10-f2-Add	SCell addition for Cell 3	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 17.4.11.1.3.3-5: SCellToAddMod-r10-f2-Add (Table 17.4.11.1.3.3-4)

Derivation Path: 36.508 clause 4.6.1 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SEQUENCE {	1 entry		
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 3		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 3		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 3		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f2		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f2		
}			

Table 17.4.11.1.3.3-6: *RadioResourceConfigCommonSCell-r10-f2* (Table 17.4.11.1.3.3-4)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 3		
}			
Ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 3	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 3		
}			
}			
}			

Table 17.4.11.1.3.3-7: *RadioResourceConfigDedicatedSCell-r10-f2* (Table 17.4.11.1.3.3-4)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

Table 17.4.11.1.3.3-8: *MBMSInterestIndication* (step 4, Table 17.4.11.1.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4C			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 1	INTEGER (0..maxEARFCN2)	
}			
}			

Table 17.4.11.1.3.3-9: *RRCConnectionReconfiguration* (step 11, Table 17.4.11.1.3.3-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8 with condition MEAS

Table 17.4.11.1.3.3-10: *MeasConfig* (Table 17.4.11.1.3.3-9)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A2		
reportConfig[1]	ReportConfig-A2-H		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A2		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f1		
}			
}			
}			

Table 17.4.11.1.3.3-11: *ReportConfig-A2-H* (Table 17.4.11.1.3.3-9)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-5 ReportConfigEUTRA-A2(-83)			
Information Element	**Value/Remark**	**Comment**	**Condition**
ReportConfigEUTRA ::= SEQUENCE {			
triggerType CHOICE {			
event SEQUENCE {			
Hysteresis	6	3 dB	
}			
}			
}			

Table 17.4.11.1.3.3-12: *MeasurementReport* (step 14, Table 17.4.11.1.3.3-2)

Derivation path: 36.508 table clause 4.6.1 table 4.6.1-5			
Information Element	**Value/Remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
measurementReport-r8 SEQUENCE {			
measResults ::= SEQUENCE {			
measId	1		
measResultServCell ::= SEQUENCE {		Report Cell 1	
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {}	Not present		
measResultServFreqList-r10 SEQUENCE {}	Not checked		
}			
}			
}			
}			
}			

Table 17.4.11.1.3.3-13: *RRCConnectionReconfiguration* (step 15, Table 17.4.11.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10	Not present		
sCellToReleaseList-r10 SEQUENCE (SIZE (1..maxSCell-r10) OF SEQUENCE {	1 entry		
sCellIndex-r10[1]	1	SCell release for Cell 3	
}			
sCellToAddModList-r10	SCellToAddMod-r10-f1-Add	SCell addition for Cell 1	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 17.4.11.1.3.3-14: *MobilityControlInfo* (Table 17.4.11.1.3.3-13)

Derivation Path: clause 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 3		
carrierFreq	Same DL EARFCN as used for Cell 3		
carrierFreq	Not present		Band > 64
carrierFreq-v9e0 SEQUENCE {			Band > 64
dl-CarrierFreq-v9e0	Same downlink EARFCN as used for Cell 3.		
}			
}			

Table 17.4.11.1.3.3-15: SCellToAddMod-r10-f1-Add (Table 17.4.11.1.3.3-13)

Derivation Path: 36.508 clause 4.6.1 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SEQUENCE {	1 entry		
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 1		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 1		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 1		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f1		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f1		
}			

Table 17.4.11.1.3.3-16: *RadioResourceConfigCommonSCell-r10-f1* (Table 17.4.11.1.3.3-13)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 1		
}			
mbsfn-SubframeConfigList-r10			
mbsfn-SubframeConfiguration SEQUENCE {			
radioframeAllocationPeriod	n4		
radioframeAllocationOffset	1		FDD
	0		TDD
subframeAllocation CHOICE{			
oneFrame	'100000'		FDD
	'000010'		TDD
}			
Ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 1	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 1		
}			
}			
}			

Table 17.4.11.1.3.3-17: *RadioResourceConfigDedicatedSCell-r10-f1* (Table 17.4.11.1.3.3-13)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

Table 17.4.11.1.3.3-18: *RRCConnectionReconfiguration* (step 22, Table 17.4.11.1.3.3-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8 with condition MEAS

Table 17.4.11.1.3.3-19: *MeasConfig* (Table 17.4.11.1.3.3-18)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A2		
reportConfig[1]	ReportConfig-A2-H		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A2		
}			
measObjectToAddModList-v9e0 ::= SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f1		
}			
}			
}			

Table 17.4.11.1.3.3-20: *ReportConfig-A2-H* (Table 17.4.11.1.3.3-18)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-5 ReportConfigEUTRA-A2(-83)			
Information Element	**Value/Remark**	**Comment**	**Condition**
ReportConfigEUTRA ::= SEQUENCE {			
triggerType CHOICE {			
event SEQUENCE {			
Hysteresis	6	3 dB	
}			
}			
}			

Table 17.4.11.1.3.3-21: *MeasurementReport* (step 25, Table 17.4.11.1.3.3-2)

Derivation path: 36.508 table clause 4.6.1 table 4.6.1-5			
Information Element	**Value/Remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
measurementReport-r8 SEQUENCE {			
measResults ::= SEQUENCE {			
measId	1		
measResultServCell ::= SEQUENCE {		Report Cell 3	
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {}	Not present		
measResultServFreqList-r10 SEQUENCE {}	Not checked		
}			
}			
}			
}			
}			

Table 17.4.11.1.3.3-22: *RRCConnectionReconfiguration* (step 26, Table 17.4.11.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10	Not present		
sCellToReleaseList-r10 SEQUENCE (SIZE (1..maxSCell-r10) OF SEQUENCE {	1 entry		
sCellIndex-r10[1]	1	SCell release for Cell 1	
}			
sCellToAddModList-r10	SCellToAddMod-r10-f2-Add	SCell addition for Cell 3	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 17.4.11.1.3.3-13-24: *MobilityControlInfo* (Table 17.4.11.1.3.3-23)

Derivation Path: clause 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 1		
carrierFreq SEQUENCE {			
dl-CarrierFreq	Same downlink EARFCN as used for Cell 1		
}			
carrierFreq	Not present		Band > 64
carrierFreq-v9e0 SEQUENCE {			Band > 64
dl-CarrierFreq-v9e0	Same downlink EARFCN as used for Cell 1.		
}			
}			

Table 17.4.11.1.3.3-25: SCellToAddMod-r10-f2-Add (Table 17.4.11.1.3.3-23)

Derivation Path: 36.508 clause 4.6.1 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SEQUENCE {	1 entry		
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 1		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 3		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 3		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f2		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f2		
}			

Table 17.4.11.1.3.3-26: *RadioResourceConfigCommonSCell-r10-f2* (Table 17.4.11.1.3.3-23)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 3		
}			
Ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 3	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 3		
}			
}			
}			

Table 17.4.11.1.3.3-27: *RadioResourceConfigDedicatedSCell-r10-f2* (Table 17.4.11.1.3.3-23)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

17.4.11.2 CA / Start MBMS reception on PCell / Continue MBMS reception after swap of SCell and PCell / Inter-band CA

17.4.11.2.1 Test Purpose (TP)

Same as TC 17.4.11.1 but applied to Inter-band CA case.

17.4.11.2.2 Conformance requirements

Same as TC 17.4.11.1.

17.4.11.2.3 Test description

17.4.11.2.3.1 Pre-test conditions

Same as test case 17.4.11.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

17.4.11.2.3.2 Test procedure sequence

Same as test case 17.4.11.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

17.4.11.2.3.3 Specific message contents

Same as test case 17.4.11.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

18 PWS

18.1 CMAS on LTE

18.1.1 PWS reception in RRC_IDLE state / Duplicate detection

18.1.1.1 Test Purpose (TP)

(1)

```
with { UE in RRC_IDLE state }
ensure that {
when  { the UE receives a Paging message with cmas-Indication }
  then { the UE is able to retrieve all the PWS message segments being broadcast, re assemble the
message and alert the user }
}
```

(2)

```
With { UE in RRC_IDLE state and pc_PWS_UpperLayer set to 'TRUE' }
ensure that {
when  { the UE receives a PWS message which is a duplicate of an already received message }
  then { the UE discards the message and does not alert the user }
}
```

18.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.2.2.4, 5.2.2.19, 5.2.2.20, 5.3.2.3; TS 23.041 clause 9.1.3.4.2.

[TS 36.331, clause 5.2.2.4]

The UE shall:

…

1> if the UE is CMAS capable:

2> upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:

3> discard any previously buffered *warningMessageSegment*;

3> clear, if any, stored values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType12* associated with the discarded *warningMessageSegment* ;

2> when the UE acquires *SystemInformationBlockType1* following CMAS indication, upon entering a cell during RRC_IDLE, following successful handover and upon connection re-establishment:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType12* is present:

4> acquire *SystemInformationBlockType12*;

NOTE 3: UEs shall start acquiring *SystemInformationBlockType12* as described above even when *systemInfoValueTag* in *SystemInformationBlockType1* has not changed.

1> if the UE is interested to receive MBMS services; and

1> if *schedulingInfoList* indicates that *SystemInformationBlockType13* is present and the UE does not have stored a valid version of this system information block:

2> acquire *SystemInformationBlockType13*;

The UE may apply the received SIBs immediately, i.e. the UE does not need to delay using a SIB until all SI messages have been received. The UE may delay applying the received SIBs until completing lower layer procedures associated with a received or a UE originated RRC message, e.g. an ongoing random access procedure.

NOTE 4: While attempting to acquire a particular SIB, if the UE detects from *schedulingInfoList* that it is no longer present, the UE should stop trying to acquire the particular SIB.

[TS 36.331, clause 5.2.2.19]

Upon receiving *SystemInformationBlockType12*, the UE shall:

1> if the *SystemInformationBlockType12* contains a complete warning message:

2> forward the received warning message, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

2> continue reception of *SystemInformationBlockType12*;

1> else:

2> if the received values of *messageIdentifier* and *serialNumber* are the same (each value is the same) as a pair for which a warning message is currently being assembled:

3> store the received *warningMessageSegment*;

3> if all segments of a warning message have been received:

4> assemble the warning message from the received *warningMessageSegment*;

4> forward the received warning message, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

4> stop assembling a warning message for this *messageIdentifier* and *serialNumber* and delete all stored information held for it;

3> continue reception of *SystemInformationBlockType12*;

2> else if the received values of *messageIdentifier* and/or *serialNumber* are not the same as any of the pairs for which a warning message is currently being assembled:

3> start assembling a warning message for this *messageIdentifier* and *serialNumber* pair;

3> store the received *warningMessageSegment*;

3> continue reception of *SystemInformationBlockType12*;

The UE should discard *warningMessageSegment* and the associated values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType12* if the complete warning message has not been assembled within a period of 3 hours.

NOTE: The number of warning messages that a UE can re-assemble simultaneously is a function of UE implementation.

[TS 36.331, clause 5.2.2.20]

No UE requirements related to the contents of this *SystemInformationBlock* apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.

[TS 36.331, clause 5.3.2.3]

Upon receiving the *Paging* message, the UE shall:

…

1> if the *cmas-Indication* is included and the UE is CMAS capable:

2> re-acquire *SystemInformationBlockType1* immediately, i.e., without waiting until the next system information modification period boundary as specified in 5.2.1.5;

2> if the *schedulingInfoList* indicates that *SystemInformationBlockType12* is present:

3> acquire *SystemInformationBlockType12*;

[TS 23.041, clause 9.1.3.4.2]

...

The warning message to be broadcast is delivered via MMEs to multiple eNodeBs. The eNodeB(s) are responsible for scheduling the broadcast of the new message and the repetitions in each cell.

The overall warning message delivery procedure is presented in figure 9.1.3.4.2-1:

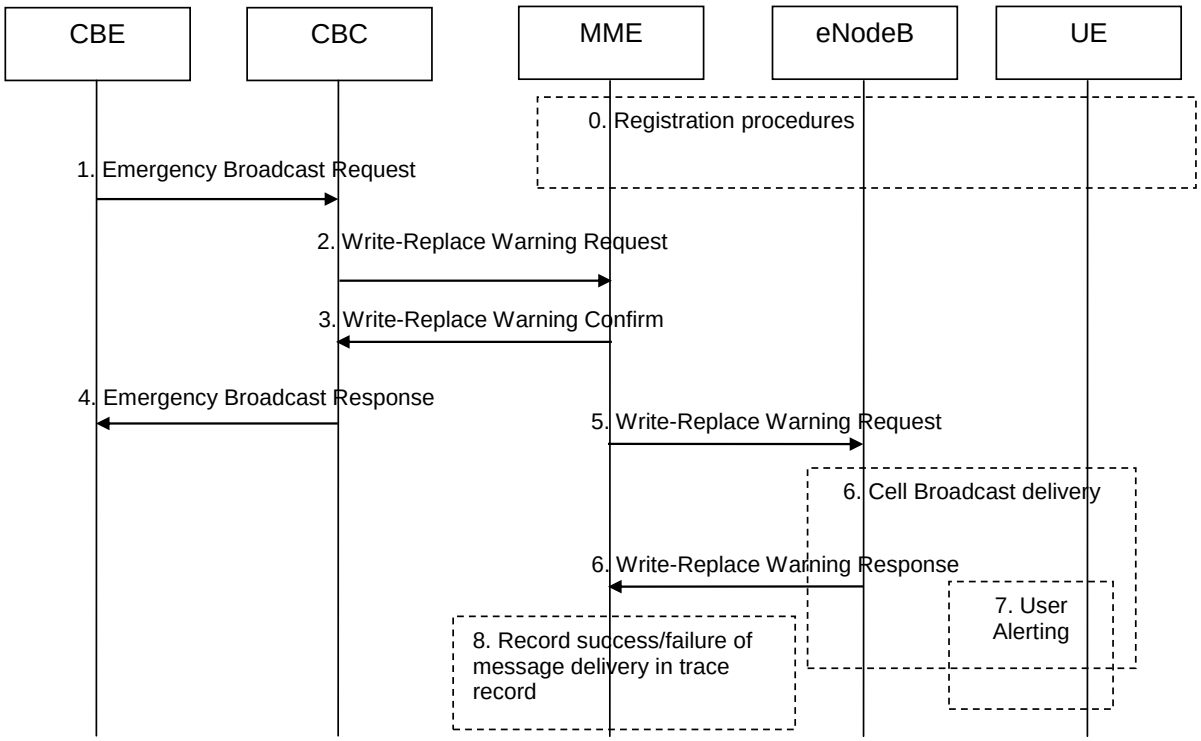

Figure 9.1.3.4.2-1: Warning message delivery procedure in E-UTRAN

0. Network registration and security (e.g. mutual authentication) procedures are performed. The UE stores a flag that indicates whether or not it has authenticated the network.

NOTE 1: This step is performed each time a UE is attached to a network (e.g. after each power on).

1. CBE (e.g. Information Source such as PSAP or Regulator) sends emergency information (e.g. "warning type", "warning message", "impacted area", "time period") to the CBC. The CBC shall authenticate this request.

2. Using the "impacted area" information, the CBC identifies which MMEs need to be contacted and determines the information to be place into the Warning Area Information Element. The CBC sends a Write-Replace Warning Request message containing the warning message to be broadcast and the delivery attributes (Message identifier, Serial Number, Tracking Area ID list, Warning Area, OMC ID, CWM Indicator) to MMEs.

The warning messages use the coding scheme for CBS data specified in 3GPP TS 23.038 [3].
The Tracking Area ID list is only used by the MME. The MME uses it for selecting which eNodeBs to forward the Write-Replace Warning Request message to.
The Warning Area shall be a list of Cell IDs and/or a list of TAIs and/or one or more Emergency Area IDs. The Warning Area is only used by the eNodeB. The eNodeB is configured with the TAI(s) and Cell ID(s) it serves and the Emergency Area ID(s) that it belongs to. The eNodeB checks for any match of the contents of the Warning Area with these IDs to identify the cells where to distribute the warning message. The Warning Area is an optional information element. If the Warning Area is absent, it shall be interpreted as "all cells on the eNodeB". The number of cell IDs will be limited by the message size on SBc and S1-MME. An Emergency Area ID is unique within the PLMN.
The message may include an OMC ID. If present, it indicates the OMC to which the Trace record generated in step 8 is destined. Co-location of that OMC with the CBC is an operator option.
CBC shall set the Concurrent Warning Message (CWM) indicator in all Write-Replace Warning Request messages, if the PLMN supports concurrent warning message broadcasts.

NOTE 2: Due to requirements in earlier versions of the specification, it is possible that "digital signature" and "timestamp" information are transmitted within the "warning message".

3. The MME sends a Write-Replace Warning Confirm message that indicates to the CBC that the MME has started to distribute the warning message to eNodeBs.
If this message is not received by the CBC within an appropriate time period, the CBC can attempt to deliver the warning message via another MME in the same pool area.
4. Upon reception of the Write-Replace Confirm messages from the MMEs, the CBC may confirm to the CBE that it has started to distribute the warning message.
5. The MME forwards Write-Replace Warning Message Request to eNodeBs. The MME shall use the Tracking Area ID list to determine the eNodeBs in the delivery area. If the Tracking Area ID list is empty the message is forwarded to all eNodeBs that are connected to the MME.
6. When S1-flex is used the eNodeB may receive same message from multiple MMEs. The eNodeB detects duplicate messages by checking the message identifier and serial number fields within the warning message. If any redundant messages are detected only the first one received will be broadcasted by the cells. The eNodeB shall use the Warning Area information to determine the cell(s) in which the message is to be broadcast. The eNodeBs return a Distribute Warning Message Response to the MME, even if it was a duplicate.
If there is a warning broadcast message already ongoing and the CWM Indicator is included in the Write-Replace Warning Message Request, the eNodeB does not stop existing broadcast message but start broadcasting the new message concurrently. Otherwise the eNodeB shall immediately replace the existing broadcast message with the newer one.

NOTE 3: If concurrent warning messages are not supported, this requires the CBE/CBC to take care that 'lower' priority warnings are not sent while a higher priority warning is still being sent.

The eNodeB broadcasts the message frequently according to the attributes set by the CBC that originated the warning message distribution.

7. If the UE has been configured to receive warning messages , and the UE has authenticated the core network of the eNodeB it is camped on, then the UE proceeds as follows:
The UE can use "warning type" values, 'earthquake', 'tsunami' or 'earthquake and tsunami', immediately to alert the user. When "warning type" is 'test', the UE silently discards the primary notification, but the UE specially designed for testing purposes may proceed with the following procedures.
The UE activates reception of the broadcast messages containing the "warning message".
The UE indicates the contents of the "warning message" to the user.
8. From the Write-Replace Warning Response messages returned by eNodeB's the MME determines the success or failure of the delivery and creates a trace record. Any OMC ID received in step 2 is written to the trace record to permit the O&M system to deliver them to the desired destination.

18.1.1.3 Test description

18.1.1.3.1 Pre-test conditions

System Simulator:

- Cell 1

UE:

None.

Preamble:

- The UE is in state Registered, Idle mode (state 2) according to [18].

18.1.1.3.2 Test procedure sequence

Table 18.1.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message	-	-
1	The SS include a CMAS message with new *messageIdentifier* and *serialNumber* in *SystemInformationBlockType12* and transmit a *Paging* message including *cmas-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
2	Check: Does the UE indicate the contents of the "warning message" to the user (NOTE 2)?	-	-	1	P
-	EXCEPTION: Steps 3a1 to 3a3 describe behaviour that depends on UE configuration; the "lower case letter" identifies a step sequence that take place if the pc_PWS_UpperLayer is set to TRUE.	-	-	-	-
3 a1	The SS waits for 10s.	-	-	-	-
3a2	The SS include a CMAS message with same *messageIdentifier* and *serialNumber* in *SystemInformationBlockType12* and transmit a *Paging* message including *cmas-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
3a3	Check: Does the UE indicate the contents of the "warning message" to the user (NOTE 2)?	-	-	2	F
NOTE 1: *SystemInformationBlockType12* contain 3 segments. NOTE 2: The data indication and user alerting are the UE implementation issues.					

18.1.1.3.3 Specific message contents

Table 18.1.1.3.3-1: *SystemInformationBlockType1* for Cell 1 (step 1, Table 18.1.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 17 in TS 36.508 section 4.4.3.1		
}			

Table 18.1.1.3.3-1A: *SystemInformationBlockType1-BR-r13* for Cell 1 (step 1 when UE under test is CAT M1, Table 18.1.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3A			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1-BR-r13 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 17 in TS 36.508 section 4.4.3.1		
}			

Table 18.1.1.3.3-2: *Paging* (step 1 and step 3a2, Table 18.1.1.3.2-1)

Derivation Path: 36.508 Table 4.6.1-7			
Information Element	**Value/remark**	**Comment**	**Condition**
Paging ::= SEQUENCE {			
pagingRecordList	Not present		
systemInfoModification	Not present		
etws-Indication	Not Present		
nonCriticalExtension SEQUENCE {}			
lateNonCriticalExtension	Not present		
nonCriticalExtension SEQUENCE {			
cmas-Indication-r9	true		
nonCriticalExtension	Not present		
}			
}			
}			

18.1.2 PWS reception in RRC_CONNECTED state / Duplicate detection

18.1.2.1 Test Purpose (TP)

(1)

```
with { UE in RRC_CONNECTED state }
  ensure that {
    when  { the UE receives a Paging message with cmas-Indication }
    then { the UE is able to retrieve all the PWS message segments being broadcast, re assemble the
message and alert the user }
```

(2)

```
With { UE in RRC_CONNECTED state and pc_PWS_UpperLayer set to 'TRUE' }
  ensure that {
    when  { the UE receives a PWS message which is a duplicate of an already received message }
    then { the UE discards the message and does not alert the user }
```

18.1.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.2.2.4, 5.2.2.19, 5.3.2.3; TS 23.041 clause 9.1.3.4.2.

[TS 36.331, clause 5.2.2.4]

The UE shall:

…

1> if the UE is CMAS capable:

2> upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:

3> discard any previously buffered *warningMessageSegment*;

3> clear, if any, stored values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType12* associated with the discarded *warningMessageSegment* ;

2> when the UE acquires *SystemInformationBlockType1* following CMAS indication, upon entering a cell during RRC_IDLE, following successful handover and upon connection re-establishment:

3> if schedulingInfoList indicates that SystemInformationBlockType12 is present:

4> acquire SystemInformationBlockType12;

NOTE 3: UEs shall start acquiring *SystemInformationBlockType12* as described above even when *systemInfoValueTag* in *SystemInformationBlockType1* has not changed.

[TS 36.331, clause 5.2.2.19]

Upon receiving *SystemInformationBlockType12*, the UE shall:

1> if the *SystemInformationBlockType12* contains a complete warning message:

2> forward the received warning message, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

2> continue reception of *SystemInformationBlockType12*;

1> else:

2> if the received values of *messageIdentifier* and *serialNumber* are the same (each value is the same) as a pair for which a warning message is currently being assembled:

3> store the received *warningMessageSegment*;

3> if all segments of a warning message have been received:

4> assemble the warning message from the received *warningMessageSegment*;

4> forward the received warning message, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

4> stop assembling a warning message for this *messageIdentifier* and *serialNumber* and delete all stored information held for it;

3> continue reception of SystemInformationBlockType12;

2> else if the received values of *messageIdentifier* and/or *serialNumber* are not the same as any of the pairs for which a warning message is currently being assembled:

3> start assembling a warning message for this *messageIdentifier* and *serialNumber* pair;

3> store the received *warningMessageSegment*;

3> continue reception of *SystemInformationBlockType12*;

The UE should discard *warningMessageSegment* and the associated values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType12* if the complete warning message has not been assembled within a period of 3 hours.

NOTE: The number of warning messages that a UE can re-assemble simultaneously is a function of UE implementation.

[TS 36.331, clause 5.3.2.3]

Upon receiving the *Paging* message, the UE shall:

…

1> if the *cmas-Indication* is included and the UE is CMAS capable:

2> re-acquire *SystemInformationBlockType1* immediately, i.e., without waiting until the next system information modification period boundary as specified in 5.2.1.5;

2> if the *schedulingInfoList* indicates that *SystemInformationBlockType12* is present:

3> acquire SystemInformationBlockType12;

[TS 23.041, clause 9.1.3.4.2]

The warning message to be broadcast is delivered via MMEs to multiple eNodeBs. The eNodeB(s) are responsible for scheduling the broadcast of the new message and the repetitions in each cell.

The overall warning message delivery procedure is presented in figure 9.1.3.4.2-1:

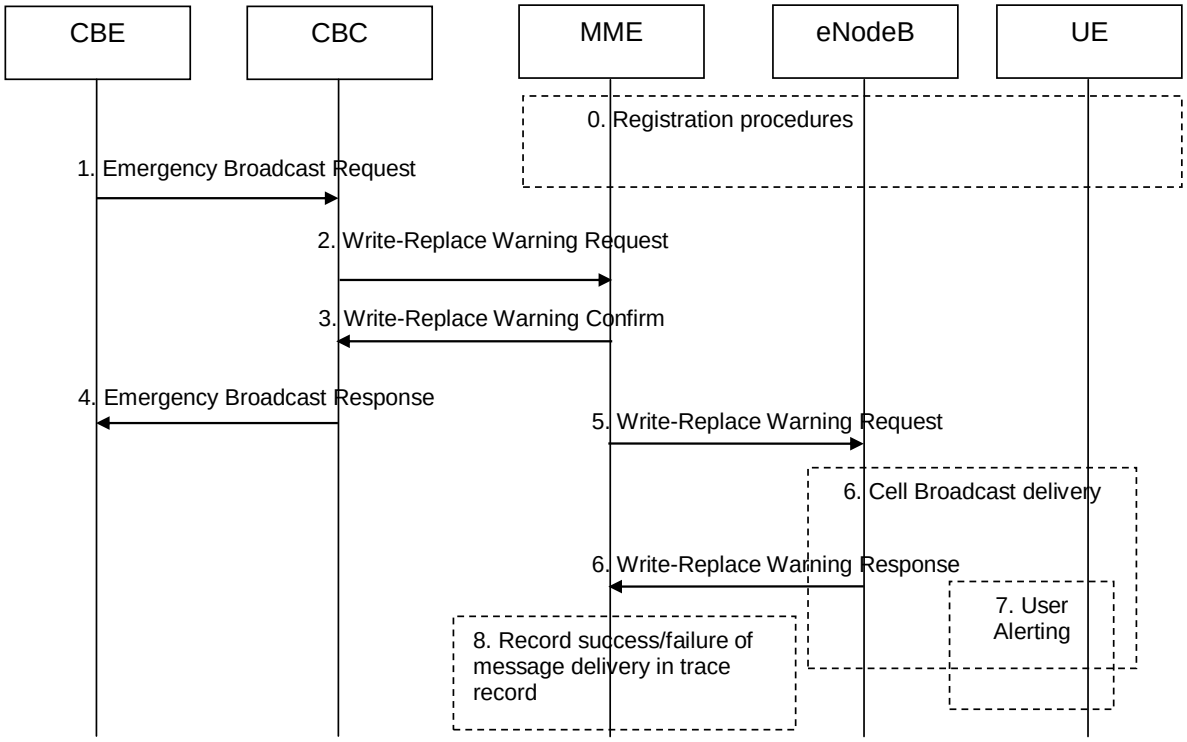

Figure 9.1.3.4.2-1: Warning message delivery procedure in E-UTRAN

0. Network registration and security (e.g. mutual authentication) procedures are performed. The UE stores a flag that indicates whether or not it has authenticated the network.

NOTE 1: This step is performed each time a UE is attached to a network (e.g. after each power on).

1. CBE (e.g. Information Source such as PSAP or Regulator) sends emergency information (e.g. "warning type", "warning message", "impacted area", "time period") to the CBC. The CBC shall authenticate this request.

2. Using the "impacted area" information, the CBC identifies which MMEs need to be contacted and determines the information to be place into the Warning Area Information Element. The CBC sends a Write-Replace Warning Request message containing the warning message to be broadcast and the delivery attributes (Message identifier, Serial Number, Tracking Area ID list, Warning Area, OMC ID, CWM Indicator) to MMEs.

   The warning messages use the coding scheme for CBS data specified in 3GPP TS 23.038 [3].

   The Tracking Area ID list is only used by the MME. The MME uses it for selecting which eNodeBs to forward the Write-Replace Warning Request message to.

   The Warning Area shall be a list of Cell IDs and/or a list of TAIs and/or one or more Emergency Area IDs. The Warning Area is only used by the eNodeB. The eNodeB is configured with the TAI(s) and Cell ID(s) it serves and the Emergency Area ID(s) that it belongs to. The eNodeB checks for any match of the contents of the Warning Area with these IDs to identify the cells where to distribute the warning message. The Warning Area is an optional information element. If the Warning Area is absent, it shall be interpreted as "all cells on the eNodeB". The number of cell IDs will be limited by the message size on SBc and S1-MME. An Emergency Area ID is unique within the PLMN.

   The message may include an OMC ID. If present, it indicates the OMC to which the Trace record generated in step 8 is destined. Co-location of that OMC with the CBC is an operator option.

   CBC shall set the Concurrent Warning Message (CWM) indicator in all Write-Replace Warning Request messages, if the PLMN supports concurrent warning message broadcasts.

NOTE 2: Due to requirements in earlier versions of the specification, it is possible that "digital signature" and "timestamp" information are transmitted within the "warning message".

3. The MME sends a Write-Replace Warning Confirm message that indicates to the CBC that the MME has started to distribute the warning message to eNodeBs.

   If this message is not received by the CBC within an appropriate time period, the CBC can attempt to deliver the warning message via another MME in the same pool area.

4. Upon reception of the Write-Replace Confirm messages from the MMEs, the CBC may confirm to the CBE that it has started to distribute the warning message.

5. The MME forwards Write-Replace Warning Message Request to eNodeBs. The MME shall use the Tracking Area ID list to determine the eNodeBs in the delivery area. If the Tracking Area ID list is empty the message is forwarded to all eNodeBs that are connected to the MME.

6. When S1-flex is used the eNodeB may receive same message from multiple MMEs. The eNodeB detects duplicate messages by checking the message identifier and serial number fields within the warning message. If any redundant messages are detected only the first one received will be broadcasted by the cells. The eNodeB shall use the Warning Area information to determine the cell(s) in which the message is to be broadcast. The eNodeBs return a Distribute Warning Message Response to the MME, even if it was a duplicate.

   If there is a warning broadcast message already ongoing and the CWM Indicator is included in the Write-Replace Warning Message Request, the eNodeB does not stop existing broadcast message but start broadcasting the new message concurrently. Otherwise the eNodeB shall immediately replace the existing broadcast message with the newer one.

NOTE 3: If concurrent warning messages are not supported, this requires the CBE/CBC to take care that 'lower' priority warnings are not sent while a higher priority warning is still being sent.

   The eNodeB broadcasts the message frequently according to the attributes set by the CBC that originated the warning message distribution.

7. If the UE has been configured to receive warning messages and the UE has authenticated the core network of the eNodeB it is camped on, then the UE proceeds as follows:

   The UE can use "warning type" values, 'earthquake', 'tsunami' or 'earthquake and tsunami', immediately to alert the user. When "warning type" is 'test', the UE silently discards the primary notification, but the UE specially designed for testing purposes may proceed with the following procedures.

   The UE activates reception of the broadcast messages containing the "warning message".

   The UE indicates the contents of the "warning message" to the user

   UE shall consider a message duplicated if the combination of "message identifier" and "serial number" matches with those of the previous message that was received from the same PLMN. The UE shall ignore the message detected as a duplicated.

   For ETWS, the UE shall perform duplicate message detection independently for primary and secondary notifications.

8. From the Write-Replace Warning Response messages returned by eNodeBs the MME determines the success or failure of the delivery and creates a trace record. Any OMC ID received in step 2 is written to the trace record to permit the O&M system to deliver them to the desired destination.

18.1.2.3 Test description

18.1.2.3.1 Pre-test conditions

System Simulator:

- Cell 1
- System information combination 1 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell

UE:

None.

Preamble:

- The UE is in state Generic RB Established (state 3) according to [18].

18.1.2.3.2 Test procedure sequence

Table 18.1.2.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message	-	-
1	The SS include a CMAS message with new *messageIdentifier* and *serialNumber* in *SystemInformationBlockType12* and transmit a *Paging* message including *cmas-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
2	Check: Does the UE indicate the contents of the "warning message" to the user (NOTE 2)?	-	-	1	P
-	EXCEPTION: Steps 3a1 to 3a3 describe behaviour that depends on UE configuration; the "lower case letter" identifies a step sequence that take place if the pc_PWS_UpperLayer is set to TRUE.	-	-	-	-
3a1	The SS waits for 10s.	-	-	-	-
3a2	The SS include a CMAS message with same *messageIdentifier* and *serialNumber* in *SystemInformationBlockType12* and transmit a *Paging* message including *cmas-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
3a3	Check: Does the UE indicate the contents of the "warning message" to the user (NOTE 2)?	-	-	2	F
NOTE 1: *SystemInformationBlockType12* contains 3 segments. NOTE 2: The data indication and user alerting are the UE implementation issues.					

18.1.2.3.3 Specific message contents

Table 18.1.2.3.3-1: *SystemInformationBlockType1* for Cell 1 (step 1, Table 18.1.2.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 17 in TS 36.508 section 4.4.3.1		
}			

Table 18.1.2.3.3-1A: *SystemInformationBlockType1-BR-r13* for Cell 1 (step 1 when UE under test is CAT M1, Table 18.1.2.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3A			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1-BR-r13 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 17 in TS 36.508 section 4.4.3.1		
}			

Table 18.1.2.3.3-2: *Paging* (step 1 and step 3a2, Table 18.1.2.3.2-1)

Derivation Path: 36.508 Table 4.6.1-7			
Information Element	**Value/remark**	**Comment**	**Condition**
Paging ::= SEQUENCE {			
pagingRecordList	Not present		
systemInfoModification	Not present		
etws-Indication	Not present		
nonCriticalExtension SEQUENCE {			
lateNonCriticalExtension	Not present		
nonCriticalExtension SEQUENCE {			
cmas-Indication-r9	true		
nonCriticalExtension	Not present		
}			
}			
}			

18.1.3 PWS reception in RRC_CONNECTED State/Power On

18.1.3.1 Test Purpose (TP)

(1)

with { UE being powered down }

```
ensure that {
when { UE is powered up while CMAS notification is present }
  then { UE successfully receives the PWS message and alerts the user accordingly  }
          }
```

(2)

```
with { UE in RRC_CONNECTED state }
ensure that {
when { the network transmits two consecutive different PWS messages and pages the UE, one paging
message per a defaultPagingCycle, to indicate the presence of each PWS message }
  then { the UE successfully receives each of the messages and alerts the user accordingly }
          }
```

18.1.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.2.2.2, 5.2.2.4, 5.2.2.19, 5.2.1.3, 5.3.2.3; TS 23.041 clause 9.1.3.4.

[TS 36.331, clause 5.2.2.2]

The UE shall apply the system information acquisition procedure upon selecting (e.g. upon power on) and upon re-selecting a cell, after handover completion, after entering E-UTRA from another RAT, upon return from out of coverage, upon receiving a notification that the system information has changed, upon receiving an indication about the presence of an ETWS notification, upon receiving an indication about the presence of a CMAS notification, upon receiving a request from CDMA2000 upper layers and upon exceeding the maximum validity duration. Unless explicitly stated otherwise in the procedural specification, the system information acquisition procedure overwrites any stored system information, i.e. delta configuration is not applicable for system information and the UE discontinues using a field if it is absent in system information unless explicitly specified otherwise.

…

[TS 36.331, clause 5.2.2.4]

The UE shall:

…

1> if the UE is CMAS capable:

2> upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:

3> discard any previously buffered *warningMessageSegment*;

3> clear, if any, stored values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType12* associated with the discarded *warningMessageSegment* ;

2> when the UE acquires *SystemInformationBlockType1* following CMAS indication, upon entering a cell during RRC_IDLE, following successful handover and upon connection re-establishment:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType12* is present:

4> acquire *SystemInformationBlockType12*;

NOTE 1: UEs shall start acquiring *SystemInformationBlockType12* as described above even when *systemInfoValueTag* in *SystemInformationBlockType1* has not changed.

The UE may apply the received SIBs immediately, i.e. the UE does not need to delay using a SIB until all SI messages have been received. The UE may delay applying the received SIBs until completing lower layer procedures associated with a received or a UE originated RRC message, e.g. an ongoing random access procedure.

NOTE 2: While attempting to acquire a particular SIB, if the UE detects from *schedulingInfoList* that it is no longer present, the UE should stop trying to acquire the particular SIB.

[TS 36.331, clause 5.2.2.19]

Upon receiving *SystemInformationBlockType12*, the UE shall:

1> if the *SystemInformationBlockType12* contains a complete warning message:

2> forward the received warning message, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

2> continue reception of *SystemInformationBlockType12*;

1> else:

2> if the received values of *messageIdentifier* and *serialNumber* are the same (each value is the same) as a pair for which a warning message is currently being assembled:

3> store the received *warningMessageSegment*;

3> if all segments of a warning message have been received:

4> assemble the warning message from the received *warningMessageSegment*;

4> forward the received warning message, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

4> stop assembling a warning message for this *messageIdentifier* and *serialNumber* and delete all stored information held for it;

3> continue reception of *SystemInformationBlockType12*;

2> else if the received values of *messageIdentifier* and/or *serialNumber* are not the same as any of the pairs for which a warning message is currently being assembled:

3> start assembling a warning message for this *messageIdentifier* and *serialNumber* pair;

3> store the received *warningMessageSegment*;

3> continue reception of *SystemInformationBlockType12*;

The UE should discard *warningMessageSegment* and the associated values of *messageIdentifier* and *serialNumber* for *SystemInformationBlockType12* if the complete warning message has not been assembled within a period of 3 hours.

NOTE 3: The number of warning messages that a UE can re-assemble simultaneously is a function of UE implementation.

[TS 36.331, clause 5.2.1.3]

E-UTRAN may not update *systemInfoValueTag* upon change of some system information e.g. ETWS information, CMAS information, regularly changing parameters like CDMA2000 system time (see 6.3). Similarly, E-UTRAN may not include the *systemInfoModification* within the *Paging* message upon change of some system information.

The UE verifies that stored system information remains valid by either checking *systemInfoValueTag* in *SystemInformationBlockType1* after the modification period boundary, or attempting to find the *systemInfoModification* indication at least *modificationPeriodCoeff* times during the modification period in case no paging is received, in every modification period. If no paging message is received by the UE during a modification period, the UE may assume that no change of system information will occur at the next modification period boundary. If UE in RRC_CONNECTED, during a modification period, receives one paging message, it may deduce from the presence/ absence of *systemInfoModification* whether a change of system information other than ETWS and CMAS information will occur in the next modification period or not.

ETWS and/or CMAS capable UEs in RRC_CONNECTED shall attempt to read paging at least once every *defaultPagingCycle* to check whether ETWS and/or CMAS notification is present or not.

…

[TS 36.331, clause 5.3.2.3]

Upon receiving the *Paging* message, the UE shall:

…

1> if the *cmas-Indication* is included and the UE is CMAS capable:

2> re-acquire *SystemInformationBlockType1* immediately, i.e., without waiting until the next system information modification period boundary as specified in 5.2.1.5;

2> if the *schedulingInfoList* indicates that *SystemInformationBlockType12* is present:

3> acquire *SystemInformationBlockType12*;

[TS 23.041, clause 9.1.3.4]

…

The warning message to be broadcast is delivered via MMEs to multiple eNodeBs. The eNodeB(s) are responsible for scheduling the broadcast of the new message and the repetitions in each cell.

The overall warning message delivery procedure is presented in figure 9.1.3.4.2-1:

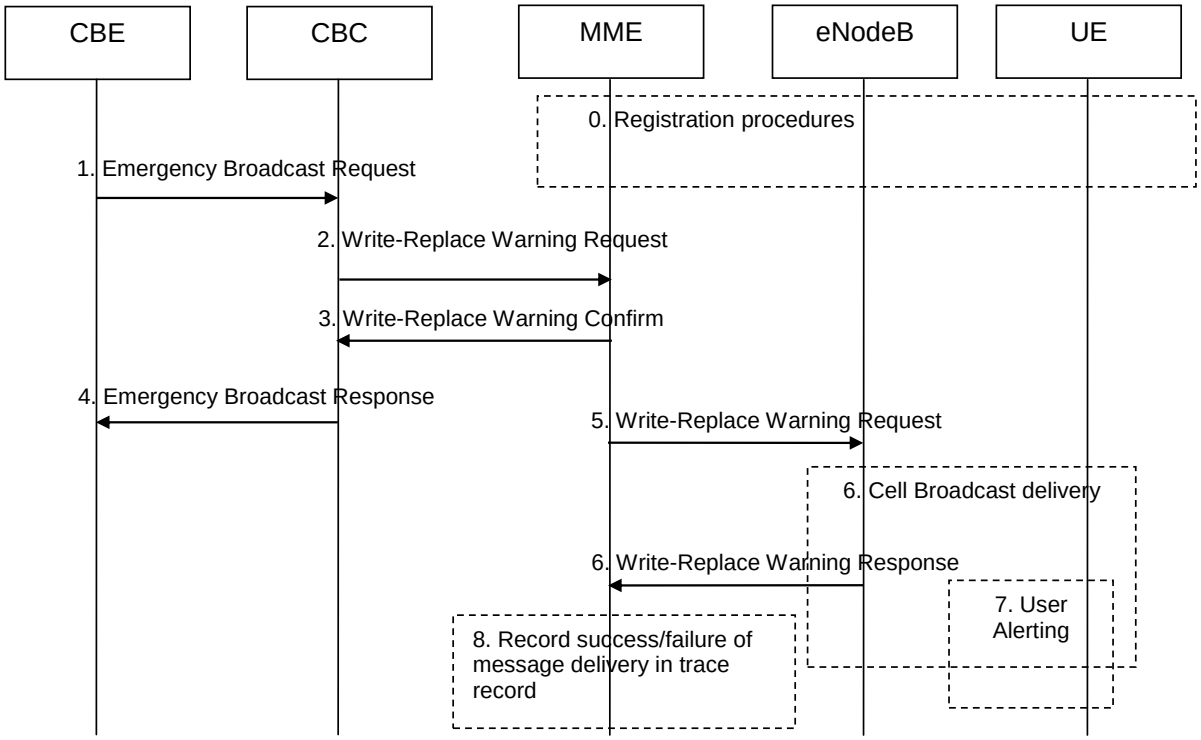

Figure 9.1.3.4.2-1: Warning message delivery procedure in E-UTRAN

0. Network registration and security (e.g. mutual authentication) procedures are performed. The UE stores a flag that indicates whether or not it has authenticated the network.

NOTE 1: This step is performed each time a UE is attached to a network (e.g. after each power on).

1. CBE (e.g. Information Source such as PSAP or Regulator) sends emergency information (e.g. "warning type", "warning message", "impacted area", "time period") to the CBC. The CBC shall authenticate this request.

2. Using the "impacted area" information, the CBC identifies which MMEs need to be contacted and determines the information to be place into the Warning Area Information Element. The CBC sends a Write-Replace Warning Request message containing the warning message to be broadcast and the delivery attributes (Message identifier, Serial Number, Tracking Area ID list, Warning Area, OMC ID, CWM Indicator) to MMEs.

   The warning messages use the coding scheme for CBS data specified in 3GPP TS 23.038 [3].

   The Tracking Area ID list is only used by the MME. The MME uses it for selecting which eNodeBs to forward the Write-Replace Warning Request message to.

   The Warning Area shall be a list of Cell IDs and/or a list of TAIs and/or one or more Emergency Area IDs. The Warning Area is only used by the eNodeB. The eNodeB is configured with the TAI(s) and Cell ID(s) it serves and the Emergency Area ID(s) that it belongs to. The eNodeB checks for any match of the contents of the Warning Area with these IDs to identify the cells where to distribute the warning message. The Warning Area is an optional information element. If the Warning Area is absent, it shall be interpreted as "all cells on the eNodeB". The number of cell IDs will be limited by the message size on SBc and S1-MME. An Emergency Area ID is unique within the PLMN.

   The message may include an OMC ID. If present, it indicates the OMC to which the Trace record generated in step 8 is destined. Co-location of that OMC with the CBC is an operator option.

   CBC shall set the Concurrent Warning Message (CWM) indicator in all Write-Replace Warning Request messages, if the PLMN supports concurrent warning message broadcasts.

NOTE 2: Due to requirements in earlier versions of the specification, it is possible that "digital signature" and "timestamp" information are transmitted within the "warning message".

3. The MME sends a Write-Replace Warning Confirm message that indicates to the CBC that the MME has started to distribute the warning message to eNodeBs.

   If this message is not received by the CBC within an appropriate time period, the CBC can attempt to deliver the warning message via another MME in the same pool area.

4. Upon reception of the Write-Replace Confirm messages from the MMEs, the CBC may confirm to the CBE that it has started to distribute the warning message.

5. The MME forwards Write-Replace Warning Message Request to eNodeBs. The MME shall use the Tracking Area ID list to determine the eNodeBs in the delivery area. If the Tracking Area ID list is empty the message is forwarded to all eNodeBs that are connected to the MME.

6. When S1-flex is used the eNodeB may receive same message from multiple MMEs. The eNodeB detects duplicate messages by checking the message identifier and serial number fields within the warning message. If any redundant messages are detected only the first one received will be broadcasted by the cells. The eNodeB shall use the Warning Area information to determine the cell(s) in which the message is to be broadcast. The eNodeBs return a Distribute Warning Message Response to the MME, even if it was a duplicate.

   If there is a warning broadcast message already ongoing and the CWM Indicator is included in the Write-Replace Warning Message Request, the eNodeB does not stop existing broadcast message but start broadcasting the new message concurrently. Otherwise the eNodeB shall immediately replace the existing broadcast message with the newer one.

NOTE 3: If concurrent warning messages are not supported, this requires the CBE/CBC to take care that 'lower' priority warnings are not sent while a higher priority warning is still being sent.

The eNodeB broadcasts the message frequently according to the attributes set by the CBC that originated the warning message distribution.

7. If the UE has been configured to receive warning messages , and the UE has authenticated the core network of the eNodeB it is camped on, then the UE proceeds as follows:

   The UE can use "warning type" values, 'earthquake', 'tsunami' or 'earthquake and tsunami', immediately to alert the user. When "warning type" is 'test', the UE silently discards the primary notification, but the UE specially designed for testing purposes may proceed with the following procedures.

   The UE activates reception of the broadcast messages containing the "warning message".

   The UE indicates the contents of the "warning message" to the user.

8. From the Write-Replace Warning Response messages returned by eNodeB's the MME determines the success or failure of the delivery and creates a trace record. Any OMC ID received in step 2 is written to the trace record to permit the O&M system to deliver them to the desired destination.

18.1.3.3 Test description

18.1.3.3.1 Pre-test conditions

System Simulator:

- Cell 1
- System information combination 17 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell.

UE:

None.

Preamble:

- The UE is SWITCHED OFF according to [18].

18.1.3.3.2 Test procedure sequence

Table 18.1.3.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	The SS include a CMAS message with new *messageIdentifier* and *serialNumber* in *SystemInformationBlockType12* (NOTE 1).			-	-
2	Power/Switch On the UE.	-	-	-	-
3-7	The authentication procedure is performed by executing steps 2 to 6 of the UE registration procedure in TS 36.508 sub clause 4.5.2.3	-	-	-	-
-	EXCEPTION: the behaviour in Table 18.1.3.3.2-2 runs in parallel with steps 8 to 17 below.	-	-	-	-
8-17	The attach procedure is performed by executing steps 7 to 16 of the UE registration procedure in TS 36.508 sub clause 4.5.2.3	-	-	-	-
18	The SS include a CMAS message with different *serialNumber* in *SystemInformationBlockType12* and transmit a *Paging* message including *cmas-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
19	Check: Does the UE indicate the contents of the "warning message" to the user (NOTE 2)?	-	-	2	P
20	The SS waits for 10s.	-	-	-	-
21	The SS include a CMAS message with different *serialNumber* in *SystemInformationBlockType12* and transmit a *Paging* message including *cmas-Indication* on Cell 1 (NOTE 1).	<--	*Paging*	-	-
22	Check: Does the UE indicate the contents of the "warning message" to the user (NOTE 2)?	-	-	2	P
23-25	IF MULTI_PDN = TRUE (NOTE 3) THEN steps 10-12 of the generic procedure for network initiated release of additional PDN connectivity specified in TS 36.508 subclause 4.5A.18.3 are performed for the non-IMS PDN	-	-	-	-
NOTE 1: *SystemInformationBlockType12* contains CMAS notification and the PWS message may be segmented in 3 segments. NOTE 2: The data indication and user alerting are the UE implementation issues. NOTE 3: MULTI_PDN as defined in TS 36.508 subclause 4.5.2.					

Table 18.1.3.3.2-2: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message	-	-
1	Check: Does the UE indicate the contents of the "warning message" to the user (NOTE 2)?	-	-	1	P

18.1.3.3.3 Specific message contents

Table 18.1.3.3.3-1: *SystemInformationBlockType1* for Cell 1 (all steps, Table 18.1.3.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 17 in TS 36.508 section 4.4.3.1		
}			

Table 18.1.3.3.3-1A: *SystemInformationBlockType1-BR-r13* for Cell 1 (all steps when UE under test is CAT M1, Table 18.1.3.3.2-1)

Derivation Path: 36.508 table 4.4.3.2-3A			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType1-BR-r13 ::= SEQUENCE {			
schedulingInformation ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SEQUENCE {}	Combination 17 in TS 36.508 section 4.4.3.1		
}			

Table 18.1.3.3.3-2: SystemInformationBlockType12 (step 18 and 21, Table 18.1.3.3.2-1)

Derivation Path: 36.331 clause 6.3.1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType12 ::= SEQUENCE {			
messageIdentifier-r9	'0001 0001 0001 0010'B	CMAS Message Identifier for CMAS Presidential Level Alerts (see TS 23.041])	
serialNumber-r9	Value different for each step		
warningMessageSegmentType	LastSegment		
warningMessageSegmentNumber	0		
warningMessageSegment	Octetstring different for each step	Provided as PIXITs	
dataCodingScheme	Bitstring (8) ID of the alphabet/coding and the applied language [see TS 23.041]	Provided as PIXITs [see TS 36.523-3 [20] cl. 9]	
lateNonCriticalExtension	Not present		
}			

Table 18.1.3.3.3-3: *Paging* (step 14 and step 17, Table 18.1.3.3.2-1)

Derivation Path: 36.508 Table 4.6.1-7			
Information Element	**Value/remark**	**Comment**	**Condition**
Paging ::= SEQUENCE {			
pagingRecordList	Not present		
systemInfoModification	Not present		
etws-Indication	Not present		
nonCriticalExtension ::= SEQUENCE {	Not present		
lateNonCriticalExtension	Not present		
nonCriticalExtension ::= SEQUENCE {			
cmas-Indication-r9	true		
nonCriticalExtension	Not present		
}			
}			
}			

19 Device to Device Proximity Service

19.1 ProSe Direct communication

19.1.1 ProSe direct Communication /Pre-configured authorisation / UE in RRC_IDLE on an E-UTRAN cell operating on the carrier frequency provisioned for ProSE direct service / Utilisation of the resources of (serving) cells/PLMNs / Transmission

19.1.1.1 Test Purpose (TP)

(0)

```
with { UE supporting ProSe direct communication }
ensure that {
  when { UE performs Attach procedure, or, Normal tracking area updating procedure }
    then { UE announces its ProSe capabilities }
            }
```

(0A)

```
with { UE being authorised for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2)
and being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" on frequency
f1, and, UE is in RRC_IDLE on Cell1/f1/PLMN1 which is not transmitting SystemInformationBlockType18
(i.e. ProSe direct communication is supported by the network) }
ensure that {
  when { UE receives a request from upper layers to transmit sidelink communication }
    then { UE does not initiate ProSe direct communication }
            }
```

(1)

```
with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2)
and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", and, UE is in
RRC_IDLE on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-
configured in the UE and is transmitting SystemInformationBlockType18 which does not include
commTxPoolNormalCommon }
ensure that {
  when { UE receives a request from upper layers to transmit sidelink communication }
    then { UE initiates an RRC connection, and, successfully completes a Sidelink UE information
procedure to indicate the sidelink communication transmission resources required }
            }
```

(2)

```
with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2)
and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", and, UE is in
RRC_IDLE on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-
configured in the UE and is transmitting SystemInformationBlockType18 indicating the provision of
resources for sidelink communication (commTxResources set to setup and resources provided in
commTxPoolNormalDedicated) }
ensure that {
  when { UE is triggered by an upper layer application to transmit sidelink communication }
    then { UE is able to transmit sidelink communication using the configured resources in
Cell1/f1/PLMN1 }
            }
```

(3)

```
with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2)
and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", and, UE is in
RRC_IDLE on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-
configured in the UE and is transmitting SystemInformationBlockType18 indicating the provision of
resources for sidelink communication }
ensure that {
  when { Cell2/f1/PLMN4 (equivalent PLMN) which is broadcasting SystemInformationBlockType18
providing resources for sidelink communication (commTxResources set to scheduled) becomes the
highest ranked cell, and, UE reselects to Cell2/f1/PLMN4 }
```

then { UE is able to transmit sidelink communication using the configured resources in Cell2/f1/PLMN4*)* }
}

(4) Void

(5)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN"**, and,** UE is in RRC_IDLE on Cell4/f1/PLMN2 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication and including *syncTxThreshIC* }
ensure that {
when { the RSRP measurement of the serving cell is below the value of *syncTxThreshIC* }
then { UE transmits SLSS and *MasterInformationBlock-SL* message in the same subframe }
}

(6)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN"**, and,** UE is in RRC_IDLE on Cell4/f1/PLMN2 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication }
ensure that {
when { Cell11/f1/PLMN3 which is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication (*commTxResources* set to setup and resources provided in *commTxPoolNormalDedicated*) becomes the highest ranked PCell**,** and**,** UE reselects to Cell11/f1/PLMN3 }
then { UE does not initiate an RRC connection and does not transmit a *SidelinkUEInformation* message to indicate the transmission resources required**, and,** does not transmit sidelink communication over the PC5 in the assigned resources in Cell11/f1/PLMN3 }
}

(7)Void

(8)

with { UE registered on PLMN1 and being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN"**, and,** UE in EMM-IDLE mode and in limited service state on Cell4/f1/PLMN2 after attempting TAU on Cell4/f1/PLMN2 and receiving a TRACKING AREA UPDATE REJECT message with the EMM cause #11 "PLMN not allowed"**, and,** n Cell4/f1/PLMN2 is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication }
ensure that {
when { UE receives a request from upper layers to send data for ProSe direct communication }
then { UE transmits sidelink communication utilising the resources provided on Cell4/f1/PLMN2 }
}

19.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: T TS 24.301, clauses 5.5.1.2.2, 5.5.3.2.2S 24.334, clauses 5.1.1, 5.1.2, 10.2.1, 10.2.2, 10.2.3, TS 36.331, clauses 5.2.2.4, 5.2.2.25, 5.3.3.1a, 5.10.1a, 5.10.2.1, 5.10.2.2, 5.10.2.3. U, 5.10.4nless otherwise stated these are Rel-12 requirements.

[TS 24.301, clause 5.5.1.2.2]

If the UE supports ProSe direct communication, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct communication bit to "ProSe direct communication supported" in the UE network capability IE of the ATTACH REQUEST message.

[TS 24.301, clause 5.5.3.2.2]

The UE in state EMM-REGISTERED shall initiate the tracking area updating procedure by sending a TRACKING AREA UPDATE REQUEST message to the MME,

...

b) when the periodic tracking area updating timer T3412 expires;

...

If the UE has to request resources for ProSe direct discovery or Prose direct communication (see 3GPP TS 36.331 [22]), then the UE shall set the "active" flag to 1 in the TRACKING AREA UPDATE REQUEST message.

...

For all cases except case b, if the UE supports ProSe direct communication, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct communication bit to "ProSe direct communication supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery announcing or ProSe direct discovery monitoring or both, and to use ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 5.1.2]

The IP address of the ProSe function in the HPLMN may be pre-configured in the UE and in this case, the UE may use the pre-configured IP address. Alternatively, the FQDN of the ProSe Function in the HPLMN may be self-constructed by the UE, i.e. derived from the PLMN ID of the HPLMN. The UE may perform DNS lookup as specified in IETF RFC 1035 [10].

[TS 24.334, clause 10.2.1]

One-to-many ProSe direct communication is applicable only to ProSe-enabled Public Safety UEs. One-to-many ProSe direct communication can only apply when the UE is:

a) served by E-UTRAN and authorised for ProSe direct communication in the registered PLMN;

...

c) in EMM-IDLE mode and in limited service state as specified in 3GPP TS 23.122 [24] and authorized for ProSe direct communication for "not served by E-UTRAN", if the reason for the UE being in limited service state is one of the following:

...

ii) the UE received an ATTACH REJECT message or a TRACKING AREA UPDATE REJECT message or a SERVICE REJECT message with the EMM cause #11 "PLMN not allowed" as specified in 3GPP TS 24.301 [11] or a LOCATION UPDATING REJECT message or a GPRS ATTACH REJECT message or ROUTING AREA UPDATE REJECT message or SERVICE REJECT message with cause #11 "PLMN not allowed" as specified in 3GPP TS 24.008 [30]; or

...

Upon receiving a request from upper layers to send or receive data for ProSe direct communication in a given group, the UE shall initiate the procedure for ProSe direct communication. For case a, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.2. For case b and c, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.3.

…

The UE shall obtain the ProSe direct communication policy parameters for that group as specified in subclause 5.

If the ProSe direct communication policy parameters indicate that the UE is configured to use IPv6 for that group, the UE shall auto-configures a link local IPv6 Address following procedures defined in RFC 4862 [15]. This address can only be used as the source IP address for one-to-many ProSe direct communication.

If the ProSe Direct communication policy parameters group indicate that the UE is configured to use IPv4 for that group, then the UE shall:

- use the configured IPv4 address for that group as source address; or
- if there is no configured IPv4 address for that group, use Dynamic Configuration of IPv4 Link-Local Addresses as specified in IETF RFC 3927 [16].

[TS 24.334, clause 10.2.2]

When the UE is served by E-UTRAN and intends to use the ProSe radio resources (i.e. carrier frequency) provided by an E-UTRAN cell, the UE requests the parameters from the lower layers for transmitting or receiving ProSe direct communication (see 3GPP TS 36.331 [12]). The UE shall perform direct communication only if the lower layers indicate that ProSe direct communication is supported by the network. If the UE in EMM-IDLE mode has to request resources for ProSe direct communication as specified in 3GPP TS 36.331 [12], the UE shall perform a service request procedure or tracking area update procedure as specified in 3GPP TS 24.301 [11]. Once the radio resources for transmitting or receiving ProSe direct communication are provided by eNodeB as specified in 3GPP TS 36.331 [12], the UE shall start ProSe direct communication.

[TS 24.334, clause 10.2.3]

Before initiating ProSe direct communication, the UE shall check with lower layers whether the selected radio parameters can be used in the current location without causing interference to other cells as specified in 3GPP TS 36.331 [12], and:

- if the lower layers indicate that the usage would not cause any interference, the UE shall initiate ProSe direct communication; or

NOTE 2: If the lower layers find that there exists a cell operating the provisioned radio resources (i.e., carrier frequency), and the cell belongs to the registered PLMN or a PLMN equivalent to the registered PLMN, and the UE is authorized for ProSe direct communication in this PLMN, the UE can use the radio parameters indicated by the cell as specified in 3GPP TS 36.331 [12].

- else if the lower layers report that one or more PLMNs operate in the provisioned radio resources (i.e. carrier frequency) then:

  a) if the following conditions are met:

     1) none of the PLMNs reported by the lower layers is the registered PLMN or equivalent to the registered PLMN; and

     2) at least one of the PLMNs reported by the lower layers is in the list of authorised PLMNs for ProSe direct communication and provides radio resources for ProSe direct communication as specified in 3GPP TS 36.331 [12];

     then the UE shall:

     1) if in EMM-IDLE mode, perform PLMN selection triggered by ProSe direct communication as specified in 3GPP TS 23.122 [24]; or

     2) else if in EMM-CONNECTED mode, either:

        i) perform a detach procedure as specified in 3GPP TS 24.301 [11] and then perform PLMN selection triggered by ProSe direct communication as specified in 3GPP TS 23.122 [24]; or

        ii) not initiate ProSe direct communication.

     Whether the UE performs i) or ii) above is left up to UE implementation; or

  b) else the UE shall not initiate ProSe direct communication.

If the registration to the selected PLMN is successful, the UE shall proceed with the procedure to initiate ProSe direct communication as specified in subclause 10.2.2.

[TS 36.331, clause 5.2.2.4]

1> if the UE is capable of sidelink communication and is configured by upper layers to receive or transmit sidelink communication:

2> if the cell used for sidelink communication meets the S-criteria as defined in TS 36.304 [4]; and

2> if *schedulingInfoList* indicates that *SystemInformationBlockType18* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType18*;

[TS 36.331, clause 5.2.2.25]

Upon receiving *SystemInformationBlockType18*, the UE shall:

1> if *SystemInformationBlockType18* message includes the *commConfig*:

...

2> if configured to transmit sidelink communication:

3> from the next SC period, as defined by *sc-Period*, use the resource pool indicated by *commTxPoolNormalCommon* or by *commTxPoolExceptional* for sidelink communication transmission, as specified in 5.10.4;

[TS 36.331, clause 5.3.3.1a]

For sidelink communication an RRC connection is initiated only in the following case:

1> if configured by upper layers to transmit sidelink communication and related data is available for transmission:

2> if *SystemInformationBlockType18* is broadcast by the cell on which the UE camps; and if the valid version of *SystemInformationBlockType18* does not include *commTxPoolNormalCommon*;

…

NOTE: Upper layers initiate an RRC connection. The interaction with NAS is left to UE implementation.

[TS 36.331, clause 5.10.1a]

When it is specified that the UE shall perform a particular sidelink operation only if the conditions defined in this section are met, the UE shall perform the concerned sidelink operation only if:

1> if the UE's serving cell is suitable (RRC_IDLE or RRC_CONNECTED); and if either the selected cell on the frequency used for sidelink operation belongs to the registered or equivalent PLMN as specified in TS 24.334 [69] or the UE is out of coverage on the frequency used for sidelink operation as defined in TS 36.304 [4, 11.4]; or

1> if the UE is camped on a serving cell (RRC_IDLE) on which it fulfils the conditions to support sidelink communication in limited service state as specified in TS 23.303 [68, 4.5.6]; and if either the serving cell is on the frequency used for sidelink operation or the UE is out of coverage on the frequency used for sidelink operation as defined in TS 36.304 [4, 11.4]; or

…

[TS 36.331, clause 5.10.2.1]

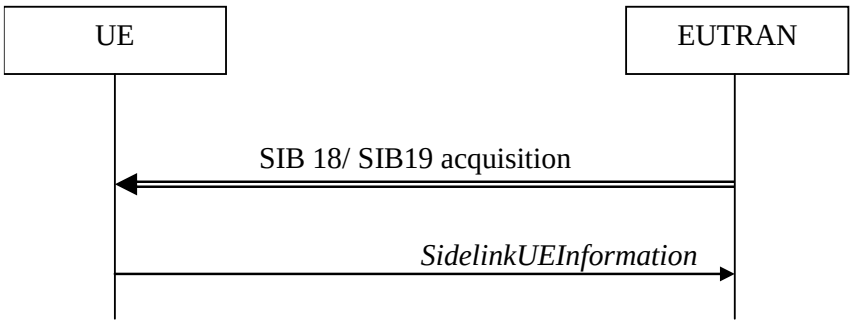

Figure 5.10.2-1: Sidelink UE information

The purpose of this procedure is to inform E-UTRAN that the UE is interested or no longer interested to receive sidelink communication or discovery, as well as to request assignment or release of transmission resources for sidelink communication or discovery announcements.

[TS 36.331, clause 5.10.2.2]

A UE capable of sidelink communication or discovery that is in RRC_CONNECTED may initiate the procedure to indicate it is (interested in) receiving sidelink communication or discovery in several cases including upon successful connection establishment, upon change of interest, upon change to a PCell broadcasting *SystemInformationBlockType18* or *SystemInformationBlockType19*. A UE capable of sidelink communication or discovery may initiate the procedure to request assignment of dedicated resources for the concerned sidelink communication transmission or discovery announcements.

NOTE 1: A UE in RRC_IDLE that is configured to transmit sidelink communication/ discovery announcements, while *SystemInformationBlockType18*/ *SystemInformationBlockType19* does not include the resources for transmission (in normal conditions), initiates connection establishment in accordance with 5.3.3.1a.

Upon initiating the procedure, the UE shall:

1> if *SystemInformationBlockType18* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType18* for the PCell;

...

2> if configured by upper layers to transmit sidelink communication:

3> if the UE did not transmit a *SidelinkUEInformation* message since entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a *SidelinkUEInformation* message the UE connected to a PCell not broadcasting *SystemInformationBlockType18*; or

3> if the last transmission of the *SidelinkUEInformation* message did not include *commTxResourceReq*; or if the information carried by the *commTxResourceReq* has changed since the last transmission of the *SidelinkUEInformation* message:

4> initiate transmission of the *SidelinkUEInformation* message to indicate the sidelink communication transmission resources required by the UE in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the *SidelinkUEInformation* message included *commTxResourceReq*:

4> initiate transmission of the *SidelinkUEInformation* message to indicate it does no longer require sidelink communication transmission resources in accordance with 5.10.2.3;

[TS 36.331, clause 5.10.2.3]

The UE shall set the contents of the *SidelinkUEInformation* message as follows:

1> if *SystemInformationBlockType18* is broadcast by the PCell:

...

2> if configured by upper layers to transmit sidelink communication:

3> include *commTxResourceReq* and set its fields as follows:

4> set *carrierFreq* to indicate the sidelink communication frequency i.e. the same value as indicated in *commRxInterestedFreq* if included;

4> set *destinationInfoList* to include the sidelink communication transmission destination(s) for which it requests E-UTRAN to assign dedicated resources;

...

The UE shall submit the *SidelinkUEInformation* message to lower layers for transmission.

[TS 36.331, clause 5.10.4]

A UE capable of sidelink communication that is configured by upper layers to transmit sidelink communication and has related data to be transmitted shall:

1> if the conditions for sidelink operation as defined in 5.10.1a are met:

2> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

...

3> else (i.e. sidelink communication in RRC_IDLE or on cell other than PCell in RRC_CONNECTED):

4> if the cell chosen for sidelink communication transmission broadcasts *SystemInformationBlockType18*:

5> if *SystemInformationBlockType18* includes *commTxPoolNormalCommon*:

6> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources indicated by the first entry in *commTxPoolNormalCommon*;

19.1.1.3 Test description

19.1.1.3.1 Pre-test conditions

System Simulator:

SS-NW

- 4 cells with parameters defined in Table 19.1.1.3.1-1.

NOTE: The test only requires at maximum 2 cells to be active at any one instance.

Table 19.1.1.3.1-1: Cell parameters values

Cell	Frequency	PLMN
1	f1	HPLMN (PLMN1)
2	f1	PLMN4
4	f1	PLMN2
11	f1	PLMN3
Note 1:	PLMN1: PLMN1 in USIM EF_{PROSE_PLMN} PLMN2: PLMN2 in USIM EF_{PROSE_PLMN} PLMN3: MCC = MCC of PLMN1 in USIM EF_{PROSE_PLMN}; MNC=03. PLMN4 is an equivalent PLMN to PLMN1; MCC = MCC of PLMN1 in USIM EF_{PROSE_PLMN}; MNC=04.	
Note 2:	The Frequency f1 shall be the frequency pre-configured in the UE for when UE is "not served by E-UTRAN".	
Note 3:	A single frequency has been chosen for all PLMNs to allow the TC to be applicable even for UEs supporting a single band which comprises a single frequency.	

- System information combination 23 as defined in TS 36.508 [18] clause 4.4.3.1 is used in all active cells.

SS-UE

- SS-UE1. As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication receiving device on the resources which the UE is expected to use for transmission (as specified in the relevant procedure steps in Table 19.1.1.3.2-1).

UE:

- ProSe related configuration

  - The UE is authorised to perform ProSe Direct Communication; the UE is equipped with a USIM containing values shown in Table 19.1.1.3.1-2, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. 2 PLMNs are authorised for ProSe Direct Communication when served by E-UTRAN, Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, ProSe Group IP multicast address, etc.).

Table 19.1.1.3.1-2: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°2 (HPLMN ProSe Function) supported.
	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.

  - For each PLMN a timer T4005 is assigned long enough not to expire before the TC is completed, e.g. 10 min (for Rel-12 this timer cannot be set in the USIM, it is expected that the UE shall provide means for setting the timer e.g. via MMI).

Preamble:

- The UE is in State Switched OFF (state 1) according to TS 36.508 [18].

19.1.1.3.2 Test procedure sequence

Table 19.1.1.3.2-0 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" ... "Tn" are to be applied subsequently. The exact instants on which these values shall be applied are described elsewhere in the present clause.

Table 19.1.1.3.2-0: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Cell 4	Cell 11
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	"Off"	"Off"	"Off"
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-79	"Off"	"Off"
T2	Cell-specific RS EPRE	dBm/15k Hz	"Off"	-85	-79	"Off"
T3	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	-87	"Off"
T4	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	-87	-79
T5	Void	-	-	-	-	-
T6	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	-79	"Off"

Table 19.1.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
0	The SS configures: SW-NW - Cell 1 **does not** transmit *SystemInformationBlockType18*.	-	-	-	-
0A	The UE is switched on.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
0B	Check: Does the Generic test procedure from step 1 to 16c1 for 'UE Registration (State 2)' defined in TS 36.508 [18] clause 4.5.2 take place during which the UE announces its ProSe direct communication capabilities in the ATTACH REQUEST message?	-	-	0	-
0C	The SS-NW transmits a UPDATE UE LOCATION INFORMATION message which provides location data as the one pre-configured in the UE for ProSe communication when UE is "not served by E-UTRAN".	<--	UPDATE UE LOCATION INFORMATION	-	-
0D	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
1	Force the UE upper layer application to request continuous transmission of sidelink communication (a maximum of 100 Bytes per communication "message"). NOTE: This can be done e.g. via a MMI command. Note that the max of 100 Bytes is not a 3GPP requirement rather it is requested only for the purpose of facilitating the test case specification.	-	-	-	-
1A	Check: Does the UE transmit during the next 3 transmission periods sidelink communication data in accordance with the resources preconfigured in the UE (the first entry in *preconfigComm* in *SL-Preconfiguration* defined in TS 36.508 [18], section 6.8.1.1 based on the UE's own timing)*?*	-->	-	0A	F
1B	SS-NW starts transmitting *SystemInformationBlockType18* not including *commTxPoolNormalCommon* (i.e. ProSe direct communication supported by the network, no resources provided yet).	-	-	-	-
2	Check: Does the UE transmit an RRCConnectionRequest message?	-->	*RRCConnectionRequest*	1	P
3	SS-NW transmits an RRCConnectionSetup message.	<--	*RRCConnectionSetup*	-	-
4	Check: Does the UE transmit an RRCConnectionSetupComplete message and a SERVICE REQUEST message to request resources for Prose direct communication transmission?	-->	*RRCConnectionSetupComplete* SERVICE REQUEST	1	P
5	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication?	-->	*SidelinkUEInformation*	1	P
6	SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
6A	SS-NW changes *SystemInformationBlockType18* to include *commTxPoolNormalCommon*.	-	-	-	-
6B	Wait for 2 modification periods to allow for the UE to obtain the new version of the *SystemInformationType18*.	-	-	-	-
7	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink	-->	*STCH PDCP SDU packet*	2	P

	communication data over the PC5 interface in accordance with the resources indicated in Cell 1 *SystemInformationBlockType18?* NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.				
8-20	Void	-	-	-	-
21	The SS configures: SW-NW Cell 1 and Cell 2 parameters according to the row "T1" in table 19.1.1.3.2-1-0 in order to simulate needs for cell reselection to Cell2. Cell 2 broadcasts *SystemInformationBlockType18* including *commTxPoolNormalCommon*.	-	-	-	-
21A	Wait for 5 sec to allow the UE to adjust to cell changes and start transmission.	-	-	-	-
22-26	Void	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 2.	-	-	-	-
27	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources indicated in the broadcast on Cell 2 *SystemInformationBlockType18*? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	3	P
28	The SS configures: SS-NW Cell 2 and Cell 4 parameters according to the row "T2" in table 19.1.1.3.2-1-0 in order to simulate cell reselection to Cell 4. Cell 4 broadcasts *SystemInformationBlockType18* providing different resources for sideling communication transmission than those provided on Cell 2. In addition to all other settings the *syncTxThreshIC* is included with value 7 (this is needed for TP5). NOTE 1: Value 7 is chosen to ensure that the Power level of Cell 4 is such that it is ensured that the RSRP measurement of the Cell 4 (serving) cell is NOT below the power value that corresponds to 7 (-85dBm).	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 4.	-	-	-	-
-	EXCEPTION: In parallel to steps 4-5 in the procedure described in step 29, the event described in Table 19.1.1.3.2-4 takes place.	-	-	-	-
29	Check: Does the Generic test procedure for 'Tracking area updating procedure' defined in TS 36.508 [18] clause 4.5A.2 take place during which the UE announces its ProSe direct communication capabilities in the TRACKING AREA UPDATE REQUEST message?	-	-	1	-
30-32	Void	-	-	-	-
33	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink	-->	*STCH PDCP SDU packet*	4	P

	communication data over the PC5 interface in accordance with the resources indicated in the broadcasted on Cell 4 *SystemInformationBlockType18*? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.				
-	EXCEPTION: Steps 34 - 35 are repeated 3 times.	-	-	-	-
34	Check: Does the UE transmit SLSS in the next transmission period?	-->	SLSS	5	F
35	Check: Does the UE transmit *MasterInformationBlock-SL* message in the same subframe as the SLSS in step 34?	-->	*MasterInformationBlock-SL*	5	F
36	The SS configures: SW-NW Cell 4 parameters according to the row "T3" in table 19.1.1.3.2-1-0. NOTE 2: The Power level of Cell 4 is such that it is ensured that the RSRP measurement of the serving cell is below the value of syncTxThreshIC (7 (-85dBm)) included in *SystemInformationBlockType18*.	-	-	-	-
36A	Wait for 1 sec to allow the UE to adjust to cell changes and start transmission.	-	-	-	-
-	EXCEPTION: Steps 37 - 38 are repeated 3 times.	-	-	-	-
37	Check: Does the UE transmit SLSS in the next transmission period in accordance with the information provided in the *SystemInformationBlockType18* (SLSSID, a subframe indicated by *syncOffsetIndicator* does not corresponds to the first subframe of the discovery transmission pool)?	-->	SLSS	5	P
38	Check: Does the UE transmit *MasterInformationBlock-SL* message in the same subframe as the SLSS in step 37?	-->	*MasterInformationBlock-SL*	5	P
39	The SS configures: SW-NW Cell 4 and Cell 11 parameters according to the row "T4" in table 19.1.1.3.2-1-0 in order to simulate needs for cell reselection to Cell 11. Cell 11 broadcasts *SystemInformationBlockType18* providing resources for sidelink communication transmission.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 11.	-	-	-	-
-	EXCEPTION: In parallel to the procedure described in step 40 the event described in Table 19.1.1.3.2-2 takes place.	-	-	-	-
40	The Generic test procedure for 'Tracking area updating procedure' defined in TS 36.508 [18] clause 4.5A.2 takes place.	-	-	-	-
41-43	Void.	-	-	-	-
44	Check: Does the UE transmit during the next 3 transmission periods sidelink communication over the PC5 interface in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* transmitted on Cell 11?	-->	-	6	F
45-	Void	-	-	-	-

50					
51	The SS configures: SW-NW Cell 11 and Cell 4 parameters according to the row "T6" in table 19.1.1.3.2-1-0 in order to simulate needs for cell reselection to Cell4. Cell 4 is transmitting *SystemInformationBlockType18* providing resources for ProSe direct communication transmission.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 4.	-	-	-	-
51 A	The UE transmits an *RRCConnectionRequest* message on the cell specified in the test case.	-->	*RRCConnectionRequest*	-	-
51 B	SS-NW transmits an *RRCConnectionSetup* message.	<--	*RRCConnectionSetup*	-	-
-	EXCEPTION: In parallel to steps 52-53, the event described in Table 19.1.1.3.2-4 takes place.	-	-	-	-
52	The UE transmits a TRACKING AREA UPDATE REQUEST message.	-->	*RRCConnectionSetupComplete* TRACKING AREA UPDATE REQUEST	-	-
53	The SS-NW transmits a TRACKING AREA UPDATE REJECT message with cause value set to “PLMN not allowed“.	<--	TRACKING AREA UPDATE REJECT	-	-
54	Void	-	-	-	-
55	SS-NW transmits an RRCConnectionRelease message to release RRC connection	<--	*RRCConnectionRelease*	-	-
56	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink data communication over the PC5 interface in accordance with the resources indicated on Cell 4? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	8	P

Table 19.1.1.3.2-2: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication in the next 5s ?	-->	*SidelinkUEInformation*	6	F

Table 19.1.1.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS-NW transmits a *SecurityModeCommand* message to activate AS security.	<--	RRC: *SecurityModeCommand*	-	-
2	The UE transmits a *SecurityModeComplete* message and establishes the initial security configuration.	-->	RRC: *SecurityModeComplete*	-	-

Table 19.1.1.3.2-4: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication in the next 5s?	-->	*SidelinkUEInformation*	-	-

19.1.1.3.3 Specific message contents

Table 19.1.1.3.3-1: *SystemInformationBlockType18* for Cell 1 (step 1B, Table 19.1.1.3.2-1)

Derivation Path: 36.508 [18] , table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[1]	Not Present		
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolNormalCommon-r12	Not Present		
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note: SideLink direct communication supported but no resources set for transmission.			

Table 19.1.1.3.3-1A: *SystemInformationBlockType18* for Cell 1 (when active steps 6A onwards, Table 19.1.1.3.2-1)

Derivation Path: 36.508 [18], table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note: SideLink direct communication supported; resources for transmission in RRC_IDLE provided (*commTxPoolNormalCommon* - 1 pool) SL-CommResourcePool-r12[1].			

Table 19.1.1.3.3-1B: *SystemInformationBlockType18* for Cell 2 when active

Derivation Path: 36.508 [18], table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[1]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note 1: SideLink direct communication supported; resources for transmission in RRC_IDLE provided (*commTxPoolNormalCommon* - 1 pool SL-CommResourcePool-r12[2]). Note 2: The transmission resources provided on Cell 2 are different to those provided on Cell 1 - differences only in the field *subframeBitmap*.			

Table 19.1.1.3.3-2: *SystemInformationBlockType18* for Cell 4 and Cell 11 when active and unless otherwise stated

Derivation Path: 36.508 [18] , table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12 SEQUENCE (SIZE (1..maxSL-SyncConfig-r12)) OF SL-SyncConfig-r12			
SL-SyncConfig-r12[2]	Not Present		
}			
}			
}			
Note 1: For the commSyncConfig/SL-SyncConfig-r12[1] settings, the *syncTxThreshIC* is included with value 7 = -85dBm - the threshold for starting transmission of SLSS (this is needed for TP5). Note 2: The transmission resources provided are different to those provided on Cell 2 - differences only in the field *subframeBitmap*.			

Table 19.1.1.3.3-3: ATTACH REQUEST (step 0B Table 19.1.1.3.2-1; step 4 TS 36.508 [18] Table 4.5.2.3-1)

Derivation path: 36.508 [18] , table 4.7.2-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.1.3.3-4: ATTACH ACCEPT (step 0B Table 19.1.1.3.2-1; step 14 TS 36.508 [18] Table 4.5.2.3-1)

Derivation path: 36.508 [18], table 4.7.2-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
Equivalent PLMNs	PLMN4		Cell 1

Table 19.1.1.3.3-5: Message TRACKING AREA UPDATE REQUEST (step 29, Table 19.1.1.3.2-1; step 4 TS 36.508 [18] Table 4.5A.2.1-1 , and step 52, Table 19.1.1.3.2-1)

Derivation path: 36.508 [18] table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
EPS update type			
"Active" flag	'1'B		
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.1.3.3-5AA: Message TRACKING AREA UPDATE REQUEST (step 40, Table 19.1.1.3.2-1; step 4 TS 36.508 [18] Table 4.5A.2.1-1)

Derivation path: 36.508 [18] table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.1.3.3-5A: Message TRACKING AREA UPDATE REQUEST REJECT (step 53, Table 19.1.1.3.2-1)

Derivation path: 36.508 [18] , table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
Cause	PLMN not allowed		

Table 19.1.1.3.3-5B: *RRCConnectionRequest* (step 2, Table 19.1.1.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-16			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionRequest ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcConnectionRequest-r8 SEQUENCE {			
establishmentCause	mo-Data		
	Delay tolerant		
	High priority access AC 11 - 15		
}			
}			
}			

Table 19.1.1.3.3-6: SidelinkUEInformation (step 5, Table 19.1.1.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs ::= SEQUENCE {			
commRxInterestedFreq-r12	Not Present	NOTE 1	
commTxResourceReq-r12 SEQUENCE {		Indicates the frequency on which the UE is interested to transmit sidelink communication as well as the sidelink communication transmission destination(s) for which the UE requests E-UTRAN to assign dedicated resources.	
carrierFreq-r12	f1	Preconfigured value for the service authorisation (same as the frequency on which the simulated cells operate)	
destinationInfoList-r12 SEQUENCE (SIZE (1..maxSL-Dest-r12)) OF SL-DestinationIdentity-r12	1 entry		
SL-DestinationIdentity-r12[1]	the destination which is identified by the ProSe Layer-2 Group ID	Preconfigured value for the service authorisation	
}			
}			
discRxInterest-r12	Not Present	NOTE 1	
discTxResourceReq-r12	Not Present	NOTE 1	
}			
NOTE 1: It is assumed that it will be possible to trigger in the UE an Application that requests only sidelink communication transmission.			

Table 19.1.1.3.3-7: Void

Table 19.1.1.3.3-8: *MasterInformationBlock-SL* (step 38, Table 19.1.1.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-4A0

Table 19.1.1.3.3-9: UPDATE UE LOCATION INFORMATION (step 0C, Table 19.1.1.3.2-1)

Derivation Path: 36.509 [38], clause 6.12.			
Information Element	**Value/remark**	**Comment**	**Condition**
ellipsoidPointWithAltitude		The Location information provided shall match the area 1 pre-configured in the UE (see TS 36.508 [18], clause 4.9.3.1, $EF_{PROSE\_RADIO\_COM}$) as geographical area where the UE is allowed to use prose communication	
horizontalVelocity	horizontalVelocity: 0 m/s		
Gnss-TOD-msec	Equal to system time		

19.1.2 ProSe direct Communication /Pre-configured authorisation / UE in RRC_IDLE on an E-UTRAN cell operating on the carrier frequency provisioned for ProSe direct service / Utilisation of the resources of (serving) cells/PLMNs / Reception

19.1.2.1 Test Purpose (TP)

(1)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_IDLE on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication *(commRxPool)* }
ensure that {
  when { UE receives a request from upper layers to receive sidelink communication }
    then { UE is able to receive sidelink communication using the configured resources in Cell1/f1/PLMN1 }
            }

(2)

Void

(3)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_IDLE on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication }
ensure that {
  when { Cell2/f1/PLMN4 (equivalent PLMN) which is broadcasting *SystemInformationBlockType18* providing resources for sidelink communication *(commRxPool)* becomes the highest ranked cell, **and,** UE reselects to Cell2/f1/PLMN4 }
    then { UE is able to receive sidelink communication using the configured resources in Cell2/f1/PLMN3}
            }

(4)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_IDLE on Cell4/f1/PLMN2 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having successfully initiated an RRC connection and completed Sidelink UE information procedure requesting sidelink communication reception resources and moved to RRC_IDLE }
ensure that {
  when { Cell4/f1/PLMN2 which is broadcasting *SystemInformationBlockType18* providing resources for sidelink communication (*commRxPool* includes multiple entries some including and others not including *rxParametersNCell*) becomes the highest ranked cell, **and,** UE reselects to Cell4/f1/PLMN2 }
    then { UE is able to receive sidelink communication from two different devices one operating on the configured for *rxParametersNCell* resources in Cell4/f1/PLMN2 and one on the resources not including *rxParametersNCell* }
            }

(5)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_IDLE on Cell4/f1/PLMN2 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having successfully completed Sidelink UE information procedure indicating the sidelink communication reception frequency of interest and receiving sidelink communication }
ensure that {
  when { Cell11/f1/PLMN3 which is broadcasting *SystemInformationBlockType18* providing resources for sidelink communication *becomes the highest ranked cell*, **and,** UE reselects to Cell11/f1/PLMN3 }
    then { UE does not receive sidelink communication on the resources configured in Cell11/f1/PLMN3}
            }

(6)

Void

19.1.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.334, clauses 5.1.1, 5.1.2, 10.2.1, 10.2.2, TS 36.331, clauses 5.2.2.4, 5.2.2.25, 5.10.1a, 5.10.3. Unless otherwise stated these are Rel-12 requirements.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery announcing or ProSe direct discovery monitoring or both, and to use ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 5.1.2]

The IP address of the ProSe function in the HPLMN may be pre-configured in the UE and in this case, the UE may use the pre-configured IP address. Alternatively, the FQDN of the ProSe Function in the HPLMN may be self-constructed by the UE, i.e. derived from the PLMN ID of the HPLMN. The UE may perform DNS lookup as specified in IETF RFC 1035 [10].

[TS 24.334, clause 10.2.1]

One-to-many ProSe direct communication is applicable only to ProSe-enabled Public Safety UEs. One-to-many ProSe direct communication can only apply when the UE is:

a) served by E-UTRAN and authorised for ProSe direct communication in the registered PLMN;

...

Upon receiving a request from upper layers to send or receive data for ProSe direct communication in a given group, the UE shall initiate the procedure for ProSe direct communication. For case a, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.2. For case b and c, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.3.

…

The UE shall obtain the ProSe direct communication policy parameters for that group as specified in subclause 5.

If the ProSe direct communication policy parameters indicate that the UE is configured to use IPv6 for that group, the UE shall auto-configures a link local IPv6 Address following procedures defined in RFC 4862 [15]. This address can only be used as the source IP address for one-to-many ProSe direct communication.

If the ProSe Direct communication policy parameters group indicate that the UE is configured to use IPv4 for that group, then the UE shall:

- use the configured IPv4 address for that group as source address; or
- if there is no configured IPv4 address for that group, use Dynamic Configuration of IPv4 Link-Local Addresses as specified in IETF RFC 3927 [16].

[TS 24.334, clause 10.2.2]

When the UE is served by E-UTRAN and intends to use the ProSe radio resources (i.e. carrier frequency) provided by an E-UTRAN cell, the UE requests the parameters from the lower layers for transmitting or receiving ProSe direct communication (see 3GPP TS 36.331 [12]). The UE shall perform direct communication only if the lower layers indicate that ProSe direct communication is supported by the network. If the UE in EMM-IDLE mode has to request resources for ProSe direct communication as specified in 3GPP TS 36.331 [12], the UE shall perform a service request procedure or tracking area update procedure as specified in 3GPP TS 24.301 [11]. Once the radio resources for transmitting or receiving ProSe direct communication are provided by eNodeB as specified in 3GPP TS 36.331 [12], the UE shall start ProSe direct communication.

[TS 36.331, clause 5.2.2.4]

1> if the UE is capable of sidelink communication and is configured by upper layers to receive or transmit sidelink communication:

2> if the cell used for sidelink communication meets the S-criteria as defined in TS 36.304 [4]; and

2> if *schedulingInfoList* indicates that *SystemInformationBlockType18* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType18*;

[TS 36.331, clause 5.2.2.25]

Upon receiving *SystemInformationBlockType18*, the UE shall:

1> if *SystemInformationBlockType18* message includes the *commConfig*:

2> if configured to receive sidelink communication:

3> from the next SC period, as defined by *sc-Period*, use the resource pool indicated by *commRxPool* for sidelink communication monitoring, as specified in 5.10.3;

[TS 36.331, clause 5.10.1a]

When it is specified that the UE shall perform a particular sidelink operation only if the conditions defined in this section are met, the UE shall perform the concerned sidelink operation only if:

1> if the UE's serving cell is suitable (RRC_IDLE or RRC_CONNECTED); and if either the selected cell on the frequency used for sidelink operation belongs to the registered or equivalent PLMN as specified in TS 24.334

[69] or the UE is out of coverage on the frequency used for sidelink operation as defined in TS 36.304 [4, 11.4]; or

[TS 36.331, clause 5.10.3]

A UE capable of sidelink communication that is configured by upper layers to receive sidelink communication shall:

1> if the conditions for sidelink operation as defined in 5.10.1a are met:

2> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

3> if the cell chosen for sidelink communication reception broadcasts *SystemInformationBlockType18* including *commRxPool*:

4> configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources indicated by *commRxPool*;

NOTE 1: If *commRxPool* includes one or more entries including *rxParametersNCell*, the UE may only monitor such entries if the associated PSS/SSS or SLSSIDs is detected. When monitoring such pool(s), the UE applies the timing of the concerned PSS/SSS or SLSS.

19.1.2.3 Test description

19.1.2.3.1 Pre-test conditions

System Simulator:

SS-NW

- 4 cells with parameters defined in Table 19.1.2.3.1-1.

NOTE: The test only requires at maximum 2 cells to be active at any one instance.

Table 19.1.2.3.1-1: Cell parameters values

Cell	Frequency	PLMN
1	f1	HPLMN (PLMN1)
2	f1	PLMN4
4	f1	PLMN2
11	f1	PLMN3
Note 1:	PLMN1: PLMN1 in USIM EF_{PROSE_PLMN} PLMN2: PLMN2 in USIM EF_{PROSE_PLMN} PLMN3: MCC = MCC of PLMN1 in USIM EF_{PROSE_PLMN}; MNC=03. PLMN4 is an equivalent PLMN to PLMN1; MCC = MCC of PLMN1 in USIM EF_{PROSE_PLMN}; MNC=04.	
Note 2:	The Frequency f1 shall be the frequency pre-configured in the UE for when UE is "not served by E-UTRAN".	
Note 3:	A single frequency has been chosen for all PLMNs to allow the TC to be applicable even for UEs supporting a single band which comprises a single frequency.	

- System information combination 23 as defined in TS 36.508 [18] clause 4.4.3.1 is used in all active cells.

SS-UE

- SS-UE1

- As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting device on the resources provided by different cells (as specified in the relevant procedure steps in Table 19.1.2.3.2-1).

- SS-UE2

- As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting device transmitting as well Synchronisation information on the resources provided by different cells (as specified in the relevant procedure steps in Table 19.1.2.3.2-1).

- When SS-UE2 is simulated, SS-UE2 and SS-UE1 transmit simultaneously.

UE:

- ProSe related configuration

  - The UE is authorised to perform ProSe Direct Communication; the UE is authorised to perform ProSe Direct Communication; the UE is equipped with a USIM containing values shown in Table 19.1.2.3.1-2, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. 2 PLMNs are authorised for ProSe Direct Communication when served by E-UTRAN, Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, ProSe Group IP multicast address, etc.).

Table 19.1.2.3.1-2: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°2 (HPLMN ProSe Function) supported.
	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.

  - For each PLMN a timer T4005 is assigned long enough not to expire before the TC is completed, e.g. 5 min (for Rel-12 this timer cannot be set in the USIM, it is expected that the UE shall provide means for setting the timer e.g. via MMI).

Preamble:

- The UE is in State RB Established, UE Test Mode Activated (State 3A) with TEST LOOP MODE E being activated on Cell 1 according to TS 36.508 [18]. During the registration PLMN4 is assigned as Equivalent PLMN.

19.1.2.3.2 Test procedure sequence

Table 19.1.2.3.2-0 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" ... "Tn" are to be applied subsequently. The exact instants on which these values shall be applied are described elsewhere in the present clause.

Table 19.1.2.3.2-0: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Cell 4	Cell 11
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	"Off"	"Off"	"Off"
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-79	"Off"	"Off"
T2	Cell-specific RS EPRE	dBm/15k Hz	-85	"Off"	-79	"Off"
T3	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	-85	-79
T4	Void					
T5	Void					

Table 19.1.2.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
0	Close UE Test Loop with bit E0 in UE test loop mode E LB setup IE set to one (TEST LOOP MODE E, TRIGGER = RECEIVE) and bring UE into state Loopback Activated (State 4). NOTE: The loop is closed here and used towards the end of the test sequence to allow that most of the time the UE is kept out of coverage and is not moving often between in and out of coverage.	<--	CLOSE UE TEST LOOP	-	-
0A	The UE responds with CLOSE UE TEST LOOP COMPLETE.	-->	CLOSE UE TEST LOOP COMPLETE	-	-
0B	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
1	Force the UE upper layer application to request reception of sidelink communication.	-	-	-	-
1A	Wait for [5] sec to allow the UE to process the request and start reception.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
2-6	Void	-	-	-	-
-	EXCEPTION: Step 7 is repeated 3 times.	-	-	-	-
7	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool* provides 2 pool for reception, the SS-UE1 shall use pool 1 (SL-CommResourcePool-r12[1])). NOTE: This step verifies TP1 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 42.	<--	*STCH PDCP SDU packet*	-	-
8-22	Void	-	-	-	-
23	The SS configures: SS-NW Cell 1 and Cell 2 parameters according to the row "T1" in table 19.1.2.3.2-1-0 in order to simulate the need for cell reselection to Cell2/f1/PLMN4. Cell 2 broadcasts *SystemInformationBlockType18* (*commRxPool* provides 2 pools for reception different to the resources provided on the previous cell on which the UE received ProSe direct communication).	-	-	-	-
23A	Wait for 5 sec to allow the UE to adjust to the cell changes	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 2.	-	-	-	-
24-27	Void	-	-	-	-
-	EXCEPTION: Step 28 is repeated 3 times.	-	-	-	-
28	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool* provides 2 pool for reception, the SS-UE1 shall use pool 2 - this is to verify that UE can read 2 pools and listen on both). NOTE: This step verifies TP3 - it is expected	<--	*STCH PDCP SDU packet*	-	-

	that the UE will be able to receive these packets - if they were received is checked in step 42.				
29-31	Void	-	-	-	-
32	The SS configures: SS-NW Cell 2 and Cell 4 parameters according to the row "T2" in table 19.1.2.3.2-1-0 in order to simulate needs for cell reselection to Cell4/f1/PLMN2. Cell 4 transmits *SystemInformationBlockType18*, *commRxPool* includes two entries, one entry including and the other not including *rxParametersNCell*: the resources are different to the resources provided on the previous cell on which the UE received ProSe direct communication.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 4.	-	-	-	-
-	EXCEPTION: In parallel to steps 4-5 in the procedure described in step 32A the event described in Table 19.1.2.3.2-3 takes place.	-	-	-	-
32A	The Generic test procedure for 'Tracking area updating procedure' defined in TS 36.508 [18] clause 4.5A.2 takes place.	-	-	-	-
33-39	Void	-	-	-	-
40	SS-UE configures SS-UE2 to start transmitting Synchronisation information (SLSS and *MasterInformationBlock-SL* message, in the same subframe as SLSS) utilising the resources indicated in the *SystemInformationBlockType18* (*commRxPool* the entry including *rxParametersNCell commRxPool* 2 (*SL-CommResourcePool-r12[2]) and the relevant SLSSID (commSyncConfig-r12*/SL-SyncConfig-r12[2]*)*).	<--	SLSS *MasterInformationBlock-SL*	-	-
40A	Wait for 5 sec to allow the UE to receive the synchronisation information.	-	-	-	-
-	EXCEPTION: Steps 40B-40C are repeated 3 times.	-	-	-	-
40B	SS-UE2 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool* the entry including *rxParametersNCell commRxPool* 2 (*SL-CommResourcePool-r12[2])*). NOTE: This step verifies TP4 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 42.	<--	*STCH PDCP SDU packet*	-	-
40C	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool* the entry NOT including *rxParametersNCell commRxPool*3 (*SL-CommResourcePool-r12[3])*). NOTE: This step verifies TP4 - it is expected that the UE will be able to receive these packets - if they were received is checked in	<--	*STCH PDCP SDU packet*	-	-

	step 42.				
40 D	SS-UE2 stops transmitting synchronisation information.	-	-	-	-
40 E	Generic procedure for Generic Radio Bearer Establishment (State 3) defined in TS 36.508 [18] clause 4.5.3 takes place	-	-	-	-
41	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST message.	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-
42	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER RESPONSE with STCH_PACKET_COUNTER=12? NOTE: In this step all received until now packets are counted.	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	1, 2, 3, 4	P
42 A	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
43	The SS configures: SS-NW Cell 4 and Cell 11 parameters according to the row "T3" in table 19.1.2.3.2-1-0 in order to simulate needs for cell reselection to Cell11/f1/PLMN3.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 11.	-	-	-	-
43 A	The Generic test procedure for 'Tracking area updating procedure' defined in TS 36.508 [18] clause 4.5A.2 takes place.	-	-	-	-
44-47	Void	-	-	-	-
48	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool, commRxPool* 1 (*SL-CommResourcePool-r12[1]*)). NOTE: This step verifies TP5 - it is expected that the UE will NOT be able to receive these packets - if they were received is checked in step 50.	<--	*STCH PDCP SDU packet*	-	-
48 A	Generic procedure for Generic Radio Bearer Establishment (State 3) defined in TS 36.508 [18] clause 4.5.3 takes place	-	-	-	-
49	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST message.	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-
50	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER RESPONSE with STCH_PACKET_COUNTER>12?	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	5	F
51-58	Void	-	-	-	-
59	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-

Table 19.1.2.3.2-2: Void

Table 19.1.2.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE transmits a *SidelinkUEInformation* message.	-->	*SidelinkUEInformation*	-	-

9.1.2.3.3 Specific message contents

Table 19.1.2.3.3-1: *SystemInformationBlockType18* for cell 1 when active and unless otherwise stated

Derivation Path: 36.508 [18] , table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note: SideLink direct communication supported; resources for reception provided in 2 *commRxPools*. One resource for transmission (*SL-CommResourcePool-r12*[1]) matching one of the resources for reception is provided and will be used by the SS-UE for transmission.			

Table 19.1.2.3.3-1A: *SystemInformationBlockType18* for cell 2 when active and unless otherwise stated

Derivation Path: 36.508 [18], table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2] SEQUENCE {		RxPool 2	
rxParametersNCell-r12	Not Present		
}			
SL-CommResourcePool-r12[3]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note: SideLink direct communication supported; resources for reception provided in 2 *commRxPools*. The new Pool 2 (SL-CommResourcePool-r12[2]) is what SIB18 on Cell 2 differs to SIB18 on Cell 1 and this pool will be used by the SS-UE for transmission.			

Table 19.1.2.3.3-2: *SystemInformationBlockType18* for Cell 4 and Cell 11 when active and unless otherwise stated

Derivation Path: 36.508 [18] , table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2] SEQUENCE {		RxPool 2	
sc-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000011 00000000 00000000 00000000 00000000	bs40-r12	FDD
}			
ue-SelectedResourceConfig-r12 SEQUENCE {			
data-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 00000000 00000011 11000000 00000000	bs40-r12	FDD
}			
}			
}			
}			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2] SEQUENCE {		TxPool 2	
sc-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000011 00000000 00000000 00000000 00000000	bs40-r12	FDD
}			
ue-SelectedResourceConfig-r12 SEQUENCE {			
data-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 00000000 00000011 11000000 00000000	bs40-r12	FDD
}			
}			
}			
}			
commTxPoolExceptional-r12	Not Present		
}			
}			
Note 1: *SystemInformationBlockType18* providing different resources for sidelink communication reception than those provided on Cell 2 (different *SL-CommResourcePool-r12[2]* and new in *SL-CommResourcePool-r12[3]*) with *commRxPool* 2 (*SL-CommResourcePool-r12[2])* also containing *rxParametersNCell* linked to the *commSyncConfig-r12*/SL-SyncConfig-r12[2]; the SS-UEs will be transmitting on *SL-CommResourcePool-r12[2]* and *SL-CommResourcePool-r12[3]*.			

Table 19.1.2.3.3-3: Message ATTACH REQUEST (Preamble)

Derivation path: 36.508 [18] , table 4.7.2-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.2.3.3-4: ATTACH ACCEPT (preamble)

Derivation path: 36.508, table 4.7.2-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
Equivalent PLMNs	PLMN4		Cell 1

Table 19.1.2.3.3-5: Message TRACKING AREA UPDATE REQUEST (step 32A, Table 19.1.2.3.2-1; step 4, TS 36.508 [18] Table 4.5A.2.1-1)

Derivation path: 36.508 [18] , table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
EPS update type			
"Active" flag	'1'B		
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.2.3.3-5A: Message TRACKING AREA UPDATE REQUEST (step 43A, Table 19.1.2.3.2-1; step 4, TS 36.508 [18] Table 4.5A.2.1-1)

Derivation path: 36.508 [18], table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.2.3.3-6: SidelinkUEInformation (step 1, Table 19.1.2.3.2-3)

Derivation Path: 36.508, Clause 4.6.1, Table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs			
commRxInterestedFreq-r12 SEQUENCE {	f1	Preconfigured value for the service authorisation (same as the frequency on which the simulated cells operate)	Indicates the frequency on which the UE is interested to receive sidelink communication
commTxResourceReq-r12	Not Present	NOTE 1	
discRxInterest-r12	Not Present	NOTE 1	
discTxResourceReq-r12	Not Present	NOTE 1	
}			
NOTE 1: It is assumed that it will be possible to trigger in the UE an Application that requests only sidelink communication transmission.			

Table 19.1.2.3.3-7: Void

Table 19.1.2.3.3-8: CLOSE UE TEST LOOP (step 0, Table 19.1.2.3.2-1)

Derivation Path: 36.508, Table 4.7A-3 condition UE TEST LOOP MODE E			
Information Element	**Value/remark**	**Comment**	**Condition**
Communication Transmit or Receive	00000000	RECEIVE receive sidelink direct communication	this is the default

Table 19.1.2.3.3-9: *MasterInformationBlock-SL* (step 40, Table 19.1.2.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-4A0

19.1.3 ProSe Direct Communication/Pre-configured authorisation / UE in RRC_CONNECTED on an E-UTRAN cell operating on the carrier frequency provisioned for ProSe direct service / Utilisation of the resources of (serving) cells/PLMNs / Transmission / RRC connection reconfiguration with/without *mobilityControlInfo* / RRC connection re-establishment

19.1.3.1 Test Purpose (TP)

(1)

```
with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2)
and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", and, UE is in
RRC_CONNECTED on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-
configured in the UE and is broadcasting SystemInformationBlockType18 indicating the provision of
resources for sidelink communication }
ensure that {
  when { UE receives a request from upper layers to transmit sidelink communication }
    then { UE successfully completes a Sidelink UE information procedure to indicate the sidelink
communication transmission resources required, and, UE is able to transmit sidelink communication
using the configured resources in Cell1/f1/PLMN1 (commTxResources set to setup and resources
provided in commTxPoolNormalDedicated) }
            }
```

(2)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having successfully completed Sidelink UE information procedure to indicate the sidelink communication transmission resources required and transmitting sidelink communication using the configured resources in Cell1/f1/PLMN1 (*commTxResources* set to setup and resources provided in *commTxPoolNormalDedicated*) }
ensure that {
  when { UE receives *RRCConnectionReconfiguration* message which does not include *mobilityControlInfo* and includes *commTxResources* set to *release* }
    then { UE from the next SC period releases the resources allocated for sidelink communication transmission previously configured by commTxResources in Cell1/f1/PLMN1, **and,** UE re-starts transmission of sidelink communication when resources become available (*commTxResources* set to *setup*, *scheduled* and resources provided in *sc-CommTxConfig* }
            }

(2A)

with { UE being authorised for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having successfully completed Sidelink UE information procedure requesting sidelink communication transmission resources and transmitting sidelink communication }
ensure that {
  when { UE receives a request from upper layers to stop sidelink communication transmission }
    then { the UE transmits a *SidelinkUEInformation* message indicating it does no longer require sidelink communication transmission resources, and, stops sidelink communication transmission on Cell1/f1/PLMN1 }
            }

(3)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having sent a *SidelinkUEInformation* message requesting sidelink communication transmission resources on Cell1/f1/PLMN1 }
ensure that {
  when { UE receives *RRCConnectionReconfiguration* message which includes *mobilityControlInfo* (handover) less than 1 sec after the UE transmitted the *SidelinkUEInformation* message, **and,** MAC successfully completes the random access procedure to the targeted PCell Cell2/f1/PLMN4 (equivalent PLMN) which is broadcasting *SystemInformationBlockType18* }
    then { UE initiates a Sidelink UE information procedure in Cell2/f1/PLMN4 requesting sidelink communication transmission resources, **and,** UE is able to transmit sidelink communication using the configured resources in Cell2/f1/PLMN4 (*commTxResources* set to setup and resources provided in *commTxPoolNormalDedicated*) }
            }

(4)

with { UE being authorised for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell2/f1/PLMN4 which is operating on the same carrier frequency as the one pre-configured in the UE and is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having sent a *SidelinkUEInformation* message requesting sidelink communication transmission resources on Cell2/f1/PLMN4 }
ensure that {
  when { UE detects radio link failure >1 sec after the UE transmitted the *SidelinkUEInformation* message, **and,** T301 is running and the cell on which the UE initiated connection re-establishment (Cell1/f1/PLMN1) broadcasts *SystemInformationBlockType18* including *commTxPoolExceptional* }
    then { UE transmits sidelink communication using the pool of resources indicated by the first entry in *commTxPoolExceptional* on Cell1/f1/PLMN1, **and**, after the T301 expires UE initiates a Sidelink UE information procedure requesting sidelink communication transmission resources, **and,** UE is able to transmit sidelink communication using the configured resources in Cell1/f1/PLMN1 (*commTxResources* set to setup and resources provided in *commTxPoolNormalDedicated*) }
            }

(5)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE transmitting and receiving sidelink communication using the configured resources in Cell1/f1/PLMN1 (*commTxPoolNormalDedicated* and *commRxPool*) }
ensure that {
  when { UE receives *RRCConnectionReconfiguration* message which includes *mobilityControlInfo* (handover), **and,** MAC successfully completes the random access procedure to the targeted PCell Cell4/f1/PLMN2 and the cell is broadcasting *SystemInformationBlockType18* }
    then { UE successfully completes a Sidelink UE information procedure requesting sidelink communication transmission resources, **and,** UE is able to transmit sidelink communication using the configured resources in Cell4/f1/PLMN2 }
            }

(6)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell4/f1/PLMN2 which is operating on the same carrier frequency as the one pre-configured in the UE and is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having successfully completed Sidelink UE information procedure requesting sidelink communication transmission resources and transmitting sidelink communication }
ensure that {
  when { UE is in RRC_CONNECTED, **and,** *networkControlledSyncTx* is configured and set to *on* }
    then { UE transmits SLSS and *MasterInformationBlock-SL* message in the same subframe }
            }

(7)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell4/f1/PLMN2 which is operating on the same carrier frequency as the one pre-configured in the UE and is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having successfully completed Sidelink UE information procedure requesting sidelink communication transmission resources and transmitting sidelink communication }
ensure that {
  when { UE is in RRC_CONNECTED, **and,** *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType18*, and, the RSRP measurement of the serving cell is below the value of *syncTxThreshIC* }
    then { UE transmits SLSS and *MasterInformationBlock-SL* message in the same subframe }
            }

(8) **Void**

(9)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell4/f1/PLMN2 which is operating on the same carrier frequency as the one pre-configured in the UE and is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having successfully completed Sidelink UE information procedure requesting sidelink communication transmission resources and transmitting sidelink communication }
ensure that {
  when { UE receives *RRCConnectionReconfiguration* message including *mobilityControlInfo*, **and,** MAC successfully completes the random access procedure to the targeted PCell Cell11/f1/PLMN3 which is broadcasting *SystemInformationBlockType18* }
    then { UE does not transmit a SidelinkUEInformation message to indicate the transmission resources required, **and,** does not transmit sidelink communication over the PC5 in the assigned resources in Cell11/f1/PLMN3 (*commTxResources* set to setup and resources provided in *commTxPoolNormalDedicated*) }
            }

(10)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and being provisioned with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE in RRC_CONNECTED on Cell11/f1/PLMN3 which is broadcasting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication on the serving PLMN, **and,** UE has previously

```
successfully completed a Sidelink UE information procedure requesting sidelink communication
transmission resources }
ensure that {
  when { UE receives RRCConnectionReconfiguration message including mobilityControlInfo, and, MAC
successfully completes the random access procedure to the targeted PCell Cell1/f1/PLMN1 which is NOT
broadcasting SystemInformationBlockType18 }
    then { UE does not transmit a SidelinkUEInformation message to indicate the transmission
resources required, and, does not transmit sidelink communication over the PC5 in Cell1/f1/PLMN1 }
          }
```

19.1.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.334, clauses 5.1.1, 5.1.2, 10.2.1, 10.2.2, 10.2.3, TS 36.331, clauses 5.2.2.4, 5.3.5.3, 5.3.5.4, 5.3.7.5, 5.3.10.15, 5.10.1a, 5.10.2.1, 5.10.2.2, 5.10.2.3, 5.10.4, 5.10.7.1, 5.10.7.2, 5.10.7.3, 5.10.7.4, 5.10.9.1, 5.10.9.2. Unless otherwise stated these are Rel-12 requirements.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery announcing or ProSe direct discovery monitoring or both, and to use ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 5.1.2]

The IP address of the ProSe function in the HPLMN may be pre-configured in the UE and in this case, the UE may use the pre-configured IP address. Alternatively, the FQDN of the ProSe Function in the HPLMN may be self-constructed by the UE, i.e. derived from the PLMN ID of the HPLMN. The UE may perform DNS lookup as specified in IETF RFC 1035 [10].

[TS 24.334, clause 10.2.1]

One-to-many ProSe direct communication is applicable only to ProSe-enabled Public Safety UEs. One-to-many ProSe direct communication can only apply when the UE is:

a) served by E-UTRAN and authorised for ProSe direct communication in the registered PLMN;

...

Upon receiving a request from upper layers to send or receive data for ProSe direct communication in a given group, the UE shall initiate the procedure for ProSe direct communication. For case a, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.2. For case b and c, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.3.

If the UE is camped on an E-UTRAN cell not operating on the carrier frequency provisioned for ProSe direct communication which indicates that ProSe direct communication is supported by the network, the UE can perform either ProSe direct communication procedures specified in subclause 10.2.2 or ProSe direct communication procedures specified in subclause 10.2.3.

The UE shall obtain the ProSe direct communication policy parameters for that group as specified in subclause 5.

If the ProSe direct communication policy parameters indicate that the UE is configured to use IPv6 for that group, the UE shall auto-configures a link local IPv6 Address following procedures defined in RFC 4862 [15]. This address can only be used as the source IP address for one-to-many ProSe direct communication.

If the ProSe Direct communication policy parameters group indicate that the UE is configured to use IPv4 for that group, then the UE shall:

- use the configured IPv4 address for that group as source address; or

- if there is no configured IPv4 address for that group, use Dynamic Configuration of IPv4 Link-Local Addresses as specified in IETF RFC 3927 [16].

[TS 24.334, clause 10.2.2]

When the UE is served by E-UTRAN and intends to use the ProSe radio resources (i.e. carrier frequency) provided by an E-UTRAN cell, the UE requests the parameters from the lower layers for transmitting or receiving ProSe direct communication (see 3GPP TS 36.331 [12]). The UE shall perform direct communication only if the lower layers indicate that ProSe direct communication is supported by the network. If the UE in EMM-IDLE mode has to request resources for ProSe direct communication as specified in 3GPP TS 36.331 [12], the UE shall perform a service request procedure or tracking area update procedure as specified in 3GPP TS 24.301 [11]. Once the radio resources for transmitting or receiving ProSe direct communication are provided by eNodeB as specified in 3GPP TS 36.331 [12], the UE shall start ProSe direct communication.

[TS 24.334, clause 10.2.3]

Before initiating ProSe direct communication, the UE shall check with lower layers whether the selected radio parameters can be used in the current location without causing interference to other cells as specified in 3GPP TS 36.331 [12], and:

- if the lower layers indicate that the usage would not cause any interference, the UE shall initiate ProSe direct communication; or

NOTE 2: If the lower layers find that there exists a cell operating the provisioned radio resources (i.e., carrier frequency), and the cell belongs to the registered PLMN or a PLMN equivalent to the registered PLMN, and the UE is authorized for ProSe direct communication in this PLMN, the UE can use the radio parameters indicated by the cell as specified in 3GPP TS 36.331 [12].

- else if the lower layers report that one or more PLMNs operate in the provisioned radio resources (i.e. carrier frequency) then:

  a) if the following conditions are met:

     1) none of the PLMNs reported by the lower layers is the registered PLMN or equivalent to the registered PLMN; and

     2) at least one of the PLMNs reported by the lower layers is in the list of authorised PLMNs for ProSe direct communication and provides radio resources for ProSe direct communication as specified in 3GPP TS 36.331 [12];

     then the UE shall:

     1) if in EMM-IDLE mode, perform PLMN selection triggered by ProSe direct communication as specified in 3GPP TS 23.122 [24]; or

     2) else if in EMM-CONNECTED mode, either:

        i) perform a detach procedure as specified in 3GPP TS 24.301 [11] and then perform PLMN selection triggered by ProSe direct communication as specified in 3GPP TS 23.122 [24]; or

        ii) not initiate ProSe direct communication.

     Whether the UE performs i) or ii) above is left up to UE implementation; or

  b) else the UE shall not initiate ProSe direct communication.

If the registration to the selected PLMN is successful, the UE shall proceed with the procedure to initiate ProSe direct communication as specified in subclause 10.2.2.

[TS 36.331, clause 5.2.2.4]

1> if the UE is capable of sidelink communication and is configured by upper layers to receive or transmit sidelink communication:

   2> if the cell used for sidelink communication meets the S-criteria as defined in TS 36.304 [4]; and

2> if *schedulingInfoList* indicates that *SystemInformationBlockType18* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType18*;

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the *RRCConnectionReconfiguration* message includes the *sl-DiscConfig* or *sl-CommConfig*:

2> perform the sidelink dedicated configuration procedure as specified in 5.3.10.15;

...

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 36.331, clause 5.3.5.4]

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the *RRCConnectionReconfiguration* message includes the *sl-DiscConfig* or *sl-CommConfig*:

2> perform the sidelink dedicated configuration procedure as specified in 5.3.10.15;

...

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission;

1> if MAC successfully completes the random access procedure:

...

2> if *SystemInformationBlockType18* is broadcast by the target PCell; and the UE transmitted a *SidelinkUEInformation* message including *commRxInterestedFreq* or *commTxResourceReq* during the last 1 second preceding reception of the *RRCConnectionReconfiguration* message including *mobilityControlInfo*; or:

...

3> initiate transmission of the *SidelinkUEInformation* message in accordance with 5.10.2.3;

[TS 36.331, clause 5.3.7.5]

NOTE 1: Prior to this, lower layer signalling is used to allocate a C-RNTI. For further details see TS 36.321 [6];

The UE shall:

1> stop timer T301;

1> consider the current cell to be the PCell;

1> re-establish PDCP for SRB1;

1> re-establish RLC for SRB1;

1> perform the radio resource configuration procedure in accordance with the received *radioResourceConfigDedicated* and as specified in 5.3.10;

1> resume SRB1;

...

1> if *SystemInformationBlockType18* is broadcast by the PCell; and the UE transmitted a *SidelinkUEInformation* message including *commRxInterestedFreq* or *commTxResourceReq* during the last 1 second preceding detection of radio link failure; or

...

2> initiate transmission of the *SidelinkUEInformation* message in accordance with 5.10.2.3;

[TS 36.331, clause 5.3.10.15]

The UE shall:

1> if the *RRCConnectionReconfiguration* message includes the *sl-CommConfig*:

2> if *commTxResources* is included and set to *setup*:

3> from the next SC period use the resources indicated by *commTxResources* for sidelink communication transmission, as specified in 5.10.4;

2> else if *commTxResources* is included and set to *release*:

3> from the next SC period, release the resources allocated for sidelink communication transmission previously configured by *commTxResources*;

[TS 36.331, clause 5.10.1a]

When it is specified that the UE shall perform a particular sidelink operation only if the conditions defined in this section are met, the UE shall perform the concerned sidelink operation only if:

1> if the UE's serving cell is suitable (RRC_IDLE or RRC_CONNECTED); and if either the selected cell on the frequency used for sidelink operation belongs to the registered or equivalent PLMN as specified in TS 24.334 [69] or the UE is out of coverage on the frequency used for sidelink operation as defined in TS 36.304 [4, 11.4]; or

[TS 36.331, clause 5.10.2.1]

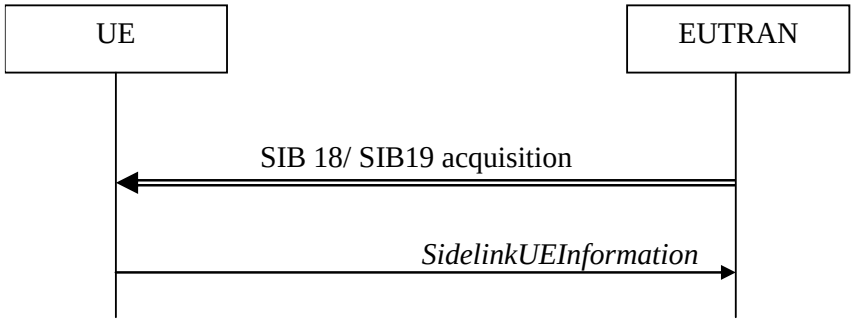

Figure 5.10.2-1: Sidelink UE information

The purpose of this procedure is to inform E-UTRAN that the UE is interested or no longer interested to receive sidelink communication or discovery, as well as to request assignment or release of transmission resources for sidelink communication or discovery announcements.

[TS 36.331, clause 5.10.2.2]

A UE capable of sidelink communication or discovery that is in RRC_CONNECTED may initiate the procedure to indicate it is (interested in) receiving sidelink communication or discovery in several cases including upon successful connection establishment, upon change of interest, upon change to a PCell broadcasting *SystemInformationBlockType18* or *SystemInformationBlockType19*. A UE capable of sidelink communication or discovery may initiate the procedure to request assignment of dedicated resources for the concerned sidelink communication transmission or discovery announcements.

NOTE 1: A UE in RRC_IDLE that is configured to transmit sidelink communication/ discovery announcements, while *SystemInformationBlockType18*/ *SystemInformationBlockType19* does not include the resources for transmission (in normal conditions), initiates connection establishment in accordance with 5.3.3.1a.

Upon initiating the procedure, the UE shall:

1> if *SystemInformationBlockType18* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType18* for the PCell;

...

2> if configured by upper layers to transmit sidelink communication:

3> if the UE did not transmit a *SidelinkUEInformation* message since entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a *SidelinkUEInformation* message the UE connected to a PCell not broadcasting *SystemInformationBlockType18*; or

3> if the last transmission of the *SidelinkUEInformation* message did not include *commTxResourceReq*; or if the information carried by the *commTxResourceReq* has changed since the last transmission of the *SidelinkUEInformation* message:

4> initiate transmission of the *SidelinkUEInformation* message to indicate the sidelink communication transmission resources required by the UE in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the *SidelinkUEInformation* message included *commTxResourceReq*:

4> initiate transmission of the *SidelinkUEInformation* message to indicate it does no longer require sidelink communication transmission resources in accordance with 5.10.2.3;

[TS 36.331, clause 5.10.2.3]

The UE shall set the contents of the *SidelinkUEInformation* message as follows:

1> if *SystemInformationBlockType18* is broadcast by the PCell:

...

2> if configured by upper layers to transmit sidelink communication:

3> include *commTxResourceReq* and set its fields as follows:

4> set *carrierFreq* to indicate the sidelink communication frequency i.e. the same value as indicated in *commRxInterestedFreq* if included;

4> set *destinationInfoList* to include the sidelink communication transmission destination(s) for which it requests E-UTRAN to assign dedicated resources;

...

The UE shall submit the *SidelinkUEInformation* message to lower layers for transmission.

[TS 36.331, clause 5.10.4]

A UE capable of sidelink communication that is configured by upper layers to transmit sidelink communication and has related data to be transmitted shall:

1> if the conditions for sidelink operation as defined in 5.10.1a are met:

2> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

3> if the UE is in RRC_CONNECTED and uses the PCell for sidelink communication:

4> if the UE is configured, by the current PCell/ the PCell in which physical layer problems or radio link failure was detected, with *commTxResources* set to *scheduled*:

5> if T310 or T311 is running; and if the PCell at which the UE detected physical layer problems or radio link failure broadcasts *SystemInformationBlockType18* including *commTxPoolExceptional*; or

5> if T301 is running and the cell on which the UE initiated connection re-establishment broadcasts *SystemInformationBlockType18* including *commTxPoolExceptional*:

6> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources indicated by the first entry in *commTxPoolExceptional*;

5> else:

6> configure lower layers to request E-UTRAN to assign transmission resources for sidelink communication;

4> else if the UE is configured with *commTxPoolNormalDedicated*:

5> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources indicated by the first entry in *commTxPoolNormalDedicated*;

[TS 36.331, clause 5.10.7.1]

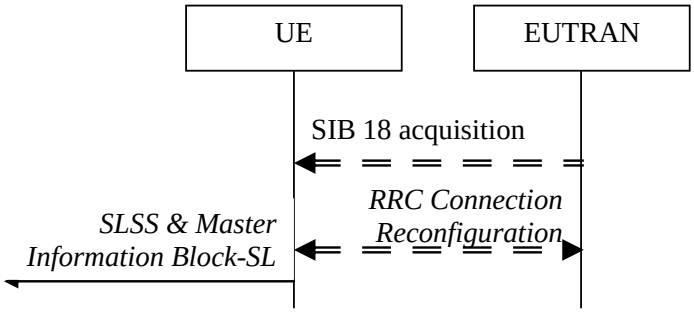

Figure 5.10.7.1-1: Synchronisation information transmission for sidelink communication, in (partial) coverage

...

The purpose of this procedure is to provide synchronisation information to a UE. The synchronisation information concerns a Sidelink Synchronisation Signal (SLSS) for sidelink discovery, while it concerns an SLSS, timing information and some additional configuration parameters (i.e. the *MasterInformationBlock-SL* message) for sidelink communication. A UE transmits synchronisation information either when E-UTRAN configures it to do so by dedicated signalling (i.e. network based), or when not configured by dedicated signalling (i.e. UE based) and E-UTRAN broadcasts (in coverage) or pre-configures a threshold (out of coverage).

The synchronisation information transmitted by the UE may be derived from information/ signals received from E-UTRAN (in coverage) or received from a UE acting as synchronisation reference for the transmitting UE. In the remainder, the UE acting as synchronisation reference is referred to as SyncRef UE.

[TS 36.331, clause 5.10.7.2]

A UE capable of sidelink communication that is configured by upper layers to transmit sidelink communication shall, irrespective of whether or not it has data to transmit:

1> if the conditions for sidelink operation as defined in 5.10.1a are met:

2> if in RRC_CONNECTED; and if *networkControlledSyncTx* is configured and set to *on*:

3> transmit SLSS in accordance with 5.10.7.3 and TS 36.211 [21];

3> transmit the *MasterInformationBlock-SL* message, in the same subframe as SLSS, and in accordance with 5.10.7.4;

A UE shall, when transmitting sidelink communication in accordance with 5.10.4 and when the following conditions are met:

1> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

2> if the UE is in RRC_CONNECTED; and *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType18*; and the RSRP measurement of the cell chosen for sidelink communication transmission is below the value of *syncTxThreshIC*; or

2> if the UE is in RRC_IDLE; and *syncTxThreshIC* is included in *SystemInformationBlockType18*; and the RSRP measurement of the cell chosen for sidelink communication transmission is below the value of *syncTxThreshIC*:

3> transmit SLSS in accordance with 5.10.7.3 and TS 36.211 [21];

3> transmit the *MasterInformationBlock-SL* message, in the same subframe as SLSS, and in accordance with 5.10.7.4;

1> else (i.e. out of coverage):

2> if *syncTxThreshOoC* is included in the preconfigured sidelink parameters (i.e. *SL-Preconfiguration* defined in 9.3); and the UE has no selected SyncRef UE or the S-RSRP measurement result of the selected SyncRef UE is below the value of *syncTxThreshOoC*:

3> transmit SLSS in accordance with 5.10.7.3 and TS 36.211 [21];

3> transmit the *MasterInformationBlock-SL* message, in the same subframe as SLSS, and in accordance with 5.10.7.4;

[TS 36.331, clause 5.10.7.3]

The UE shall select the SLSSID and the subframe in which to transmit SLSS as follows:

...

1> if triggered by sidelink communication:

2> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

3> select the SLSSID included in the entry of *commSyncConfig* that is included in the received *SystemInformationBlockType18* and includes *txParameters*;

3> use *syncOffsetIndicator* corresponding to the selected SLSSID;

3> if in RRC_CONNECTED; and if *networkControlledSyncTx* is configured and set to *on*:

4> select the subframe(s) indicated by *syncOffsetIndicator*;

3> else (when transmitting communication):

4> select the subframe(s) indicated by *syncOffsetIndicator* within the SC period in which the UE intends to transmit sidelink control information or data;

2> else (i.e. out of coverage on sidelink carrier):

3> select the synchronisation reference UE (i.e. SyncRef UE) as defined in 5.10.8;

3> if the UE has a selected SyncRef UE and *inCoverage* in the *MasterInformationBlock-SL* message received from this UE is set to *TRUE*; or

3> if the UE has a selected SyncRef UE and *inCoverage* in the *MasterInformationBlock-SL* message received from this UE is set to *FALSE* while the SLSS from this UE is part of the set defined for out of coverage, see TS 36.211 [21]:

4> select the same SLSSID as the SLSSID of the selected SyncRef UE;

4> select the subframe in which to transmit the SLSS according to the *syncOffsetIndicator1* or *syncOffsetIndicator2* included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration* defined in 9.3), such that the subframe timing is different from the SLSS of the selected SyncRef UE;

3> else if the UE has a selected SyncRef UE:

4> select the SLSSID from the set defined for out of coverage having an index that is 168 more than the index of the SLSSID of the selected SyncRef UE, see TS 36.211 [21];

4> select the subframe in which to transmit the SLSS according to *syncOffsetIndicator1* or *syncOffsetIndicator2* included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration* defined in 9.3), such that the subframe timing is different from the SLSS of the selected SyncRef UE;

3> else (i.e. no SyncRef UE selected):

4> randomly select, using a uniform distribution, an SLSSID from the set of sequences defined for out of coverage, see TS 36.211 [21];

4> select the subframe in which to transmit the SLSS according to the *syncOffsetIndicator1* or *syncOffsetIndicator2* (arbitrary selection between these) included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration* defined in 9.3);

[TS 36.331, clause 5.10.7.4]

The UE shall set the contents of the *MasterInformationBlock-SL* message as follows:

1> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

2> set *inCoverage* to *TRUE*;

2> set *sl-Bandwidth* to the value of *ul-Bandwidth* as included in the received *SystemInformationBlockType2* of the cell chosen for sidelink communication;

2> if *tdd-Config* is included in the received *SystemInformationBlockType1*:

3> set *subframeAssignmentSL* to the value representing the same meaning as of s*ubframeAssignment* that is included in *tdd-Config* in the received *SystemInformationBlockType1*;

2> else:

3> set *subframeAssignmentSL* to *none*;

2> if *syncInfoReserved* is included in an entry of *commSyncConfig* from the received *SystemInformationBlockType18*;

3> set *reserved* to the value of *syncInfoReserved* in the received *SystemInformationBlockType18*;

2> else:

3> set all bits in *reserved* to 0;

1> else if the UE has a selected SyncRef UE (as defined in 5.10.8):

2> set *inCoverage* to *FALSE*;

2> set *sl-Bandwidth*, *subframeAssignmentSL* and *reserved* to the value of the corresponding field included in the received *MasterInformationBlock-SL*;

1> else (i.e. no SyncRef UE selected):

2> set *inCoverage* to *FALSE*;

2> set *sl-Bandwidth*, *subframeAssignmentSL* and *reserved* to the value of the corresponding field included in the preconfigured sidelink parameters (i.e. *preconfigGeneral* in *SL-Preconfiguration* defined in 9.3);

1> set *directFrameNumber* and *directSubframeNumber* according to the subframe used to transmit the SLSS, as specified in 5.10.7.3;

1> submit the *MasterInformationBlock-SL* message to lower layers for transmission upon which the procedure ends;

[TS 36.331, clause 5.10.9.1]

The sidelink common control information is carried by a single message, the *MasterInformationBlock-SL* (MIB-SL) message. The MIB-SL includes timing information as well as some configuration parameters and is transmitted via SL-BCH.

The MIB-SL uses a fixed schedule with a periodicity of 40 ms without repetitions. In particular, the MIB-SL is scheduled in subframes indicated by *syncOffsetIndicator* i.e. for which (10*DFN + subframe number) mod 40 = *syncOffsetIndicator*.

The sidelink common control information may change at any transmission i.e. neither a modification period nor a change notification mechanism is used.

A UE configured to receive or transmit sidelink communication shall:

1> if the UE has a selected SyncRef UE, as specified in 5.10.8.2:

2> ensure having a valid version of the *MasterInformationBlock-SL* message of that SyncRefUE:

[TS 36.331, clause 5.10.9.2]

Upon receiving *MasterInformationBlock-SL*, the UE shall:

1> apply the values of *sl-Bandwidth*, *subframeAssignmentSL*, *directFrameNumber* and *directSubframeNumber* included in the received *MasterInformationBlock-SL* message;

19.1.3.3 Test description

19.1.3.3.1 Pre-test conditions

System Simulator:

SS-NW

- 4 cells with parameters defined in Table 19.1.3.3.1-1.

NOTE: The test only requires at maximum 2 cells to be active at any one instance.

Table 19.1.3.3.1-1: Cell parameters values

Cell	Frequency	PLMN
1	f1	HPLMN (PLMN1)
2	f1	PLMN4
4	f1	PLMN2
11	f1	PLMN3
Note 1:	PLMN1: PLMN1 in USIM EF_{PROSE_PLMN} PLMN2: PLMN2 in USIM EF_{PROSE_PLMN} PLMN3: MCC = MCC of PLMN1 in USIM EF_{PROSE_PLMN}; MNC=03. PLMN4 is an equivalent PLMN to PLMN1; MCC = MCC of PLMN1 in USIM EF_{PROSE_PLMN}; MNC=04.	
Note 2:	The Frequency f1 shall be the frequency pre-configured in the UE for when UE is "not served by E-UTRAN".	
Note 3:	A single frequency has been chosen for all PLMNs to allow the TC to be applicable even for UEs supporting a single band which comprises a single frequency.	

- System information combination 23 as defined in TS 36.508 [18] clause 4.4.3.1 is used in all active cells.

SS-UE

- SS-UE1. As defined in TS 36.508 [18], configured and operating for/as ProSe Direct Communication receiving device on the resources which the UE is expected to use for transmission (as specified in the relevant procedure steps in Table 19.1.3.3.2-1).

UE:

- ProSe related configuration

  - The UE is authorised to perform ProSe Direct Communication; the UE is equipped with a USIM containing values shown in Table 19.1.3.3.3-2, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. 2 PLMNs are authorised for ProSe Direct Communication when served by E-UTRAN, Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, ProSe Group IP multicast address, etc.).

Table 19.1.3.3.1-2: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°2 (HPLMN ProSe Function) supported.
	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.

  - For each PLMN a timer T4005 is assigned long enough not to expire before the TC is completed, e.g. 12 min (for Rel-12 this timer cannot be set in the USIM, it is expected that the UE shall provide means for setting the timer e.g. via MMI).

Preamble:

- The UE is in State 2 RRC_IDLE on Cell 1 according to TS 36.508 [18]. During the registration PLMN4 is assigned as Equivalent PLMN.

19.1.3.3.2 Test procedure sequence

Table 19.1.3.3.2-0 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" ... "Tn" are to be applied subsequently. The exact instants on which these values shall be applied are described elsewhere in the present clause.

Table 19.1.3.3.2-0: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Cell 4	Cell 11
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	"Off"	"Off"	"Off"
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-79	"Off"	"Off"
T2	Cell-specific RS EPRE	dBm/15k Hz	-85	"Off"	"Off"	"Off"
T3	Cell-specific RS EPRE	dBm/15k Hz	-85	"Off"	-79	"Off"
T4	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	-87	"Off"
T5	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	-87	-79
T6	Cell-specific RS EPRE	dBm/15k Hz	-79	"Off"	"Off"	-85

Table 19.1.3.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Force the UE upper layer application to request continuous transmission of sidelink communication (a maximum of 100 Bytes per communication "message"). NOTE: This can be done e.g. via a MMI command. Note that the max of 100 Bytes is not a 3GPP requirement rather it is requested only for the purpose of facilitating the test case specification.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
2-5	Void.	-	-	-	-
6	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication in RRC_CONNECTED in the next 5 sec?	-->	*SidelinkUEInformation*	1	P
7	SS-NW transmits an *RRCConnectionReconfiguration* message assigning sidelink communication transmission resources for RRC_CONNECTED (*commTxResources* set to *setup, ue-Selected* and resources provided in *commTxPoolNormalDedicated*; the provided Tx resources are different to the Tx resources for RRC_IDLE provided in SIB18).	<--	*RRCConnectionReconfiguration*	-	-
8	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
9	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources indicated in the *RRCConnectionReconfiguration*? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	1	P
10	SS-NW transmits an *RRCConnectionReconfiguration* message requesting the UE to release the resources allocated for sidelink communication transmission in RRC_CONNECTED (*commTxResources* set to *release*).	<--	*RRCConnectionReconfiguration*	-	-
11	The UE submits *RRCConnectionReconfigurationComplete* message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
12	Check: Does the UE transmit during the next 3 transmission periods sidelink communication data over the PC5 interface on the requested to be released resources in the next transmission period?	-->	-	2	F
13	SS-NW transmits an *RRCConnectionReconfiguration* message providing new resources for sidelink communication transmission in RRC_CONNECTED (*commTxResources* set to *setup , scheduled* and resources provided in *sc-CommTxConfig*; the provided Tx resources are different to the Tx resources for RRC_IDLE provided in SIB18).	<--	*RRCConnectionReconfiguration*	-	-

14	The UE submits *RRCConnectionReconfigurationComplete* message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
14A	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface accordance with the resources indicated in the *RRCConnectionReconfiguration*? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	2	P
14B	Force the UE upper layer application to request stop of sidelink communication.	-	-	-	-
14C	Check: Does the UE transmit a *SidelinkUEInformation* message indicating it does no longer require sidelink communication transmission resources in the next 5 sec?	-->	*SidelinkUEInformation*	2A	P
-	EXCEPTION: Step 14D is repeated 3 times. NOTE: Depending on the size of the sidelink communication data a STCH PDCP SDU may fit in one sidelink transmission period but may as well be fragmented over multiple transmissions periods.	-	-	-	-
14D	Check: Does the UE transmit during the next 3 transmission periods sidelink communication data over the PC5 interface in the next transmission period in accordance with the resources indicated in the last *RRCConnectionReconfiguration* message?	-->	-	2A	F
14E	Force the UE upper layer application to request continuous transmission of sidelink communication.	-	-	-	-
15	The UE transmits a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication.	-->	*SidelinkUEInformation*	-	-
16	The SS configures: SW-NW Cell 1 and Cell 2 parameters according to the row "T1" in table 19.1.3.3.2-0 in order to simulate needs for handover. Cell 2 broadcasts *SystemInformationBlockType18* including *commTxPoolExceptional*.	-	-	-	-
17	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover). NOTE: To achieve the TP this message shall be sent less than 1 sec after the message in step 15.	<--	*RRCConnectionReconfiguration*	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 2.	-	-	-	-
18	The UE submits *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
19	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication in the next 1 sec?	-->	*SidelinkUEInformation*	3	P
20	SS-NW transmits an *RRCConnectionReconfiguration* message assigning sidelink communication transmission scheduled resources (*commTxResources* set to *setup, scheduled* and resources provided in	<--	*RRCConnectionReconfiguration*	-	-

	sc-CommTxConfig).				
21	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
22	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources indicated in the *RRCConnectionReconfiguration*? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	3	P
23	The SS configures: SS-NW Cell 1 and Cell 2 parameters according to the row "T2" in table 19.1.3.3.2-0 in order to simulate radio link failure.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
24	UE sends *RRCConnectionReestablishmentRequest* message.	-->	*RRCConnectionReestablishmentRequest*		
25	Wait for time=(T301)/2	-	-	-	-
26	Check: Does the UE transmit during the re-establishment procedure one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources indicated in the broadcasted on Cell 2 *SystemInformationBlockType18 commTxPoolExceptional*? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	4	P
27	The SS-NW transmits *RRCConnectionReestablishment* message.	<--	*RRCConnectionReestablishment*	-	-
28	The UE transmits *RRCConnectionReestablishmentComplete* message.	-->	*RRCConnectionReestablishmentComplete*	-	-
29	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication in the next 1 sec?	-->	*SidelinkUEInformation*	4	P
30	SS-NW transmits an *RRCConnectionReconfiguration* message assigning sidelink communication transmission scheduled resources (*commTxResources* set *scheduled*).	<--	*RRCConnectionReconfiguration*	-	-
31	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
32	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources indicated in the *RRCConnectionReconfiguration*? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	4	P
33	The SS configures: SW-NW Cell 1 and Cell 4 parameters according to the row "T3" in table 19.1.3.3.2-0 in order to simulate needs for handover.	-	-	-	-

	Cell 4 broadcasts *SystemInformationBlockType18* in which in addition to all other settings the *syncTxThreshIC* is included with value 7 (this is needed for TP7). NOTE 1: Value 7 is chosen to ensure that the Power level of Cell 4 is such that it is ensured that the RSRP measurement of the Cell 4 (serving) cell is NOT below the power value that corresponds to 7 (-85dBm).				
34	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover to Cell 4).	<--	*RRCConnectionReconfiguration*	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 4.	-	-	-	-
35	The UE submits *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: In parallel to the procedure described in steps 36 - 42 the procedure described in Table 19.1.3.3.2-2 takes place.	-	-	-	-
36	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication in the next 1 sec?	-->	*SidelinkUEInformation*	5	P
37	SS-NW transmits an *RRCConnectionReconfiguration* message assigning sidelink communication transmission scheduled resources (*commTxResources* set to *setup* and resources provided in *commTxPoolNormalDedicated*), and, *networkControlledSyncTx* is configured and set to *on*.	<--	*RRCConnectionReconfiguration*	-	-
38	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
39	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources indicated in the *RRCConnectionReconfiguration*. NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	5	P
-	EXCEPTION: Steps 40 - 41 are repeated 3 times.	-	-	-	-
40	Check: Does the UE transmit SLSS in accordance with the information provided in the *SystemInformationBlockType18* (SLSSID, a subframe indicated by *syncOffsetIndicator* does not corresponds to the first subframe of the discovery transmission pool) in the next transmission period?	-->	SLSS	6	P
41	Check: Does the UE transmit *MasterInformationBlock-SL* message in the same subframe as the SLSS in step 40?	-->	*MasterInformationBlock-SL*	6	P
42	SS-NW transmits an *RRCConnectionReconfiguration networkControlledSyncTx* is configured and set to *off*.	<--	*RRCConnectionReconfiguration*	-	-
43	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new	-->	*RRCConnectionReconfigurationComplete*	-	-

	configuration.				
44	Check: Does the UE transmit during the next 3 transmission periods a SLSS?	-->	SLSS	7	F
45	Check: Does the UE transmit *MasterInformationBlock-SL* message in the same subframe as the SLSS (step 44)?	-->	*MasterInformationBlock-SL*	7	F
46	The SS configures: SW-NW Cell 1 and Cell 4 parameters according to the row "T4" in table 19.1.3.3.2-0. NOTE: The Power level of Cell 4 is such that it is ensured that the RSRP measurement of the serving cell is below the value of *syncTxThreshIC* included in *SystemInformationBlockType18*.	-	-	-	-
-	EXCEPTION: Steps 47 - 48 are repeated 3 times.	-	-	-	-
47	Check: Does the UE transmit SLSS in accordance with the information provided in the *SystemInformationBlockType18* (SLSSID, a subframe indicated by *syncOffsetIndicator* does not corresponds to the first subframe of the discovery transmission pool) in the next transmission period?	-->	SLSS	7	P
48	Check: Does the UE transmit *MasterInformationBlock-SL* message in the same subframe as the SLSS in step 47?	-->	*MasterInformationBlock-SL*	7	P
49-55	Void.	-	-	-	-
56	The SS configures: SW-NW Cell 4 and Cell 11 parameters according to the row "T5" in table 19.1.3.3.2-0 in order to simulate needs for handover to Cell 11.	-	-	-	-
57	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover to Cell 11).	<--	*RRCConnectionReconfiguration*	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 11.	-	-	-	-
58	The UE submits *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: In parallel to the procedure described in steps 59 - 60 the procedure described in Table 19.1.3.3.2-2 takes place.	-	-	-	-
59	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication and/or indicating the sidelink communication reception frequency of interest in the next 1 sec?	-->	*SidelinkUEInformation*	9	F
60	Check: Does the UE transmit during the next 3 transmission periods sidelink communication data over the PC5 interface in accordance with the resources indicated on Cell 11?	-->	-	9	F
61	The SS configures: SW-NW Cell 1 and Cell 11 parameters according to the row "T6" in table 19.1.3.3.2-0 in order to simulate needs for handover. Cell 1 does nor transmit *SystemInformationBlockType18*.	-	-	-	-
62	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover to Cell	<--	*RRCConnectionReconfiguration*	-	-

	1).				
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
63	The UE submits *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
64	Void	-	-	-	-
-	EXCEPTION: In parallel to the procedure described in step 65 the procedure described in Table 19.1.3.3.2-2 takes place.	-	-	-	-
65	Check: Does the UE transmit a *SidelinkUEInformation* message in the next 1 sec?	-->	*SidelinkUEInformation*	10	F
66	Force the UE upper layer application to request transmission of sidelink communication.	-	-	-	-
67	Check: Does the UE transmit a *SidelinkUEInformation* in the next 5 sec?	-->	*SidelinkUEInformation*	10	F
-	EXCEPTION: Step 68 is repeated 3 times.	-	-	-	-
68	Check: Does the UE transmit in the next 3 transmission periods sidelink communication data over the PC5 interface in accordance with the pre-configured in the UE for out of coverage resources?	-->	-	10	F
70	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-

Table 19.1.3.3.2-2: Parallel behaviour - TAU

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE transmits a TRACKING AREA UPDATE REQUEST message.	-->	TRACKING AREA UPDATE REQUEST	-	-
2	SS-NW responds with TRACKING AREA UPDATE ACCEPT message.	<--	TRACKING AREA UPDATE ACCEPT	-	-
3	The UE transmits a TRACKING AREA UPDATE COMPLETE.	-->	TRACKING AREA UPDATE COMPLETE	-	-

Table 19.1.3.3.2-3: Void

Table 19.1.3.3.2-4: Void

19.1.3.3.3 Specific message contents

Table 19.1.3.3.3-1: *SystemInformationBlockType18* for Cell 1 when active and unless otherwise stated

Derivation Path: 36.508 [18] , table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[1]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note 1: 3 commRxPools are provided for reception in RRC_IDLE and RRC_CONNECTED; 1 pool is provided for transmission in RRC_IDLE which matches one of the Rx pools, the other 2 Rx pools will be allocated for transmission in RRC_CONNECTED; no resources for commTxPoolExceptional.			

Table 19.1.3.3.3-1A: *SystemInformationBlockType18* for Cell 2 when active and unless otherwise stated

Derivation Path: 36.508 [18], table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[1]	Not Present		
}			
commSyncConfig-r12	Not Present		
}			
}			
Note 1: 3 commRxPools are provided for reception in RRC_IDLE and RRC_CONNECTED; 1 pool is provided for transmission in RRC_IDLE (SL-CommResourcePool-r12[2]) which matches one of the Rx pools; resources for *commTxPoolExceptional* are provided and one of the reception resources (SL-CommResourcePool-r12[3]) matches it (to be used for link failure case); the other resources for reception (SL-CommResourcePool-r12[1]) will be allocated for transmission in RRC_CONNECTED.			

Table 19.1.3.3.3-2: *SystemInformationBlockType18* for Cell 4 and Cell 11 when active and unless otherwise stated

Derivation Path: 36.508 [18] , table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[1]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12 SEQUENCE (SIZE (1..maxSL-SyncConfig-r12)) OF SL-SyncConfig-r12			
SL-SyncConfig-r12[2]	Not Present		
}			
}			
}			
Note 1: 2 commRxPools are provided for reception in RRC_IDLE and RRC_CONNECTED; 1 pool is provided for transmission in RRC_IDLE (SL-CommResourcePool-r12[2]) which matches one of the Rx pools; no resources for commTxPoolExceptional; the resources for reception (SL-CommResourcePool-r12[1]) will be allocated for transmission in RRC_CONNECTED. Note 1: Entry 1 in SL-SyncConfig sets *syncTxThreshIC-r12* to 7 (see 36.508 [18] Table 4.4.3.3-17), i.e. -85dBm is the threshold for starting transmission of SLSS.			

Table 19.1.3.3.3-3: ATTACH REQUEST (Preamble)

Derivation path: 36.508 [18] , table 4.7.2-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.3.3.3-4: ATTACH ACCEPT (preamble)

Derivation path: 36.508 [18], table 4.7.2-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
Equivalent PLMNs	PLMN4		Cell 1

Table 19.1.3.3.3-5: TRACKING AREA UPDATE REQUEST (step 1, Table 19.1.3.3.2-2 when it is transmitted in parallel with step 36, Table 19.1.3.3.2-1)

Derivation path: 36.508 [18] table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
EPS update type			
"Active" flag	'1'B		
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.3.3.3-5A: TRACKING AREA UPDATE REQUEST (step 1, Table 19.1.3.3.2-2 when it is transmitted in parallel with steps 59 and 65, Table 19.1.3.3.2-1)

Derivation path: 36.508 [18] table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.3.3.3-6: *SidelinkUEInformation* (steps 6, 15, 19, 29, 36, Table 19.1.3.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs ::= SEQUENCE {			
commRxInterestedFreq-r12	Not Present	Note 1	
commTxResourceReq-r12 SEQUENCE {		Indicates the frequency on which the UE is interested to transmit sidelink communication as well as the sidelink communication transmission destination(s) for which the UE requests E-UTRAN to assign dedicated resources.	
carrierFreq-r12	f1	Preconfigured value for the service authorisation (same as the frequency on which the simulated cells operate)	
destinationInfoList-r12 SEQUENCE (SIZE (1..maxSL-Dest-r12)) OF SL-DestinationIdentity-r12	1 entry		
SL-DestinationIdentity-r12[1]	the destination which is identified by the ProSe Layer-2 Group ID	Preconfigured value for the service authorisation	
}			
}			
discRxInterest-r12	Not Present	Note 1	
discTxResourceReq-r12	Not Present	Note 1	
}			
Note 1: It is assumed that it will be possible to trigger in the UE an Application that requests only sidelink communication transmission.			

Table 19.1.3.3.3-7: *SidelinkUEInformation* (step 14C, Table 19.1.3.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs ::= SEQUENCE {			
commRxInterestedFreq-r12	Not Present	Note 1	
commTxResourceReq-r12 SEQUENCE {			
carrierFreq-r12	omit	No interest in prose communication transmission	
destinationInfoList-r12	Not present		
}			
discRxInterest-r12	Not Present	Note 1	
discTxResourceReq-r12	Not Present	Note 1	
}			
Note 1: It is assumed that it will be possible to trigger in the UE an Application that requests only sidelink communication transmission.			

Table 19.1.3.3.3-8: *RRCConnectionReconfiguration* (step 7, Table 19.1.3.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-8 A, condition [COMM AND SETUP AND UE-SELECTED]

Table 19.1.3.3.3-9: *RRCConnectionReconfiguration* (step 10, Table 19.1.3.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-8 A, condition [COMM AND RELEASE]

Table 19.1.3.3.3-10: *RRCConnectionReconfiguration* (step 20, Table 19.1.3.3.2-1)

Derivation Path: 36.508 table 4.6.1-8 A, condition [COMM AND SETUP AND SCHEDULED			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-CommConfig-r12 SEQUENCE {			COMM
commTxResources-r12 CHOICE {			
setup CHOICE {			SETUP
scheduled-r12 SEQUENCE {			SCHEDULED
sc-CommTxConfig-r12 SEQUENCE {			
sc-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	11000000 00000000 00000000 00000000 00000000	bs40-r12	FDD
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			

Table 19.1.3.3.3-11: *RRCConnectionReconfiguration* (steps 13, 30, 42, Table 19.1.3.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-8 A, condition [COMM AND SETUP AND SCHEDULED]

Table 19.1.3.3.3-12: *RRCConnectionReconfiguration* (steps 17, 34, 57, 62, Table 19.1.3.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-8, condition HO

Table 19.1.3.3.3-13: *RRCConnectionReconfiguration* (step 37, Table 19.1.3.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-8 A, condition [COMM AND SETUP AND SCHEDULED]			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-SyncTxControl-r12 SEQUENCE {			
networkControlledSyncTx-r12	on		
}			
}			
}			
}			
}			
}			
}			
}			
}			

Table 19.1.3.3.3-14: Void

Table 19.1.3.3.3-15: *RRCConnectionReestablishmentRequest* (step 24, Table 19.1.3.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-13			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReestablishmentRequest ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcConnectionReestablishmentRequest-r8 SEQUENCE {			
ue-Identity SEQUENCE {			
c-RNTI	the value of the C-RNTI of the UE		
physCellId	PhysicalCellIdentity of Cell 2		
shortMAC-I	The same value as the 16 least significant bits of the XMAC-I value calculated by SS		
}			
reestablishmentCause	otherFailure		
}			
}			
}			

Table 19.1.3.3.3-16: *MasterInformationBlock-SL* (steps 40, 44, 47, Table 19.1.3.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-4A0

19.1.4 ProSe Direct Communication/Pre-configured authorisation / UE in RRC_CONNECTED on an E-UTRAN cell operating on the carrier frequency provisioned for ProSe direct service / Utilisation of the resources of (serving) cells/PLMNs / Reception / RRC connection reconfiguration with *mobilityControlInfo* / RRC connection re-establishment

19.1.4.1 Test Purpose (TP)

(1)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication (*commRxPool*) }
ensure that {
  when { UE receives a request from upper layers to receive sidelink communication }
    then { UE successfully completes a Sidelink UE information procedure to indicate it is interested in receiving sidelink communication, **and,** UE is able to receive sidelink communication on the configured resources in Cell1/f1/PLMN1 }
            }

(2)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication (*commRxPool*), **and,** UE having successfully completed Sidelink UE information procedure indicating its interest receiving sidelink communication and receiving sidelink communication on the resources provided by cell Cell1/f1/PLMN1 }
ensure that {
  when { UE is triggered by an upper layer application to stop sidelink communication reception }
    then { the UE transmits a *SidelinkUEInformation* message indicating it is no longer interested in sidelink communication reception }
            }

(3)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication, **and,** UE having sent a *SidelinkUEInformation* message to indicate it is interested in receiving sidelink communication on Cell1/f1/PLMN1 }
ensure that {
  when { UE receives *RRCConnectionReconfiguration* message which includes *mobilityControlInfo* (handover) less than 1 sec after the UE transmitted the *SidelinkUEInformation* message, **and,** MAC successfully completes the random access procedure to the targeted PCell Cell2/f1/PLMN4 (equivalent PLMN) which is broadcasting *SystemInformationBlockType18* (*commRxPool*) }
    then { UE initiates a Sidelink UE information procedure in Cell2/f1/PLMN4 indicating the sidelink communication reception frequency of interest, **and,** UE is able to receive sidelink communication on the configured resources in Cell2/f1/PLMN4 }
            }

(4)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell2/f1/PLMN4 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication (*commRxPool*), **and,** UE having sent a *SidelinkUEInformation* message to indicate it is interested in receiving sidelink communication on Cell1/f1/PLMN1 }
ensure that {
  when { UE detects radio link failure >1 sec after the UE transmitted the *SidelinkUEInformation* message, **and,** the cell on which the UE initiated connection re-establishment (Cell1/f1/PLMN1) transmits *SystemInformationBlockType18* indicating the provision of resources for sidelink communication (*commRxPool*) }

then { UE is able to receive sidelink communication on the configured resources in Cell1/f1/PLMN1 }
}

(5)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell1/f1/PLMN1 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication (*commRxPool*), **and,** UE receiving sidelink communication on the configured resources in Cell1/f1/PLMN1 }
ensure that {
when { UE receives *RRCConnectionReconfiguration* message which includes *mobilityControlInfo* (handover) more than 1 sec after the UE transmitted the *SidelinkUEInformation* message, **and,** MAC successfully completes the random access procedure to the targeted PCell Cell4/f1/PLMN2 and the cell is broadcasting *SystemInformationBlockType18* (*commRxPool* includes entries including *rxParametersNCell*) }
then { UE is able to receive sidelink communication from two different devices one operating on the configured for *rxParametersNCell* resources in Cell4/f1/PLMN2 and one on the resources not including *rxParametersNCell* }
}

(6)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and pre-configured with Radio parameters for when the UE is "not served by E-UTRAN", **and,** UE is in RRC_CONNECTED on Cell4/f1/PLMN2 which is operating on the same carrier frequency as the one pre-configured in the UE and is transmitting *SystemInformationBlockType18* indicating the provision of resources for sidelink communication (*commRxPool*), **and,** UE receiving sidelink communication on the configured resources in Cell4/f1/PLMN2 }
ensure that {
when { UE receives *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover), **and,** MAC successfully completes the random access procedure to the targeted PCell Cell11/f1/PLMN3 (PLMN not authorised for performing ProSe Direct Communication) which is broadcasting *SystemInformationBlockType18 (commRxPool)* }
then { UE does not transmit a *SidelinkUEInformation* message to indicate the reception frequency of interest does not receive sidelink communication over the PC5 in the assigned resources in Cell11/f1/PLMN3 }
}

19.1.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.334, clauses 5.1.1, 5.1.2, 10.2.1, 10.2.2, 10.2.3, TS 36.331, clauses 5.2.2.4, 5.2.2.25, 5.3.5.4, 5.3.7.5, 5.10.1a, 5.10.2.1, 5.10.2.2, 5.10.2.3, 5.10.3. Unless otherwise stated these are Rel-12 requirements.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery announcing or ProSe direct discovery monitoring or both, and to use ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 5.1.2]

The IP address of the ProSe function in the HPLMN may be pre-configured in the UE and in this case, the UE may use the pre-configured IP address. Alternatively, the FQDN of the ProSe Function in the HPLMN may be self-constructed by the UE, i.e. derived from the PLMN ID of the HPLMN. The UE may perform DNS lookup as specified in IETF RFC 1035 [10].

[TS 24.334, clause 10.2.1]

One-to-many ProSe direct communication is applicable only to ProSe-enabled Public Safety UEs. One-to-many ProSe direct communication can only apply when the UE is:

a) served by E-UTRAN and authorised for ProSe direct communication in the registered PLMN;

...

Upon receiving a request from upper layers to send or receive data for ProSe direct communication in a given group, the UE shall initiate the procedure for ProSe direct communication. For case a, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.2. For case b and c, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.3.

If the UE is camped on an E-UTRAN cell not operating on the carrier frequency provisioned for ProSe direct communication which indicates that ProSe direct communication is supported by the network, the UE can perform either ProSe direct communication procedures specified in subclause 10.2.2 or ProSe direct communication procedures specified in subclause 10.2.3.

The UE shall obtain the ProSe direct communication policy parameters for that group as specified in subclause 5.

If the ProSe direct communication policy parameters indicate that the UE is configured to use IPv6 for that group, the UE shall auto-configures a link local IPv6 Address following procedures defined in RFC 4862 [15]. This address can only be used as the source IP address for one-to-many ProSe direct communication.

If the ProSe Direct communication policy parameters group indicate that the UE is configured to use IPv4 for that group, then the UE shall:

- use the configured IPv4 address for that group as source address; or

- if there is no configured IPv4 address for that group, use Dynamic Configuration of IPv4 Link-Local Addresses as specified in IETF RFC 3927 [16].

[TS 24.334, clause 10.2.2]

When the UE is served by E-UTRAN and intends to use the ProSe radio resources (i.e. carrier frequency) provided by an E-UTRAN cell, the UE requests the parameters from the lower layers for transmitting or receiving ProSe direct communication (see 3GPP TS 36.331 [12]). The UE shall perform direct communication only if the lower layers indicate that ProSe direct communication is supported by the network. If the UE in EMM-IDLE mode has to request resources for ProSe direct communication as specified in 3GPP TS 36.331 [12], the UE shall perform a service request procedure or tracking area update procedure as specified in 3GPP TS 24.301 [11]. Once the radio resources for transmitting or receiving ProSe direct communication are provided by eNodeB as specified in 3GPP TS 36.331 [12], the UE shall start ProSe direct communication.

[TS 24.334, clause 10.2.3]

Before initiating ProSe direct communication, the UE shall check with lower layers whether the selected radio parameters can be used in the current location without causing interference to other cells as specified in 3GPP TS 36.331 [12], and:

- if the lower layers indicate that the usage would not cause any interference, the UE shall initiate ProSe direct communication; or

NOTE 2: If the lower layers find that there exists a cell operating the provisioned radio resources (i.e., carrier frequency), and the cell belongs to the registered PLMN or a PLMN equivalent to the registered PLMN, and the UE is authorized for ProSe direct communication in this PLMN, the UE can use the radio parameters indicated by the cell as specified in 3GPP TS 36.331 [12].

- else if the lower layers report that one or more PLMNs operate in the provisioned radio resources (i.e. carrier frequency) then:

  a) if the following conditions are met:

     1) none of the PLMNs reported by the lower layers is the registered PLMN or equivalent to the registered PLMN; and

2) at least one of the PLMNs reported by the lower layers is in the list of authorised PLMNs for ProSe direct communication and provides radio resources for ProSe direct communication as specified in 3GPP TS 36.331 [12];

then the UE shall:

1) if in EMM-IDLE mode, perform PLMN selection triggered by ProSe direct communication as specified in 3GPP TS 23.122 [24]; or

2) else if in EMM-CONNECTED mode, either:

i) perform a detach procedure as specified in 3GPP TS 24.301 [11] and then perform PLMN selection triggered by ProSe direct communication as specified in 3GPP TS 23.122 [24]; or

ii) not initiate ProSe direct communication.

Whether the UE performs i) or ii) above is left up to UE implementation; or

b) else the UE shall not initiate ProSe direct communication.

If the registration to the selected PLMN is successful, the UE shall proceed with the procedure to initiate ProSe direct communication as specified in subclause 10.2.2.

[TS 36.331, clause 5.2.2.4]

1> if the UE is capable of sidelink communication and is configured by upper layers to receive or transmit sidelink communication:

2> if the cell used for sidelink communication meets the S-criteria as defined in TS 36.304 [4]; and

2> if *schedulingInfoList* indicates that *SystemInformationBlockType18* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType18*;

[TS 36.331, clause 5.2.2.25]

Upon receiving *SystemInformationBlockType18*, the UE shall:

1> if *SystemInformationBlockType18* message includes the *commConfig*:

2> if configured to receive sidelink communication:

3> from the next SC period, as defined by *sc-Period*, use the resource pool indicated by *commRxPool* for sidelink communication monitoring, as specified in 5.10.3;

[TS 36.331, clause 5.3.5.4]

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if MAC successfully completes the random access procedure:

...

2> if *SystemInformationBlockType18* is broadcast by the target PCell; and the UE transmitted a *SidelinkUEInformation* message including *commRxInterestedFreq* or *commTxResourceReq* during the last 1 second preceding reception of the *RRCConnectionReconfiguration* message including *mobilityControlInfo*; or:

...

3> initiate transmission of the *SidelinkUEInformation* message in accordance with 5.10.2.3;

[TS 36.331, clause 5.3.7.5]

NOTE 1: Prior to this, lower layer signalling is used to allocate a C-RNTI. For further details see TS 36.321 [6];

The UE shall:

1> stop timer T301;

1> consider the current cell to be the PCell;

1> re-establish PDCP for SRB1;

1> re-establish RLC for SRB1;

1> perform the radio resource configuration procedure in accordance with the received *radioResourceConfigDedicated* and as specified in 5.3.10;

1> resume SRB1;

...

1> if *SystemInformationBlockType18* is broadcast by the PCell; and the UE transmitted a *SidelinkUEInformation* message including *commRxInterestedFreq* or *commTxResourceReq* during the last 1 second preceding detection of radio link failure; or

...

2> initiate transmission of the *SidelinkUEInformation* message in accordance with 5.10.2.3;

[TS 36.331, clause 5.10.1a]

When it is specified that the UE shall perform a particular sidelink operation only if the conditions defined in this section are met, the UE shall perform the concerned sidelink operation only if:

1> if the UE's serving cell is suitable (RRC_IDLE or RRC_CONNECTED); and if either the selected cell on the frequency used for sidelink operation belongs to the registered or equivalent PLMN as specified in TS 24.334 [69] or the UE is out of coverage on the frequency used for sidelink operation as defined in TS 36.304 [4, 11.4]; or

[TS 36.331, clause 5.10.2.1]

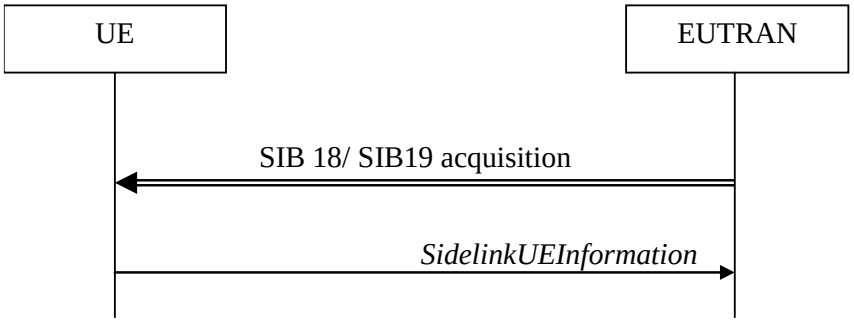

Figure 5.10.2-1: Sidelink UE information

The purpose of this procedure is to inform E-UTRAN that the UE is interested or no longer interested to receive sidelink communication or discovery, as well as to request assignment or release of transmission resources for sidelink communication or discovery announcements.

[TS 36.331, clause 5.10.2.2]

A UE capable of sidelink communication or discovery that is in RRC_CONNECTED may initiate the procedure to indicate it is (interested in) receiving sidelink communication or discovery in several cases including upon successful connection establishment, upon change of interest, upon change to a PCell broadcasting *SystemInformationBlockType18* or *SystemInformationBlockType19*. A UE capable of sidelink communication or discovery may initiate the procedure to

request assignment of dedicated resources for the concerned sidelink communication transmission or discovery announcements.

...

Upon initiating the procedure, the UE shall:

1> if *SystemInformationBlockType18* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType18* for the PCell;

2> if configured by upper layers to receive sidelink communication:

3> if the UE did not transmit a *SidelinkUEInformation* message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a *SidelinkUEInformation* message the UE connected to a PCell not broadcasting *SystemInformationBlockType18*; or

NOTE 2: After handover/ re-establishment from a source PCell not broadcasting *SystemInformationBlockType18* the UE repeats the same interest information that it provided previously as such a source PCell may not forward the interest information.

3> if the last transmission of the *SidelinkUEInformation* message did not include *commRxInterestedFreq*; or if the frequency configured by upper layers to receive sidelink communication on has changed since the last transmission of the *SidelinkUEInformation* message:

4> initiate transmission of the *SidelinkUEInformation* message to indicate the sidelink communication reception frequency of interest in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the *SidelinkUEInformation* message included *commRxInterestedFreq*:

4> initiate transmission of the *SidelinkUEInformation* message to indicate it is no longer interested in sidelink communication reception in accordance with 5.10.2.3;

[TS 36.331, clause 5.10.2.3]

The UE shall set the contents of the *SidelinkUEInformation* message as follows:

1> if *SystemInformationBlockType18* is broadcast by the PCell:

2> if configured by upper layers to receive sidelink communication:

3> include *commRxInterestedFreq* and set it to the sidelink communication frequency;

...

The UE shall submit the *SidelinkUEInformation* message to lower layers for transmission.

[TS 36.331, clause 5.10.3]

A UE capable of sidelink communication that is configured by upper layers to receive sidelink communication shall:

1> if the conditions for sidelink operation as defined in 5.10.1a are met:

2> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

3> if the cell chosen for sidelink communication reception broadcasts *SystemInformationBlockType18* including *commRxPool*:

4> configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources indicated by *commRxPool*;

NOTE 1: If *commRxPool* includes one or more entries including *rxParametersNCell*, the UE may only monitor such entries if the associated PSS/SSS or SLSSIDs is detected. When monitoring such pool(s), the UE applies the timing of the concerned PSS/SSS or SLSS.

19.1.4.3 Test description

19.1.4.3.1 Pre-test conditions

System Simulator:

SS-NW

- 4 cells with parameters defined in Table 19.1.4.3.1-1.

NOTE: The test only requires at maximum 2 cells to be active at any one instance.

Table 19.1.4.3.1-1: Cell parameters values

Cell	Frequency	PLMN
1	f1	HPLMN (PLMN1)
2	f1	PLMN4
4	f1	PLMN2
11	f1	PLMN3
Note 1:	PLMN1: PLMN1 in USIM EF_{PROSE_PLMN} PLMN2: PLMN2 in USIM EF_{PROSE_PLMN} PLMN3: MCC = MCC of PLMN1 in USIM EF_{PROSE_PLMN}; MNC=03. PLMN4 is an equivalent PLMN to PLMN1; MCC = MCC of PLMN1 in USIM EF_{PROSE_PLMN}; MNC=04.	
Note 2:	The Frequency f1 shall be the frequency pre-configured in the UE for when UE is "not served by E-UTRAN".	
Note 3:	A single frequency has been chosen for all PLMNs to allow the TC to be applicable even for UEs supporting a single band which comprises a single frequency.	

- System information combination 23 as defined in TS 36.508 [18] clause 4.4.3.1 is used in all active cells.

SS-UE

- SS-UE1

  - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting device on the resources provided by different cells (as specified in the relevant procedure steps in Table 19.1.4.3.2-1).

- SS-UE2

  - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting device transmitting as well Synchronisation information on the resources provided by different cells (as specified in the relevant procedure steps in Table 19.1.4.3.2-1).

  - When SS-UE2 is simulated, SS-UE2 and SS-UE1 transmit simultaneously.

UE:

- ProSe related configuration

  - The UE is authorised to perform ProSe Direct Communication; the UE is equipped with a USIM containing values shown in Table 19.1.4.3.3-2, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. 2 PLMNs are authorised for ProSe Direct Communication when served by E-UTRAN, Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, ProSe Group IP multicast address, etc.).

Table 19.1.4.3.3-2: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°2 (HPLMN ProSe Function) supported.
	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.

- For each PLMN a timer T4005 is assigned long enough not to expire before the TC is completed, e.g. 5 min (for Rel-12 this timer cannot be set in the USIM, it is expected that the UE shall provide means for setting the timer e.g. via MMI).

Preamble:

- The UE is in state Generic RB Established, UE Test Mode Activated (State 3A) with TEST LOOP MODE E being activated according to TS 36.508 [18] on Cell 1. During the registration PLMN4 is assigned as Equivalent PLMN. Cell 1 is broadcasting SystemInformationBlockType18 providing Rx resources for reception in RRC_IDLE and RRC_CONNECTED, and, Tx resources for transmission in RRC_IDLE.

19.1.4.3.2 Test procedure sequence

Table 19.1.4.3.2-0 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" ... "Tn" are to be applied subsequently. The exact instants on which these values shall be applied are described elsewhere in the present clause.

Table 19.1.4.3.2-0: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Cell 4	Cell 11
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-91	"Off"	"Off"
T1	Cell-specific RS EPRE	dBm/15kHz	-85	-79	"Off"	"Off"
T2	Cell-specific RS EPRE	dBm/15kHz	-85	"Off"	"Off"	"Off"
T3	Cell-specific RS EPRE	dBm/15kHz	-85	"Off"	-79	"Off"
T4	Cell-specific RS EPRE	dBm/15kHz	"Off"	"Off"	-85	-79
T5	Void					
T6	Void					

Table 19.1.4.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Force the UE upper layer application to request continuous reception of sidelink communication.	-	-	-	-
2-5	Void.	-	-	-	-
6	Check: Does the UE transmit a *SidelinkUEInformation* message to indicate it is interested in receiving sidelink communication in the next 5 sec ?	-->	*SidelinkUEInformation*	1	P
7	The Generic test procedure for 'Loopback Activation (State 4)' defined in TS 36.508 [18] clause 4.5.4 takes place (TEST LOOP MODE E, TRIGGER = RECEIVE).	-	-	-	-
-	EXCEPTION: Step 8 is repeated 3 times.	-	-	-	-
8	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool provides 2 pools for transmission, the SS-UE1 shall use pool 1 (SL-CommResourcePool-r12[1]*). Note: This step verifies TP1 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 10.	<--	*STCH PDCP SDU packet*	-	-
9	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST message	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-
10	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER RESPONSE with STCH_PACKET_COUNTER=3?	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	1	P
11	Force the UE upper layer application to request stop of sidelink communication reception.	-	-	-	-
12	Check: Does the UE transmit a *SidelinkUEInformation* message to indicate it is NOT interested in receiving sidelink communication in the next 5 sec ?	-->	*SidelinkUEInformation*	2	P
13-15	Void	-	-	-	-
16	Force the UE upper layer application to request reception of sidelink communication.	-	-	-	-
17	The UE transmit a *SidelinkUEInformation* message to indicate it is interested in receiving sidelink communication.	-->	*SidelinkUEInformation*	-	-
18	The SS configures: SS-NW Cell 1 and Cell 2 parameters according to the row "T1" in table 19.1.4.3.2-1-0 in order to simulate needs for handover to Cell 2. Cell 2 broadcasts *SystemInformationBlockType18* (*commRxPool* provides 2 pools for reception different to the resources provided on the previous cell on which the UE received ProSe direct communication).	-	-	-	-
19	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover). NOTE: To achieve the TP this message shall	<--	*RRCConnectionReconfiguration*	-	-

	be sent less than 1 sec after the message in step 17.				
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 2.	-	-	-	-
20	The UE submits *RRCConnectionReconfigurationComplete* message (handover to Cell 2).	-->	*RRCConnectionReconfigurationComplete*	-	-
21	Check: Does the UE transmit a *SidelinkUEInformation* message to indicate it is interested in receiving sidelink communication in the next 1 sec ?	-->	*SidelinkUEInformation*	3	P
-	EXCEPTION: Step 22 is repeated 3 times.	-	-	-	-
22	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commTxPoolNormalCommon*/*commRxPool SL-CommResourcePool-r12[2]*). Note: This step verifies TP3 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 24.	<--	*STCH PDCP SDU packet*	-	-
23	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST message.	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-
24	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER RESPONSE with STCH_PACKET_COUNTER=6?	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	3	P
25	The SS configures: SS-NW Cell 1 and Cell 2 parameters according to the row "T2" in table 19.1.4.3.2-0 in order to simulate radio link failure.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
26	UE sends *RRCConnectionReestablishmentRequest* message?	-->	*RRCConnectionReestablishmentRequest*		
27	The SS-NW transmits *RRCConnectionReestablishment* message.	<--	*RRCConnectionReestablishment*		
28	The UE transmits *RRCConnectionReestablishmentComplete* message.	-->	*RRCConnectionReestablishmentComplete*		
29	Void	-	-	-	-
-	EXCEPTION: Step 30 is repeated 3 times.	-	-	-	-
30	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool, SL-CommResourcePool-r12[1]*). Note: This step verifies TP4 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 32.	<--	*STCH PDCP SDU packet*	-	-
31	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST message.	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-
32	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER RESPONSE with STCH_PACKET_COUNTER=9?	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	4	P
33	The SS configures: SS-NW	-	-	-	-

	Cell 1 and Cell 4 parameters according to the row "T3" in table 19.1.4.3.2-1-0 in order to simulate needs for handover. Cell 4 transmits *SystemInformationBlockType18*, *commRxPool* includes two entries, one entry including and the other not including *rxParametersNCell: the resources are different to the resources provided on the previous cell on which the UE received ProSe direct communication.*				
34	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover to Cell 4).	<--	*RRCConnectionReconfiguration*	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 4.	-	-	-	-
35	The UE submits *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: In parallel to the event described in step 39 the procedure described in Table 19.1.4.3.2-2 takes place.	-	-	-	-
36-38	Void	-	-	-	-
39	The UE transmit a *SidelinkUEInformation* message.	-->	*SidelinkUEInformation*	-	-
40	The SS configures: SS-UE2starts continuously transmitting Synchronisation information (SLSS and *MasterInformationBlock-SL* message, in the same subframe as SLSS).	<--	SLSS *MasterInformationBlock-SL*	-	-
40A	Wait for [5] sec to allow the UE to receive the synchronisation information.	-	-	-	-
-	EXCEPTION: Steps 40B-40C are repeated 3 times.	-	-	-	-
40B	SS-UE2 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool* the entry including *rxParametersNCell commRxPool 2 (SL-CommResourcePool-r12[2])*). Note: This step verifies TP5 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 42.	<--	*STCH PDCP SDU packet*	-	-
40C	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool* the entry NOT including *rxParametersNCell commRxPool 3 (SL-CommResourcePool-r12[3])*). The SS-UE1 does not transmit synchronisation information. Note: This step verifies TP5 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 42.	<--	*STCH PDCP SDU packet*	-	-
41	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST message.	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-
42	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	5	P

	RESPONSE with STCH_PACKET_COUNTER=15?				
42 A	SS-UE2 stops transmitting synchronisation information.	-	-	-	-
43	The SS configures: SS-NW Cell 4 and Cell 11 parameters according to the row "T4" in table 19.1.4.3.2-1-0 in order to simulate needs for handover.	-	-	-	-
44	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover to Cell 11).	<--	*RRCConnectionReconfiguration*	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 11.	-	-	-	-
45	The UE submits *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: In parallel to the procedure described in step 46 the procedure described in Table 19.1.4.3.2-2 takes place.	-	-	-	-
46	Check: Does the UE transmit a *SidelinkUEInformation* message to indicate it is (interested in) receiving sidelink communication in the next 1 sec ?	-->	*SidelinkUEInformation*	6	F
47-56	Void	-	-	-	-
57	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-

Table 19.1.4.3.2-2: Parallel behaviour - TAU

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE transmits a TRACKING AREA UPDATE REQUEST message.	-->	TRACKING AREA UPDATE REQUEST	-	-
2	SS-NW responds with TRACKING AREA UPDATE ACCEPT message.	<--	TRACKING AREA UPDATE ACCEPT	-	-
3	The UE transmits a TRACKING AREA UPDATE COMPLETE.	-->	TRACKING AREA UPDATE COMPLETE	-	-

Table 19.1.4.3.2-3: Void

19.1.4.3.3 Specific message contents

Table 19.1.4.3.3-1: *SystemInformationBlockType18* for cell 1 when active and unless otherwise stated

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note: SideLink direct communication supported; one resource for transmission (SL-CommResourcePool-r12[1]) matching one of the resources for reception is provided and will be used by the SS-UE for transmission.			

Table 19.1.4.3.3-1A: *SystemInformationBlockType18* for cell 2 when active and unless otherwise stated

Derivation Path: 36.508 [18], table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2] SEQUENCE {		RxPool 2	
rxParametersNCell-r12	Not Present		
}			
SL-CommResourcePool-r12[3]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note: SideLink direct communication supported; resources for reception provided in 2 commRxPools. The new Pool 2 (SL-CommResourcePool-r12[2]) is what SIB18 on Cell 2 differs to SIB18 on Cell 1 and this pool will be used by the SS-UE for transmission.			

Table 19.1.4.3.3-2: *SystemInformationBlockType18* for Cell 4 and Cell 11 when active and unless otherwise stated

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2] SEQUENCE {		RxPool 2	
sc-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000011 00000000 00000000 00000000 00000000	bs40-r12	FDD
}			
ue-SelectedResourceConfig-r12 SEQUENCE {			
data-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 00000000 00000011 11000000 00000000	bs40-r12	FDD
}			
}			
}			
}			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2] SEQUENCE {		TxPool 2	
sc-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000011 00000000 00000000 00000000 00000000	bs40-r12	FDD
}			
ue-SelectedResourceConfig-r12 SEQUENCE {			
data-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 00000000 00000011 11000000 00000000	bs40-r12	FDD
}			
}			
}			
}			
commTxPoolExceptional-r12	Not Present		
}			
}			
Note 1: *SystemInformationBlockType18* providing different resources for sidelink communication transmission/reception than those provided on Cell 2 (different SL-CommResourcePool-r12[2] and new in SL-CommResourcePool-r12[3]) with *commRxPool* 2 (*SL-CommResourcePool-r12[2])* also containing *rxParametersNCell* linked to the *commSyncConfig-r12*/SL-SyncConfig-r12[2]; the SS-UEs will be transmitting on SL-CommResourcePool-r12[2] and SL-CommResourcePool-r12[3].			

Table 19.1.4.3.3-3: ATTACH REQUEST (Preamble)

Derivation path: 36.508 [18] table 4.7.2-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.4.3.3-4: ATTACH ACCEPT (preamble)

Derivation path: 36.508 Table 4.7.2-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
Equivalent PLMNs	PLMN4		Cell 1

Table 19.1.4.3.3-5: TRACKING AREA UPDATE REQUEST (step 1, Table 19.1.4.3.2-2 when it is transmitted in parallel with step 39, Table 19.1.4.3.2-1)

Derivation path: 36.508 [18] table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
EPS update type			
"Active" flag	'1'B		
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.4.3.3-5A: TRACKING AREA UPDATE REQUEST (step 1, Table 19.1.4.3.2-2 when it is transmitted in parallel with step 46, Table 19.1.4.3.2-1)

Derivation path: 36.508 [18] table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.4.3.3-6: *SidelinkUEInformation* (steps 6, 17, 21, 39, 46, Table 19.1.4.3.2-1)

Derivation Path: 36.508, Clause 4.6.1, Table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs SEQUENCE {			
commRxInterestedFreq-r12	f1	Indicates the frequency on which the UE is interested to receive sidelink communication Preconfigured value for the service authorisation (same as the frequency on which the simulated cells operate)	
commTxResourceReq-r12	Not Present	Note 1	
discRxInterest-r12	Not Present	Note 1	
discTxResourceReq-r12	Not Present	Note 1	
}			
Note 1: It is assumed that it will be possible to trigger in the UE an Application that requests only sidelink communication transmission.			

Table 19.1.4.3.3-7: *SidelinkUEInformation* (step 12, Table 19.1.4.3.2-1)

Derivation Path: 36.508, Clause 4.6.1, Table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs ::= SEQUENCE {			
commRxInterestedFreq-r12	Not Present	No interest in prose communication transmission	
commTxResourceReq-r12	Not Present	Note 1	
discRxInterest-r12	Not Present	Note 1	
discTxResourceReq-r12	Not Present	Note 1	
}			
Note 1: It is assumed that it will be possible to trigger in the UE an Application that requests only sidelink communication transmission.			

Table 19.1.4.3.3-8: *RRCConnectionReconfiguration* (steps 19, 27, 34, 44, 51, Table 19.1.4.3.2-1)

Derivation Path: 36.508, table 4.6.1-8, condition HO

Table 19.1.4.3.3-9: *RRCConnectionReestablishmentRequest* (step 26, Table 19.1.4.3.2-1)

Derivation Path: 36.508, Table 4.6.1-13			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReestablishmentRequest ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcConnectionReestablishmentRequest-r8 SEQUENCE {			
ue-Identity SEQUENCE {			
c-RNTI	the value of the C-RNTI of the UE		
physCellId	PhysicalCellIdentity of Cell 2		
shortMAC-I	The same value as the 16 least significant bits of the XMAC-I value calculated by SS		
}			
reestablishmentCause	otherFailure		
}			
}			
}			

Table 19.1.4.3.3-10: CLOSE UE TEST LOOP (step 7, Table 19.1.4.3.2-1)

Derivation Path: 36.508, Table 4.7A-3 condition UE TEST LOOP MODE E			
Information Element	**Value/remark**	**Comment**	**Condition**
Communication Transmit or Receive	00000000	RECEIVE receive sidelink direct communication	this is the default

Table 19.1.4.3.3-11: *MasterInformationBlock-SL* (step 40, Table 19.1.4.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-4A0

19.1.5 ProSe Direct Communication/Pre-configured authorisation / UE camped on an E-UTRAN cell not operating on the carrier frequency provisioned for ProSe direct service / Utilisation of the resources of (not serving) cells/PLMNs / Transmission and Reception

19.1.5.1 Test Purpose (TP)

(1)

```
with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2)
being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" carrier frequency
f1, and, UE in RRC_IDLE on Cell3/f2/PLMN1 which does not indicate that ProSe direct communication is
supported by the network }
ensure that {
  when { UE wants to transmit prose direct communication, and, the lower layers find that there
exists a cell Cell2/f1/PLMN1 operating the provisioned radio resources (i.e. carrier frequency), and
the cell belongs to the registered PLMN }
    then { UE is able to transmit sidelink communication using the assigned/configured resources in
Cell2/f1/PLMN1 without re-selection to Cell2/f1/PLMN1 }
            }
```

(2)

```
with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2)
and being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" carrier
frequency f1, and, UE in RRC_IDLE on Cell3/f2/PLMN1 which does not indicate that ProSe direct
communication is supported by the network }
```

ensure that {
  when { UE wants to receive prose direct communication, **and,** the lower layers find that there exists a cell Cell2/f1/PLMN1 operating the provisioned radio resources (i.e. carrier frequency), and the cell belongs to the registered PLMN }
    then { UE is able to receive sidelink communication transmitted in accordance with the assigned/configured resources in Cell2/f1/PLMN1 without re-selection to Cell2/f1/PLMN1 }
            }

(3)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" carrier frequency f1, **and,** UE in RRC_IDLE on Cell3/f2/PLMN1 which does not indicate that ProSe direct communication is supported by the network }
ensure that {
  when { UE wants to transmit prose direct communication, **and,** the lower layers find that there exists a cell Cell4/f1/PLMN3 operating the provisioned radio resources (i.e. carrier frequency), and the cell belongs to a PLMN equivalent to the registered PLMN }
    then { UE is able to transmit sidelink communication using the assigned/configured resources in Cell4/f1/PLMN3 without re-selection to Cell4/f1/PLMN3 }
            }

(4)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" carrier frequency f1, **and,** UE in RRC_IDLE on Cell3/f2/PLMN1 which does not indicate that ProSe direct communication is supported by the network }
ensure that {
  when { UE wants to receive prose direct communication, **and,** the lower layers find that there exists a cell Cell4/f1/PLMN3 operating the provisioned radio resources (i.e. carrier frequency), and the cell belongs to a PLMN equivalent to the registered PLMN }
    then { UE is able to receive sidelink communication transmitted in accordance with the assigned/configured resources in Cell4/f1/PLMN3 without re-selection to Cell4/f1/PLMN3 }
            }

(5) Void

(6) Void

(7)

with { UE being authorized for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" carrier frequency f1, **and,** UE in RRC_CONNECTED on Cell3/f2/PLMN1 which does not indicate that ProSe direct communication is supported by the network }
ensure that {
  when { UE wants to transmit prose direct communication, **and,** UE is capable of simultaneous transmission of EUTRA and sidelink communication (on different carriers), **and,** the lower layers find that there are not cells operating on the preconfigured radio resources (i.e. carrier frequency) }
    then { UE is able to transmit sidelink communication using the preconfigured for "not served by E-UTRAN" resources }
            }

(8)

with { UE being authorised for performing ProSe Direct Communication in two PLMNs (PLMN1 and PLMN2) and being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" carrier frequency f1, **and,** UE in RRC_CONNECTED on Cell3/f2/PLMN1 which does not indicate that ProSe direct communication is supported by the network }
ensure that {
  when { UE wants to transmit prose direct communication, **and,** UE us capable of simultaneous transmission of EUTRA and sidelink communication (on different carriers), **and,** the lower layers find that there are not cells operating on the preconfigured radio resources (i.e. carrier frequency) }
    then { UE is able to receive sidelink communication using the preconfigured "not served by E-UTRAN" resources }
            }

19.1.5.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.334, clauses 5.1.1, 5.1.2, 10.2.1, 10.2.2, 10.2.3, TS 36.331, clauses 5.2.2.4, 5.2.2.25, 5.10.1a, 5.10.3, 5.10.4. Unless otherwise stated these are Rel-12 requirements.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery announcing or ProSe direct discovery monitoring or both, and to use ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 5.1.2]

The IP address of the ProSe function in the HPLMN may be pre-configured in the UE and in this case, the UE may use the pre-configured IP address. Alternatively, the FQDN of the ProSe Function in the HPLMN may be self-constructed by the UE, i.e. derived from the PLMN ID of the HPLMN. The UE may perform DNS lookup as specified in IETF RFC 1035 [10].

[TS 24.334, clause 10.2.1]

One-to-many ProSe direct communication is applicable only to ProSe-enabled Public Safety UEs. One-to-many ProSe direct communication can only apply when the UE is:

a) served by E-UTRAN and authorised for ProSe direct communication in the registered PLMN;

b) not served by E-UTRAN, and authorised for ProSe direct communication for "not served by E-UTRAN"; or

...

Upon receiving a request from upper layers to send or receive data for ProSe direct communication in a given group, the UE shall initiate the procedure for ProSe direct communication. For case a, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.2. For case b and c, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.3.

If the UE is camped on an E-UTRAN cell not operating on the carrier frequency provisioned for ProSe direct communication which indicates that ProSe direct communication is supported by the network, the UE can perform either ProSe direct communication procedures specified in subclause 10.2.2 or ProSe direct communication procedures specified in subclause 10.2.3.

The UE shall obtain the ProSe direct communication policy parameters for that group as specified in subclause 5.

If the ProSe direct communication policy parameters indicate that the UE is configured to use IPv6 for that group, the UE shall auto-configures a link local IPv6 Address following procedures defined in RFC 4862 [15]. This address can only be used as the source IP address for one-to-many ProSe direct communication.

If the ProSe Direct communication policy parameters group indicate that the UE is configured to use IPv4 for that group, then the UE shall:

- use the configured IPv4 address for that group as source address; or

- if there is no configured IPv4 address for that group, use Dynamic Configuration of IPv4 Link-Local Addresses as specified in IETF RFC 3927 [16].

[TS 24.334, clause 10.2.2]

When the UE is served by E-UTRAN and intends to use the ProSe radio resources (i.e. carrier frequency) provided by an E-UTRAN cell, the UE requests the parameters from the lower layers for transmitting or receiving ProSe direct communication (see 3GPP TS 36.331 [12]). The UE shall perform direct communication only if the lower layers

indicate that ProSe direct communication is supported by the network. If the UE in EMM-IDLE mode has to request resources for ProSe direct communication as specified in 3GPP TS 36.331 [12], the UE shall perform a service request procedure or tracking area update procedure as specified in 3GPP TS 24.301 [11]. Once the radio resources for transmitting or receiving ProSe direct communication are provided by eNodeB as specified in 3GPP TS 36.331 [12], the UE shall start ProSe direct communication.

[TS 24.334, clause 10.2.3]

Before initiating ProSe direct communication, the UE shall check with lower layers whether the selected radio parameters can be used in the current location without causing interference to other cells as specified in 3GPP TS 36.331 [12], and:

- if the lower layers indicate that the usage would not cause any interference, the UE shall initiate ProSe direct communication; or

NOTE 2: If the lower layers find that there exists a cell operating the provisioned radio resources (i.e., carrier frequency), and the cell belongs to the registered PLMN or a PLMN equivalent to the registered PLMN, and the UE is authorized for ProSe direct communication in this PLMN, the UE can use the radio parameters indicated by the cell as specified in 3GPP TS 36.331 [12].

- else if the lower layers report that one or more PLMNs operate in the provisioned radio resources (i.e. carrier frequency) then:

  a) if the following conditions are met:

     1) none of the PLMNs reported by the lower layers is the registered PLMN or equivalent to the registered PLMN; and

     2) at least one of the PLMNs reported by the lower layers is in the list of authorised PLMNs for ProSe direct communication and provides radio resources for ProSe direct communication as specified in 3GPP TS 36.331 [12];

     then the UE shall:

     1) if in EMM-IDLE mode, perform PLMN selection triggered by ProSe direct communication as specified in 3GPP TS 23.122 [24]; or

     ...

If the registration to the selected PLMN is successful, the UE shall proceed with the procedure to initiate ProSe direct communication as specified in subclause 10.2.2.

[TS 36.331, clause 5.2.2.4]

1> if the UE is capable of sidelink communication and is configured by upper layers to receive or transmit sidelink communication:

   2> if the cell used for sidelink communication meets the S-criteria as defined in TS 36.304 [4]; and

   2> if *schedulingInfoList* indicates that *SystemInformationBlockType18* is present and the UE does not have stored a valid version of this system information block:

      3> acquire *SystemInformationBlockType18*;

[TS 36.331, clause 5.2.2.25]

Upon receiving *SystemInformationBlockType18*, the UE shall:

1> if *SystemInformationBlockType18* message includes the *commConfig*:

   2> if configured to receive sidelink communication:

      3> from the next SC period, as defined by *sc-Period*, use the resource pool indicated by *commRxPool* for sidelink communication monitoring, as specified in 5.10.3;

   2> if configured to transmit sidelink communication:

3> from the next SC period, as defined by *sc-Period*, use the resource pool indicated by *commTxPoolNormalCommon* or by *commTxPoolExceptional* for sidelink communication transmission, as specified in 5.10.4;

[TS 36.331, clause 5.10.1a]

When it is specified that the UE shall perform a particular sidelink operation only if the conditions defined in this section are met, the UE shall perform the concerned sidelink operation only if:

1> if the UE's serving cell is suitable (RRC_IDLE or RRC_CONNECTED); and if either the selected cell on the frequency used for sidelink operation belongs to the registered or equivalent PLMN as specified in TS 24.334 [69] or the UE is out of coverage on the frequency used for sidelink operation as defined in TS 36.304 [4, 11.4]; or

[TS 36.331, clause 5.10.3]

A UE capable of sidelink communication that is configured by upper layers to receive sidelink communication shall:

1> if the conditions for sidelink operation as defined in 5.10.1a are met:

2> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

3> if the cell chosen for sidelink communication reception broadcasts *SystemInformationBlockType18* including *commRxPool*:

4> configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources indicated by *commRxPool*;

NOTE 1: If *commRxPool* includes one or more entries including *rxParametersNCell*, the UE may only monitor such entries if the associated PSS/SSS or SLSSIDs is detected. When monitoring such pool(s), the UE applies the timing of the concerned PSS/SSS or SLSS.

2> else (i.e. out of coverage on the sidelink carrier):

3> configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources that were preconfigured (i.e. *preconfigComm* in *SL-Preconfiguration* defined in 9.3);

NOTE 2: The UE may monitor in accordance with the timing of the selected SyncRef UE, or if the UE does not have a selected SyncRef UE, based on the UE's own timing.

[TS 36.331, clause 5.10.4]

A UE capable of sidelink communication that is configured by upper layers to transmit sidelink communication and has related data to be transmitted shall:

1> if the conditions for sidelink operation as defined in 5.10.1a are met:

2> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

...

3> else (i.e. sidelink communication in RRC_IDLE or on cell other than PCell in RRC_CONNECTED):

4> if the cell chosen for sidelink communication transmission broadcasts *SystemInformationBlockType18*:

5> if *SystemInformationBlockType18* includes *commTxPoolNormalCommon*:

6> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources indicated by the first entry in *commTxPoolNormalCommon*;

5> else:

6> if the last connection establishment was initiated to request sidelink communication transmission resources and resulted in T300 expiry; and

6> if the cell on which the UE initiated connection establishment broadcasts *SystemInformationBlockType18* including *commTxPoolExceptional*:

7> from the moment T300 expired, as specified in 5.3.3.6, until receiving an *RRCConnectionReconfiguration* including *sl-CommConfig* or until receiving an *RRCConnectionRelease* or an *RRCConnectionReject*;

8> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources indicated by the first entry in *commTxPoolExceptional*;

2> else (i.e. out of coverage on sidelink carrier):

3> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources that were preconfigured i.e. indicated by the first entry in *preconfigComm* in *SL-Preconfiguration* defined in 9.3 and in accordance with the timing of the selected SyncRef UE, or if the UE does not have a selected SyncRef UE, based on the UEs own timing;

19.1.5.3 Test description

19.1.5.3.1 Pre-test conditions

System Simulator:

SS-NW

- 3 cells with parameters defined in Table 19.1.5.3.1-1.

NOTE: The test only requires at maximum 2 cells to be active at any one instant.

Table 19.1.5.3.1-1: Cell parameters values

Cell	Frequency	PLMN
3	f2	HPLMN (PLMN1)
2	f1	PLMN1
4	f1	PLMN3
Note 1: PLMN1: PLMN1 in USIM EF_{PROSE_PLMN} PLMN3 is an equivalent PLMN to PLMN1; MCC = MCC of PLMN1 in USIM EF_{PROSE_PLMN}; MNC=04.		
Note 2: The Frequency f1 shall be the frequency pre-configured in the UE for when UE is "not served by E-UTRAN". The Frequency f2 is a frequency for which the UE is not authorised/preconfigured for ProSe.		

- System information combination 1 as defined in TS 36.508 [18] clause 4.4.3.1 is used on Cell 3 (Cell 3 does not broadcast SIB18). System information combination 23 as defined in TS 36.508 [18] clause 4.4.3.1 is used on Cell 2 and Cell 4when active.

SS-UE

- SS-UE1.
  - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting and receiving device on the resources provided by cells Cell 2 and Cell 4 when active (as specified in the relevant procedure steps in Table 19.1.5.3.2-1).
- SS-UE2.
  - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting and receiving device on the resources configured in the UE for transmission/reception of ProSe Direct Communication when "not served by E-UTRAN".

UE:

- ProSe related configuration

  - The UE is authorised to perform ProSe Direct Communication; the UE is equipped with a USIM containing values shown in Table 19.1.5.3.1-2, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. 2 PLMNs are authorised for ProSe Direct Communication when served by E-UTRAN, Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, ProSe Group IP multicast address, etc.).

Table 19.1.5.3.1-2: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°2 (HPLMN ProSe Function) supported.
	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.

  - For each PLMN a timer T4005 is assigned long enough not to expire before the TC is completed, e.g. 9 min (for Rel-12 this timer cannot be set in the USIM, it is expected that the UE shall provide means for setting the timer e.g. via MMI).

Preamble:

- The UE is in state Generic RB Established, UE Test Mode E Activated (State 3A) according to [18] on Cell 3. During the registration PLMN3 is assigned as Equivalent PLMN.

19.1.5.3.2 Test procedure sequence

Table 19.1.5.3.2-0 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" ... "Tn" are to be applied subsequently. The exact instants on which these values shall be applied are described elsewhere in the present clause.

Table 19.1.5.3.2-0: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 3	Cell 2	Cell 4
T0	Cell-specific RS EPRE	dBm/15kHz	-79	"Off"	"Off"
T1	Cell-specific RS EPRE	dBm/15kHz	-79	-85	"Off"
T2	Cell-specific RS EPRE	dBm/15kHz	-79	"Off"	-85
T3	Cell-specific RS EPRE	dBm/15kHz	-79	"Off"	"Off"

Table 19.1.5.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Close UE Test Loop with bit E0 in UE test loop mode E LB setup IE set to one and bring UE into state Loopback Activated (State 4). NOTE: The loop is closed here and used towards the end of the test sequence to allow that most of the time the UE is kept out of coverage and is not moving often between in and out of coverage.	<--	CLOSE UE TEST LOOP	-	-
2	The UE responds with CLOSE UE TEST LOOP COMPLETE.	-->	CLOSE UE TEST LOOP COMPLETE	-	-
2A	The SS-NW sends UPDATE UE LOCATION INFORMATION message which provides location data = to one of the location areas pre-configured in the UE for prose communication (e.g. area 1).	<--	UPDATE UE LOCATION INFORMATION	-	-
3	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
4	The SS configures: SS-NW Cell 3 and Cell 2 parameters according to the row "T1" in table 19.1.5.3.2-0. Cell 2 is transmitting *SystemInformationBlockType18* providing resources for transmission in RRC_IDLE.	-	-	-	-
5	Wait for 5 sec to allow the UE to acquire the *SystemInformationBlockType18* transmitted on Cell 2.				
6	Force the UE upper layer application to request continuous transmission and reception of sidelink communication (the transmissions should be a maximum of 100 Bytes per communication "message"). NOTE: This can be done e.g. via a MMI command. Note that the max of 100 Bytes is not a 3GPP requirement rather it is requested only for the purpose of facilitating the test case specification.	-	-	-	-
6A	Wait for 5 sec to allow the UE to start transmission.	-	-	-	-
7	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources provided by Cell 2 (*commTxPoolNormalCommon*/SL-CommResourcePool-r12[1])? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	1	P
-	EXCEPTION: Step 8 is repeated 3 times.	-	-	-	-
8	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* on cell 2. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType18/commRxPool-r12/SL-CommResourcePool-r12[3]*. Note that SIB18 does not include a corresponding Tx resource for transmission in RRC_IDLE, i.e. the SS-UE1 is behaving as an	<--	*STCH PDCP SDU packet*	-	-

	UE transmitting announcements in RRC_CONNECTED. For avoiding testing complexity, the transmission pools in step 11 and 12 are deliberately different to avoid collisions between the transmissions of the UE and the SS-UE1. NOTE: This step verifies TP2 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 25.				
9	The SS configures: SS-NW Cell 3, Cell 2 and Cell 4 parameters according to the row "T2" in table 19.1.5.3.2-0. Cell 4 is transmitting *SystemInformationBlockType18* providing resources for transmission in RRC_IDLE.	-	-	-	-
10	Wait for 5 sec to allow the UE to acquire the *SystemInformationBlockType18* transmitted on Cell 4				
11	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources provided by Cell 4 (*commTxPoolNormalCommon*/SL-CommResourcePool-r12[2])? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	3	P
-	EXCEPTION: Step 12 is repeated 3 times.	-	-	-	-
12	SS-UE1 transmits sidelink communication in the next transmission period in accordance with the resources indicated in the *SystemInformationBlockType18* (*commRxPool*) on cell 4. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType18/commRxPool-r12/SL-CommResourcePool-r12[3]*. Note that SIB18 does not include a corresponding Tx resource for transmission in RRC_IDLE, i.e. the SS-UE1 is behaving as an UE transmitting announcements in RRC_CONNECTED. For avoiding testing complexity, the transmission pools in step 11 and 12 are deliberatelydifferent to avoid collisions between the transmissions of the UE and the SS-UE1. NOTE: This step verifies TP4 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 25.	<--	*STCH PDCP SDU packet*	-	-
13-22	Void	-	-	-	-
23	Generic procedure for Generic Radio Bearer Establishment (State 3) defined in TS 36.508 [18] clause 4.5.3 takes place	-	-	-	-
24	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-

	message.				
25	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER RESPONSE with STCH_PACKET_COUNTER=6?	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	2,4	P
26	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
-	EXCEPTION: Steps 27a1 - 27a13 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place if the UE is capable of simultaneous transmission/reception of EUTRA and sidelink communication (on different carriers).	-	-	-	-
27a 1	IF pc_commSimultaneousTx THEN The SS configures: SS-NW Cell 3, and Cell 4 parameters according to the row "T 3" in table 19.1.5.3.2-0.	-	-	-	-
27a 2	Wait for 5 sec to allow the UE to adjust to the cell changes and continue transmission accordingly.	-	-	-	-
27a 3	Generic procedure for Generic Radio Bearer Establishment (State 3) defined in TS 36.508 [18] clause 4.5.3 takes place on Cell 3.	-	-	-	-
27a 4-27a 7	Void.	-	-	-	-
27a 8	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the pre-configured for "not served by E-UTRAN" resources on frequency f1? NOTE: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	7	P
27a 9	Force the UE upper layer application to stop continuous transmission but keep reception of sidelink communication.	-	-	-	-
-	EXCEPTION: Step 27a9 is repeated 3 times.	-	-	-	-
27a 10	SS-UE2 transmits sidelink communication in the next transmission period in accordance with the resources pre-configured in the UE for "not served by E-UTRAN" (on frequency f1). NOTE: This step verifies TP8 - it is expected that the UE will be able to receive these packets - if they were received is checked in step 27a12.	<--	*STCH PDCP SDU packets*	-	-
27a 11	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST message.	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-
27a 12	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER RESPONSE with STCH_PACKET_COUNTER=9?	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	8	P
27a 13	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-

Table 19.1.5.3.2-2: Void

19.1.5.3.3 Specific message contents

Table 19.1.5.3.3-1: *SystemInformationBlockType18* for Cell 2 when active

Derivation Path: 36.508 [18] , table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note: SideLink direct communication supported; resources for transmission in RRC_IDLE provided (*commTxPoolNormalCommon* - 1 pool, SL-CommResourcePool-r12[1]); resources for reception in RRC_IDLE provided (commRxPool - 2 pools SL-CommResourcePool-r12[1], SL-CommResourcePool-r12[3]).			

Table 19.1.5.3.3-1A: *SystemInformationBlockType18* for Cell 4 when active

Derivation Path: 36.508 [18], table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[1]	Not Present		
SL-CommResourcePool-r12[3] SEQUENCE {			
sc-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000011 00000000 00000000 00000000 00000000	bs40-r12	FDD
}			
ue-SelectedResourceConfig-r12 SEQUENCE {			
data-TF-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 00000000 00000011 1100000000 00000000	bs40-r12	FDD
}			
}			
}			
}			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[1]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note: Different to the pool provided in Cell 2SideLink direct communication supported; resources for transmission in RRC_IDLE provided (*commTxPoolNormalCommon* - 1 pool, SL-CommResourcePool-r12[2]) - Different to the pool provided in Cell 2; resources for reception in RRC_IDLE provided (commRxPool - 2 pools SL-CommResourcePool-r12[2], SL-CommResourcePool-r12[3]) - different to the pool used on Cell 2.			

Table 19.1.5.3.3-2: ATTACH REQUEST (Preamble)

Derivation path: 36.508 [18] , table 4.7.2-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	ProSe direct communication Supported	

Table 19.1.5.3.3-3: ATTACH ACCEPT (preamble)

Derivation path: 36.508 [18], table 4.7.2-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
Equivalent PLMNs	PLMN3		Cell 1

Table 19.1.5.3.3-4: Void

Table 19.1.5.3.3-5: Void

Table 19.1.5.3.3-6: CLOSE UE TEST LOOP (step 1, Table 19.1.5.3.2-1)

Derivation Path: 36.508 [18], table 4.7A-3 condition UE TEST LOOP MODE E			
Information Element	**Value/remark**	**Comment**	**Condition**
Communication Transmit or Receive	00000000	RECEIVE receive sidelink direct communication	this is the default

Table 19.1.5.3.3-7: UPDATE UE LOCATION INFORMATION (step 2A, Table 19.1.5.3.2-1)

Derivation Path: 36.509 [38], clause 6.12.			
Information Element	**Value/remark**	**Comment**	**Condition**
ellipsoidPointWithAltitude		The Location information provided shall match the area 1 pre-configured in the UE (see TS 36.508 [18], clause 4.9.3.1, $EF_{PROSE\_RADIO\_COM}$) as geographical area where the UE is allowed to use prose communication	
horizontalVelocity	horizontalVelocity: 0 m/s		
Gnss-TOD-msec	Equal to system time		

19.1.6 ProSe Direct Communication/Pre-configured authorisation / UE out of coverage on the frequency used for sidelink communication / Transmission and Reception / Operation with/without SyncRef UE / Usage information report list sending procedure

19.1.6.1 Test Purpose (TP)

(1)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE wants to transmit ProSe direct communication, and, UE determines itself as being not
located in that geographical area }
    then { UE does not initiate ProSe direct communication }
            }
```

(2)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE wants to transmit ProSe direct communication, and, UE has determined itself located in
that geographical area, and, UE does not have a selected SyncRef UE }
    then { UE is able to transmit ProSe Direct Communication utilizing the radio parameters
associated with that geographical area based on the UE's own timing }
```

}

(3)

with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, **and**, UE out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE wants to transmit ProSe direct communication, and, UE can determine itself located in that geographical area, and, *syncTxThreshOoC* is included in the preconfigured sidelink parameters and the UE does not have a selected SyncRef UE }
    then { UE selects the correct SLSSID and subframe for transmission and transmits SLSS and *MasterInformationBlock-SL* message }
}

(4)

with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, **and**, UE out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE wants to transmit ProSe direct communication, and, UE has determined itself located in that geographical area, and, UE does have a selected SyncRef UE }
    then { UE is able to transmit ProSe Direct Communication utilizing the radio parameters associated with that geographical area and in accordance with the timing of the selected SyncRef UE }
}

(5)

with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, **and**, UE out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE wants to transmit ProSe direct communication, and, UE can determine itself located in that geographical area, and, *syncTxThreshOoC* is included in the preconfigured sidelink parameters and the UE has selected SyncRef UE and the S-RSRP measurement result of the selected SyncRef UE is below the value of *syncTxThreshOoC*, and, *inCoverage* in the *MasterInformationBlock-SL* message received from this UE is set to *TRUE* }
    then { UE selects the correct SLSSID and subframe for transmission and transmits SLSS and MasterInformationBlock-SL message }
}

(6)

with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, **and**, UE out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE wants to transmit ProSe direct communication, and, UE can determine itself located in that geographical area, and, *syncTxThreshOoC* is included in the preconfigured sidelink parameters and the UE has selected SyncRef UE and the S-RSRP measurement result of the selected SyncRef UE is below the value of *syncTxThreshOoC*, and, *inCoverage* in the *MasterInformationBlock-SL* message received from this UE is set to FALSE while the SLSS from this UE is NOT part of the set defined for out of coverage }
    then { UE selects the correct SLSSID and subframe for transmission and transmits SLSS and MasterInformationBlock-SL message }
}

(7)

with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, **and**, UE out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE wants to receive ProSe direct communication, and, UE can determine itself located in that geographical area, and, UE does not have a selected SyncRef UE }
    then { UE is able to receive ProSe Direct Communication utilizing the radio parameters associated with that geographical area based on the UE's own timing }
}

(8)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE wants to receive ProSe direct communication, and, UE can determine itself located in
that geographical area, and, UE does have a selected SyncRef UE }
    then { UE is able to receive ProSe Direct Communication utilizing the radio parameters
associated with that geographical area and in accordance with the timing of the selected SyncRef UE
}
            }
```

(9)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE returns to coverage, and, a usage information report list sending procedure was not
performed yet after beginning of ProSe direct communication, the configured collection period has
elapsed since beginning of ProSe direct communication and the configured reporting window has not
elapsed after the configured collection period elapsed, and, UE is in the RRC CONNECTED mode, and,
UE has usage information for at least one collection period }
    then { UE performs the usage information report list sending procedure }
            }
```

(10)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with two geographical areas, and,
UE out of coverage on the frequency used for sidelink communication }
ensure that {
  when { UE moves from one to another geographical are }
    then { UE obeys the resource configured for the new geographical area and uses them for
transmission/reception of ProSe Direct Communication }
            }
```

19.1.6.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.334, clauses 5.1.1, 5.1.2, 10.2.1, 10.2.2, 10.2.3, 10.3.2.1.1, 10.3.2.1.2, TS 36.331, clauses 5.2.2.4, 5.2.2.25, 5.10.3, 5.10.4, 5.10.7.1, 5.10.7.2, 5.10.7.3, 5.10.7.4, 5.10.9.1, 5.10.9.2. Unless otherwise stated these are Rel-12 requirements.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery announcing or ProSe direct discovery monitoring or both, and to use ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 5.1.2]

The IP address of the ProSe function in the HPLMN may be pre-configured in the UE and in this case, the UE may use the pre-configured IP address. Alternatively, the FQDN of the ProSe Function in the HPLMN may be self-constructed by the UE, i.e. derived from the PLMN ID of the HPLMN. The UE may perform DNS lookup as specified in IETF RFC 1035 [10].

[TS 24.334, clause 10.2.1]

One-to-many ProSe direct communication is applicable only to ProSe-enabled Public Safety UEs. One-to-many ProSe direct communication can only apply when the UE is:

...

b) not served by E-UTRAN, and authorised for ProSe direct communication for "not served by E-UTRAN"; or

...

Upon receiving a request from upper layers to send or receive data for ProSe direct communication in a given group, the UE shall initiate the procedure for ProSe direct communication. For case a, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.2. For case b and c, the UE shall perform ProSe direct communication procedures specified in subclause 10.2.3.

...

The UE shall obtain the ProSe direct communication policy parameters for that group as specified in subclause 5.

If the ProSe direct communication policy parameters indicate that the UE is configured to use IPv6 for that group, the UE shall auto-configures a link local IPv6 Address following procedures defined in RFC 4862 [15]. This address can only be used as the source IP address for one-to-many ProSe direct communication.

If the ProSe Direct communication policy parameters group indicate that the UE is configured to use IPv4 for that group, then the UE shall:

- use the configured IPv4 address for that group as source address; or
- if there is no configured IPv4 address for that group, use Dynamic Configuration of IPv4 Link-Local Addresses as specified in IETF RFC 3927 [16].

[TS 24.334, clause 10.2.2]

When the UE is served by E-UTRAN and intends to use the ProSe radio resources (i.e. carrier frequency) provided by an E-UTRAN cell, the UE requests the parameters from the lower layers for transmitting or receiving ProSe direct communication (see 3GPP TS 36.331 [12]). The UE shall perform direct communication only if the lower layers indicate that ProSe direct communication is supported by the network. If the UE in EMM-IDLE mode has to request resources for ProSe direct communication as specified in 3GPP TS 36.331 [12], the UE shall perform a service request procedure or tracking area update procedure as specified in 3GPP TS 24.301 [11]. Once the radio resources for transmitting or receiving ProSe direct communication are provided by eNodeB as specified in 3GPP TS 36.331 [12], the UE shall start ProSe direct communication.

[TS 24.334, clause 10.2.3]

When the UE is not served by E-UTRAN, the UE shall select the radio parameters to be used for ProSe direct communication as follows:

- if the UE can determine itself located in a geographical area, and the UE is provisioned with radio parameters for the geographical area, the UE shall select the radio parameters associated with that geographical area; or
- in all other cases, the UE shall not initiate ProSe direct communication.

NOTE 1: It is out of scope of the present specification to define how the UE can locate itself in a specific Geographical Area. When the UE is in coverage of a 3GPP RAT it can for example use information derived from the serving PLMN. When the UE is not in coverage of a 3GPP RAT it can use other techniques as determined by local regulations.

...

If the UE is performing ProSe direct communication using radio parameters associated with a geographical area and moves out of that geographical area, the UE shall stop performing ProSe direct communication and then:

- if the UE is not served by E-UTRAN or the UE intends to use radio resources for ProSe other than those operated by the serving E-UTRAN cell, the UE shall select appropriate radio parameters for the new geographical area as specified above; or
- if the UE is served by E-UTRAN and intends to use radio resources for ProSe operated by the serving E-UTRAN cell, the UE shall proceed with the procedure to initiate ProSe direct communication when served by E-UTRAN.

[TS 24.334, clause 10.3.2.1.1]

The purpose of the usage information report list sending procedure is to enable a ProSe-enabled Public Safety UE to provide information necessary for composing of charging events related to the ProSe direct communication as defined in 3GPP TS 32.277 [27].

The UE shall perform the usage information report list sending procedure with the Accounting Data Forwarding (ADF) function block of the Charging Trigger Function (CTF) in the ProSe Function (ProSe Function CTF (ADF)) residing in the HPLMN.

The UE shall construct the usage information report based on the policy described in subclause 5.1.3.

[TS 24.334, clause 10.3.2.1.2]

The UE shall perform the usage information report list sending procedure if the UE is in E-UTRAN coverage and if:

a) the following is true:

   1) if a usage information report list sending procedure was already performed after beginning of ProSe direct communication, the configured collection period has elapsed since the end of the previous usage information report list sending procedure;

   2) if a usage information report list sending procedure was not performed yet after beginning of ProSe direct communication, the configured collection period has elapsed since beginning of ProSe direct communication;

   3) the configured reporting window has not elapsed after the configured collection period elapsed;

   4) the UE is in the RRC CONNECTED mode; and

   5) the UE has usage information for at least one collection period; or

b) the following is true:

   1) if a usage information report list sending procedure was already performed after beginning of ProSe direct communication, the configured collection period has elapsed since the end of the previous usage information report list sending procedure;

   2) if a usage information report list sending procedure was not performed yet after beginning of ProSe direct communication, the configured collection period has elapsed since beginning of ProSe direct communication;

   3) the configured reporting window has elapsed after the configured collection period elapsed; and

   4) the UE has usage information for at least one collection period.

The UE shall initiate the usage information report list sending procedure by sending a USAGE_INFORMATION_REPORT_LIST message to the ProSe Function CTF (ADF).

If the UE is configured with the IP address of the ProSe Function CTF (ADF), the UE shall send the USAGE_INFORMATION_REPORT_LIST message to the configured IP address of the ProSe Function CTF (ADF). If the UE is not configured with the IP address of the ProSe Function CTF (ADF), the UE shall send the USAGE_INFORMATION_REPORT_LIST message to the IP address of the ProSe Function discovered as described in subclause 5.1.2.

In the USAGE_INFORMATION_REPORT_LIST message, the UE:

a) shall include a new transaction ID;

b) shall include the UE identity set to the UE's IMSI;

c) for each collection period:

   1) shall include a sequence number of the usage information report;

   2) if the UE is configured to report the time stamps when it went in and out of E-UTRAN coverage during the collection period in the usage information, for each going in or out of E-UTRAN coverage:

      A) shall include information whether the UE was in or out of E-UTRAN coverage;

B) shall include the time stamp of the move; and

C) if the UE was in E-UTRAN coverage and the UE is configured to report the list of locations of the UE when in E-UTRAN coverage during the collection period in the usage information, for each camping on a cell or usage of a cell in the EMM-CONNECTED mode:

i) shall include the E-UTRAN cell global identification of the cell; and

ii) shall include the time stamp of beginning of the camping on the cell or of beginning of the usage of the cell in the EMM-CONNECTED mode;

3) if the UE is configured to report the group parameters in the usage information, for each group:

A) shall include the ProSe Layer-2 Group ID;

B) shall include the ProSe Group IP multicast address;

C) if the UE transmitted data during the collection period and the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include the time stamp of the first transmission to the ProSe Group IP multicast address in the collection period;

D) if the UE received data during the collection period and the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include the time stamp of the first reception from the ProSe Group IP multicast address in the collection period;

E) shall include an IP address used by the UE as a source address;

F) shall include the ProSe UE ID;

G) for each transmitter in one-to-many ProSe direct communication, shall include the Source L2 ID and IP address of the transmitter;

H) if the UE is configured to report the amount of data transmitted during the collection period with location information in the usage information, per each in or out of E-UTRAN coverage period and per each E-UTRAN cell used when in E-UTRAN coverage:

i) shall indicate whether the data are sent in or out of E-UTRAN coverage;

ii) if the UE transmitted data in an E-UTRAN cell during an in E-UTRAN coverage period:

- shall include the E-UTRAN cell global identification of the E-UTRAN cell;

- shall include amount of the data transmitted in the E-UTRAN cell;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission in the E-UTRAN cell; and

- if the UE is configured to report the radio parameters used for ProSe direct communication (i.e. indicator of which radio resources used and radio frequency used) during the reporting period in the usage information, shall include the indicator of which radio resources were used;

iii) if the UE transmitted data during out of E-UTRAN coverage period:

- shall include amount of the data transmitted during the out of E-UTRAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission during the out of E-UTRAN coverage period; and

iv) if the UE is configured to report the radio parameters used for ProSe direct communication (i.e. indicator of which radio resources used and radio frequency used) during the reporting period in the usage information, shall include the used radio frequency; and

I) if the UE is configured to report the amount of data transmitted during the collection period without location information in the usage information, per each in or out of E-UTRAN coverage period:

i) shall indicate whether the data are sent in or out of E-UTRAN coverage;

ii) if the UE transmitted data during in E-UTRAN coverage period:

- shall include amount of the data transmitted during the in E-UTRAN coverage period;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission during the in E-UTRAN coverage period; and

- if the UE is configured to report the radio parameters used for ProSe direct communication (i.e. indicator of which radio resources used and radio frequency used) during the reporting period in the usage information, shall include the indicator of which radio resources were used;

iii) if the UE transmitted data during out of E-UTRAN coverage period:

- shall include amount of the data transmitted during the out of E-UTRAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first transmission during the out of E-UTRAN coverage period; and

iv) if the UE is configured to report the radio parameters used for ProSe direct communication (i.e. indicator of which radio resources used and radio frequency used) during the reporting period in the usage information, shall include the used radio frequency; and

J) if the UE is configured to report the amount of data received during the collection period with location information in the usage information, per each in or out of E-UTRAN coverage period and per each E-UTRAN cell used when in E-UTRAN coverage:

i) shall indicate whether the data are sent in or out of E-UTRAN coverage;

ii) if the UE received data in an E-UTRAN cell during an in E-UTRAN coverage period:

- shall include the E-UTRAN cell global identification of the E-UTRAN cell;

- shall include amount of the data received in the E-UTRAN cell;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception in the E-UTRAN cell; and

- if the UE is configured to report the radio parameters used for ProSe direct communication (i.e. indicator of which radio resources used and radio frequency used) during the reporting period in the usage information, shall include the indicator of which radio resources were used;

iii) if the UE received data during out of E-UTRAN coverage period:

- shall include amount of the data received during the out of E-UTRAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception during the out of E-UTRAN coverage period; and

iv) if the UE is configured to report the radio parameters used for ProSe direct communication (i.e. indicator of which radio resources used and radio frequency used) during the reporting period in the usage information, shall include the used radio frequency; and

K) if the UE is configured to report the amount of data received during the collection period without location information in the usage information, per each in or out of E-UTRAN coverage period:

i) shall indicate whether the data are sent in or out of E-UTRAN coverage;

ii) if the UE received data during in E-UTRAN coverage period:

- shall include amount of the data received during the in E-UTRAN coverage period;

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception during the in E-UTRAN coverage period; and

- if the UE is configured to report the radio parameters used for ProSe direct communication (i.e. indicator of which radio resources used and radio frequency used) during the reporting period in the usage information, shall include the indicator of which radio resources were used;

iii) if the UE received data during out of E-UTRAN coverage period:

- shall include amount of the data received during the out of E-UTRAN coverage period; and

- if the UE is configured to report the time stamps of the first transmission/reception during the collection period in the usage information, shall include time stamp of the first reception during the out of E-UTRAN coverage period; and

iv) if the UE is configured to report the radio parameters used for ProSe direct communication (i.e. indicator of which radio resources used and radio frequency used) during the reporting period in the usage information, shall include the used radio frequency; and

4) if configured radio parameters for the ProSe direct communication applicable in the geographical area of the UE were used during the collection period, shall include the configured radio parameters for the ProSe direct communication applicable in the geographical area of the UE; and

d) for each application specific data received from upper layers during the collection period, shall include the received application specific data.

Figure 10.3.2.1.2.1 illustrates the interaction of the UE and the ProSe Function CTF (ADF) in the usage information report list sending procedure.

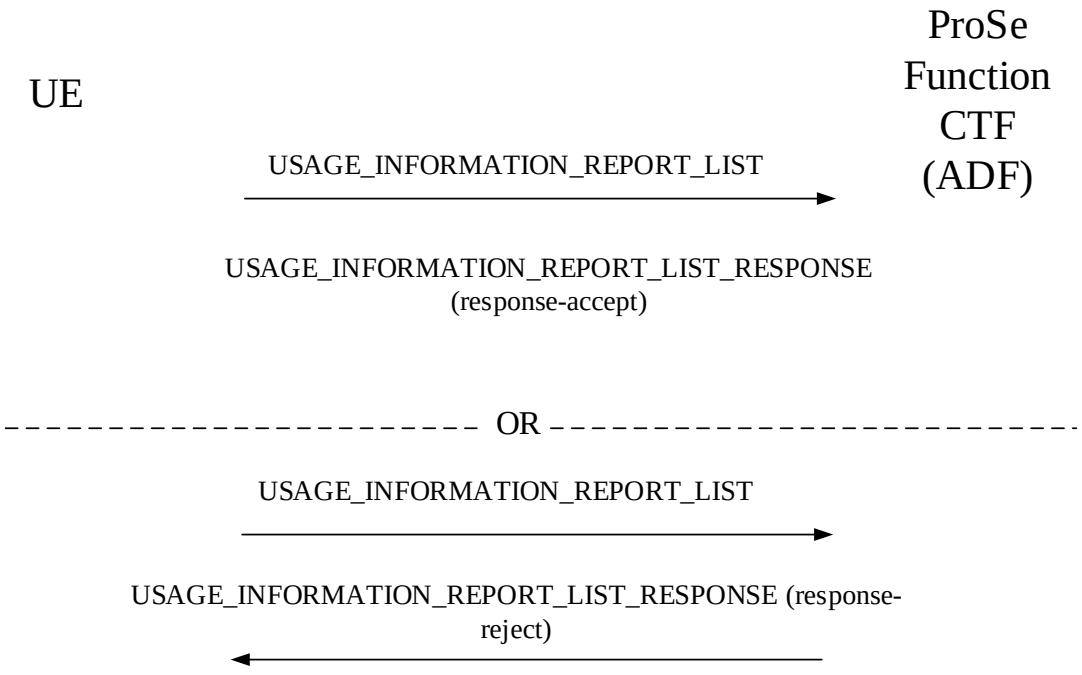

Figure 10.3.2.1.2.1: Usage information report list sending procedure

[TS 36.331, clause 5.2.2.4]

1> if the UE is capable of sidelink communication and is configured by upper layers to receive or transmit sidelink communication:

2> if the cell used for sidelink communication meets the S-criteria as defined in TS 36.304 [4]; and

2> if *schedulingInfoList* indicates that *SystemInformationBlockType18* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType18*;

[TS 36.331, clause 5.2.2.25]

Upon receiving *SystemInformationBlockType18*, the UE shall:

1> if *SystemInformationBlockType18* message includes the *commConfig*:

2> if configured to receive sidelink communication:

3> from the next SC period, as defined by *sc-Period*, use the resource pool indicated by *commRxPool* for sidelink communication monitoring, as specified in 5.10.3;

2> if configured to transmit sidelink communication:

3> from the next SC period, as defined by *sc-Period*, use the resource pool indicated by *commTxPoolNormalCommon* or by *commTxPoolExceptional* for sidelink communication transmission, as specified in 5.10.4;

[TS 36.331, clause 5.10.3]

A UE capable of sidelink communication that is configured by upper layers to receive sidelink communication shall:

...

2> else (i.e. out of coverage on the sidelink carrier):

3> configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources that were preconfigured (i.e. *preconfigComm* in *SL-Preconfiguration* defined in 9.3);

NOTE 2: The UE may monitor in accordance with the timing of the selected SyncRef UE, or if the UE does not have a selected SyncRef UE, based on the UE's own timing.

[TS 36.331, clause 5.10.4]

A UE capable of sidelink communication that is configured by upper layers to transmit sidelink communication and has related data to be transmitted shall:

...

2> else (i.e. out of coverage on sidelink carrier):

3> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources that were preconfigured i.e. indicated by the first entry in *preconfigComm* in *SL-Preconfiguration* defined in 9.3 and in accordance with the timing of the selected SyncRef UE, or if the UE does not have a selected SyncRef UE, based on the UEs own timing;

[TS 36.331, clause 5.10.7.1]

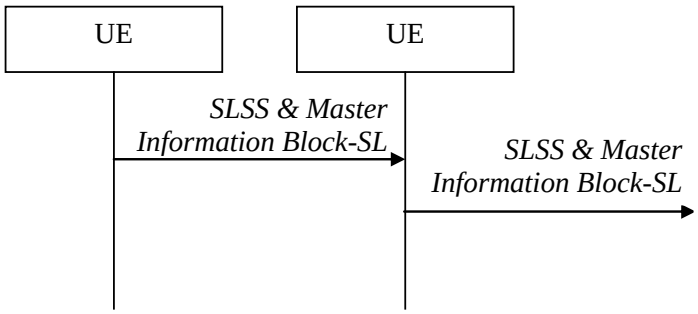

Figure 5.10.7.1-2: Synchronisation information transmission for sidelink communication, out of coverage

...

The purpose of this procedure is to provide synchronisation information to a UE. The synchronisation information concerns a Sidelink Synchronisation Signal (SLSS) for sidelink discovery, while it concerns an SLSS, timing information and some additional configuration parameters (i.e. the *MasterInformationBlock-SL* message) for sidelink communication. A UE transmits synchronisation information either when E-UTRAN configures it to do so by dedicated signalling (i.e. network based), or when not configured by dedicated signalling (i.e. UE based) and E-UTRAN broadcasts (in coverage) or pre-configures a threshold (out of coverage).

The synchronisation information transmitted by the UE may be derived from information/ signals received from E-UTRAN (in coverage) or received from a UE acting as synchronisation reference for the transmitting UE. In the remainder, the UE acting as synchronisation reference is referred to as SyncRef UE.

[TS 36.331, clause 5.10.7.2]

A UE shall, when transmitting sidelink communication in accordance with 5.10.4 and when the following conditions are met:

..

1> else (i.e. out of coverage):

2> if *syncTxThreshOoC* is included in the preconfigured sidelink parameters (i.e. *SL-Preconfiguration* defined in 9.3); and the UE has no selected SyncRef UE or the S-RSRP measurement result of the selected SyncRef UE is below the value of *syncTxThreshOoC*:

3> transmit SLSS in accordance with 5.10.7.3 and TS 36.211 [21];

3> transmit the *MasterInformationBlock-SL* message, in the same subframe as SLSS, and in accordance with 5.10.7.4;

[TS 36.331, clause 5.10.7.3]

The UE shall select the SLSSID and the subframe in which to transmit SLSS as follows:

...

1> if triggered by sidelink communication:

...

2> else (i.e. out of coverage on sidelink carrier):

3> select the synchronisation reference UE (i.e. SyncRef UE) as defined in 5.10.8;

3> if the UE has a selected SyncRef UE and *inCoverage* in the *MasterInformationBlock-SL* message received from this UE is set to *TRUE*; or

...

4> select the same SLSSID as the SLSSID of the selected SyncRef UE;

4> select the subframe in which to transmit the SLSS according to the *syncOffsetIndicator1* or *syncOffsetIndicator2* included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration* defined in 9.3), such that the subframe timing is different from the SLSS of the selected SyncRef UE;

3> else if the UE has a selected SyncRef UE:

4> select the SLSSID from the set defined for out of coverage having an index that is 168 more than the index of the SLSSID of the selected SyncRef UE, see TS 36.211 [21];

4> select the subframe in which to transmit the SLSS according to *syncOffsetIndicator1* or *syncOffsetIndicator2* included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration* defined in 9.3), such that the subframe timing is different from the SLSS of the selected SyncRef UE;

3> else (i.e. no SyncRef UE selected):

4> randomly select, using a uniform distribution, an SLSSID from the set of sequences defined for out of coverage, see TS 36.211 [21];

4> select the subframe in which to transmit the SLSS according to the *syncOffsetIndicator1* or *syncOffsetIndicator2* (arbitrary selection between these) included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration* defined in 9.3);

[TS 36.331, clause 5.10.7.4]

The UE shall set the contents of the *MasterInformationBlock-SL* message as follows:

...

1> else if the UE has a selected SyncRef UE (as defined in 5.10.8):

2> set *inCoverage* to *FALSE*;

2> set *sl-Bandwidth*, *subframeAssignmentSL* and *reserved* to the value of the corresponding field included in the received *MasterInformationBlock-SL*;

1> else (i.e. no SyncRef UE selected):

2> set *inCoverage* to *FALSE*;

2> set *sl-Bandwidth*, *subframeAssignmentSL* and *reserved* to the value of the corresponding field included in the preconfigured sidelink parameters (i.e. *preconfigGeneral* in *SL-Preconfiguration* defined in 9.3);

1> set *directFrameNumber* and *directSubframeNumber* according to the subframe used to transmit the SLSS, as specified in 5.10.7.3;

1> submit the *MasterInformationBlock-SL* message to lower layers for transmission upon which the procedure ends;

[TS 36.331, clause 5.10.9.1]

The sidelink common control information is carried by a single message, the *MasterInformationBlock-SL* (MIB-SL) message. The MIB-SL includes timing information as well as some configuration parameters and is transmitted via SL-BCH.

The MIB-SL uses a fixed schedule with a periodicity of 40 ms without repetitions. In particular, the MIB-SL is scheduled in subframes indicated by *syncOffsetIndicator* i.e. for which (10*DFN + subframe number) mod 40 = *syncOffsetIndicator*.

The sidelink common control information may change at any transmission i.e. neither a modification period nor a change notification mechanism is used.

A UE configured to receive or transmit sidelink communication shall:

1> if the UE has a selected SyncRef UE, as specified in 5.10.8.2:

2> ensure having a valid version of the *MasterInformationBlock-SL* message of that SyncRefUE:

[TS 36.331, clause 5.10.9.2]

Upon receiving *MasterInformationBlock-SL*, the UE shall:

1> apply the values of *sl-Bandwidth*, *subframeAssignmentSL*, *directFrameNumber* and *directSubframeNumber* included in the received *MasterInformationBlock-SL* message;

19.1.6.3 Test description

19.1.6.3.1 Pre-test conditions

System Simulator:

SS-NW

- Cell 1, operating on the frequency f1 configured in the UE for usage for ProSe Communication, HPLMN (PLMN1 authorised for ProSe Communication, PLMN1 in USIM EF_{PROSE_PLMN}).
- System information combination23 as defined in TS 36.508 [18] clause 4.4.3.1 is transmitted on Cell 1 when active.

SS-UE

- SS-UE1.
  - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting and receiving device, as well as, transmitting Synchronisation information on the resources which the UE is expected to use for transmission and reception (as specified in the relevant procedure steps in Table 19.1.6.3.2-1).

UE:

- ProSe related configuration
  - The UE is authorised to perform ProSe Direct Communication; The UE is equipped with a USIM containing values shown in Table 19.1.6.3.1-1, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. 2 PLMNs are authorised for ProSe Direct Communication when served by E-UTRAN, Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, ProSe Group IP multicast address, relevant information requesting/allowing the submission of Usage Information Reports, etc.).

Table 19.1.6.3.1-1: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°2 (HPLMN ProSe Function) supported.
	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
	Service n°8 (ProSe Usage Information Reporting configuration) supported.
	Service n°9 (UICC ProSe Direct Communication usage information reporting) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.

  - For each PLMN a timer T4005 is assigned long enough not to expire before the TC is completed, e.g. 9 min (for Rel-12 this timer cannot be set in the USIM, it is expected that the UE shall provide means for setting the timer e.g. via MMI).

NOTE: The requirement for authorisation of a second PLMN is not essential for the present TC. It is included simply to allow the same pre-configured SIM to be used for most, if not all, of the ProSe TCs).

Preamble:

- The UE is in state Generic RB Established, UE Test Mode E Activated (State 3A) according to [18] on Cell 1.

19.1.6.3.2 Test procedure sequence

Table 19.1.6.3.2-0 illustrates the downlink power levels and other, if any, changing parameters to be applied for the SS-UEs at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" ... "Tn" are to be applied subsequently. The exact instants on which these values shall be applied are described elsewhere in the present clause.

Table 19.1.6.3.2-0: Time instances of simulated SS-UE power level and parameter changes

	Parameter	Unit	SS-UE1	Comment
T0	S-RSRP	dBm/15kHz	"Off"	
T1	S-RSRP	dBm/15kHz	-79	The power levels of the SS-UE are set so that upon S-RSRP measurement by the UE the result is NOT below the value of *syncTxThreshOoC (SL-Preconfiguration*).
T2	S-RSRP	dBm/15kHz	-85	The power levels of the SS-UE are set so that upon S-RSRP measurement by the UE the result is below the value of *syncTxThreshOoC (SL-Preconfiguration*).
T3	S-RSRP	dBm/15kHz	-79	The power levels of the SS-UE are set so that upon S-RSRP measurement by the UE the result is NOT below the value of *syncTxThreshOoC (SL-Preconfiguration*).

Table 19.1.6.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS-NW sends UPDATE UE LOCATION INFORMATION message which provides location data different to the location area pre-configured in the UE for prose communication (see TS 36.508 [18], clause 4.9.3.1, $EF_{PROSE\_RADIO\_COM}$).	<--	UPDATE UE LOCATION INFORMATION	-	-
2	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
3	SS-NW Configures Cell 1 as "Not suitable "Off" cell".	-	-	-	-
4	Force the UE upper layer application to request continuous transmission of sidelink communication (a maximum of 100 Bytes per communication "message"). NOTE: This can be done e.g. via a MMI command. Note that the max of 100 Bytes is not a 3GPP requirement rather it is requested only for the purpose of facilitating the test case specification.	-	-	-	-
4A	Wait for 5 sec to allow the UE to start transmission.	-	-	-	-
5	Check: Does the UE transmit sidelink communication data over the PC5 interface in the next 3 transmission periods in accordance with the resources pre-configured for usage when "Out of coverage"?	-->	-	1	F
6	SS configures: SS-NW Cell 1 as "Serving cell".	-	-	-	-
6A	Void	-	-	-	-
7-10A	Steps 1 - 4 from the generic test procedure for UE registration, UE Test Mode Activated (State 2A) defined in TS 36.508 [18] subclause 4.5.2A take place.	-	-	-	-
-	EXCEPTION: In parallel to the event described in steps 11 – 11N1 the events described in Table 19.1.6.3.2-2 take place	-	-	-	-
11-11N1	Steps 5 - 19 from the generic test procedure for UE Registration, UE Test Mode Activated (State 2A) defined in TS 36.508 [18] subclause 4.5.2A take place.	-	-	-	-
12	The SS-NW sends UPDATE UE LOCATION INFORMATION message for area 1 (see TS 36.508 [18], clause 4.9.3.1, $EF_{PROSE\_RADIO\_COM}$).	<--	UPDATE UE LOCATION INFORMATION	-	-
13	Close UE Test Loop with bit E0 in UE test loop mode E LB setup IE set to one and bring UE into state Loopback Activated (State 4). NOTE: The loop is closed here and used towards the end of the test sequence to allow that most of the time the UE is kept out of coverage and is not moving often between in and out of coverage.	<--	CLOSE UE TEST LOOP	-	-
14	The UE responds with CLOSE UE TEST LOOP COMPLETE.	-->	CLOSE UE TEST LOOP COMPLETE	-	-
14A	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
15-15Ab1	Void.	-	-	-	-
16	SS-NW configures:	-	-	-	-

	SS-NW Cell 1 as "Not suitable "Off" cell"				
17	Wait for 5 sec to allow the UE to adjust to the cell changes and "recognise" it is out of coverage.	-	-	-	-
17A	Force the UE upper layer application to request continuous transmission of sidelink communication (a maximum of 100 Bytes per communication "message"). NOTE: Although the UE is expected to transmit continuously, only the STCH PDCP SDU packets which need to be checked are shown explicitly in the step sequence.	-	-	-	-
17B	Wait for 5 sec to allow the UE to start transmission.	-	-	-	-
-	EXCEPTION: Steps 17C - 17D are repeated 3 times.	-	-	-	-
17C	Check: Does the UE transmit SLSS in accordance with the information provided in s*yncTxThreshOoC* included in the preconfigured sidelink parameters (*SL-Preconfiguration*) in the next transmission period? UE shall - select the subframe in which to transmit the SLSS according to the *syncOffsetIndicator1* or *syncOffsetIndicator2* (arbitrary selection between these) included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration*). NOTE: UE does not have a selected SyncRef UE and therefore shall use timing based on the UE's own timing.	-->	SLSS	3	P
17D	Check: Does the UE transmit *MasterInformationBlock-SL* message in the same subframe as the SLSS in step 19?	-->	*MasterInformationBlock-SL*	3	P
18	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources pre-configured for usage when "Out of coverage"? NOTE 1: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict. NOTE 2: UE does not have a selected SyncRef UE and therefore shall use timing based on the UE's own timing.	-->	*STCH PDCP SDU packet*	2	P
19-21	Void.				
22	SS configures: SS-UE1 in accordance with " T1" defined in Table 19.1.6.3.2-0. SS-UE1 continuously transmits SLSS and *MasterInformationBlock-SL* message in the same subframe as the SLSS. SLSS-ID is set to 101, syncOffsetIndicator is set to 3. the SLSS transmitted is NOT part of the set defined for out of coverage in the UE *inCoverage* in the *MasterInformationBlock-SL* message set to *TRUE*.	<--	SLSS *MasterInformationBlock-SL*	-	-

	Note: The power levels of the SS-UE1 are set so that upon S-RSRP measurement by the UE the result is NOT below the value of *syncTxThreshOoC (SL-Preconfiguration*).				
23	Wait for 1 sec to allow time for the UE to select the SS-UE1 for SyncRef UE.	-	-	-	-
-	EXCEPTION: Step 24 is repeated until one completed STCH PDCP SDU packet is received.	-	-	-	-
24	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources pre-configured for usage when "Out of coverage" and the information provided by the SyncRef UE (SS-UE1)? NOTE 1: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict.	-->	*STCH PDCP SDU packet*	4	P
-	EXCEPTION: Steps 25 - 26 is repeated 3 times.	-	-	-	-
25	Check: Does the UE transmit SLSS in the next transmission period in accordance with the information provided by the SyncRef UE?	-->	SLSS	5	F
26	Check: Does the UE transmit *MasterInformationBlock-SL* message in the same subframe as the SLSS in step 25?	-->	*MasterInformationBlock-SL*	5	F
27	SS configures: SS-UE1 in accordance with "T2" defined in Table 19.1.6.3.2-0. Note: SS configures a SS-UE1 so that upon S-RSRP measurement by the UE the result is below the value of *syncTxThreshOoC (SL-Preconfiguration*). No changes to the SLSS and *MasterInformationBlock-SL* message	-	-	-	-
-	EXCEPTION: Steps 28 - 29 are repeated 3 times.	-	-	-	-
28	Check: Does the UE transmit SLSS in the next transmission period in accordance with the information provided by the SyncRef UE (SS-UE1)? UE shall: - select the same SLSSID as the SLSSID of the selected SyncRef UE; - select the subframe in which to transmit the SLSS according to the *syncOffsetIndicator1* or *syncOffsetIndicator2* included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration* defined in section 19.1.6.3.3), such that the subframe timing is different from the SLSS of the selected SyncRef UE.	-->	SLSS	5	P
29	Check: Does the UE transmit *MasterInformationBlock-SL* message in the same subframe as the SLSS in step 28?	-->	*MasterInformationBlock-SL*	5	P
30	SS-UE1 while continuing transmitting SLSS and *MasterInformationBlock-SL* message in the same subframe as the SLSS, changes the *inCoverage* in the *MasterInformationBlock-SL* message to *FALSE*. SLSS-ID = 172.	<--	SLSS *MasterInformationBlock-SL*	-	-
-	EXCEPTION: Steps 31 - 32 are repeated 3 times.	-	-	-	-
31	Check: Does the UE transmit SLSS in the next	-->	SLSS	6	P

	transmission period in accordance with the information provided by the SyncRef UE? The UE shall: - select the SLSSID from the set defined for out of coverage having an index that is 168 more than the index of the SLSSID of the selected SyncRef UE, see TS 36.211]; - select the subframe in which to transmit the SLSS according to *syncOffsetIndicator1* or *syncOffsetIndicator2* included in the preconfigured sidelink parameters (i.e. *preconfigSync* in *SL-Preconfiguration* defined in section 19.1.6.3.3), such that the subframe timing is different from the SLSS of the selected SyncRef UE.				
32	Check: Does the UE transmit *MasterInformationBlock-SL* message in the same subframe as the SLSS in step 30?	-->	*MasterInformationBlock-SL*	6	P
33	SS-UE1 stops transmitting Synchronisation information.	-	-	-	-
33 A	Force the UE upper layer application to stop transmission of sidelink communication.	-	-	-	-
34	Force the UE upper layer application to request reception of sidelink communication.	-	-	-	-
34 A	Wait for 5 sec to allow the UE to start searching for transmission.	-	-	-	-
-	EXCEPTION: Step 35 is repeated 3 times.	-	-	-	-
35	SS-UE1 sends sidelink communication over the PC5 interface in the next transmission period using the UE timing. NOTE: This step verifies TP7 - it is expected that the UE shall receive these packets - if they were received is checked in step 69.	<--	*STCH PDCP SDU packet*	-	-
36	SS configures: SS-UE1 in accordance with "T3" defined in Table 19.1.6.3.2-0. SS-UE1 continuously transmits SLSS and *MasterInformationBlock-SL* message in the same subframe as the SLSS. The timing used is different than the timing used by the UE. Note: The power levels of the SS-UE1 are set so that upon S-RSRP measurement by the UE the result is NOT below the value of *syncTxThreshOoC (SL-Preconfiguration*).	<--	SLSS *MasterInformationBlock-SL*	-	-
37	Wait for 1 sec to allow time for the UE to search for SyncRef UE and find the SS-UE1 and select it as SyncRef UE.	-	-	-	-
-	EXCEPTION: Step 38 is repeated 3 times.	-	-	-	-
38	SS-UE1 sends sidelink communication over the PC5 interface in the next transmission period using its own timing. NOTE: This step verifies TP8 - it is expected that the UE shall receive these packets - if they were received is checked in step 69.	<--	*STCH PDCP SDU packet*	-	-
39	SS configures: SS-NW Cell 1 as "Serving cell". The provided in the *SystemInformationBlockType18* message resources for transmission/reception of sidelink	-	-	-	-

	communication are different to the preconfigured resources.				
39A	Void	-	-	-	-
40-43A	Steps 1 - 4 from the generic test procedure for UE Registration, UE Test Mode Activated (State 2A) defined in TS 36.508 [18] subclause 4.5.2A take place.	-	-	-	-
-	EXCEPTION: In parallel to the event described in steps 44 – 48N1 the events described in Table 19.1.6.3.2-2 take place	-	-	-	-
44-48N1	Steps 5 - 19 from the generic test procedure for UE Registrations, UE Test Mode Activated (State 2A) defined in TS 36.508 [18] subclause 4.5.2A take place.	-	-	-	-
49-67	Void				
68	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST message.	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-
69	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER RESPONSE with STCH_PACKET_COUNTER=6? (Confirmation that the messages sent in steps 35 and 38 were received.)	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	7, 8	P
70	The SS-NW sends UPDATE UE LOCATION INFORMATION message for area 2 (see TS 36.508 [18], clause 4.9.3.1, EF$_{PROSE_RADIO_COM}$).	<--	UPDATE UE LOCATION INFORMATION	-	-
70A	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
71-71Ab1	Void.	-	-	-	-
72	SS-NW Configures Cell 1 as "Not suitable "Off" cell"	-	-	-	-
73	Wait for 5 sec to allow the UE to adjust to the cell changes and "recognise" it is out of coverage..	-	-	-	-
73A	Force the UE upper layer application to start transmission of sidelink communication.	-	-	-	-
73B	Wait for 5 sec for UE to process the request and start transmitting.	-	-	-	-
-	EXCEPTION: Step 74 is repeated until one complete STCH PDCP SDU packet is received.	-	-	-	-
74	Check: Does the UE transmit in the next 60 sec one STCH PDCP SDU packet of sidelink communication data over the PC5 interface in accordance with the resources pre-configured for usage when "Out of coverage" for area 2? NOTE 1: The UE may send multiple packets. The reception of one of them is sufficient for achieving the Pass verdict	-->	*STCH PDCP SDU packet*	10	P
74A	Force the UE upper layer application to stop transmission of sidelink communication.	-	-	-	-
74B	Wait for 5 sec for UE to process the request and stop transmitting.	-	-	-	-
-	EXCEPTION: Step 75 is repeated 3 times.	-	-	-	-
75	SS-UE1 sends sidelink communication over the PC5 interface in the next transmission period using its own timing. NOTE: This step verifies TP10 - it is expected	<--	*STCH PDCP SDU packet*	-	-

	that the UE shall receive these packets - if they were received is checked in step 105.				
76	SS-NW Configures Cell 1 as "Serving cell"	-	-	-	-
76A	Void	-	-	-	-
77-80A	Steps 1 - 4 from the generic test procedure for UE Registration, UE Test Mode Activated (State 2A) defined in TS 36.508 [18] subclause 4.5.2A take place.	-	-	-	-
-	EXCEPTION: In parallel to the event described in steps 81 - 85 N1 the events described in Table 19.1.6.3.2-2 take place	-	-	-	-
81-85N1	Steps 5 - 19 from the generic test procedure for UE Registration, UE Test Mode Activated (State 2A) defined in TS 36.508 [18] subclause 4.5.2A take place.	-	-	-	-
86-103	Void	-	-	-	-
104	The SS-NW transmits an UE TEST LOOP PROSE PACKET COUNTER REQUEST message.	<--	UE TEST LOOP PROSE PACKET COUNTER REQUEST	-	-
105	Check: Does the UE respond with UE TEST LOOP PROSE PACKET COUNTER RESPONSE with STCH_PACKET_COUNTER=9?	-->	UE TEST LOOP PROSE PACKET COUNTER RESPONSE	10	P
106-107b1	Void.	-	-	-	-
108	The SS transmits an OPEN UE TEST LOOP message to exit the UE test loop mode.	<--	OPEN UE TEST LOOP	-	-
109	The UE transmits an OPEN UE TEST LOOP COMPLETE message.	-->	OPEN UE TEST LOOP COMPLETE	-	-
110	The SS transmits a DEACTIVATE TEST MODE message to de-activate UE radio bearer test mode procedure.	<--	DEACTIVATE TEST MODE	-	-
111	The UE transmits a DEACTIVATE TEST MODE COMPLETE message.	-->	DEACTIVATE TEST MODE COMPLETE	-	-
112	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
113	Wait for the configured collection period time to elapse (see 36.508 [18], clause 4.9.3.1, ProSe CollectionPeriod value in EF_{PROSE_UIRC}). NOTE: The period starts with the first UE Direct communication transmission in step 17B. Note that depending on the time the TC may take to move from step 17B to step 112 the configured collection period time may have already elapsed at this point of time.	-	-	-	-
114	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition USAGEINFOREPORT defined in TS 36.508 [18] subclause 4.5A.22 take place in the next 5 sec? (UE performs Usage information report list sending procedure) NOTE: The pre-configured timers shall be set so that it is ensured that at this moment of time the configured reporting window has not elapsed after the configured collection period elapsed see 36.508 [18], clause 4.9.3.1, ProSe ReportingWindow value in EF_{PROSE_UIRC}.	-	-	9	P
115	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-

Table 19.1.6.3.2-2: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE transmit a *SidelinkUEInformation* message requesting resources for transmission of sidelink communication in RRC_CONNECTED.	-->	*SidelinkUEInformation*	-	-

19.1.6.3.3 Specific message contents

Table 19.1.6.3.3-1: *SystemInformationBlockType18* for Cell 1 when active

Derivation Path: 36.508 [18] , table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType18-r12 ::= SEQUENCE {			
commConfig-r12 SEQUENCE {			
commRxPool-r12 SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolNormalCommon-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12 {			
SL-CommResourcePool-r12[2]	Not Present		
}			
commTxPoolExceptional-r12	Not Present		
commSyncConfig-r12	Not Present		
}			
}			
Note: SideLink direct communication supported; resources for transmission in RRC_IDLE provided (*commTxPoolNormalCommon* - 1 pool, *SL-CommResourcePool-r12[1]*); resources for reception in RRC_IDLE provided (*commRxPool* - 2 pools *SL-CommResourcePool-r12[1]*, *SL-CommResourcePool-r12[3]*).			

Table 19.1.6.3.3-2: ATTACH REQUEST (Preamble)

Derivation path: 36.508 [18] , table 4.7.2-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'0' or '1'	The UE may, but need not to, support also ProSe direct discovery	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'1'	The ProSe direct communication supported	

Table 19.1.6.3.3-3: Void

Table 19.1. 6.3.3-4: *SidelinkUEInformation* (step 1, Table 19.1.6.3.2-2, step 11, Table 19.1.6.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs ::= SEQUENCE {			
commRxInterestedFreq-r12	f1	Preconfigured value for the service authorisation (same as the frequency on which the simulated cells operate)	Indicates the frequency on which the UE is interested to receive sidelink communication
commTxResourceReq-r12 SEQUENCE {		Indicates the frequency on which the UE is interested to transmit sidelink communication as well as the sidelink communication transmission destination(s) for which the UE requests E-UTRAN to assign dedicated resources.	
carrierFreq-r12	f1	Preconfigured value for the service authorisation (same as the frequency on which the simulated cells operate)	
destinationInfoList-r12 SEQUENCE (SIZE (1..maxSL-Dest-r12)) OF SL-DestinationIdentity-r12	1 entry		
SL-DestinationIdentity-r12[1]	the destination which is identified by the ProSe Layer-2 Group ID	Preconfigured value for the service authorisation	
}			
}			
discRxInterest-r12	Not Present	Note 1	
discTxResourceReq-r12	Not Present	Note 1	
}			
Note 1: It is assumed that it will be possible to trigger in the UE an Application that requests only sidelink communication transmission.			

Table 19.1.6.3.3-5: *MasterInformationBlock-SL* (steps 17D, 29, 32, Table 19.1.6.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-4A0			
Information Element	**Value/remark**	**Comment**	**Condition**
MasterInformationBlock-SL ::= SEQUENCE {			
inCoverage-r12	FALSE	UE is out of E-UTRAN coverage	
}			

Table 19.1.6.3.3-6: *MasterInformationBlock-SL* (step 22, Table 19.1.6.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-4A0			
Information Element	**Value/remark**	**Comment**	**Condition**
MasterInformationBlock-SL ::= SEQUENCE {			
sl-Bandwidth-r12	px_SL_AdditionalSupportedBandwidth : a value different to the value of the corresponding field included in the preconfigured sidelink parameters (i.e. *preconfigGeneral* in *SL-Preconfiguration*)		
}			

Table 19.1.6.3.3-7: Void

Table 19.1.6.3.3-8: *MasterInformationBlock-SL* (step 30, Table 19.1.6.3.2-1)

Derivation Path: 36.508 [18], table 4.6.1-4A0			
Information Element	**Value/remark**	**Comment**	**Condition**
MasterInformationBlock-SL ::= SEQUENCE {			
sl-Bandwidth-r12	px_SL_AdditionalSupportedBandwidth : a value different to the value of the corresponding field included in the preconfigured sidelink parameters (i.e. *preconfigGeneral* in *SL-Preconfiguration*)		
inCoverage-r12	FALSE	UE is out of E-UTRAN coverage	
}			

Table 19.1.6.3.3-9: UPDATE UE LOCATION INFORMATION (step 1, Table 19.1.6.3.2-1)

Derivation Path: 36.509 [38], clause 6.12.			
Information Element	**Value/remark**	**Comment**	**Condition**
ellipsoidPointWithAltitude		The Location information provided shall be different to the one pre-configured in the UE (see TS 36.508 [18], clause 4.9.3.1, $EF_{PROSE\_RADIO\_COM}$) as geographical area where the UE is allowed to use prose communication	
horizontalVelocity	horizontalVelocity: 0 m/s		
Gnss-TOD-msec	Equal to system time		

Table 19.1.6.3.3-10: UPDATE UE LOCATION INFORMATION (step 12, Table 19.1.6.3.2-1)

Derivation Path: 36.509 [38], clause 6.12.			
Information Element	**Value/remark**	**Comment**	**Condition**
ellipsoidPointWithAltitude		The Location information provided shall match the area 1 pre-configured in the UE (see TS 36.508 [18], clause 4.9.3.1, $EF_{PROSE\_RADIO\_COM}$) as geographical area where the UE is allowed to use prose communication	
horizontalVelocity	horizontalVelocity: 0 m/s		
Gnss-TOD-msec	Equal to system time		

Table 19.1.6.3.3-11: CLOSE UE TEST LOOP (step 13, Table 19.1.6.3.2-1)

Derivation Path: 36.508 [18], table 4.7A-3 condition UE TEST LOOP MODE E			
Information Element	Value/remark	Comment	Condition
Communication Transmit or Receive	00000000	RECEIVE receive sidelink direct communication	this is the default

Table 19.1.6.3.3-12: UPDATE UE LOCATION INFORMATION (step 70, Table 19.1.6.3.2-1)

Derivation Path: 36.509 [38], clause 6.12.			
Information Element	**Value/remark**	**Comment**	**Condition**
ellipsoidPointWithAltitude		The Location information provided shall match the area 2 pre-configured in the UE (see TS 36.508 [18], clause 4.9.3.1, $EF_{PROSE\_RADIO\_COM}$) as geographical area where the UE is allowed to use prose communication	
horizontalVelocity	horizontalVelocity: 0 m/s		
Gnss-TOD-msec	Equal to system time		

19.1.7 Void

19.1.8 ProSe Direct Communication/Security Aspects / Release of PDN Connection used to receive MIKEY Messages/ Correct Key Request Message/ MIKEY Verification Message

19.1.8.1 Test Purpose (TP)

(1)

```
with { UE served by E-UTRAN PLMN supporting ProSe and intending to use One-to-many ProSe direct
communication }
```

```
ensure that {
  when { the UE received MIKEY message on additional PDN and UE is triggered to initiate
deactivation of the additional PDN }
   then { the UE shall not send PDN DISCONNECT REQUEST }
            }
```

(2)

```
with { the UE has informed the ProSe Key Management Function that it no longer requires PGK }
ensure that {
  when { the UE is triggered to initiate deactivation of the additional PDN }
   then { the UE shall send PDN DISCONNECT REQUEST  }
            }
```

19.1.8.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 33.303, clause 6.2.3.3.2.2

[TS 33.303, clause 6.2.3.3.2.2]

…

The UE shall not release the PDN connection used to receive MIKEY messages containing PGKs until the UE has informed the ProSe Key Management Function that it no longer requires PGKs. This is to ensure that the ProSe Key Management Function is aware of the correct UE IP address for the purpose of performing PGK deliveries as specified in clause 6.2.3.3.2.3.

…

19.1.8.3 Test description

19.1.8.3.1 Pre-test conditions

System Simulator:

- Cell 1
- System information combination 23 as defined in TS 36.508 [18] clause 4.4.3.1 is used in E-UTRA Cell 1.

UE:

- The UE is authorised to perform ProSe Direct Communication.
- The UE has pre-configured radio parameters (*preconfigComm*) as defined in TS 36.508 with an associated geographical area and a UICC with all values equal to the default profile given inTS 36.508 [18], section 4.9.3.1 except for those listed in Table 19.1.8.3.1-1.

Table 19.1.8.3.1-1: **USIM configuration**

USIM field	Priority	Value
$EF_{PROSE\_RADIO\_COM}$		Is present
EF_{UST}		Service 101 is supported
EF_{AD}		UE is authorized to use pre-configured parameters for ProSe
EF_{PROSE_PLMN}		PLMN of Cell 1
EF_{PST}		Service n°3 and service n°6 are supported
EF_{PROSE_POLICY}		Group ID = '0000 0000 0000 0000 0000 0000 0000 0000' [BIN]
		ProSe UE ID = '0000 0000 0000 0000 0000 0000 0000 0001' [BIN]

Preamble:

- The UE is in state Registered, Idle mode (state 2) according to [18].

19.1.8.3.2 Test procedure sequence

Table 19.1.8.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Trigger the UE to send the KEY_REQUEST. (Note 1)	-	-	-	-
2-12	TS 36.508 clause 4.5A.22: Step 1-11 of Communication with the ProSe Function procedure is completed. TS 36.508 Table 4.5A.22.3-2: Step 1a1 to 9 is only executed	-	-	-	-
13	UE sends KEY_REQUEST message to the ProSe Key Management Function	-->	HTTP Request containing KEY_REQUEST	-	-
14	SS transmits a KEY_RESPONSE message	<--	HTTP Response containing KEY_RESPONSE	-	-
15	SS transmits a MIKEY message containing PGK	<--	MIKEY message containing Key Delivery message	-	-
16	UE sends MIKEY verification message	-->	MIKEY message containing verification message	-	-
17	Initiate the deactivation of the additional PDN in UE. (see Note 2)	-	-	-	-
18	Check: Does the UE transmit PDN DISCONNECT REQUEST message?	-->	PDN DISCONNECT REQUEST	-	F
19	Trigger the UE to send KEY_REQUEST message to the ProSe Key Management Function to inform that UE no longer requires PGK. (Note 3)	-->	HTTP Request containing KEY_REQUEST	-	-
20	SS transmits a KEY_RESPONSE message	<--	HTTP Response containing KEY_RESPONSE	-	-
21	Initiate the deactivation of the additional PDN in UE. (see Note 2)	-	-	-	-
22	Check: Does the UE transmit PDN DISCONNECT REQUEST message?	-->	PDN DISCONNECT REQUEST	-	P
23	Deactivation of the additional PDN is triggered in UE. The additional PDN shall be released as specified in steps 10-13 of TS 36.508 subclause 4.5A.17.	-	-	-	-
Note 1: The trigger in step 1 is the same as in the generic procedure in 36.508 clause 4.5A.22 Note 2: Deactivation of the additional PDN is initiated by MMI or AT command Note 3: Trigger is initiated by MMI or AT command					

19.1.8.3.3 Specific message contents:

Table 19.1.8.3.3-1: KEY_REQUEST (step 19, table 19.1.8.3.2-1)

Derivation path: 36.508 Table 4.7F.3-1			
Field	**Value/remark**	**Comment**	**Condition**
transaction-ID	Any		
GroupKeyReq	Not Present		
GroupKeyStop	One entry		
GroupId	Same as the GroupId sent in Step 13		

Table 19.1.8.3.3-2: KEY_RESPONSE (step 20, table 19.1.8.3.2-1)

Derivation path: 36.508 Table 4.7F.3-2			
Field	**Value/remark**	**Comment**	**Condition**
transaction-ID	Same as in Step 19		
GroupNotSupported	One entry		
GroupId	Same as the GroupId sent in Step 19		
Error-Code	4	UE requested to stop receiving PGKs for this group	
GroupResponse	Not Present		
Key-info	Not Present		

19.1.9 ProSe Direct Communication/Pre-configured authorisation / UE out of coverage on the frequency used for sidelink communication / Isolated one-to-one ProSe direct communication / Success/Direct link keepalive/Release upon User request / MO

19.1.9.1 Test Purpose (TP)

(1)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication and within the pre-set geographical
area }
ensure that {
  when { UE wants to establish one-to-one ProSe direct communication with a remote UE with the link
layer identifier for the target UE pre-configured }
    then { UE sends a DIRECT_COMMUNICATION_REQUEST message }
            }
```

(2)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication and within the pre-set geographical
area, and, the UE having sent a DIRECT_COMMUNICATION_REQUEST message }
ensure that {
  when { UE receives a DIRECT SECURITY MODE COMMAND from the remote UE requesting the establishment
of Security association for the requested direct link }
    then { UE sends a DIRECT_SECURITY_MODE_COMPLETE message ciphered and integrity protected with
the new security context, and, from this moment on protects all signalling messages and user data
with the new security context }
            }
```

(3)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication and within the pre-set geographical
area, and, the UE having established one-to-one ProSe direct communication with a remote UE }
ensure that {
  when { UE's keepalive timer T4102 expires }
    then { UE performs a Direct link keepalive procedure }
            }
```

(4)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication and within the pre-set geographical
area, and, the UE having established one-to-one ProSe direct communication with a remote UE }
ensure that {
  when { UE receives request from upper layers to release a direct link with the peer UE }
```

```
then { UE releases the secure direct link }
       }
```

19.1.9.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 23.303, clause 5.4.5.1, TS 36.331, clause 5.10.4, TS 24.334, clauses 5.1.1, 10.2.3, 10.4.1A, 10.4.2.1, 10.4.2.2, 10.4.2.4, 10.4.3.2, 10.4.3.4, 10.4.4.2, 10.4.4.4, 10.4.5.1, 10.4.5.3, 10.4.6.1, 10.4.6.2. Unless otherwise stated these are Rel-13 requirements.

[TS 23.303, clause 5.4.5.1]

One-to-one ProSe Direct Communication is realised by establishing a secure layer-2 link over PC5 between two UEs.

Each UE has a Layer-2 ID for unicast communication that is included in the Source Layer-2 ID field of every frame that it sends on the layer-2 link and in the Destination Layer-2 ID of every frame that it receives on the layer-2 link.

NOTE: Conflicts between Destination Layer-2 ID for unicast and one-to-many communication will be resolved by RAN WG2.

The UE needs to ensure that the Layer-2 ID for unicast communication is at least locally unique. To that effect the UE should be prepared to handle Layer-2 ID conflicts with adjacent UEs using unspecified mechanisms (e.g. self-assign a new Layer-2 ID for unicast communication when a conflict is detected).

The layer-2 link for one-to-one ProSe Direct Communication is identified by the combination of the Layer-2 IDs of the two UEs. This means that the UE can engage in multiple layer-2 links for one-to-one ProSe Direct Communication using the same Layer-2 ID.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery and ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 10.4.1A]

The UE shall be authorised for one-to-one ProSe direct communication and obtain the ProSe direct communication policy parameters based on the service authorisation procedure as specified in clause 5 before initiating or participating in any PC5 Signalling Protocol procedures for one-to-one ProSe direct communication.

The UE shall select the radio resources for one-to-one ProSe direct communication as described for one-to-many ProSe direct communication in subclauses 10.2.1, 10.2.2 and 10.2.3.

[TS 36.331, clause 5.10.4]

A UE capable of sidelink communication that is configured by upper layers to transmit non-relay related sidelink communication and has related data to be transmitted or a UE capable of relay related sidelink communication that is configured by upper layers to transmit relay related sidelink communications and satisfies the conditions for relay related sidelink communication specified in this section shall:

...

2> else (i.e. out of coverage on sidelink carrier):

3> if *priorityList* is included for the entries of *preconfigComm* in *SL-Preconfiguration* defined in 9.3:

...

3> else:

4> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources that were preconfigured i.e. indicated by the first entry in *preconfigComm* in *SL-Preconfiguration* defined in 9.3 and in accordance with the timing of the selected SyncRef UE, or if the UE does not have a selected SyncRef UE, based on the UEs own timing;

[TS 24.334, clause 10.2.3]

When the UE is not served by E-UTRAN, the UE shall select the radio parameters to be used for ProSe direct communication as follows:

- if the UE can determine itself located in a geographical area, and the UE is provisioned with radio parameters for the geographical area, the UE shall select the radio parameters associated with that geographical area; or

- in all other cases, the UE shall not initiate ProSe direct communication.

NOTE 1: It is out of scope of the present specification to define how the UE can locate itself in a specific Geographical Area. When the UE is in coverage of a 3GPP RAT it can for example use information derived from the serving PLMN. When the UE is not in coverage of a 3GPP RAT it can use other techniques as determined by local regulations.

Before initiating ProSe direct communication, the UE shall check with lower layers whether the selected radio parameters can be used in the current location without causing interference to other cells as specified in 3GPP TS 36.331 [12], and:

- if the lower layers indicate that the usage would not cause any interference, the UE shall initiate ProSe direct communication; or

[TS 24.334, clause 10.4.2.1]

If the direct link setup is for isolated one-to-one ProSe direct communication, i.e. when none of the two UEs is a ProSe UE-to-network relay, both UEs are required to have fetched in advance the public key of the KMS (Key Management Server), and a set of credentials associated with the UE's identity (as defined in IETF RFC 6507 [39] and IETF RFC 6508 [40]), as specified by 3GPP TS 33.303 [6].

[TS 24.334, clause 10.4.2.2]

The initiating UE shall meet the following pre-conditions before initiating this procedure:

- a request from upper layers to establish a direct link with the target UE is received and there is no existing link between the initiating UE and that target UE;

- the link layer identifier for the initiating UE (i.e., Layer 2 ID used for unicast communication) is available (e.g. pre-configured or self-assigned);

- the link layer identifier for the target UE (i.e., Layer 2 ID used for unicast communication) is available to the initiating UE (e.g., pre-configured or obtained via ProSe direct discovery); and

- the initiating UE is either authorised for ProSe direct communication in the serving PLMN, or has a valid authorization for ProSe direct communication when not served by E-UTRAN.

The initiating UE initiates the direct link setup procedure by generating a DIRECT_COMMUNICATION_REQUEST message with:

- the User Info set to:

  - the initiating UE’s User Info received from upper layers if the target UE is not a ProSe UE-to-network relay UE;

  ...

- an IP Address Config IE set to one of the following values:

  - "DHCPv4 Server" if only IPv4 address allocation mechanism is supported by the initiating UE, i.e., acting as a DHCPv4 Server;

- "IPv6 Router" if only IPv6 address allocation mechanism is supported by the initiating UE, i.e., acting as an IPv6 Router;

- "DHCPv4 Server & IPv6 Router" if both IPv4 and IPv6 address allocation mechanisms are supported by the initiating UE; or

- "address allocation not supported" if neither IPv4 nor IPv6 address allocation mechanism is supported by the initiating UE;

- a Link Local IPv6 Address IE formed locally based on IETF RFC 4862 [15] if the IP Address Config IE is set to "address allocation not supported" and the link is setup for isolated one-to-one communication;

NOTE 1: the UE can reuse a Link Local IPv6 IP address for multiple isolated one-to-one communication links.

- a Maximum Inactivity Period IE to indicate the maximum inactivity period of the requesting UE over this direct link;

NOTE 2: The value of Maximum Inactivity Period IE can be calculated based on UE's local settings, such as keepalive timer T4102 (see 10.4.3), retransmission timer T4101 (see 10.4.3), and maximum number of allowed retransmissions for DIRECT_COMMUNICATION_KEEPALIVE message.

- a Nonce_1 IE set to the 128-bit nonce value generated by the initiating UE for the purpose of session key establishment over this direct link;

- a UE Security Capabilities IE set to indicate the list of algorithms that the initiating UE supports for the security establishment of this direct link;

- an MSB of $K_{D\text{-}sess}$ ID IE set to the most significant 8 bits of the $K_{D\text{-}sess}$ ID; and

- Optionally, a K_D ID IE set to the known ID of K_D which was previously established if the initiating UE has an existing K_D with the target UE.

If the direct link setup is for isolated one-to-one ProSe direct communication, the DIRECT_COMMUNICATION_REQUEST message shall also include the following parameters:

- the Signature IE set to the ECCSI signature calculated with the following information elements, as specified in 3GPP TS 33.303 [6]:

  - User Info; and

  - Nonce_1.

...

After the DIRECT_COMMUNICATION_REQUEST message is generated, the initiating UE shall pass this message to the lower layers for transmission along with the initiating UE's Layer 2 ID (for unicast communication) and the target UE's Layer 2 ID (for unicast communication), and start timer T4100. The UE shall not send a new DIRECT_COMMUNICATION_REQUEST message to the same target UE while timer T4100 is running.

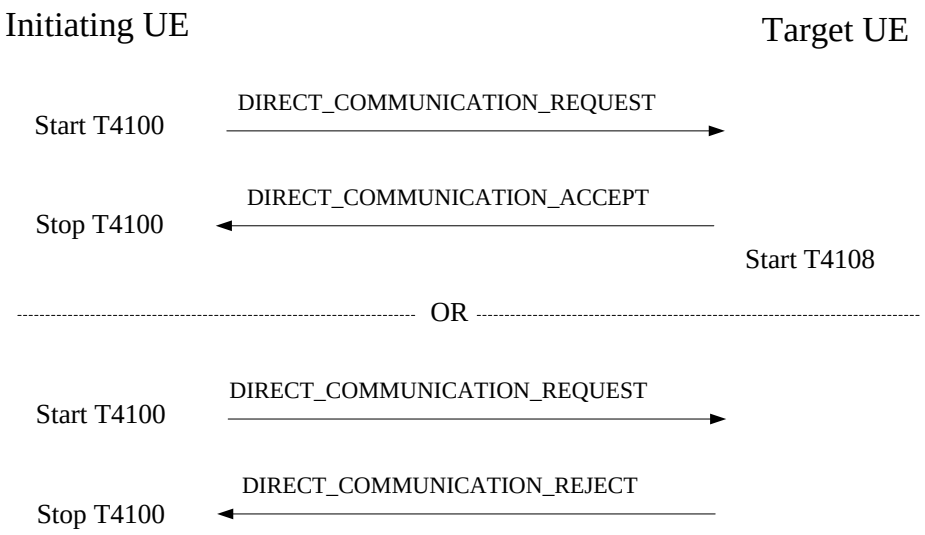

Figure 10.4.2.2.1: Direct link setup procedure

[TS 24.334, clause 10.4.5.1]

Security association for a direct link between two ProSe-Enabled UEs is established during the direct link setup procedure or direct link rekeying procedure with the exchange of message contents related to direct security mode establishment. After successful completion of the direct security mode control procedure, the selected security algorithms and keys are used to integrity protect and cipher all PC5 Signalling messages exchanged between the UEs; and are also used to cipher all data plane traffic exchanged between the UEs.

[TS 24.334, clause 10.4.5.3]

Upon receipt of the DIRECT_SECURITY_MODE_COMMAND message, the peer UE shall check whether the security mode command can be accepted or not. This is done by performing the integrity check of the message and by checking that the received UE security capabilities have not been altered compared to the latest values that the peer UE sent to the commanding UE in the DIRECT_COMMUNICATION_REQUEST or DIRECT_REKEYING_REQUEST message.

In order to check the integrity, the peer UE needs to create the security context as described in 3GPP TS 33.303 [6]. If the MSB of K_D ID were included in the DIRECT_SECURITY_MODE_COMMAND message then the peer UE shall take one of the following two actions:

- If performing isolated one-to-one ProSe direct communication, the peer UE shall first check the signature included in the SIGN IE of the DIRECT SECURITY MODE COMMAND and then obtain the new K_D from the Encrypted Payload IE; or

...

If MSB of K_D ID was not included in the DIRECT_SECURITY_MODE_COMMAND, then the peer UE shall use either the existing K_D indicated by the K_D ID included in the DIRECT_COMMUNICATION_REQUEST or the currently used one.

The peer UE shall then derive the $K_{D\text{-}sess}$ based on the $KD\text{-}_{sess}$ ID in the same way as the commanding UE. Finally the peer UE shall use the algorithms indicated in the Chosen Algorithms IE.

If the DIRECT_SECURITY_MODE_COMMAND message can be accepted, the peer UE shall send a DIRECT_SECURITY_MODE_COMPLETE message ciphered and integrity protected with the new security context. The DIRECT_SECURITY_MODE_COMPLETE message shall include the 16 least significant bits of the K_D ID if the initiating UE included the MSB of K_D ID in the DIRECT_SECURITY_MODE_COMMAND message.

From this time onward the peer UE shall protect all signalling messages and user data with the new security context.

[TS 24.334, clause 10.4.2.4]

Upon receipt of the DIRECT_COMMUNICATION_ACCEPT message, the initiating UE shall stop timer T4100. From this time onward the initiating UE shall use the established link for all one-to-one communication (including additional PC5 Signalling messages) to the target UE.

[TS 24.334, clause 10.4.6.1]

The IP address configuration procedure is performed after the establishment of the direct link to enable IP connectivity between the UEs at each end of the direct link.

[TS 24.334, clause 10.4.6.2]

When neither of the two UEs on the direct link acts as a ProSe UE-to-network relay, the two UEs shall select the IP version (IPv4 or IPv6) to be used based on the following rules:

...

- if the target UE in the direct link setup procedure has indicated "address allocation not supported" in the IP Address Config IE and the initiating UE has indicated "DHCPv4 Server", "IPv6 Router" or "DHCPv4 Server & IPv6 Router" in the IP Address Config IE, then the target UE shall:

  a) initiate the IPv4 address configuration with DHCPv4 procedure acting as a DHCP client, if the initiating UE has indicated "DHCPv4 Server";

  b) initiate the IPv6 address configuration with IPv6 stateless address auto-configuration acting as an IPv6 host if the initiating UE has indicated "IPv6 Router"; and

  c) choose either IP version and initiate the corresponding IP address configuration procedure as a client or host, if the other UE has indicated "DHCPv4 Server & IPv6 Router"; and

- if both of the UEs has indicated "address allocation not supported" in the IP Address Config IE, then the UEs shall use IPv6 link-local addresses formed locally as defined in RFC 4862 [15].

[TS 24.334, clause 10.4.3.2]

The requesting UE manages a keepalive timer T4102 and a keepalive counter for this procedure. The keepalive timer T4102 is used to trigger the periodic initiation of the procedure. It is started or restarted whenever the UE receives a PC5 Signalling message or PC5 user plane data from the peer UE over this link. The keepalive counter is set to an initial value of zero after link establishment.

The requesting UE may initiate the procedure if:

- a request from upper layers to check the viability of the direct link is received; or

- the keepalive timer T4102 for this link expires.

The requesting UE initiates the procedure by stopping timer T4102 if it is still running and generating a DIRECT_COMMUNICATION_KEEPALIVE message with a Keepalive Counter IE that contains the value of the keepalive counter for this link. Optionally, the initiating UE may include a Maximum Inactivity Period IE to indicate the maximum inactivity period of the requesting UE over this direct link. When a remote UE sends DIRECT_COMMUNICATION_KEEPALIVE message to the ProSe UE-to-network relay UE, this IE shall be included.

After the DIRECT_COMMUNICATION_KEEPALIVE message is generated, the requesting UE shall pass this message to the lower layers for transmission along with the requesting UE’s Layer 2 ID (for unicast communication) and the peer UE's Layer 2 ID (for unicast communication), and start retransmission timer T4101.

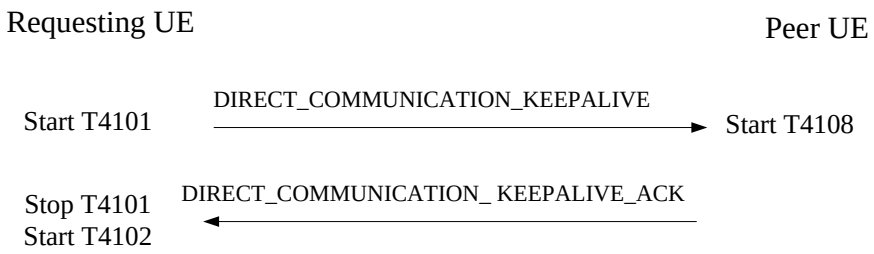

Figure 10.4.3.2.1: Direct link keepalive procedure

[TS 24.334, clause 10.4.3.4]

Upon receiving a DIRECT_COMMUNICATION_KEEPALIVE_ACK message, the requesting UE shall stop retransmission timer T4101, start keepalive timer T4102 and increment the keepalive counter for this link.

[TS 24.334, clause 10.4.4.2]

The releasing UE shall initiate the procedure if:

- a request from upper layers to release a direct link with the peer UE which uses a known Layer 2 ID (for unicast communication) is received and there is an existing link between those two UEs; or

...

The releasing UE initiates the direct link release procedure by generating a DIRECT_COMMUNICATION_RELEASE message with a Release Reason IE indicating one of the following cause values:

#1 Direct Communication to peer UE no longer needed;

...

After the DIRECT_COMMUNICATION_RELEASE message is generated, the releasing UE shall pass this message to the lower layers for transmission along with the releasing UE's Layer 2 ID (for unicast communication) and the peer UE's Layer 2 ID (for unicast communication). The releasing UE shall release the direct link locally if the release reason is #3 "Direct connection is not available any more". Otherwise, the releasing UE shall start timer T4103.

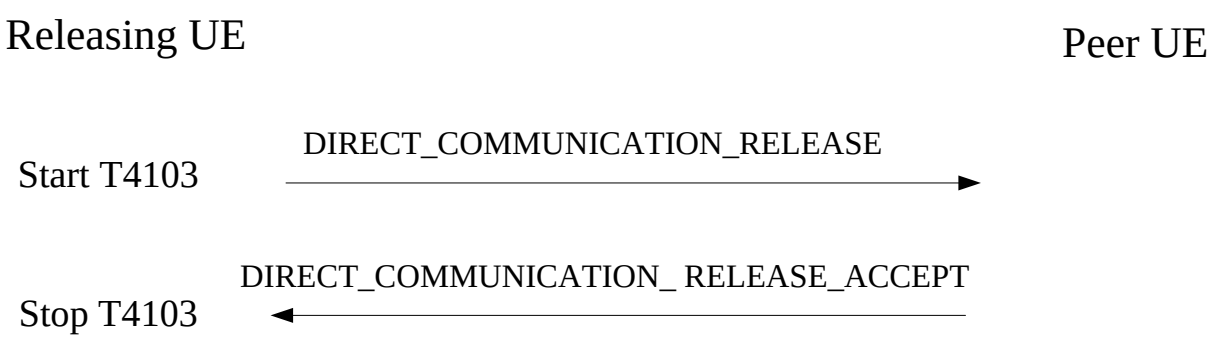

Figure 10.4.4.2.1: Direct link release procedure

[TS 24.334, clause 10.4.4.4]

Upon receipt of the DIRECT_COMMUNICATION_RELEASE_ACCEPT message, the releasing UE shall stop timer T4103. From this time onward the releasing UE shall no longer send or receive any messages via this link.

19.1.9.3 Test description

19.1.9.3.1 Pre-test conditions

System Simulator:

SS-UE

- SS-UE1.
  - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting and receiving device.

GNSS simulator (optional).

NOTE: For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". This can be done by usage of a GNSS simulator, or some suitable MMI action.

UE:

- ProSe related configuration
  - The UE is authorised to perform ProSe Direct Communication; The UE is equipped with a USIM containing values shown in Table 19.1.9.3.1-1, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, etc.).

Table 19.1.9.3.1-1: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.
$EF_{PROSE\_RADIO\_COM}$	b2=1 indicates that the UE is authorised to perform one-to-one ProSe direct communication when not served by E-UTRAN.

  - For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". If this is not done by using n GNSS simulator then the UE needs to be preconfigured via a suitable MMI action.

Preamble:

- The UE is in state Switched OFF (state 1) according to TS 36.508 [18].

19.1.9.3.2 Test procedure sequence

Table 19.1.9.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Power up the UE.	-	-	-	-
2	Wait for 15 sec to allow the UE to establish that it is out of coverage and initiate scanning the frequency pre-set for ProSe communication for any activities.	-	-	-	-
3	Make the UE initiate one-to-one ProSe direct communication with the remote UE preconfigured in the USIM (ProSe Layer-2 Group ID).	-	-	-	-
4	Check: Does the UE send a DIRECT_COMMUNICATION_REQUEST message, IP Address Config IE set to "address allocation not supported"?	-->	DIRECT_COMMUNICATION_REQUEST	1	P
5	SS-UE1 sends a DIRECT_SECURITY_MODE_COMMAND message.	<--	DIRECT_SECURITY_MODE_COMMAND	-	-
6	Check: Does the UE send a DIRECT_SECURITY_MODE_COMPLETE message ciphered and integrity protected with the new security context?	-->	DIRECT_SECURITY_MODE_COMPLETE	2	P
7	SS-UE1 sends a DIRECT_COMMUNICATION_ACCEPT message.	<--	DIRECT_COMMUNICATION_ACCEPT	-	-
-	EXCEPTION: After the communication is established, an IP address configuration procedure is performed depending on what the UE has indicated in the IP Address Config IE (if it is not "address allocation not supported") in the DIRECT_COMMUNICATION_REQUEST message, and, the SS-UE1 itself indicating "address allocation not supported" in the DIRECT_COMMUNICATION_ACCEPT message.	-	-	-	-
8	Start timer T4102=px_ProSe_T4102_keepalive_value. NOTE: The SS shall not send any direct communication data (neither PC5 Signalling message nor PC5 user plane data) until the event in step 9 takes place to ensure that the UE does not re-start timer T4102.	-	-	-	-
9	Timer T4102 expires	-	-	-	-
10	Check: Does the UE send a DIRECT_COMMUNICATION_KEEPALIVE message with a Keepalive Counter IE that contains the value of the keepalive counter for this link=0?	-->	DIRECT_COMMUNICATION_KEEPALIVE	3	P
11	SS-UE1 sends a DIRECT_COMMUNICATION_KEEPALIVE_ACK message.	<--	DIRECT_COMMUNICATION_KEEPALIVE_ACK	-	-
12	Make the UE release the one-to-one ProSe direct communication with the remote UE.	-	-	-	-
13	Check: Does the UE send a DIRECT_COMMUNICATION_RELEASE message with a Release Reason IE indicating 'Direct Communication to peer UE no longer needed'?	-->	DIRECT_COMMUNICATION_RELEASE	4	P
14	SS-UE1 sends a DIRECT_COMMUNICATION_RELEASE_ACCEPT message.	<--	DIRECT_COMMUNICATION_RELEASE_ACCEPT	-	-

19.1.9.3.3 Specific message contents

Table 19.1.9.3.3-1: DIRECT_COMMUNICATION_ACCEPT (step 7 Table 19.1.9.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0A.			
Information Element	**Value/remark**	**Comment**	**Condition**
IP Address Config	'0011'B	address allocation not supported	
Link Local IPv6 Address	If the UE indicated 'address allocation not supported' in the IP Address Config IE in the DIRECT_COMMUNICATION_REQUEST message then a link-local IPv6 address formed locally	128-bit IPv6 address	

Table 19.1.9.3.3-2: DIRECT_SECURITY_MODE_COMMAND (step 5, Table 19.1.9.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0G.			
Information Element	**Value/remark**	**Comment**	**Condition**
UE Security Capabilities	Set to the UE Security Capabilities received in the DIRECT_COMMUNICATION_REQUEST message		
Chosen Algorithms	One of the non-null algorithms provided in UE Security Capabilities (i.e. different to EIA0 (null integrity protection algorithm)/EEA0 (null ciphering algorithm))		
MSB of K_D ID	The MSB of KD ID of the new KD		
K_D Freshness	Not included		
GPI	Not included		
User Info {			
Type of User Info	IMSI		
Odd/even indication	Reflecting the number of digits in the IMSI		
Identity digits	A value different to the IMSI of the UE		
}			

Table 19.1.9.3.3-3: DIRECT_SECURITY_MODE_COMPLETE (step 6, Table 19.1.9.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0H.			
Information Element	**Value/remark**	**Comment**	**Condition**
LSB of KD ID	Not included		

Table 19.1.9.3.3-4: DIRECT_COMMUNICATION_KEEPALIVE (step 10, Table 19.1.9.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0B.			
Information Element	**Value/remark**	**Comment**	**Condition**
Keepalive Counter	0		
Maximum Inactivity Period	Any allowed value		

Table 19.1.9.3.3-5: DIRECT_COMMUNICATION_RELEASE (step 13, Table 19.1.9.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0D.			
Information Element	**Value/remark**	**Comment**	**Condition**
Release Reason	'0001'B	Direct communication to the peer UE no longer needed	

19.1.10 ProSe Direct Communication/Pre-configured authorisation / UE out of coverage on the frequency used for sidelink communication / Isolated one-to-one ProSe direct communication / Success/Direct link keepalive/Release upon User request / MT

19.1.10.1 Test Purpose (TP)

(1)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication and within the pre-set geographical
area }
ensure that {
  when { UE receives a request for the establishment of one-to-one ProSe direct communication from a
remote UE }
    then { UE request the establishment of Security association for the requested for a direct link
by sending DIRECT SECURITY MODE COMMAND message unciphered and integrity protected with the new
security context }
            }
```

(2)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication and within the pre-set geographical
area, and, the UE having requested establishment of Security association for the requested for a
direct link }
ensure that {
  when { UE receives a DIRECT_SECURITY_MODE_COMPLETE message from the remote UE }
    then { UE sends a DIRECT_COMMUNICATION_ACCEPT message and considers the establishment of one-to-
one ProSe direct communication completed }
            }
```

(3)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication and within the pre-set geographical
area, and, the UE having established one-to-one ProSe direct communication with a remote UE }
ensure that {
  when { UE receives a DIRECT_COMMUNICATION_KEEPALIVE message including a Maximum Inactivity Period
IE as part of a Direct link keepalive procedure }
    then { UE responds with a DIRECT_COMMUNICATION_KEEPALIVE_ACK message }
            }
```

(4)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication and within the pre-set geographical
area, and, the UE having established one-to-one ProSe direct communication with a remote UE, and,
having set timer T4108 as result of a Direct link keepalive procedure }
ensure that {
  when { UE gets involved in a communication with the remote UE }
    then { UE restarts timer T4108, and, when timer T4108 expires without any communication the UE
either initiate its own keepalive procedure to check the link or releases the secure direct link
with the release reason #3 "Direct connection is not available any more" }
            }
```

(5)

```
with { UE being authorized for performing ProSe Direct Communication being provisioned with Radio
parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, and, UE
out of coverage on the frequency used for sidelink communication and within the pre-set geographical
area, and, the UE having established one-to-one ProSe direct communication with a remote UE }
ensure that {
  when { UE receives request from upper layers to release a direct link with the peer UE }
    then { UE releases the secure direct link }
            }
```

19.1.10.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 23.303, clause 5.4.5.1, TS 36.331, clause 5.10.4, TS 24.334, clauses 5.1.1, 10.2.3, 10.4.1A, 10.4.2.1, 10.4.2.3, 10.4.3.2, 10.4.3.3, 10.4.3.4, 10.4.3.5.2, 10.4.4.2, 10.4.4.4, 10.4.5.1, 10.4.5.2, 10.4.5.4, 10.4.6.1, 10.4.6.2. Unless otherwise stated these are Rel-13 requirements.

[TS 23.303, clause 5.4.5.1]

One-to-one ProSe Direct Communication is realised by establishing a secure layer-2 link over PC5 between two UEs.

Each UE has a Layer-2 ID for unicast communication that is included in the Source Layer-2 ID field of every frame that it sends on the layer-2 link and in the Destination Layer-2 ID of every frame that it receives on the layer-2 link.

NOTE: Conflicts between Destination Layer-2 ID for unicast and one-to-many communication will be resolved by RAN WG2.

The UE needs to ensure that the Layer-2 ID for unicast communication is at least locally unique. To that effect the UE should be prepared to handle Layer-2 ID conflicts with adjacent UEs using unspecified mechanisms (e.g. self-assign a new Layer-2 ID for unicast communication when a conflict is detected).

The layer-2 link for one-to-one ProSe Direct Communication is identified by the combination of the Layer-2 IDs of the two UEs. This means that the UE can engage in multiple layer-2 links for one-to-one ProSe Direct Communication using the same Layer-2 ID.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery and ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 10.4.1A]

The UE shall be authorised for one-to-one ProSe direct communication and obtain the ProSe direct communication policy parameters based on the service authorisation procedure as specified in clause 5 before initiating or participating in any PC5 Signalling Protocol procedures for one-to-one ProSe direct communication.

The UE shall select the radio resources for one-to-one ProSe direct communication as described for one-to-many ProSe direct communication in subclauses 10.2.1, 10.2.2 and 10.2.3.

[TS 36.331, clause 5.10.4]

A UE capable of sidelink communication that is configured by upper layers to transmit non-relay related sidelink communication and has related data to be transmitted or a UE capable of relay related sidelink communication that is configured by upper layers to transmit relay related sidelink communications and satisfies the conditions for relay related sidelink communication specified in this section shall:

...

2> else (i.e. out of coverage on sidelink carrier):

3> if *priorityList* is included for the entries of *preconfigComm* in *SL-Preconfiguration* defined in 9.3:

...

3> else:

4> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources that were preconfigured i.e. indicated by the first entry in *preconfigComm* in *SL-Preconfiguration* defined in 9.3 and in accordance with the timing of the selected SyncRef UE, or if the UE does not have a selected SyncRef UE, based on the UEs own timing;

[TS 24.334, clause 10.2.3]

When the UE is not served by E-UTRAN, the UE shall select the radio parameters to be used for ProSe direct communication as follows:

- if the UE can determine itself located in a geographical area, and the UE is provisioned with radio parameters for the geographical area, the UE shall select the radio parameters associated with that geographical area; or
- in all other cases, the UE shall not initiate ProSe direct communication.

NOTE 1: It is out of scope of the present specification to define how the UE can locate itself in a specific Geographical Area. When the UE is in coverage of a 3GPP RAT it can for example use information derived from the serving PLMN. When the UE is not in coverage of a 3GPP RAT it can use other techniques as determined by local regulations.

Before initiating ProSe direct communication, the UE shall check with lower layers whether the selected radio parameters can be used in the current location without causing interference to other cells as specified in 3GPP TS 36.331 [12], and:

- if the lower layers indicate that the usage would not cause any interference, the UE shall initiate ProSe direct communication; or

[TS 24.334, clause 10.4.2.1]

If the direct link setup is for isolated one-to-one ProSe direct communication, i.e. when none of the two UEs is a ProSe UE-to-network relay, both UEs are required to have fetched in advance the public key of the KMS (Key Management Server), and a set of credentials associated with the UE's identity (as defined in IETF RFC 6507 [39] and IETF RFC 6508 [40]), as specified by 3GPP TS 33.303 [6].

[TS 24.334, clause 10.4.2.3]

Upon receiving a DIRECT_COMMUNICATION_REQUEST message, the target UE shall store the pair of Layer 2 IDs (for unicast communication) used in the transport of this message provided by the lower layers and associate them with a direct link context.

The target UE then checks the User Info IE included in the DIRECT_COMMUNICATION_REQUEST message and determines whether this request can be accepted or not. Then, the target UE examines the IP Address Config IE to see whether there is at least one common IP address configuration option supported by both the initiating UE and the target UE. If the above check is successful, the target UE shall invoke the direct security mode control procedure as specified in subclause 10.4.5 to establish a security association between the target UE and the initiating UE. Only after the completion of link authentication procedure and a successful establishment of the security association, the target UE shall send a DIRECT_COMMUNICATION_ACCEPT message to the initiating UE.

The target UE shall include an IP Address Config IE set to one of the following values:

- "DHCPv4 Server" if only IPv4 address allocation mechanism is supported by the target UE and the target UE is able to act as DHCP server;
- "IPv6 Router" if only IPv6 address allocation mechanism is supported by the target UE and the target UE is able to act as IPv6 Router;
- "DHCPv4 Server & IPv6 Router" if both IPv4 and IPv6 address allocation mechanisms are supported by the target UE; or

- "address allocation not supported" if neither IPv4 nor IPv6 address allocation is supported by the target UE.

If the IP Address Config IE is set to "address allocation not supported" and the received DIRECT_COMMUNICATION_REQUEST message included a Link Local IPv6 Address IE, the target UE shall include a Link Local IPv6 Address IE set to the link-local IPv6 address formed locally.

NOTE: the UE can reuse a Link Local IPv6 IP address for multiple isolated one-to-one communication links.

[TS 24.334, clause 10.4.5.1]

Security association for a direct link between two ProSe-Enabled UEs is established during the direct link setup procedure or direct link rekeying procedure with the exchange of message contents related to direct security mode establishment. After successful completion of the direct security mode control procedure, the selected security algorithms and keys are used to integrity protect and cipher all PC5 Signalling messages exchanged between the UEs; and are also used to cipher all data plane traffic exchanged between the UEs.

[TS 24.334, clause 10.4.5.2]

A commanding UE may initiate the direct security mode control procedure in response to receiving a DIRECT_COMMUNICATION_REQUEST or a DIRECT_REKEYING_REQUEST message.

...

To initiate this procedure, the commanding UE shall either identify an existing K_D based on the K_D ID included in the DIRECT_COMMUNICATION_REQUEST or DIRECT_REKEYING_REQUEST message, or derive a new K_D if it either does not share a known K_D with the peer UE or wishes to derive a new K_D, as specified in 3GPP TS 33.303 [6]. In the latter case, the commanding UE shall generate the MSB of K_D ID to ensure that the resultant K_D ID will be unique in the commanding UE. Then, it shall generate a LSB of $K_{D\text{-}sess}$ ID such that the $K_{D\text{-}sess}$ ID formed by combining with the MSB of $K_{D\text{-}sess}$ ID (received in the DIRECT_COMMUNICATION_REQUEST or DIRECT_REKEYING_REQUEST that triggered the direct security mode procedure) is unique within the commanding UE.

Following this, the commanding UE shall generate a 128-bit Nonce_2 value. With K_D, Nonce_2 and Nonce_1 received in the DIRECT_COMMUNICATION_REQUEST or DIRECT_REKEYING_REQUEST message, the commanding UE shall derive $K_{D\text{-}sess}$ as specified in 3GPP TS 33.303 [6].

Then, the UE shall construct a DIRECT_SECURITY_MODE_COMMAND message with the following:

- Nonce_2 IE set to Nonce_2;
- the LSB of $K_{D\text{-}sess}$ ID IE set to indicate the least significant 8-bits of $K_{D\text{-}sess}$ ID;
- the UE Security Capabilities IE set to the UE Security Capabilities received in the DIRECT_COMMUNICATION_REQUEST message or DIRECT_REKEYING_REQUEST; and
- the Chosen Algorithms IE set to the algorithms to be used for ciphering and integrity protection.

...

If the DIRECT_SECURITY_MODE_COMMAND message is used for isolated one-to-one ProSe direct communication, then the commanding UE shall include the following additional parameters in the DIRECT_SECURITY_MODE_COMMAND message in order to create a new K_D:

- the User Info IE set to the User Info received from upper layers;
- the MSB of K_D ID IE set to the MSB of K_D ID of the new K_D; and
- the Signature IE set to the ECCSI signature value calculated with the following information elements, as specified in 3GPP TS 33.303 [6]:
  - User Info;
  - Nonce_1; and
  - the Encrypted Payload IE set to the SAKKE payload generated as specified in 3GPP TS 33.303 [6].

The commanding UE shall select the integrity protection and ciphering algorithms that will be used and include these choices in the Chosen algorithms IE in the DIRECT SECURITY MODE COMMAND message. The UE shall include the received UE security capabilities that was present in the DIRECT_COMMUNICATION_REQUEST or a DIRECT_REKEYING_REQUEST message that triggered the DIRECT SECURITY MODE COMMAND message.

The commanding UE shall send the DIRECT SECURITY MODE COMMAND message unciphered, but shall integrity protect the message with the new security context. After sending the DIRECT_SECURITY_MODE_COMMAND message, the commanding UE shall start timer T4111 (see figure 10.4.5.2.1).

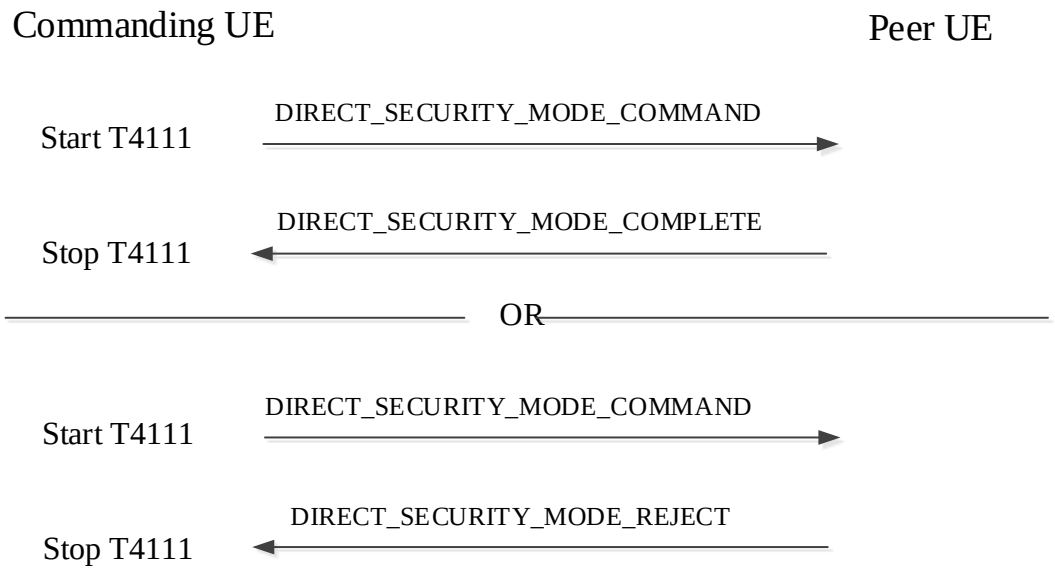

Figure 10.4.5.2.1: Direct Security mode control procedure

[TS 24.334, clause 10.4.5.4]

Upon receipt of the DIRECT_SECURITY_MODE_COMPLETE message, the commanding UE shall stop timer T4111. If an LSB of K_D ID IE was included in the message, the commanding UE uses this and the MSB of K_D ID it previously sent to form the K_D ID of the new K_D. From this time onwards the commanding UE shall protect all signalling messages and user data with the new security context.

[TS 24.334, clause 10.4.6.1]

The IP address configuration procedure is performed after the establishment of the direct link to enable IP connectivity between the UEs at each end of the direct link.

[TS 24.334, clause 10.4.6.2]

When neither of the two UEs on the direct link acts as a ProSe UE-to-network relay, the two UEs shall select the IP version (IPv4 or IPv6) to be used based on the following rules:

- if the target UE in the direct link setup procedure (see subclause 10.4.2) has indicated "DHCPv4 Server" in the IP Address Config IE, then the initiating UE in the direct link setup procedure (see subclause 10.4.2) shall initiate the IPv4 address configuration with DHCPv4 procedure acting as a DHCP client;

- if the target UE in the direct link setup procedure has indicated "IPv6 Router" in the IP Address Config IE , then the initiating UE in the direct link setup procedure shall initiate the IPv6 address configuration with IPv6 stateless address auto-configuration acting as an IPv6 host;

- if the target UE in the direct link setup procedure has indicated "DHCPv4 Server & IPv6 Router" in the IP Address Config IE, then the initiating UE in the direct link setup procedure shall choose either IP version and initiate the address configuration procedure, acting as a client or host;

- if the target UE in the direct link setup procedure has indicated "address allocation not supported" in the IP Address Config IE and the initiating UE has indicated "DHCPv4 Server", "IPv6 Router" or "DHCPv4 Server & IPv6 Router" in the IP Address Config IE, then the target UE shall:

  a) initiate the IPv4 address configuration with DHCPv4 procedure acting as a DHCP client, if the initiating UE has indicated "DHCPv4 Server";

  b) initiate the IPv6 address configuration with IPv6 stateless address auto-configuration acting as an IPv6 host if the initiating UE has indicated "IPv6 Router"; and

  c) choose either IP version and initiate the corresponding IP address configuration procedure as a client or host, if the other UE has indicated "DHCPv4 Server & IPv6 Router"; and

- if both of the UEs has indicated "address allocation not supported" in the IP Address Config IE, then the UEs shall use IPv6 link-local addresses formed locally as defined in RFC 4862 [15].

[TS 24.334, clause 10.4.3.2]

The requesting UE manages a keepalive timer T4102 and a keepalive counter for this procedure. The keepalive timer T4102 is used to trigger the periodic initiation of the procedure. It is started or restarted whenever the UE receives a PC5 Signalling message or PC5 user plane data from the peer UE over this link. The keepalive counter is set to an initial value of zero after link establishment.

The requesting UE may initiate the procedure if:

- a request from upper layers to check the viability of the direct link is received; or

- the keepalive timer T4102 for this link expires.

The requesting UE initiates the procedure by stopping timer T4102 if it is still running and generating a DIRECT_COMMUNICATION_KEEPALIVE message with a Keepalive Counter IE that contains the value of the keepalive counter for this link. Optionally, the initiating UE may include a Maximum Inactivity Period IE to indicate the maximum inactivity period of the requesting UE over this direct link. When a remote UE sends DIRECT_COMMUNICATION_KEEPALIVE message to the ProSe UE-to-network relay UE, this IE shall be included.

After the DIRECT_COMMUNICATION_KEEPALIVE message is generated, the requesting UE shall pass this message to the lower layers for transmission along with the requesting UE’s Layer 2 ID (for unicast communication) and the peer UE's Layer 2 ID (for unicast communication), and start retransmission timer T4101.

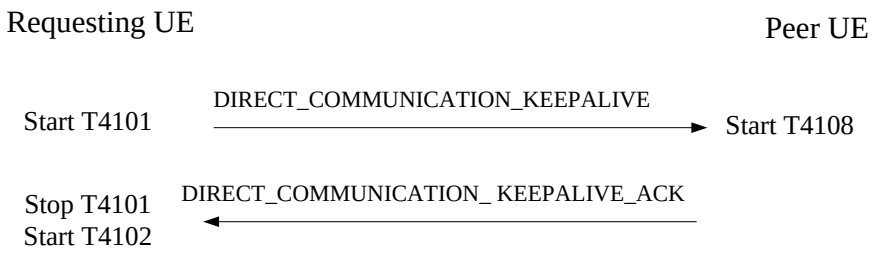

Figure 10.4.3.2.1: Direct link keepalive procedure

[TS 24.334, clause 10.4.3.3]

Upon receiving a DIRECT_COMMUNICATION_KEEPALIVE message, the peer UE shall respond with a DIRECT_COMMUNICATION_KEEPALIVE_ACK message including the Keepalive Counter IE set to the same value as that received in the DIRECT_COMMUNICATION_KEEPALIVE message.

If a Maximum Inactivity Period IE is included in the DIRECT_COMMUNICATION_KEEPALIVE message, the peer UE shall stop the inactivity timer T4108 if it is running, and restart the timer T4108 with the value provided in the IE, If any communication activity occurs in this direct link before the timer T4108 expires, the UE shall stop the timer T4108 and reset it with the initial value.

[TS 24.334, clause 10.4.3.4]

Upon receiving a DIRECT_COMMUNICATION_KEEPALIVE_ACK message, the requesting UE shall stop retransmission timer T4101, start keepalive timer T4102 and increment the keepalive counter for this link.

[TS 24.334, clause 10.4.3.5.2]

If the inactivity timer T4108 expires, if the peer UE is a ProSe UE-to-network relay UE, it shall initiate the direct link release procedure specified in 10.4.4 with the release reason #3 "Direct connection is not available any more". Otherwise, the peer UE may:

A) initiate is own keepalive procedure to check the link; or

B) initiate the direct link release procedure specified in 10.4.4 with the release reason #3 "Direct connection is not available any more".

Whether the UE chooses A or B is left to UE implementation.

[TS 24.334, clause 10.4.4.2]

The releasing UE shall initiate the procedure if:

- a request from upper layers to release a direct link with the peer UE which uses a known Layer 2 ID (for unicast communication) is received and there is an existing link between those two UEs; or

...

The releasing UE initiates the direct link release procedure by generating a DIRECT_COMMUNICATION_RELEASE message with a Release Reason IE indicating one of the following cause values:

#1 Direct Communication to peer UE no longer needed;

...

After the DIRECT_COMMUNICATION_RELEASE message is generated, the releasing UE shall pass this message to the lower layers for transmission along with the releasing UE's Layer 2 ID (for unicast communication) and the peer UE's Layer 2 ID (for unicast communication). The releasing UE shall release the direct link locally if the release reason is #3 "Direct connection is not available any more". Otherwise, the releasing UE shall start timer T4103.

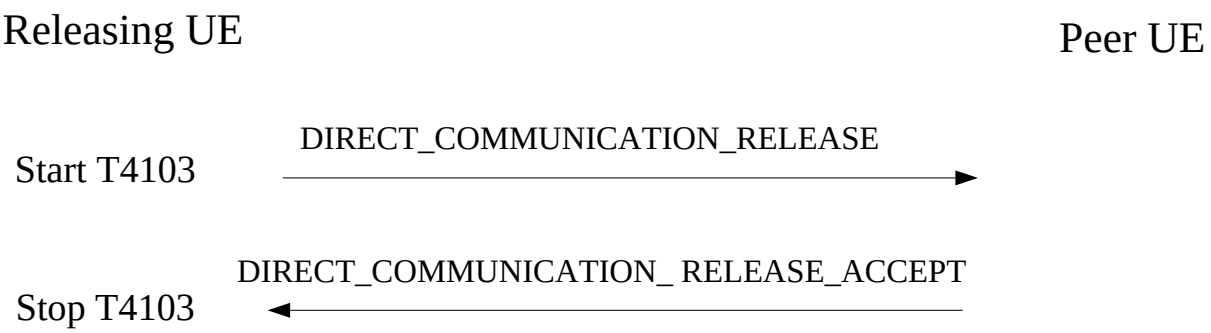

Figure 10.4.4.2.1: Direct link release procedure

[TS 24.334, clause 10.4.4.4]

Upon receipt of the DIRECT_COMMUNICATION_RELEASE_ACCEPT message, the releasing UE shall stop timer T4103. From this time onward the releasing UE shall no longer send or receive any messages via this link.

19.1.10.3 Test description

19.1.10.3.1 Pre-test conditions

System Simulator:

SS-UE

- SS-UE1.

  - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting and receiving device.

GNSS simulator (optional).

NOTE: For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". This can be done by usage of an GNSS simulator, or some suitable MMI action.

UE:

- ProSe related configuration

  - The UE is authorised to perform ProSe Direct Communication; The UE is equipped with a USIM containing values shown in Table 19.1.10.3.1-1, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, etc.).

Table 19.1.10.3.1-1: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.
$EF_{PROSE\_RADIO\_COM}$	b2=1 indicates that the UE is authorised to perform one-to-one ProSe direct communication when not served by E-UTRAN.

- For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". If this is not done by using n GNSS simulator then the UE needs to be preconfigured via a suitable MMI action.

Preamble:

- The UE is in state Switched OFF (state 1) according to TS 36.508 [18].

19.1.10.3.2 Test procedure sequence

Table 19.1.10.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Power up the UE.	-	-	-	-
2	Wait for 15 sec to allow the UE to establish that it is out of coverage and initiate scanning the frequency pre-set for ProSe communication for any activities.	-	-	-	-
3	SS-UE1 sends a DIRECT_COMMUNICATION_REQUEST message, IP Address Config IE set to "address allocation not supported".	<--	DIRECT_COMMUNICATION_REQUEST	-	-
4	Check: Does the UE send a DIRECT_SECURITY_MODE_COMMAND message unciphered but integrity protected with the new security context?	-->	DIRECT_SECURITY_MODE_COMMAND	1	P
5	SS-UE1 sends a DIRECT_SECURITY_MODE_COMPLETE message ciphered and integrity protected with the new security context.	<--	DIRECT_SECURITY_MODE_COMPLETE	-	-
6	Check: Does the UE send a DIRECT_COMMUNICATION_ACCEPT message?	-->	DIRECT_COMMUNICATION_ACCEPT	2	P
-	EXCEPTION: After the communication is established, an IP address configuration procedure is performed depending on what the UE has indicated in the IP Address Config IE (if it is not "address allocation not supported") in the DIRECT_COMMUNICATION_REQUEST message, and, the SS-UE1 itself indicating "address allocation not supported" in the DIRECT_COMMUNICATION_ACCEPT message.	-	-	-	-
7	SS-UE1 sends a DIRECT_COMMUNICATION_KEEPALIVE message with a Keepalive Counter IE that contains the value of the keepalive counter for this link=0, and a Maximum Inactivity Period IE.	<--	DIRECT_COMMUNICATION_KEEPALIVE	-	-
8	Does the UE send a DIRECT_COMMUNICATION_KEEPALIVE_ACK message including the Keepalive Counter IE set to the same value as that received in the DIRECT_COMMUNICATION_KEEPALIVE message?	-->	DIRECT_COMMUNICATION_KEEPALIVE_ACK	3	P
9	Wait 1/2 T4108 sec (=the value of the Maximum Inactivity Period IE sent in the DIRECT_COMMUNICATION_KEEPALIVE message).	-	-	-	-
10	SS-UE1 sends a DIRECT_COMMUNICATION_KEEPALIVE message with a Keepalive Counter IE that contains the value of the keepalive counter for this link=0, and not including the Maximum Inactivity Period IE. NOTE: Upon receiving the message the UE is expected to restart timer T4108.	<--	DIRECT_COMMUNICATION_KEEPALIVE	-	-
11	Does the UE send a DIRECT_COMMUNICATION_KEEPALIVE_ACK message including the Keepalive Counter IE set to the same value as that received in the DIRECT_COMMUNICATION_KEEPALIVE message?	-->	DIRECT_COMMUNICATION_KEEPALIVE_ACK	3	P

12	Start timer T4108=the value set in Maximum Inactivity Period IE send in the DIRECT_COMMUNICATION_KEEPALIVE message in step 6. NOTE: The SS shall not sent any direct communication data (neither PC5 Signalling message nor PC5 user plane data) until the event in step 14 takes place to ensure that the UE does not re-start timer T4108.	-	-	-	-
13	Timer T4108 expires.	-	-	-	-
-	EXCEPTION: Steps 14a1 to 14b2 describe behaviour that depends on UE implementation; the "lower case letter" identifies a step sequence that depends on how the UE reacts upon timer T4108 expiry.	-	-	-	-
14a 1	Check: Does the UE send a DIRECT_COMMUNICATION_KEEPALIVE message with a Keepalive Counter IE that contains the value of the keepalive counter for this link=0?	-->	DIRECT_COMMUNICATION_KEEPALIVE	4	P
14a 2	SS-UE1 sends a DIRECT_COMMUNICATION_KEEPALIVE_ACK message.	<--	DIRECT_COMMUNICATION_KEEPALIVE_ACK	-	-
14a 3	Make the UE release the one-to-one ProSe direct communication with the remote UE.	-	-	-	-
14a 4	Check: Does the UE send a DIRECT_COMMUNICATION_RELEASE message with a Release Reason IE indicating 'Direct connection is not available any more'?	-->	DIRECT_COMMUNICATION_RELEASE	5	P
14a 5	SS-UE1 sends a DIRECT_COMMUNICATION_RELEASE_ACCEPT message	<--	DIRECT_COMMUNICATION_RELEASE_ACCEPT	-	-
14b 1	Check: Does the UE send a DIRECT_COMMUNICATION_RELEASE message with a Release Reason IE indicating 'Direct Communication to peer UE no longer needed'?	-->	DIRECT_COMMUNICATION_RELEASE	4	P
14b 2	SS-UE1 sends a DIRECT_COMMUNICATION_RELEASE_ACCEPT message.	<--	DIRECT_COMMUNICATION_RELEASE_ACCEPT	-	-

19.1.10.3.3 Specific message contents

Table 19.1.10.3.3-1: DIRECT_COMMUNICATION_REQUEST (step 3, Table 19.1.10.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0F.			
Information Element	**Value/remark**	**Comment**	**Condition**
User Info {			
Type of User Info	IMSI		
Odd/even indication	Reflecting the number of digits in the IMSI		
Identity digits	A value different to the IMSI of the UE		
}			
IP Address Config	'0011'B	address allocation not supported	
Maximum Inactivity Period	'100 0000'B	64 sec, randomly chosen	
Nonce_1			
UE Security Capabilities	01111111 01111111	All but null algorithms supported	
MSB of $K_{D\text{-}sess}$ ID	the 8 most significant bits of the KD-sess ID		
K_D ID	Not present		
Signature	the ECCSI signature calculated with the User Info and Nonce_1 as specified in 3GPP TS 33.303 [51]		
Link Local IPv6 Address	a link-local IPv6 address formed locally		

Table 19.1.10.3.3-2: DIRECT_SECURITY_MODE_COMMAND (step 4 Table 19.1.10.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0G.			
Information Element	**Value/remark**	**Comment**	**Condition**
MSB of K_D ID	Any allowed value		
K_D Freshness	Not included		
GPI	Not included		
Signature	The ECCSI signature calculated with the User Info and Nonce_1 as specified in 3GPP TS 33.303 [51]		
Encrypted Payload	The SAKKE payload generated as specified in 3GPP TS 33.303 [51].		

Table 19.1.10.3.3-3: DIRECT_SECURITY_MODE_COMPLETE (step 5, Table 19.1.10.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0H.			
Information Element	**Value/remark**	**Comment**	**Condition**
LSB of KD ID	16 least significant bits of KD ID		

Table 19.1.10.3.3-4: DIRECT_COMMUNICATION_KEEPALIVE (step 7, Table 19.1.10.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0B.			
Information Element	**Value/remark**	**Comment**	**Condition**
Keepalive Counter	0		
Maximum Inactivity Period	'100 0000'B	64 sec, randomly chosen	

Table 19.1.10.3.3-5: DIRECT_COMMUNICATION_KEEPALIVE (step 10, Table 19.1.10.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0B.			
Information Element	**Value/remark**	**Comment**	**Condition**
Keepalive Counter	1		
Maximum Inactivity Period	Not present		

Table 19.1.10.3.3-6: DIRECT_COMMUNICATION_RELEASE (step 14a4, Table 19.1.10.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0D.			
Information Element	**Value/remark**	**Comment**	**Condition**
Release Reason	'0011'B	Direct connection is not available any more	

Table 19.1.10.3.3-7: DIRECT_COMMUNICATION_RELEASE (step 14b1, Table 19.1.10.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.3-0D.			
Information Element	**Value/remark**	**Comment**	**Condition**
Release Reason	'0001'B	Direct communication to the peer UE no longer needed	

19.2 ProSe Direct discovery

19.2.1 ProSe Direct Discovery Monitoring/Pre-configured authorisation / Monitoring / Handling of validity timers / Utilisation of the resources of different cells/PLMNs

19.2.1.1 Test Purpose (TP)

(1)

```
with { UE supporting ProSe direct discovery monitoring }
ensure that {
  when { UE performs Attach procedure, or, Normal tracking area updating procedure }
    then { UE announces its ProSe capabilities }
            }
```

(2)

```
with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and
PLMN2) operating on the same frequency, and, UE attached to Cell1/f1/PLMN1 which is NOT transmitting
SystemInformationBlockType19 }
ensure that {
  when { UE is triggered by an upper layer application to perform ProSe direct discovery monitoring
corresponding to a ProSe Application ID and the UE has no valid Discovery Filters corresponding to
the requested ProSe Application ID for that upper layer application }
    then { UE does not initiate Monitoring request procedure }
            }
```

(3)

```
with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and
PLMN2) operating on the same frequency, and, UE attached to Cell1/f1/PLMN1 which is transmitting
SystemInformationBlockType19 indicating the provision of Direct Discovery monitoring resources on
the two PLMNs/frequencies }
ensure that {
  when { UE is triggered by an upper layer application to perform ProSe direct discovery monitoring
corresponding to a ProSe Application ID and the UE has no valid Discovery Filters corresponding to
the requested ProSe Application ID for that upper layer application }
    then { UE successfully completes a Monitoring request procedure including the transmission of
SidelinkUEInformation message indicating it is interested in sidelink discovery reception }
            }
```

(4)

with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is transmitting *SystemInformationBlockType19* indicating the provision of Direct Discovery monitoring resources on the two PLMNs/frequencies, **and,** UE has successfully completed Monitoring request procedure, **and,** the TTL timer T4002 associated with the Discovery Filter allocated during the procedure has not expired }
ensure that {
  when { UE is monitoring for ProSe Announcements in the assigned resources on Cell1/f1/PLMN1 }
    then { UE is able to receive messages announced over the PC5 in the assigned resources in Cell1/f1/PLMN1 }
            }

(5)

with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is transmitting *SystemInformationBlockType19* indicating the provision of Direct Discovery monitoring resources on the two PLMNs/frequencies, **and,** UE monitoring for ProSe Announcements on Cell1/f1/PLMN1, **and,** the TTL timer T4002 associated with the Discovery Filter has not expired }
ensure that {
  when { there is a match event of one of the ProSe Application Codes received from the lower layers, and the UE does not have a corresponding ProSe Application ID already locally stored }
    then { the UE successfully performs a Match report procedure }
            }

(6)

with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is transmitting *SystemInformationBlockType19* indicating the provision of Direct Discovery monitoring resources on the two PLMNs/frequencies, **and,** UE monitoring for ProSe Announcements on Cell1/f1/PLMN1, **and,** the TTL timer T4002 associated with the Discovery Filter has not expired, **and,** UE having successfully performed a Match report procedure }
ensure that {
  when { UE has a locally stored mapping for the ProSe Application Code that resulted in the match event, but the match report refresh timer T4006 of the ProSe Application Code has expired }
    then { the UE initiates the match report procedure }
            }

(7)

with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is transmitting *SystemInformationBlockType19* indicating the provision of Direct Discovery monitoring resources on the two PLMNs/frequencies, **and,** UE monitoring for ProSe Announcements on Cell1/f1/PLMN1, **and,** the TTL timer T4002 associated with the Discovery Filter has not expired, **and,** the UE having successfully performed a Match report procedure }
ensure that {
  when { UE has a locally stored mapping for the ProSe Application Code that resulted in the match event, but the validity timer T4004 of the ProSe Application Code has expired }
    then { the UE initiates the match report procedure }
            }

(8)

with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is transmitting *SystemInformationBlockType19* indicating the provision of Direct Discovery monitoring resources on the two PLMNs/frequencies, **and,** UE monitoring for ProSe Announcements on Cell1/f1/PLMN1, **and,** the TTL timer T4002 associated with the Discovery Filter has not expired }
ensure that {
  when { UE moves to a new Cell2/f1/PLMN1 which is transmitting *SystemInformationBlockType19* }
    then { the UE continues successful monitoring without initiating a new Monitoring request procedure, **and,** is able to receive messages announced over the PC5 in the assigned resources in Cell2/f1/PLMN1 }
            }

(9)

with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell2/f1/PLMN1 which is transmitting *SystemInformationBlockType19* indicating the provision of Direct Discovery monitoring resources on the two PLMNs/frequencies, **and,** UE monitoring for ProSe Announcements on Cell2/f1/PLMN1, **and,** the TTL timer T4002 associated with the Discovery Filter has not expired }
ensure that {
  when { UE moves to a new Cell4/f1/PLMN2 (new PLMN)authorized for ProSe Direct Discovery Monitoring and transmitting *SystemInformationBlockType19* providing Direct Discovery monitoring resources on the serving cell }
    then { the UE initiates and successfully completes a new Monitoring request procedure, **and,** is able to receive messages announced over the PC5 in the assigned resources in Cell4/f1/PLMN2 }
            }

(10)

with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell4/f1/PLMN2 which is transmitting *SystemInformationBlockType19* indicating the provision of Direct Discovery monitoring resources on the two PLMNs/frequencies, **and,** UE monitoring for ProSe Announcements on Cell1/f1/PLMN1, **and,** the TTL timer T4002 associated with the Discovery Filter has not expired, **and,** monitoring for announcements on the resources of Cell4/f1/PLMN2 }
ensure that {
  when { TTL timer T4002 expires }
    then { the UE initiates and successfully completes a new Monitoring request procedure, and, is able to receive messages announced over the PC5 in the assigned resources in Cell4/f1/PLMN2 }
            }

(11) Void

(12) Void

(13)

with { UE being authorized for performing ProSe Direct Discovery Monitoring on two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell4/f1/PLMN2 which is transmitting *SystemInformationBlockType19* indicating the provision of Direct Discovery monitoring resources on the two PLMNs/frequencies, **and**, UE monitoring for ProSe Announcements, **and,** the TTL timer T4002 associated with the Discovery Filter allocated during the most recent Monitoring request procedure has not expired }
ensure that {
  when { UE moves to a new Cell11/f1/PLMN3 transmitting *SystemInformationBlockType19* however UE is not authorized for ProSe Direct Discovery Monitoring on PLMN3 }
    then { the UE does not initiate Monitoring request procedure, **and,** does not monitor for messages announced over the PC5 in the assigned resources in Cell11/f1/PLMN3 }
            }

19.2.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 23.303, clause 5.3.1.1, TS 24.301, clauses 5.5.1.2.2, 5.5.3.2.2, 6.1.1, TS 24.334, clauses 5.1.1, 5.1.2, 6.2.3.2, 6.2.3.4, 6.2.4.2, 6.2.4.4, TS 36.331, clauses 5.2.2.4, 5.2.2.26, 5.10.2.1, 5.10.2.2, 5.10.2.3, 5.10.5. Unless otherwise stated these are Rel-12 requirements.

[TS 23.303, clause 5.3.1.1]

The UE can act as "announcing UE" only in the band designated by the serving PLMN but may act as a "monitoring" UE also in the resources of the serving PLMN and Local PLMNs.

ProSe-enabled UEs which have obtained authorization to participate in ProSe Direct Discovery procedures shall not continue in participating in ProSe Direct Discovery procedures as soon as they detect loss of E-UTRA coverage in the serving PLMN.

[TS 24.301, clause 5.5.1.2.2]

If the UE supports ProSe direct discovery, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct discovery bit to "ProSe direct discovery supported" in the UE network capability IE of the ATTACH REQUEST message.

[TS 24.301, clause 5.5.3.2.2]

The UE in state EMM-REGISTERED shall initiate the tracking area updating procedure by sending a TRACKING AREA UPDATE REQUEST message to the MME,

...

b) when the periodic tracking area updating timer T3412 expires;

...

If the UE has to request resources for ProSe direct discovery or Prose direct communication (see 3GPP TS 36.331 [22]), then the UE shall set the "active" flag to 1 in the TRACKING AREA UPDATE REQUEST message.

...

For all cases except case b, if the UE supports ProSe direct communication, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct communication bit to "ProSe direct communication supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery announcing or ProSe direct discovery monitoring or both, and to use ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

2) transferred between the UE and the ProSe Function over the PC3 interface with the ProSe Direct Services Provisioning Management Object or the ProSe Public Safety Direct Services Provisioning Management Object as specified in 3GPP TS 24.333 [9].

...

The service authorisation provided by the ProSe Function of the HPLMN for ProSe direct discovery contains a list of PLMNs in which the UE is authorised to use ProSe direct discovery.

[TS 24.334, clause 5.1.2]

The IP address of the ProSe function in the HPLMN may be pre-configured in the UE and in this case, the UE may use the pre-configured IP address. Alternatively, the FQDN of the ProSe Function in the HPLMN may be self-constructed by the UE, i.e. derived from the PLMN ID of the HPLMN. The UE may perform DNS lookup as specified in IETF RFC 1035 [10].

[TS 24.334, clause 6.1.1]

The UE and ProSe Function shall use HTTP 1.1 as specified in IETF RFC 7230 [18] and IETF RFC 7231 [19] as the transport protocol for ProSe messages over the PC3 interface. The ProSe messages described here shall be included in the body of either an HTTP request message or an HTTP response message. The following rules apply:

- The UE initiates ProSe transactions with an HTTP request message containing the PC3 request(s);

- The ProSe Function responds to the requests with an HTTP response message containing the PC3 response(s) for the PC3 request(s); and

- HTTP POST methods are used for PC3 direct discovery procedures.

Optionally, the operator can configure the UE with configuration parameters for establishment of the PDN connection for reaching the HPLMN ProSe Function. If the UE is configured with the configuration parameter for establishment of the PDN connection for reaching the HPLMN ProSe Function (see 3GPP TS 24.333 [9]):

a) if a PDN connection for reaching the HPLMN ProSe Function is not established yet, the UE shall establish the PDN connection for reaching the HPLMN ProSe Function according to the UE configuration and shall send the HTTP request message via the PDN connection for reaching the HPLMN ProSe Function; and

b) if a PDN connection for reaching the HPLMN ProSe Function is already established (e.g. either due to other ProSe feature or due to other application), the UE shall send the HTTP request message via the PDN connection for reaching the HPLMN ProSe Function;

[TS 24.334, clause 6.2.3.2]

Before initiating the monitor request procedure, the UE is configured with the data structure of the ProSe Application IDs it wants to monitor. This step is performed using mechanisms that are out of scope of 3GPP.

If the UE is authorised to perform ProSe direct discovery monitoring in at least one PLMN, it shall initiate a monitor request procedure:

a) when the UE is triggered by an upper layer application to perform ProSe direct discovery monitoring corresponding to a ProSe Application ID and the UE has no valid Discovery Filters corresponding to the requested ProSe Application ID for that upper layer application; or

b) when the TTL timer T4002 assigned by the ProSe Function to a Discovery Filter has expired and the request from upper layers to monitor that ProSe Application ID is still in place.

NOTE 1: To ensure service continuity if the UE needs to keep monitoring the same Discovery Filter, the UE can initiate the monitor request procedure before the TTL timer T4002 assigned by the ProSe Function for a Discovery Filter expires.

The UE initiates the monitor request procedure by sending a DISCOVERY_REQUEST message with a new transaction ID, the ProSe Application ID set to the ProSe Application ID received from upper layers, the command set to "monitor", the UE identity set to the UE's IMSI, and the Application Identity set to the Application Identity of the upper layer application that requested the monitoring.

NOTE 2: A UE can include one or multiple transactions in one DISCOVERY_REQUEST message for one or more ProSe Application IDs, and receive corresponding <response-monitor> element or <response-reject> element in the DISCOVERY_RESPONSE message for each respective transaction. In the following description of the monitor request procedure, only one transaction is included.

Figure 6.2.3.2.1 illustrates the interaction between the UE and the ProSe Function in the monitor request procedure.

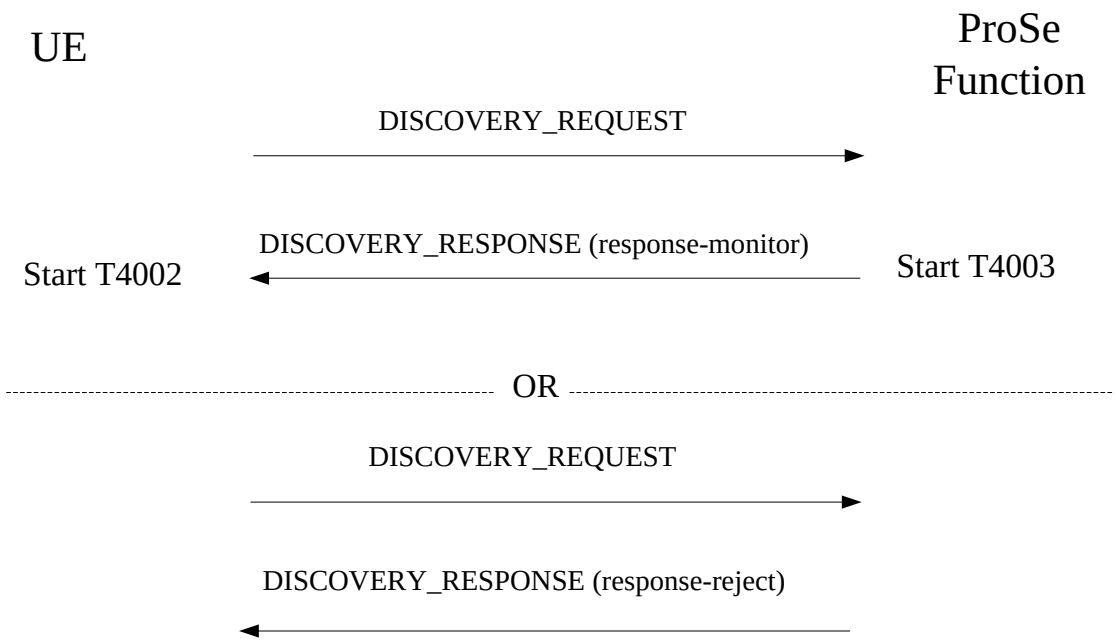

Figure 6.2.3.2.1: Monitor request procedure

[TS 24.334, clause 6.2.3.4]

Upon receipt of the DISCOVERY_RESPONSE message, if the transaction ID contained in the <response-monitor> element matches the value sent by the UE in a DISCOVERY_REQUEST message with the command set to "monitor", the UE shall, for each Discovery Filter assigned by the ProSe Function, stop TTL timer T4002 if running and start TTL timer T4002 with the received value. Otherwise the UE shall discard the DISCOVERY_RESPONSE message and shall not perform the procedures below.

The UE may perform monitor for discovery messages received over the PC5 interface as described below.

For a ProSe Application ID requested by the monitoring UE, the ProSe Function may have assigned one or more Discovery Filters. The UE should apply all assigned Discovery Filters to its monitoring operation. Using these Discovery Filters may result in a match event. In case of a match event, the UE shall consider that the ProSe Application ID it seeks to monitor has been discovered. A match event is defined as follows:

There is a match event when, for any of the ProSe Application Masks in a Discovery Filter, the output of a bitwise AND operation between the ProSe Application Code contained in the received PC5_DISCOVERY message and the ProSe Application Mask, matches the output of a bitwise AND operation between the ProSe Application Mask and the ProSe Application Code contained in the same Discovery Filter.

NOTE: A ProSe Application Mask with all bits set to "1" is assigned by the ProSe Function for full matching.

The UE may instruct the lower layers to start monitoring if all of the following conditions are met:

- the UE is currently authorized to perform monitoring in at least one PLMN;
- the UE has obtained at least one Discovery Filter and their respective TTL timer T4002(s) have not expired; and
- a request from upper layers to monitor for the ProSe Application ID associated with an authorised Application Identity is still in place.

If the UE is in EMM-CONNECTED mode, the monitoring UE shall also trigger the corresponding procedure in lower layers as specified in 3GPP TS 36.331 [12].

During the monitoring operation, the UE receives all PC5_DISCOVERY messages and associated UTC times from the lower layers.

During the monitoring operation, if one of the above conditions is no longer met, the UE may instruct the lower layers to stop monitoring. When the UE stops monitoring, if the UE is in EMM-CONNECTED mode, the UE shall trigger the corresponding procedure in lower layers as specified in 3GPP TS 36.331 [12].

[TS 24.334, clause 6.2.4.2]

The UE shall meet the following pre-conditions before initiating this procedure:

- a request from upper layers to monitor for the ProSe Application ID, which resulted in the matched ProSe Application Code, is still in place;
- the lower layers have provided a "Monitored PLMN ID" value, and UTC time information, along with the discovery message containing a ProSe Application Code; and
- the TTL timer T4002 associated with the Discovery Filter, which resulted in a match event of the ProSe Application Code, has not expired.

If the UE is authorised to perform ProSe direct discovery monitoring in the monitored PLMN, it should initiate a match report procedure:

a) when there is a match event of one of the ProSe Application Codes received from the lower layers, and the UE does not have a corresponding ProSe Application ID already locally stored;

b) when the UE has a locally stored mapping for the ProSe Application Code that resulted in a match event, but the validity timer T4004 of the ProSe Application Code has expired; or

c) when the UE has a locally stored mapping for the ProSe Application Code that resulted in a match event, but the match report refresh timer T4006 of the ProSe Application Code has expired.

The UE initiates the match report procedure by sending a MATCH_REPORT message with a new transaction ID and shall set the message contents as follows:

- the UE shall set the ProSe Application Code to the ProSe Application Code for which there was a match event;
- the UE shall set the UE identity to the UE's IMSI;
- the UE shall set the UTC-based counter as follows:
  - the 28 most significant bits of the UTC-based counter shall be set to the 28 most significant bits of the UTC time provided by the lower layers for the PC5_DISCOVERY message that contained the ProSe Application Code for which there was a match event encoded as specified in subclause 12.2.2.18; and
  - the 4 least significant bits of the UTC-based counter shall be set to the 4 least significant bits of the UTC-based counter contained in the PC5_DISCOVERY message that contained the ProSe Application Code for which there was a match event, as specified in 3GPP TS 33.303 [6];
- the UE shall set the MIC to the MIC of the PC5_DISCOVERY message that contained the ProSe Application Code for which there was a match event;
- the UE shall set the Monitored PLMN ID to the PLMN ID of the PLMN where the PC5_DISCOVERY message was received, as provided by the lower layers;
- if the UE was roaming when the match event occurred, the UE shall set the VPLMN ID to the PLMN ID of the PLMN in which the UE was registered when the match event occurred; and
- the UE shall set the Metadata Flag to indicate whether or not it wishes to receive metadata information associated with the ProSe Application ID in the MATCH_REPORT_ACK message from the ProSe Function.

NOTE 1: A UE can include one or multiple transactions in one MATCH_REPORT message for different ProSe Application Codes, and receive corresponding <match-ack> element or <match-reject> element in the MATCH_REPORT_ACK message for each respective transaction. In the following description of match report procedure, only one transaction is included.

NOTE 2: The value of the Metadata Flag is determined through an indication from upper layers in the original request to monitor for a ProSe Application ID.

Figure 6.2.4.2.1 illustrates the interaction between the UE and the ProSe Function in the match report procedure.

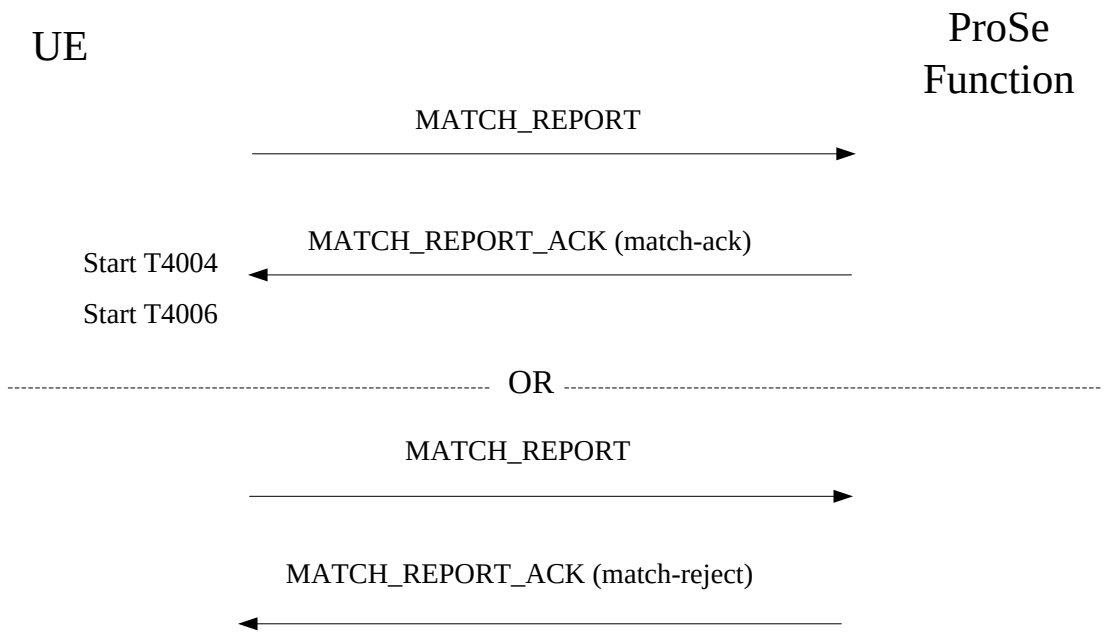

Figure 6.2.4.2.1: Match report procedure

[TS 24.334, clause 6.2.4.4]

Upon receipt of the MATCH_REPORT_ACK message, if the transaction ID contained in the <match-ack> element matches the value sent by the UE in a MATCH_REPORT message, the UE shall store the mapping between the ProSe Application Code and ProSe Application ID locally, start timers T4004 and T4006, and may inform the upper layers of this match of the ProSe Application ID. Otherwise the UE shall discard the MATCH_REPORT_ACK message.

Upon receipt of the MATCH_REPORT_ACK message, if the transaction ID contained in the <match-reject> element matches the value sent by the UE in a MATCH_REPORT message and if the received PC3 Control Protocol cause value is #5 "Invalid MIC", as specified in subclause 6.2.4.5, the UE shall stop timer T4004 if it is running.

NOTE 1: It is an implementation specific choice whether the UE informs the upper layers every time a ProSe Application ID triggers a match event, or only the first time this match occurs.

NOTE 2: The UE can also inform the upper layers if a ProSe Application ID is no longer matched, because the validity timer T4004 of the corresponding ProSe Application Code expires.

NOTE 3: The UE can also inform the upper layers if a ProSe Application ID is no longer matched, because the validity timer T4004 of the corresponding ProSe Application Code is stopped upon receiving MATCH_REPORT_ACK message with a <match-reject> element with PC3 Control Protocol cause value #5 "Invalid MIC".

[TS 36.331, clause 5.2.2.4]

1> if the UE is capable of sidelink discovery and is configured by upper layers to receive or transmit sidelink discovery announcements on the primary frequency:

2> if *schedulingInfoList* indicates that *SystemInformationBlockType19* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType19*;

2> for each of the one or more frequencies included in *discInterFreqList*, if included in *SystemInformationBlockType19* and for which the UE is configured by upper layers to receive sidelink discovery announcements on:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType19* is present and the UE does not have stored a valid version of this system information block:

4> acquire *SystemInformationBlockType19*;

[TS 36.331, clause 5.2.2.26]

Upon receiving *SystemInformationBlockType19*, the UE shall:

1> if *SystemInformationBlockType19* message includes the *discConfig*:

2> from the next discovery period, as defined by *discPeriod*, use the resources indicated by *discRxPool* for sidelink discovery monitoring, as specified in 5.10.5;

[TS 36.331, clause 5.10.2.1]

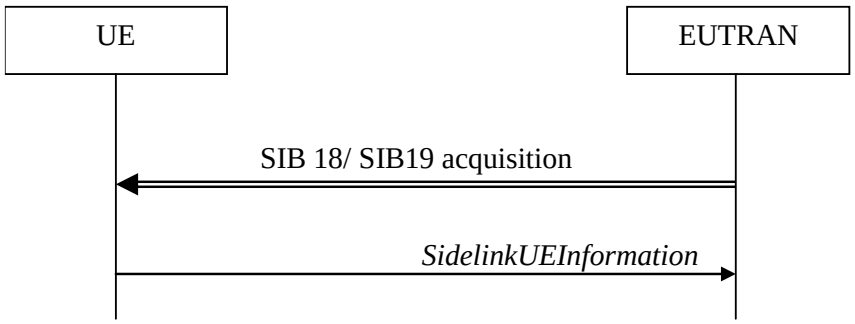

Figure 5.10.2-1: Sidelink UE information

The purpose of this procedure is to inform E-UTRAN that the UE is interested or no longer interested to receive sidelink communication or discovery, as well as to request assignment or release of transmission resources for sidelink communication or discovery announcements.

[TS 36.331, clause 5.10.2.2]

A UE capable of sidelink communication or discovery that is in RRC_CONNECTED may initiate the procedure to indicate it is (interested in) receiving sidelink communication or discovery in several cases including upon successful connection establishment, upon change of interest, upon change to a PCell broadcasting *SystemInformationBlockType18* or *SystemInformationBlockType19*. A UE capable of sidelink communication or discovery may initiate the procedure to request assignment of dedicated resources for the concerned sidelink communication transmission or discovery announcements.

...

Upon initiating the procedure, the UE shall:

...

1> if *SystemInformationBlockType19* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType19* for the PCell;

2> if configured by upper layers to receive sidelink discovery announcements on a serving frequency or on one or more frequencies included in *discInterFreqList*, if included in *SystemInformationBlockType19*:

3> if the UE did not transmit a *SidelinkUEInformation* message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a *SidelinkUEInformation* message the UE connected to a PCell not broadcasting *SystemInformationBlockType19*; or

3> if the last transmission of the *SidelinkUEInformation* message did not include *discRxInterest*:

4> initiate transmission of the *SidelinkUEInformation* message to indicate it is interested in sidelink discovery reception in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the *SidelinkUEInformation* message included *discRxInterest*:

4> initiate transmission of the *SidelinkUEInformation* message to indicate it is no longer interested in sidelink discovery reception in accordance with 5.10.2.3;

[TS 36.331, clause 5.10.2.3]

The UE shall set the contents of the *SidelinkUEInformation* message as follows:

...

1> if *SystemInformationBlockType19* is broadcast by the PCell:

2> if configured by upper layers to receive sidelink discovery announcements on a serving frequency or one or more frequencies included in *discInterFreqList*, if included in *SystemInformationBlockType19*:

3> include *discRxInterest*;

...

The UE shall submit the *SidelinkUEInformation* message to lower layers for transmission.

[TS 36.331, clause 5.10.5]

A UE capable of sidelink discovery that is configured by upper layers to monitor sidelink discovery announcements shall:

1> for each frequency the UE is configured to monitor sidelink discovery announcements on, prioritising the frequencies included in *discInterFreqList*, if included in *SystemInformationBlockType19*:

2> configure lower layers to monitor sidelink discovery announcements using the pool of resources indicated by *discRxPool* in *SystemInformationBlockType19* without affecting normal operation i.e. receive during idle periods or by using a spare receiver;

NOTE 1: The requirement not to affect normal UE operation also applies for the acquisition of sidelink discovery related system and synchronisation information from inter-frequency cells.

NOTE 2: The UE is not required to monitor all pools simultaneously.

NOTE 3: It is up to UE implementation to decide whether a cell is sufficiently good to be used to monitor sidelink discovery announcements.

19.2.1.3 Test description

19.2.1.3.1 Pre-test conditions

System Simulator:

SS-NW

- 4 cells with parameters defined in Table 19.2.1.3.1-1.

NOTE: The test only requires 2 cells to be active at any one instant.

Table 19.2.1.3.1-1: Cell parameters values

Cell	Frequency	PLMN
1	f1	HPLMN (PLMN1)
2	f1	HPLMN (PLMN1)
4	f1	PLMN2
11	f1	PLMN3
Note 1: PLMN1: PLMN1 in USIM EF_{PROSE_MON} PLMN2: PLMN2 in USIM EF_{PROSE_MON} PLMN3: MCC = MCC of PLMN1 in USIM EF_{PROSE_MON}; MNC=03. Note 2: A single frequency has been chosen for all PLMNs to allow the TC to be applicable even for UEs supporting a single band which comprises a single frequency.		

- System information combination 24 as defined in TS 36.508 [18] clause 4.4.3.1 is used in all cells when SystemInformationBlockType19 is transmitted. In all other cases System information combination 1 as defined in TS 36.508 [18] clause 4.4.3.1 shall be used.

- *SystemInformationBlockType19* is transmitted on all cells when they are active unless otherwise stated; the sidelink related resources in each instance are specified in the specific message content.

SS-UE

- SS-UE 1.

  - As defined in TS 36.508 [18], configured and operating for/as ProSe Direct Discovery Announcing on the resources provided by different cells (as specified in the relevant procedure steps in Table 19.2.1.3.2-1)

UE:

- ProSe related configuration

  The UE is equipped with a USIM containing values shown in Table 19.2.1.3.1-2, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. 2 PLMNs are authorised for ProSe Direct Discovery Monitoring).

Table 19.2.1.3.1-2: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°1 (ProSe direct discovery parameters) supported
	Service n°4 (ProSe Direct Discovery monitoring radio parameters) supported
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage

  Depending on implementation, a Rel-12 UE may not support USIM settings for ProSe Direct Discovery Monitoring (pc_disc_public_safety=FALSE, i.e. ProSe Discovery for Public Safety not supported) . Such UEs are expected to provide means for pre-configuring the PLMNs which are authorised for ProSe Direct Discovery Monitoring (e.g. via MMI). The values specified for EF_{PROSE_MON} in TS 36.508 [18], section 4.9.3.1 shall be preconfigured.

  - For each PLMN a timer T4005 is assigned long enough not to expire before the TC is completed, e.g. 7 min (For Rel-12 this timer cannot be set in the USIM, it is expected that the UE shall provide means for setting the timer e.g. via MMI).

- The UE is configured with the data structure of the ProSe Application ID (px_ProSeMonApplicationIdentity1) it wants to monitor (This step is performed using UE implementation dependent mechanisms, e.g. MMI command, or, may be pre-loaded in the UE).

- A number of arbitrarily chosen ProSe Application IDs are provided during the test. The UE shall have no knowledge of them before the test is started.
- The UE has no valid Discovery Filters corresponding to the configured ProSe Application ID (px_ProSeMonApplicationIdentity1) nor to any other possibly pre-loaded ProSe Application IDs (this is to ensure that the provided during the test ProSe Application Codes are not known to the UE).

Preamble:

- The UE is in state Switched OFF (state 1) according to TS 36.508 [18].

19.2.1.3.2 Test procedure sequence

Table 19.2.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS configures: SS-NW - Cell 1 as the "Serving cell". - Cell 2 as the "Non-suitable “Off” cell". - Cell 4 as the "Non-suitable “Off” cell". - Cell 11 as the "Non-suitable “Off” cell". Cell 1 **does not** transmit *SystemInformationBlockType19*.	-	-	-	-
2	The UE is switched on.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
3	Check: Does the UE announce that it is ProSe capable during registration? The Generic test procedure for 'UE Registration (State 2)' defined in TS 36.508 [18] clause 4.5.2 takes place.	-	-	1	P
4	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeMonApplicationIdentity1 to initiate continuous ProSe direct discovery monitoring.	-	-	-	-
5	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22 take place (UE performs Monitor request procedure) in the next 5 sec?	-	-	2	F
6	From the beginning of the next modification period the SS-NW starts broadcast of *SystemInformationBlockType19* (according to System information combination 24 as defined in TS 36.508[18] clause 4.4.3.1) on Cell 1.	-	-	-	-
7	Wait for 2 modification periods to allow for the UE to obtain the new version of the *SystemInformationType19.*	-	-	-	-
8	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeMonApplicationIdentity1 to initiate continuous ProSe direct discovery monitoring.	-	-	-	-
9	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22 take place (UE performs Monitor request procedure)?	-	-	3	P
10	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
-	EXCEPTION: The events described in steps 10A - 10B are sent in the same transmission period.	-	-	-	-
10A	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message which will produce match, and for which the UE does not have a corresponding ProSe Application ID already locally stored. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType19/discRxPool-r12/SL-DiscResourcePool-r12[2]* broadcasted on the serving cell.	<--	PC5_DISCOVERY	-	-

	Note that SIB19 includes a corresponding Tx resource for transmission in RRC_IDLE *SystemInformationBlockType19/discTxPoolCommon-r12/SL-DiscResourcePool-r12[2]*, i.e. the SS-UE1 is behaving as an UE transmitting announcements in RRC_IDLE.				
10B	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message and which will not produce match. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType19/discRxPool-r12/SL-DiscResourcePool-r12[2]* broadcasted on the serving cell. Note that SIB19 includes a corresponding Tx resource for transmission in RRC_IDLE *SystemInformationBlockType19/discTxPoolCommon-r12/SL-DiscResourcePool-r12[2]*, i.e. the SS-UE1 is behaving as an UE transmitting announcements in RRC_IDLE.	<--	PC5_DISCOVERY	-	-
-	EXCEPTION: In parallel to the events described in step 11 the events described in Table 19.2.1.3.2-3 take place (the same PC5_DISCOVERY messages are transmitted 2 more times).	-	-	-	-
11	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition MATCH REPORT defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Match report procedure including the ProSe-Application-Code transmitted in step 10A and receiving a new ProSe-Application-ID)? NOTE: MATCH_REPORT_ACK message assigning T4006=[1] min, T4004=[4] min relevant to the newly provided ProSe-Application-ID.	-	-	4, 5	P
12	SS starts timer T4006.	-	-	-	-
13	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
14	Void.	-	-	-	-
15	SS waits for T4006 (match-report-refresh-timer) to expire.	-	-	-	-
15A	SS-UE1 transmits he same PC5_DISCOVERY message and utilising the same resources as the message transmitted in step 10A.	<--	PC5_DISCOVERY	-	-
15B	SS-UE1 transmits the same PC5_DISCOVERY message and utilising the same resources as the message transmitted in step 10B.	<--	PC5_DISCOVERY	-	-
-	EXCEPTION: In parallel to the events described in step 16 the events described in Table 19.2.1.3.2-3 take place (the same PC5_DISCOVERY messages are transmitted 2 more times).	-	-	-	-
16	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition MATCH REPORT defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Match report procedure)? NOTE: MATCH_REPORT_ACK message assigning T4006=[4] min, T4004=[1] min	-	-	6	P

17	SS starts timer T4004.	-	-	-	-
18	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
19	Void.	-	-	-	-
20	SS waits for T4004 (validity-timer) to expire.	-	-	-	-
20 A	SS-UE1 transmits he same PC5_DISCOVERY message and utilising the same resources as the message transmitted in step 15A.	<--	PC5_DISCOVERY	-	-
20 B	SS-UE1 transmits he same PC5_DISCOVERY message and utilising the same resources as the message transmitted in step 15B.	<--	PC5_DISCOVERY	-	-
-	EXCEPTION: In parallel to the events described in step 21 the events described in Table 19.2.1.3.2-3 take place (the same PC5_DISCOVERY messages are transmitted 2 more times).	-	-	-	-
21	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition MATCH REPORT defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Match report procedure)?	-	-	7	P
22	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
23	The SS configures: SS-NW - Cell 1 as the "Non-suitable “Off” cell". - Cell 2 as the "Serving cell". Cell 2 broadcasts *SystemInformationBlockType19* which provides 2 reception pools, one of them is different to the resources broadcasted on the previous cell on which the UE monitored ProSe direct announcements (*SL-DiscResourcePool-r12[1]*).	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 2.	-	-	-	-
-	EXCEPTION: The events described in steps 23A - 23B are sent in the same transmission period.	-	-	-	-
23 A	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message which will produce match, and for which the UE does not have a corresponding ProSe Application ID already locally stored. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType19/discRxPool-r12/SL-DiscResourcePool-r12[1]* broadcasted on the serving cell. Note that SIB19 does not include a corresponding Tx resource for transmission in RRC_IDLE, i.e. the SS-UE1 is behaving as an UE transmitting announcements in RRC_CONNECTED.	<--	PC5_DISCOVERY	-	-
23 B	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message and which will not produce match. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType19/discRxPool-r12/SL-DiscResourcePool-r12[1]* broadcasted on the serving cell.	<--	PC5_DISCOVERY	-	-

	Note that SIB19 does not include a corresponding Tx resource for transmission in RRC_IDLE, i.e. the SS-UE1 is behaving as an UE transmitting announcements in RRC_CONNECTED.				
-	EXCEPTION: In parallel to the events described in step 24 the events described in Table 19.2.1.3.2-3 take place (the same PC5_DISCOVERY messages are transmitted 2 more times).	-	-	-	-
24	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition MATCH REPORT defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Match report procedure including the ProSe-Application-ID transmitted in step 21)?	-	-	8	P
25	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
26	The SS configures: SS-NW - Cell 2 as the "Non-suitable “Off” cell". - Cell 4 as the "Serving cell". - Cell 1 as "Suitable neighbour intra-frequency cell". Cell 4 broadcasts *SystemInformationBlockType19* which provides 2 reception pools, one of them is different to the resources broadcasted on the previous cell on which the UE monitored ProSe direct announcements (*SL-DiscResourcePool-r12[1]*).	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 4.	-	-	-	-
27	Check: Does the UE announce its ProSe direct discovery capabilities? The Generic test procedure for 'Tracking area updating procedure' defined in TS 36.508 [18] clause 4.5A.2 takes place.	-	-	1	P
28	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Monitor request procedure)?	-	-	9	P
29	SS-NW starts a timer=T4002. (the value of T4002 is provided in the DISCOVERY_RESPONSE message, step 28)	-	-	-	-
30	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
-	EXCEPTION: The events described in steps 30A - 30B are sent in the same transmission period.	-	-	-	-
30 A	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message which will produce match, and for which the UE does not have a corresponding ProSe Application ID already locally stored. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType19/discRxPool-r12/SL-DiscResourcePool-r12[1]* broadcasted on the serving cell. Note that SIB19 does not include a	<--	PC5_DISCOVERY	-	-

	corresponding Tx resource for transmission in RRC_IDLE, i.e. the SS-UE1 is behaving as an UE transmitting announcements in RRC_CONNECTED.				
30B	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message and which will not produce match. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType19/discRxPool-r12/SL-DiscResourcePool-r12[1]* broadcasted on the serving cell. Note that SIB19 does not include a corresponding Tx resource for transmission in RRC_IDLE, i.e. the SS-UE1 is behaving as an UE transmitting announcements in RRC_CONNECTED.	<--	PC5_DISCOVERY	-	-
-	EXCEPTION: In parallel to the events described in step 31 the events described in Table 19.2.1.3.2-3 take place (the same PC5_DISCOVERY messages are transmitted 2 more times).	-	-	-	-
31	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition MATCH REPORT defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Match report procedure including the ProSe-Application-ID transmitted in step 28)?	-	-	9	P
32	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
33	SS-NW waits until the timer = T4002 set in step 29 expires.	-	-	-	-
34	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22A take place? (UE performs Monitor request procedure)	-	-	10	P
34A	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
35-48	Void	-	-	-	-
49	The SS configures: SS-NW - Cell 11 as the "Serving cell". - Cell 4 as the "Non-suitable “Off” cell". - Cell 1 as "Non-suitable “Off” cell". Cell 11 broadcasts *SystemInformationBlockType19* which provides the same 2 reception pools as the previous cell on which the UE monitored ProSe direct announcements.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 11.	-	-	-	-
50	Check: Does the UE announce that it is ProSe capable during 'Tracking area updating procedure? The Generic test procedure for 'Tracking area updating procedure' defined in TS 36.508 [18] clause 4.5A.2 takes place.	-	-	1	P
51	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR	-	-	13	F

	REQUEST defined in TS 36.508 [18] subclause 4.5A.22A takes place (UE performs Monitor request procedure) within the next 5s?				
52	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeMonApplicationIdentity1 to initiate ProSe direct discovery monitoring.	-	-	-	-
53	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Monitor request procedure) within the next 5?	-	-	13	F
-	EXCEPTION: The events described in steps 53A - 53B are sent in the same transmission period.	-	-	-	-
53 A	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message which will produce match, and for which the UE does not have a corresponding ProSe Application ID already locally stored. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType19/discRxPool-r12/SL-DiscResourcePool-r12[1]* broadcasted on the serving cell. Note that SIB19 does not include a corresponding Tx resource for transmission in RRC_IDLE, i.e. the SS-UE1 is behaving as an UE transmitting announcements in RRC_CONNECTED.	<--	PC5_DISCOVERY	-	-
53 B	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message and which will not produce match. For the transmission the SS-UE1 shall use the resources indicated in *SystemInformationBlockType19/discRxPool-r12/SL-DiscResourcePool-r12[1]* broadcasted on the serving cell. Note that SIB19 does not include a corresponding Tx resource for transmission in RRC_IDLE, i.e. the SS-UE1 is behaving as an UE transmitting announcements in RRC_CONNECTED.	<--	PC5_DISCOVERY	-	-
-	EXCEPTION: In parallel to the events described in step 54 the events described in Table 19.2.1.3.2-3 take place (the same PC5_DISCOVERY messages are transmitted 2 more times).	-	-	-	-
54	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition MATCH REPORT defined in TS 36.508 [18] subclause 4.5A.22A take place within the next 5 sec?	-	-	13	F

Table 19.2.1.3.2-2: Void

Table 19.2.1.3.2-3: Parallel behaviour - PC5_DISCOVERY transmission

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
-	EXCEPTION: The events described in steps 1 - 2 are repeated 2 times. They shall be sent in the same transmission period.	-	-	-	-
1	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message which will produce match, and for which the UE does not have a corresponding ProSe Application ID already locally stored. For the transmission the SS-UE1 shall use the resources used for the first transmission of the same PC5_DISCOVERY message indicated in the relevant step in the main behaviour preceding the execution of the parallel behaviour.	<--	PC5_DISCOVERY	-	-
2	SS-UE1 transmits a PC5_DISCOVERY message containing a ProSe Application Code different to the one provided in the last received DISCOVERY_RESPONSE message and which will not produce match. For the transmission the SS-UE1 shall use the resources used for the first transmission of the same PC5_DISCOVERY message indicated in the relevant step in the main behaviour preceding the execution of the parallel behaviour.	<--	PC5_DISCOVERY	-	-

19.2.1.3.3 Specific message contents

Table 19.2.1.3.3-1: *SystemInformationBlockType19* (Transmitted on Cell 1 in Table 19.2.1.3.2-1)

Derivation Path: 36.508 [18] Table 4.4.3.3-17

Table 19.2.1.3.3-2: *SystemInformationBlockType19* (Transmitted on Cell 4 and Cell 11 in Table 19.2.1.3.2-1)

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType19 ::= SEQUENCE {			
discConfig-r12 ::= SEQUENCE {			
discRxPool-r12 ::= SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[1] ::= SEQUENCE {		RxPool 1	
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 00000011 00000000 00000000 00000000	bs40-r12	FDD
	00000000 00000011	bs16-r12	TDD
}			
}			
}			
discTxPoolCommon-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[1]	Not Present		
}			
}			
}			
Note 1: The resources provided on RxPool 1 are different to the Rx resource(s) provided on cell 2 where the UE operates prior to moving to Cell 4.			

Table 19.2.1.3.3-3: *SystemInformationBlockType19* (Transmitted on Cell 2 in Table 19.2.1.3.2-1)

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType19 ::= SEQUENCE {			
discConfig-r12 ::= SEQUENCE {			
discRxPool-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[1] SEQUENCE {		RxPool 1	
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 11000000 00000000 00000000 00000000	bs40-r12	FDD
	00000000 11000000	bs16-r12	TDD
}			
}			
}			
discTxPoolCommon-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[1]	Not Present		
}			
}			
}			
Note 1: The resources provided on RxPool 1 are different to the Rx resource(s) provided on cell 1 where the UE operates prior to moving to Cell 2.			

Table 19.2.1.3.3-4: ATTACH REQUEST (step 3, Table 19.2.1.3.2-1; step 4, TS 36.508 [18] Table 4.5.2.3-1)

Derivation path: 36.508 [18] table 4.7.2-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'1'	ProSe direct discovery Supported	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'0' or '1'	The UE may, but need not to, support also ProSe direct communication	

Table 19.2.1.3.3-5: TRACKING AREA UPDATE REQUEST (steps 27, 50, Table 19.2.1.3.2-1; step 4, TS 36.508 [18] Table 4.5A.2.1-1)

Derivation path: 36.508 [18] table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
EPS update type			
"Active" flag	'1'B		
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'1'	ProSe direct discovery Supported	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'0' or '1'	The UE may, but need not to, support also ProSe direct communication	

Table 19.2.1.3.3-5 A : *RRCConnectionRequest* (steps 9, 28, 34, Table 19.2.1.3.2-1)

Derivation Path: 36.508, Table 4.6.1-16.			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionRequest ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcConnectionRequest-r8 SEQUENCE {			
establishmentCause	mo-Data		
	Delay tolerant		
	High priority access AC 11 - 15		
}			
}			
}			

Table 19.2.1.3.3-6: DISCOVERY_REQUEST (steps 9, 28, 34, Table 19.2.1.3.2-1; step 10a1, TS 36.508 [18] Table 4.5A.22.3-2)

Derivation path: 36.508 [18] , Table 4.7F.1-1.			
Information Element	**Value/remark**	**Comment**	**Condition**
discovery-request1 {			
command	2	monitor	
}			

Table 19.2.1.3.3-7: DISCOVERY_RESPONSE (step 9, Table 19.2.1.3.2-1; step 10a2, TS 36.508 [18] Table 4.5A.22.3-2)

Derivation path: 36.508 [18] , Table 4.7F.1-2.			
Information Element	**Value/remark**	**Comment**	**Condition**
Current-time	Current UTC time		
response-announce[1]	Not Present		

Table 19.2.1.3.3-8: SidelinkUEInformation (steps 9, 28, 34, 47, Table 19.2.1.3.2-1)

Derivation Path: 36.508, Clause 4.6.1, Table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs ::= SEQUENCE {			
commRxInterestedFreq-r12	Not Present		
commTxResourceReq-r12	Not Present		
discRxInterest-r12	true		
discTxResourceReq-r12	Not Present		
}			

Table 19.2.1.3.3-9: Void

Table 19.2.1.3.3-10: PC5_DISCOVERY (steps 10B, 15B, 20B, 23B, 30B, 53B, Table 19.2.1.3.2-1 and step 2, Table 19.2.1.3.2-3 when step 2 happens in sequence with step 10B, 15B, 20B, 23B, 30B or 53B)

Derivation path: 36.508 [18] , Table 4.7F.1-5.			
Information Element	**Value/remark**	**Comment**	**Condition**
ProSe Application Code {			
TemporaryID	0000000011111111 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000	Different to the one set by SS-NW in the DISCOVERY_RESPONSE message sent during the latest Monitor request procedure which will NOT provide a match with any of ProSe Application Masks included in the DISCOVERY_RESPONSE.	
}			

Table 19.2.1.3.3-11: PC5_DISCOVERY (steps 10A, 15A, 20A, Table 19.2.1.3.2-1 and step 1, Table 19.2.1.3.2-3 when step 1 happens in sequence with step 10A, 15A, 20A)

Derivation path: 36.508 [18] , Table 4.7F.1-5.			
Information Element	**Value/remark**	**Comment**	**Condition**
ProSe Application Code {			
TemporaryID	1111111100000000 0000000000000000 1111111100000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000	Different to the one set by SS-NW in the DISCOVERY_RESPONSE message sent during the latest Monitor request procedure which will provide a match. Will provide match when ProSe Application Mask[1] included in the DISCOVERY_RESPONSE is applied.	
}			

Table 19.2.1.3.3-12: MATCH_REPORT (steps 11, 16, 21, Table 19.2.1.3.2-1)

Derivation path: 36.508 [18] , Table 4.7F.1-3.			
Information Element	**Value/remark**	**Comment**	**Condition**
transaction-ID	a new transaction ID		
ProSe-Application-Code	The code transmitted by PC5_DISCOVERY which was sent immediately before the MATCH REPORT and for which there was a match event (Table 19.2.1.3.3-11)		
Monitored-PLMN-id	PLMN1		

Table 19.2.1.3.3-12A: MATCH_REPORT_ACK (steps 11, 16, 21, Table 19.2.1.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.1-4.			
Information Element	**Value/remark**	**Comment**	**Condition**
Current-Time	Current UTC time		
match-ack {			
transaction-ID	the transaction ID received in the MATCH_REPORT Table 19.2.1.3.3-12		
ProSe-Application-ID	mcc001.mnc001.ProSeApp.Food.Restaurants.Bulgarian999	a ProSe Application ID which the UE does not have The MCC/MNC values in mcc001.mnc001 shall be equal to the PLMN1. The ProSe Application ID Name part (ProSeApp.Food.Restaurants.Bulgarian999) is an arbitrary chosen (see TS 23.003 [2])	
validity-timer-T4004	4	4 min	
match-report-refresh-timer-T4006	1	1 min	
}			

Table 19.2.1.3.3-12B: PC5_DISCOVERY (step 23A, Table 19.2.1.3.2-1 and step 1, Table 19.2.1.3.2-3 when step 1 happens in sequence with step 23A)

Derivation path: 36.508 [18] clause 4.7F.1			
Information Element	**Value/remark**	**Comment**	**Condition**
ProSe Application Code {			
TemporaryID	1111000000000000 0000000000000000 1111111100000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000011111111	Different to the one set by SS-NW in the DISCOVERY_RESPONSE message sent during the latest Monitor request procedure which will provide a match. Will provide match when ProSe Application Mask[2] included in the DISCOVERY_RESPONSE is applied.	
}			

Table 19.2.1.3.3-13: MATCH_REPORT (step 24, Table 19.2.1.3.2-1)

Derivation path: 36.508 [18] , Table 4.7F.1-3.			
Information Element	**Value/remark**	**Comment**	**Condition**
transaction-ID	a new transaction ID		
ProSe-Application-Code	The code transmitted by PC5_DISCOVERY which was sent immediately before the MATCH REPORT and for which there was a match event (Table 19.2.1.3.3-12B)		
Monitored-PLMN-id	PLMN1		

Table 19.2.1.3.3-14: MATCH_REPORT_ACK (step 24, Table 19.2.1.3.2-1)

Derivation path: 36.508 [18] , Table 4.7F.1-4.			
Information Element	**Value/remark**	**Comment**	**Condition**
Current-Time	Current UTC time		
match-ack {			
transaction-ID	the transaction ID received in the MATCH_REPORT Table 19.2.1.3.3-13		
ProSe-Application-ID	mcc001.mnc001.ProSeApp.Food.Restaurants.Bulgarian888	a ProSe Application ID which the UE does not have The MCC/MNC values in mcc001.mnc001 shall be equal to the PLMN1. The ProSe Application ID Name part (ProSeApp.Food.Restaurants.Bulgarian888) is an arbitrary chosen (see TS 23.003 [2])	
}			

Table 19.2.1.3.3-14A: DISCOVERY_RESPONSE (steps 28, 34, Table 19.2.1.3.2-1; step 10a2, TS 36.508 [18] Table 4.5A.22.3-2)

Derivation path: 36.508 [18], Table 4.7F.1-1.			
Information Element	**Value/remark**	**Comment**	**Condition**
response-monitor1 {			
transaction-ID	Same as that included by UE in the relevant DISCOVERY_REQUEST message and the relevant discovery-request		
discovery-filter[1] {			
ProSe Application Code1 {			
TemporaryID	1111111100000000 1111111100000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000		
}			
ProSe Application Mask[1]	0000111111111100 00000000 1111111111111111 1111111111111111 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000	Full matching for the MCC part is required, as well as for the first 32 bits of the Temporary ID in order a received ProSe Application Code to result in a match	
ProSe Application Mask[2]	Not Present		
TTLTimer T4002	2		
}			
}			

Table 19.2.1.3.3-14B: PC5_DISCOVERY (steps 30A, 53A Table 19.2.1.3.2-1 and step 1, Table 19.2.1.3.2-3 when step 1 happens in sequence with steps 30A or 53A)

Derivation path: 36.508 [18], Table 4.7F.1-5.			
Information Element	**Value/remark**	**Comment**	**Condition**
ProSe Application Code {			
TemporaryID	1111111100000000 1111111100000000 1111111111111111 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000000	Different to the one set by SS-NW in the DISCOVERY_RESPONSE message sent during the latest Monitor request procedure which will provide a match. Will provide match when ProSe Application Mask[1] included in the DISCOVERY_RESPONSE is applied.	
}			

Table 19.2.1.3.3-14C: MATCH_REPORT (step 31, Table 19.2.1.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.1-3.			
Information Element	**Value/remark**	**Comment**	**Condition**
transaction-ID	a new transaction ID		
ProSe-Application-Code	The code transmitted by PC5_DISCOVERY which was sent immediately before the MATCH REPORT and for which there was a match event (Table 19.2.1.3.3-14B)		
Monitored-PLMN-id	PLMN2		

Table 19.2.1.3.3-15: MATCH_REPORT_ACK (step 31, Table 19.2.1.3.2-1)

Derivation path: 36.508 [18] , Table 4.7F.1-4.			
Information Element	**Value/remark**	**Comment**	**Condition**
match-ack {			
transaction-ID	the transaction ID received in the MATCH_REPORT Table 19.2.1.3.3-14C		
ProSe-Application-ID	mcc001.mnc001.ProSeApp.Food.Restaurants.Bulgarian777	a ProSe Application ID which the UE does not have The MCC/MNC values in mcc001.mnc001 shall be equal to the PLMN1. The ProSe Application ID Name part (ProSeApp.Food.Restaurants.Bulgarian777) is an arbitrary chosen (see TS 23.003 [2])	
validity-timer-T4004	1	4 min	
match-report-refresh-timer-T4006	4	4 min	
}			

19.2.2 ProSe Direct Discovery Announcing/Pre-configured authorisation / Announcing and SLSS transmission in RRC_IDLE / Handling of validity timers / Utilisation of the resources of different cells/PLMNs

19.2.2.1 Test Purpose (TP)

(1)

```
with { UE supporting ProSe direct discovery announcing }
ensure that {
  when { UE performs Attach procedure, or, Normal tracking area updating procedure }
    then { UE announces its ProSe capabilities }
            }
```

(2)

```
with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and
PLMN2) operating on the same frequency, and, UE attached to Cell1/f1/PLMN1 which is NOT broadcasting
SystemInformationBlockType19 }
ensure that {
  when { UE is triggered by an upper layer application to announce a ProSe Application ID and the UE
has no valid corresponding ProSe Application Code for that upper layer application }
    then { UE does not initiate Announce request procedure }
            }
```

(3)

```
with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and
PLMN2) operating on the same frequency, and, UE attached to Cell1/f1/PLMN1 which is broadcasting
SystemInformationBlockType19 but not indicating the provision of resources for sidelink discovery
announcement on the serving PLMN }
ensure that {
  when { UE is triggered by an upper layer application to announce a ProSe Application ID and the UE
has no valid corresponding ProSe Application Code for that upper layer application }
```

then { UE initiates and successfully completes an Announce request procedure including the transmission of SidelinkUEInformation message to request assignment of transmission resources for sidelink discovery announcements }
}

(4)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of SidelinkUEInformation message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
when { UE is in RRC_IDLE, and, UE is configured with *discTxResources* set to *ue-Selected* and *poolSelection* within *poolToAddModList* is set to *rsrpBased* }
then { UE is able to transmit the sidelink discovery announcement using the assigned/configured resources in Cell1/f1/PLMN1 selecting for the transmission an entry of *discTxPoolCommon* for which RSRP measurement of the serving is in-between *threshLow* and *threshHigh* }
}

(5)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of SidelinkUEInformation message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
when { UE moves to RRC_IDLE on a new Cell2/f1/PLMN1 which provides resources for sidelink discovery announcements (*poolSelection* provided in the *SystemInformationBlockType19*/*discTxPoolCommon* is NOT set to *rsrpBasedUE*) }
then { UE does not initiate a new Announce request procedure, **and,** is able to transmit sidelink discovery announcements using the assigned/configured resources in Cell2/f1/PLMN1 }
}

(6)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell2/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of SidelinkUEInformation message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
when { UE moves to a new Cell4/f1/PLMN2 authorized for ProSe Direct Discovery Announcing and broadcasting *SystemInformationBlockType19* indicating the provision of Direct Discovery announcing resources on the serving PLMNs }
then { UE initiates and successfully completes an Announce request procedure }
}

(7)

with { UE capable of SLSS transmission, **and,** being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell4/f1/PLMN2 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of SidelinkUEInformation message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
when { UE is in RRC_IDLE, **and,** *networkControlledSyncTx* is not configured, and, *syncTxThreshIC* is included in *SystemInformationBlockType19*, and, the RSRP measurement of the serving cell is below the value of *syncTxThreshIC* }
then { UE transmits SLSS }
}

(8)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell4/f1/PLMN2 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of SidelinkUEInformation message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
  when { timer T4000 expires }
    then { UE initiates and successfully completes an Announce request procedure }
            }

(9) Void

(10) Void

(11)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell4/f1/PLMN2 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of SidelinkUEInformation message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
  when { UE moves to a new Cell11/f1/PLMN3 broadcasting *SystemInformationBlockType19* providing resources for sidelink discovery announcements, **and,** the UE is not authorized for ProSe Direct Discovery announcing on this PLMN }
    then { the UE does not initiate Announce request procedure, **and,** does not announce over the PC5 in the assigned resources in Cell11/f1/PLMN3 }
            }

19.2.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 23.303, clause 5.3.1.1, TS 24.301, clauses 5.5.1.2.2, 5.5.3.2.2, 5.6.1.1, TS 24.334, clauses 5.1.1, 5.1.2, 6.1.1, 6.2.2.2, 6.2.2.4, TS 36.331, clauses 5.2.2.4, 5.2.2.26, 5.3.3.1a, 5.10.2.1, 5.10.2.2, 5.10.2.3, 5.10.6, 5.10.7.1, 5.10.7.2, 5.10.7.3. Unless otherwise stated these are Rel-12 requirements.

[TS 23.303, clause 5.3.1.1]

The UE can act as "announcing UE" only in the band designated by the serving PLMN but may act as a "monitoring" UE also in the resources of the serving PLMN and Local PLMNs.

ProSe-enabled UEs which have obtained authorization to participate in ProSe Direct Discovery procedures shall not continue in participating in ProSe Direct Discovery procedures as soon as they detect loss of E-UTRA coverage in the serving PLMN.

[TS 24.301, clause 5.5.1.2.2]

If the UE supports ProSe direct discovery, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct discovery bit to "ProSe direct discovery supported" in the UE network capability IE of the ATTACH REQUEST message.

[TS 24.301, clause 5.5.3.2.2]

The UE in state EMM-REGISTERED shall initiate the tracking area updating procedure by sending a TRACKING AREA UPDATE REQUEST message to the MME,

...

b) when the periodic tracking area updating timer T3412 expires;

...

If the UE has to request resources for ProSe direct discovery or Prose direct communication (see 3GPP TS 36.331 [22]), then the UE shall set the "active" flag to 1 in the TRACKING AREA UPDATE REQUEST message.

...

For all cases except case b, if the UE supports ProSe direct discovery, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct discovery bit to "ProSe direct discovery supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

[TS 24.301, clause 5.6.1.1]

The purpose of the service request procedure is to transfer the EMM mode from EMM-IDLE to EMM-CONNECTED mode and establish the radio and S1 bearers when user data or signalling is to be sent. Another purpose of this procedure is to invoke MO/MT CS fallback or 1xCS fallback procedures.

This procedure is used when:

...

- the UE has to request resources for ProSe direct discovery or Prose direct communication.

...

The UE shall invoke the service request procedure when:

...

l) the UE in EMM-IDLE mode has to request resources for ProSe direct discovery or Prose direct communication (see 3GPP TS 36.331 [22]).

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery announcing or ProSe direct discovery monitoring or both, and to use ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

2) transferred between the UE and the ProSe Function over the PC3 interface with the ProSe Direct Services Provisioning Management Object or the ProSe Public Safety Direct Services Provisioning Management Object as specified in 3GPP TS 24.333 [9].

...

The service authorisation provided by the ProSe Function of the HPLMN for ProSe direct discovery contains a list of PLMNs in which the UE is authorised to use ProSe direct discovery.

...

The UE discovers the IP address of the ProSe Functions of the HPLMN as specified in subclause 5.1.2.

[TS 24.334, clause 5.1.2]

The IP address of the ProSe function in the HPLMN may be pre-configured in the UE and in this case, the UE may use the pre-configured IP address. Alternatively, the FQDN of the ProSe Function in the HPLMN may be self-constructed by the UE, i.e. derived from the PLMN ID of the HPLMN. The UE may perform DNS lookup as specified in IETF RFC 1035 [10].

[TS 24.334, clause 6.1.1]

The UE and ProSe Function shall use HTTP 1.1 as specified in IETF RFC 7230 [18] and IETF RFC 7231 [19] as the transport protocol for ProSe messages over the PC3 interface. The ProSe messages described here shall be included in the body of either an HTTP request message or an HTTP response message. The following rules apply:

- The UE initiates ProSe transactions with an HTTP request message containing the PC3 request(s);
- The ProSe Function responds to the requests with an HTTP response message containing the PC3 response(s) for the PC3 request(s); and
- HTTP POST methods are used for PC3 direct discovery procedures.

Optionally, the operator can configure the UE with configuration parameters for establishment of the PDN connection for reaching the HPLMN ProSe Function. If the UE is configured with the configuration parameter for establishment of the PDN connection for reaching the HPLMN ProSe Function (see 3GPP TS 24.333 [9]):

a) if a PDN connection for reaching the HPLMN ProSe Function is not established yet, the UE shall establish the PDN connection for reaching the HPLMN ProSe Function according to the UE configuration and shall send the HTTP request message via the PDN connection for reaching the HPLMN ProSe Function; and

b) if a PDN connection for reaching the HPLMN ProSe Function is already established (e.g. either due to other ProSe feature or due to other application), the UE shall send the HTTP request message via the PDN connection for reaching the HPLMN ProSe Function;

[TS 24.334, clause 6.2.2.2]

Before initiating the announce request procedure, the UE is configured with the data structure of the ProSe Application IDs appropriate for its HPLMN. This step is performed using mechanisms out of scope of 3GPP.

If the UE is authorised to perform ProSe direct discovery announcing in the registered PLMN, it shall initiate an announce request procedure:

a) when the UE is triggered by an upper layer application to announce a ProSe Application ID and the UE has no valid corresponding ProSe Application Code for that upper layer application;

b) when the validity timer T4000 assigned by the ProSe Function to a ProSe Application Code has expired and the request from upper layers to announce the ProSe Application ID corresponding to that ProSe Application Code is still in place; or

c) when the UE selects a new PLMN while announcing a ProSe Application Code and the UE is authorised for ProSe direct discovery announcing in the new PLMN.

When the UE selects a new PLMN while announcing a ProSe Application Code and the UE is not yet authorised for ProSe direct discovery announcing in the new PLMN, the UE shall initiate an announce request procedure only after the UE is authorised for ProSe direct discovery announcing in the new PLMN.

NOTE 1: To ensure service continuity if the UE needs to keep announcing a ProSe Application Code corresponding to the same ProSe Application ID, the UE can initiate the announce request procedure before the TTL timer T4000 assigned by the ProSe Function for a Prose Application Code expires.

The UE initiates the announce request procedure by sending a DISCOVERY_REQUEST message with a new transaction ID, the ProSe Application ID set to the ProSe Application ID received from upper layers, the command set to "announce", the UE identity set to the UE's IMSI, and the Application Identity set to the Application Identity of the upper layer application that requested the announcing.

NOTE 2: A UE can include one or multiple transactions in one DISCOVERY_REQUEST message for different ProSe Application IDs, and receive corresponding <response-announce> element or <response-reject> element in a DISCOVERY_RESPONSE message for each respective transaction. In the following description of the announce request procedure, only one transaction is included.

Figure 6.2.2.2.1 illustrates the interaction of the UE and the ProSe Function in the announce request procedure.

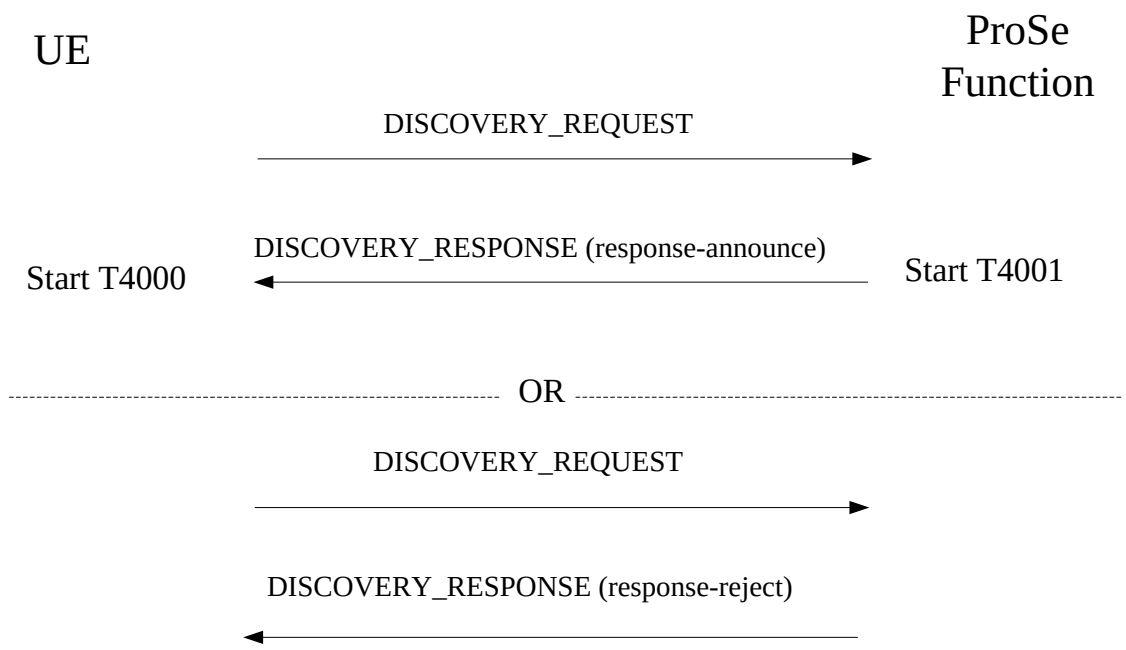

Figure 6.2.2.2.1: Announce request procedure

[TS 24.334, clause 6.2.2.4]

Upon receipt of the DISCOVERY_RESPONSE message, if the transaction ID contained in the <response-announce> element matches the value sent by the UE in a DISCOVERY_REQUEST message with the command set to "announce", the UE shall, for each ProSe Application Code received in the DISCOVERY_RESPONSE message, stop the validity timer T4000 if running and start the validity timer T4000 with the received value. Otherwise the UE shall discard the DISCOVERY_RESPONSE message and shall not perform the procedures below.

The UE may perform direct discovery announcing as described below.

The UE requests the parameters from the lower layers for Prose direct discovery announcing (see 3GPP TS 36.331 [12]). The UE shall perform direct discovery announcing only if the lower layers indicate that ProSe direct discovery is supported by the network. If the UE in EMM-IDLE mode has to request resources for ProSe direct discovery announcing as specified in 3GPP TS 36.331 [12], the UE shall perform a service request procedure or tracking area update procedure as specified in 3GPP TS 24.301 [11]. The UE shall obtain the UTC time for the next discovery transmission opportunity for ProSe direct discovery from the lower layers.

If a valid UTC time is obtained, the UE shall generate the UTC-based counter corresponding to this UTC time as specified in subclause 12.2.2.18, and then use the UTC-based counter to compute the MIC field for the PC5_DISCOVERY message as described in 3GPP TS 33.303 [6].

The UE shall use the ProSe Application Code received in the DISCOVERY_RESPONSE message, along with the MIC and the four least significant bits of the UTC-based counter, in order to construct a PC5_DISCOVERY message, according to the format defined in subclause 11.2.5.

The UE then passes the PC5_DISCOVERY message to the lower layers for transmission if:

- the UE is currently authorised to perform direct discovery announcing in the registered PLMN;
- the validity timer T4000 for the allocated ProSe Application Code has not expired; and

- a request from upper layers to announce the ProSe Application ID associated with both the ProSe Application Code and the authorised Application Identity is still in place.

The UE shall ensure that it keeps on passing PC5_DISCOVERY messages to the lower layers for transmission until the validity timer T4000 of the ProSe Application Code expires. How this is achieved is left up to UE implementation.

During the announcing operation, if one of the above conditions is no longer met, the UE may instruct the lower layers to stop announcing. When the UE stops announcing, if the lower layers indicate that the UE is required to send a discovery indication to the eNodeB and the UE is in EMM-CONNECTED mode, the UE shall trigger the corresponding procedure in lower layers as specified in 3GPP TS 36.331 [12].

[TS 36.331, clause 5.2.2.4]

1> if the UE is capable of sidelink discovery and is configured by upper layers to receive or transmit sidelink discovery announcements on the primary frequency:

2> if *schedulingInfoList* indicates that *SystemInformationBlockType19* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType19*;

[TS 36.331, clause 5.2.2.26]

Upon receiving *SystemInformationBlockType19*, the UE shall:

1> if *SystemInformationBlockType19* message includes the *discConfig*:

...

2> if *SystemInformationBlockType19* message includes the *discTxPoolCommon*; and the UE is in RRC_IDLE:

3> from the next discovery period, as defined by *discPeriod*, use the resources indicated by *discTxPoolCommon* for sidelink discovery announcement, as specified in 5.10.6;

[TS 36.331, clause 5.3.3.1a]

For sidelink discovery an RRC connection is initiated only in the following case:

1> if configured by upper layers to transmit sidelink discovery announcements:

2> if *SystemInformationBlockType19* is broadcast by the cell on which the UE camps: and if the valid version of *SystemInformationBlockType19* does not include *discTxPoolCommon*;

NOTE: Upper layers initiate an RRC connection. The interaction with NAS is left to UE implementation.

[TS 36.331, clause 5.10.2.1]

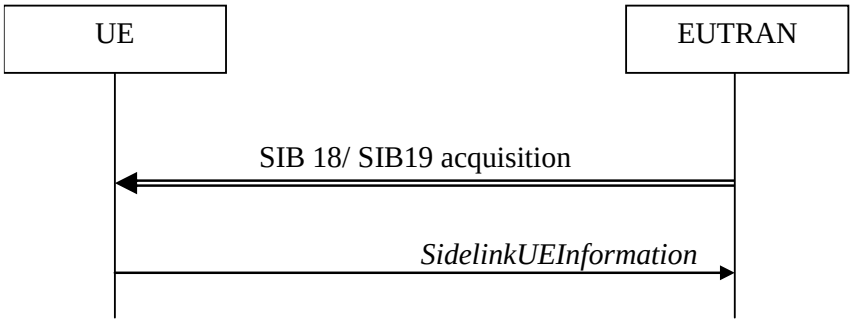

Figure 5.10.2-1: Sidelink UE information

The purpose of this procedure is to inform E-UTRAN that the UE is interested or no longer interested to receive sidelink communication or discovery, as well as to request assignment or release of transmission resources for sidelink communication or discovery announcements.

[TS 36.331, clause 5.10.2.2]

A UE capable of sidelink communication or discovery that is in RRC_CONNECTED may initiate the procedure to indicate it is (interested in) receiving sidelink communication or discovery in several cases including upon successful connection establishment, upon change of interest, upon change to a PCell broadcasting *SystemInformationBlockType18* or *SystemInformationBlockType19*. A UE capable of sidelink communication or discovery may initiate the procedure to request assignment of dedicated resources for the concerned sidelink communication transmission or discovery announcements.

NOTE 1: A UE in RRC_IDLE that is configured to transmit sidelink communication/ discovery announcements, while *SystemInformationBlockType18*/ *SystemInformationBlockType19* does not include the resources for transmission (in normal conditions), initiates connection establishment in accordance with 5.3.3.1a.

Upon initiating the procedure, the UE shall:

...

1> if *SystemInformationBlockType19* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType19* for the PCell;

...

2> if the UE is configured by upper layers to transmit sidelink discovery announcements:

3> if the UE did not transmit a *SidelinkUEInformation* message since entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a *SidelinkUEInformation* message the UE connected to a PCell not broadcasting *SystemInformationBlockType19*; or

3> if the last transmission of the *SidelinkUEInformation* message did not include *discTxResourceReq*; or if the sidelink discovery announcement resources required by the UE have changed (i.e. resulting in a change of *discTxResourceReq*) since the last transmission of the *SidelinkUEInformation* message:

4> initiate transmission of the *SidelinkUEInformation* message to indicate the sidelink discovery announcement resources required by the UE in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the *SidelinkUEInformation* message included *discTxResourceReq*:

4> initiate transmission of the *SidelinkUEInformation* message to indicate it does no longer require sidelink discovery announcement resources in accordance with 5.10.2.3;

[TS 36.331, clause 5.10.2.3]

The UE shall set the contents of the *SidelinkUEInformation* message as follows:

...

1> if *SystemInformationBlockType19* is broadcast by the PCell:

...

2> if the UE is configured by upper layers to transmit sidelink discovery announcements:

3> include *discTxResourceReq* and set it to indicate the number of discovery messages for sidelink discovery announcement(s) for which it requests E-UTRAN to assign dedicated resources;

The UE shall submit the *SidelinkUEInformation* message to lower layers for transmission.

[TS 36.331, clause 5.10.6]

A UE capable of sidelink discovery that is configured by upper layers to transmit sidelink discovery announcements shall:

NOTE 1: In case the configured resources are insufficient it is up to UE implementation to decide which sidelink discovery announcements to transmit.

1> if the UE's serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) is suitable as defined in TS 36.304 [4]:

...

2> else if T300 is not running (i.e. UE in RRC_IDLE, announcing via serving cell):

3> if *SystemInformationBlockType19* of the serving cell includes *discTxPoolCommon*:

4> if *poolSelection* is set to *rsrpBased*:

5> select an entry of *discTxPoolCommon* for which RSRP measurement of the serving cell is in-between *threshLow* and *threshHigh*;

4> else:

5> randomly select, using a uniform distribution, an entry of *discTxPoolCommon*;

4> configure lower layers to transmit the sidelink discovery announcement using the selected pool of resources;

NOTE 2: When performing resource pool selection based on RSRP, the UE uses the latest results of the available measurements used for cell reselection evaluation in RRC_IDLE/ for measurement report triggering evaluation in RRC_CONNECTED, which are performed in accordance with the performance requirements specified in TS 36.133 [16].

[TS 36.331, clause 5.10.7.1]

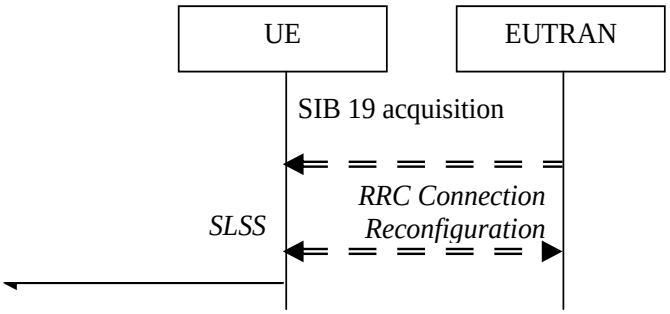

Figure 5.10.7.1-3: Synchronisation information transmission for sidelink discovery

The purpose of this procedure is to provide synchronisation information to a UE. The synchronisation information concerns a Sidelink Synchronisation Signal (SLSS) for sidelink discovery, while it concerns an SLSS, timing information and some additional configuration parameters (i.e. the *MasterInformationBlock-SL* message) for sidelink communication. A UE transmits synchronisation information either when E-UTRAN configures it to do so by dedicated signalling (i.e. network based), or when not configured by dedicated signalling (i.e. UE based) and E-UTRAN broadcasts (in coverage) or pre-configures a threshold (out of coverage).

The synchronisation information transmitted by the UE may be derived from information/ signals received from E-UTRAN (in coverage) or received from a UE acting as synchronisation reference for the transmitting UE. In the remainder, the UE acting as synchronisation reference is referred to as SyncRef UE.

[TS 36.331, clause 5.10.7.2]

A UE capable of SLSS transmission shall, when transmitting sidelink discovery announcements in accordance with 5.10.6 and when the following conditions are met:

1> if the UE's serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) is suitable as defined in TS 36.304 [4]:

...

2> if *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType19*; and the RSRP measurement of the serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) is below the value of *syncTxThreshIC*:

3> transmit SLSS in accordance with 5.10.7.3 and TS 36.211 [21], unless the UE uses the selected subframe for regular uplink transmission;

[TS 36.331, clause 5.10.7.3]

The UE shall select the SLSSID and the subframe in which to transmit SLSS as follows:

1> if triggered by sidelink discovery announcement:

2> select the SLSSID included in the entry of *discSyncConfig* included in the received *SystemInformationBlockType19*, that includes *txParameters*;

2> use *syncOffsetIndicator* corresponding to the selected SLSSID;

2> for each pool used for the transmission of discovery announcements (each corresponding to the selected SLSSID):

3> if a subframe indicated by *syncOffsetIndicator* corresponds to the first subframe of the discovery transmission pool;

4> select the concerned subframe;

3> else

4> select the subframe indicated by *syncOffsetIndicator* that precedes and which, in time domain, is nearest to the first subframe of the discovery transmission pool;

19.2.2.3 Test description

19.2.2.3.1 Pre-test conditions

System Simulator:

SS-NW

- 4 cells with parameters defined in Table 19.2.2.3.1-1.

NOTE: The test only requires at maximum 2 cells to be active at any one instant.

Table 19.2.2.3.1-1: Cell parameters values

Cell	Frequency	PLMN
1	f1	HPLMN (PLMN1)
2	f1	HPLMN (PLMN1)
4	f1	PLMN2
11	f1	PLMN3
Note 1:	PLMN1: PLMN1 in USIM EF_{PROSE_ANN} PLMN2: PLMN2 in USIM EF_{PROSE_ANN} PLMN3: MCC = MCC of PLMN1 in USIM EF_{PROSE_ANN}; MNC=03.	
Note 2:	A single frequency has been chosen for all PLMNs to allow the TC to be applicable even for UEs supporting a single band which comprises a single frequency.	

- System information combination 24 as defined in TS 36.508 [18] clause 4.4.3.1 is used in all active cells when *SystemInformationBlockType19* is transmitted. In all other cases System information combination 1 as defined in TS 36.508 [18] clause 4.4.3.1 shall be used.

- *SystemInformationBlockType19* is transmitted on all cells when they are active unless otherwise stated; the sidelink related resources in each instance are specified in the specific message content.

SS-UE

- SS-UE 1.
  - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Discovery Monitoring on the resources which the UE is expected to use for transmission (as specified in the relevant procedure steps in Table 19.2.2.3.2-1).

UE:

- ProSe related configuration
  - The UE is equipped with a USIM containing values shown in Table 19.2.2.3.1-2, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. 2 PLMNs are authorised for ProSe Direct Discovery Announcing).

Table 19.2.2.3.1-2: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°1 (ProSe direct discovery parameters) supported
	Service n°5 (ProSe Direct Discovery announcing radio parameters) supported
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage

Depending on implementation, a Rel-12 UE may not support USIM settings for ProSe Direct Discovery Announcing (pc_disc_public_safety=FALSE, i.e. ProSe Discovery for Public Safety not supported) . Such UEs are expected to provide means for pre-configuring the PLMNs which are authorised for ProSe Direct Discovery Announcing (e.g. via MMI). The values specified for EF_{PROSE_ANN} in TS 36.508 [18], section 4.9.3.1 shall be preconfigured.

- For each PLMN a timer T4005 is assigned long enough not to expire before the TC is completed, e.g. 5min (For Rel-12 this timer cannot be set in the USIM, it is expected that the UE shall provide means for setting the timer e.g. via MMI).
- The UE is configured with the data structure of the ProSe Application ID (px_ProSeAnnApplicationIdentity1) it wants to announce (This step is performed using UE implementation dependent mechanisms, e.g. MMI command, or, may be pre-loaded in the UE).
- The UE has no valid ProSe Application Code corresponding to the configured ProSe Application ID (px_ProSeAnnApplicationIdentity1).

Preamble:

- The UE is in state Switched OFF (state 1) according to TS 36.508 [18].

19.2.2.3.2 Test procedure sequence

Table 19.2.2.3.2-0 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" ... "Tn" are to be applied subsequently. The exact instants on which these values shall be applied are described elsewhere in the present clause.

Table 19.2.2.3.2-0: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Cell 4	Cell 11	Comments
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	"Off"	"Off"	"Off"	Note 1
T1	Cell-specific RS EPRE	dBm/15k Hz	"Off"	-85	"Off"	"Off"	
T2	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	-79	"Off"	
T3	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	-87	"Off"	Note 2
T4	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	"Off"	-79	

Note 1: The Cell power is set to satisfy the *SystemInformationBlockType19* pool settings (*discTxPoolCommon* set to *rsrpBasedUE*)
Note 2: The Cell power is set to ensure that the RSRP measurement is below the value of *syncTxThreshIC* included in *SystemInformationBlockType19*.

Table 19.2.2.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS configures: SS-NW Cell 1 **does not** broadcast *SystemInformationBlockType19*.	-	-	-	-
2	The UE is switched on.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
3	Check: Does the UE announce its ProSe direct discovery capabilities? The Generic test procedure for 'UE Registration, UE Test Mode Activated (State 2A)' defined in TS 36.508 [18] clause 4.5.2A takes place.	-	-	1	P
4	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeAnnApplicationIdentity1 to initiate continuous ProSe direct discovery announcing. NOTE: Although the UE is expected to transmit continuously, only the PC5_DISCOVERY messages which need to be checked are shown explicitly in the step sequence.	-	-	-	-
5	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22 take place (UE performs Announce request procedure) in the next 5s?	-	-	2	F
6	SS-NW starts broadcasting *SystemInformationBlockType19* on Cell 1, no resources for Announcing are provided at this moment of time.	-	-	-	-
7	Wait for 2 modification periods to allow for the UE to obtain the new version of the *SystemInformationType19*.	-	-	-	-
8	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeAnnApplicationIdentity1 to initiate continuous ProSe direct discovery announcing.	-	-	-	-
9	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22 take place (UE performs Announce request procedure)?	-	-	3	P
10	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
11	SS-NW modifies the transmitted *SystemInformationBlockType19* on Cell 1 to provide resources for Direct discovery announcing, the *poolSelection* provided in the *discTxPoolCommon* is set to *rsrpBasedUE*.	-	-	-	-
12	Wait for 2 modification periods to allow for the UE to obtain the new version of the *SystemInformationType19*.	-	-	-	-
-	EXCEPTION: Step 13 is repeated 3 times .	-	-	-	-
13	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 9) and utilising the resources configured in the	-->	PC5_DISCOVERY	4	P

	SystemInformationType19 transmitted on the serving cell? NOTE: The UE uses for the transmission the DiscResourcePool entry in *discTxPoolCommon* for which RSRP measurement of the serving cell is in-between the set for that pool *threshLow* and *threshHigh (SystemInformationType19/discTxPoolCommon/ SL-DiscResourcePool-r12[1])*.				
14	Check: Does the UE transmit in the next3 transmission periods a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 9) and utilising the resources configured in the *SystemInformationType19 transmitted on the serving cell*? NOTE: The UE uses for the transmission the DiscResourcePool entry in *discTxPoolCommon* for which RSRP measurement of the serving cell is NOT in-between the set in that pool *threshLow* and *threshHigh (SystemInformationType19/discTxPoolCommon/ SL-DiscResourcePool-r12[2])*.	-->	PC5_DISCOVERY	4	F
15	The SS configures: SS-NW Cell 1 and Cell 2 parameters according to the row "T1" in table 19.2.2.3.2-0. Cell 2 broadcasts *SystemInformationBlockType19* with the *poolSelection* provided in the *discTxPoolCommon* is NOT set to *rsrpBasedUE*.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 2.	-	-	-	-
16	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Announce request procedure) in the next 5 sec?	-	-	5	F
-	EXCEPTION: Step 17 is repeated 3 times .	-	-	-	-
17	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 9) and utilising the resources configured in the *SystemInformationType19 transmitted on the serving cell*(2 transmission pools; the pool to be used for transmission is to be chosen by the UE randomly)?	-->	PC5_DISCOVERY	5	P
18	The SS configures: SS-NW Cell 2 and Cell 4 parameters according to the row "T 2" in table 19.2.2.3.2-0.. Cell 4 broadcasts *SystemInformationBlockType19* providing different resources for Announcing than those provided on Cell 2. In addition to all other settings the *syncTxThreshIC* is included in the *SystemInformationBlockType19*	-	-	-	-

	Note: The Power level of Cell 4 is such that it is ensured that the RSRP measurement of the serving cell is NOT below the value of *syncTxThreshIC* included in *SystemInformationBlockType19*.				
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 4.	-	-	-	-
19	Check: Does the UE announce its ProSe direct discovery capabilities? The Generic test procedure for 'Tracking area updating procedure' defined in TS 36.508 [18] clause 4.5A.2 takes place.	-	-	1	P
20	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Announce request procedure)?	-	-	6	P
21	SS-NW starts a timer=T4000 (the value of T4000 is provided in the DISCOVERY_RESPONSE message sent in the procedure taking place in step 20; the expiry of this timer takes place in step 25)	-	-	-	-
22	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
-	EXCEPTION: Step 23 is repeated 3 times .	-	-	-	-
23	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 18) and utilising the resources configured in the *SystemInformationType19* transmitted on the serving cell *(SystemInformationType19/discTxPoolCommon/ SL-DiscResourcePool-r12[2])*?	-->	PC5_DISCOVERY	6	P
-	EXCEPTION: Steps 24a1 - 24a3 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place if the UE is capable of SLSS transmission.	-	-	-	-
24a 1	IF pc_discSLSS THEN Check: Does the UE transmit SLSS in the next3transmission periods? NOTE: The Power level of Cell 4 is such that it is ensured that the RSRP measurement of the serving cell is NOT below the value of *syncTxThreshIC* included in *SystemInformationBlockType19*.	-	SLSS	7	F
24a 2	The SS configures: SS-NW Cell 4 parameters according to the row "T 3" in table 19.2.2.3.2-0. Note: RSRP measurement of Cell 4 (the serving cell) is below the value of *syncTxThreshIC* included in *SystemInformationBlockType19*.	-	-	-	-
-	EXCEPTION: Step 24a3 is repeated 3 times.	-	-	-	-
24a 3	Check: Does the UE transmit SLSS in the next transmission period in accordance with the information provided in the *SystemInformationBlockType19* (SLSSID, a subframe indicated by *syncOffsetIndicator*)?	-->	SLSS	7	P
25	SS-NW waits until the timer T4000 set in step 21 expires.	-	-	-	-
26	Check: Does the generic test procedure for	-	-	8	P

	'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Announce request procedure)?				
27	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-
28-35	Void	-	-	-	-
36	The SS configures: SS-NW Cell 4 and Cell 11 parameters according to the row "T 4" in table 19.2.2.3.2-0 Cell 11 broadcasts *SystemInformationBlockType19* providing resources for Announcing.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 11.	-	-	-	-
37	Check: Does the UE announce its ProSe direct discovery capabilities? The Generic test procedure for 'Tracking area updating procedure' defined in TS 36.508 [18] clause 4.5A.2 takes place.	-	-	1	P
38	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Announce request procedure) in the next 5s?	-	-	11	F
39	Check: Does the UE transmit in the next3 transmission periods a PC5_DISCOVERY message containing a ProSe Application Code and utilising the resources configured in the *SystemInformationType19* transmitted on the serving cell *(SystemInformationType19/discTxPoolCommon/ SL-DiscResourcePool-r12[2])*?	-->	PC5_DISCOVERY	11	F
40	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeAnnApplicationIdentity1 to initiate ProSe direct discovery announcing.	-	-	-	-
41	Check: Does the generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22A take place (UE performs Announce request procedure) in the next 5s?	-	-	11	F

Table 19.2.2.3.2-2: Parallel behaviour - Generic RB Establishment

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1-2	Steps 6 - 7 from the Generic test procedure 'Generic Radio Bearer Establishment (State 3)' defined in TS 36.508 [18] subclause 4.5.3 take place.	-	-	-	-

19.2.2.3.3 Specific message contents

Table 19.2.2.3.3-1: *SystemInformationBlockType19* for Cell 1 (step 6, Table 19.2.2.3.2-1)

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType19-r12 ::= SEQUENCE {			
discConfig-r12 SEQUENCE {		No Resources for Direct Discovery Announcing.	
discTxPoolCommon-r12	Not Present		
discTxPowerInfo-r12	Not Present		
discSyncConfig-r12	Not Present		
}			
}			

Table 19.2.2.3.3-2: *SystemInformationBlockType19* for Cell 1 (step 11, Table 19.2.2.3.2-1)

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType19-r12 ::= SEQUENCE {			
discConfig-r12 SEQUENCE {			
discTxPoolCommon-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[1] SEQUENCE {	Pool 1		
txParameters-r12 SEQUENCE {			
ue-SelectedResourceConfig-r12 SEQUENCE {			
poolSelection-r12 SEQUENCE {		*rsrpBased-r12*	
threshLow-r12	3	-90dBm	
threshHigh-r12	4	-80dBm	
}			
}			
}			
}			
SL-DiscResourcePool-r12[2] SEQUENCE {	Pool 2		
txParameters-r12 SEQUENCE {			
ue-SelectedResourceConfig-r12 SEQUENCE {			
poolSelection-r12 SEQUENCE {		*rsrpBased-r12*	
threshLow-r12	4	-80dBm	
threshHigh-r12	5	-70dBm	
}			
}			
}			
}			
}			
}			
}			
Note 1: The *rsrpBased-r12*r values are chosen in regard to Cell 1 setting to -85 dBm in Table 19.2.2.3.2-0; Pool1 is set so that -85 dBm is between of *threshLow* and *threshHigh*; Pool 2 is set so that -85 dBm is outside *threshLow ... threshHigh*			

Table 19.2.2.3.3-3: *SystemInformationBlockType19* for Cell 2 when active

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType19-r12 ::= SEQUENCE {			
discConfig-r12 SEQUENCE {			
discRxPool-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[1] SEQUENCE {		RxPool 1	
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00001100 00000000 00000000 00000000 00000000	bs40-r12	FDD
	00001100 00000000	bs16-r12	TDD
}			
}			
SL-DiscResourcePool-r12[2] SEQUENCE {		RxPool 2	
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000011 00000000 00000000 00000000 00000000	bs40-r12	FDD
	00000011 00000000	bs16-r12	TDD
}			
}			
discTxPoolCommon-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[1] SEQUENCE {		TxPool 1	
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00001100 00000000 00000000 00000000 00000000	bs40-r12	FDD
	00001100 00000000	bs16-r12	TDD
}			
}			
SL-DiscResourcePool-r12[2] SEQUENCE {		TxPool 2	
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000011 00000000 00000000 00000000 00000000	bs40-r12	FDD
	00000011 00000000	bs16-r12	TDD
}			
}			
}			
}			
}			
Note 1: 2 transmission/reception pools; the pool to be used for transmission is to be chosen by the UE randomly. Note 2 The resources provided for Tx are different to the resources on Cell 1 where the UE operates prior to moving to Cell 2.			

Table 19.2.2.3.3-4: *SystemInformationBlockType19* for Cell 4 and Cell 11 when active

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType19-r12 ::= SEQUENCE {			
discConfig-r12 SEQUENCE {			
discRxPool-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[2] SEQUENCE {		RxPool 2	
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 11000000 00000000 00000000 00000000	bs40-r12	FDD
	00000000 11000000	bs16-r12	TDD
}			
}			
}			
discTxPoolCommon-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[1]	Not Present		
SL-DiscResourcePool-r12[2] SEQUENCE {			
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 11000000 00000000 00000000 00000000	bs40-r12	FDD
	00000000 11000000	bs16-r12	TDD
}			
rxParameters-r12 SEQUENCE {			
syncConfigIndex-r12	1	Entry 2 in discSyncConfig-r12 (SL-SyncConfig-r12[2]) (Note 1)	
}			
}			
}			
}			
}			

Note 1: Entry 2 in *discSyncConfig-r12* sets *syncTxThreshIC-r12* to 7 (see 36.508 [18] Table 4.4.3.3-17), i.e. -85dBm is the threshold for starting transmission of SLSS, which with the Cell 4 settings to -79dBm and -87dBm in Table 19.2.2.3.2-0 should ensure that for "T2" there should be no SLSS transmission and for "T3" there should be SLSS transmission.

Note 2: Only one Tx resource provided SL-DiscResourcePool-r12[2] and it is different to the Tx resource(s) provided on cell 2 where the UE operates prior to moving to Cell 4.

Table 19.2.2.3.3-5: Void

Table 19.2.2.3.3-6: ATTACH REQUEST (step 3, Table 19.2.2.3.2-1; step 4, TS 36.508 [18] Table 4.5.2.3-1)

Derivation path: 36.508 [18] table 4.7.2-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'1'	ProSe direct discovery Supported	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'0' or '1'	The UE may, but need not to, support also ProSe direct communication	

Table 19.2.2.3.3-7: TRACKING AREA UPDATE REQUEST (steps 19, 37, Table 19.2.2.3.2-1; step 4, TS 36.508 [18] Table 4.5A.2.1-1)

Derivation path: 36.508 [18] table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
EPS update type			
"Active" flag	'1'B		
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'1'	ProSe direct discovery Supported	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'0' or '1'	The UE may, but need not to, support also ProSe direct communication	

Table 19.2.2.3.3-7A: *RRCConnectionRequest* (steps 9, 17E, 20, Table 19.2.2.3.2-1)

Derivation Path: 36.508, Table 4.6.1-16.			
Information Element	Value/remark	Comment	Condition
RRCConnectionRequest ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcConnectionRequest-r8 SEQUENCE {			
establishmentCause	mo-Data		
	Delay tolerant		
	High priority access AC 11 - 15		
}			
}			
}			

Table 19.2.2.3.3-8: DISCOVERY_REQUEST (steps 9, 20, 26, Table 19.2.2.3.2-1; step 10a1, TS 36.508 [18] Table 4.5A.22.3-2)

Derivation path: 36.508 [18] , Table 4.7F.1-1.			
Information Element	**Value/remark**	**Comment**	**Condition**
discovery-request[1] {			
command	1	announce	
}			

Table 19.2.2.3.3-9: DISCOVERY_RESPONSE (steps 9, 20, 26, Table 19.2.2.3.2-1; step 10a2, TS 36.508 [18] Table 4.5A.22.3-2)

Derivation path: 36.508 [18] , Table 4.7F.1-2.			
Information Element	**Value/remark**	**Comment**	**Condition**
response-monitor[1]	Not Present		
response-announce[1] {			
validity-timer-T4000	2min	Note: Value of 2 min has been arbitrary chosen with the aim from one side not to prolong unnecessarily the TC when the expiration of the timer is checked, and, on another not to trigger not relevant to the TPs ANNOUNCE REQUEST procedure.	
}			

Table 19.2.2.3.3-10: *SidelinkUEInformation* (steps 9, 20, 26, Table 19.2.2.3.2-1)

Derivation Path: 36.508, Clause 4.6.1, Table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs ::= SEQUENCE {			
commRxInterestedFreq-r12	Not Present	Note 1	
commTxResourceReq-r12	Not Present	Note 1	
discRxInterest-r12	Not Present	Note 1	
discTxResourceReq-r12	1	Note 2	
}			
Note 1: It is assumed that it will be possible to trigger in the UE an Application that requests only Announcing. Note 2 This TC assumes that the UE is triggering ProSe Direct Discovery Announcing for only one ProSe Application px_ProSeAnnApplicationIdentity1.			

Table 19.2.2.3.3-11: Void

Table 19.2.2.3.3-12: PC5_DISCOVERY (steps 13, 14, 17, 23, Table 19.2.2.3.2-1)

Derivation path: 36.508 [18] , Table 4.7F.1-5.

19.2.3 ProSe Direct Discovery Announcing/Pre-configured authorisation / Announcing and SLSS transmission in RRC_CONNECTED / RRC connection reconfiguration with/without the *mobilityControlInfo* / RRC connection re-establishment

19.2.3.1 Test Purpose (TP)

(1)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }

ensure that {
  when { UE is in RRC_CONNECTED, **and,** UE is configured with *discTxResources* set to *scheduled* }
    then { UE is able to transmit the sidelink discovery announcement using the assigned/configured resources in Cell1/f1/PLMN1 }
            }

(2)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
  when { UE is in RRC_CONNECTED, **and,** UE is configured with *discTxResources* set to *ue-Selected* and *poolSelection* within *poolToAddModList* is set to *rsrpBased* }
    then { UE is able to transmit the sidelink discovery announcement using the assigned/configured resources in Cell1/f1/PLMN1 selecting for the transmission an entry of *poolToAddModList* for which the RSRP measurement of the PCell, after applying the layer 3 filter defined by *quantityConfig* is in-between *threshLow* and *threshHigh* }
            }

(3)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
  when { UE receives *RRCConnectionReconfiguration* message not including the *mobilityControlInfo* which includes the *sl-DiscConfig* and *discTxResources* set to *release* }
    then { UE release the resources allocated for sidelink discovery announcement previously assigned/configured in Cell1/f1/PLMN1 by *discTxResources* from the next discovery period, as defined by *discPeriod*, and, UE re-starts announcing when resources become available }
            }

(3A)

with { UE being authorised for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
  when { UE receives a request from upper layers to stop sidelink discovery announcement }
    then { the UE transmits a *SidelinkUEInformation* message indicating it does no longer require sidelink discovery announcement resources, and, stops sidelink discovery announcement on Cell1/f1/PLMN1 }
            }

(4)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
  when { UE receives *RRCConnectionReconfiguration* message including *mobilityControlInfo* and *sl-DiscConfig* less than 1 sec after the UE transmitted a *SidelinkUEInformation* message including *discRxInterest* on Cell1/f1/PLMN1, **and,** MAC successfully completes the random access procedure to the targeted PCell Cell2/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* }
    then { UE does not initiate a new Announce request procedure, **and,** transmits a *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery

announcements, and, is able to transmit sidelink discovery announcements using the assigned/configured resources in Cell2/f1/PLMN1 }
}

(5)

with { UE being authorised for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell2/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
when { UE detects radio link failure >1 sec after the UE transmitted a *SidelinkUEInformation* message including *discRxInterest* on Cell2/f1/PLMN1, **and,** UE completes RRC connection re-establishment on Cell1/f1/PLMN1 }
then { UE does not initiate a new Announce request procedure, **and,** does not transmit a *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** continue announcing on Cell1/f1/PLMN1 }
}

(6)

with { UE being authorised for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell1/f1/PLMN1 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
when { UE receives *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover), **and,** MAC successfully completes the random access procedure to the targeted PCell Cell4/f1/PLMN2 which is broadcasting *SystemInformationBlockType19* }
then { UE initiates and successfully completes an Announce request procedure including the transmission of SidelinkUEInformation message to request assignment of transmission resources for sidelink discovery announcements }
}

(7)

with { UE capable of SLSS transmission, **and,** being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell4/f1/PLMN2 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
when { UE is in RRC_CONNECTED, **and,** *networkControlledSyncTx* is configured and set to *on* }
then { UE transmits SLSS }
}

(8)

with { UE capable of SLSS transmission, **and,** being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell4/f1/PLMN2 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
when { UE is in RRC_CONNECTED, **and,** *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType19,* and, the RSRP measurement of the serving cell is below the value of *syncTxThreshIC* }
then { UE transmits SLSS }
}

(9)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell4/f1/PLMN2 which is broadcasting

SystemInformationBlockType19 indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
  when { UE receives *RRCConnectionReconfiguration* message including *mobilityControlInfo*, **and,** MAC successfully completes the random access procedure to the targeted PCell Cell11/f1/PLMN3 which is broadcasting *SystemInformationBlockType19* }
    then { UE does not initiates an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements **and,** does not announce over the PC5 in the assigned resources in Cell11/f1/PLMN3 }
            }

(10)

with { UE being authorized for performing ProSe Direct Discovery Announcing in two PLMNs (PLMN1 and PLMN2) operating on the same frequency, **and,** UE attached to Cell11/f1/PLMN3 which is broadcasting *SystemInformationBlockType19* indicating the provision of resources for sidelink discovery announcement on the serving PLMN, **and,** UE has previously successfully completed an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements, **and,** the timer T4000 associated with the ProSe Application Code allocated during the procedure has not expired }
ensure that {
  when { UE receives *RRCConnectionReconfiguration* message including *mobilityControlInfo*, **and,** MAC successfully completes the random access procedure to the targeted PCell Cell1/f1/PLMN1 which is NOT broadcasting *SystemInformationBlockType19* }
    then { UE does not initiates an Announce request procedure including the transmission of *SidelinkUEInformation* message to request assignment of transmission resources for sidelink discovery announcements **and,** does not announce over the PC5 in the assigned resources in Cell1/f1/PLMN1 }
            }

19.2.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 23.303, clause 5.3.1.1, TS 24.334, clauses 5.1.1, 5.1.2, 6.1.1, 6.2.2.2, 6.2.2.4, TS 36.331, clauses 5.2.2.4, 5.3.3.1a, 5.3.5.3, 5.3.5.4, 5.3.7.5, 5.3.10.15, 5.10.2.1, 5.10.2.2, 5.10.2.3, 5.10.6, 5.10.7.1, 5.10.7.2, 5.10.7.3. Unless otherwise stated these are Rel-12 requirements.

[TS 23.303, clause 5.3.1.1]

The UE can act as "announcing UE" only in the band designated by the serving PLMN but may act as a "monitoring" UE also in the resources of the serving PLMN and Local PLMNs.

ProSe-enabled UEs which have obtained authorization to participate in ProSe Direct Discovery procedures shall not continue in participating in ProSe Direct Discovery procedures as soon as they detect loss of E-UTRA coverage in the serving PLMN.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery announcing or ProSe direct discovery monitoring or both, and to use ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

2) transferred between the UE and the ProSe Function over the PC3 interface with the ProSe Direct Services Provisioning Management Object or the ProSe Public Safety Direct Services Provisioning Management Object as specified in 3GPP TS 24.333 [9].

...

The service authorisation provided by the ProSe Function of the HPLMN for ProSe direct discovery contains a list of PLMNs in which the UE is authorised to use ProSe direct discovery.

...

The UE discovers the IP address of the ProSe Functions of the HPLMN as specified in subclause 5.1.2.

[TS 24.334, clause 5.1.2]

The IP address of the ProSe function in the HPLMN may be pre-configured in the UE and in this case, the UE may use the pre-configured IP address. Alternatively, the FQDN of the ProSe Function in the HPLMN may be self-constructed by the UE, i.e. derived from the PLMN ID of the HPLMN. The UE may perform DNS lookup as specified in IETF RFC 1035 [10].

[TS 24.334, clause 6.1.1]

The UE and ProSe Function shall use HTTP 1.1 as specified in IETF RFC 7230 [18] and IETF RFC 7231 [19] as the transport protocol for ProSe messages over the PC3 interface. The ProSe messages described here shall be included in the body of either an HTTP request message or an HTTP response message. The following rules apply:

- The UE initiates ProSe transactions with an HTTP request message containing the PC3 request(s);
- The ProSe Function responds to the requests with an HTTP response message containing the PC3 response(s) for the PC3 request(s); and
- HTTP POST methods are used for PC3 direct discovery procedures.

Optionally, the operator can configure the UE with configuration parameters for establishment of the PDN connection for reaching the HPLMN ProSe Function. If the UE is configured with the configuration parameter for establishment of the PDN connection for reaching the HPLMN ProSe Function (see 3GPP TS 24.333 [9]):

a) if a PDN connection for reaching the HPLMN ProSe Function is not established yet, the UE shall establish the PDN connection for reaching the HPLMN ProSe Function according to the UE configuration and shall send the HTTP request message via the PDN connection for reaching the HPLMN ProSe Function; and

b) if a PDN connection for reaching the HPLMN ProSe Function is already established (e.g. either due to other ProSe feature or due to other application), the UE shall send the HTTP request message via the PDN connection for reaching the HPLMN ProSe Function;

[TS 24.334, clause 6.2.2.2]

Before initiating the announce request procedure, the UE is configured with the data structure of the ProSe Application IDs appropriate for its HPLMN. This step is performed using mechanisms out of scope of 3GPP.

If the UE is authorised to perform ProSe direct discovery announcing in the registered PLMN, it shall initiate an announce request procedure:

a) when the UE is triggered by an upper layer application to announce a ProSe Application ID and the UE has no valid corresponding ProSe Application Code for that upper layer application;

b) when the validity timer T4000 assigned by the ProSe Function to a ProSe Application Code has expired and the request from upper layers to announce the ProSe Application ID corresponding to that ProSe Application Code is still in place; or

c) when the UE selects a new PLMN while announcing a ProSe Application Code and the UE is authorised for ProSe direct discovery announcing in the new PLMN.

When the UE selects a new PLMN while announcing a ProSe Application Code and the UE is not yet authorised for ProSe direct discovery announcing in the new PLMN, the UE shall initiate an announce request procedure only after the UE is authorised for ProSe direct discovery announcing in the new PLMN.

NOTE 1: To ensure service continuity if the UE needs to keep announcing a ProSe Application Code corresponding to the same ProSe Application ID, the UE can initiate the announce request procedure before the TTL timer T4000 assigned by the ProSe Function for a Prose Application Code expires.

The UE initiates the announce request procedure by sending a DISCOVERY_REQUEST message with a new transaction ID, the ProSe Application ID set to the ProSe Application ID received from upper layers, the command set to "announce", the UE identity set to the UE's IMSI, and the Application Identity set to the Application Identity of the upper layer application that requested the announcing.

NOTE 2: A UE can include one or multiple transactions in one DISCOVERY_REQUEST message for different ProSe Application IDs, and receive corresponding <response-announce> element or <response-reject> element in a DISCOVERY_RESPONSE message for each respective transaction. In the following description of the announce request procedure, only one transaction is included.

Figure 6.2.2.2.1 illustrates the interaction of the UE and the ProSe Function in the announce request procedure.

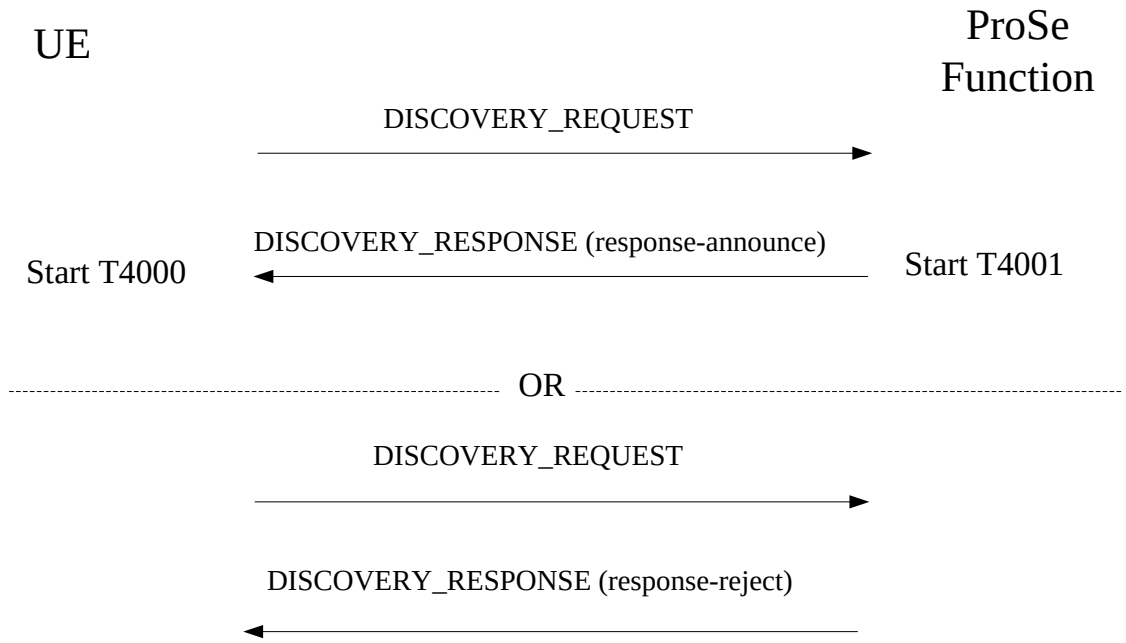

Figure 6.2.2.2.1: Announce request procedure

[TS 24.334, clause 6.2.2.4]

Upon receipt of the DISCOVERY_RESPONSE message, if the transaction ID contained in the <response-announce> element matches the value sent by the UE in a DISCOVERY_REQUEST message with the command set to "announce", the UE shall, for each ProSe Application Code received in the DISCOVERY_RESPONSE message, stop the validity timer T4000 if running and start the validity timer T4000 with the received value. Otherwise the UE shall discard the DISCOVERY_RESPONSE message and shall not perform the procedures below.

The UE may perform direct discovery announcing as described below.

The UE requests the parameters from the lower layers for Prose direct discovery announcing (see 3GPP TS 36.331 [12]). The UE shall perform direct discovery announcing only if the lower layers indicate that ProSe direct discovery is supported by the network. If the UE in EMM-IDLE mode has to request resources for ProSe direct discovery announcing as specified in 3GPP TS 36.331 [12], the UE shall perform a service request procedure or tracking area update procedure as specified in 3GPP TS 24.301 [11]. The UE shall obtain the UTC time for the next discovery transmission opportunity for ProSe direct discovery from the lower layers.

If a valid UTC time is obtained, the UE shall generate the UTC-based counter corresponding to this UTC time as specified in subclause 12.2.2.18, and then use the UTC-based counter to compute the MIC field for the PC5_DISCOVERY message as described in 3GPP TS 33.303 [6].

The UE shall use the ProSe Application Code received in the DISCOVERY_RESPONSE message, along with the MIC and the four least significant bits of the UTC-based counter, in order to construct a PC5_DISCOVERY message, according to the format defined in subclause 11.2.5.

The UE then passes the PC5_DISCOVERY message to the lower layers for transmission if:

- the UE is currently authorised to perform direct discovery announcing in the registered PLMN;
- the validity timer T4000 for the allocated ProSe Application Code has not expired; and
- a request from upper layers to announce the ProSe Application ID associated with both the ProSe Application Code and the authorised Application Identity is still in place.

The UE shall ensure that it keeps on passing PC5_DISCOVERY messages to the lower layers for transmission until the validity timer T4000 of the ProSe Application Code expires. How this is achieved is left up to UE implementation.

During the announcing operation, if one of the above conditions is no longer met, the UE may instruct the lower layers to stop announcing. When the UE stops announcing, if the lower layers indicate that the UE is required to send a discovery indication to the eNodeB and the UE is in EMM-CONNECTED mode, the UE shall trigger the corresponding procedure in lower layers as specified in 3GPP TS 36.331 [12].

[TS 36.331, clause 5.2.2.4]

1> if the UE is capable of sidelink discovery and is configured by upper layers to receive or transmit sidelink discovery announcements on the primary frequency:

2> if *schedulingInfoList* indicates that *SystemInformationBlockType19* is present and the UE does not have stored a valid version of this system information block:

3> acquire *SystemInformationBlockType19*;

[TS 36.331, clause 5.3.3.1a]

For sidelink discovery an RRC connection is initiated only in the following case:

1> if configured by upper layers to transmit sidelink discovery announcements:

2> if *SystemInformationBlockType19* is broadcast by the cell on which the UE camps: and if the valid version of *SystemInformationBlockType19* does not include *discTxPoolCommon*;

NOTE: Upper layers initiate an RRC connection. The interaction with NAS is left to UE implementation.

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the *RRCConnectionReconfiguration* message includes the *sl-DiscConfig* or *sl-CommConfig*:

2> perform the sidelink dedicated configuration procedure as specified in 5.3.10.15;

...

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 36.331, clause 5.3.5.4]

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the *RRCConnectionReconfiguration* message includes the *sl-DiscConfig* or *sl-CommConfig*:

2> perform the sidelink dedicated configuration procedure as specified in 5.3.10.15;

...

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission;

1> if MAC successfully completes the random access procedure:

...

2> if *SystemInformationBlockType19* is broadcast by the target PCell; and the UE transmitted a *SidelinkUEInformation* message including *discRxInterest* or *discTxResourceReq* during the last 1 second preceding reception of the *RRCConnectionReconfiguration* message including *mobilityControlInfo*:

3> initiate transmission of the *SidelinkUEInformation* message in accordance with 5.10.2.3;

[TS 36.331, clause 5.3.7.5]

NOTE 1: Prior to this, lower layer signalling is used to allocate a C-RNTI. For further details see TS 36.321 [6];

The UE shall:

1> stop timer T301;

1> consider the current cell to be the PCell;

1> re-establish PDCP for SRB1;

1> re-establish RLC for SRB1;

1> perform the radio resource configuration procedure in accordance with the received *radioResourceConfigDedicated* and as specified in 5.3.10;

1> resume SRB1;

...

1> if *SystemInformationBlockType19* is broadcast by the PCell; and the UE transmitted a *SidelinkUEInformation* message including *discRxInterest* or *discTxResourceReq* during the last 1 second preceding detection of radio link failure:

2> initiate transmission of the *SidelinkUEInformation* message in accordance with 5.10.2.3;

[TS 36.331, clause 5.3.10.15]

The UE shall:

...

1> if the *RRCConnectionReconfiguration* message includes the *sl-DiscConfig*:

2> if *discTxResources* is included and set to *setup*:

3> from the next discovery period, as defined by *discPeriod*, use the resources indicated by *discTxResources* for sidelink discovery announcement, as specified in 5.10.6;

2> else if *discTxResources* is included and set to *release*:

3> from the next discovery period, as defined by *discPeriod*, release the resources allocated for sidelink discovery announcement previously configured by *discTxResources*;

[TS 36.331, clause 5.10.2.1]

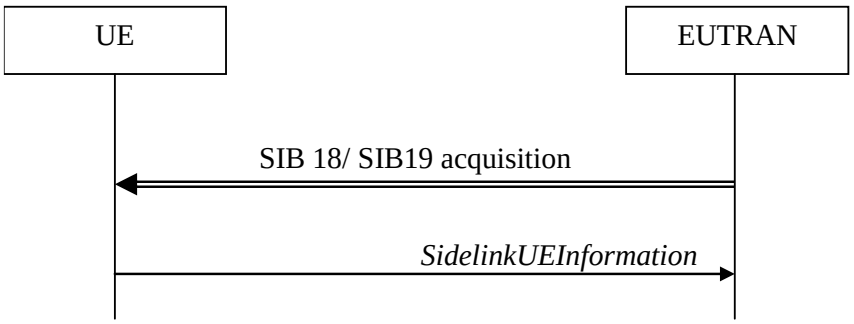

Figure 5.10.2-1: Sidelink UE information

The purpose of this procedure is to inform E-UTRAN that the UE is interested or no longer interested to receive sidelink communication or discovery, as well as to request assignment or release of transmission resources for sidelink communication or discovery announcements.

[TS 36.331, clause 5.10.2.2]

A UE capable of sidelink communication or discovery that is in RRC_CONNECTED may initiate the procedure to indicate it is (interested in) receiving sidelink communication or discovery in several cases including upon successful connection establishment, upon change of interest, upon change to a PCell broadcasting *SystemInformationBlockType18* or *SystemInformationBlockType19*. A UE capable of sidelink communication or discovery may initiate the procedure to request assignment of dedicated resources for the concerned sidelink communication transmission or discovery announcements.

NOTE 1: A UE in RRC_IDLE that is configured to transmit sidelink communication/ discovery announcements, while *SystemInformationBlockType18*/ *SystemInformationBlockType19* does not include the resources for transmission (in normal conditions), initiates connection establishment in accordance with 5.3.3.1a.

Upon initiating the procedure, the UE shall:

...

1> if *SystemInformationBlockType19* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType19* for the PCell;

...

2> if the UE is configured by upper layers to transmit sidelink discovery announcements:

3> if the UE did not transmit a *SidelinkUEInformation* message since entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a *SidelinkUEInformation* message the UE connected to a PCell not broadcasting *SystemInformationBlockType19*; or

3> if the last transmission of the *SidelinkUEInformation* message did not include *discTxResourceReq*; or if the sidelink discovery announcement resources required by the UE have changed (i.e. resulting in a change of *discTxResourceReq*) since the last transmission of the *SidelinkUEInformation* message:

4> initiate transmission of the *SidelinkUEInformation* message to indicate the sidelink discovery announcement resources required by the UE in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the *SidelinkUEInformation* message included *discTxResourceReq*:

4> initiate transmission of the *SidelinkUEInformation* message to indicate it does no longer require sidelink discovery announcement resources in accordance with 5.10.2.3;

[TS 36.331, clause 5.10.2.3]

The UE shall set the contents of the *SidelinkUEInformation* message as follows:

...

1> if *SystemInformationBlockType19* is broadcast by the PCell:

...

2> if the UE is configured by upper layers to transmit sidelink discovery announcements:

3> include *discTxResourceReq* and set it to indicate the number of discovery messages for sidelink discovery announcement(s) for which it requests E-UTRAN to assign dedicated resources;

The UE shall submit the *SidelinkUEInformation* message to lower layers for transmission.

[TS 36.331, clause 5.10.6]

A UE capable of sidelink discovery that is configured by upper layers to transmit sidelink discovery announcements shall:

NOTE 1: In case the configured resources are insufficient it is up to UE implementation to decide which sidelink discovery announcements to transmit.

1> if the UE's serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) is suitable as defined in TS 36.304 [4]:

2> if the UE is in RRC_CONNECTED (i.e. PCell is used for sidelink discovery announcement):

3> if the UE is configured with *discTxResources* set to *scheduled*:

4> configure lower layers to transmit the sidelink discovery announcement using the assigned resources indicated by *scheduled* in *discTxResources*;

3> else if the UE is configured with *discTxPoolDedicated* (i.e. *discTxResources* set to *ue-Selected*):

4> if *poolSelection* within *poolToAddModList* is set to *rsrpBased*:

5> select an entry of *poolToAddModList* for which the RSRP measurement of the PCell, after applying the layer 3 filter defined by *quantityConfig* as specified in 5.5.3.2 , is in-between *threshLow* and *threshHigh*;

4> else:

5> randomly select, using a uniform distribution, an entry of *poolToAddModList*;

4> configure lower layers to transmit the sidelink discovery announcement using the selected pool of resources:

[TS 36.331, clause 5.10.7.1]

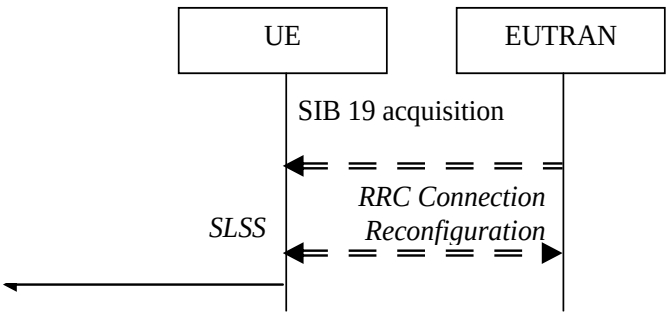

Figure 5.10.7.1-3: Synchronisation information transmission for sidelink discovery

The purpose of this procedure is to provide synchronisation information to a UE. The synchronisation information concerns a Sidelink Synchronisation Signal (SLSS) for sidelink discovery, while it concerns an SLSS, timing

information and some additional configuration parameters (i.e. the *MasterInformationBlock-SL* message) for sidelink communication. A UE transmits synchronisation information either when E-UTRAN configures it to do so by dedicated signalling (i.e. network based), or when not configured by dedicated signalling (i.e. UE based) and E-UTRAN broadcasts (in coverage) or pre-configures a threshold (out of coverage).

The synchronisation information transmitted by the UE may be derived from information/ signals received from E-UTRAN (in coverage) or received from a UE acting as synchronisation reference for the transmitting UE. In the remainder, the UE acting as synchronisation reference is referred to as SyncRef UE.

[TS 36.331, clause 5.10.7.2]

A UE capable of SLSS transmission shall, when transmitting sidelink discovery announcements in accordance with 5.10.6 and when the following conditions are met:

1> if the UE's serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) is suitable as defined in TS 36.304 [4]:

2> if in RRC_CONNECTED; and if *networkControlledSyncTx* is configured and set to *on*; or

2> if *networkControlledSyncTx* is not configured; and *syncTxThreshIC* is included in *SystemInformationBlockType19*; and the RSRP measurement of the serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) is below the value of *syncTxThreshIC*:

3> transmit SLSS in accordance with 5.10.7.3 and TS 36.211 [21], unless the UE uses the selected subframe for regular uplink transmission;

[TS 36.331, clause 5.10.7.3]

The UE shall select the SLSSID and the subframe in which to transmit SLSS as follows:

1> if triggered by sidelink discovery announcement:

2> select the SLSSID included in the entry of *discSyncConfig* included in the received *SystemInformationBlockType19*, that includes *txParameters*;

2> use *syncOffsetIndicator* corresponding to the selected SLSSID;

2> for each pool used for the transmission of discovery announcements (each corresponding to the selected SLSSID):

3> if a subframe indicated by *syncOffsetIndicator* corresponds to the first subframe of the discovery transmission pool;

4> select the concerned subframe;

3> else

4> select the subframe indicated by *syncOffsetIndicator* that precedes and which, in time domain, is nearest to the first subframe of the discovery transmission pool;

19.2.3.3 Test description

19.2.3.3.1 Pre-test conditions

System Simulator:

SS-NW

- 4 cells with parameters defined in Table 19.2.3.3.1-1.

NOTE: The test only requires at maximum 2 cells to be active at any one instant.

Table 19.2.3.3.1-1: Cell parameters values

Cell	Frequency	PLMN
1	f1	HPLMN (PLMN1)
2	f1	HPLMN (PLMN1)
4	f1	PLMN2
11	f1	PLMN3
Note 1: PLMN1: PLMN1 in USIM EF_{PROSE_ANN} PLMN2: PLMN2 in USIM EF_{PROSE_ANN} PLMN3: MCC = MCC of PLMN1 in USIM EF_{PROSE_ANN}; MNC=03. Note 2: A single frequency has been chosen for all PLMNs to allow the TC to be applicable even for UEs supporting a single band which comprises a single frequency.		

- System information combination 24 as defined in TS 36.508 [18] clause 4.4.3.1 is used in all active cells.

SS-UE

- SS-UE 1.

  - As defined in TS 36.508 [18], configured and operating for/as ProSe Direct Discovery Monitoring on the resources which the UE is expected to use for transmission (as specified in the relevant procedure steps in Table 19.2.3.3.2-1).

UE:

- ProSe related configuration

  - The UE is equipped with a USIM containing values shown in Table 19.2.3.3.1-2, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. 2 PLMNs are authorised for ProSe Direct Discovery Announcing).

Table 19.2.3.3.1-2: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°1 (ProSe direct discovery parameters) supported
	Service n°5 (ProSe Direct Discovery announcing radio parameters) supported
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage

Depending on implementation, a Rel-12 UE may not support USIM settings for ProSe Direct Discovery Announcing (pc_disc_public_safety=FALSE, i.e. ProSe Discovery for Public Safety not supported) . Such UEs are expected to provide means for pre-configuring the PLMNs which are authorised for ProSe Direct Discovery Announcing (e.g. via MMI). The values specified for EF_{PROSE_ANN} in TS 36.508 [18], section 4.9.3.1 shall be preconfigured.

- For each PLMN a timer T4005 is assigned long enough not to expire before the TC is completed, e.g. 5min (For Rel-12 this timer cannot be set in the USIM, it is expected that the UE shall provide means for setting the timer e.g. via MMI).

- The UE is configured with the data structure of the ProSe Application ID (px_ProSeAnnApplicationIdentity1) it wants to announce (This step is performed using UE implementation dependent mechanisms, e.g. MMI command, or, may be pre-loaded in the UE).

- The UE has no valid ProSe Application Code corresponding to the configured ProSe Application ID (px_ProSeAnnApplicationIdentity1).

Preamble:

- The UE is in state Generic Radio Bearer Established (State 3) according to TS 36.508 [18] on Cell 1.

19.2.3.3.2 Test procedure sequence

Table 19.2.3.3.2-0 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" ... "Tn" are to be applied subsequently. The exact instants on which these values shall be applied are described elsewhere in the present clause.

Table 19.2.3.3.2-0: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Cell 4	Cell 11
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	"Off"	"Off"
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-77	"Off"	"Off"
T2	Cell-specific RS EPRE	dBm/15k Hz	-85	"Off"	"Off"	"Off"
T3	Cell-specific RS EPRE	dBm/15k Hz	-85	"Off"	-77	"Off"
T4	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	-87	"Off"
T5	Cell-specific RS EPRE	dBm/15k Hz	"Off"	"Off"	"Off"	-79
T6	Cell-specific RS EPRE	dBm/15k Hz	-79	"Off"	"Off"	-85

Table 19.2.3.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeAnnApplicationIdentity1 to initiate continuous ProSe direct discovery announcing. NOTE: Although the UE is expected to transmit continuously, only the PC5_DISCOVERY messages which need to be checked are shown explicitly in the step sequence.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
2-2C	Check: Do steps 8 - 11 from t he generic test procedure for 'Communication with the ProSe Function' with the condition ANNOUNCE/MONITOR REQUEST defined in TS 36.508 [18] subclause 4.5A.22 take place (UE performs Announce request procedure and requests assignment of dedicated resources for direct discovery announcing) ?	-	-	1	P
-	EXCEPTION: Steps 3a1 - 3a3 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that takes place if the UE supports transmission of discovery announcements based on network scheduled resource allocation.	-	-	-	-
3a1	IF pc_discScheduledResourceAlloc THEN SS-NW transmits an *RRCConnectionReconfiguration* message assigning announce transmission scheduled resources to the UE (i.e. *discTxResources* set to *scheduled*).	<--	*RRCConnectionReconfiguration*	-	-
3a2	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: Step 3a3 is repeated 3 times .	-	-	-	-
3a3	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 2) and utilising the resources configured in the *RRCConnectionReconfiguration* message?	-->	PC5_DISCOVERY	1	P
-	EXCEPTION: Steps 4a1 - 4a3 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that takes place if the UE supports transmission of discovery announcements based on UE autonomous resource selection.	-	-	-	-
4a1	IF pc_discUESelectedResourceAlloc THEN SS-NW transmits an *RRCConnectionReconfiguration* message assigning announce transmission resources for UE autonomous resource selection: *discTxResources* set to *ue-Selected* and *poolSelection* within *poolToAddModList* is set to *rsrpBased*. The *DiscTxPoolList* contains 2 Pools each providing different sets of *threshLow* and *threshHigh*. One of these sets is defined so that RSRP measurement of the serving cell will	<--	*RRCConnectionReconfiguration*	-	-

	result in the RSRP being in-between the *threshLow* and *threshHigh, whereas for the other it will be out*.				
4a2	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: Step 4a3 is repeated 3 times .	-	-	-	-
4a3	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 2) and utilising the resources configured in the *RRCConnectionReconfiguration* message? NOTE: The UE uses for the transmission the -*DiscResourcePool* entry in *discTxPoolCommon* for which RSRP measurement of the serving cell is in-between the set for that pool *threshLow* and *threshHigh (ue-Selected-r12/SL-DiscTxPoolToAddMod-r12[1])*.	-->	PC5_DISCOVERY	2	P
5	SS-NW transmits an *RRCConnectionReconfiguration* message requesting the UE to release the resources allocated for sidelink discovery announcement previously configured by discTxResources (i.e. *discTxResources* is included and set to *release*).	<--	*RRCConnectionReconfiguration*	-	-
6	The UE submits *RRCConnectionReconfigurationComplete* message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: Steps 7a1 - 7b1 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place depending on the type of resource selection UE supports for transmission of discovery announcements.	-	-	-	-
7a1	IF (pc_discScheduledResourceAlloc AND NOT pc_discUESelectedResourceAlloc) THEN Check: Does the UE transmit during the next 10 discovery periods a PC5_DISCOVERY message utilising the resources used for transmission in step 3a3?	-->	PC5_DISCOVERY	3	F
7b1	IF pc_discUESelectedResourceAlloc THEN Check: Does the UE transmit during the next 10 discovery periods a PC5_DISCOVERY message utilising the resources used for transmission in step 4a3?	-->	PC5_DISCOVERY	3	F
-	EXCEPTION: Steps 7Aa1 - 7Ab3 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place depending on the type of resource selection UE supports for transmission of discovery announcements. NOTE: In comparison to the similar sequences earlier in the step sequence testing only one of the 2 options here is enough to satisfy the TP.	-	-	-	-
7Aa1	IF pc_discScheduledResourceAlloc THEN SS-NW transmits an *RRCConnectionReconfiguration* message assigning announce transmission scheduled resources to the UE (i.e. *discTxResources* set to *scheduled*).	<--	*RRCConnectionReconfiguration*	-	-
7A	The UE submits	-->	*RRCConnectionReconfigurationC*	-	-

a2	RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.		*omplete*		
-	EXCEPTION: Step 7Aa3 is repeated 3 times.	-	-	-	-
7A a3	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 2) and utilising the resources configured in the *RRCConnectionReconfiguration* message?	-->	PC5_DISCOVERY	3	P
7A b1	IF (pc_discUESelectedResourceAlloc AND NOT pc_discScheduledResourceAlloc) THEN SS-NW transmits an *RRCConnectionReconfiguration* message assigning announce transmission resources for UE autonomous resource selection: *discTxResources* set to *ue-Selected* and *poolSelection* within *poolToAddModList* is set to *rsrpBased*.	<--	*RRCConnectionReconfiguration*	-	-
7A b2	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: Step 7Ab3 is repeated 3x times.	-	-	-	-
7A b3	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 2) and utilising the resources configured in the *RRCConnectionReconfiguration* message? NOTE: The UE uses for the transmission the -DiscResourcePool entry in *discTxPoolCommon* for which RSRP measurement of the serving cell is in-between the set for that pool *threshLow* and *threshHigh (ue-Selected-r12/SL-DiscTxPoolToAddMod-r12[1])*.	-->	PC5_DISCOVERY	3	P
8	Force the UE upper layer application to request stop of sidelink direct discovery announcing..	-	-	-	-
8A	Check: Does the UE transmit a SidelinkUEInformation message indicating it does no longer require resources for sidelink direct discovery announcing transmission in the next 1 sec?	-->	*SidelinkUEInformation*	3A	P
9	Force the UE upper layer application to request restart of sidelink direct discovery announcing.	-	-	-	-
10	The UE transmit a *SidelinkUEInformation* message requesting resources for Announcing.	-->	*SidelinkUEInformation*	-	-
11	The SS configures: SW-NW Cell 1 and Cell 2 parameters according to the row "T1" in table 19.2.3.3.2-0 in order to simulate needs for handover.	-	-	-	-
-	EXCEPTION: Steps 12a1 - 12b1 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place depending on the type of resource selection UE supports for transmission of discovery announcements.	-	-	-	-
12a 1	IF pc_discScheduledResourceAlloc THEN SS-NW transmits an *RRCConnectionReconfiguration* message	<--	*RRCConnectionReconfiguration*	-	-

	including *mobilityControlInfo* (handover) and *sl-DiscConfig* assigning announce transmission scheduled resources to the UE (i.e. *discTxResources* set to *scheduled*). The message is sent less than 1 sec after the *SidelinkUEInformation* message sent in Step 10.				
12b 1	IF (pc_discUESelectedResourceAlloc AND NOT pc_discScheduledResourceAlloc) THEN SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover) and *sl-DiscConfig* announce transmission resources for UE autonomous resource selection: *discTxResources* set to *ue-Selected* and *poolSelection* within *poolToAddModList* is set to *rsrpBased*. The message is sent less than 1 sec after the *SidelinkUEInformation* message sent in Sep 10.	<--	*RRCConnectionReconfiguration*	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 2.	-	-	-	-
13	The UE submits *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: In parallel to the event described in step 14 the event described in Table 19.2.3.3.2-4 takes place.	-	-	-	-
14	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for Announcing?	-->	*SidelinkUEInformation*	4	P
-	EXCEPTION: Steps 15a1 - 15b3 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place depending on the type of resource selection UE supports for transmission of discovery announcements. NOTE: In comparison to the similar sequences earlier in the step sequence testing only one of the 2 options here is enough to satisfy the TP.	-	-	-	-
15a 1	IF pc_discScheduledResourceAlloc THEN SS-NW transmits an *RRCConnectionReconfiguration* message assigning announce transmission scheduled resources to the UE (i.e. *discTxResources* set to *scheduled*).	<--	*RRCConnectionReconfiguration*	-	-
15a 2	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: Step 15a3 is repeated 3 times .	-	-	-	-
15a 3	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 2) and utilising the resources configured in the *RRCConnectionReconfiguration* message?	-->	PC5_DISCOVERY	4	P
15b 1	IF (pc_discUESelectedResourceAlloc AND NOT pc_discScheduledResourceAlloc) THEN SS-NW transmits an *RRCConnectionReconfiguration* message assigning announce transmission resources for UE autonomous resource selection: *discTxResources* set to *ue-Selected* and *poolSelection* within *poolToAddModList* is set to *rsrpBased*.	<--	*RRCConnectionReconfiguration*	-	-

15b 2	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: Step 15b3 is repeated 3 times .	-	-	-	-
15b 3	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 2) and utilising the resources configured in the *RRCConnectionReconfiguration* message? NOTE: The UE uses for the transmission the -DiscResourcePool entry in *discTxPoolCommon* for which RSRP measurement of the serving cell is in-between the set for that pool *threshLow* and *threshHigh (ue-Selected-r12/SL-DiscTxPoolToAddMod-r12[2])*.	-->	PC5_DISCOVERY	4	P
16	The SS configures SS-NW Cell 1 and Cell 2 parameters according to the row "T2" in table 19.2.3.3.2-0 in order to simulate radio link failure.	-	-	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
17	The UE sends *RRCConnectionReestablishmentRequest* message.	-->	*RRCConnectionReestablishmentRequest*		
18	The SS-NW transmits *RRCConnectionReestablishment* message.	<--	*RRCConnectionReestablishment*		
19	The UE transmits *RRCConnectionReestablishmentComplete* message.	-->	*RRCConnectionReestablishmentComplete*		
-	EXCEPTION: In parallel to the event described in step 20 the event described in Table 19.2.3.3.2-4 takes place.	-	-	-	-
20	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for Announcing in the next 1 sec?	-->	*SidelinkUEInformation*	5	F
-	EXCEPTION: Steps 21a1 - 21b1 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place if the UE supports transmission of discovery announcements based on network scheduled resource allocation. NOTE: Which of the resources the UE will use depends on which was the last resources assigned in steps 15a1 or 15b1 above.	-	-	-	-
-	EXCEPTION: When the condition matches, step 21a1 is repeated 3 times .	-	-	-	-
21a 1	IF pc_discUESelectedResourceAlloc THEN Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 2) and utilising the resources configured in the *RRCConnectionReconfiguration* message? NOTE: The UE uses for the transmission the -DiscResourcePool entry in *discTxPoolCommon* for which RSRP measurement of the serving cell is in-between the set for that pool *threshLow* and *threshHigh*	-->	PC5_DISCOVERY	5	P

	(ue-Selected-r12/SL-DiscTxPoolToAddMod-r12[1]).				
-	EXCEPTION: When the condition matches, step 21b1 is repeated 3 times .	-	-	-	-
21b 1	IF (pc_discScheduledResourceAlloc AND NOT pc_discUESelectedResourceAlloc) Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 2) and utilising the resources configured in the *RRCConnectionReconfiguration* message?	-->	PC5_DISCOVERY	5	P
22	The SS configures: SW-NW Cell 1 and Cell 4 parameters according to the row "T3" in table 19.2.3.3.2-0 in order to simulate needs for handover. Cell 4 broadcasts *SystemInformationBlockType19* providing different resources for Announcing than those provided on Cell 1. In addition to all other settings the *syncTxThreshIC* is included with value 7 (this is needed for TP7). NOTE 1: Value 7 is chosen to ensure that the Power level of Cell 4 is such that it is ensured that the RSRP measurement of the Cell 4 (serving cell) is NOT below the power value that corresponds to 7 (-85dBm).	-	-	-	-
23	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover to Cell 4).	<--	*RRCConnectionReconfiguration*	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 4.	-	-	-	-
24	The UE submits *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: In parallel to the procedure described in steps 25 - 27 the procedure described in Table 19.2.3.3.2-2 takes place.	-	-	-	-
25	Check: Does the UE transmit a DISCOVERY_REQUEST message over the PC3 (UE to ProSe Function) interface?	-->	DISCOVERY_REQUEST	6	P
26	The SS-NW transmits a DISCOVERY_RESPONSE message over the PC3 (UE to ProSe Function) interface.	<--	DISCOVERY_RESPONSE	-	-
27	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for Announcing?	-->	*SidelinkUEInformation*	6	P
-	EXCEPTION: Steps 28a1 - 28a9 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that takes place if the UE is capable of SLSS transmission.	-	-	-	-
-	EXCEPTION: Steps 28a1a1 - 28a1b1 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place depending on the type of resource selection UE supports for transmission of discovery announcements.	-	-	-	-
28a 1 a1	IF pc_discSLSS AND pc_discScheduledResourceAlloc THEN SS-NW transmits an	<--	*RRCConnectionReconfiguration*	-	-

	RRCConnectionReconfiguration networkControlledSyncTx is configured and set to *on, discTxResources* set to *scheduled*.				
28a 1b1	IF pc_discSLSS AND (pc_discUESelectedResourceAlloc AND NOT pc_discScheduledResourceAlloc) THEN SS-NW transmits an *RRCConnectionReconfiguration networkControlledSyncTx* is configured and set to *on, discTxResources* set to *ue-selected*.	<--	*RRCConnectionReconfiguration*	-	-
28a 2	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: Step 28a3 is repeated 3 times.	-	-	-	-
28a 3	Check: Does the UE transmit in the next transmission period SLSS in accordance with the information provided in the *SystemInformationBlockType19* (SLSSID, a subframe indicated by *syncOffsetIndicator* does not corresponds to the first subframe of the discovery transmission pool)?	-->	SLSS	7	P
-	EXCEPTION: Steps 28a4a1 - 28a4b1 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place depending on the type of resource selection UE supports for transmission of discovery announcements.	-	-	-	-
28a 4 a1	IF pc_discScheduledResourceAlloc THEN SS-NW transmits an *RRCConnectionReconfiguration networkControlledSyncTx* is configured and set to *off, discTxResources* set to *scheduled*.	<--	*RRCConnectionReconfiguration*	-	-
28a 4b1	IF (pc_discUESelectedResourceAlloc AND NOT pc_discScheduledResourceAlloc) THEN SS-NW transmits an *RRCConnectionReconfiguration networkControlledSyncTx* is configured and set to *off, discTxResources* set to *ue-selected*.	<--	*RRCConnectionReconfiguration*	-	-
28a 5	The UE submits RRCConnectionReconfigurationComplete message to confirm acceptance of the new configuration.	-->	*RRCConnectionReconfigurationComplete*	-	-
28a 6	Check: Does the UE transmit during the next3 transmission periods SLSS?	-->	SLSS	7	F
28a 7	The SS configures: SW-NW Cell 1 and Cell 4 parameters according to the row "T4" in table 19.2.3.3.2-0. NOTE: The Power level of Cell 4 is such that it is ensured that the RSRP measurement of the serving cell is below the value of *syncTxThreshIC (7* (-85dBm)) included in *SystemInformationBlockType19*.	-	-	-	-
-	EXCEPTION: Step 28a9 is repeated 3 times.	-	-	-	-
28a 9	Check: Does the UE transmit in the next transmission period SLSS in accordance with the information provided in the *SystemInformationBlockType19* (SLSSID, a subframe indicated by *syncOffsetIndicator* does not corresponds to the first subframe of the discovery transmission pool)?	-->	SLSS	8	P
29	The SS configures: SW-NW Cell 4 and Cell 11 parameters according to the row "T5" in table 19.2.3.3.2-0 in order to simulate needs for handover.	-	-	-	-

30	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover to Cell 11).	<--	*RRCConnectionReconfiguration*	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 11.	-	-	-	-
31	The UE submits *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: In parallel to the procedure described in steps 32 - 33 the procedure described in Table 19.2.3.3.2-2 takes place.	-	-	-	-
-	EXCEPTION: In parallel to the event described in step 32 the event described in Table 19.2.3.3.2-4 takes place.	-	-	-	-
32	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for Announcing in the next 1 sec?	-->	*SidelinkUEInformation*	9	F
-	EXCEPTION: Steps 33a1 - 33b1 describe behaviour that depends on UE capabilities; the "lower case letter" identifies a step sequence that take place if the UE supports transmission of discovery announcements based on network scheduled resource allocation.	-	-	-	-
33a1	IF pc_discScheduledResourceAlloc THEN Check: Does the UE transmit during the next10 transmission periods a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 26) over the resources it last transmitted on cell 4 (provided in step 28a1a1)?	-->	PC5_DISCOVERY	9	F
33b1	IF (pc_discUESelectedResourceAlloc AND NOT pc_discScheduledResourceAlloc) THEN Check: Does the UE transmit during the next 10 transmission periods a PC5_DISCOVERY message containing the ProSe Application Code (provided in the DISCOVERY_RESPONSE in step 26) over the resources it last transmitted on cell 4 (provided in step 28a1b1) *(ue-Selected-r12/SL-DiscTxPoolToAddMod-r12[2])*?	-->	PC5_DISCOVERY	9	F
34	The SS configures: SW-NW Cell 1 and Cell 11 parameters according to the row "T6" in table 19.2.3.3.2-0 in order to simulate needs for handover. Cell 1 does not transmit *SystemInformationBlockType19*.	-	-	-	-
35	SS-NW transmits an *RRCConnectionReconfiguration* message including *mobilityControlInfo* (handover to Cell 1).	<--	*RRCConnectionReconfiguration*	-	-
-	EXCEPTION: The following events unless otherwise stated are to be observed in Cell 1.	-	-	-	-
36	The UE submits *RRCConnectionReconfigurationComplete* message on Cell 1.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	EXCEPTION: In parallel to the procedure described in step 37 the procedure described in Table 19.2.3.3.2-2 takes place.	-	-	-	-
-	EXCEPTION: In parallel to the event described in step 37 the event described in Table 19.2.3.3.2-4 takes place.	-	-	-	-
37	Check: Does the UE transmit a	-->	*SidelinkUEInformation*	10	F

	SidelinkUEInformation message requesting resources for Announcing in the next 1 sec?				
38-39	Void	-	-	-	-
40	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeAnnApplicationIdentity1 to initiate ProSe direct discovery announcing.	-	-	-	-
-	EXCEPTION: In parallel to the event described in step 41 the event described in Table 19.2.3.3.2-4 takes place.	-	-	-	-
41	Check: Does the UE transmit a *SidelinkUEInformation* message requesting resources for Announcing in the next 1 sec?	-->	*SidelinkUEInformation*	10	F
42	The SS-NW releases the connection.	<--	*RRCConnectionRelease*	-	-

Table 19.2.3.3.2-2: Parallel behaviour - TAU

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE transmits a TRACKING AREA UPDATE REQUEST message.	-->	TRACKING AREA UPDATE REQUEST	-	-
2	SS-NW responds with TRACKING AREA UPDATE ACCEPT message.	<--	TRACKING AREA UPDATE ACCEPT	-	-
3	The UE transmits a TRACKING AREA UPDATE COMPLETE.	-->	TRACKING AREA UPDATE COMPLETE	-	-

Table 19.2.3.3.2-3: Void

Table 19.2.3.3.2-4: Parallel behaviour - Discovery request

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Check: Does the UE transmit a DISCOVERY_REQUEST message over the PC3 (UE to ProSe Function) interface?	-->	DISCOVERY_REQUEST	4,5, 9,10	F

19.2.3.3.3 Specific message contents

Table 19.2.3.3.3-1: *SystemInformationBlockType19* for cells 1 and 2 when active

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType19-r12 ::= SEQUENCE {			
discConfig-r12 SEQUENCE {			
discRxPool-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[3] SEQUENCE {		RxPool 3	
cp-Len-r12	normal		
discPeriod-r12	rf128		
numRetx-r12	0		
numRepetition-r12	1		
tf-ResourceConfig-r12 SEQUENCE {			
prb-Num-r12	12		BW5
	24		BW10
prb-Start-r12	0		
prb-End-r12	23		BW5
	48		BW10
offsetIndicator-r12	160	small-r12	FDD
	163		TDD
subframeBitmap-r12	00001111 11111111 00000000 00000000 00000000	bs40-r12	FDD
	00001111 11111111	bs16-r12	TDD
}			
txParameters-r12	Not present		
rxParameters-r12	Not present		
}			
}			
discTxPoolCommon-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[2]	Not Present		
}			
}			
}			
Note: It is assumed that the pools allocated for announcing need to be provided for monitoring. The Rx Pool 3 is the pool allocated for the Tx resources allocated in the various *RRCConnectionReconfiguration* messages sent during the TC when the UE is on Cell 1 or Cell 2.			

Table 19.2.3.3.3-2: *SystemInformationBlockType19* for cells 4 and 11 when active

Derivation Path: 36.508 [18] Table 4.4.3.3-17			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType19-r12 ::= SEQUENCE {			
discConfig-r12 SEQUENCE {			
discRxPool-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[3] SEQUENCE {		RxPool 3	
cp-Len-r12	normal		
discPeriod-r12	rf128		
numRetx-r12	0		
numRepetition-r12	1		
tf-ResourceConfig-r12 SEQUENCE {			
prb-Num-r12	12		BW5
	24		BW10
prb-Start-r12	0		
prb-End-r12	23		BW5
	48		BW10
offsetIndicator-r12	160	small-r12	FDD
	163		TDD
subframeBitmap-r12	00000000 11110011 00000000 00000000 00000000	bs40-r12	FDD
	00000000 11110011	bs16-r12	TDD
}			
txParameters-r12	Not present		
rxParameters-r12	Not present		
}			
}			
discTxPoolCommon-r12 SEQUENCE SIZE (1..maxSL-TxPool-r12) OF SL-DiscResourcePool-r12 {			
SL-DiscResourcePool-r12[1]	Not Present		
SL-DiscResourcePool-r12[2] SEQUENCE {			
rxParameters-r12 SEQUENCE {			
syncConfigIndex-r12	2	Entry 2 in discSyncConfig-r12 (Note 1)	
}			
}			
}			
}			
}			

Note 1: Entry 2 in *discSyncConfig-r12* sets *syncTxThreshIC-r12* to 7 (see 36.508 [18] Table 4.4.3.3-17), i.e. -85dBm is the threshold for starting transmission of SLSS, which with the Cell 4 settings to -79dBm and -87dBm in Table 19.2.2.3.2-0 should ensure that for "T3" there should be no SLSS transmission and for "T4" there should be SLSS transmission; The Rx Pool 3 is the pool allocated for the Tx resources allocated in the various *RRCConnectionReconfiguration* messages sent during the TC when the UE is on Cell 4.

Table 19.2.3.3.3-3: ATTACH REQUEST (Preamble)

Derivation path: 36.508 [18] table 4.7.2-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'1'	ProSe direct discovery Supported	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'0' or '1'	The UE may, but need not to, support also ProSe direct communication	

Table 19.2.3.3.3-4: TRACKING AREA UPDATE REQUEST (step 1, Table 19.2.3.3.2-2)

Derivation path: 36.508 [18] table 4.7.2-27			
Information Element	**Value/Remark**	**Comment**	**Condition**
EPS update type			
"Active" flag	'1'B		
UE network capability			
ProSe (octet 7, bit 7)	'1'	ProSe Supported	
..ProSe direct discovery (ProSe-dd) (octet 7, bit 8)	'1'	ProSe direct discovery Supported	
ProSe direct communication (ProSe-dc) (octet 8, bit 1)	'0' or '1'	The UE may, but need not to, support also ProSe direct communication	

Table 19.2.3.3.3-5: DISCOVERY_REQUEST (step 2, Table 19.2.3.3.2-1; step 10a1, TS 36.508 [18] Table 4.5A.22-1, step 27, Table 19.2.3.3.2-1)

Derivation path: 36.508 [18] , table 4.7F.1-1.			
Information Element	**Value/remark**	**Comment**	**Condition**
discovery-request[1] {			
command	1	announce	
}			

Table 19.2.3.3.3-6: DISCOVERY_RESPONSE (step 2, Table 19.2.3.3.2-1; step 10a2, TS 36.508 [18] Table 4.5A.22-1, step 28, Table 19.2.3.3.2-1)

Derivation path: 36.508 [18] , table 4.7F.1-1.			
Information Element	**Value/remark**	**Comment**	**Condition**
response-monitor[1]	Not Present		
response-announce[1] {			
validity-timer-T4000	2 min	Note: Value of 2 min has been arbitrary chosen with the aim from one side not to prolong unnecessarily the TC when the expiration of the timer is checked, and, on another not to trigger not relevant to the TPs ANNOUNCE REQUEST procedure.	
}			

Table 19.2.3.3.3-7: *SidelinkUEInformation* (steps 2, 10, 14, 27, 37, Table 19.2.3.3.2-1)

Derivation Path: 36.508, Clause 4.6.1, Table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs ::= SEQUENCE {			
commRxInterestedFreq-r12	Not Present	Note 1	
commTxResourceReq-r12	Not Present	Note 1	
discRxInterest-r12	Not Present	Note 1	
discTxResourceReq-r12	1	Indicates the number of separate discovery message(s) the UE wants to transmit every discovery period. Note 2	
}			
Note 1: It is assumed that it will be possible to trigger in the UE an Application that requests only Announcing. Note 2 This TC assumes that the UE is triggering ProSe Direct Discovery Announcing for only one ProSe Application px_ProSeAnnApplicationIdentity1.			

Table 19.2.3.3.3-7A: *SidelinkUEInformation* (step 8A, Table 19.2.3.3.2-1)

Derivation Path: 36.508, Clause 4.6.1, Table 4.6.1-21A			
Information Element	**Value/remark**	**Comment**	**Condition**
SidelinkUEInformation-r12-IEs ::= SEQUENCE {			
commRxInterestedFreq-r12	Not Present	Note 1	
commTxResourceReq-r12	Not Present	Note 1	
discRxInterest-r12	Not Present	Note 1	
discTxResourceReq-r12	Not Present	Note 2	
}			
Note 1: It is assumed that it will be possible to trigger in the UE an Application that requests only Announcing. Note 2: Not including the TxResourceReq after the UE has submitted a SidelinkUEInformation which included one, is assumed as indication the UE does no longer require sidelink discovery announcement resources.			

Table 19.2.3.3.3-8: PC5_DISCOVERY (steps 3a3, 4a3, 15a3, 15b3, 21a1, 21b1, Table 19.2.3.3.2-1)

Derivation path: 36.508 [18] , table 4.7F.1-5.

Table 19.2.3.3.3-9: *RRCConnectionReconfiguration* (steps 3a1, 7Aa1, 28a4a1, Table 19.2.3.3.2-1)

Derivation Path: 36.508, table 4.6.1-8 A, condition [DISC AND SETUP AND SCHEDULED]				
Information Element		**Value/remark**	**Comment**	**Condition**
Note:	The *discTxResources* set to *setup*, *scheduled*, one transmission pool *SL-DiscResourcePool-r12*. The transmission pool provides different settings in comparison to the transmission pool set in the broadcasted on the serving cell *SystemInformationBlockType19* (see Table 19.2.3.3.3-1 or Table 19.2.3.3.3-2).			

Table 19.2.3.3.3-10: *RRCConnectionReconfiguration* (step 4a1, 7Ab1, 28a4b1, Table 19.2.3.3.2-1)

Derivation Path: 36.508, table 4.6.1-8 A, condition [DISC AND SETUP AND UE-SELECTED]				
Information Element		**Value/remark**	**Comment**	**Condition**
Note:	The *discTxResources* set to *setup*, *ue-Selected* and *poolSelection* within *poolToAddModList* is set to *rsrpBased* with *threshLow* and *threshHigh* and the serving cell power levels set to ensure that the RSRP measurement of the PCell, after applying the layer 3 filter defined by *quantityConfig* (part of *MeasConfig*) is in-between *threshLow* and *threshHigh of exactly one of the provided pools*. The transmission pools provides different settings in comparison to the transmission pool set in the broadcasted on the serving cell *SystemInformationBlockType19* (see Table 19.2.3.3.3-1 or Table 19.2.3.3.3-2).			

Table 19.2.3.3.3-11: *RRCConnectionReconfiguration* (step 5, Table 19.2.3.3.2-1)

Derivation Path: 36.508, table 4.6.1-8 A, condition [DISC AND RELEASE]				
Information Element		**Value/remark**	**Comment**	**Condition**
Note:	The *poolToReleaseList-r12* indicates the release of the pool used for transmission until this time, all pools are released to ensure that the UE will ask for resources.			

Table 19.2.3.3.3-12: *RRCConnectionReconfiguration* (step 12a1, Table 19.2.3.3.2-1)

Derivation Path: 36.508, table 4.6.1-8 A, condition [DISC AND SETUP AND SCHEDULED AND HO]			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-DiscConfig-r12 SEQUENCE {			
discTxResources-r12 CHOICE {			
setup CHOICE {			SETUP
scheduled-r12 SEQUENCE {			SCHEDULED
discTxConfig-r12 SEQUENCE {			
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 00001100 00000000 00000000 00000000	bs40-r12	FDD
	00000000 00001100	bs16-r12	TDD
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
Note: Including *mobilityControlInfo* (handover) and *sl-DiscConfig, discTxResources* set to *setup*, *scheduled*, one pool *SL-DiscResourcePool-r12;* Different settings to the pool(s) used before the release (set in step 3a1 and 7Aa1), different settings to the pool(s) set in the transmitted on the serving cell *SystemInformationBlockType19*.			

Table 19.2.3.3.3-13: *RRCConnectionReconfiguration* (step 12b1, Table 19.2.3.3.2-1)

Derivation Path: 36.508, table 4.6.1-8 A, condition [DISC AND SETUP AND UE-SELECTED AND HO]			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-DiscConfig-r12 SEQUENCE {			
discTxResources-r12 CHOICE {			
setup CHOICE {			SETUP
ue-Selected-r12 SEQUENCE {			UE-SELECTED
discTxPoolDedicated-r12 SEQUENCE {			
poolToAddModList-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-DiscTxPoolToAddMod-r12			SETUP
SL-DiscTxPoolToAddMod-r12[1] ::= SEQUENCE {		TxPool 1	
poolIdentity-r12	1		
pool-r12 SEQUENCE {			
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000011 00000000 00000000 00000000 00000000	bs40-r12	FDD
	00000011 00000000	bs16-r12	TDD
}			
}			
SL-DiscTxPoolToAddMod-r12[2] ::= SEQUENCE {		TxPool 2	
poolIdentity-r12	2		
pool-r12 SEQUENCE {			
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00001100 00000000 00000000 00000000 00000000	bs40-r12	FDD
	00001100 00000000	bs16-r12	TDD
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			

}			
Note: Including *mobilityControlInfo* (handover) and the *discTxResources* set to *setup*, *ue-Selected* and *poolSelection* within *poolToAddModList* is set to *rsrpBased* with *threshLow* and *threshHigh* and the serving cell power levels set to ensure that the RSRP measurement of the PCell, after applying the layer 3 filter defined by *quantityConfig* (part of *MeasConfig*) is in-between *threshLow* and *threshHigh of exactly one of the provided pools*. The transmission pools provides different settings in comparison to the transmission pool set in the broadcasted on the serving cell *SystemInformationBlockType19* (see Table 19.2.3.3.3-1 or Table 19.2.3.3.3-2).			

Table 19.2.3.3.3-14: *RRCConnectionReconfiguration* (step 15a1, Table 19.2.3.3.2-1)

Derivation Path: 36.508, table 4.6.1-8 A, condition [DISC AND SETUP AND SCHEDULED]			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-DiscConfig-r12 SEQUENCE {			
discTxResources-r12 CHOICE {			
setup CHOICE {			SETUP
scheduled-r12 SEQUENCE {			SCHEDULED
discTxConfig-r12 SEQUENCE {			
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000000 00001100 00000000 00000000 00000000	bs40-r12	FDD
	00000000 00001100	bs16-r12	TDD
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
Note: The same as step 12a1, Table 19.2.3.3.3-12, without the handover part.			

Table 19.2.3.3.3-15: *RRCConnectionReconfiguration* (step 15b1, Table 19.2.3.3.2-1)

Derivation Path: 36.508 table 4.6.1-8 A, condition [DISC AND SETUP AND UE-SELECTED]			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-DiscConfig-r12 SEQUENCE {			
discTxResources-r12 CHOICE {			
setup CHOICE {			SETUP
ue-Selected-r12 SEQUENCE {			UE-SELECTED
discTxPoolDedicated-r12 SEQUENCE {			
poolToAddModList-r12 SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-DiscTxPoolToAddMod-r12			SETUP
SL-DiscTxPoolToAddMod-r12[1] ::= SEQUENCE {		TxPool 1	
poolIdentity-r12	1		
pool-r12 SEQUENCE {			
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00000011 00000000 00000000 00000000 00000000	bs40-r12	FDD
	00000011 00000000	bs42-r12	TDD
}			
}			
SL-DiscTxPoolToAddMod-r12[2] ::= SEQUENCE {		TxPool 2	
poolIdentity-r12	2		
pool-r12 SEQUENCE {			
tf-ResourceConfig-r12 SEQUENCE {			
subframeBitmap-r12	00001100 00000000 00000000 00000000 00000000	bs40-r12	FDD
	00001100 00000000	bs42-r12	TDD
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			

}			
Note: The same as step 12b1, Table 19.2.3.3.3-13, without the handover part.			

Table 19.2.3.3.3-16: *RRCConnectionReconfiguration* (steps 23, 30, 35, Table 19.2.3.3.2-1)

Derivation Path: 36.508, table 4.6.1-8, condition HO			
Information Element	**Value/remark**	**Comment**	**Condition**
Note: A "standard" message for handover, including *mobilityControlInfo* but no *sl-DiscConfig* or any other DISC related IEs.			

Table 19.2.3.3.3-17: *RRCConnectionReconfiguration* (step 28a1 a1, Table 19.2.3.3.2-1)

Derivation Path: 36.508, table 4.6.1-8 A, condition [DISC AND SETUP AND SCHEDULED]			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-SyncTxControl-r12 SEQUENCE {			
networkControlledSyncTx-r12	on		
}			
}			
}			
}			
}			
}			
}			
}			
}			
}			

Table 19.2.3.3.3-18: *RRCConnectionReconfiguration* (step 28a1b1, Table 19.2.3.3.2-1)

Derivation Path: 36.508, table 4.6.1-8 A, condition [DISC AND SETUP AND UE-SELECTED]			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sl-SyncTxControl-r12 SEQUENCE {			
networkControlledSyncTx-r12	on		
}			
}			
}			
}			
}			
}			
}			
}			
}			

Table 19.2.3.3.3-19: *RRCConnectionReestablishmentRequest* (step 17, Table 19.2.3.3.2-1)

Derivation Path: 36.508, Table 4.6.1-13			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReestablishmentRequest ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcConnectionReestablishmentRequest-r8 SEQUENCE {			
ue-Identity SEQUENCE {			
c-RNTI	the value of the C-RNTI of the UE		
physCellId	PhysicalCellIdentity of Cell 2		
shortMAC-I	The same value as the 16 least significant bits of the XMAC-I value calculated by SS		
}			
reestablishmentCause	otherFailure		
}			
}			
}			

19.2.4 Void

19.2.5 Void

19.2.6 One-to-many ProSe direct communication/Pre-configured authorisation/Off-network / ProSe Direct Discovery for public safety use / Announcing UE procedure for group member discovery

19.2.6.1 Test Purpose (TP)

(1)

```
with { ProSe-enabled public safety UE being authorized for performing ProSe Direct Communication
being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" associated with a
geographical area, and, UE out of coverage on the frequency used for sidelink communication and
within the pre-set geographical area }
ensure that {
  when { When the UE is triggered by an upper layer application to announce availability in a
discovery group }
    then { UE continuously announces its availability in the discovery group to other ProSe-enabled
public safety UEs applying full protection on the discovery messages over PC5 utilising DUSK), DUCK
and DUIK }
            }
```

19.2.6.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.334, clauses 5.1.1, 10A.2.1, 10A.2.1A, 10A.2.6.1, 10A.2.6.2, TS 33.303, clauses 6.6.3.1, 6.6.3.2, 6.6.7. Unless otherwise stated these are Rel-13 requirements.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery and ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured

service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 10A.2.1]

The following procedures are defined for the ProSe direct discovery for public safety use:

...

- announcing UE procedure for group member discovery;
- monitoring UE procedure for group member discovery;

...

Each ProSe-enabled Public Safety UE needs to obtain the security parameters from the ProSe Key Management Function before participating in ProSe direct discovery for public safety use, as specified in 3GPP TS 33.303 [6]. For each given Relay Service Code in UE-to-network relay discovery or Discovery Group ID in group member discovery, the ProSe Key Management Function (PKMF) will provide the following in the security parameters:

- PSDK (Public Safety Discovery Key) and the associated Expiry Time for this PSDK;
- configurations to signal which combination of keys to be used for the discovery process; and
- optionally, if DUCK is to be used, an indication of which PC5_DISCOVERY message fields shall be protected by the DUCK.

After receiving the PSDK from the PKMF for the relay service or discovery group, the UE shall use it to derive specific DUIK, DUCK and DUSK needed to protect the ProSe direct discovery messages for the corresponding public safety use, as specified in 3GPP TS 33.303 [6].

[TS 24.334, clause 10A.2.1A]

The UE shall select the radio resource parameters to be used for ProSe direct discovery as follows:

...

- when the UE is not served by E-UTRAN or when the UE is served by E-UTRAN and intends to use the provisioned ProSe radio resources (i.e. carrier frequency):

  1) if the UE can determine itself located in a geographical area, and the UE is provisioned with radio parameters for the geographical area, then the UE shall search for a cell with any PLMN operating the selected provisioned radio resources (i.e. carrier frequency) associated with that geographical area, and:

     ...

     iii) if the UE does not find any such cell in any PLMN, then the UE shall use the provisioned radio resource parameters; or

  2) else the UE shall not initiate ProSe direct discovery.

[TS 24.334, clause 10A.2.6.1]

The purpose of the announcing UE procedure for group member discovery is to enable a ProSe-enabled public safety UE to announce availability in a discovery group to other ProSe-enabled public safety UEs, upon a request from upper layers as defined in 3GPP TS 23.303 [2].

[TS 24.334, clause 10A.2.6.2]

The UE is authorised to perform the announcing UE procedure for group member discovery if:

a) the following is true:

   1) the UE is not served by E-UTRAN, is authorised to perform ProSe direct discovery for public safety use announcing when the UE is not served by E-UTRAN as specified in clause 5, and is configured with the radio parameters to be used for ProSe direct discovery for public safety use when not served by E-UTRAN;

...

Figure 10A.2.6.2.1 illustrates the interaction of the UEs in the announcing UE procedure for group member discovery.

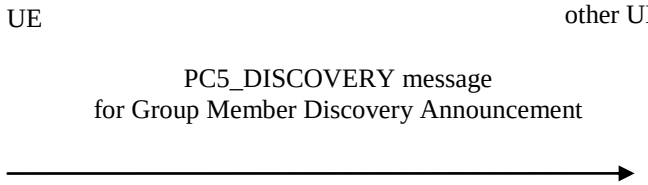

Figure 10A.2.6.2.1: Announcing UE procedure for group member discovery

When the UE is triggered by an upper layer application to announce availability in a discovery group, if the UE is authorised to perform the announcing UE procedure for group member discovery, then the UE:

...

b) shall obtain a valid UTC time for the discovery transmission from the lower layers and generate the UTC-based counter corresponding to this UTC time as specified in subclause 12.2.2.18;

c) shall generate a PC5_DISCOVERY message for Group Member Discovery Announcement according to subclause 11.2.5.1. In the PC5_DISCOVERY message for Group Member Discovery Announcement, the UE:

   1) shall set the ProSe UE ID to the Layer 2 ID used for unicast communication configured in clause 5;

   2) shall set the Announcer Info parameter to the User Info ID for the group member discovery parameter, configured in clause 5;

   3) shall set the Discovery Group ID parameter to the Discovery Group ID parameter identifying the discovery group to be announced, configured in clause 5; and

   4) shall set the UTC-based counter LSB parameter to include the eight least significant bits of the UTC-based counter;

d) shall apply the DUIK, DUSK, or DUCK with the associated Encrypted Bitmask, along with the UTC-based counter to the PC5_DISCOVERY message for whichever security mechanism(s) configured to be applied, e.g., integrity protection, message scrambling or confidentiality protection of one or more above parameters, as specified in 3GPP TS 33.303 [6]; and

e) shall pass the resulting PC5_DISCOVERY message for Group Member Discovery Announcement to the lower layers for transmission over the PC5 interface with an indication that the message is for public safety use.

The UE shall ensure that it keeps on passing the same PC5_DISCOVERY message and the indication that the message is for public safety use to the lower layers for transmission until the UE is triggered by an upper layer application to stop announcing availability in a discovery group, or until the UE stops being authorised to perform the announcing UE procedure for group member discovery. How this is achieved is left up to UE implementation.

[TS 33.303, clause 6.6.3.1]

There are two types of ProSe Public Safety Discovery described in TS 23.303 [2]: Relay Discovery (including the additional Discovery messages) and Group Member Discovery. The security measures for both of these are identical and are reusing the following aspects:

- the key provisioning mechanism that ProSe one-to-many communication uses, whereby a root key is fetched (the PGK – see subclause 6.2.3.1 of the present specification) along with associated security information; and

- the mechanisms defined for restricted discovery in terms of protecting the discovery messages over the air (see subclause 6.1.3.4.3 of the present specification with the needed DUIK, DUCK and DUSKs derived from the root key). It is optional to support scrambling for Public Safety Discovery.

Like open and restricted discovery, ProSe Public Safety Discovery also uses a UTC-based counter (see step 9 in clause 6.1.3.3) to provide freshness for the protection of the restricted discovery message on the PC5 interface. The parameters CURRENT_TIME and MAX_OFFSET are also provided to the UE from the PKMF to ensure that the obtained UTC-based counter is sufficiently close to real time to protect against replays.

[TS 33.303, clause 6.6.3.2]

The Public Safety Discovery Key (PSDK) is the root key that is used for the protection of the Pubic Safety Discovery messages. It is identified by an 8-bit PSDK ID and each PSDK is associated with one or more Relay Service Codes and/or Discovery Group IDs. This association is achieved by allocating a 24-bit Key Type ID to the Relay Service Codes (RSCs) and Discovery Group IDs during the Key Request/Key Response procedure. The Key Type ID is also included in the MIKEY message, so a delivered PSDK can be associated with the correct RSCs and/or Discovery Group IDs.

NOTE: The allocation of RSC and/or Discovery Group ID to a particular Key Type ID is specific to a UE and does not need to be common across all UEs.

When the PSDKs are provided to the UE, they shall be provided with an Expiry Time. The Expiry Time of the PSDK needs to be set such that the keys for later periods have a longer expiration period. Each PSDKs for each Key Type ID shall be associated with a different Expiry Time value.

All expired PSDK, except the most recently expired of the PSDK(s), should be deleted.

Public Safety discovery also uses the PMK and PMK ID for the MIKEY messages as described in subclauses 6.2.3.1 and 6.2.3.2 of the present specification.

[TS 33.303, clause 6.6.7]

The protection of ProSe Public Safety Discovery Message over PC5 is very similar to that of Restricted Discovery. When sending and receiving a discovery message, the UE uses the PSDK that has not expired (using the time in the UTC based counter associated with the discovery slot to check expiry) and has the earliest expiration time to derive the needed subkeys for the security of that message.

In order to protect the discovery messages over PC5, the UE first calculates the necessary (as indicated in the security meta-data) DUSK, DUCK and DUIK for the particular discovery using the appropriate PSDK. To this end, a KDF is used to derive each of the keys indicated in the security meta-data, as follows:

- If the security meta-data indicates a DUSK should be used, then the UE derives the DUSK from the PSDK using a KDF as in Annex A.8.

- If the security meta-data indicates a DUCK should be used, and an Encrypted_bits_mask is included, then the UE derives the DUCK from the PSDK using a KDF as in Annex A.8

If the security meta-data indicates a DUIK should be used, then the UE derives the DUIK from the PSDK using a KDF as in Annex A.8.

...

A sending UE then follows subclause 6.1.3.4.3.2, while a receiving UE follows subclause 6.1.3.4.3.3 except that it never sends the discovery message to the ProSe Function for MIC checking.

19.2.6.3 Test description

19.2.6.3.1 Pre-test conditions

System Simulator:

SS-UE

- SS-UE1.

- As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting and receiving device.

GNSS simulator (optional).

NOTE: For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". This can be done by usage of a GNSS simulator, or some suitable MMI action.

UE:

- ProSe related configuration

  - The UE is authorised to perform ProSe Direct Communication; The UE is equipped with a USIM containing values shown in Table 19.2.6.3.1-1, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, etc.).

Table 19.2.6.3.1-1: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.
$EF_{PROSE\_RADIO\_ANN}$	FFS: b1=1 indicates that the UE is authorised to perform ProSe direct discovery model A announcing when not served by E-UTRAN. b2=0 indicates that the UE is not authorised to perform ProSe direct discovery model B discoverer operation when not served by E-UTRAN b2=1 indicates that the UE is authorised to perform ProSe direct discovery model B discoverer operation when not served by E-UTRAN.
$EF_{PROSE\_RADIO\_MON}$	FFS: b1=1 indicates that the UE is authorised to perform ProSe direct discovery model A monitoring when not served by E-UTRAN. b2=0 indicates that the UE is not authorised to perform ProSe direct discovery model B discoveree operation when not served by E-UTRAN b2=1 indicates that the UE is authorised to perform ProSe direct discovery model B discoveree operation when not served by E-UTRAN.
EF_{PROSE_POLICY}	FFS
EF_{PROSE_GC}	FFS: ProSe Layer-2 Group ID PTK ID Counter
$EF_{PROSE\_RELAY\_DISCOVERY}$	FFS: The UE is preconfigured with PSDK, Bitmask of keys: b1=1 indicates that DUSK is to be used b2=1 indicates that DUCK is to be used b3=1 indicates that DUIK is to be used and DUCK encryption bitmask
$EF_{PROSE\_GM\_DISCOVERY}$	FFS

- The UE has a Public Safety Discovery Key (PSDK) with not expired validity timer allowing for the calculation of the various keys needed for applying protection on the discovery messages over PC5

(Discovery User Scrambling Key (DUSK), Discovery User Confidentiality Key (DUCK) and Discovery User Integrity Key (DUIK)).

- For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". If this is not done by using n GNSS simulator then the UE needs to be preconfigured via a suitable MMI action.

Preamble:

- The UE is in state Switched OFF (state 1) according to TS 36.508 [18].

19.2.6.3.2 Test procedure sequence

Table 19.2.6.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Power up the UE.	-	-	-	-
2	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeAnnApplicationIdentity2 to initiate continuous announcing availability in a discovery group. NOTE: Although the UE is expected to transmit continuously, only the PC5_DISCOVERY messages which need to be checked are shown explicitly in the step sequence.	-	-	-	-
-	EXCEPTION: Step 3 is repeated 10 times.	-	-	-	-
3	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message for Group Member Discovery Announcement applying DUIK, DUSK, and DUCK with the associated Encrypted Bitmask, along with the UTC-based counter to the PC5_DISCOVERY message?	-->	PC5_DISCOVERY	1	P

19.2.6.3.3 Specific message contents

Table 19.2.6.3.3-1: PC5_DISCOVERY (step 3 Table 19.2.6.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.1-5A.

19.2.7 One-to-many ProSe direct communication/Pre-configured authorisation/Off-network / ProSe Direct Discovery for public safety use / Discoverer UE procedure for group member discovery

19.2.7.1 Test Purpose (TP)

(1)

```
with { ProSe-enabled public safety UE being authorized for performing ProSe Direct Communication
being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" associated with a
geographical area, and, UE out of coverage on the frequency used for sidelink communication and
within the pre-set geographical area }
ensure that {
  when { When the UE is triggered by an upper layer application to solicit proximity of other UEs in
a discovery group }
    then { UE performs a Discoverer UE procedure for group member discovery applying full protection
on the discovery messages over PC5 utilising DUSK), DUCK and DUIK }
           }
```

19.2.7.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.334, clauses 5.1.1, 10A.2.1, 10A.2.1A, 10A.2.8.1, 10A.2.8.2, TS 33.303, clauses 6.6.3.1, 6.6.3.2, 6.6.7. Unless otherwise stated these are Rel-13 requirements.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery and ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 10A.2.1]

The following procedures are defined for the ProSe direct discovery for public safety use:

...

- discoverer UE procedure for group member discovery;

- discoveree UE procedure for group member discovery;

...

Each ProSe-enabled Public Safety UE needs to obtain the security parameters from the ProSe Key Management Function before participating in ProSe direct discovery for public safety use, as specified in 3GPP TS 33.303 [6]. For each given Relay Service Code in UE-to-network relay discovery or Discovery Group ID in group member discovery, the ProSe Key Management Function (PKMF) will provide the following in the security parameters:

- PSDK (Public Safety Discovery Key) and the associated Expiry Time for this PSDK;

- configurations to signal which combination of keys to be used for the discovery process; and

- optionally, if DUCK is to be used, an indication of which PC5_DISCOVERY message fields shall be protected by the DUCK.

After receiving the PSDK from the PKMF for the relay service or discovery group, the UE shall use it to derive specific DUIK, DUCK and DUSK needed to protect the ProSe direct discovery messages for the corresponding public safety use, as specified in 3GPP TS 33.303 [6].

[TS 24.334, clause 10A.2.1A]

The UE shall select the radio resource parameters to be used for ProSe direct discovery as follows:

...

- when the UE is not served by E-UTRAN or when the UE is served by E-UTRAN and intends to use the provisioned ProSe radio resources (i.e. carrier frequency):

  1) if the UE can determine itself located in a geographical area, and the UE is provisioned with radio parameters for the geographical area, then the UE shall search for a cell with any PLMN operating the selected provisioned radio resources (i.e. carrier frequency) associated with that geographical area, and:

     ...

     iii) if the UE does not find any such cell in any PLMN, then the UE shall use the provisioned radio resource parameters; or

  2) else the UE shall not initiate ProSe direct discovery.

[TS 24.334, clause 10A.2.8.1]

The purpose of the discoverer UE procedure for group member discovery is to enable a ProSe-enabled public safety UE to solicit proximity of other ProSe-enabled public safety UEs in a discovery group, upon a request from upper layers as defined in 3GPP TS 23.303 [2].

[TS 24.334, clause 10A.2.8.2]

The UE is authorised to perform the discoverer UE procedure for group member discovery if:

a) the following is true:

   1) the UE is not served by E-UTRAN, is authorised to perform ProSe direct discovery for public safety use discoverer operation when the UE is not served by E-UTRAN as specified in clause 5, and is configured with the radio parameters to be used for ProSe direct discovery for public safety use when not served by E-UTRAN;

   ...

Figure 10A.2.8.2.1 illustrates the interaction of the UEs in the discoverer UE procedure for group member discovery.

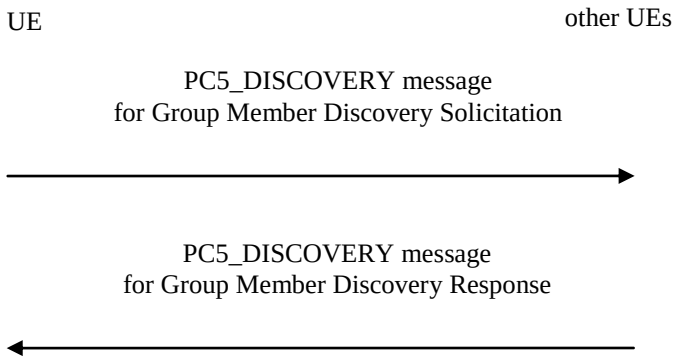

Figure 10A.2.8.2.1: Discoverer UE procedure for group member discovery

When the UE is triggered by an upper layer application to solicit proximity of other UEs in a discovery group, and if the UE is authorised to perform the discoverer UE procedure for group member discovery, then the UE:

...

b) shall obtain a valid UTC time for the discovery transmission from the lower layers and generate the UTC-based counter corresponding to this UTC time as specified in subclause 12.2.2.18;

c) shall generate a PC5_DISCOVERY message for Group Member Discovery Solicitation according to subclause 11.2.5.1. In the PC5_DISCOVERY message for Group Member Discovery Solicitation, the UE:

   1) shall set the Discoverer Info parameter to the User Info ID for the group member discovery parameter, configured in clause 5;

   2) shall set the Discovery Group ID parameter to the Discovery Group ID parameter identifying the discovery group to be solicited, configured in clause 5;

   3) shall set either the Target User Info parameter or the Target Group Info parameter according to the target information provided by the upper layer application; and

   4) shall set the UTC-based counter LSB parameter to include the eight least significant bits of the UTC-based counter;

d) shall apply the DUIK, DUSK, or DUCK with the associated Encrypted Bitmask, along with the UTC-based counter to the PC5_DISCOVERY message for whichever security mechanism(s) configured to be applied, e.g. integrity protection, message scrambling or confidentiality protection of one or more above parameters, as specified in 3GPP TS 33.303 [6]; and

e) shall pass the resulting PC5_DISCOVERY message for Group Member Discovery Solicitation to the lower layers for transmission over the PC5 interface with an indication that the message is for public safety use.

The UE shall ensure that it keeps on passing the same PC5_DISCOVERY message to the lower layers for transmission with an indication that the message is for public safety use until the UE is triggered by an upper layer application to stop soliciting proximity of other UEs in a discovery group, or until the UE stops being authorised to perform the discoverer UE procedure for group member discovery. How this is achieved is left up to UE implementation.

Upon reception of a PC5_DISCOVERY message for Group Member Discovery Response according to subclause 11.2.5.1, for the target Discovery Group ID of the discovery group to be discovered, the UE shall use the associated DUSK, if configured, and the UTC-based counter obtained during the monitoring operation to unscramble the PC5_DISCOVERY message as described in 3GPP TS 33.303 [6]. Then, if a DUCK is configured, the UE shall use the DUCK and the UTC-based counter to decrypt the configured message-specific confidentiality-protected portion, as described in 3GPP TS 33.303 [6]. Finally, if a DUIK is configured, the UE shall use the DUIK and UTC-based counter to verify the MIC field in the unscrambled PC5_DISCOVERY message for Group Member Discovery Response.

Then if the Discovery Group ID parameter of the PC5_DISCOVERY message for Group Member Discovery Response is the same as the Discovery Group ID parameter of the PC5_DISCOVERY message for Group Member Discovery Solicitation, the UE shall consider that other UE in the discovery group the UE seeks to discover has been discovered.

[TS 33.303, clause 6.6.3.1]

There are two types of ProSe Public Safety Discovery described in TS 23.303 [2]: Relay Discovery (including the additional Discovery messages) and Group Member Discovery. The security measures for both of these are identical and are reusing the following aspects:

- the key provisioning mechanism that ProSe one-to-many communication uses, whereby a root key is fetched (the PGK – see subclause 6.2.3.1 of the present specification) along with associated security information; and

- the mechanisms defined for restricted discovery in terms of protecting the discovery messages over the air (see subclause 6.1.3.4.3 of the present specification with the needed DUIK, DUCK and DUSKs derived from the root key). It is optional to support scrambling for Public Safety Discovery.

Like open and restricted discovery, ProSe Public Safety Discovery also uses a UTC-based counter (see step 9 in clause 6.1.3.3) to provide freshness for the protection of the restricted discovery message on the PC5 interface. The parameters CURRENT_TIME and MAX_OFFSET are also provided to the UE from the PKMF to ensure that the obtained UTC-based counter is sufficiently close to real time to protect against replays.

[TS 33.303, clause 6.6.3.2]

The Public Safety Discovery Key (PSDK) is the root key that is used for the protection of the Pubic Safety Discovery messages. It is identified by an 8-bit PSDK ID and each PSDK is associated with one or more Relay Service Codes and/or Discovery Group IDs. This association is achieved by allocating a 24-bit Key Type ID to the Relay Service Codes (RSCs) and Discovery Group IDs during the Key Request/Key Response procedure. The Key Type ID is also included in the MIKEY message, so a delivered PSDK can be associated with the correct RSCs and/or Discovery Group IDs.

NOTE: The allocation of RSC and/or Discovery Group ID to a particular Key Type ID is specific to a UE and does not need to be common across all UEs.

When the PSDKs are provided to the UE, they shall be provided with an Expiry Time. The Expiry Time of the PSDK needs to be set such that the keys for later periods have a longer expiration period. Each PSDKs for each Key Type ID shall be associated with a different Expiry Time value.

All expired PSDK, except the most recently expired of the PSDK(s), should be deleted.

Public Safety discovery also uses the PMK and PMK ID for the MIKEY messages as described in subclauses 6.2.3.1 and 6.2.3.2 of the present specification.

[TS 33.303, clause 6.6.7]

The protection of ProSe Public Safety Discovery Message over PC5 is very similar to that of Restricted Discovery. When sending and receiving a discovery message, the UE uses the PSDK that has not expired (using the time in the UTC based counter associated with the discovery slot to check expiry) and has the earliest expiration time to derive the needed subkeys for the security of that message.

In order to protect the discovery messages over PC5, the UE first calculates the necessary (as indicated in the security meta-data) DUSK, DUCK and DUIK for the particular discovery using the appropriate PSDK. To this end, a KDF is used to derive each of the keys indicated in the security meta-data, as follows:

- If the security meta-data indicates a DUSK should be used, then the UE derives the DUSK from the PSDK using a KDF as in Annex A.8.

- If the security meta-data indicates a DUCK should be used, and an Encrypted_bits_mask is included, then the UE derives the DUCK from the PSDK using a KDF as in Annex A.8

If the security meta-data indicates a DUIK should be used, then the UE derives the DUIK from the PSDK using a KDF as in Annex A.8.

...

A sending UE then follows subclause 6.1.3.4.3.2, while a receiving UE follows subclause 6.1.3.4.3.3 except that it never sends the discovery message to the ProSe Function for MIC checking.

19.2.7.3 Test description

19.2.7.3.1 Pre-test conditions

System Simulator:

SS-UE

- SS-UE1.

    - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting and receiving device.

GNSS simulator (optional).

NOTE: For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". This can be done by usage of a GNSS simulator, or some suitable MMI action.

UE:

- ProSe related configuration

    - The UE is authorised to perform ProSe Direct Communication; The UE is equipped with a USIM containing values shown in Table 19.2.7.3.1-1, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, etc.).

Table 19.2.7.3.1-1: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.
$EF_{PROSE\_RADIO\_ANN}$	FFS: b1=1 indicates that the UE is authorised to perform ProSe direct discovery model A announcing when not served by E-UTRAN. b2=0 indicates that the UE is not authorised to perform ProSe direct discovery model B discoverer operation when not served by E-UTRAN b2=1 indicates that the UE is authorised to perform ProSe direct discovery model B discoverer operation when not served by E-UTRAN.
$EF_{PROSE\_RADIO\_MON}$	FFS: b1=1 indicates that the UE is authorised to perform ProSe direct discovery model A monitoring when not served by E-UTRAN. b2=0 indicates that the UE is not authorised to perform ProSe direct discovery model B discoveree operation when not served by E-UTRAN b2=1 indicates that the UE is authorised to perform ProSe direct discovery model B discoveree operation when not served by E-UTRAN.
EF_{PROSE_POLICY}	FFS
EF_{PROSE_GC}	FFS: ProSe Layer-2 Group ID PTK ID Counter
$EF_{PROSE\_RELAY\_DISCOVERY}$	FFS: The UE is preconfigured with PSDK, Bitmask of keys: b1=1 indicates that DUSK is to be used b2=1 indicates that DUCK is to be used b3=1 indicates that DUIK is to be used and DUCK encryption bitmask
$EF_{PROSE\_GM\_DISCOVERY}$	FFS

- The UE has a Public Safety Discovery Key (PSDK) with not expired validity timer allowing for the calculation of the various keys needed for applying protection on the discovery messages over PC5 (Discovery User Scrambling Key (DUSK), Discovery User Confidentiality Key (DUCK) and Discovery User Integrity Key (DUIK)).

- For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". If this is not done by using n GNSS simulator then the UE needs to be preconfigured via a suitable MMI action.

Preamble:

- The UE is in state Switched OFF (state 1) according to TS 36.508 [18].

19.2.7.3.2 Test procedure sequence

Table 19.2.7.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Power up the UE.	-	-	-	-
2	Force the UE upper layer application corresponding to ProSe Application ID px_ProSeAnnApplicationIdentity2 to solicit proximity of other UEs in a discovery group.	-	-	-	-
-	EXCEPTION: Step 3 is repeated 10 times.	-	-	-	-
3	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message for Group Member Discovery Solicitation applying DUIK, DUSK, and DUCK with the associated Encrypted Bitmask, along with the UTC-based counter to the PC5_DISCOVERY message?	-->	PC5_DISCOVERY	1	P
4	SS-UE1 transmits a PC5_DISCOVERY message for Group Member Discovery Response applying DUIK, DUSK, and DUCK with the associated Encrypted Bitmask, along with the UTC-based counter to the PC5_DISCOVERY message and including the target Discovery Group ID of the discovery group to be discovered in step 3.	<--	PC5_DISCOVERY	-	-

19.2.7.3.3 Specific message contents

Table 19.2.7.3.3-1: PC5_DISCOVERY (step 3 Table 19.2.7.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.1-5B.

Table 19.2.7.3.3-2: PC5_DISCOVERY (step 4 Table 19.2.7.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.1-5C.

19.2.8 One-to-many ProSe direct communication/Pre-configured authorisation/Off-network / ProSe Direct Discovery for public safety use / Discoveree UE procedure for group member discovery

19.2.8.1 Test Purpose (TP)

(1)

```
with { ProSe-enabled public safety UE being authorized for performing ProSe Direct Communication
being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" associated with a
geographical area, and, UE out of coverage on the frequency used for sidelink communication and
within the pre-set geographical area }
ensure that {
  when { When the UE receives a solicitation from other ProSe-enabled public safety UEs on proximity
in a discovery group }
    then { UE responds to the request in accordance with the Discoveree UE procedure for group
member discovery applying full protection on the discovery messages over PC5 utilising DUSK), DUCK
and DUIK }
            }
```

19.2.8.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.334, clauses 5.1.1, 10A.2.1, 10A.2.1A, 10A.2.9.1, 10A.2.9.2, TS 33.303, clauses 6.6.3.1, 6.6.3.2, 6.6.7. Unless otherwise stated these are Rel-13 requirements.

[TS 24.334, clause 5.1.1]

The service authorisation for ProSe direct discovery and ProSe direct communication determines whether the UE is authorised to use ProSe direct discovery and ProSe direct communication, in a particular PLMN or when not served by E-UTRAN. In this release of the specification, ProSe direct communication is supported only for Public Safety ProSe-enabled UE. The service authorisation is either:

1) pre-configured in the UE. The pre-configured service authorisation may be stored in the ME, or in the USIM as specified in 3GPP TS 31.102 [17], or in both the ME and the USIM. If both the ME and the USIM contain the same parameters, the values stored in the USIM shall take precedence. The UE shall not use the pre-configured service authorisation if the contents of the USIM indicate that the UE is not authorised to use them (see 3GPP TS 31.102 [17]); or

[TS 24.334, clause 10A.2.1]

The following procedures are defined for the ProSe direct discovery for public safety use:

...

- discoverer UE procedure for group member discovery;

- discoveree UE procedure for group member discovery;

...

Each ProSe-enabled Public Safety UE needs to obtain the security parameters from the ProSe Key Management Function before participating in ProSe direct discovery for public safety use, as specified in 3GPP TS 33.303 [6]. For each given Relay Service Code in UE-to-network relay discovery or Discovery Group ID in group member discovery, the ProSe Key Management Function (PKMF) will provide the following in the security parameters:

- PSDK (Public Safety Discovery Key) and the associated Expiry Time for this PSDK;

- configurations to signal which combination of keys to be used for the discovery process; and

- optionally, if DUCK is to be used, an indication of which PC5_DISCOVERY message fields shall be protected by the DUCK.

After receiving the PSDK from the PKMF for the relay service or discovery group, the UE shall use it to derive specific DUIK, DUCK and DUSK needed to protect the ProSe direct discovery messages for the corresponding public safety use, as specified in 3GPP TS 33.303 [6].

[TS 24.334, clause 10A.2.1A]

The UE shall select the radio resource parameters to be used for ProSe direct discovery as follows:

...

- when the UE is not served by E-UTRAN or when the UE is served by E-UTRAN and intends to use the provisioned ProSe radio resources (i.e. carrier frequency):

  1) if the UE can determine itself located in a geographical area, and the UE is provisioned with radio parameters for the geographical area, then the UE shall search for a cell with any PLMN operating the selected provisioned radio resources (i.e. carrier frequency) associated with that geographical area, and:

     ...

     iii) if the UE does not find any such cell in any PLMN, then the UE shall use the provisioned radio resource parameters; or

  2) else the UE shall not initiate ProSe direct discovery.

[TS 24.334, clause 10A.2.9.1]

The purpose of the discoveree UE procedure for group member discovery is to enable a ProSe-enabled public safety UE to respond to solicitation from other ProSe-enabled public safety UEs on proximity in a discovery group, upon a request from upper layers as defined in 3GPP TS 23.303 [2].

[TS 24.334, clause 10A.2.9.2]

The UE is authorised to perform the discoveree UE procedure for group member discovery if:

a) the following is true:

   1) the UE is not served by E-UTRAN, is authorised to perform ProSe direct discovery for public safety use discoveree operation when the UE is not served by E-UTRAN as specified in clause 5, and is configured with the radio parameters to be used for ProSe direct discovery for public safety use when not served by E-UTRAN;

   ...

Figure 10A.2.9.2.1 illustrates the interaction of the UEs in the Discoveree UE procedure for group member discovery.

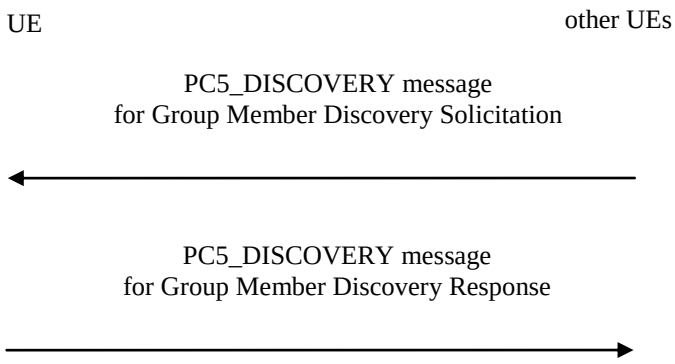

Figure 10A.2.9.2.1: Discoveree UE procedure for group member discovery

When the UE is triggered by an upper layer application to start responding to solicitation on proximity of a UE in a discovery group, and if the UE is authorised to perform the discoveree UE procedure for group member discovery, then the UE:

...

b) shall instruct the lower layers to start monitoring for PC5_DISCOVERY messages with an indication that the message is for public safety use.

Upon reception of a PC5_DISCOVERY message for Group Member Discovery Solicitation according to subclause 11.2.5.1, for the Discovery Group ID of the discovery group which the UE is configured to respond for, the UE shall use the associated DUSK, if configured, and the UTC-based counter obtained during the monitoring operation to unscramble the PC5_DISCOVERY message as described in 3GPP TS 33.303 [6]. Then, if a DUCK is configured, the UE shall use the DUCK and the UTC-based counter to decrypt the configured message-specific confidentiality protected portion, as described in 3GPP TS 33.303 [6]. Finally, if a DUIK is configured, the UE shall use the DUIK and UTC-based counter to verify the MIC field in the unscrambled PC5_DISCOVERY message for Group Member Discovery Solicitation.

Then, if:

- the Discovery Group ID parameter of the received PC5_DISCOVERY message is the same as a Discovery Group ID parameter configured as specified in clause 5 for the discovery group;

- the Target User Info parameter is not included in the received PC5_DISCOVERY message or the Target User Info parameter of the received PC5_DISCOVERY message is the same as the User Info ID for the group member discovery parameter specified in clause 5; and

- the Target Group Info parameter is not included in the received PC5_DISCOVERY message or the Target Group Info parameter of the received PC5_DISCOVERY message is the same as the identifier of the targeted group provided by the upper layer application (e.g. ProSe Layer-2 Group ID of the ProSe direct communication service authorisation specified in clause 5);

the UE:

a) shall obtain a valid UTC time for the discovery transmission from the lower layers and generate the UTC-based counter corresponding to this UTC time as specified in subclause 12.2.2.18;

b) shall generate a PC5_DISCOVERY message for Group Member Discovery Response according to subclause 11.2.5.1. In the PC5_DISCOVERY message for Group Member Discovery Response, the UE:

   1) shall set the ProSe UE ID to the Layer 2 ID used for unicast communication, configured in clause 5;

   2) shall set the Discoveree Info parameter to the User Info ID for the group member discovery parameter, configured in clause 5;

   3) shall set the Discovery Group ID parameter to the Discovery Group ID parameter of the PC5_DISCOVERY message for Group Member Discovery Solicitation; and

   4) shall set the UTC-based counter LSB parameter to include the eight least significant bits of the UTC-based counter;

c) shall apply the DUIK, DUSK, or DUCK with the associated Encrypted Bitmask, along with the UTC-based counter to the PC5_DISCOVERY message for whichever security mechanism(s) configured to be applied, e.g. integrity protection, message scrambling or confidentiality protection of one or more above parameters, as specified in 3GPP TS 33.303 [6]; and

d) shall pass the resulting PC5_DISCOVERY message for Group Member Discovery Response with an indication that the message is for public safety use to the lower layers for transmission over the PC5 interface.

[TS 33.303, clause 6.6.3.1]

There are two types of ProSe Public Safety Discovery described in TS 23.303 [2]: Relay Discovery (including the additional Discovery messages) and Group Member Discovery. The security measures for both of these are identical and are reusing the following aspects:

- the key provisioning mechanism that ProSe one-to-many communication uses, whereby a root key is fetched (the PGK – see subclause 6.2.3.1 of the present specification) along with associated security information; and

- the mechanisms defined for restricted discovery in terms of protecting the discovery messages over the air (see subclause 6.1.3.4.3 of the present specification with the needed DUIK, DUCK and DUSKs derived from the root key). It is optional to support scrambling for Public Safety Discovery.

Like open and restricted discovery, ProSe Public Safety Discovery also uses a UTC-based counter (see step 9 in clause 6.1.3.3) to provide freshness for the protection of the restricted discovery message on the PC5 interface. The parameters CURRENT_TIME and MAX_OFFSET are also provided to the UE from the PKMF to ensure that the obtained UTC-based counter is sufficiently close to real time to protect against replays.

[TS 33.303, clause 6.6.3.2]

The Public Safety Discovery Key (PSDK) is the root key that is used for the protection of the Pubic Safety Discovery messages. It is identified by an 8-bit PSDK ID and each PSDK is associated with one or more Relay Service Codes and/or Discovery Group IDs. This association is achieved by allocating a 24-bit Key Type ID to the Relay Service Codes (RSCs) and Discovery Group IDs during the Key Request/Key Response procedure. The Key Type ID is also included in the MIKEY message, so a delivered PSDK can be associated with the correct RSCs and/or Discovery Group IDs.

NOTE: The allocation of RSC and/or Discovery Group ID to a particular Key Type ID is specific to a UE and does not need to be common across all UEs.

When the PSDKs are provided to the UE, they shall be provided with an Expiry Time. The Expiry Time of the PSDK needs to be set such that the keys for later periods have a longer expiration period. Each PSDKs for each Key Type ID shall be associated with a different Expiry Time value.

All expired PSDK, except the most recently expired of the PSDK(s), should be deleted.

Public Safety discovery also uses the PMK and PMK ID for the MIKEY messages as described in subclauses 6.2.3.1 and 6.2.3.2 of the present specification.

[TS 33.303, clause 6.6.7]

The protection of ProSe Public Safety Discovery Message over PC5 is very similar to that of Restricted Discovery. When sending and receiving a discovery message, the UE uses the PSDK that has not expired (using the time in the UTC based counter associated with the discovery slot to check expiry) and has the earliest expiration time to derive the needed subkeys for the security of that message.

In order to protect the discovery messages over PC5, the UE first calculates the necessary (as indicated in the security meta-data) DUSK, DUCK and DUIK for the particular discovery using the appropriate PSDK. To this end, a KDF is used to derive each of the keys indicated in the security meta-data, as follows:

- If the security meta-data indicates a DUSK should be used, then the UE derives the DUSK from the PSDK using a KDF as in Annex A.8.

- If the security meta-data indicates a DUCK should be used, and an Encrypted_bits_mask is included, then the UE derives the DUCK from the PSDK using a KDF as in Annex A.8

If the security meta-data indicates a DUIK should be used, then the UE derives the DUIK from the PSDK using a KDF as in Annex A.8.

...

A sending UE then follows subclause 6.1.3.4.3.2, while a receiving UE follows subclause 6.1.3.4.3.3 except that it never sends the discovery message to the ProSe Function for MIC checking.

19.2.8.3 Test description

19.2.8.3.1 Pre-test conditions

System Simulator:

SS-UE

- SS-UE1.

    - As defined in TS 36.508 [18], configured for and operating as ProSe Direct Communication transmitting and receiving device.

GNSS simulator (optional).

NOTE: For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". This can be done by usage of a GNSS simulator, or some suitable MMI action.

UE:

- ProSe related configuration

    - The UE is authorised to perform ProSe Direct Communication; The UE is equipped with a USIM containing values shown in Table 19.2.8.3.1-1, and, relevant to each of the supported services values as specified in TS 36.508 [18], section 4.9.3.1 (e.g. Direct Communication Radio Parameters and geographical area when UE is "not served by E-UTRAN", ProSe Layer-2 Group ID, etc.).

Table 19.2.8.3.1-1: USIM Configuration

USIM field	Value
EF_{UST}	Service n°101 (ProSe) supported.
EF_{PST}	Service n°3 (ProSe Direct Communication radio parameters) supported.
	Service n°6 (ProSe policy parameters) supported.
	Service n°7 (ProSe group counter) supported.
EF_{AD}	b3=1: the ME is authorized to use the parameters stored in the USIM or in the ME for ProSe services for Public Safety usage.
$EF_{PROSE\_RADIO\_ANN}$	FFS: b1=1 indicates that the UE is authorised to perform ProSe direct discovery model A announcing when not served by E-UTRAN. b2=0 indicates that the UE is not authorised to perform ProSe direct discovery model B discoverer operation when not served by E-UTRAN b2=1 indicates that the UE is authorised to perform ProSe direct discovery model B discoverer operation when not served by E-UTRAN.
$EF_{PROSE\_RADIO\_MON}$	FFS: b1=1 indicates that the UE is authorised to perform ProSe direct discovery model A monitoring when not served by E-UTRAN. b2=0 indicates that the UE is not authorised to perform ProSe direct discovery model B discoveree operation when not served by E-UTRAN b2=1 indicates that the UE is authorised to perform ProSe direct discovery model B discoveree operation when not served by E-UTRAN.
EF_{PROSE_POLICY}	FFS
EF_{PROSE_GC}	FFS: ProSe Layer-2 Group ID PTK ID Counter
$EF_{PROSE\_RELAY\_DISCOVERY}$	FFS: The UE is preconfigured with PSDK, Bitmask of keys: b1=1 indicates that DUSK is to be used b2=1 indicates that DUCK is to be used b3=1 indicates that DUIK is to be used and DUCK encryption bitmask
$EF_{PROSE\_GM\_DISCOVERY}$	FFS

- The UE has a Public Safety Discovery Key (PSDK) with not expired validity timer allowing for the calculation of the various keys needed for applying protection on the discovery messages over PC5 (Discovery User Scrambling Key (DUSK), Discovery User Confidentiality Key (DUCK) and Discovery User Integrity Key (DUIK)).

- For operation in off-network environment, it shall be ensured that after the UE is powered up it considers the geographical area as being one of the geographical areas set in the USIM for operation when UE is "not served by E-UTRAN". If this is not done by using n GNSS simulator then the UE needs to be preconfigured via a suitable MMI action.

Preamble:

- The UE is in state Switched OFF (state 1) according to TS 36.508 [18].

19.2.8.3.2 Test procedure sequence

Table 19.2.8.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Power up the UE.	-	-	-	-
2	Wait for 15 sec to allow the UE to establish that it is out of coverage and initiate scanning the frequency pre-set for ProSe communication for any activities.	-	-	-	-
3	SS sets WaitForMessageCounter=1	-	-	-	-
-	EXCEPTION: Steps 4-5b1 are repeated until WaitForMessageCounter=11 OR the event described in step 5a1 takes place.	-	-	-	-
4	SS-UE1 transmits in the next transmission period a PC5_DISCOVERY message for Group Member Discovery Solicitation applying DUIK, DUSK, and DUCK with the associated Encrypted Bitmask, along with the UTC-based counter to the PC5_DISCOVERY message. WaitForMessageCounter=WaitForMessageCounter+1	<--	PC5_DISCOVERY	-	-
-	EXCEPTION: Steps 5a1-5b1 describe events which depend on the UE behaviour; the "lower case letter" identifies a step sequence that take place if the UE transmit or not in the next transmission period a PC5_DISCOVERY message.	-	-	-	-
5a1	Check: Does the UE transmit in the next transmission period a PC5_DISCOVERY message for Group Member Discovery Response applying DUIK, DUSK, and DUCK with the associated Encrypted Bitmask, along with the UTC-based counter to the PC5_DISCOVERY message and including the target Discovery Group ID of the discovery group to be discovered in step 4?	-->	PC5_DISCOVERY	1	P
5a2	Check: Does the WaitForMessageCounter<11?	-	-	1	P
5b1	Check: Does the WaitForMessageCounter=11?	-	-	1	F

19.2.8.3.3 Specific message contents

Table 19.2.8.3.3-1: PC5_DISCOVERY (step 4 Table 19.2.8.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.1-5B.

Table 19.2.8.3.3-2: PC5_DISCOVERY (step 5a1 Table 19.2.8.3.2-1)

Derivation path: 36.508 [18], Table 4.7F.1-5C.

20 Tunnel management procedures UE to ePDG

20.1 Void

20.2 Selection of ePDG and Tunnel establishment

20.2.1 Test Purpose (TP)

(1)

```
with { UE including ePDG configuration information }
ensure that {
  when { The tunnel establishment procedure is initiated by the UE }
    then { The UE transmits a DNS Query with QNAME set to FQDN of the ePDG }
            }
```

(2)

```
with { UE has acquired an IP address }
ensure that {
  when { UE has acquired the IP address of the ePDG }
    then { UE transmits an IKE_SA_INIT Request message addressed to the ePDG to initiate security
association establishment }
            }
```

(3)

```
with { UE has transmitted an IKE_SA_INIT Request message addressed to the ePDG to initiate security
association establishment }
ensure that {
  when { UE receives an IKE_SA_INIT Response message }
    then { UE transmits an IKE_AUTH Request message containing the configuration payload to request
IP addresses for UE and for P-CSCF }
            }
```

(4)

```
with { UE has transmitted an IKE_AUTH Request message containing the configuration payload }
ensure that {
  when { UE receives an IKE_AUTH Response message including an EAP-Request/AKA Challenge }
    then { UE transmits an IKE_AUTH Request message containing the correct EAP-Response/AKA-
Challenge }
            }
```

(5)

```
with { UE has transmitted an IKE_AUTH Request message containing an EAP-Response/AKA-Challenge }
ensure that {
  when { UE receives an IKE_AUTH Response message including EAP-Success }
    then { UE transmits an IKE_AUTH Request message with Authentication payload }
            }
```

(6)

```
Void
```

20.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 23.003 clause 19.4.2.9.2, TS 24.302 clauses 4.4.3, 7.2.1 and 7.2.2.1, TS 23.402 clauses 4.5.4.2 and 8.2.2 and TS 24.229 clause R.2.2.1.

[Rel-13, TS 23.003, clause 19.4.2.9.2]

The ePDG Fully Qualified Domain Name (ePDG FQDN) contains an Operator Identifier that shall uniquely identify the PLMN where the ePDG is located. The ePDG FQDN is composed of seven labels. The last three labels shall be

"pub.3gppnetwork.org". The third and fourth labels together shall uniquely identify the PLMN. The first two labels shall be "epdg.epc". The result of the ePDG FQDN will be:

"epdg.epc.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org"

[Rel-13, TS 24.302, clause 7.2.2.1]

Once the ePDG has been selected, the UE shall initiate the IPsec tunnel establishment procedure using the IKEv2 protocol as defined in IETF RFC 5996 and 3GPP TS 33.402.

The UE shall send an IKE_SA_INIT request message to the selected ePDG in order to setup an IKEv2 security association. Upon receipt of an IKE_SA_INIT response, the UE shall send an IKE_AUTH request message to the ePDG, including:

- The type of IP address (IPv4 address or IPv6 prefix or both) that needs to be configured in an IKEv2 CFG_REQUEST Configuration Payload. If the UE requests for both IPv4 address and IPv6 prefix, the UE shall send two configuration attributes in the CFG_REQUEST Configuration Payload: one for the IPv4 address and the other for the IPv6 prefix;

- The "IDr" payload, containing the APN in the Identification Data, for non-emergency session establishment. For emergency session establishment, the UE shall format the "IDr" payload according to subclause 7.2.5. The UE shall set the ID Type field of the "IDr" payload to ID_FQDN as defined in IETF RFC 5996 [28]. The UE indicates a request for the default APN by omitting the "IDr" payload, which is in accordance with IKEv2 protocol as defined in IETF RFC 5996 [28]; and

- The "IDi" payload containing the NAI.

…

After the successful authentication with the 3GPP AAA server, the UE receives from the ePDG an IKE_AUTH response message containing a single CFG_REPLY Configuration Payload including the assigned remote IP address information (IPv4 address or IPv6 prefix) as described in subclause 7.4.1.

…

During the IKEv2 authentication and security association establishment, following the UE's initial IKE_AUTH request message to the ePDG, if the UE subsequently receives an IKE_AUTH response message from the ePDG containing the EAP-Request/AKA-Challenge, after verifying the received authentication parameters and successfully authenticating the ePDG as specified in 3GPP TS 33.402, the UE shall send a new IKE_AUTH request message to the ePDG including the EAP-Response/AKA-Challenge. In addition, the UE shall provide the requested mobile device identity if available, as specified in subclause 7.2.6.

[Rel-13, TS 23.402, clause 4.5.4.2]

When the UE attempts to construct an FQDN for selecting an ePDG in a certain PLMN-x (either a VPLMN or the HPLMN), then the UE shall construct one of the following FQDN formats:

- Operator Identifier FQDN: The UE constructs the FQDN by using the PLMN-x ID as the Operator Identifier.

- Tracking/Location Area Identity FQDN: The UE constructs the FQDN by using the identity of the Tracking Area/Location Area it is located in (i.e. based on PLMN-x ID and TAC/LAC). The Tracking/Location Area Identity FQDN is used to support location-specific ePDG selection within a PLMN.

The ePDG FQDN formats are specified in TS 23.003.

The UE selects one of the above FQDN formats as follows:

a) If the UE attempts to select an ePDG in the registered PLMN and the UE is configured to use for this PLMN the Tracking/Location Area Identity FQDN as defined in point 2) of clause 4.5.4.3; and

b) the UE knows the TAI/LAI of the area the UE it is located in (e.g. the TAI/LAI from the most recent Attach or TAU/LAU),

then the UE constructs a Tracking/Location Area Identity FQDN. Otherwise the UE constructs the Operator Identifier FQDN.

[Rel-13, TS 24.302, clause 4.4.3]

An ePDG Fully Qualified Domain Name (ePDG FQDN) is either provisioned by the home operator or constructed by UE in either the Operator Identifier FQDN format or the Tracking/Location Area Identity FQDN format as described in subclause 4.5.4.2 of 3GPP TS 23.402, and used as input to the DNS mechanism for ePDG selection.

The detailed format of this ePDG FQDN is specified in 3GPP TS 23.003.

[Rel-13, TS 24.302, clause 7.2.1]

The UE performs ePDG selection based on the ePDG configuration information configured by the home operator in the UE either via H-ANDSF or via USIM or via implementation specific means. The ePDG configuration information may consist of home ePDG identifier or ePDG selection information or both:

- when configured via H-ANDSF, the ePDG configuration information is provisioned in ePDG node under Home Network Preference as specified in 3GPP TS 24.312; and
- when configured via USIM, the ePDG configuration information is provisioned in EF_{ePDGId} and $EF_{ePDGSelection}$ files as specified in 3GPP TS 31.102.

NOTE 1: Implementation specific means apply only if the configurations via H-ANDSF and USIM are not present.

The UE shall support the implementation of standard DNS mechanisms in order to retrieve the IP address(es) of the ePDG. The input to the DNS query is an ePDG FQDN as specified in subclause 4.4.3 and in 3GPP TS 23.003.

[Rel-13, TS 33.402, clause 8.2.2]

The tunnel end point in the network is the ePDG. As part of the tunnel establishment attempt the use of a certain APN is requested. When a new attempt for tunnel establishment is performed by the UE the UE shall use IKEv2 as specified in RFC 5996 [30]. The authentication of the UE in its role as IKEv2 initiator terminates in the 3GPP AAA Server. The UE shall send EAP messages over IKEv2 to the ePDG. The ePDG shall extract the EAP messages received from the UE over IKEv2, and send them to the 3GPP AAA Server. The UE shall use the Configuration Payload of IKEv2 to obtain the Remote IP address.

The EAP-AKA message parameters and procedures regarding authentication are omitted. Only decisions and processes relevant to the use of EAP-AKA within IKEv2 are explained.

The message flow for the full authentication is depicted in the Figure 8.2.2-1.

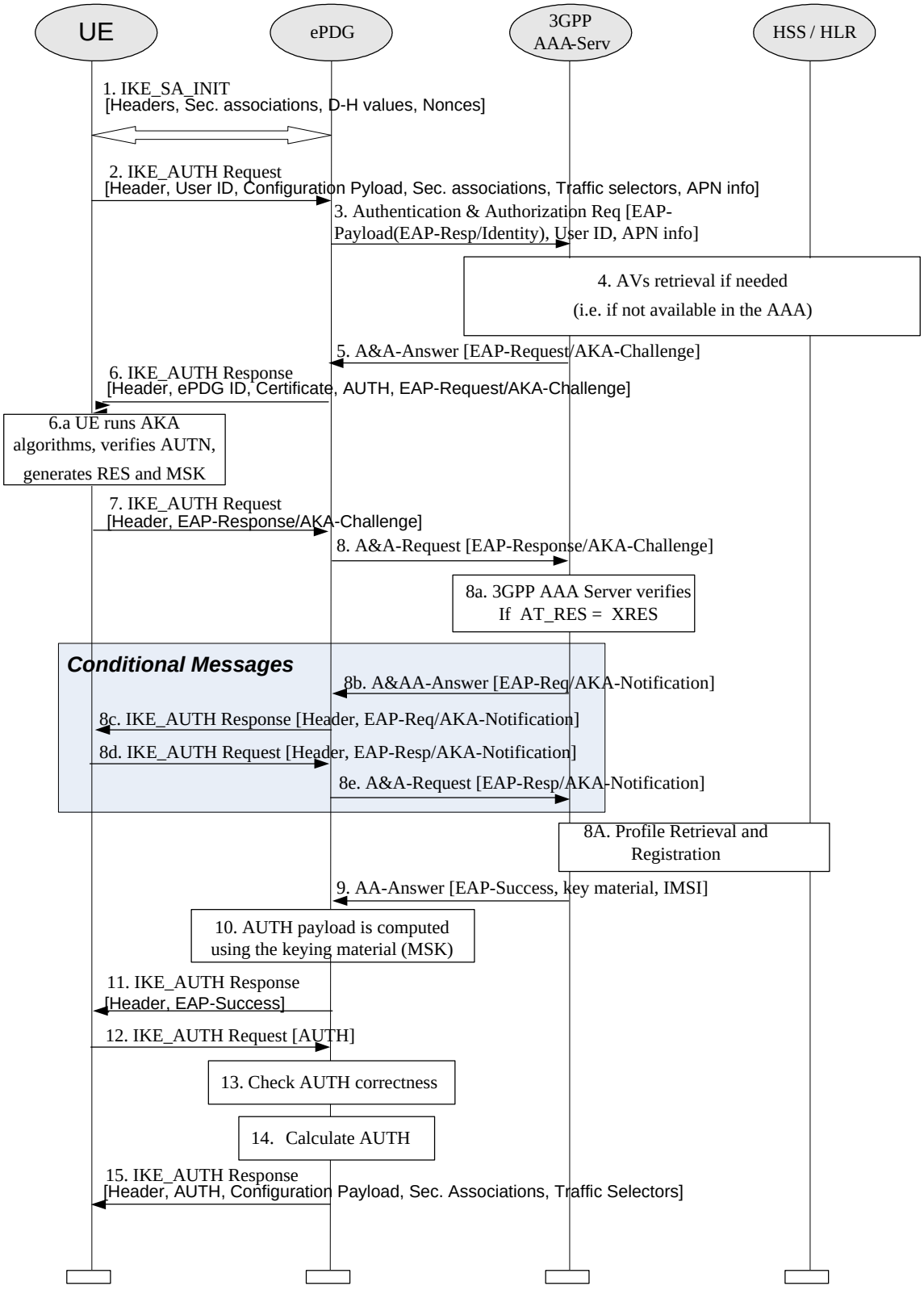

Figure 8.2.2-1: Tunnel full authentication and authorization

As the UE and ePDG generate nonces as input to derive the encryption and authentication keys in IKEv2, replay protection is provided. For this reason, there is no need for the 3GPP AAA Server to request the user identity again using the EAP-AKA specific methods (as specified in RFC 4187 [7]), because the 3GPP AAA Server is certain that no intermediate node has modified or changed the user identity.

1. The UE and the ePDG exchange the first pair of messages, known as IKE_SA_INIT, in which the ePDG and UE negotiate cryptographic algorithms, exchange nonces and perform a Diffie_Hellman exchange.

2. The UE sends the user identity (in the IDi payload) and the APN information (in the IDr payload) in this first message of the IKE_AUTH phase, and begins negotiation of child security associations. The UE omits the AUTH parameter in order to indicate to the ePDG that it wants to use EAP over IKEv2. The user identity shall be compliant with Network Access Identifier (NAI) format specified in TS 23.003 [8], containing the IMSI or the pseudonym, as defined for EAP-AKA in RFC 4187 [7]). The UE shall send the configuration payload (CFG_REQUEST) within the IKE_AUTH request message to obtain an IPv4 and/or IPV6 home IP Address and/or a Home Agent Address.

3. The ePDG sends the Authentication and Authorization Request message to the 3GPP AAA Server, containing the user identity and APN. The UE shall use the NAI as defined in accordance with clause 19.3 of 3GPP TS 23.003 [8], the 3GPP AAA server shall identify based on the realm part of the NAI that combined authentication and authorization is being performed for tunnel establishment with an ePDG which allows only EAP-AKA (and not an I-WLAN PDG as defined in TS 33.234 [9], which would allow also EAP-SIM). The different Diameter application IDs will help the 3GPP AAA Server distinguish among authentications for trusted access, as specified in clause 6 of the present document (which requires EAP-AKA' authentication), and authentications for tunnel setup in EPS (which allows only EAP-AKA).

4. The 3GPP AAA Server shall fetch the authentication vectors from HSS/HLR (if these parameters are not available in the 3GPP AAA Server). The 3GPP AAA Server shall lookup the IMSI of the authenticated user based on the received user identity (root NAI or pseudonym) and include the EAP-AKA as requested authentication method in the request sent to the HSS. The HSS shall then generate authentication vectors with AMF separation bit = 0 and send them back to the 3GPP AAA server.

5. The 3GPP AAA Server initiates the authentication challenge. The user identity is not requested again.

6. The ePDG responds with its identity, a certificate, and sends the AUTH parameter to protect the previous message it sent to the UE (in the IKE_SA_INIT exchange). The EAP message received from the 3GPP AAA Server (EAP-Request/AKA-Challenge) is included in order to start the EAP procedure over IKEv2.

7. The UE checks the authentication parameters and responds to the authentication challenge. The IKE_AUTH request message includes the EAP message (EAP-Response/AKA-Challenge) containing UE’s response to the authentication challenge.

8. The ePDG forwards the EAP-Response/AKA-Challenge message to the 3GPP AAA Server.

8.a The AAA checks, if the authentication response is correct.

8.b-e If dynamic IP mobility selection is executed embedded to the authentication and authorization, the selected mobility mode is sent to the user in an AKA-Notification request, over Diameter A&A answer and IKE_AUTH message. The UE responds to this over IKEv2 and the ePDG forwards the response to the 3GPP AAA Server.

8A. The 3GPP AAA Server shall initiate the Subscriber Profile Retrieval and 3GPP AAA Server registration to the HSS. The 3GPP AAA Server checks in user's subscription if he/she is authorized for non-3GPP access.

9. When all checks are successful, the 3GPP AAA Server sends the final Authentication and Authorization Answer (with a result code indicating success) including the relevant service authorization information, an EAP success and the key material to the ePDG. This key material shall consist of the MSK generated during the authentication process. When the SWm and SWd interfaces between ePDG and 3GPP AAA Server are implemented using Diameter, the MSK shall be encapsulated in the EAP-Master-Session-Key-AVP, as defined in RFC 4072 [10].

10. The MSK shall be used by the ePDG to generate the AUTH parameters in order to authenticate the IKE_SA_INIT phase messages, as specified for IKEv2 in RFC 5996 [30]. These two first messages had not been authenticated before as there was no key material available yet. According to RFC 5996 [30], the shared secret generated in an EAP exchange (the MSK), when used over IKEv2, shall be used to generated the AUTH parameters.

11. The EAP Success/Failure message is forwarded to the UE over IKEv2.

12. The UE shall take its own copy of the MSK as input to generate the AUTH parameter to authenticate the first IKE_SA_INIT message. The AUTH parameter is sent to the ePDG.

13. The ePDG checks the correctness of the AUTH received from the UE. At this point the UE is authenticated. In case S2b is used, PMIP signalling between ePDG and PDN GW can now start, as specified in TS 23.402 [5]. The ePDG continues with the next step in the procedure described here only after successful completion of the PMIP binding update procedure.

14. The ePDG calculates the AUTH parameter which authenticates the second IKE_SA_INIT message. The ePDG shall send the assigned Remote IP address in the configuration payload (CFG_REPLY).

15 The AUTH parameter is sent to the UE together with the configuration payload, security associations and the rest of the IKEv2 parameters and the IKEv2 negotiation terminates.

[Rel-13, TS 24.229, clause R.2.2.1]

Prior to communication with the IM CN subsystem:

…

a) the UE establishes an IP-CAN bearer for SIP signalling as follows:

…

b) the UE shall acquire a P-CSCF address(es).

…

The methods for P-CSCF discovery are:

…

IV. Obtain P-CSCF address(es) using signalling for access to the EPC via WLAN.

If the UE attaches to the EPC via S2b using untrusted WLAN IP access, the UE shall request P-CSCF IPv4 address(es), P-CSCF IPv6 address(es) or both using the P_CSCF_IP4_ADDRESS attribute, the P_CSCF_IP6_ADDRESS attribute or both in the CFG_REQUEST configuration payload as described in 3GPP TS 24.302 [8U]. The network can provide the UE with the P-CSCF IPv4 address(es), P-CSCF IPv6 address(es) or both using the P_CSCF_IP4_ADDRESS attribute, the P_CSCF_IP6_ADDRESS attribute or both in the CFG_REPLY configuration payload as described in 3GPP TS 24.302 [8U]. If the UE receives multiple P-CSCF IPv4 or IPv6 addresses, the UE shall assume that the list is ordered top-down with the first P-CSCF address within the CFG_REPLY configuration payload as the P-CSCF address having the highest preference and the last P-CSCF address within the CFG_REPLY configuration payload as the P-CSCF address having the lowest preference.

20.2.3 Test description

20.2.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27 according to Table 4.4.8-1 in [18].

UE:

- None

Preamble:

- The UE is in state Switched OFF (state 1) according to [18].

20.2.3.2 Test procedure sequence

Table 20.2.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE is switched on.	-	-	-	-
2	UE associates with the WLAN AP and obtains the local IP address.	-	-	-	-
-	EXCEPTION: In parallel to the event described in steps 3 and 4 below the UE may transmit other DNS queries	-	-	-	-
3	Check: Does the UE transmit a DNS Query message with QNAME set to FQDN of the ePDG?	-->	DNS Query	1	P
4	The SS transmits a DNS Response message with the IP address of the ePDG.	<--	DNS Response	-	-
5	Check: Does the UE transmit an IKE_SA_INIT message to the ePDG?	-->	IKE_SA_INIT Request	2	P
6	The SS transmits an IKE_SA_INIT message	<--	IKE_SA_INIT Response	-	-
7	Check: Does the UE transmit an IKE_AUTH Request message including a Configuration payload?	-->	IKE_AUTH Request	3	P
8	The SS transmits an IKE_AUTH Response message including an EAP-Request/AKA-Challenge.	<--	IKE_AUTH Response	-	-
9	Check: Does the UE transmit an IKE_AUTH Request message including the EAP-Response/AKA-Challenge?	-->	IKE_AUTH Request	4	P
10	The SS transmits an IKE_AUTH Response message including EAP-Success.	<--	IKE_AUTH Response	-	-
11	Check: Does the UE transmit an IKE_AUTH Request message with Authentication payload?	-->	IKE_AUTH Request	5	P
12	The SS transmits an IKE_AUTH Response message with Authentication and Configuration payloads.	<--	IKE_AUTH Response	-	-
13-21	The UE performs the IMS registration procedure according TS 34.229-1 [43] subclause C.2c (steps 2-9).	-	-	-	-

20.2.3.3 Specific message contents

Table 20.2.3.3-1: Message DNS Query (step 3, Table 20.2.3.2-1)

Derivation path: IETF RFC 1035 [56]			
Information Element	**Value/remark**	**Comment**	**Condition**
QR=	'0'	Query	
OPCODE=	'0000'	QUERY	
QNAME=	Operator provisioned FQDN of the ePDG.		pc_ePDG_FQDN_Provisioned
	Operator Identifier FQDN format shall be "epdg.epc.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org"		pc_ePDG_FQDN_constructed
QTYPE=	A	query for the IPv4 address	IPv4
	AAAA	query for the IPv6 address	IPv6
QCLASS=	IN		

Condition	Explanation
IPv4	DNS query for IPv4 address
IPv6	DNS query for IPv6 address

Table 20.2.3.3-2: Message DNS Response (step 4, Table 20.2.3.2-1)

Derivation path: IETF RFC 1035 [56]			
Information Element	**Value/remark**	**Comment**	**Condition**
QR=	'1'	Response	
OPCODE=	'0000'	QUERY	
QNAME=	Same as received in DNS Query		
QTYPE=	A		
QCLASS=	IN		
RR {			
NAME	Same as received in DNS Query		
TYPE	Same as received in DNS Query	A for IPv4 AAAA for IPv6	
CLASS	IN		
RDATA	IP address of ePDG		
}			

Table 20.2.3.3-2A: IKE_AUTH request (step 7, Table 20.2.3.2-1)

Derivation path: 36.508 table 4.7G-3			
Information Element	**Value/remark**	**Comment**	**Condition**
IKE Header			
Next Payload	'00101111'B	CP	
Exchange Type	'00100011'B	IKE_AUTH	
Configuration Payload			
Next Payload	'00000000'B	No Next Payload if CP is the last payload	
CFG Type	'00000001'B	CFG_REQUEST	
Attribute Type	'00000001'B	INTERNAL_IP4_ADDRESS	IPv4
IPv4 Address	Not checked		IPv4
Attribute Type	'00001000'B	INTERNAL_IP6_ADDRESS	IPv6
IPv6 Address	Not checked		IPv6
Attribute Type	'00010100'B	P_CSCF_IP4_ADDRESS	IPv4
IPv4 Address	Not checked		IPv4
Attribute Type	'00010101'B	P_CSCF_IP6_ADDRESS	IPv6
IPv6 Address	Not checked		IPv6
NOTE 1: The order of Payloads/fields is not checked, unless explicitly specified. Additional Payloads/fields are ignored.			

Condition	Explanation
IPv4	If the UE requests an IPv4 address
IPv6	If the UE requests an IPv6 address
NOTE: At least one of IPv4 and IPv6 shall be true.	

Table 20.2.3.3-2B: IKE_AUTH request (step 9, Table 20.2.3.2-1)

Derivation path: 36.508 table 4.7G-3			
Information Element	**Value/remark**	**Comment**	**Condition**
IKE Header			
Next Payload	'00110000'B	EAP	
Exchange Type	'00100011'B	IKE_AUTH	
Extensible Authentication Payload			
Next Payload	'00000000'B	No Next Payload if EAP is the last payload	
Code	'00000010'B	Response	
Identifier	Not checked		
Type	Not checked		
Type_Data	Not checked		
NOTE 1: The order of Payloads/fields is not checked, unless explicitly specified. Additional Payloads/fields are ignored.			

Table 20.2.3.3-3: IKE_AUTH request (step 11, Table 20.2.3.2-1)

Derivation path: 36.508 table 4.7G-3			
Information Element	**Value/remark**	**Comment**	**Condition**
IKE Header			
Next Payload	'00101111'B	AUTH	
Exchange Type	'00100011'B	IKE_AUTH	
Authentication Payload			
Next Payload	'00000000'B	No Next Payload if AUTH is the last payload	
Authentication Method	Not checked		
Authentication Data	Not checked		
NOTE 1: The order of Payloads/fields is not checked, unless explicitly specified. Additional Payloads/fields are ignored.			

Table 20.2.3.3-4: IKE_AUTH response (step 12, Table 20.2.3.2-1)

Derivation path: 36.508 table 4.7G-4			
Information Element	**Value/remark**	**Comment**	**Condition**
IKE Header			
Next Payload	'00101111'B	CP	
Exchange Type	'00100011'B	IKE_AUTH	
Configuration Payload			
Next Payload	Set by the SS		
CFG Type	'00000010'B	CFG_REPLY	
Attribute Type	'00000001'B	INTERNAL_IP4_ADDRESS	IPv4
IPv4 Address	Set by the SS		IPv4
Attribute Type	'00001000'B	INTERNAL_IP6_ADDRESS	IPv6
IPv6 Address	Set by the SS		IPv6
Attribute Type	'00010100'B	P_CSCF_IP4_ADDRESS	
IPv4 Address	Set by the SS		
Attribute Type	'00010101'B	P_CSCF_IP6_ADDRESS	
IPv6 Address	Set by the SS		

Condition	Explanation
IPv4	If the UE requested an IPv4 address
IPv6	If the UE requested an IPv6 address

20.3 UE initiated disconnection

20.3.1 Test Purpose (TP)

(1)

```
with { UE has an established tunnel }
ensure that {
  when { UE initiate disconnection }
    then { UE transmits an INFORMATIONAL Request message containing the delete payload }
          }
```

20.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.302 clause 7.2.4.1.

[Rel-13, TS 24.302, clause 7.2.4.1]

The UE shall use the procedures defined in the IKEv2 protocol (see IETF RFC 5996 [28]) to disconnect an IPsec tunnel to the ePDG. The UE shall close the incoming security associations associated with the tunnel and instruct the ePDG to do the same by sending the INFORMATIONAL request message including a "DELETE" payload. The DELETE payload shall contain either:

i) Protocol ID set to "1" and no subsequent Security Parameters Indexes (SPIs) in the payload. This indicates closing of IKE security association, and implies the deletion of all IPsec ESP security associations that were negotiated within the IKE security association; or

ii) Protocol ID set to "3" for ESP. The Security Parameters Indexes included in the payload shall correspond to the particular incoming ESP security associations at the UE for the given tunnel in question.

20.3.3 Test description

20.3.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27 according to Table 4.4.8-1 in [18].

UE:

- None

Preamble:

- The UE has an established tunnel according to table 4.5A.23.3-1 in [18].

20.3.3.2 Test procedure sequence

Table 20.3.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Make UE initiate disconnection.	-	-	-	-
-	EXCEPTION: Table 20.3.3.2-2 describes optional behaviour that depends on the UE implementation	-	-		
2	Check: Does the UE transmit an INFORMATIONAL Request message including a Delete payload?	-->	INFORMATIONAL Request	1	P
3	The SS transmits an INFORMATIONAL Response message.	<--	INFORMATIONAL Response	-	-

Table 20.3.3.2-2: Optional behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	The SS starts Timer_1 = 2 seconds	-	-	-	-
-	EXCEPTION: Steps 2a1 – 2b1 describe behaviour that depends on the UE implementation	-	-	-	-
2a1	IMS de-registration is performed using the generic procedure defined in 34.229-1 [40] Annex C.30. Note: The SS cancels the Timer_1	-	-	-	-
2b1	The SS waits for Timer_1 expiry	-	-	-	-

20.3.3.3 Specific message contents

Table 20.3.3.3-1: INFORMATIONAL request (step 2, Table 20.3.3.2-1)

Derivation path: IETF RFC 5996 [57]			
Information Element	**Value/remark**	**Comment**	**Condition**
IKE Header			
Next Payload	'00101010'B	D	
Exchange Type	'00100011'B	INFORMATIONAL	
Delete Payload			
Next Payload	'00000000'B	No Next Payload if D is the last payload	
Protocol ID	'00000001'B	For IKE SA	
NOTE 1: The order of Payloads/fields is not checked, unless explicitly specified. Additional Payloads/fields are ignored.			

Table 20.3.3.3-2: INFORMATIONAL response (step 3, Table 20.3.3.2-1)

Derivation path: IETF RFC 5996 [57]			
Information Element	**Value/remark**	**Comment**	**Condition**
IKE Header			
Next Payload	'00101010'B	D	
Exchange Type	'00100011'B	INFORMATIONAL	
Delete Payload			
Next Payload	'00000000'B	No Next Payload	
Protocol ID	'00000001'B	For IKE SA	

20.4 ePDG initiated disconnection

20.4.1 Test Purpose (TP)

(1)

```
with { UE has an established tunnel }
ensure that {
  when { UE receives an INFORMATIONAL Request message including a delete payload }
    then { UE transmits an INFORMATIONAL Response message }
          }
```

20.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.302 clause 7.2.4.2.

[Rel-13, TS 24.302, clause 7.2.4.2]

On receipt of the INFORMATIONAL request message including "DELETE" payload, indicating that the ePDG is attempting tunnel disconnection, the UE shall:

i) Close all security associations identified within the DELETE payload (these security associations correspond to outgoing security associations from the UE perspective). If no security associations were present in the DELETE payload, and the protocol ID was set to "1", the UE shall close the IKE security association, and all IPsec ESP security associations that were negotiated within it towards the ePDG; and

ii) The UE shall delete the incoming security associations corresponding to the outgoing security associations identified in the "DELETE" payload.

The UE shall send an INFORMATIONAL response message. If the INFORMATIONAL request message contained a list of security associations, the INFORMATIONAL response message shall contain a list of security associations deleted in step (ii) above.

If the UE is unable to comply with the INFORMATIONAL request message, the UE shall send INFORMATION response message with either:

i) A NOTIFY payload of type "INVALID_SPI", for the case that it could not identify one or more of the Security Parameters Indexes in the message from the ePDG; or

ii) A more general NOTIFY payload type. This payload type is implementation dependent.

If the INFORMATIONAL request message including the DELETE payload contains the REACTIVATION_REQUESTED_CAUSE Notify payload, the UE shall re-establish the IPsec Tunnel for the corresponding PDN connection after its release. The coding of the P-CSCF_RESELECTION_SUPPORT Notify payload is described in subclause 8.2.9.6.

NOTE: For an IMS PDN connection, the re-establishment of the IPSec tunnel is part of the "Re-establishment of the IP-CAN used for SIP signalling procedure" specified in 3GPP TS 24 229 [67] subclause R.2.2.1B.

20.4.3 Test description

20.4.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27 according to Table 4.4.8-1 in [18].

UE:

- None

Preamble:

- The UE has an established tunnel according to table 4.5A.23.3-1 in [18].

20.4.3.2 Test procedure sequence

Table 20.4.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits an INFORMATIONAL Request message including a Delete payload.	<--	INFORMATIONAL Request	-	-
2	Check: Does the UE transmit an INFORMATIONAL Response message?	-->	INFORMATIONAL Response	1	P

20.4.3.3 Specific message contents

Table 20.4.3.3-1: INFORMATIONAL request (step 1, Table 20.4.3.2-1)

Derivation path: IETF RFC 5996 [57]			
Information Element	**Value/remark**	**Comment**	**Condition**
IKE Header			
Next Payload	'00101010'B	D	
Exchange Type	'00100011'B	INFORMATIONAL	
Delete Payload			
Next Payload	'00000000'B	No Next Payload	
Protocol ID	'00000001'B	For IKE SA	

Table 20.4.3.3-2: INFORMATIONAL response (step 2, Table 20.4.3.2-1)

Derivation path: IETF RFC 5996 [57]			
Information Element	**Value/remark**	**Comment**	**Condition**
IKE Header			
Next Payload	Not checked		
Exchange Type	'00100011'B	INFORMATIONAL	
NOTE 1: The order of Payloads/fields is not checked, unless explicitly specified. Additional Payloads/fields are ignored.			

21 SC-PTM in LTE

21.1 SC-MCCH Information Acquisition

(…)

21.1.1 SC-MCCH information acquisition/ UE is switched on

21.1.1.1 Test Purpose (TP)

(1)

```
with { UE in switched off state and interested to receive MBMS services via SC-MRB }
ensure that {
  when { UE is switched on }
    then { acquire the SCPTM-Configuration message at the next repetition period }
           }
```

21.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8a.2.2 and 5.8a.2.3.

[TS 36.331, clause 5.8a.2.2]

A UE interested to receive MBMS services via SC-MRB shall apply the SC-MCCH information acquisition procedure upon entering the cell broadcasting *SystemInformationBlockType20* (e.g. upon power on, following UE mobility) and upon receiving a notification that the SC-MCCH information has changed. A UE that is receiving an MBMS service via SC-MRB shall apply the SC-MCCH information acquisition procedure to acquire the SC-MCCH information that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the SC-MCCH information acquisition procedure overwrites any stored SC-MCCH information, i.e. delta configuration is not applicable for SC-MCCH information and the UE discontinues using a field if it is absent in SC-MCCH information unless explicitly specified otherwise.

[TS 36.331, clause 5.8a.2.3]

A SC-PTM capable UE shall:

…

1> if the UE enters a cell broadcasting *SystemInformationBlockType20*:

2> acquire the *SCPTM-Configuration* message at the next repetition period;

…

21.1.1.3 Test description

21.1.1.3.1 Pre-test conditions

System Simulator:

- Cell 1.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell 1.
- SCPTMConfiguration as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in state Switched OFF (state 1).-Before being switched off the UE is made interested in receiving MBMS service in the PLMN of Cell 1 with MBMS Service ID 1.

21.1.1.3.2 Test procedure sequence

Table 21.1.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The UE is switched on.	-	-	-	-
2	The generic procedure described in TS 36.508 subclause 4.5.2A.3 is performed on Cell 1 to activate the UE test mode.	-		-	-
3	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message.	-	-	-	-
4	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 activating UE test loop Mode F.	-	-	-	-
-	Exception; Step 5 is repeated 5 times.	-	-	-	-
5	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets.	-	-
6	The SS transmits an UE TEST LOOP MODE F SC-PTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SC-PTM PACKET COUNTER REQUEST	-	-
7	UE responds with UE TEST LOOP MODE F SC-PTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SC-PTM PACKET COUNTER RESPONSE	-	-
8	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 7 greater than zero?	-	-	1	P

21.1.1.3.3 Specific message contents

Table 21.1.1.3.3-1: ACTIVATE TEST MODE (step 2, Table 21.1.1.3.2-1)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F

Table 21.1.1.3.3-2: CLOSE UE TEST LOOP (step 4, Table 21.1.1.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

21.1.2 SC-MCCH information acquisition/ cell reselection to a cell broadcasting SIB20

21.1.2.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state and interested to receive SC-PTM services }
ensure that {
  when { UE reselects to a cell broadcasting SIB20 }
    then { UE shall acquire the SCPTMConfiguration message at the next repetition period }
           }
```

21.1.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8a.2.2 and 5.8a.2.3.

[TS 36.331, clause 5.8a.2.2]

A UE interested to receive MBMS services via SC-MRB shall apply the SC-MCCH information acquisition procedure upon entering the cell broadcasting *SystemInformationBlockType20* (e.g. upon power on, following UE mobility) and upon receiving a notification that the SC-MCCH information has changed. A UE that is receiving an MBMS service via SC-MRB shall apply the SC-MCCH information acquisition procedure to acquire the SC-MCCH information that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the SC-MCCH information acquisition procedure overwrites any stored SC-MCCH information, i.e. delta configuration is not applicable for SC-MCCH information and the UE discontinues using a field if it is absent in SC-MCCH information unless explicitly specified otherwise.

[TS 36.331, clause 5.8a.2.3]

A SC-PTM capable UE shall:

…

1> if the UE enters a cell broadcasting *SystemInformationBlockType20*:

2> acquire the *SCPTMConfiguration* message at the next repetition period;

…

21.1.2.3 Test description

21.1.2.3.1 Pre-test conditions

System Simulator:

- Cell 1 and Cell 2.
- System information combination 1 and 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell 1 and cell 2 correspondingly.
- SCPTMConfiguration as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH in Cell 2

UE:

- E-UTRAN UE supporting SC-PTM services

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 2 with MBMS Service ID 1.

21.1.2.3.2 Test procedure sequence

Table 21.1.2.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while the column marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.1.2.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-91	
T1	Cell-specific RS EPRE	dBm/15kHz	-85	-79	The power level values are assigned to satisfy $R_{Cell\ 1} < R_{Cell\ 2}$.

Table 21.1.2.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS changes Cell 2 level according to the row "T1" in table 21.1.2.3.2-1.	-	-	-	-
2	The UE executes the generic test procedure described in TS 36.508 subclause 6.4.2.2 and UE shall camp on E-UTRA Cell 2.	-	-	-	-
3	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message.		-	-	-
4	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 2 activating UE test loop Mode F.	-	-	-	-
-	Exception: Step 5 is repeated 5 times	-	-	-	-
5	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets.	-	-
6	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message to set UE to Mode F.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
7	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
8	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 7 greater than zero?	-	-	1	P

21.1.2.3.3 Specific message contents

Table 21.1.2.3.3-1: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.1.2.3.3-2: CLOSE UE TEST LOOP (step 4, Table 21.1.2.3.2-2)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

21.1.3 SC-MCCH information acquisition/ UE handover to a cell broadcasting SIB20

21.1.3.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC CONNECTED state and interested to receive SC-PTM services }
ensure that {
  when { UE handovers to a cell broadcasting SIB20 }
    then { UE should acquire the SCPTMConfiguration message at the next repetition period }
           }
```

21.1.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8a.2.2 and 5.8a.2.3.

[TS 36.331, clause 5.8a.2.2]

A UE interested to receive MBMS services via SC-MRB shall apply the SC-MCCH information acquisition procedure upon entering the cell broadcasting *SystemInformationBlockType20* (e.g. upon power on, following UE mobility) and upon receiving a notification that the SC-MCCH information has changed. A UE that is receiving an MBMS service via SC-MRB shall apply the SC-MCCH information acquisition procedure to acquire the SC-MCCH information that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the SC-MCCH information acquisition procedure overwrites any stored SC-MCCH information, i.e. delta configuration is not applicable for SC-MCCH information and the UE discontinues using a field if it is absent in SC-MCCH information unless explicitly specified otherwise

[TS 36.331, clause 5.8a.2.3]

A SC-PTM capable UE shall:

…

1> if the UE enters a cell broadcasting *SystemInformationBlockType20*:

2> acquire the *SCPTMConfiguration* message at the next repetition period;

…

21.1.3.3 Test description

21.1.3.3.1 Pre-test conditions

System Simulator:

- Cell 1 and Cell 2.
- System information combination 1 and 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell 1 and cell 2 correspondingly .
- SCPTMConfiguration as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH in Cell 2.

UE:

- E-UTRAN UE supporting SC-PTM services

Preamble:

- UE is in state Generic RB Established, Test Mode Activated (state 3A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 2 with MBMS Service ID 1.

21.1.3.3.2 Test procedure sequence

Table 21.1.3.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.1.3.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy exit condition for event A3 (M2 < M1) (NOTE 1).
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-79	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M2 > M1) (NOTE 1).

Table 21.1.3.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits an *RRCConnectionReconfiguration* message to setup intra frequency measurement on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
2	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of intra frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
3	The SS changes Cell 1, Cell 2 parameters according to the row "T1" in table 21.1.3.3.2-1.	-	-	-	-
4	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 2.	-->	*MeasurementReport*	-	-
5	The SS transmits an *RRCConnectionReconfiguration* message to order the UE to perform intra frequency handover to Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
6	UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2	-->	*RRCConnectionReconfigurationComplete*	-	-
7	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message		-		
8	The generic procedures described in TS 36.508 subclause 4.5.4.3 are performed on Cell 2 activating UE test loop Mode F.	-	-	-	-
-	Exception: Step 9 is repeated 5 times	-	-	-	-
9	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets.	-	-
10	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message to set UE to Mode F.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
11	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
12	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 11 greater than zero?	-	-	1	P

21.1.3.3.3 Specific message contents

Table 21.1.2.3.3-0: Conditions for specific message contents in Tables 21.1.2.3.3-3 and Table 21.1.3.3.3-6

Condition	Explanation
Band > 64	This condition applies if the band number is bigger than 64.

Table 21.1.3.3.3-1: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.1.3.3.3-2: *RRCConnectionReconfiguration* (step 1, Table 21.1.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS

Table 21.1.3.3.3-3: *MeasConfig* (Table 21.1.3.3.3-2)

Derivation Path: 36.508, Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 ::= SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f1		
}			
}			
}			

Table 21.1.3.3.3-4: *MeasurementReport* (step 4, Table 21.1.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultServCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 2		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			
}			

Table 21.1.3.3.3-5: *RRCConnectionReconfiguration* (step 5, Table 21.1.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition HO

Table 21.1.3.3.3-6: *MobilityControlInfo* (Table 21.1.3.3.3-5)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 2		
carrierFreq SEQUENCE {			
dl-CarrierFreq	Same downlink EARFCN as used for Cell 2		
}			
carrierFreq	Not present		Band > 64
carrierFreq-v9e0 SEQUENCE {			Band > 64
dl-CarrierFreq-v9e0	Same downlink EARFCN as used for Cell 2		
}			
}			

Table 21.1.3.3.3-7: CLOSE UE TEST LOOP (step 8, Table 21.1.3.3.2-2)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

21.1.4 SC-MCCH information acquisition/ UE is receiving an SC-PTM service

21.1.4.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state }
ensure that {
  when { UE is receiving an SC-PTM service }
    then { UE shall start acquiring the SCPTMConfiguration message that corresponds with the service
that is being received, from the beginning of each modification period }
           }
```

21.1.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8a.2.2 and 5.8a.2.3.

[TS 36.331, clause 5.8a.2.2]

A UE interested to receive MBMS services via SC-MRB shall apply the SC-MCCH information acquisition procedure upon entering the cell broadcasting *SystemInformationBlockType20* (e.g. upon power on, following UE mobility) and upon receiving a notification that the SC-MCCH information has changed. A UE that is receiving an MBMS service via SC-MRB shall apply the SC-MCCH information acquisition procedure to acquire the SC-MCCH information that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the SC-MCCH information acquisition procedure overwrites any stored SC-MCCH information, i.e. delta configuration is not applicable for SC-MCCH information and the UE discontinues using a field if it is absent in SC-MCCH information unless explicitly specified otherwise.

[TS 36.331, clause 5.8a.2.3]

An SC-PTM capable UE shall:

…

1> if the UE is receiving an MBMS service via an SC-MRB:

2> start acquiring the *SCPTMConfiguration* message from the beginning of each modification period.

…

21.1.4.3 Test description

21.1.4.3.1 Pre-test conditions

System Simulator:

- Cell 1.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell 1.
- SCPTMConfiguration as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 1 with MBMS Service ID 1.

21.1.4.3.2 Test procedure sequence

Table 21.1.4.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS transmits *SCPTMConfiguration* message.	<--	*SCPTMConfiguration*	-	-
2	Wait for a period equal to the SC-MCCH modification period for the UE to receive *SCPTMConfiguration* message.	-	-	-	-
3	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 closing UE test loop Mode F.	-	-	-	-
-	Exception: Step 4 is repeated 2 times	-	-	-	-
4	The SS transmits 5 MBMS Packets on the SC-MTCH.	-	MBMS Packets.	-	-
5	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
6	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
7	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 7 greater than zero?	-	-	1	P
8	SS performs procedures on opening UE test loop Mode F and then closing it again for the g-RNTI defined in step 10				
9	The SS transmits an *RRCConnectionRelease* message to release RRC connection and move to RRC_IDLE.	<--	RRC: *RRCConnectionRelease*	-	-
10	SS transmits an updated *SCPTMConfiguration* message, at the beginning of next modification period MPa.	<--	*SCPTMConfiguration*	-	-
11	Wait for the duration of one repetition period for the UE to receive *SCPTMConfiguration* message.	-	-	-	-
-	Exception: Step 12 is repeated 2 times	-	-	-	-
12	The SS transmits 5 MBMS Packets on the SC-MTCH.	<--	MBMS Packets.	-	-
13	Steps 2 to 7 of the generic procedure described in TS 36.508 subclause 4.5.3A.3 are performed on Cell 1.	-	-		
14	The SS transmits an *RRCConnectionReconfiguration* message to configure data radio bearer(s) associated with the existing EPS bearer context.	<--	RRC: *RRCConnectionReconfiguration*		
15	The UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	RRC: *RRCConnectionReconfigurationComplete*		
16	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
17	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
18	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 17 greater than zero?	-	-	1	P
Note: The checking of UE received MBMS packets in steps 7 and 18 is to verify that SC-PTM reception is ongoing before and after the SCPTMconfiguration change in step 10.					

21.1.4.3.3 Specific message contents

Table 21.1.4.3.3-1: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.1.4.3.3-2: CLOSE UE TEST LOOP (step 3, Table 21.1.4.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

Table 21.1.4.3.3-3: CLOSE UE TEST LOOP (step 8, Table 21.1.4.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F			
Information Element	**Value/remark**	**Comment**	**Condition**
UE test loop mode F setup		SC-MCCH ID	
g-RNTI	'0200'H		

Table 21.1.4.3.3-4: *SCPTMConfiguration* for Cell 1 (step 10, Table 21.1.4.3.2-1)

Derivation Path: 36.508 table 4.6.1-18a			
Information Element	**Value/remark**	**Comment**	**Condition**
SCPTMConfiguration-r13 ::= SEQUENCE {			
sc-mtch-InfoList-r13 SEQUENCE (SIZE (0..maxSC-MTCH-r13)) OF SEQUENCE {			
g-RNTI-r13	'0200'H		

Table 21.1.4.3.3-5: RRCConnectionReconfiguration (step 14, Table 21.1.4.3.2-1)

Derivation Path: 36.508 Table 4.6.1-8, condition SRB2-DRB(2, 0)			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
dedicatedInfoNASList SEQUENCE (SIZE(1..maxDRB)) OF	Not present		
}			
}			
}			
}			

21.1.5 SC-MCCH information acquisition/ UE is not receiving SC-PTM data

21.1.5.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state and interested to receive SC-PTM services }
ensure that {
  when { UE is not receiving an SC-PTM service and receives SC-MCCH information change notification
}
    then { UE shall start acquiring the SCPTMConfiguration message from the subframe where the
change notification was received }
            }
```

21.1.5.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8a.2.2 and 5.8a.2.3.

[TS 36.331, clause 5.8a.2.2]

A UE interested to receive MBMS services via SC-MRB shall apply the SC-MCCH information acquisition procedure upon entering the cell broadcasting *SystemInformationBlockType20* (e.g. upon power on, following UE mobility) and upon receiving a notification that the SC-MCCH information has changed. A UE that is receiving an MBMS service via SC-MRB shall apply the SC-MCCH information acquisition procedure to acquire the SC-MCCH information that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the SC-MCCH information acquisition procedure overwrites any stored SC-MCCH information, i.e. delta configuration is not applicable for SC-MCCH information and the UE discontinues using a field if it is absent in SC-MCCH information unless explicitly specified otherwise.

[TS 36.331, clause 5.8a.2.3]

An SC-PTM capable UE shall:

1> if the procedure is triggered by an SC-MCCH information change notification:

2> start acquiring the *SCPTMConfiguration* message from the subframe where the change notification was received;

NOTE 1: The UE continues using the previously received SC-MCCH information until the new SC-MCCH information has been acquired.

21.1.5.3 Test description

21.1.5.3.1 Pre-test conditions

System Simulator:

- Cell 1.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1.
- SCPTMConfiguration as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH in Cell 1.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 1 with MBMS Service ID 0.

21.1.5.3.2 Test procedure sequence

Table 21.1.5.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS transmits updated *SCPTMConfiguration* and SC-MCCH information change notification from the beginning of next modification period MPa.	-	*SCPTMConfiguration* (MCCH information change notification)	-	-
2	Void	-	-	-	-
3	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 to close UE test loop F	-	-	-	-
-	Exception: Step 4 is repeated 2 times	-	-	-	-
4	The SS transmits 8 MBMS Packets on the SC-MTCH	<--	MBMS Packets	-	-
5	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
6	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
7	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 6 greater than zero?	-	-	1	P

21.1.5.3.3 Specific message contents

Table 21.1.5.3.3-1: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.1.5.3.3-2: *SystemInformationBlockType20 (preamble)*

Derivation Path: 36.331 clause 6.3.1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType20-r13 ::= SEQUENCE {			
sc-mcch-RepetionPeriod-r13	Rf64		
sc-mcch-Offset-r13	1		
sc-mcch-FirstSubframe-r13	0		
sc-mcch-duration-r13	2		
sc-mcch-ModificationPeriod-r13	Rf512		
lateNonCriticalExtension			
}			

Table 21.1.5.3.3-3: *SCPTMConfiguration* for Cell 1 (step 1, Table 21.1.5.3.2-1)

Derivation Path: 36.508 table 4.6.1-18a			
Information Element	**Value/remark**	**Comment**	**Condition**
SCPTMConfiguration-r13 ::= SEQUENCE {			
sc-mtch-InfoList-r13 SEQUENCE (SIZE (0..maxSC-MTCH-r13)) OF SEQUENCE {			
mbmsSessionInfo-r13 SEQUENCE {			
tmgi-r13 SEQUENCE {			
plmn-Id-r9 CHOICE {			
plmn-Index-r9	1		
}			
}			
serviceId-r9	'000000'H	OCTET STRING (SIZE (3))	
}			
sessionId-r13	Not present		
}			
g-RNTI-r13	'0200'H		

Table 21.1.5.3.3-4: CLOSE UE TEST LOOP (step 3, Table 21.1.5.3.2-2)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C			
Information Element	**Value/remark**	**Comment**	**Condition**
UE test loop mode F setup		SC-MCCH ID	
g-RNTI	'0200'H		

21.1.6 SC-MCCH information acquisition / Enhanced Coverage

21.1.6.1 Test Purpose (TP)

(1)

```
with { Enhanced Coverage Capable UE in E-UTRAN RRC IDLE state }
ensure that {
  when { UE is receiving SC-PTM service }
    then { { UE shall start acquiring the SCPTMConfiguration message at the start of the next
modification period upon receiving a notification that the SC-MCCH information that corresponds with
the service that is being received is about to be changed }
           }
```

21.1.6.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 36.331, clauses 5.8a.1.3 and 5.8.2.

[TS 36.331, clause 5.8a.1.3]

…

When the network changes (some of) the SC-MCCH information for start of new MBMS service(s) transmitted using SC-PTM, it notifies BL UEs, UEs in CE or NB-IoT UEs about the change in every PDCCH which schedules the first SC-MCCH in a repetition period in the current modification period. The notification is transmitted with 1 bit. The bit, when set to '1', indicates the start of new MBMS service(s), see TS 36.212 [22, 5.3.3.1.14 & 6.4.3.3]. Upon receiving a change notification, a BL UE, UE in CE or NB-IoT UE interested to receive MBMS services transmitted using SC-PTM acquires the new SC-MCCH information scheduled by the PDCCH. The BL UE, UE in CE or NB-IoT UE applies the previously acquired SC-MCCH information until the BL UE, UE in CE or NB-IoT UE acquires the new SC-MCCH information.

…

[TS 36.331, clause 5.8.2]

…

The UE applies the SC-MCCH information acquisition procedure to acquire the SC-PTM control information that is broadcast by the E-UTRAN. The procedure applies to SC-PTM capable UEs that are in RRC_IDLE. This procedure also applies to SC-PTM capable UEs that are in RRC_CONNECTED except for BL UEs, UEs in CE or NB-IoT UEs.

…

A UE interested to receive MBMS services via SC-MRB shall apply the SC-MCCH information acquisition procedure upon entering the cell broadcasting *SystemInformationBlockType20* (*SystemInformationBlockType20-NB* in NB-IoT) (e.g. upon power on, following UE mobility) and upon receiving a notification that the SC-MCCH information has changed. A UE, except for BL UE, UE in CE or NB-IoT UE, that is receiving an MBMS service via SC-MRB shall apply the SC-MCCH information acquisition procedure to acquire the SC-MCCH information that corresponds with the service that is being received, at the start of each modification period. The BL UE, UE in CE or NB-IoT UE that is receiving an MBMS service via SC-MRB shall apply the SC-MCCH information acquisition procedure upon receiving a notification that the SC-MCCH information that corresponds with the service that is being received is about to be changed. The BL UE, UE in CE or NB-IoT UE that is receiving an MBMS service via SC-MRB may apply the SC-MCCH information acquisition procedure upon receiving a notification that the SC-MCCH information is about to be changed due to start of a new service.

…

A SC-PTM capable UE shall:

1> if the procedure is triggered by an SC-MCCH information change notification and the UE has no ongoing MBMS service:

2> except for a BL UE, UE in CE or NB-IoT UE, start acquiring the *SCPTMConfiguration* message from the subframe in which the change notification was received;

2> for a BL UE, UE in CE or NB-IoT UE, acquire the *SCPTMConfiguration* message scheduled by the PDCCH in which the change notification was received;

NOTE 1: The UE continues using the previously received SC-MCCH information until the new SC-MCCH information has been acquired.

1> if the UE enters a cell broadcasting *SystemInformationBlockType20* (*SystemInformationBlockType20-NB* in NB-IoT):

2> acquire the *SCPTMConfiguration* message at the next repetition period;

1> if the UE is receiving an MBMS service via an SC-MRB:

2> except for BL UE, UE in CE or NB-IoT UE, start acquiring the *SCPTMConfiguration* message from the beginning of each modification period;

2> a BL UE, UE in CE or NB-IoT UE shall start acquiring the *SCPTMConfiguration* message at the start of the next modification period upon receiving a notification that the SC-MCCH information that corresponds with the service that is being received is about to be changed;

2> a BL UE, UE in CE or NB-IoT UE may start acquiring the *SCPTMConfiguration* message at the start of the next modification period upon receiving a notification that the SC-MCCH information is about to be changed due to start of a new service;

…

21.1.6.3 Test description

21.1.6.3.1 Pre-test conditions

System Simulator:

- Cell 1.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell 1.
- SCPTMConfiguration-BR as defined in TS 36.508[18] table 4.6.1-18b is transmitted on SC-MCCH in Cell 1.

UE:

- E-UTRAN UE supporting Enhanced Coverage and SC-PTM services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE F.

- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 1 with MBMS Service ID 1.

21.1.6.3.2 Test procedure sequence

Table 21.1.6.3.2-1: Main Behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	SS transmits *SCPTMConfiguration-BR* message.	<--	*SCPTMConfiguration-BR*	-	-
2	Wait for a period equal to the SC-MCCH modification period for the UE to receive *SCPTMConfiguration-BR* message	-	-	-	-
3	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 to close UE test loop F	-	-	-	-
-	Exception: Step 4 is repeated 2 times	-	-	-	-
4	The SS transmits 5 MBMS Packets on the SC-MTCH.	<--	MBMS Packets.	-	-
5	The SS transmits a UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
6	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
7	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 6 greater than zero?	-	-	-	-
8	SS procedures on opening UE test loop Mode F and then closing it again for the G-RNTI defined in step 11	-	-	-	-
9	The SS transmits an *RRCConnectionRelease* message to release RRC connection and move to RRC_IDLE.	<--	*RRC: RRCConnectionRelease*	-	-
10	SS transmits updated *SCPTMConfiguration-BR* and SC-MCCH information change notification from the next modification period.	<--	*SCPTMConfiguration-BR* (SC-MCCH information change notification)	-	-
11	Wait for a period equal to the SC-MCCH modification period for the UE to receive the *SCPTMConfiguration-BR* message	-	-	-	-
-	Exception: Step 12 is repeated 2 times	-	-	-	-
12	The SS transmits 5 MBMS Packets on the SC-MTCH	<--	MBMS Packets	-	-
13	Steps 2 -7 of the generic procedures described in TS 36.508 subclause 4.5.3A.3 are performed on Cell 1.	-	-	-	-
14	The SS transmits an *RRCConnectionReconfiguration* message to configure data radio bearer(s) associated with the existing EPS bearer context.	<--	RRC: *RRCConnectionReconfiguration*	-	-
15	The UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	RRC: *RRCConnectionReconfigurationComplete*	-	-
16	The SS transmits a UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
17	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
18	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 17 greater than zero?	-	-	1	P
Note: The checking of UE received MBMS packets in steps 7 and 15 is to verify that SC-PTM reception is ongoing before and after the SCPTMconfiguration change in step 10.					

21.1.6.3.3 Specific message contents

Table 21.1.6.3.3-1: *SystemInformationBlockType20* for Cell 1 (all steps, Table 21.1.6.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-18			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType20-r13 ::= SEQUENCE {			
br-BCCH-Config-r14 SEQUENCE {			
dummy	rf1		
dummy2	rf1		
mpdcch-Narrowband-SC-MCCH-r14	1		
mpdcch-NumRepetition-SC-MCCH-r14	r1		
mpdcch-StartSF-SC-MCCH-r14 CHOICE {			
fdd-r14	v1		FDD
tdd-r14	v1		TDD
}			
mpdcch-PDSCH-HoppingConfig-SC-MCCH-r14	off		
sc-mcch-CarrierFreq-r14	Same frequency as Cell 1		
sc-mcch-Offset-BR-r14	0		
sc-mcch-RepetitionPeriod-BR-r14	rf32		
sc-mcch-ModificationPeriod-BR-r14	Rf512		
}			
sc-mcch-SchedulingInfo-r14	Not present		
pdsch-maxNumRepetitionCEmodeA-SC-MTCH-r14	Not present		
	r32		CE-ModeA
pdsch-maxNumRepetitionCEmodeB-SC-MTCH-r14	Not present		
	r512		CE-ModeB
sc-mcch-RepetitionPeriod-v1470	Not present		
sc-mcch-ModificationPeriod-v1470	Not present		
}			

Table 21.1.6.3.3-1: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.1.6.3.3-2: CLOSE UE TEST LOOP (step 3, Table 21.1.6.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

Table 21.1.4.3-3: CLOSE UE TEST LOOP (step 8, Table 21.1.4.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F			
Information Element	**Value/remark**	**Comment**	**Condition**
UE test loop mode F setup		SC-MCCH ID	
g-RNTI	‘0200’H		

Table 21.1.4.3-4: *SCPTMConfiguration-BR* (step 11, Table 21.1.4.3.2-1)

Derivation Path: 36.508, Table 4.6.1-18b			
Information Element	**Value/remark**	**Comment**	**Condition**
SCPTMConfiguration-BR-r14 ::= SEQUENCE {		SC-MCCH ID	
sc-mtch-InfoList-r14 SEQUENCE (SIZE (0..maxSC-MTCH-BR-r14)) OF SEQUENCE {			
g-RNTI-r14	‘0200’H		
}			
}			

21.1.7 SC-MCCH information acquisition / Enhanced Coverage / Paging precedence

21.1.7.1 Test Purpose (TP)

(1)

```
with { Enhanced Coverage Capable UE in E-UTRAN RRC IDLE state and is receiving an SC-PTM service }
ensure that {
  when { UE is paged }
    then { UE responds to paging }
            }
```

21.1.7.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.304, clause 36.304 cl. 6.2.

[TS 36.304, clause 6.2]

A UE, except for BL UE or UE in enhanced coverage or NB-IoT UE, interested to receive MBMS services provided using MBSFN transmission shall apply the MCCH information acquision procedure as specified in [3] to receive the MCCH information upon entering the corresponding MBSFN area and upon receiving a notification that the MCCH information has changed. A UE interested to receive MBMS services provided using MBSFN transmission identifies if a service that it is interested to receive is started or ongoing by receiving the MCCH information, and then receives a MTCH corresponding to the identified service.

A UE interested to receive MBMS services provided using SC-PTM transmission shall apply the SC-MCCH information acquisition procedure as specified in [3] to receive the SC-MCCH information upon entering a new cell and upon receiving a notification that the SC-MCCH information has changed. A UE interested to receive MBMS services provided using SC-PTM transmission identifies if a service that it is interested to receive is started or ongoing by receiving the SC-MCCH information, and then receives a SC-MTCH configured using the SC-MRB establishment procedure in [3] and using the DL-SCH reception and SC-PTM DRX procedure as specified in [30].

For BL UE or UE in enhanced coverage or NB-IoT UE interested to receive MBMS services provided using SC-PTM transmission, in case of conflict, reception of paging or establishment of a RRC connection for Mobile Terminated Call and Mobile Originated Signalling takes precedence over SC-PTM reception.

21.1.7.3 Test description

21.1.7.3.1 Pre-test conditions

System Simulator:

- Cell 1.
- System information combination 1 and 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1.
- SCPTMConfiguration-BR as defined in TS 36.508[18] table 4.6.1-18b is transmitted on SC-MCCH

UE:

- E-UTRAN UE supporting Enhanced Coverage and SC-PTM services

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A-CE) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 1 with MBMS Service ID 1.

21.1.7.3.2 Test procedure sequence

Table 21.1.7.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS transmits *SCPTMConfiguration-BR* message.	<--	*SCPTMConfiguration-BR*	-	-
2	Wait for a period equal to the SC-MCCH modification period for the UE to receive *SCPTMConfiguration-BR* message.	-	-	-	-
3	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 closing UE test loop Mode F.	-	-	-	-
4	The SS transmits an *RRCConnectionRelease* message to release RRC connection	<--	RRC: *RRCConnectionRelease*	-	-
-	EXCEPTION: Step 5 is repeated 2 times	-	-	-	-
5	The SS transmits 5 MBMS Packets on the SC-MTCH.	-	MBMS Packets.	-	-
-	EXCEPTION: In parallel to the events described in steps 6-8, the Step 5 specified above is repeated 2 times.	-	-	-	-
6	Steps 2 to 7 of the generic procedure described in TS 36.508 subclause 4.5.3A.3 are performed on Cell 1.	-	-		
7	The SS transmits an RRCConnectionReconfiguration message to configure data radio bearer(s) associated with the existing EPS bearer context.	<--	RRC: RRCConnectionReconfiguration		
8	The UE transmits an RRCConnectionReconfigurationComplete message.	-->	RRC: RRCConnectionReconfigurationComplete		
9	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
10	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
11	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 10 greater than zero?	-	-	1	P

21.1.7.3.3 Specific message contents

Table 21.1.7.3.3-1: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.1.7.3.3-2: CLOSE UE TEST LOOP (step 3, Table 21.1.7.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

21.2 DRX operation

21.2.1 DRX operation / Parameters configured by RRC

21.2.1.1 Test Purpose (TP)

(1)

```
with { UE in CONNECTED mode }
ensure that {
  when { SC-MTCH-SchedulingCycle is configured and [(SFN * 10) + subframe number] modulo (SC-MTCH-SchedulingCycle) = SC-MTCH-SchedulingOffset }
```

```
    then { UE starts the OnDurationTimerSCPTM and monitors the PDCCH for OnDurationTimerSCPTM PDCCH-
subframes }
            }
```

(2)

```
with { UE in CONNECTED mode }
ensure that {
  when { SC-MTCH-SchedulingCycle is configured and a new DL transmission is indicated on the PDCCH
during Active Time }
    then { UE starts or restarts the Drx-InactivityTimerSCPTM and monitors the PDCCH for Drx-
InactivityTimerSCPTM PDCCH sub-frames starting from the next PDCCH sub-frame of the PDCCH sub-frame
where the DL new transmission was indicated }
            }
```

21.2.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 36.321, clauses 3.1 and 5.7a.

[TS 36.321, clause 3.1]

Active Time: Time related to DRX operation, as defined in subclause 5.7, during which the UE monitors the PDCCH in PDCCH-subframes.

...

DRX Cycle: Specifies the periodic repetition of the On Duration followed by a possible period of inactivity (see figure 3.1-1 below).

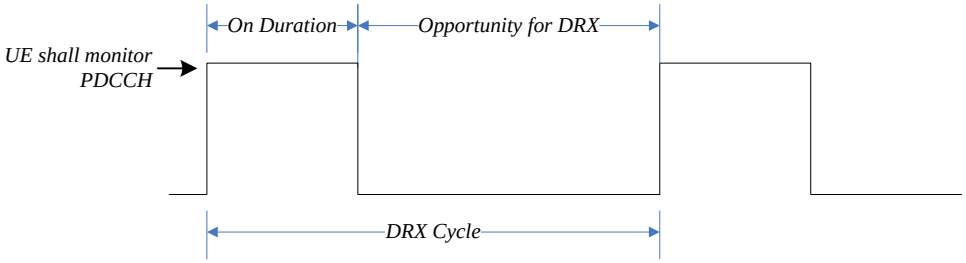

Figure 3.1-1: DRX Cycle

drx-InactivityTimer: Specifies the number of consecutive PDCCH-subframe(s) after successfully decoding a PDCCH indicating an initial UL or DL user data transmission for this UE.

...

drxStartOffset: Specifies the subframe where the DRX Cycle starts.

...

onDurationTimer: Specifies the number of consecutive PDCCH-subframe(s) at the beginning of a DRX Cycle.

PDCCH-subframe: For FDD UE operation, this represents any subframe; for TDD, only downlink subframes and subframes including DwPTS.

[TS 36.321, clause 5.7a]

Each G-RNTI of the MAC entity may be configured by RRC with a DRX functionality that controls the UE's PDCCH monitoring activity for this G-RNTI as specified in [8]. When in RRC_IDLE or RRC_CONNECTED, if DRX is configured, the MAC entity is allowed to monitor the PDCCH for this G-RNTI discontinuously using the DRX operation specified in this subclause; otherwise the MAC entity monitors the PDCCH for this G-RNTI continuously. For each G-RNTI of the MAC entity, RRC controls its DRX operation by configuring the timers *onDurationTimerSCPTM*, *drx-InactivityTimerSCPTM*, the *SC-MTCH-SchedulingCycle* and the value of the *SC-MTCH-*

SchedulingOffset. The DRX operation specified in this subclause is performed independently for each G-RNTI and independently from the DRX operation specified in subclause 5.7.

When DRX is configured for a G-RNTI, the Active Time includes the time while:

- *onDurationTimerSCPTM* or *drx-InactivityTimerSCPTM* is running.

When DRX is configured for a G-RNTI as specified in [8], the MAC entity shall for each subframe for this G-RNTI:

- if [(SFN * 10) + subframe number] modulo (*SC-MTCH-SchedulingCycle*) = *SC-MTCH-SchedulingOffset*:
  - start *onDurationTimerSCPTM*.
- during the Active Time, for a PDCCH-subframe:
  - monitor the PDCCH;
  - if the PDCCH indicates a DL transmission:
- start or restart *drx-InactivityTimerSCPTM*.

21.2.1.3 Test description

21.2.1.3.1 Pre-test conditions

System Simulator:

- Cell 1.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell 1.
- SCPTMConfiguration as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH in Cell 1.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 1 with MBMS Service ID 1.

21.2.1.3.2 Test procedure sequence

For FDD, *NormalSF*(current SFN,current subframe number,y)=y; For TDD, *NormalSF*(current SFN,current subframe number,y) counts the minimum number of normal subframes needed to cover y number of PDCCH-subframes until next PDCCH-subframe available, starting from current subframe number on current SFN. For example at step 1, *drxStartOffset* can point to UL or DL subframe for TDD. If it points to a UL subframe, *NormalSF*(current SFN,current subframe number,0) counts the number of normal subframes until reach the first DL/special subframe available. If *drxStartOffset* points to a DL subframe, *NormalSF*(current SFN,current subframe number,0)=0.

For example at step 12, assuming *SC-MTCH-SchedulingOffset* points to subframe number 0 at frame number A, *NormalSF*(A, 0, *onDurationTimer+drx-InactivityTimer-1*) is added, which counts 18 PDCCH-subframes/30 normal subframes in this case. The current subframe becomes subframe number 0 at frame number A+3.

Table 21.2.1.3.2-1: Main Behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	SS transmits updated *SCPTMConfiguration* to configure specific DRX parameters, from the beginning of next modification period MPa.	<--	*SCPTMConfiguration*	-	-
2	Wait for a period equal to the SC-MCCH modification period for the UE to receive *SCPTMConfiguration* message				
3	In the first PDCCH subframe when the OnDurationTimer is running, the SS indicates the transmission of a DL MAC PDU on the PDCCH using G-RNTI. i.e., on the subframe with the subframe number = [csfn1 + *NormalSF*(SFN1, csfn1, 0)] modulo 10, and system frame number = SFN1 + floor([csfn1 + *NormalSF*(SFN1, csfn1, 0)]/10); where [(SFN1 * 10) + csfn1] modulo (*SC-MTCH-SchedulingCycle*) = *SC-MTCH-SchedulingOffset*	<--	MAC PDU	-	-
4	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 to close UE test loop F				
5	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
6	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
7	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 6 greater than zero?	-	-	1	P
8	At least drx-InactivityTimer PDCCH-sub frames after the transmission of the MBMS packet in Step 3 has been indicated(This means the next DRX cycle or later after Step 3) in the last PDCCH subframe while the onDurationTimer is still running, the SS indicates the transmission of a DL MAC PDU on the PDCCH using G-RNTI. (Note 3). i.e., on the subframe with the subframe number = [csfn2 + *NormalSF*(SFN2,csfn2,onDurationTimer-1)] modulo 10, and system frame number = SFN2 + floor([csfn2 + *NormalSF*(SFN2,csfn2,onDurationTimer-1)]/10); where [(SFN2 * 10) + csfn2] modulo (*SC-MTCH-SchedulingCycle*) = *SC-MTCH-SchedulingOffset*	<--	MAC PDU	-	-
9	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
10	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
11	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 10 greater than the value reported in step 6?	-	-	1	P
12	drx-InactivityTimer PDCCH-subframes after the transmission of the SC-MTCH transmitted in step 8 was indicated on the PDCCH, the SS indicates the transmission of a DL MAC PDU on the PDCCH using G-RNTI. (Note 3) i.e. on the subframe with the subframe number = [csfn2 + *NormalSF*(SFN2,csfn2,onDurationTimer + drx-	<--	MAC PDU	-	-

	InactivityTimer-1)] modulo 10, and system frame number = SFN2 + floor([csfn2 + *NormalSF*(SFN2,csfn2,onDurationTimer+ drx-InactivityTimer-1)]/10)				
13	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
14	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
15	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 14 greater than the value reported in step 10?	-	-	2	P
Note 1: All the DL MAC PDU are transmitted with the NDI set on the PDCCH. Note 2: Timer tolerances for the MAC DRX related drx-InactivityTimer measured in subframes or PDCCH subframes is 0. Note 3: The drx-InactivityTimer is started in the next PDCCH sub-frame of the PDCCH sub-frame where DL new transmission is indicated.					

21.2.1.3.3 Specific message contents

Table 21.2.1.3.3-1: ACTIVATE TEST MODE **(preamble)**

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.2.1.3.3-2: *SCPTMConfiguration* for Cell 1 (step 1, Table 21.2.1.3.2-1)

Derivation Path: 36.508 table 4.6.1-18a			
Information Element	**Value/remark**	**Comment**	**Condition**
SCPTMConfiguration-r13 ::= SEQUENCE {			
sc-mtch-InfoList-r13 SEQUENCE (SIZE (0..maxSC-MTCH-r13)) OF SEQUENCE {			
sc-mtch-schedulingInfo-r13 SEQUENCE {			
on-DurationTimerSCPTM-r13	psf50		
drx-InactivityTimerSCPTM-r13	psf10		
schedulingPeriodStartOffsetSCPTM-r13 CHOICE{			
sf160	10		
}			
}			
}			
}			

Table 21.2.1.3.3-3: CLOSE UE TEST LOOP (step 4, Table 21.2.1.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

21.2.2 DRX operation / Parameters configured by RRC / Enhanced Coverage

21.2.2.1 Test Purpose (TP)

(1)

```
with { UE in CONNECTED mode }
ensure that {
  when { SCPTM-SchedulingCycle is configured and [(H-SFN * 10240 + SFN * 10) + subframe number]
modulo (SCPTM-SchedulingCycle) = SCPTM-SchedulingOffset }
    then { UE starts the onDurationTimerSCPTM and monitors the PDCCH for onDurationTimerSCPTM PDCCH-
subframes }
            }
```

(2)

```
with { UE in CONNECTED mode }
```

```
ensure that {
  when { SCPTM-SchedulingCycle is configured and a new DL transmission is indicated on the PDCCH
during Active Time }
    then { UE starts or restarts the drx-InactivityTimerSCPTM and monitors the PDCCH for drx-
InactivityTimerSCPTM PDCCH sub-frames starting from the next PDCCH sub-frame of the PDCCH sub-frame
where the DL new transmission was indicated }
            }
```

21.2.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 36.321, clauses 3.1 and 5.7a.

[TS 36.321, clause 3.1]

Active Time: Time related to DRX operation, as defined in subclause 5.7, during which the UE monitors the PDCCH in PDCCH-subframes.

...

DRX Cycle: Specifies the periodic repetition of the On Duration followed by a possible period of inactivity (see figure 3.1-1 below).

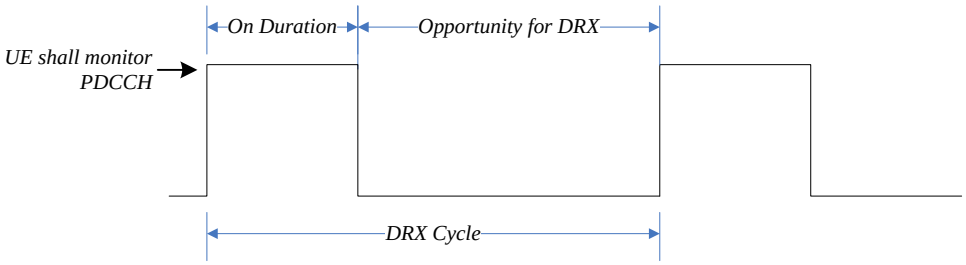

Figure 3.1-1: DRX Cycle

drx-InactivityTimer: Specifies the number of consecutive PDCCH-subframe(s) after successfully decoding a PDCCH indicating an initial UL or DL user data transmission for this UE.

...

drxStartOffset: Specifies the subframe where the DRX Cycle starts.

...

onDurationTimer: Specifies the number of consecutive PDCCH-subframe(s) at the beginning of a DRX Cycle.

PDCCH-subframe: For FDD UE operation, this represents any subframe; for TDD, only downlink subframes and subframes including DwPTS.

[TS 36.321, clause 5.7a]

Each G-RNTI and, for NB-IoT UEs, BL UEs or UEs in enhanced coverage, each SC-RNTI of the MAC entity may be configured by RRC with a DRX functionality that controls the UE's PDCCH monitoring activity for this G-RNTI and SC-RNTI as specified in [8]. When in RRC_IDLE or RRC_CONNECTED, if DRX is configured, the MAC entity is allowed to monitor the PDCCH for this G-RNTI or SC-RNTI discontinuously using the DRX operation specified in this subclause; otherwise the MAC entity monitors the PDCCH for this G-RNTI or SC-RNTI continuously. For each G-RNTI or SC-RNTI of the MAC entity, RRC controls its DRX operation by configuring the timers *onDurationTimerSCPTM*, *drx-InactivityTimerSCPTM*, the *SCPTM-SchedulingCycle* and the value of the *SCPTM-SchedulingOffset* for G-RNTI and for SC-RNTI. The DRX operation specified in this subclause is performed independently for each G-RNTI and SC-RNTI and independently from the DRX operation specified in subclause 5.7.

When DRX is configured for a G-RNTI or for SC-RNTI, the Active Time includes the time while:

- *onDurationTimerSCPTM* or *drx-InactivityTimerSCPTM* is running.

When DRX is configured for a G-RNTI or for SC-RNTI as specified in [8], the MAC entity shall for each subframe for this G-RNTI:

- if [(H-SFN * 10240 + SFN * 10) + subframe number] modulo (*SCPTM-SchedulingCycle*) = *SCPTM-SchedulingOffset*:
  - start *onDurationTimerSCPTM*.
- during the Active Time, for a PDCCH-subframe:
  - monitor the PDCCH;
  - if the PDCCH indicates a DL transmission:
    - if the UE is a BL UE or a UE in enhanced coverage:
      - start or re-start the *drx-InactivityTimerSCPTM* in the subframe containing the last repetition of the corresponding PDSCH reception.
    - if the UE is an NB-IoT UE:
      - stop *onDurationTimerSCPTM*;
      - stop *drx-InactivityTimerSCPTM*;
      - start the *drx-InactivityTimerSCPTM* in the first subframe of the next PDCCH occasion following the subframe containing the last repetition of the corresponding PDSCH reception.
    - else:
      - start or restart *drx-InactivityTimerSCPTM*.

NOTE: If H-SFN is not configured its value is set to 0 in the calculation of the starting subframe.

21.2.2.3 Test description

21.2.2.3.1 Pre-test conditions

System Simulator:

- Cell 1.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell 1.
- SCPTMConfiguration-BR as defined in TS 36.508[18] table 4.6.1-18b is transmitted on SC-MCCH in Cell 1.

UE:

- E-UTRAN UE supporting Enhanced Coverage and SC-PTM services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 1 with MBMS Service ID 1.

21.2.2.3.2 Test procedure sequence

For FDD, *NormalSF*(current SFN,current subframe number,y)=y; For TDD, *NormalSF*(current SFN,current subframe number,y) counts the minimum number of normal subframes needed to cover y number of PDCCH-subframes until next PDCCH-subframe available, starting from current subframe number on current SFN. For example at step 1, *SCPTM-SchedulingOffset* can point to UL or DL subframe for TDD. If it points to a UL subframe, *NormalSF*(current SFN,current subframe number,0) counts the number of normal subframes until reach the first DL/special subframe available. If *SCPTM-SchedulingOffset* points to a DL subframe, *NormalSF*(current SFN,current subframe number,0)=0.

For example at step 12, assuming *SCPTM-SchedulingOffset* points to subframe number 0 at frame number A, *NormalSF*(A, 0, *onDurationTimerSCPTM +drx-InactivityTimerSCPTM -1*) is added, which counts 18 PDCCH-subframes/30 normal subframes in this case. The current subframe becomes subframe number 0 at frame number A+3.

Table 21.2.2.3.2-1: Main Behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	SS transmits updated *SCPTMConfiguration-BR* to configure specific DRX parameters, from the beginning of next modification period MPa.	<--	*SCPTMConfiguration-BR*	-	-
2	Wait for a period equal to the SC-MCCH modification period for the UE to receive *SCPTMConfiguration* message				
3	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 to close UE test loop F				
4	In the first PDCCH subframe when the onDurationTimerSCPTM is running, the SS indicates the transmission of a DL MAC PDU on the PDCCH using SC-RNTI. i.e., on the subframe with the subframe number = [csfn1 + *NormalSF*(SFN1, csfn1, 0)] modulo 10, and system frame number = SFN1 + floor([csfn1 + *NormalSF*(SFN1, csfn1, 0)]/10); where [(H-SFN * 10240 + SFN1 * 10) + csfn1] modulo (*SCPTM-SchedulingCycle*) = *SCPTM-SchedulingOffset*	<--	MAC PDU	-	-
5	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
6	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
7	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 6 greater than zero?	-	-	1	P
8	At least drx-InactivityTimerSCPTM PDCCH-sub frames after the transmission of the MBMS packet in Step 3 has been indicated(This means the next DRX cycle or later after Step 3) in the last PDCCH subframe while the onDurationTimerSCPTM is still running, the SS indicates the transmission of a DL MAC PDU on the PDCCH using SC-RNTI. (Note 3). i.e., on the subframe with the subframe number = [csfn2 + *NormalSF*(SFN2,csfn2,onDurationTimerSCPTM-1)] modulo 10, and system frame number = SFN2 + floor([csfn2 + *NormalSF*(SFN2,csfn2,onDurationTimerSCPTM-1)]/10); where [(H-SFN * 10240 + SFN2 * 10) + csfn2] modulo (*SCPTM-SchedulingCycle*) = *SCPTM-SchedulingOffset*	<--	MAC PDU	-	-
9	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
10	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
11	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 10 greater than the value reported in step 6?	-	-	1	P
12	drx-InactivityTimerSCPTM PDCCH-subframes after the transmission of the SC-MTCH transmitted in step 8 was indicated on the PDCCH, the SS indicates the transmission of a DL MAC PDU on the PDCCH using SC-RNTI. (Note 3) i.e. on the subframe with the subframe number	<--	MAC PDU	-	-

	= [csfn2 + *NormalSF*(SFN2,csfn2,onDurationTimerSCPTM + drx-InactivityTimerSCPTM-1)] modulo 10, and system frame number = SFN2 + floor([csfn2 + *NormalSF*(SFN2,csfn2,onDurationTimerSCPTM+ drx-InactivityTimerSCPTM-1)]/10)				
13	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
14	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
15	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 14 greater than the value reported in step 10?	-	-	2	P
Note 1: All the DL MAC PDU are transmitted with the NDI set on the PDCCH. Note 2: Timer tolerances for the MAC DRX related drx-InactivityTimerSCPTM measured in subframes or PDCCH subframes is 0. Note 3: The drx-InactivityTimerSCPTM is started in the subframe containing the last repetition of the corresponding PDSCH reception.					

21.2.2.3.3 Specific message contents

Table 21.2.2.3.3-1: *SystemInformationBlockType20* for Cell 1 (all steps, Table 21.2.2.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-18			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType20-r13 ::= SEQUENCE {			
br-BCCH-Config-r14 SEQUENCE {			
dummy	rf1		
dummy2	rf1		
mpdcch-Narrowband-SC-MCCH-r14	1		
mpdcch-NumRepetition-SC-MCCH-r14	r1		
mpdcch-StartSF-SC-MCCH-r14 CHOICE {			
fdd-r14	v1		FDD
tdd-r14	v1		TDD
}			
mpdcch-PDSCH-HoppingConfig-SC-MCCH-r14	off		
sc-mcch-CarrierFreq-r14	FFS		
sc-mcch-Offset-BR-r14	0		
sc-mcch-RepetitionPeriod-BR-r14	rf32		
sc-mcch-ModificationPeriod-BR-r14	Rf512		
}			
sc-mcch-SchedulingInfo-r14	Not present		
pdsch-maxNumRepetitionCEmodeA-SC-MTCH-r14	Not present		
	r32		CE-ModeA
pdsch-maxNumRepetitionCEmodeB-SC-MTCH-r14	Not present		
	r512		CE-ModeB
sc-mcch-RepetitionPeriod-v1470	Not present		
sc-mcch-ModificationPeriod-v1470	Not present		
}			

Table 21.2.2.3.3-2: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.2.2.3.3-3: *SCPTMConfiguration-BR* for Cell 1 (step 1, Table 21.2.2.3.2-1)

Derivation Path: 36.508 table 4.6.1-18b			
Information Element	**Value/remark**	**Comment**	**Condition**
SCPTMConfiguration-BR-r14 ::= SEQUENCE {			
sc-mtch-InfoList-r14 SEQUENCE (SIZE (0..maxSC-MTCH-BR-r14)) OF SEQUENCE {			
sc-mtch-schedulingInfo-r14SEQUENCE {			
onDurationTimerSCPTM-r14	psf300		
drx-InactivityTimerSCPTM-r14	psf8		
schedulingPeriodStartOffsetSCPTM-r14 CHOICE {			
sf160	10		
}			
}			
}			
}			

Table 21.2.2.3.3-4: CLOSE UE TEST LOOP (step 4, Table 21.2.2.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

21.3 SC-PTM Service Continuity

21.3.1 Cell reselection to intra-frequency cell to continue SC-PTM service reception

21.3.1.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state with ongoing SC-PTM reception on a cell broadcasting SIB15
indicating the MBMS SAI and SIB20 indicating SCPTMConfiguration associated with the ongoing SC-PTM
service for the frequency of the cell }
ensure that {
  when { an intra-frequency neighbour cell providing the SC-PTM service and an inter-frequency
neighbour cell not providing the SC-PTM service becomes better than the serving cell }
    then { UE performs cell reselection to the intra-frequency cell even if the inter-frequency cell
is better and continues SC-PTM reception }
            }
```

21.3.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.304, clause 5.2.4.1 and TS 36.331, clause 5.2.2.4. Unless otherwise stated these are Rel-13 requirements.

[TS 36.304, clause 5.2.4.1]

Absolute priorities of different E-UTRAN frequencies or inter-RAT frequencies may be provided to the UE in the system information, in the *RRCConnectionRelease* message, or by inheriting from another RAT at inter-RAT cell (re)selection. In the case of system information, an E-UTRAN frequency or inter-RAT frequency may be listed without providing a priority (i.e. the field *cellReselectionPriority* is absent for that frequency). If priorities are provided in dedicated signalling, the UE shall ignore all the priorities provided in system information. If UE is in *camped on any cell* state, UE shall only apply the priorities provided by system information from current cell, and the UE preserves priorities provided by dedicated signalling and *deprioritisationReq* received in *RRCConnectionReject* unless specified otherwise. When the UE in *camped normally* state, has only dedicated priorities other than for the current frequency, the UE shall consider the current frequency to be the lowest priority frequency (i.e. lower than any of the network configured values). While the UE is camped on a suitable CSG cell, the UE shall always consider the current frequency to be the highest priority frequency (i.e. higher than any of the network configured values), irrespective of any other priority value allocated to this frequency if that cell can be accessed in normal coverage. If the UE capable of sidelink communication is configured to perform sidelink communication and can only perform the sidelink communication while camping on a frequency, the UE may consider that frequency to be the highest priority.

NOTE: The prioritization among the frequencies which UE considers to be the highest priority frequency is left to UE implementation.

If the UE is capable either of MBMS Service Continuity or of SC-PTM reception and is receiving or interested to receive an MBMS service and can only receive this MBMS service while camping on a frequency on which it is provided, the UE may consider that frequency to be the highest priority during the MBMS session [2] as long as the two following conditions are fulfilled:

1) Either:

- the UE is capable of MBMS service continuity and the reselected cell is broadcasting SIB13; or

- the UE is capable of SC-PTM reception and the reselected cell is broadcasting SIB20;

2) Either:

- SIB15 of the serving cell indicates for that frequency one or more MBMS SAIs included in the MBMS User Service Description (USD) [22] of this service; or

- SIB15 is not broadcast in the serving cell and that frequency is included in the USD of this service.

If the UE is capable either of MBMS Service Continuity or of SC-PTM reception and is receiving or interested to receive an MBMS service provided on a downlink only MBMS frequency, the UE may consider cell reselection candidate frequencies at which it can not receive the MBMS service to be of the lowest priority during the MBMS session [2], as long as the above mentioned condition 1) is fulfilled for the cell on the MBMS frequency which the UE monitors and as long as the above mentioned condition 2) is fulfilled for the serving cell.

NOTE: An example scenario in which the previous down-prioritisation may be needed concerns the case the MBMS frequency is a downlink only carrier on which camping is not possible, while the UE can only receive this MBMS frequency when camping on a subset of cell reselection candidate frequencies.

...

[TS 36.331, clause 5.2.2.4]

The UE shall:

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> if the procedure is triggered by a system information change notification:

2> if the UE uses an idle DRX cycle longer than the modification period:

3> start acquiring the required system information, as defined in 5.2.2.3, from the next eDRX acquisition period boundary;

2> else

3> start acquiring the required system information, as defined in 5.2.2.3, from the beginning of the modification period following the one in which the change notification was received;

NOTE 1: The UE continues using the previously received system information until the new system information has been acquired.

1> if the UE is in RRC_IDLE and enters a cell for which the UE does not have stored a valid version of the system information required in RRC_IDLE, as defined in 5.2.2.3:

2> acquire, using the system information acquisition procedure as defined in 5.2.3, the system information required in RRC_IDLE, as defined in 5.2.2.3;

…

1> if the UE is interested to receive MBMS services:

2> if the UE is capable of MBMS reception as specified in 5.8:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType13* is present and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType13;

2> if the UE is capable of SC-PTM reception as specified in 5.8a:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType20* is present and the UE does not have stored a valid version of this system information block:

4> acquire *SystemInformationBlockType20*;

2> if the UE is capable of MBMS Service Continuity:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType15* is present and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType15;

…

The UE may apply the received SIBs immediately, i.e. the UE does not need to delay using a SIB until all SI messages have been received. The UE may delay applying the received SIBs until completing lower layer procedures associated with a received or a UE originated RRC message, e.g. an ongoing random access procedure.

NOTE 6: While attempting to acquire a particular SIB, if the UE detects from *schedulingInfoList* that it is no longer present, the UE should stop trying to acquire the particular SIB.

21.3.1.3 Test description

21.3.1.3.1 Pre-test conditions

System Simulator:

- 3 E-UTRA cells with the same PLMN. Cell 1 and Cell 11 are intra-frequency cells. Cell 3 is inter-frequency cell to Cell 1 and Cell 11. Cell 1 "Serving cell", Cell 11 and Cell 3 are "Non-suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1 and Cell 11.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 3.
- SCPTMConfiguration as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH on Cell 1 and Cell 11.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in Loopback Activated (State 4) according to [18] in Cell 1 (serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service with MBMS Service ID=1 as broadcasted in *SCPTMConfiguration* on.

21.3.1.3.2 Test procedure sequence

Table 21.3.1.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while row marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.3.1.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 11	Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-91	-91	
T1	Cell-specific RS EPRE	dBm/15kHz	-91	-85	-79	The power level values are assigned to satisfy $R_{Cell\ 1} < R_{Cell\ 11} < R_{Cell\ 3}$.

Table 21.3.1.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 11.	<--	*Paging*	-	-
2	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* including mbms-SAI-IntraFreqList-r11 indicating MBMS SAI=1 according to system information combination 27 on Cell 1 and Cell 11.	<--	*SystemInformationBlockType15*	-	-
-	The following messages are to be observed on Cell 1 unless explicitly stated otherwise.	-	-	-	-
3	UE transmits an *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
4	The SS transmits an *RRCConnectionRelease* message to release RRC connection and move to RRC_IDLE.	<--	RRC: *RRCConnectionRelease*	-	-
-	EXCEPTION: Step 5 is repeated 5 times.	-	-	-	-
5	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
-	EXCEPTION: In parallel to the events described in steps 6, 7 and 8, the steps described in Table 21.3.1.3.2-3 may take place, depending on the UE implementation.	-	-	-	-
6	Generic test procedure Generic Radio Bearer Establishment as described in TS 36.508 subclause 4.5.3 is executed.	-	-	-	-
7	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
8	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
9	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 8 greater than zero? (Note: This verifies that SC-PTM reception is active in the UE in RRC_IDLE mode on Cell 1 before the cell re-selection to Cell 11).	-	-	1	P
10	The SS transmits an *RRCConnectionRelease* message to release RRC connection and move to RRC_IDLE.	<--	RRC: *RRCConnectionRelease*		
11	The SS changes Cell 1, Cell 11 and Cell 3 levels according to the row "T1" in table 21.3.1.3.2-1.	-	-	-	-
-	The following messages are to be observed on Cell 11 unless explicitly stated otherwise.	-	-	-	-
-	EXCEPTION: In parallel to the events described in step 12, the steps described in Table 21.3.1.3.2-3 may take place, depending on the UE implementation.	-	-	-	-
12	The UE executes the generic test procedure described in TS 36.508 subclause 6.4.2.7 and UE should camp on E-UTRA Cell 11. NOTE: The UE performs a TAU procedure and the RRC connection is released.	-	-	-	-
13	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message.		-	-	-
-	EXECPTION: Step 14 is repeated 5 times.	-	-	-	-
14	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
-	EXCEPTION: In parallel to the events described in steps 15, 16 and 17, the steps described in Table 21.3.1.3.2-3 may take	-	-	-	-

	place, depending on the UE implementation.				
15	Generic test procedure Generic Radio Bearer Establishment as described in TS 36.508 subclause 4.5.3 is executed.	-	-		
16	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
17	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
18	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 17 greater than the number of reported in step 8? (Note: This verifies that UE has selected Cell 11 providing the SC-PTM service and continue SC-PTM reception).	-	-	1	P

Table 21.3.1.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-

21.3.1.3.3 Specific message contents

Table 21.3.1.3.3-1: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.3.1.3.3-2: CLOSE UE TEST LOOP (preamble)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

Table 21.3.1.3.3-3: *SystemInformationBlockType15* for Cells 1 and 11 (Step 2 and all later steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_intraFreq.

21.3.1a Cell reselection to intra-frequency cell to continue SC-PTM service reception / Single Frequency operation (inter-band neighbouring cell)

21.3.1a.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state with ongoing SC-PTM reception on a cell broadcasting SIB15
indicating the MBMS SAI and SIB20 indicating SCPTMConfiguration associated with the ongoing SC-PTM
service for the frequency of the cell}
ensure that {
  when { an intra-frequency neighbour cell providing the SC-PTM service and an inter-band neighbour
cell not providing the SC-PTM service becomes better than the serving cell }
    then { UE performs cell reselection to the intra-frequency cell even if the inter-band cell is
better and continues SC-PTM reception }
            }
```

21.3.1a.2 Conformance requirements

Same as test case 21.3.1.

21.3.1a.3 Test description

21.3.1a.3.1 Pre-test conditions

Same as test case 21.3.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

21.3.1a.3.2 Test procedure sequence

Same as test case 21.3.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

21.3.1a.3.3 Specific message contents

Same as test case 21.3.1.

21.3.2 Cell reselection to inter-frequency cell to start SC-PTM service reception

21.3.2.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state on a cell broadcasting SIB15 and interested to receive a SC-PTM
service }
ensure that {
  when { SIB15 indicates that the SC-PTM service is available on a frequency of an inter-frequency
neighbour cell }
    then { UE performs cell reselection to the inter-frequency neighbour cell even if the serving
cell is better and starts SC-PTM reception }
           }
```

21.3.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.304, clause 5.2.4.1 and TS 36.331, clause 5.2.2.4. Unless otherwise stated these are Rel-13 requirements.

[TS 36.304, clause 5.2.4.1]

Absolute priorities of different E-UTRAN frequencies or inter-RAT frequencies may be provided to the UE in the system information, in the *RRCConnectionRelease* message, or by inheriting from another RAT at inter-RAT cell (re)selection. In the case of system information, an E-UTRAN frequency or inter-RAT frequency may be listed without providing a priority (i.e. the field *cellReselectionPriority* is absent for that frequency). If priorities are provided in dedicated signalling, the UE shall ignore all the priorities provided in system information. If UE is in *camped on any cell* state, UE shall only apply the priorities provided by system information from current cell, and the UE preserves priorities provided by dedicated signalling and *deprioritisationReq* received in *RRCConnectionReject* unless specified otherwise. When the UE in *camped normally* state, has only dedicated priorities other than for the current frequency, the UE shall consider the current frequency to be the lowest priority frequency (i.e. lower than any of the network configured values). While the UE is camped on a suitable CSG cell, the UE shall always consider the current frequency to be the highest priority frequency (i.e. higher than any of the network configured values), irrespective of any other priority value allocated to this frequency if that cell can be accessed in normal coverage. If the UE capable of sidelink communication is configured to perform sidelink communication and can only perform the sidelink communication while camping on a frequency, the UE may consider that frequency to be the highest priority.

NOTE: The prioritization among the frequencies which UE considers to be the highest priority frequency is left to UE implementation.

If the UE is capable either of MBMS Service Continuity or of SC-PTM reception and is receiving or interested to receive an MBMS service and can only receive this MBMS service while camping on a frequency on which it is provided, the UE may consider that frequency to be the highest priority during the MBMS session [2] as long as the two following conditions are fulfilled:

1) Either:

- the UE is capable of MBMS service continuity and the reselected cell is broadcasting SIB13; or

- the UE is capable of SC-PTM reception and the reselected cell is broadcasting SIB20;

2) Either:

- SIB15 of the serving cell indicates for that frequency one or more MBMS SAIs included in the MBMS User Service Description (USD) [22] of this service; or

- SIB15 is not broadcast in the serving cell and that frequency is included in the USD of this service.

If the UE is capable either of MBMS Service Continuity or of SC-PTM reception and is receiving or interested to receive an MBMS service provided on a downlink only MBMS frequency, the UE may consider cell reselection candidate frequencies at which it can not receive the MBMS service to be of the lowest priority during the MBMS session [2], as long as the above mentioned condition 1) is fulfilled for the cell on the MBMS frequency which the UE monitors and as long as the above mentioned condition 2) is fulfilled for the serving cell.

NOTE: An example scenario in which the previous down-prioritisation may be needed concerns the case the MBMS frequency is a downlink only carrier on which camping is not possible, while the UE can only receive this MBMS frequency when camping on a subset of cell reselection candidate frequencies.

...

[TS 36.331, clause 5.2.2.4]

The UE shall:

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> if the procedure is triggered by a system information change notification:

2> if the UE uses an idle DRX cycle longer than the modification period:

3> start acquiring the required system information, as defined in 5.2.2.3, from the next eDRX acquisition period boundary;

2> else

3> start acquiring the required system information, as defined in 5.2.2.3, from the beginning of the modification period following the one in which the change notification was received;

NOTE 1: The UE continues using the previously received system information until the new system information has been acquired.

1> if the UE is in RRC_IDLE and enters a cell for which the UE does not have stored a valid version of the system information required in RRC_IDLE, as defined in 5.2.2.3:

2> acquire, using the system information acquisition procedure as defined in 5.2.3, the system information required in RRC_IDLE, as defined in 5.2.2.3;

…

1> if the UE is interested to receive MBMS services:

2> if the UE is capable of MBMS reception as specified in 5.8:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType13* is present and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType13;

2> if the UE is capable of SC-PTM reception as specified in 5.8a:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType20* is present and the UE does not have stored a valid version of this system information block:

4> acquire *SystemInformationBlockType20*;

2> if the UE is capable of MBMS Service Continuity:

3> if *schedulingInfoList* indicates that *SystemInformationBlockType15* is present and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType15;

…

The UE may apply the received SIBs immediately, i.e. the UE does not need to delay using a SIB until all SI messages have been received. The UE may delay applying the received SIBs until completing lower layer procedures associated with a received or a UE originated RRC message, e.g. an ongoing random access procedure.

NOTE 6: While attempting to acquire a particular SIB, if the UE detects from *schedulingInfoList* that it is no longer present, the UE should stop trying to acquire the particular SIB.

21.3.2.3 Test description

21.3.2.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN. Cell 1 and Cell 23 are inter-frequency cells. Cell 1 is "Serving cell" and Cell 23 is "Non-suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1.
- System information combination 26 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 23.
- SCPTMConfiguration as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH on Cell 23.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1 (serving cell).
- The UE is made interested in receiving SC-PTM service with MBMS Service ID=1 as broadcasted in *SCPTMConfiguration* .

21.3.2.3.2 Test procedure sequence

Table 21.3.2.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while row marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.3.2.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 23	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	The power level values are assigned to satisfy $R_{Cell\ 23} < R_{Cell\ 1}$.

Table 21.3.2.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 23.	<--	*Paging*	-	-
2	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* including mbms-SAI-InterFreqList-r11 indicating MBMS SAI=1 according to system information combination 18 on Cell 1 and according to system information combination 28 on Cell 23.	<--	*SystemInformationBlockType15*	-	-
3	Void	-	-	-	-
-	EXCEPTION: the behaviour in table 21.3.2.3.2-3 runs in parallel with steps 4 and 5 below.	-	-	-	-
4	The UE executes the generic test procedure described in TS 36.508 subclause 6.4.2.7 and UE should camp on E-UTRA Cell 23. NOTE: The UE performs a TAU procedure and the RRC connection is released.	-	-	-	-
5	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message on Cell 23.	-	-	-	-
-	EXCEPTION: In parallel to the events described in step 6, the steps described in Table 21.3.2.3.2-3 may take place, depending on the UE implementation.	-	-	-	-
6	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 23 activating UE test loop Mode F.	-	-	-	-
7	The SS transmits an *RRCConnectionRelease* message to release RRC connection and move to RRC_IDLE.	<--	RRC: *RRCConnectionRelease*	-	-
-	Exception; Step 8 is repeated 5 times	-	-	-	-
8	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
-	EXCEPTION: In parallel to the events described in steps 9, 10 and 11, the steps described in Table 21.3.2.3.2-3 may take place, depending on the UE implementation.	-	-	-	-
9	Generic test procedure Generic Radio Bearer Establishment as described in TS 36.508 subclause 4.5.3 is executed.	-	-	-	-
10	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message to set UE to Mode F.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
11	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
12	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 11 greater than zero? (Note: This verifies that UE has selected Cell 23 providing the SC-PTM service and starts SC-PTM reception)	-	-	1	P

Table 21.3.2.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-

21.3.2.3.3 Specific message contents

Table 21.3.2.3.3-1: *SystemInformationBlockType15* for Cell 1 (step 2 and all later steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_interFreq.			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 23, see table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	
}			
}			

Table 21.3.2.3.3-2: *SystemInformationBlockType15* for Cell 23 (step 2 and all later steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_interFreq.			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 1, see table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	
}			
}			

Table 21.3.2.3.3-3: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.3.2.3.3-4: CLOSE UE TEST LOOP (step 6)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F

21.3.2a Cell reselection to inter-band cell to start SC-PTM service reception

21.3.2a.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC IDLE state on a cell broadcasting SIB15 and interested to receive a SC-PTM
service }
ensure that {
  when { SIB15 indicates that the SC-PTM service is available on a frequency of an inter-band
neighbour cell }
    then { UE performs cell reselection to the inter-band neighbour cell even if the serving cell is
better and starts SC-PTM reception }
           }
```

21.3.2a.2 Conformance requirements

Same as test case 21.3.2.

21.3.2a.3 Test description

21.3.2a.3.1 Pre-test conditions

Same as test case 21.3.2 with the following differences:

- Cells configuration: Cell 10 replaces Cell 23 with TA# set to TAI-2.

NOTE: TA# of Cell 10 shall be different from Cell 1 (TAI-1) to trigger TAU procedure in step 1 in Table 21.3.2.3.2-2.

21.3.2a.3.2 Test procedure sequence

Same as test case 21.3.2 with the following differences:

- Cells configuration: Cell 10 replaces Cell 23.

21.3.2a.3.3 Specific message contents

Same as test case 21.3.2 with the following differences:

- Cells configuration: Cell 10 replaces Cell 23.

21.3.2b

21.3.2c Cell reselection to inter-frequency cell using $Qoffset_{SCPTM}$ / Enhanced Coverage

21.3.2c.1 Test Purpose (TP)

(1)

```
with { Enhanced Coverage Capable UE in E-UTRAN RRC IDLE state on a cell broadcasting SIB15 and
interested to receive a SC-PTM service }
ensure that {
  when { a suitable inter-frequency neighbour cell is broadcasting SIB20 }
    then { UE performs cell reselection to the inter-frequency cell using Qoffset_SCPTM and starts SC-
PTM reception }
            }
```

21.3.2c.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.304, clause 5.2.4.6 and 5.2.4.7. Unless otherwise stated these are Rel-14 requirements.

[TS 36.304, clause 5.2.4.6]

The cell-ranking criterion R_s for serving cell and R_n for neighbouring cells is defined by:

$$R_s = Q_{meas,s} + Q_{Hyst} - Qoffset_{temp} + Qoffset_{SCPTM}$$

$$R_n = Q_{meas,n} - Qoffset - Qoffset_{temp} + Qoffset_{SCPTM}$$

where:

Q_{meas}	RSRP measurement quantity used in cell reselections.
Qoffset	For intra-frequency: Equals to $Qoffset_{s,n}$, if $Qoffset_{s,n}$ is valid, otherwise this equals to zero. For inter-frequency: Except for NB-IoT, equals to $Qoffset_{s,n}$ plus $Qoffset_{frequency}$, if $Qoffset_{s,n}$ is valid, otherwise this equals to $Qoffset_{frequency}$. For NB-IoT equals to $QoffsetDedicated_{frequency}$ for any frequency other than the frequency of the dedicated frequency offset, if $QoffsetDedicated_{frequency}$ is valid, otherwise this equals to $Qoffset_{frequency}$ (if $QoffsetDedicated_{frequency}$ is valid $Qoffset_{frequency}$ is not used).
$Qoffset_{temp}$	Offset temporarily applied to a cell as specified in [3]
$Qoffset_{SCPTM}$	Offset temporarily applied to an SC-PTM frequency as specified below. The offset is applied to all cells on the SC-PTM frequency. If $Qoffset_{SCPTM}$ is valid, Qoffset for inter-frequency neighbour cells is not used.

If the NB-IoT UE or UE in enhanced coverage is capable of SC-PTM reception and is receiving or interested to receive an MBMS service and can only receive this MBMS service while camping on a frequency on which it is provided (SC-PTM frequency), the UE considers $Qoffset_{SCPTM}$ to be valid during the MBMS session [2] as long as the following condition is fulfilled:

Either:

- SIB15 (or SIB15-NB) of the serving cell indicates for that frequency one or more MBMS SAIs included in the MBMS User Service Description (USD) [22] of this service; or

- SIB15 (or SIB15-NB) is not broadcast in the serving cell and that frequency is included in the USD of this service.

NOTE: UE should search for a higher ranked cell on another frequency for cell reselection as soon as possible after the UE stops using $Qoffset_{SCPTM}$.

The UE shall perform ranking of all cells that fulfil the cell selection criterion S, which is defined in 5.2.3.2 (5.2.3.2a for NB-IoT), but may exclude all CSG cells that are known by the UE not to be CSG member cells.

The cells shall be ranked according to the R criteria specified above, deriving $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values using averaged RSRP results.

If a cell is ranked as the best cell the UE shall perform cell reselection to that cell. If this cell is found to be not-suitable, the UE shall behave according to subclause 5.2.4.4.

In all cases, the UE shall reselect the new cell, only if the following conditions are met:

- the new cell is better ranked than the serving cell during a time interval $Treselection_{RAT}$;

- more than 1 second has elapsed since the UE camped on the current serving cell.

When the UE uses infinite dBs for $Qoffset_{SCPTM}$, the UE shall use $Qoffset_{SCPTM}$ zero and rank the cells on the SC-PTM frequency(ies) only first. If the UE cannot find a suitable cell on an SC-PTM frequency, the UE shall rank the cells on all frequencies.

...

[TS 36.331, clause 5.2.4.6a]

Ranking as defined in sub-clause 5.2.4.6 is applied for intra-frequency and inter-frequency cell reselection (irrespective of configured frequency priorities, if any) while the UE is in enhanced coverage.

[TS 36.331, clause 5.2.4.7]

Cell reselection parameters are broadcast in system information and are read from the serving cell as follows:

…

$Qoffset_{scptm}$

This specifies the offset to be used for cell re-selection for SC-PTM service reception for BL UE, UE in enhanced coverage and NB-IoT UE. The same offset is applicable to all frequencies providing MBMS services via SC-PTM.

…

21.3.2c.3 Test description

21.3.2c.3.1 Pre-test conditions

Same as test case 21.3.2 with the following differences:

- Cell 1 and Cell 3 support CE.
- In preamble, UE is in Registered, Idle mode, Test Mode Activated (State 2A-CE) according to [18] in Cell 1 (serving cell).

21.3.2c.3.2 Test procedure sequence

Same as test case 21.3.2.

21.3.2c.3.3 Specific message contents

Same as test case 21.3.2 with the following differences:

Table 21.3.2c.3.3-1: *SystemInformationBlockType5* for Cell 1 (preamble and all later steps in Table 21.3.2.3.2-2)

Derivation path: 36.508 table 4.4.3.3-4			
Information Element	**Value/Remark**	**Comment**	**Condition**
SystemInformationBlockType5 ::= SEQUENCE {			
scptm-FreqOffset-r14	6 (12dB)	INTEGER (1..8)	
}			

21.3.3 Handover to inter-frequency cell to start SC-PTM service reception

21.3.3.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC_Connected state AND on a cell broadcasting SIB15 and interested to receive
a SC-PTM service }
ensure that {
  when { SIB15 indicates that the SC-PTM service is available on a frequency of an inter-frequency
neighbour cell }
    then { UE transmits a MBMSInterestIndication message indicating interest in SC-PTM reception on
the frequency }
            }
```

(2)

```
with { UE in E-UTRAN RRC_Connected state AND having transmitted a MBMSInterestIndication message
indicating interest in SC-PTM reception on a frequency of an inter-frequency neighbour cell }
ensure that {
  when { 1s after the UE has transmitted the MBMSInterestIndication message the UE receives
RRCConnectionReconfiguration message including a mobilityControlInfo indicating the E-UTRAN
frequency of the inter-frequency neighbour cell }
    then { UE performs inter-frequency handover and starts SC-PTM reception }
            }
```

21.3.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.4, 5.8.5.2, 5.8.5.3, 5.8.5.3a and 5.8.5.4. Unless otherwise stated these are Rel-13 requirements.

[TS 36.331, clause 5.3.5.4]

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

1> stop timer T310, if running;

1> stop timer T312, if running;

1> start timer T304 with the timer value set to *t304*, as included in the *mobilityControlInfo*;

1> stop timer T370, if running;

1> if the *carrierFreq* is included:

2> consider the target PCell to be one on the frequency indicated by the *carrierFreq* with a physical cell identity indicated by the *targetPhysCellId*;

…

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission;

1> if MAC successfully completes the random access procedure:

…

2> if *SystemInformationBlockType15* is broadcast by the PCell:

3> if the UE has transmitted a *MBMSInterestIndication* message during the last 1 second preceding reception of the *RRCConnectionReconfiguration* message including *mobilityControlInfo*:

4> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

4> determine the set of MBMS frequencies of interest in accordance with 5.8.5.3;

4> determine the set of MBMS services of interest in accordance with 5.8.5.3a;

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

[TS 36.331, clause 5.8.5.2]

An MBMS or SC-PTM capable UE in RRC_CONNECTED may initiate the procedure in several cases including upon successful connection establishment, upon entering or leaving the service area, upon session start or stop, upon change of interest, upon change of priority between MBMS reception and unicast reception or upon change to a PCell broadcasting *SystemInformationBlockType15*.

Upon initiating the procedure, the UE shall:

1> if *SystemInformationBlockType15* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

2> if the UE did not transmit an *MBMSInterestIndication* message since last entering RRC_CONNECTED state; or

2> if since the last time the UE transmitted an *MBMSInterestIndication* message, the UE connected to a PCell not broadcasting *SystemInformationBlockType15*:

3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

2> else:

3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, has changed since the last transmission of the *MBMSInterestIndication* message; or

3> if the prioritisation of reception of all indicated MBMS frequencies compared to reception of any of the established unicast bearers has changed since the last transmission of the *MBMSInterestIndication* message:

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

NOTE: The UE may send an *MBMSInterestIndication* even when it is able to receive the MBMS services it is interested in i.e. to avoid that the network allocates a configuration inhibiting MBMS reception.

3> else if *SystemInformationBlockType20* is broadcast by the PCell:

4> if since the last time the UE transmitted an *MBMSInterestIndication* message, the UE connected to a PCell not broadcasting *SystemInformationBlockType20*; or

4> if the set of MBMS services of interest determined in accordance with 5.8.5.3a is different from *mbms-Services* included in the last transmission of the *MBMSInterestIndication* message;

5> initiate the transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4.

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB or SC-MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB or SC-MRB for the concerned session. I.e. the UE does not verify if the session is indicated on (SC-)MCCH

NOTE 3: The UE considers the frequencies of interest independently of any synchronization state, e.g. [9, Annex J.1]

2> the UE is capable of simultaneously receiving MRBs and/or is capable of simultaneously receiving SC-MRBs on the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 4: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* or *SystemInformationBlockType20* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 5: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 6: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

[TS 36.331, clause 5.8.5.3a]

The UE shall:

1> consider a MBMS service to be part of the MBMS services of interest if the following conditions are met:

2> the UE is SC-PTM capable; and

2> the UE is receiving or interested to receive this service via an SC-MRB; and

2> one session of this service is ongoing or about to start; and

2> one or more MBMS SAIs in the USD for this service is included in *SystemInformationBlockType15* acquired from the PCell for a frequency belonging to the set of MBMS frequencies of interest, determined according to 5.8.5.3.

[TS 36.331, clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest sorted by decreasing order of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1* (for serving frequency), if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15* (for neighbouring frequencies);

NOTE 1: The EARFCN included in *mbms-FreqList* is merely used to indicate a physical frequency the UE is interested to receive i.e. the UE may not support the band corresponding to the included EARFCN (but it does support at least one of the bands indicated in system information for the concerned physical frequency).

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

2> if *SystemInformationBlockType20* is broadcast by the PCell:

3> include *mbms-Services* and set it to indicate the set of MBMS services of interest determined in accordance with 5.8.5.3a;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

21.3.3.3 Test description

21.3.3.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN. Cell 1 and Cell 3 are inter-frequency cells. Cell 1 is "Serving cell" and Cell 3 is "Non-suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1.
- System information combination 26 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 3.
- *SCPTMConfiguration* as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH on Cell 3.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in Loopback Activated (State 4) according to [18] in Cell 1 (serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service with MBMS Service ID=1 as broadcasted in *SCPTMConfiguration*.

21.3.3.3.2 Test procedure sequence

Table 21.3.3.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while row marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.3.3.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 3 (M3) satisfy exit condition for event A3 (M3 < M1).
T1	Cell-specific RS EPRE	dBm/15kHz	-85	-79	The power level values are such that measurement results for Cell 1 (M1) and Cell 3 (M3) satisfy entry condition for event A3 (M3 > M1).

Table 21.3.3.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 3.	<--	*Paging*	-	-
2	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to System information combination 18 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1, and System information combination 28 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 3. *SystemInformationBlockType15* on Cell 1 is including mbms-SAI-InterFreqList-r11 list for the frequency of Cell 3 indicating MBMS SAI=1. *SystemInformationBlockType15* on Cell 3 is including mbms-SAI-IntraFreq-r11 indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
3	Check: Does the UE transmit *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	1	P
4	The SS waits for 1s	-	-	-	-
5	The SS transmits an *RRCConnectionReconfiguration* message to setup inter frequency measurement on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
6	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of inter frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
7	The SS changes Cell 1 and Cell 3 level according to the row "T1" in table 21.3.3.3.2-1.	-	-	-	-
8	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 3.	-->	*MeasurementReport*	-	-
9	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform inter-frequency handover to Cell 3.	<--	*RRCConnectionReconfiguration*	-	-
10	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 3?	-->	*RRCConnectionReconfigurationComplete*	-	-
11	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message on Cell 3.	-	-	-	-
-	Exception; Step 12 is repeated 5 times. In parallel to the events described in step 12, the steps described in Table 21.3.3.3.2-3 may take place, depending on the UE implementation.	-	-	-	-
12	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
13	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message to set UE to Mode F.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
14	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
15	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 14 greater than zero?	-	-	2	P

Table 21.3.3.3.2-3: Parallel behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-

21.3.3.3.3 Specific message contents

Table 21.3.3.3.3-0: Conditions for specific message contents in Tables 21.3.3.3.3-7 and 21.3.3.3.3-10

Condition	Explanation
Band > 64	If band > 64 is selected

Table 21.3.3.3.3-1: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.3.3.3.3-2: CLOSE UE TEST LOOP (preamble)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F.

Table 21.3.3.3.3-3: *SystemInformationBlockType15* for Cell 1 (step 2 and all later steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_interFreq.			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 3, see table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	
}			
}			

Table 21.3.3.3.3-4: *SystemInformationBlockType15* for Cell 3 (step 2 and all later steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_intraFreq.

Table 21.3.3.3.3-5: *MBMSInterestIndication* (step 3, Table 21.3.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC, condition SC-PTM.			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 3	INTEGER (0..maxEARFCN2)	
}			
}			

Table 21.3.3.3.3-6: *RRCConnectionReconfiguration* (step 5, Table 21.3.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS.

Table 21.3.3.3.3-7: *MeasConfig* (Table 21.3.3.3.3-6)

Derivation Path: 36.508, Table 4.6.6-1, condition INTER-FREQ.			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	2 entries		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)	Cell 1	
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
measObjectId[2]	IdMeasObject-f2		
measObject[2]	MeasObjectEUTRA-GENERIC(f2)	Cell 3	
measObject[2]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f2		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 1		
}			
measObjectEUTRA-v9e0[2] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 3		
}			
}			
}			

Table 21.3.3.3.3-8: *MeasurementReport* (step 8, Table 21.3.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 3		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			
}			

Table 21.3.3.3.3-9: *RRCConnectionReconfiguration* (step 9, Table 21.3.3.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition HO.

Table 21.3.3.3.3-10: *MobilityControlInfo-HO* (Table 21.3.3.3.3-9)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 3		
carrierFreq SEQUENCE {			
dl-CarrierFreq	Same downlink EARFCN as used for Cell 3		
}			
carrierFreq	Not present		Band > 64
carrierFreq-v9e0 SEQUENCE {			Band > 64
dl-CarrierFreq-v9e0	Same downlink EARFCN as used for Cell 3.		
}			
}			

21.3.3a Handover to inter-band cell to start SC-PTM service reception

21.3.3a.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC_Connected state AND on a cell broadcasting SIB15 and interested to receive
a SC-PTM service }
ensure that {
```

```
  when { SIB15 indicates that the SC-PTM service is available on a frequency of a neighbour cell on
a different frequency band }
    then { UE transmits a MBMSInterestIndication message indicating interest in SC-PTM reception on
the frequency }
            }
```

(2)

```
with { UE in E-UTRAN RRC_Connected state AND having transmitted a MBMSInterestIndication message
indicating interest in SC-PTM reception on a frequency of a neighbour cell on a different frequency
band }
ensure that {
  when { 1s after the UE has transmitted the MBMSInterestIndication message the UE receives
RRCConnectionReconfiguration message including a mobilityControlInfo indicating the E-UTRAN
frequency of the inter-band neighbour cell }
    then { UE performs inter-band handover and starts SC-PTM reception }
            }
```

21.3.3a.2 Conformance requirements

Same as test case 21.3.3.

21.3.3a.3 Test description

21.3.3a.3.1 Pre-test conditions

Same as test case 21.3.3 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

21.3.3a.3.2 Test procedure sequence

Same as test case 21.3.3 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

21.3.3a.3.3 Specific message contents

Same as test case 21.3.3.

21.3.4 Handover to intra-frequency cell to continue SC-PTM service reception

21.3.4.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state with ongoing SC-PTM reception }
ensure that {
  when { UE receives RRCConnectionReconfiguration message including a mobilityControlInfo for intra
frequency neighbour cell providing SC-PTM service }
    then { UE performs intra_frequency handover and continues to receive SC-PTM service }
            }
```

21.3.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.4, 5.8.5.2, 5.8.5.3, 5.8.5.3a and 5.8.5.4. Unless otherwise stated these are Rel-13 requirements.

[TS 36.331, clause 5.3.5.4]

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

1> stop timer T310, if running;

1> stop timer T312, if running;

1> start timer T304 with the timer value set to *t304*, as included in the *mobilityControlInfo*;

1> stop timer T370, if running;

1> if the *carrierFreq* is included:

2> consider the target PCell to be one on the frequency indicated by the *carrierFreq* with a physical cell identity indicated by the *targetPhysCellId*;

…

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission;

1> if MAC successfully completes the random access procedure:

…

2> if *SystemInformationBlockType15* is broadcast by the PCell:

3> if the UE has transmitted a *MBMSInterestIndication* message during the last 1 second preceding reception of the *RRCConnectionReconfiguration* message including *mobilityControlInfo*:

4> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

4> determine the set of MBMS frequencies of interest in accordance with 5.8.5.3;

4> determine the set of MBMS services of interest in accordance with 5.8.5.3a;

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

[TS 36.331, clause 5.8.5.2]

An MBMS or SC-PTM capable UE in RRC_CONNECTED may initiate the procedure in several cases including upon successful connection establishment, upon entering or leaving the service area, upon session start or stop, upon change of interest, upon change of priority between MBMS reception and unicast reception or upon change to a PCell broadcasting *SystemInformationBlockType15*.

Upon initiating the procedure, the UE shall:

1> if *SystemInformationBlockType15* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

2> if the UE did not transmit an *MBMSInterestIndication* message since last entering RRC_CONNECTED state; or

2> if since the last time the UE transmitted an *MBMSInterestIndication* message, the UE connected to a PCell not broadcasting *SystemInformationBlockType15*:

3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

2> else:

3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, has changed since the last transmission of the *MBMSInterestIndication* message; or

3> if the prioritisation of reception of all indicated MBMS frequencies compared to reception of any of the established unicast bearers has changed since the last transmission of the *MBMSInterestIndication* message:

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

NOTE: The UE may send an *MBMSInterestIndication* even when it is able to receive the MBMS services it is interested in i.e. to avoid that the network allocates a configuration inhibiting MBMS reception.

3> else if *SystemInformationBlockType20* is broadcast by the PCell:

4> if since the last time the UE transmitted an *MBMSInterestIndication* message, the UE connected to a PCell not broadcasting *SystemInformationBlockType20*; or

4> if the set of MBMS services of interest determined in accordance with 5.8.5.3a is different from *mbms-Services* included in the last transmission of the *MBMSInterestIndication* message;

5> initiate the transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4.

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB or SC-MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB or SC-MRB for the concerned session. I.e. the UE does not verify if the session is indicated on (SC-)MCCH

NOTE 3: The UE considers the frequencies of interest independently of any synchronization state, e.g. [9, Annex J.1]

2> the UE is capable of simultaneously receiving MRBs and/or is capable of simultaneously receiving SC-MRBs on the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 4: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* or *SystemInformationBlockType20* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 5: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 6: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

[TS 36.331, clause 5.8.5.3a]

The UE shall:

1> consider a MBMS service to be part of the MBMS services of interest if the following conditions are met:

2> the UE is SC-PTM capable; and

2> the UE is receiving or interested to receive this service via an SC-MRB; and

2> one session of this service is ongoing or about to start; and

2> one or more MBMS SAIs in the USD for this service is included in *SystemInformationBlockType15* acquired from the PCell for a frequency belonging to the set of MBMS frequencies of interest, determined according to 5.8.5.3.

[TS 36.331, clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest sorted by decreasing order of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1* (for serving frequency), if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15* (for neighbouring frequencies);

NOTE 1: The EARFCN included in *mbms-FreqList* is merely used to indicate a physical frequency the UE is interested to receive i.e. the UE may not support the band corresponding to the included EARFCN (but it does support at least one of the bands indicated in system information for the concerned physical frequency).

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

2> if *SystemInformationBlockType20* is broadcast by the PCell:

3> include *mbms-Services* and set it to indicate the set of MBMS services of interest determined in accordance with 5.8.5.3a;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

21.3.4.3 Test description

21.3.4.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN. Cell 1 and Cell 2 are intra-frequency cells. Cell 1 is "Serving cell" and Cell 2 is "Non-suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1 and Cell 2.
- *SCPTMConfiguration* as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH on Cell 1 and Cell 2.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in Loopback Activated (State 4) according to [18] in Cell 1 (serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service with MBMS Service ID=1 as broadcasted in *SCPTMConfiguration*.

21.3.4.3.2 Test procedure sequence

Table 21.3.4.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while row

marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.3.4.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy exit condition for event A3 (M2 < M1).
T1	Cell-specific RS EPRE	dBm/15kHz	-85	-79	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M2 > M1).

Table 21.3.4.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 2.	<--	*Paging*	-	-
2	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to System information combination 27 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 and Cell 2. *SystemInformationBlockType15* on Cell 1 and Cell 2 is including mbms-SAI-IntraFreq list for the frequency of Cell 1 and Cell 2 indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
3	The UE transmits *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
-	Exception; Step 4 is repeated 5 times.	-	-	-	-
4	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
5	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
6	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
7	Check: Is the number of reported MBMS Packets received on the MTCH in step 6 greater than zero? (Note: This verifies that UE is receiving active SC-PTM reception on Cell 1 before Intra-frequency handover to Cell 2.)	-	-	-	-
8	The SS transmits an *RRCConnectionReconfiguration* message to setup intra frequency measurement on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
9	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of intra frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
10	The SS changes Cell 1 and Cell 2 level according to the row "T1" in table 21.3.4.3.2-1.	-	-	-	-
11	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 2.	-->	*MeasurementReport*	-	-
12	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform intra-frequency handover to Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
13	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2.	-->	*RRCConnectionReconfigurationComplete*	-	-
14	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message on Cell 2.	-	-	-	-
-	Exception; Step 15 is repeated 5 times. .	-	-	-	-
15	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
16	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
17	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
18	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 17 greater than the number of reported in step 6?	-	-	1	P

	Note: This verifies that UE has performed intra-frequency handover to Cell 2 providing the SC-PTM service and continue SC-PTM reception.				

21.3.4.3.3 Specific message contents

Table 21.3.4.3.3-1: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.3.4.3.3-2: CLOSE UE TEST LOOP (preamble)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F.

Table 21.3.4.3.3-3: *SystemInformationBlockType15* for Cell 1 (step 2 and all later steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_intraFreq.

Table 21.3.4.3.3-4: *MBMSInterestIndication* (step 3, Table 21.3.4.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC, condition SC-PTM.			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 1	INTEGER (0..maxEARFCN2)	
}			
}			

Table 21.3.4.3.3-5: *RRCConnectionReconfiguration* (step 8, Table 21.3.4.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS.

Table 21.3.4.3.3-6: *MeasConfig* (Table 21.3.4.3.3-5)

Derivation Path: 36.508, Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f1		
}			
}			
}			

Condition	Explanation
Band > 64	This condition applies if the band number is bigger than 64.

Table 21.3.4.3.3-7: *MeasurementReport* (step 11, Table 21.3.4.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 2		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			
}			

Table 21.3.4.3.3-8: *RRCConnectionReconfiguration* (step 12, Table 21.3.4.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition HO.

Table 21.3.4.3.3-9: *MobilityControlInfo-HO* (Table 21.3.4.3.3-8)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 2		
carrierFreq	Not present		
}			

21.3.5 Conditional retransmission of MBMS Interest Indication after handover

21.3.5.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC_Connected state AND SystemInformationBlockType15 and
SystemInformationBlockType20 have been acquired by the UE AND the UE has transmitted a
MBMSInterestIndication message on the Pcell }
ensure that {
  when { UE receives a RRCConnectionReconfiguration message including mobilityControlInfo less than
1 second after the last transmission of an MBMSInterestIndication message AND UE has completed the
intra frequency handover procedure }
    then { UE should re-transmit a MBMSInterestIndication message }
           }
```

21.3.5.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.4, 5.8.5.3 and 5.8.5.4. Unless otherwise stated these are Rel-13 requirements.

[TS 36.331, clause 5.3.5.4]

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

1> stop timer T310, if running;

1> stop timer T312, if running;

1> start timer T304 with the timer value set to *t304*, as included in the *mobilityControlInfo*;

1> stop timer T370, if running;

1> if the *carrierFreq* is included:

2> consider the target PCell to be one on the frequency indicated by the *carrierFreq* with a physical cell identity indicated by the *targetPhysCellId*;

…

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission;

1> if MAC successfully completes the random access procedure:

…

2> if *SystemInformationBlockType15* is broadcast by the PCell:

3> if the UE has transmitted a *MBMSInterestIndication* message during the last 1 second preceding reception of the *RRCConnectionReconfiguration* message including *mobilityControlInfo*:

4> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

4> determine the set of MBMS frequencies of interest in accordance with 5.8.5.3;

4> determine the set of MBMS services of interest in accordance with 5.8.5.3a;

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB or SC-MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB or SC-MRB for the concerned session. I.e. the UE does not verify if the session is indicated on (SC-)MCCH

NOTE 3: The UE considers the frequencies of interest independently of any synchronization state, e.g. [9, Annex J.1]

2> the UE is capable of simultaneously receiving MRBs and/or is capable of simultaneously receiving SC-MRBs on the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 4: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* or *SystemInformationBlockType20* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 5: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 6: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

[TS 36.331, clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest sorted by decreasing order of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1* (for serving frequency), if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15* (for neighbouring frequencies);

NOTE 1: The EARFCN included in *mbms-FreqList* is merely used to indicate a physical frequency the UE is interested to receive i.e. the UE may not support the band corresponding to the included EARFCN (but it does support at least one of the bands indicated in system information for the concerned physical frequency).

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

2> if *SystemInformationBlockType20* is broadcast by the PCell:

3> include *mbms-Services* and set it to indicate the set of MBMS services of interest determined in accordance with 5.8.5.3a;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

21.3.5.3 Test description

21.3.5.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN. Cell 1 and Cell 2 are intra-frequency cells. Cell 1 is "Serving cell" and Cell 2 is "Non-suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.

- System information combination 27 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1 and Cell 2.

- *SCPTMConfiguration* as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH on Cell 1 and Cell 2.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in state Registered, Idle Mode (state 2) on Cell 1 according to [18].

21.3.5.3.2 Test procedure sequence

Table 21.3.5.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while row marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.3.5.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy exit condition for event A3 (M2 < M1).
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-79	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M2 > M1).

Table 21.3.5.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	Void	-	-	-	-
2	The generic procedures described in TS 36.508 sub clause 4.5.3.3 are performed on Cell 1.	-	-	-	-
3	The SS transmits an *RRCConnectionReconfiguration* message to setup intra frequency measurement on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
4	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of intra frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
5	The SS changes Cell 1 and Cell 2 level according to the row "T1" in table 21.3.5.3.2-1.	-	-	-	-
6	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 2.	-->	*MeasurementReport*	-	-
7	The UE is made interested in receiving SC-PTM service with MBMS Service ID=0 associated with the MBMS SAI (1) broadcasted in SIB15 mbms-SAI-IntraFreq list on Cell 1 and Cell 2.	-	-	-	-
8	The UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
9	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform intra-frequency handover to Cell 2 within 500 ms after reception of the *MBMSInterestIndication* message in step 8.	<--	*RRCConnectionReconfiguration*	-	-
10	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2.	-->	*RRCConnectionReconfigurationtComplete*	-	-
11	Check: Does the UE transmit *MBMSInterestIndication* message?	-->	*MBMSInterestIndication*	1	P

21.3.5.3.3 Specific message contents

Table 21.3.5.3.3-1: *SystemInformationBlockType15* for Cell 1 (step 2 and all later steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_intraFreq.

Table 21.3.5.3.3-2: *RRCConnectionReconfiguration* (step 3, Table 21.3.5.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS.

Table 21.3.5.3.3-3: *MeasConfig* (Table 21.3.5.3.3-2)

Derivation Path: 36.508, Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f1		
}			
}			
}			

Condition	Explanation
Band > 64	This condition applies if the band number is bigger than 64.

Table 21.3.5.3.3-4: *MeasurementReport* (step 6, Table 21.3.5.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 2		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			
}			

Table 21.3.5.3.3-5: *MBMSInterestIndication* (step 8 and step 11, Table 21.3.5.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC, condition SC-PTM.			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 1	INTEGER (0..maxEARFCN2)	
}			
}			

Table 21.3.5.3.3-6: *RRCConnectionReconfiguration* (step 9, Table 21.3.5.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition HO.

Table 21.3.5.3.3-7: *MobilityControlInfo-HO* (Table 21.3.5.3.3-6)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 2		
carrierFreq	Not present		
}			

21.3.6 MBMS Interest Indication retransmission after returning from cell not broadcasting SIB15

21.3.6.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state AND is receiving SC-PTM service and having transmitted a
MBMSInterestIndication message }
ensure that {
  when { UE performs handover to a PCell not broadcasting SystemInformationBlockType15 followed by a
handover to a PCell broadcasting SystemInformationBlockType15 }
    then { UE transmits a MBMSInterestIndication message }
          }
```

21.3.6.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331 clauses 5.8.5.2, 5.8.5.3, 5.8.5.3a and 5.8.5.4.

[TS 36.331 clause 5.8.5.2]

An MBMS or SC-PTM capable UE in RRC_CONNECTED may initiate the procedure in several cases including upon successful connection establishment, upon entering or leaving the service area, upon session start or stop, upon change of interest, upon change of priority between MBMS reception and unicast reception or upon change to a PCell broadcasting *SystemInformationBlockType15*.

Upon initiating the procedure, the UE shall:

1> if *SystemInformationBlockType15* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

2> if the UE did not transmit an *MBMSInterestIndication* message since last entering RRC_CONNECTED state; or

2> if since the last time the UE transmitted an *MBMSInterestIndication* message, the UE connected to a PCell not broadcasting *SystemInformationBlockType15*:

3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

[TS 36.331 clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB or SC-MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB or SC-MRB for the concerned session. I.e. the UE does not verify if the session is indicated on (SC-)MCCH

NOTE 3: The UE considers the frequencies of interest independently of any synchronization state, e.g. [9, Annex J.1]

2> the UE is capable of simultaneously receiving MRBs and/or is capable of simultaneously receiving SC-MRBs on the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 4: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* or *SystemInformationBlockType20* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 5: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 6: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

[TS 36.331 clause 5.8.5.3a]

The UE shall:

1> consider a MBMS service to be part of the MBMS services of interest if the following conditions are met:

2> the UE is SC-PTM capable; and

2> the UE is receiving or interested to receive this service via an SC-MRB; and

2> one session of this service is ongoing or about to start; and

2> one or more MBMS SAIs in the USD for this service is included in *SystemInformationBlockType15* acquired from the PCell for a frequency belonging to the set of MBMS frequencies of interest, determined according to 5.8.5.3.

[TS 36.331 clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest sorted by decreasing order of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1* (for serving frequency), if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15* (for neighbouring frequencies);

NOTE 1: The EARFCN included in *mbms-FreqList* is merely used to indicate a physical frequency the UE is interested to receive i.e. the UE may not support the band corresponding to the included EARFCN (but it does support at least one of the bands indicated in system information for the concerned physical frequency).

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

2> if *SystemInformationBlockType20* is broadcast by the PCell:

3> include *mbms-Services* and set it to indicate the set of MBMS services of interest determined in accordance with 5.8.5.3a;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

21.3.6.3 Test description

21.3.6.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN (PLMN1), Cell 1 and Cell 2 are intra-frequency cells. Cell 1 is a SC-PTM cell and Cell 2 is a non-SC-PTM cell.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1.
- System information combination 1 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 2.
- *SCPTMConfiguration* as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH in Cell 1.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in state Generic RB Established, Test Mode Activated (state 3A) according to [18] in Cell 1 (serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 1 with MBMS Service ID=1.
- The UE is made aware that the SC-PTM service is active.

21.3.6.3.2 Test procedure sequence

Table 21.3.6.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T0", "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.3.6.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy exit condition for event A3 (M1 > M2).
T1	Cell-specific RS EPRE	dBm/15k Hz	-91	-85	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M2 > M1).
T2	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 2 (M2) satisfy entry condition for event A3 (M1 > M2).

Table 21.3.6.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for Cell 1.	<--	*Paging*	-	-
2	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to System information combination 27 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 including mbms-SAI-IntraFreq-r11 indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
3	The UE transmit *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
4	The SS transmits an *RRCConnectionReconfiguration* message to setup intra-frequency measurement.	<--	*RRCConnectionReconfiguration*	-	-
5	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of intra-frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
6	The SS changes Cell 1 and Cell 2 level according to the row "T1" in table 21.3.6.3.2-1.	-	-	-	-
7	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 2.	-->	*MeasurementReport*	-	-
8	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform intra-frequency handover to Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
9	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2	-->	*RRCConnectionReconfigurationComplete*	-	-
10	The SS transmits an *RRCConnectionReconfiguration* message to setup intra frequency measurement on Cell 2.	<--	*RRCConnectionReconfiguration*	-	-
11	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 2 to confirm the setup of intra frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
12	Wait 5 seconds for the UE to be able to monitor absence of *SystemInformationBlockType15* on Cell 2.	-	-	-	-
13	The SS changes Cell 1 and Cell 2 levels according to the row "T2" in table 21.3.6.3.2-1.	-	-	-	-
14	The UE transmits a *MeasurementReport* message to report event A3 on Cell 2 with the measured RSRP, RSRQ value for Cell 1.	-->	*MeasurementReport*	-	-
15	The SS transmits an *RRCConnectionReconfiguration* message on Cell 2 to order the UE to perform intra-frequency handover to Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
16	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1.	-->	*RRCConnectionReconfigurationComplete*	-	-
17	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message on Cell 1.	-	-	-	-
18	Check: Does the UE transmit *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	1	P

21.3.6.3.3 Specific message contents

Table 21.3.6.3.3-1: *SystemInformationBlockType15* for Cell 1 (Step 2 and all the subsequent steps, Table 21.3.6.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_intraFreq.

Table 21.3.6.3.3-2: *RRCConnectionReconfiguration* (step 4 and 10, Table 21.3.6.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS

Table 21.3.6.3.3-3: *MeasConfig* (Table 21.3.6.3.3-2)

Derivation Path: 36.508, Table 4.6.6-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f1		
}			
}			
}			

Condition	Explanation
Band > 64	This condition applies if the band number is bigger than 64.

Table 21.3.6.3.3-4: *MeasurementReport* (step 7, Table 21.3.6.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 2		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			

Table 21.3.6.3.3-5: *MeasurementReport* (step 14, Table 21.3.6.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 1		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			

Table 21.3.6.3.3-6: *MBMSInterestIndication* (step 3 and 18, Table 21.3.6.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
interestIndication-r11 OF SEQUENCE {			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	EARFCN of Cell 1		
nonCriticalExtension SEQUENCE {			SC-PTM
mbms-Services-r13 SEQUENCE (SIZE (0..maxMBMS-ServiceListPerUE-r13)) OF SEQUENCE {			
tmgi-r13 SEQUENCE {			
plmn-Id-r9 CHOICE {			
plmn-Index-r9	1		
}			
serviceId-r9	'000001'H	OCTET STRING (SIZE (3))	
}			
}			
}			
}			
}			

21.3.7 MBMS Interest Indication retransmission after returning from cell not broadcasting SIB20

21.3.7.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRA RRC_Connected state with ongoing SC-PTM service AND having transmitted a
MBMSInterestIndication message }
ensure that {
  when { UE performs handover to a Pcell not broadcasting SystemInformationBlockType20 followed by a
handover to a Pcell broadcasting SystemInformationBlockType20 }
    then { UE transmits a MBMSInterestIndication message }
            }
```

21.3.7.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.8.5.2, 5.8.5.3, 5.8.5.3a and 5.8.5.4. Unless otherwise stated these are Rel-13 requirements.

[TS 36.331, clause 5.8.5.2]

An MBMS or SC-PTM capable UE in RRC_CONNECTED may initiate the procedure in several cases including upon successful connection establishment, upon entering or leaving the service area, upon session start or stop, upon change of interest, upon change of priority between MBMS reception and unicast reception or upon change to a PCell broadcasting *SystemInformationBlockType15*.

Upon initiating the procedure, the UE shall:

1> if *SystemInformationBlockType15* is broadcast by the PCell:

2> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

2> if the UE did not transmit an *MBMSInterestIndication* message since last entering RRC_CONNECTED state; or

2> if since the last time the UE transmitted an *MBMSInterestIndication* message, the UE connected to a PCell not broadcasting *SystemInformationBlockType15*:

3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

2> else:

3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, has changed since the last transmission of the *MBMSInterestIndication* message; or

3> if the prioritisation of reception of all indicated MBMS frequencies compared to reception of any of the established unicast bearers has changed since the last transmission of the *MBMSInterestIndication* message:

4> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

NOTE: The UE may send an *MBMSInterestIndication* even when it is able to receive the MBMS services it is interested in i.e. to avoid that the network allocates a configuration inhibiting MBMS reception.

3> else if *SystemInformationBlockType20* is broadcast by the PCell:

4> if since the last time the UE transmitted an *MBMSInterestIndication* message, the UE connected to a PCell not broadcasting *SystemInformationBlockType20*; or

4> if the set of MBMS services of interest determined in accordance with 5.8.5.3a is different from *mbms-Services* included in the last transmission of the *MBMSInterestIndication* message;

5> initiate the transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4.

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB or SC-MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB or SC-MRB for the concerned session. I.e. the UE does not verify if the session is indicated on (SC-)MCCH

NOTE 3: The UE considers the frequencies of interest independently of any synchronization state, e.g. [9, Annex J.1]

2> the UE is capable of simultaneously receiving MRBs and/or is capable of simultaneously receiving SC-MRBs on the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 4: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* or *SystemInformationBlockType20* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 5: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 6: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

[TS 36.331, clause 5.8.5.3a]

The UE shall:

1> consider a MBMS service to be part of the MBMS services of interest if the following conditions are met:

2> the UE is SC-PTM capable; and

2> the UE is receiving or interested to receive this service via an SC-MRB; and

2> one session of this service is ongoing or about to start; and

2> one or more MBMS SAIs in the USD for this service is included in *SystemInformationBlockType15* acquired from the PCell for a frequency belonging to the set of MBMS frequencies of interest, determined according to 5.8.5.3.

[TS 36.331, clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest sorted by decreasing order of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1* (for serving frequency), if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15* (for neighbouring frequencies);

NOTE 1: The EARFCN included in *mbms-FreqList* is merely used to indicate a physical frequency the UE is interested to receive i.e. the UE may not support the band corresponding to the included EARFCN (but it does support at least one of the bands indicated in system information for the concerned physical frequency).

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

2> if *SystemInformationBlockType20* is broadcast by the PCell:

3> include *mbms-Services* and set it to indicate the set of MBMS services of interest determined in accordance with 5.8.5.3a;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

21.3.7.3 Test description

21.3.7.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN. Cell 1 and Cell 3 are inter-frequency cells. Cell 1 is "Serving cell" and Cell 3 is "Non-suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.

- System information combination 26 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1.

- System information combination 18 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 3.

- *SCPTMConfiguration* as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH on Cell 1.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in state Generic RB Established (state 3) on Cell 1 according to [18].
- The UE is made interested in receiving a SC-PTM service with MBMS Service ID=1 as broadcasted in *SCPTMConfiguration*.

21.3.7.3.2 Test procedure sequence

Table 21.3.7.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while row marked "T1" and "T2" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.3.7.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 3 (M3) satisfy exit condition for event A3 (M1 > M3).
T1	Cell-specific RS EPRE	dBm/15k Hz	-91	-85	The power level values are such that measurement results for Cell 1 (M1) and Cell 3 (M3) satisfy entry condition for event A3 (M3 > M1).
T2	Cell-specific RS EPRE	dBm/15k Hz	-85	-91	The power level values are such that measurement results for Cell 1 (M1) and Cell 3 (M3) satisfy entry condition for event A3 (M1 > M3).

Table 21.3.7.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for Cell 1.	<--	*Paging*	-	-
2	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to System information combination 28 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 including mbms-SAI-InterFreqList-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
3	Check: Does the UE transmit *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
4	The SS transmits an *RRCConnectionReconfiguration* message to setup inter-frequency measurement on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
5	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1 to confirm the setup of inter-frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
6	The SS changes Cell 1 and Cell 3 level according to the row "T1" in table 21.3.7.3.2-1.	-	-	-	-
7	The UE transmits a *MeasurementReport* message to report event A3 on Cell 1 with the measured RSRP, RSRQ value for Cell 3.	-->	*MeasurementReport*	-	-
8	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to order the UE to perform inter-frequency handover to Cell 3.	<--	*RRCConnectionReconfiguration*	-	-
9	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 3.	-->	*RRCConnectionReconfigurationComplete*	-	-
10	Wait for a period equal to the SC-MCCH repetition period for the UE to be able to monitor *SCPTMConfiguration* message.	-	-	-	-
11	The SS transmits an *RRCConnectionReconfiguration* message to setup inter-frequency measurement on Cell 3.	<--	*RRCConnectionReconfiguration*	-	-
12	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 3 to confirm the setup of inter-frequency measurement.	-->	*RRCConnectionReconfigurationComplete*	-	-
13	The SS changes Cell 1 and Cell 3 levels according to the row "T2" in table 21.3.7.3.2-1.	-	-	-	-
14	The UE transmits a *MeasurementReport* message to report event A3 on Cell 3 with the measured RSRP, RSRQ value for Cell 1.	-->	*MeasurementReport*	-	-
15	The SS transmits an *RRCConnectionReconfiguration* message on Cell 3 to order the UE to perform inter-frequency handover to Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
16	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1.	-->	*RRCConnectionReconfigurationtComplete*	-	-
17	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message.	-	-	-	-
18	Check: Does the UE transmit *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	1	P

21.3.7.3.3 Specific message contents

Table 21.3.7.3.3-0: Conditions for specific message contents in Tables 21.3.7.3.3-4, 21.3.7.3.3-8 and 21.3.7.3.3-9

Condition	Explanation
Band > 64	This condition applies if the band number is bigger than 64.

Table 21.3.7.3.3-1: *SystemInformationBlockType15* for Cell 1 (step 2 and all later steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_interFreq.			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 3, see table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	
}			
}			

Table 21.3.7.3.3-2: *SystemInformationBlockType15* for Cell 3 (preamble and all steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_interFreq.			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 1, see table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	
}			
}			

Table 21.3.7.3.3-3: *RRCConnectionReconfiguration* (step 4 and step 11, Table 21.3.7.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition MEAS.

Table 21.3.7.3.3-4: *MeasConfig* (Table 21.3.7.3.3-3)

Derivation Path: 36.508, Table 4.6.6-1, condition INTER-FREQ.			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasConfig SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	2 entries		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)	Cell 1	
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
measObjectId[2]	IdMeasObject-f2		
measObject[2]	MeasObjectEUTRA-GENERIC(f2)	Cell 3	
measObject[2]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f2		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 1		
}			
measObjectEUTRA-v9e0[2] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 3		
}			
}			
}			

Table 21.3.7.3.3-5: *MeasurementReport* (step 7, Table 21.3.7.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 3		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			
}			

Table 21.3.7.3.3-6: *MeasurementReport* (step 14, Table 21.3.7.3.2-2)

Derivation Path: 36.508, Table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
measurementReport-r8 SEQUENCE {			
measResults SEQUENCE {			
measId	1		
measResultPCell SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {	1 entry		
physCellId[1]	PhysicalCellIdentity of Cell 1		
cgi-Info[1]	Not present		
measResult[1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
}			
}			
}			
}			
}			

Table 21.3.7.3.3-7: *RRCConnectionReconfiguration* (step 8 and step 15, Table 21.3.7.3.2-2)

Derivation Path: 36.508, Table 4.6.1-8, condition HO.

Table 21.3.7.3.3-8: *MobilityControlInfo-HO* (Table 21.3.7.3.3-7 for step 8)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 3		
carrierFreq SEQUENCE {			
dl-CarrierFreq	Same downlink EARFCN as used for Cell 3		
}			
carrierFreq	Not present		Band > 64
carrierFreq-v9e0 SEQUENCE {			Band > 64
dl-CarrierFreq-v9e0	Same downlink EARFCN as used for Cell 3		
}			
}			

Table 21.3.7.3.3-9: *MobilityControlInfo-HO* (Table 21.3.7.3.3-7 for step 15)

Derivation Path: 36.508, Table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 1		
carrierFreq SEQUENCE {			
dl-CarrierFreq	Same downlink EARFCN as used for Cell 1		
}			
carrierFreq	Not present		Band > 64
carrierFreq-v9e0 SEQUENCE {			Band > 64
dl-CarrierFreq-v9e0	Same downlink EARFCN as used for Cell 1		
}			
}			

Table 21.3.7.3.3-10: *MBMSInterestIndication* (step 3 and step 18, Table 21.3.7.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC, condition SC-PTM.			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 1	INTEGER (0..maxEARFCN2)	
}			
}			

21.3.8 MBMS Interest Indication after Radio Link Failure

21.3.8.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC_Connected stated AND SystemInformationBlockType15 and
SystemInformationBlockType20 have been acquired by the UE }
ensure that {
  when { the UE detects a radio link failure less than 1 second after the last transmission of an
MBMSInterestIndication message }
```

```
then { the UE should re-transmits a MBMSInterestIndication message }
        }
```

21.3.8.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.7.5, 5.8.5.3, 5.8.5.3a and 5.8.5.4. Unless otherwise stated these are Rel-13 requirements.

[TS 36.331, clause 5.3.7.5]

The UE shall:

…

1> if *SystemInformationBlockType15* is broadcast by the PCell:

2> if the UE has transmitted an *MBMSInterestIndication* message during the last 1 second preceding detection of radio link failure:

3> ensure having a valid version of *SystemInformationBlockType15* for the PCell;

3> determine the set of MBMS frequencies of interest in accordance with 5.8.5.3;

3> determine the set of MBMS services of interest in accordance with 5.8.5.3a;

3> initiate transmission of the *MBMSInterestIndication* message in accordance with 5.8.5.4;

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB or SC-MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB or SC-MRB for the concerned session. I.e. the UE does not verify if the session is indicated on (SC-)MCCH

NOTE 3: The UE considers the frequencies of interest independently of any synchronization state, e.g. [9, Annex J.1]

2> the UE is capable of simultaneously receiving MRBs and/or is capable of simultaneously receiving SC-MRBs on the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 4: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* or *SystemInformationBlockType20* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 5: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 6: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

[TS 36.331, clause 5.8.5.3a]

The UE shall:

1> consider a MBMS service to be part of the MBMS services of interest if the following conditions are met:

2> the UE is SC-PTM capable; and

2> the UE is receiving or interested to receive this service via an SC-MRB; and

2> one session of this service is ongoing or about to start; and

2> one or more MBMS SAIs in the USD for this service is included in *SystemInformationBlockType15* acquired from the PCell for a frequency belonging to the set of MBMS frequencies of interest, determined according to 5.8.5.3.

[TS 36.331, clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest sorted by decreasing order of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1* (for serving frequency), if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15* (for neighbouring frequencies);

NOTE 1: The EARFCN included in *mbms-FreqList* is merely used to indicate a physical frequency the UE is interested to receive i.e. the UE may not support the band corresponding to the included EARFCN (but it does support at least one of the bands indicated in system information for the concerned physical frequency).

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

2> if *SystemInformationBlockType20* is broadcast by the PCell:

3> include *mbms-Services* and set it to indicate the set of MBMS services of interest determined in accordance with 5.8.5.3a;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

21.3.8.3 Test description

21.3.8.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells with the same PLMN. Cell 1 and Cell 2 are intra-frequency cells. Cell 1 is "Serving cell" and Cell 2 is "Non-suitable cell" as defined in TS 36.508 Table 6.2.2.1-1.

- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA Cell 1 and Cell 2.

- SCPTMConfiguration as defined in TS 36.508[18] table 4.6.1-18a is transmitted on SC-MCCH on Cell 1 and Cell 2.

UE:

- E-UTRAN UE supporting SC-PTM services.

Preamble:

- UE is in state Generic RB Established (state 3) on Cell 1 according to [18].
- The UE is made interested in receiving a SC-PTM service with MBMS Service ID=1 as broadcasted in *SCPTMConfiguration*.

21.3.8.3.2 Test procedure sequence

Table 21.3.8.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while row marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.3.8.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 2
T0	Cell-specific RS EPRE	dBm/15kHz	-85	-115
T1	Cell-specific RS EPRE	dBm/15kHz	“Off”	-85

Table 21.3.8.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for Cell1 and Cell 2.	<--	*Paging*	-	-
2	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to System information combination 27 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 and Cell 2 including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
3	Check: Does the UE transmit *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
4	The SS changes Cell 1 and Cell 2 level according to the row "T1" in table 21.3.8.3.2-1 within 500 ms after reception of the *MBMSInterestIndication* message in step 3.	-	-	-	-
-	The following messages are to be observed on Cell 2 unless explicitly stated otherwise.	-	-	-	-
5	The UE transmits *RRCConnectionReestablishmentRequest* message.	-->	*RRCConnectionReestablishment Request*	-	-
6	The SS transmits *RRCConnectionReestablishment* message.	<--	*RRCConnectionReestablishment*	-	-
7	The UE transmits *RRCConnectionReestablishmentComplete* message.	-->	*RRCConnectionReestablishment Complete*	-	-
8	The SS transmits an *RRCConnectionReconfiguration* message to resume existing radio bearer.	<--	*RRCConnectionReconfiguration*	-	-
9	The UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationtComplete*	-	-
10	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message.	-	-	-	-
11	Check: Does the UE transmit *MBMSInterestIndication* message?	-->	*MBMSInterestIndication*	1	P

21.3.8.3.3 Specific message contents

Table 21.3.8.3.3-1: *SystemInformationBlockType15* for Cell 1 and Cell 2 (step 2 and all later steps)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_intraFreq.

Table 21.3.8.3.3-2: *MBMSInterestIndication* (step 3 and step 11, Table 21.3.8.3.2-2)

Derivation Path: 36.508 Table 4.6.1-4AC			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
interestIndication-r11 OF SEQUENCE {			
mbms-FreqList-r11[1] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	EARFCN of Cell 1	1 entry	
}			
}			
}			

Table 21.3.8.3.3-3: RRCConnectionReconfiguration (step 8, Table 21.3.8.3.2-2)

Derivation Path: 36.508 table 4.6.1-8, condition SRB2-DRB(1, 0)			
Information Element	**Value/Remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
radioResourceConfigDedicated SEQUENCE {			
mac-MainConfig CHOICE {			
explicitValue SEQUENCE {			
drx-Config	Not present		NOT pc_FeatrGrp_5
drx-Config CHOICE {			pc_FeatrGrp_5
setup SEQUENCE {			
onDurationTimer	psf2		
drx-InactivityTimer	psf100		
drx-RetransmissionTimer	psf16		
longDRX-CycleStartOffset CHOICE {			
sf40	4		
}			
shortDRX	Not present		
}			
}			
}			
}			
}			
}			
}			
}			

21.3.9 Continued SC-PTM service reception after E-UTRAN release of unicast bearer

21.3.9.1 Test Purpose (TP)

```
(1)

with { UE in RRC Connected state on a SC-PTM cell and is prioritising MBMS service over unicast data
}
ensure that {
  when { UE receives the SystemInformationBlockType15 message broadcasted on the SC-PTM cell }
    then { UE transmits an MBMSInterestIndication message including the mbms-Priority IE indicating
that UE prioritises reception of MBMS frequencies above reception of any of the unicast bearers }
            }

(2)

with { UE in E-UTRA RRC_Connected state with a unicast bearer configured AND is receiving SC-PTM
service }
ensure that {
  when { UE receives a RRCConnectionReconfiguration message to release the unicast bearer }
    then { UE accepts the release of the unicast bearer and continues to receive MBMS service }
            }
```

21.3.9.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331 clause 5.8.5.4. Unless otherwise stated these are Rel-13 requirements.

[TS 36.331 clause 5.8.5.4]

The UE shall set the contents of the *MBMSInterestIndication* message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:

2> include *mbms-FreqList* and set it to include the MBMS frequencies of interest sorted by decreasing order of interest, using the EARFCN corresponding with *freqBandIndicator* included in *SystemInformationBlockType1* (for serving frequency), if applicable, and the EARFCN(s) as included in *SystemInformationBlockType15* (for neighbouring frequencies);

NOTE 1: The EARFCN included in *mbms-FreqList* is merely used to indicate a physical frequency the UE is interested to receive i.e. the UE may not support the band corresponding to the included EARFCN (but it does support at least one of the bands indicated in system information for the concerned physical frequency).

2> include *mbms-Priority* if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;

2> if *SystemInformationBlockType20* is broadcast by the PCell:

3> include *mbms-Services* and set it to indicate the set of MBMS services of interest determined in accordance with 5.8.5.3a;

NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the *MBMSInterestIndication* message to lower layers for transmission.

21.3.9.3 Test description

21.3.9.3.1 Pre-test conditions

System Simulator:

- 1 E-UTRA Cell 1 is “Serving cell” as defined in TS 36.508 Table 6.2.2.1-1.
- System information combination 25 as defined in TS 36.508 [18] clause 4.4.3.1 is used in E-UTRA Cell 1.
- *SCPTMConfiguration* message as defined in TS 36.508 [18] Table 4.6.1-18a is transmitted on Cell 1.

UE:

- The UE is supporting SC-PTM services.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE F on Cell 1 according to [18].
- The UE has one dedicated EPS bearer (DRB2) established.
- The UE is made interested in receiving SC-PTM service with MBMS Service ID=1 as broadcasted in *SCPTMConfiguration*.
- The UE is configured to prioritise reception of MBMS frequencies above reception of any unicast bearers.
- The UE is made aware that the SC-PTM service is active.

21.3.9.3.2 Test procedure sequence

Table 21.3.9.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a *Paging* message including a *systemInfoModification* for cell1.	<--	*Paging*	-	-
2	From the beginning of the next modification period the SS transmits *SystemInformationBlockType15* according to system information combination 27 as defined in TS 36.508[18] clause 4.4.3.1 including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
3	UE transmits *MBMSInterestIndication* message condition SC-PTM. Check: Does UE transmit an *MBMSInterestIndication* message including the *mbms-Priority IE* set to True?	-->	*MBMSInterestIndication*	1	P
4	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message.	-	-	-	-
-	Exception; Step 5 is repeated 5 times	-	-	-	-
5	The SS transmits 2 MBMS Packets on the SC-MTCH	<--	MBMS Packets	-	-
6	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
7	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
8	The SS transmits an *RRCConnectionReconfiguration* message to release the unicast bearer (DRB2 that established during preamble) due to congestion on the MBMS carrier(s)	<--	*RRCConnectionReconfiguration*	-	-
9	The UE transmits an *RRCConnectionReconfigurationComplete* message to confirm the release.	-->	*RRCConnectionReconfigurationComplete*	-	-
-	Exception; Step 10 is repeated 5 times	-	-	-	-
10	The SS transmits 2 MBMS Packets on the SC-MTCH	<--	MBMS Packets	-	-
11	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
12	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
13	Check: Is the number of reported MBMS Packets received on the SC-MTCH greater than the number of MBMS Packets reported in step 7?	-	-	2	P

21.3.9.3.3 Specific message contents

Table 21.3.9.3.3-1: *MBMSInterestIndication* (step 1, Table 21.3.9.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC condition SC-PTM			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
interestIndication-r11 OF SEQUENCE {			
mbms-FreqList-r11[1] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	EARFCN of Cell 1	1 entry	
mbms-Priority-r11	true	ENUMERATED {true}	
}			
}			
}			

Table 21.3.9.3.3-2: *RRCConnectionReconfiguration* (step 8, Table 21.3.9.3.2-1)

Derivation Path: 36.508, Table 4.6.1-8, condition DRB-REL

21.3.10 CA / Start SC-PTM reception on Non-Serving Cell / Continue SC-PTM reception on SCell after SCell addition

21.3.10.1 CA / Start SC-PTM reception on Non-Serving Cell / Continue SC-PTM reception on SCell after SCell addition / intra-band Contiguous CA

21.3.10.1.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC CONNECTED state on a SC-PTM capable cell broadcasting SIB15 and interested
to receive a SC-PTM service}
ensure that {
  when { SIB15 indicates that the MBMS service is available on a frequency on an inter-frequency
neighbour cell within the UE signalled supportedBandCombination capabilities }
    then { UE starts SC-PTM reception on the Non-Serving neighbour cell }
            }
```

(2)

```
with { UE in E-UTRA RRC_CONNECTED state with ongoing SC-PTM reception on a Non-Serving neighbour
cell }
ensure that {
  when { UE receives an RRCConnectionReconfiguration message containing sCellToAddModList with a
SCell addition of the Non-Serving cell with ongoing SC-PTM reception and UE adds the new SCell,
configures lower layers to consider the SCell to be in deactivated state and sends an
RRCConnectionReconfigurationComplete message }
    then { UE continues SC-PTM reception on the new SCell }
            }
```

21.3.10.1.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 36.306, clause 4.3.5.2 and TS 36.331, clause 5.8.5.3. Unless otherwise stated these are Rel-13 requirements.

[TS 36.306, clause 4.3.5.2]

This field defines the carrier aggregation, MIMO and MBMS reception capabilities (via MBSFN or SC-PTM) supported by the UE for configurations with inter-band, intra-band non-contiguous, intra-band contiguous carrier aggregation and without carrier aggregation. For each band in a band combination the UE provides the supported CA bandwidth classes and the corresponding MIMO capabilities for downlink. The UE also has to provide the supported uplink CA bandwidth class and the corresponding MIMO capability for at least one band in the band combination.

Applicability of provisioning uplink CA bandwidth class for each band in the band combinations is defined in TS 36.101 [6]. A MIMO capability applies to all carriers of a bandwidth class of a band in a band combination. For bandwidth classes that include multiple component carriers (i.e. bandwidth classes B, C, D and so on), the UE may also indicate a separate MIMO capability that applies to each individual carrier of a bandwidth class of a band in a band combination.

(...)

The UE that supports MBMS reception via MBSFN shall support MBMS reception via MBSFN on the PCell of MCG, and it may indicate support for MBMS reception via MBSFN on configured SCells (*mbms-SCell*) and for any cell that may be additionally configured as an SCell (*mbms-NonServingCell*) according to this field. The UE that supports MBMS reception via SC-PTM shall support MBMS reception via SC-PTM on the PCell of MCG, and it may indicate support for MBMS reception via SC-PTM on configured SCells (*scptm-SCell*) and for any cell that may be additionally configured as an SCell (*scptm-NonServingCell*) according to this field. The UE shall apply the system information acquisition and change monitoring procedure relevant for MBMS operation for these cells.

The UE indicating more than one frequency in the *MBMSInterestIndication* message as specified in TS 36.331 [5] shall support simultaneous reception of MBMS (via MBSFN or SC-PTM) on the indicated frequencies when the frequencies of the configured serving cells and the indicated frequencies belong to at least one band combination.

(...)

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB or SC-MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB or SC-MRB for the concerned session. I.e. the UE does not verify if the session is indicated on (SC-)MCCH.

NOTE 3: The UE considers the frequencies of interest independently of any synchronization state, e.g. [9, Annex J.1]

2> the UE is capable of simultaneously receiving MRBs and/or is capable of simultaneously receiving SC-MRBs on the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 4: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 5: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 6: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

21.3.10.1.3 Test Description

21.3.10.1.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells. Cell 1 is the PCell and Cell3 is an inactive SCell to be added according to [18] cl. 6.3.4.
- SCPTMConfiguration message as defined in TS 36.508 [18] Table 4.6.1-18a is transmitted on Cell 3.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 1.
- System information combination 26 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 3.

UE:

- The UE is configured to receive MBMS services.
- The UE has in the signalled IE “supportedBandCombination” indicated support of the CA configuration for the frequency of Cell 1.
- The UE is capable to receiving SCPTM on SCell.
- The UE is capable to receiving SCPTM on NonServingCell.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE F on Cell 1 according to [18].
- The UE is made interested in receiving SC-PTM service with MBMS Service ID=1 as broadcasted in *SCPTMConfiguration*.
- The UE is made aware that the MBMS service is active.

21.3.10.1.3.2 Test procedure sequence

Table 21.3.10.1.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while the configuration marked "T1" is applied at the point indicated in the Main behaviour description in Table 21.3.10.1.3.2-2.

Table 21.3.10.1.3.2-1: Time instances of cell power level and parameter changes

	Parameter	Unit	Cell 1	Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15k Hz	-85	Off	The power level values are such that camping on Cell 1 is guarantee.
T1	Cell-specific RS EPRE	dBm/15k Hz	-85	-79	The power level values are such that measurement results for Cell 1 (M1) and Cell 3 (M3) satisfy entry condition for event A3 (M3 > M1).

Table 21.3.10.1.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	The SS transmits an *RRCConnectionReconfiguration* message on Cell 1 to setup inter Frequency measurement.	<--	*RRCConnectionReconfiguration*	-	-
2	The UE transmits an *RRCConnectionReconfigurationComplete* message on Cell 1.	-->	*RRCConnectionReconfigurationComplete*	-	-
3	The SS changes Cell 3 parameters according to the row "T1" in table 21.3.10.1.3.2-1.	-	-	-	-
4	The UE transmits a *MeasurementReport* message on Cell 1 to report event A3 with the measured RSRP, RSRQ value for Cell 3.	-->	*MeasurementReport*	-	-
5	The SS transmits a Paging message including a systemInfoModification for Cell1.	<--	*Paging*	-	-
6	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to system information combination 18 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 and according to system information combination 28 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 3. *SystemInformationBlockType15* on Cell 1 is including mbms-SAI-InterFreqList-r11 list for the frequency of Cell 3 indicating MBMS SAI=1. *SystemInformationBlockType15* on Cell 3 is including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
7	The UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
8	SS waits 2 seconds to allow UE to read the necessary system and SC-MCCH information; and to receive SCPTMConfiguration message on the non-serving cell.	-	-	-	-
-	Exception; Step 9 is repeated 5 times	-	-	-	-
9	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
10	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message on Cell 1.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
11	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
12	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 11 greater than zero? (Note: This verifies that UE has received MBMS packets on the Non-Serving Cell 3 providing the MBMS service and started SC-PTM reception)	-	-	1	P
13	The SS transmits an *RRCConnectionReconfiguration* message containing an *sCellToAddModList* with SCell Cell 3 addition	<--	*RRCConnectionReconfiguration*	-	-
14	The UE transmits an *RRCConnectionReconfigurationComplete* message	-->	*RRCConnectionReconfigurationComplete*	-	-
-	Exception; Step 15 is repeated 5 times	-	-	-	-
15	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
16	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message on Cell 1	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-

17	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
18	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 17 greater than the number reported in step 11? (Note: This verifies that UE continue to receive MBMS packets on Cell 3 after being added as SCell)	-	-	2	P

21.3.10.1.3.3 Specific message contents

Table 21.3.10.1.3.3-0: Conditions for specific message contents in Tables 21.3.10.1.3.3-4, Tables 21.3.10.1.3.3-9, 21.3.10.1.3.3-10 and 21.3.10.1.3.3-11

Condition	Explanation
Uplink_CA	The UE supports carrier aggregation in UL under the test band.
Band > 64	This condition applies if the band number is bigger than 64.

Table 21.3.10.1.3.3-1: *SystemInformationBlockType15* for Cell 1 (from step 6 and all subsequent steps, Table 21.3.10.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_interFreq.			
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 3, see [18] table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	
}			
}			

Table 21.3.10.1.3.3-2: *SystemInformationBlockType15* for Cell 3 (from step 6 and all subsequent steps, Table 21.3.10.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_intraFreq.

Table 21.3.10.1.3.3-3: *RRCConnectionReconfiguration* (step 1, Table 21.3.10.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8 with condition MEAS

Table 21.3.10.1.3.3-4: *MeasConfig* (Table 21.3.10.1.3.3-3)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-1, condition INTER-FREQ			
Information Element	**Value/Remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	2 entries		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)	Cell 1	
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
measObjectId[2]	IdMeasObject-f2		
measObject[2]	MeasObjectEUTRA-GENERIC(f2)	Cell 3	
measObject[2]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfigEUTRA-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f2		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 1		
}			
measObjectEUTRA-v9e0[2] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 3		
}			
}			
}			

Table 21.3.10.1.3.3-5: *ReportConfigEUTRA-A3* (Table 21.3.10.1.3.3-4)

Derivation Path: 36.508 clause 4.6.6 table 4.6.6-6			
Information Element	**Value/remark**	**Comment**	**Condition**
ReportConfigEUTRA-A3 ::= SEQUENCE {			
triggerType CHOICE {			
event SEQUENCE {			
eventId CHOICE {			
eventA3 SEQUENCE {			
a3-Offset	-24 (-12 dB)		
reportOnLeave	TRUE		
}			
}			
}			
}			
}			

Table 21.3.10.1.3.3-6: *MeasurementReport* (step 4, Table 21.3.10.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-5			
Information Element	**Value/remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
measurementReport-r8 SEQUENCE {			
measResults ::= SEQUENCE {			
measId	1		
measResultPCell ::= SEQUENCE {		Report Cell 1	
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {			
measResultListEUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE {		Report Cell 3	
physCellId [1]	physicalCellId of Cell 3		
cgi-Info [1] SEQUENCE {}	Not present		
measResult [1] SEQUENCE {			
rsrpResult	(0..97)		
rsrqResult	(0..34)		
additionalSI-Info-r9 SEQUENCE {}	Not present		
}			
}			
}			
measResultForECID-r9 SEQUENCE {}	Not present		
locationInfo-r10 SEQUENCE {}	Not present		
measResultServFreqList-r10 SEQUENCE {}	Not present		
}			
}			
}			
}			
}			

Table 21.3.10.1.3.3-7: *MBMSInterestIndication* (step 7, Table 21.3.10.1.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC, condition SC-PTM			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 3	INTEGER (0..maxEARFCN2)	
}			
}			

Table 21.3.10.1.3.3-8: *RRCConnectionReconfiguration* (step 13, Table 21.3.10.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10	Not present		
sCellToAddModList-r10	SCellToAddMod-r10-f2-Add	SCell addition for Cell 3	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 21.3.10.1.3.3-9: SCellToAddMod-r10-f2-Add (Table 21.3.10.1.3.3-8)

Derivation Path: 36.508 clause 4.6.1 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE {			
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 3		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 3		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 3		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f2		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f2		
}			

Table 21.3.10.1.3.3-10: *RadioResourceConfigCommonSCell-r10-f2* (Table 21.3.10.1.3.3-9)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 3		
}			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 3	Optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 3		
}			
}			
}			

Table 21.3.10.1.3.3-11: *RadioResourceConfigDedicatedSCell-r10-f2* (Table 21.3.10.1.3.3-9)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

(…)

21.3.10.2 CA / Start SC-PTM reception on Non-Serving Cell / Continue SC-PTM reception on SCell after SCell addition / Inter-band CA

21.3.10.2.1 Test Purpose (TP)

Same as TC 21.3.10.1 but applied to Inter-band CA case.

21.3.10.2.2 Conformance requirements

Same as TC 21.3.10.1.

21.3.10.2.3 Test description

21.3.10.2.3.1 Pre-test conditions

Same as test case 21.3.10.1 with the following differences:

- Cell configuration: Cell 10 replaces Cell 3

21.3.10.2.3.2 Test procedure sequence

Same as test case 21.3.10.1 with the following differences:

- Cell configuration: Cell 10 replaces Cell 3.

21.3.10.2.3.3 Specific message contents

Same as test case 21.3.10.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.
- Specific message content of *MeasConfig* in Table 21.3.10.2.3.3-1 replaces content in Table 21.3.10.1.3.3-4.

Table 21.3.10.2.3.3-1: *MeasConfig* (Table 21.3.10.1.3.3-4)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-1, condition INTER-FREQ			
Information Element	**Value/Remark**	**Comment**	**Condition**
MeasConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	2 entries		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)	Cell 1	
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
measObjectId[2]	IdMeasObject-f5		
measObject[2]	MeasObjectEUTRA-GENERIC(f5)	Cell 10	
measObject[2]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A3		
reportConfig[1]	ReportConfig-A3		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f5		
reportConfigId[1]	IdReportConfig-A3		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 1		
}			
measObjectEUTRA-v9e0[2] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for Cell 10		
}			
}			
}			

Condition	Explanation
Band > 64	This condition applies if the band number is bigger than 64.

21.3.11 CA / Start SC-PTM reception on SCell / Continue SC-PTM reception on Non-Serving after SCell release

21.3.11.1 CA / Start SC-PTM reception on SCell / Continue SC-PTM reception on Non-Serving after SCell release / Intra-band Contiguous CA

21.3.11.1.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC CONNECTED state with PCell and SCell activate and both broadcasting SIB15
and UE is interested to receive a SC-PTM service}
ensure that {
  when { SIB15 indicates that the MBMS service is available on the frequency of the SCell }
    then { UE starts SC-PTM reception on the Scell }
            }
```

(2)

```
with { UE in E-UTRA RRC_CONNECTED state with active PCell and SCell and ongoing SC-PTM reception on
the SCell }
ensure that {
  when { UE receives an RRCConnectionReconfiguration message containing sCellToReleaseList with a
sCellIndex equalling to the current UE SCell configuration with ongoing SC-PTM reception and UE
releases the SCell and sends an RRCConnectionReconfigurationComplete message }
    then { UE continues SC-PTM reception on the former SCell (now Non-Serving cell) }
            }
```

21.3.11.1.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 36.306, clause 4.3.5.2 and TS 36.331, clause 5.8.5.3 and 5.8.5.3a. Unless otherwise stated these are Rel-13 requirements.

[TS 36.306, clause 4.3.5.2]

This field defines the carrier aggregation, MIMO and MBMS reception capabilities (via MBSFN or SC-PTM) supported by the UE for configurations with inter-band, intra-band non-contiguous, intra-band contiguous carrier aggregation and without carrier aggregation. For each band in a band combination the UE provides the supported CA bandwidth classes and the corresponding MIMO capabilities for downlink. The UE also has to provide the supported uplink CA bandwidth class and the corresponding MIMO capability for at least one band in the band combination. Applicability of provisioning uplink CA bandwidth class for each band in the band combinations is defined in TS 36.101 [6]. A MIMO capability applies to all carriers of a bandwidth class of a band in a band combination. For bandwidth classes that include multiple component carriers (i.e. bandwidth classes B, C, D and so on), the UE may also indicate a separate MIMO capability that applies to each individual carrier of a bandwidth class of a band in a band combination.

(...)

The UE that supports MBMS reception via MBSFN shall support MBMS reception via MBSFN on the PCell of MCG, and it may indicate support for MBMS reception via MBSFN on configured SCells (*mbms-SCell*) and for any cell that may be additionally configured as an SCell (*mbms-NonServingCell*) according to this field. The UE that supports MBMS reception via SC-PTM shall support MBMS reception via SC-PTM on the PCell of MCG, and it may indicate support for MBMS reception via SC-PTM on configured SCells (*scptm-SCell*) and for any cell that may be additionally configured as an SCell (*scptm-NonServingCell*) according to this field. The UE shall apply the system information acquisition and change monitoring procedure relevant for MBMS operation for these cells.

The UE indicating more than one frequency in the *MBMSInterestIndication* message as specified in TS 36.331 [5] shall support simultaneous reception of MBMS (via MBSFN or SC-PTM) on the indicated frequencies when the frequencies of the configured serving cells and the indicated frequencies belong to at least one band combination.

(...)

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB or SC-MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB or SC-MRB for the concerned session. I.e. the UE does not verify if the session is indicated on (SC-)MCCH.

NOTE 3: The UE considers the frequencies of interest independently of any synchronization state, e.g. [9, Annex J.1]

2> the UE is capable of simultaneously receiving MRBs and/or is capable of simultaneously receiving SC-MRBs on the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 4: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 5: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 6: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

[TS 36.331, clause 5.8.5.3a]

The UE shall:

1> consider a MBMS service to be part of the MBMS services of interest if the following conditions are met:

2> the UE is SC-PTM capable; and

2> the UE is receiving or interested to receive this service via an SC-MRB; and

2> one session of this service is ongoing or about to start; and

2> one or more MBMS SAIs in the USD for this service is included in *SystemInformationBlockType15* acquired from the PCell for a frequency belonging to the set of MBMS frequencies of interest, determined according to 5.8.5.3.

21.3.11.1.3 Test Description

21.3.11.1.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells. Cell 1 is the PCell, Cell3 is an inactive SCell to be added, according to [18] cl. 6.3.4.
- SCPTMConfiguration message as defined in TS 36.508 [18] Table 4.6.1-18a is transmitted on Cell 3.

- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 1.
- System information combination 26 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 3.

UE:

- The UE is configured to receive MBMS services.
- The UE has in the signalled IE “supportedBandCombination” indicated support of the CA configuration for the frequency of Cell 1.
- The UE is capable to receiving SCPTM on SCell.
- The UE is capable to receiving SCPTM on NonServingCell.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE F on Cell 1 according to [18].
- The UE is made interested in receiving SC-PTM service with MBMS Service ID=1 as broadcasted in *SCPTMConfiguration*.
- The UE is made aware that the MBMS service is active.

21.3.11.1.3.2 Test procedure sequence

Table 21.3.11.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	The SS transmits an *RRCConnectionReconfiguration* message containing a *sCellToAddModList* with Cell 3 as SCell addition.	<--	*RRCConnectionReconfiguration*	-	-
2	The UE transmits an *RRCConnectionReconfigurationComplete* message	-->	*RRCConnectionReconfigurationComplete*	-	-
3	The SS transmits a Paging message including a systemInfoModification for Cell1.	<--	*Paging*	-	-
4	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to system information combination 18 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 and according to system information combination 28 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 3. *SystemInformationBlockType15* on Cell 1 is including mbms-SAI-InterFreqList-r11 list for the frequency of Cell 3 indicating MBMS SAI=1. *SystemInformationBlockType15* on Cell 3 is including mbms-SAI-IntraFreq-r11 list indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
5	The UE transmits an *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
6	Wait for a period equal to the SC-MCCH repetition period for the UE to receive *SCPTMConfiguration* message	-	-	-	-
-	Exception; Step 7 is repeated 5 times	-	-	-	-
7	The SS transmits 2 MBMS Packets on the SC-MTCH	<--	MBMS Packets	-	-
8	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message on Cell 1.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
9	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
10	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 9 greater than zero? (Note: This verifies that UE has received MBMS packets on the SCell providing the MBMS service and started SC-PTM reception)	-	-	1	P
11	The SS transmits an *RRCConnectionReconfiguration* message containing a *sCellToReleaseList* with SCell release of Cell 3.	<--	*RRCConnectionReconfiguration*	-	-
12	The UE transmits an *RRCConnectionReconfigurationComplete* message	-->	*RRCConnectionReconfigurationComplete*	-	-
-	Exception; Step 13 is repeated 5 times	-	-	-	-
13	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
14	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message on Cell 1	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
15	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
16	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 15	-	-	2	P

	greater than the number reported in step 9? (Note: This verifies that UE continue to receive MBMS packets on Cell 3 after being released as SCell and becoming a Non-Serving cell)				

21.3.11.1.3.3 Specific message contents

Table 21.3.11.1.3.3-0: Conditions for specific message contents in Tables 21.3.11.1.3.3-5 and 21.3.11.1.3.3-6

Condition	Explanation
Uplink_CA	The UE supports carrier aggregation in UL under the test band.

Table 21.3.11.1.3.3-1: *SystemInformationBlockType15* for Cell 1 (from step 4 and all subsequent steps, Table 21.3.11.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_interFreq.			
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 3, see [18] table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	
}			
}			

Table 21.3.11.1.3.3-2: *SystemInformationBlockType15* for Cell 3 (from step 4 and all subsequent steps, Table 21.3.11.1.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_intraFreq.

Table 21.3.11.1.3.3-3: *RRCConnectionReconfiguration* (step 1, Table 21.3.11.1.3.2-1)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10	Not present		
sCellToAddModList-r10	SCellToAddMod-r10-f2-Add	SCell addition for Cell 3	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 21.3.11.1.3.3-4: SCellToAddMod-r10-f2-Add (Table 21.3.11.1.3.3-3)

Derivation Path: 36.508 clause 4.6. 3 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE {			
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 3		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 3		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 3		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f2		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f2		
}			

Table 21.3.11.1.3.3-5: *RadioResourceConfigCommonSCell-r10-f2* (Table 21.3.11.1.3.3-4)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 3		
}			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 3	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 3		
}			
}			
}			

Table 21.3.11.1.3.3-6: *RadioResourceConfigDedicatedSCell-r10-f2* (Table 21.3.11.1.3.3-4)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

Table 21.3.11.1.3.3-7: *MBMSInterestIndication* (step 4, Table 21.3.11.1.3.2-1)

Derivation Path: 36.508, Table 4.6.1-4AC condition SC-PTM			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 3	INTEGER (0..maxEARFCN2)	
}			
}			

Table 21.3.11.1.3.3-8: *RRCConnectionReconfiguration* (step 11, Table 21.3.11.1.3.2-1)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10 SEQUENCE (SIZE (1..maxSCell-r10) OF SEQUENCE {	1 entry		
sCellIndex-r10[1]	1	SCell release for Cell 3	
}			
sCellToAddModList-r10	Not present		
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

21.3.11.2 CA / Start SC-PTM reception on SCell / Continue SC-PTM reception on Non-Serving after SCell release / Inter-band CA

21.3.11.2.1 Test Purpose (TP)

Same as TC 21.3.11.1 but applied to Inter-band CA case.

21.3.11.2.2 Conformance requirements

Same as TC 21.3.11.1.

21.3.11.2.3 Test description

21.3.11.2.3.1 Pre-test conditions

Same as test case 21.3.11.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

21.3.11.2.3.2 Test procedure sequence

Same as test case 21.3.11.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

21.3.11.2.3.3 Specific message contents

Same as test case 21.3.11.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

21.3.12 CA / Start SC-PTM reception on PCell / Continue MBMS reception after swap of SCell and PCell

21.3.12.1 CA / Start SC-PTM reception on PCell / Continue SC-PTM reception after swap of SCell and PCell / Intra-band Contiguous CA

21.3.12.1.1 Test Purpose (TP)

(1)

```
with { UE in E-UTRAN RRC CONNECTED state with SC-PTM capable PCell and SCell activate and both
broadcasting SIB15 and UE is interested to receive a SC-PTM service}
ensure that {
  when { SIB15 indicates that the MBMS service is available on the frequency of the PCell }
    then { UE starts SC-PTM reception on the Pcell }
            }
```

(2)

```
with { UE in E-UTRA RRC_CONNECTED state with active PCell and SCell and ongoing SC-PTM reception on
the PCell }
ensure that {
  when { UE receives an RRCConnectionReconfiguration message to reconfigure the SCell as PCell and
the PCell as SCell and sends an RRCConnectionReconfigurationComplete message }
    then { UE continues SC-PTM reception on the new SCell  }
            }
```

(3)

```
with { UE in E-UTRA RRC_CONNECTED state with active PCell and SCell and ongoing SC-PTM reception on
the SCell }
ensure that {
  when { UE receives an RRCConnectionReconfiguration message to reconfigure the SCell as PCell and
the PCell as SCell and sends an RRCConnectionReconfigurationComplete message }
    then { UE continues SC-PTM reception on the new PCell  }
            }
```

21.3.12.1.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 36.306, clause 4.3.5.2 and TS 36.331, clauses 5.8.5.3 and 5.8.5.3a. Unless otherwise stated these are Rel-13 requirements.

[TS 36.306, clause 4.3.5.2]

This field defines the carrier aggregation, MIMO and MBMS reception capabilities (via MBSFN or SC-PTM) supported by the UE for configurations with inter-band, intra-band non-contiguous, intra-band contiguous carrier aggregation and without carrier aggregation. For each band in a band combination the UE provides the supported CA bandwidth classes and the corresponding MIMO capabilities for downlink. The UE also has to provide the supported uplink CA bandwidth class and the corresponding MIMO capability for at least one band in the band combination. Applicability of provisioning uplink CA bandwidth class for each band in the band combinations is defined in TS 36.101 [6]. A MIMO capability applies to all carriers of a bandwidth class of a band in a band combination. For bandwidth classes that include multiple component carriers (i.e. bandwidth classes B, C, D and so on), the UE may also indicate a separate MIMO capability that applies to each individual carrier of a bandwidth class of a band in a band combination.

(...)

The UE that supports MBMS reception via MBSFN shall support MBMS reception via MBSFN on the PCell of MCG, and it may indicate support for MBMS reception via MBSFN on configured SCells (*mbms-SCell*) and for any cell that may be additionally configured as an SCell (*mbms-NonServingCell*) according to this field. The UE that supports MBMS reception via SC-PTM shall support MBMS reception via SC-PTM on the PCell of MCG, and it may indicate support for MBMS reception via SC-PTM on configured SCells (*scptm-SCell*) and for any cell that may be additionally configured as an SCell (*scptm-NonServingCell*) according to this field. The UE shall apply the system information acquisition and change monitoring procedure relevant for MBMS operation for these cells.

The UE indicating more than one frequency in the *MBMSInterestIndication* message as specified in TS 36.331 [5] shall support simultaneous reception of MBMS (via MBSFN or SC-PTM) on the indicated frequencies when the frequencies of the configured serving cells and the indicated frequencies belong to at least one band combination.

(...)

[TS 36.331, clause 5.8.5.3]

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions *SystemInformationBlockType15* acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB for the concerned session. I.e. the UE does not verify if the session is indicated on MCCH.

2> the UE is capable of simultaneously receiving the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the *supportedBandCombination* the UE included in *UE-EUTRA-Capability* contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 3: Indicating a frequency implies that the UE supports *SystemInformationBlockType13* acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 4: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 5: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in *SystemInformationBlockType1* (for serving frequency) or *SystemInformationBlockType15* (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to *supportedBandCombination*).

[TS 36.331, clause 5.8.5.3a]

The UE shall:

1> consider a MBMS service to be part of the MBMS services of interest if the following conditions are met:

2> the UE is SC-PTM capable; and

2> the UE is receiving or interested to receive this service via an SC-MRB; and

2> one session of this service is ongoing or about to start; and

2> one or more MBMS SAIs in the USD for this service is included in *SystemInformationBlockType15* acquired from the PCell for a frequency belonging to the set of MBMS frequencies of interest, determined according to 5.8.5.3.

21.3.12.1.3 Test Description

21.3.12.1.3.1 Pre-test conditions

System Simulator:

- 2 E-UTRA cells. Cell 1 is the PCell, Cell3 is an inactive SCell to be added according to [18] cl. 6.3.4.
- SCPTMConfiguration message as defined in TS 36.508 [18] Table 4.6.1-18a is transmitted on Cell 1.
- System information combination 26 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 1.
- System information combination 3 as defined in TS 36.508[18] clause 4.4.3.1 is used in Cell 3.

UE:

- The UE is configured to receive MBMS services.
- The UE has in the signalled IE “supportedBandCombination” indicated support of the CA configuration for the frequency of Cell 1.
- The UE is capable to receiving SCPTM on SCell.

Preamble:

- UE is in state Loopback Activated (State 4) with UE TEST LOOP MODE F on Cell 1 according to [18].
- The UE is made interested in receiving a MBMS service with MBMS Service ID=1 associated with the MBMS SAI (1) broadcasted in *SCPTMConfiguration*.
- The UE is made aware that the MBMS service is active.

21.3.12.1.3.2 Test procedure sequence

Table 21.3.12.1.3.2-1 illustrates the downlink power levels to be applied for Cell 1 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 21.3.12.1.3.2-1: Power levels

	Parameter	Unit	Cell 1	Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15 kHz	-70	-96	Power level for Cell 1 is such that *Ms* > *Thresh* + *Hys*
T1			-96	-70	Power level for Cell 1 is such that entry condition for event A2 is satisfied *Ms* + *Hys* < *Thresh*
T2			-70	-96	Power level for Cell 3 is such that exit condition for event A2 is satisfied *Ms* > *Thresh* + *Hys*
Note: The total tolerance used is the sum of downlink signal level uncertainty (TS 36.508 clause 6.2.2.1) and absolute UE measurement accuracy (TS 36.133 clause 9).					

Table 21.3.12.1.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	The SS transmits an *RRCConnectionReconfiguration* message containing a *sCellToAddModList* with Cell 3 as SCell addition on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
2	The UE transmits an *RRCConnectionReconfigurationComplete* message	-->	*RRCConnectionReconfigurationComplete*	-	-
3	The SS transmits a Paging message including a systemInfoModification for Cell1.	<--	*Paging*	-	-
4	From the beginning of the next modification period the SS starts broadcast of *SystemInformationBlockType15* according to system information combination 28 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 1 and according to system information combination 18 as defined in TS 36.508[18] clause 4.4.3.1 on Cell 3. *SystemInformationBlockType15* on Cell 1 is including mbms-SAI-IntraFreqList-r11 list indicating MBMS SAI=1. *SystemInformationBlockType15* on Cell 3 is including mbms-SAI-InterFreqList-r11 list for the frequency of Cell 1 indicating MBMS SAI=1.	<--	*SystemInformationBlockType15*	-	-
5	The UE transmits a *MBMSInterestIndication* message.	-->	*MBMSInterestIndication*	-	-
6	Wait for a period equal to the SC-MCCH modification period for the UE to receive *SCPTMConfiguration* message	-	-	-	-
-	Exception; Step 7 is repeated 5 times	-	-	-	-
7	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets	-	-
8	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message on Cell 1.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
9	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
10	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 9 greater than zero? (Note: This verifies that UE has received MBMS packets on the PCell providing the MBMS service and started SC-PTM reception)	-	-	1	P
11	SS transmits an *RRCConnectionReconfiguration* message including *measConfig* to setup intra LTE measurement and reporting for event A2 on Cell 1.	<--	*RRCConnectionReconfiguration*	-	-
12	The UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
13	SS re-adjusts the cell-specific reference signal level according to row "T1" in table 21.3.12.1.3.2-1.	-	-	-	-
14	UE transmits a *MeasurementReport* message to report event A2 for Cell 1	-->	*MeasurementReport*	-	-
15	The SS transmits an *RRCConnectionReconfiguration* message containing to reconfigure the PCell as SCell and the SCell as PCell	<--	*RRCConnectionReconfiguration*	-	-
16	The UE transmits an	-->	*RRCConnectionReconfigurationC*	-	-

	RRCConnectionReconfigurationComplete message		*omplete*		
17	Wait for a period equal to the SC-MCCH modification period for the UE to receive *SCPTMConfiguration* message on SCell (Cell 1)	-	-	-	-
-	Exception; Step 18 is repeated 5 times	-	-	-	-
18	The SS transmits 2 MBMS Packets on the SC-MTCH.	<--	MBMS Packets.	-	-
19	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message on Cell 3.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
20	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
21	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 16 greater than the number reported in step 9? (Note: This verifies that UE continue to receive MBMS packets on Cell 1 after being reconfigured as SCell)	-	-	2	P
22	SS transmits an *RRCConnectionReconfiguration* message on Cell 3 including *measConfig* to setup intra LTE measurement and reporting for event A2 on Cell 3.	<--	*RRCConnectionReconfiguration*	-	-
23	The UE transmits an *RRCConnectionReconfigurationComplete* message.	-->	*RRCConnectionReconfigurationComplete*	-	-
24	SS re-adjusts the cell-specific reference signal level according to row "T2" in table 21.3.12.1.3.2-1.	-	-	-	-
25	UE transmits a *MeasurementReport* message to report event A2 for Cell 3	-->	*MeasurementReport*	-	-
26	The SS transmits an *RRCConnectionReconfiguration* message containing to reconfigure the PCell as SCell and the SCell as PCell	<--	*RRCConnectionReconfiguration*	-	-
27	The UE transmits an *RRCConnectionReconfigurationComplete* message	-->	*RRCConnectionReconfigurationComplete*	-	-
28	Wait for a period equal to the SC-MCCH modification period for the UE to receive *SCPTMConfiguration* message on PCell (Cell 1)	-	-	-	-
-	Exception: Step 29 is repeated 5 times				
29	The SS transmits 2 MBMS Packets on the SC-MTCH on Cell 1.	<--	MBMS Packets.	-	-
30	The SS transmits an UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message on Cell 1	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
31	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
32	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 31 greater than the number reported in step 20? (Note: This verifies that UE continues to receive MBMS packets on Cell 1 after being reconfigured as PCell)	-	-	3	P

21.3.12.1.3.3 Specific message contents

Table 21.3.12.1.3.3-0: Conditions for specific message contents in Tables 21.3.12.1.3.3-4, 21.3.12.1.3.3-5, 21.3.12.1.3.3-6, 21.3.12.1.3.3-9, 21.3.12.1.3.3-13, 21.3.12.1.3.3-14 21.3.12.1.3.3-15, 21.3.12.1.3.3-16, 21.3.12.1.3.3-18, 21.3.12.1.3.3-22, 21.3.12.1.3.3-23 21.3.12.1.3.3-24 and 21.3.12.1.3.3-25

Condition	Explanation
Uplink_CA	The UE supports carrier aggregation in UL under the test band.
Band > 64	This condition applies if the band number is bigger than 64.

Table 21.3.12.1,3.3-1: *SystemInformationBlockType15* for Cell 1 (from step 4 and all subsequent steps, Table 21.3.12.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_intraFreq.

Table 21.3.12.1.3.3-2: *SystemInformationBlockType15* for Cell 3 (from step 4 and all subsequent steps, Table 21.3.12.1.3.2-2)

Derivation Path: 36.508 table 4.4.3.3-14, condition SCPTM_interFreq.			
SystemInformationBlockType15 ::= SEQUENCE {			
mbms-SAI-IntraFreq-r11 SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	Not present		
mbms-SAI-InterFreqList-r11[1] SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {		1 entry	
dl-CarrierFreq-r11	Downlink EARFCN for Cell 1, see [18] table 6.3.1.2-1.		
mbms-SAI-List-r11[1] SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF { INTEGER (0..65535) }	1	1 entry INTEGER (0..65535)	
}			
}			

Table 21.3.12.1.3.3-3: *RRCConnectionReconfiguration* (step 1, Table 21.3.12.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10	Not present		
sCellToAddModList-r10	SCellToAddMod-r10-f2-Add	SCell addition for Cell 3	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 21.3.12.1.3.3-4: SCellToAddMod-r10-f2-Add (Table 21.3.12.1.3.3-3)

Derivation Path: 36.508 clause 4.6. 3 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE {			
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 3		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 3		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 3		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f2		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f2		
}			

Table 21.3.12.1.3.3-5: *RadioResourceConfigCommonSCell-r10-f2* (Table 21.3.12.1.3.3-4)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 3		
}			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 3	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 3		
}			
}			
}			

Table 21.3.12.1.3.3-6: *RadioResourceConfigDedicatedSCell-r10-f2* (Table 21.3.12.1.3.3-4)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

Table 21.3.12.1.3.3-7: *MBMSInterestIndication* (step 5, Table 21.3.12.1.3.2-2)

Derivation Path: 36.508, Table 4.6.1-4AC condition SC-PTM			
Information Element	**Value/remark**	**Comment**	**Condition**
criticalExtensions CHOICE {			
c1 CHOICE{			
mbms-FreqList-r11[*1*] SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF { INTEGER (0..maxEARFCN2) }	Same EARFCN as used for Cell 1	INTEGER (0..maxEARFCN2)	
}			
}			

Table 21.3.12.1.3.3-8: *RRCConnectionReconfiguration* (step 11, Table 21.3.12.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8 with condition MEAS

Table 21.3.12.1.3.3-9: *MeasConfig* (Table 21.3.12.1.3.3-8)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A2		
reportConfig[1]	ReportConfigEUTRA-A2-H		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A2		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f 1		
}			
}			
}			

Table 21.3.12.1.3.3-10: *ReportConfigEUTRA-A2-H* (Table 21.3.12.1.3.3-9)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-5 ReportConfigEUTRA-A2(-83)			
Information Element	**Value/Remark**	**Comment**	**Condition**
ReportConfigEUTRA ::= SEQUENCE {			
triggerType CHOICE {			
event SEQUENCE {			
hysteresis	6	3 dB	
}			
}			
}			

Table 21.3.12.1.3.3-11: *MeasurementReport* (step 14, Table 21.3.12.1.3.2-2)

Derivation path: 36.508 table clause 4.6.1 table 4.6.1-5			
Information Element	**Value/Remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
measurementReport-r8 SEQUENCE {			
measResults ::= SEQUENCE {			
measId	1		
measResultPCell ::= SEQUENCE {		Report Cell 1	
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {}	Not present		
measResultServFreqList-r10 SEQUENCE {}	Not checked		
}			
}			
}			
}			
}			

Table 21.3.12.1.3.3-12: *RRCConnectionReconfiguration* (step 15, Table 21.3.12.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10 SEQUENCE (SIZE (1..maxSCell-r10) OF SEQUENCE {	1 entry		
sCellIndex-r10[1]	1	SCell release for Cell 3	
}			
sCellToAddModList-r10	SCellToAddMod-r10-f1-Add	SCell addition for Cell 1	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 21.3.12.1.3.3-13: *MobilityControlInfo* (Table 21.3.12.1.3.3-12)

Derivation Path: clause 4.6.5 table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 3		
carrierFreq SEQUENCE {			
dl-CarrierFreq	Same downlink EARFCN as used for Cell 3		
}			
carrierFreq	Not present		Band > 64
carrierFreq-v9e0 SEQUENCE {			Band > 64
dl-CarrierFreq-v9e0	Same downlink EARFCN as used for Cell 3.		
}			
}			

Table 21.3.12.1.3.3-14: SCellToAddMod-r10-f1-Add (Table 21.3.12.1.3.3-12)

Derivation Path: 36.508 clause 4.6. 3 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE {			
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 1		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 1		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 1		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f1		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f1		
}			

Table 21.3.12.1.3.3-15: *RadioResourceConfigCommonSCell-r10-f1* (Table 21.3.12.1.3.3-14)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 1		
}			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 1	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 1		
}			
}			
}			

Table 21.3.12.1.3.3-16: *RadioResourceConfigDedicatedSCell-r10-f1* (Table 21.3.12.1.3.3-14)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

Table 21.3.12.1.3.3-17: *RRCConnectionReconfiguration* (step 22, Table 21.3.12.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8 with condition MEAS

Table 21.3.12.1.3.3-18: *MeasConfig* (Table 21.3.12.1.3.3-17)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-1			
Information Element	**Value/Remark**	**Comment**	**Condition**
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {	1 entry		
measObjectId[1]	IdMeasObject-f1		
measObject[1]	MeasObjectEUTRA-GENERIC(f1)		
measObject[1]	MeasObjectEUTRA-GENERIC(maxEARFCN)		Band > 64
}			
reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE {	1 entry		
reportConfigId[1]	IdReportConfig-A2		
reportConfig[1]	ReportConfigEUTRA-A2-H		
}			
measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE {	1 entry		
measId[1]	1		
measObjectId[1]	IdMeasObject-f1		
reportConfigId[1]	IdReportConfig-A2		
}			
measObjectToAddModList-v9e0 SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE {			Band > 64
measObjectEUTRA-v9e0[1] SEQUENCE {			
carrierFreq-v9e0	Same downlink EARFCN as used for f1		
}			
}			
}			

Table 21.3.12.1.3.3-19: *ReportConfigEUTRA-A2-H* (Table 21.3.12.1.3.3-18)

Derivation path: 36.508 clause 4.6.6 table 4.6.6-5 ReportConfigEUTRA-A2(-83)			
Information Element	**Value/Remark**	**Comment**	**Condition**
ReportConfigEUTRA ::= SEQUENCE {			
triggerType CHOICE {			
event SEQUENCE {			
hysteresis	6	3 dB	
}			
}			
}			

Table 21.3.12.1.3.3-20: *MeasurementReport* (step 25, Table 21.3.12.1.3.2-2)

Derivation path: 36.508 table clause 4.6.1 table 4.6.1-5			
Information Element	**Value/Remark**	**Comment**	**Condition**
MeasurementReport ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
measurementReport-r8 SEQUENCE {			
measResults ::= SEQUENCE {			
measId	1		
measResultPCell ::= SEQUENCE {		Report Cell 3	
rsrpResult	(0..97)		
rsrqResult	(0..34)		
}			
measResultNeighCells CHOICE {}	Not present		
measResultServFreqList-r10 SEQUENCE {}	Not checked		
}			
}			
}			
}			
}			

Table 21.3.12.1.3.3-21: *RRCConnectionReconfiguration* (step 26, Table 21.3.12.1.3.2-2)

Derivation Path: 36.508 clause 4.6.1 table 4.6.1-8			
Information Element	**Value/remark**	**Comment**	**Condition**
RRCConnectionReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE{			
rrcConnectionReconfiguration-r8 SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
nonCriticalExtension SEQUENCE {			
sCellToReleaseList-r10 SEQUENCE (SIZE (1..maxSCell-r10) OF SEQUENCE {	1 entry		
sCellIndex-r10[1]	1	SCell release for Cell 1	
}			
sCellToAddModList-r10	SCellToAddMod-r10-f2-Add	SCell addition for Cell 3	
nonCriticalExtension SEQUENCE {}	Not present		
}			
}			
}			
}			
}			
}			
}			

Table 21.3.12.1.3.3-22: *MobilityControlInfo* (Table 21.3.12.1.3.3-21)

Derivation Path: clause 4.6.5 table 4.6.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MobilityControlInfo ::= SEQUENCE {			
targetPhysCellId	PhysicalCellIdentity of Cell 1		
carrierFreq SEQUENCE {			
dl-CarrierFreq	Same downlink EARFCN as used for Cell 1		
}			
carrierFreq	Not present		Band > 64
carrierFreq-v9e0 SEQUENCE {			Band > 64
dl-CarrierFreq-v9e0	Same downlink EARFCN as used for Cell 1.		
}			
}			

Table 21.3.12.1.3.3-23: SCellToAddMod-r10-f2-Add (Table 21.3.12.1.3.3-21)

Derivation Path: 36.508 clause 4.6.1 table 4.6.3-19D SCellToAddMod-r10-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
SCellToAddMod-r10 ::= SEQUENCE {			
sCellIndex-r10	1		
cellIdentification-r10 SEQUENCE {			
physCellId-r10	Physical Cell Identity of Cell 3		
dl-CarrierFreq-r10	Same downlink EARFCN as used for Cell 3		
dl-CarrierFreq-r10	maxEARFCN		Band > 64
}			
dl-CarrierFreq-v1090	Same downlink EARFCN as used for Cell 3		Band > 64
radioResourceConfigCommonSCell-r10	RadioResourceConfigCommonSCell-r10-f2		
radioResourceConfigDedicatedSCell-r10	RadioResourceConfigDedicatedSCell-r10-f2		
}			

Table 21.3.12.1.3.3-24: *RadioResourceConfigCommonSCell-r10-f2* (Table 21.3.12.1.3.3-23)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-13A			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {			
nonUL-Configuration-r10 SEQUENCE {			
dl-Bandwidth-r10	Same downlink system bandwidth as used for Cell 3		
}			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
ul-FreqInfo-r10 SEQUENCE {			
ul-Bandwidth-r10	Same uplink system bandwidth as used for Cell 3	optional	FDD
	Not present		TDD
additionalSpectrumEmissionSCell-r10	Same additionalSpectrumEmission as used for Cell 3		
}			
}			
}			

Table 21.3.12.1.3.3-25: *RadioResourceConfigDedicatedSCell-r10-f2* (Table 21.3.12.1.3.3-23)

Derivation Path: 36.508 clause 4.6.3 table 4.6.3-19AA			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {			
physicalConfigDedicatedSCell-r10 SEQUENCE {			
ul-Configuration-r10	Not present		
ul-Configuration-r10 SEQUENCE {			Uplink_CA
antennaInfoUL-r10	Not present		
pusch-ConfigDedicatedSCell-r10	Not present		
uplinkPowerControlDedicatedSCell-r10	UplinkPowerControlDedicatedSCell-r10-DEFAULT		
cqi-ReportConfigSCell-r10	CQI-ReportConfigSCell-r10-DEFAULT		
soundingRS-UL-ConfigDedicated-r10	Not present		
soundingRS-UL-ConfigDedicated-v1020	Not present		
soundingRS-UL-ConfigDedicatedAperiodic-r10	Not present		
}			
}			
}			

21.3.12.2 CA / Start SC-PTM reception on PCell / Continue SC-PTM reception after swap of SCell and PCell / Inter-band CA

21.3.12.2.1 Test Purpose (TP)

Same as TC 21.3.12.1 but applied to Inter-band CA case.

21.3.12.2.2 Conformance requirements

Same as TC 21.3.12.1.

21.3.12.2.3 Test description

21.3.12.2.3.1 Pre-test conditions

Same as test case 21.3.12.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3

21.3.12.2.3.2 Test procedure sequence

Same as test case 21.3.12.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

21.3.12.2.3.3 Specific message contents

Same as test case 21.3.12.1 with the following differences:

- Cells configuration: Cell 10 replaces Cell 3.

21.3.13 SC-PTM Stop Indication / Enhanced Coverage

21.3.13.1 Test Purpose (TP)

(1)

```
with { Enhanced Coverage Capable UE receiving SC-PTM service }
ensure that {
  when { SC-PTM Stop Indication MAC control element associated with a G-RNTI is received }
    then { UE stops  monitoring the PDCCH for this G-RNTI }
          }
```

21.3.13.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 36.321, clauses 5.21, 6.1.3.12 and 6.2.1

[TS 36.321, clause 5.21]

For NB-IoT UEs, BL UEs or UEs in enhanced coverage, the eNB may transmit the SC-PTM Stop Indication MAC control element to the MAC entity to indicate that the transmission of SC-MTCH associated with a G-RNTI is stopped as described in subclause 6.1.3.12.

Upon reception of the SC-PTM Stop Indication MAC control element associated with a G-RNTI, the MAC entity shall:

- stop monitoring the PDCCH for this G-RNTI;
- indicate to upper layers that the associated MBMS session is stopped.

[TS 36.321, clause 6.1.3.12]

The SC-PTM Stop Indication MAC control element is applicable to NB-IoT UEs and BL UEs or UEs in enhanced coverage and indicates that the SC-MTCH transmission for a specific G-RNTI is stopped. It is identified by a MAC PDU subheader with LCID as specified in table 6.2.1-1.

It has a fixed size of zero bits.

[TS 36.321, clause 6.2.1]

…

The MAC header and subheaders are octet aligned.

Table 6.2.1-1 Values of LCID for DL-SCH

Codepoint/Index	LCID values
00000	CCCH
00001-01010	Identity of the logical channel
01011-01111	Reserved
10000	Extended logical channel ID field
10001	Reserved
10010	Activation/Deactivation of PDCP Duplication
10011	Hibernation (1 octet)
10100	Hibernation (4 octets)
10101	Activation/Deactivation of CSI-RS
10110	Recommended bit rate
10111	SC-PTM Stop Indication
11000	Activation/Deactivation (4 octets)
11001	SC-MCCH, SC-MTCH (see note)
11010	Long DRX Command
11011	Activation/Deactivation (1 octet)
11100	UE Contention Resolution Identity
11101	Timing Advance Command
11110	DRX Command
11111	Padding
NOTE: Both SC-MCCH and SC-MTCH cannot be multiplexed with other logical channels in the same MAC PDU except for Padding and SC-PTM Stop Indication	

Table 6.2.1-1a Values of eLCID for DL-SCH

Codepoint	Index	LCID values
000000-000110	32-38	Identity of the logical channel
000111-111111	39-95	Reserved

For NB-IoT only the following LCID values for DL-SCH are applicable: CCCH, Identity of the logical channel, SC-PTM Stop Indication, SC-MCCH/SC-MTCH, UE Contention Resolution Identity, Timing Advance Command, DRX Command and Padding.

…

21.3.13.3 Test description

21.3.13.3.1 Pre-test conditions

System Simulator:

- Cell 1.
- System information combination 25 as defined in TS 36.508[18] clause 4.4.3.1 is used in E-UTRA cell 1.
- SCPTMConfiguration-BR as defined in TS 36.508[18] table 4.6.1-18b is transmitted on SC-MCCH in Cell 1.

UE:

- E-UTRAN UE supporting Enhanced Coverage and SC-PTM services.

Preamble:

- UE is in Registered, Idle mode, Test Mode Activated (State 2A) according to [18] in Cell 1(serving cell) with the UE TEST LOOP MODE F.
- The UE is made interested in receiving SC-PTM service in the PLMN of Cell 1 with MBMS Service ID 1.

21.3.13.3.2 Test procedure sequence

Table 21.3.13.3.2-1: Main Behaviour

St	Procedure	Message Sequence		TP	Verdict
		U – S	Message		
1	SS transmits *SCPTMConfiguration-BR* message.	<--	*SCPTMConfiguration-BR*	-	-
2	Wait for a period equal to the SC-MCCH modification period for the UE to receive *SCPTMConfiguration-BR* message	-	-	-	-
3	The generic procedures described in TS 36.508 subclause 4.5.3A.3 and 4.5.4.3 are performed on Cell 1 to close UE test loop F	-	-	-	-
-	Exception: Step 4 is repeated 2 times	-	-	-	-
4	The SS transmits 5 MBMS Packets on the SC-MTCH using G-RNTI.	<--	MBMS Packets.	-	-
5	The SS transmits a UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
6	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
7	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 6 greater than zero?	-	-	-	-
8	The SS transmits 1 MBMS Packet on the SC-MTCH, with SC-PTM Stop Indication MAC Control Element with LCID = '10111'.	<--	MBMS Packet.	-	-
10	The SS transmits 2 MBMS Packets on the SC-MTCH using G-RNTI	<--	MBMS Packets.		
11	The SS transmits a UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST message.	<--	UE TEST LOOP MODE F SCPTM PACKET COUNTER REQUEST	-	-
12	UE responds with UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE.	-->	UE TEST LOOP MODE F SCPTM PACKET COUNTER RESPONSE	-	-
13	Check: Is the number of reported MBMS Packets received on the SC-MTCH in step 10 the same as the value reported in step 6 +1?	-	-	1	P

21.3.13.3.3 Specific message contents

Table 21.3.13.3.3-1: *SystemInformationBlockType20* for Cell 1 (all steps, Table 21.3.13.3.2-1)

Derivation Path: 36.508 table 4.4.3.3-18			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType20-r13 ::= SEQUENCE {			
br-BCCH-Config-r14 SEQUENCE {			
dummy	rf1		
dummy2	rf1		
mpdcch-Narrowband-SC-MCCH-r14	1		
mpdcch-NumRepetition-SC-MCCH-r14	r1		
mpdcch-StartSF-SC-MCCH-r14 CHOICE {			
fdd-r14	v1		FDD
tdd-r14	v1		TDD
}			
mpdcch-PDSCH-HoppingConfig-SC-MCCH-r14	off		
sc-mcch-CarrierFreq-r14	Same frequency as Cell 1		
sc-mcch-Offset-BR-r14	0		
sc-mcch-RepetitionPeriod-BR-r14	rf32		
sc-mcch-ModificationPeriod-BR-r14	Rf512		
}			
sc-mcch-SchedulingInfo-r14	Not present		
pdsch-maxNumRepetitionCEmodeA-SC-MTCH-r14	Not present		
	r32		CE-ModeA
pdsch-maxNumRepetitionCEmodeB-SC-MTCH-r14	Not present		
	r512		CE-ModeB
sc-mcch-RepetitionPeriod-v1470	Not present		
sc-mcch-ModificationPeriod-v1470	Not present		
}			

Table 21.3.13.3.3-2: ACTIVATE TEST MODE (preamble)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE F.

Table 21.3.13.3.3-3: CLOSE UE TEST LOOP (step 3, Table 21.3.13.3.2-1)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE F