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Table 9 - Offsets and step adjustments of UTC, until 1987 November 30

Date(at 0h UTC)			Offsets	Steps
1961	Jan.	1	-150×10^{-10}	
	Aug.	1	"	+ 0.050s
1962	Jan.	1	-130×10^{-10}	
1963	Nov.	1	"	- 0.100s
1964	Jan.	1	-150×10^{-10}	
	April	1	"	- 0.100s
	Sept.	1	"	- 0.100s
1965	Jan.	1	"	- 0.100s
	March	1	"	- 0.100s
	July	1	"	- 0.100s
	Sept.	1	"	- 0.100s
1966	Jan.	1	-300×10^{-10}	
1968	Feb.	1	"	+ 0.100s

Date(at 0h UTC)			Offsets	Steps
1972	Jan.	1	0	- 0.107 7580s
	July	1	"	- 1s
1973	Jan.	1	"	- 1s
1974	Jan.	1	"	- 1s
1975	Jan.	1	"	- 1s
1976	Jan.	1	"	- 1s
1977	Jan.	1	"	- 1s
1978	Jan.	1	"	- 1s
1979	Jan.	1	"	- 1s
1980	Jan.	1	"	- 1s
1981	July	1	"	- 1s
1982	July	1	"	- 1s
1983	July	1	"	- 1s
1985	July	1	"	- 1s

Table 10 - Relationship between TAI and UTC, until 1987 November 30

Limits of validity(at 0h UTC)					TAI - UTC
1961	Jan. 1	- 1961	Aug. 1		1.422 818 0s + (MJD - 37 300) x 0.001 296s
	Aug. 1	- 1962	Jan. 1		1.372 818 0s + " "
1962	Jan. 1	- 1963	Nov. 1		1.845 858 0s + (MJD - 37 665) x 0.001 123 2s
1963	Nov. 1	- 1964	Jan. 1		1.945 858 0s + " "
1964	Jan. 1	-	April 1		3.240 130 0s + (MJD - 38 761) x 0.001 296s
	April 1	-	Sept. 1		3.340 130 0s + " "
	Sept. 1	- 1965	Jan. 1		3.440 130 0s + " "
1965	Jan. 1	-	March 1		3.540 130 0s + " "
	March 1	-	July 1		3.640 130 0s + " "
	July 1	-	Sept. 1		3.740 130 0s + " "
	Sept. 1	- 1966	Jan. 1		3.840 130 0s + " "
1966	Jan. 1	- 1968	Feb. 1		4.313 170 0s + (MJD - 39 126) x 0.002 592s
1968	Feb. 1	- 1972	Jan. 1		4.213 170 0s + " "
1972	Jan. 1	-	July 1	10s	(integral number of seconds)
	July 1	- 1973	Jan. 1	11s	
1973	Jan. 1	- 1974	Jan. 1	12s	
1974	Jan. 1	- 1975	Jan. 1	13s	
1975	Jan. 1	- 1976	Jan. 1	14s	
1976	Jan. 1	- 1977	Jan. 1	15s	
1977	Jan. 1	- 1978	Jan. 1	16s	
1978	Jan. 1	- 1979	Jan. 1	17s	
1979	Jan. 1	- 1980	Jan. 1	18s	
1980	Jan. 1	- 1981	July 1	19s	
1981	July 1	- 1982	July 1	20s	
1982	July 1	- 1983	July 1	21s	
1983	July 1	- 1985	July 1	22s	
1985	July 1			23s	

TABLE 11 - Atomic time, collaborating laboratories

AOS	Astronomical Latitude Observatory, Borowiec, Polska
APL	Applied Physics Laboratory, Laurel, USA
ASMW	Amt für Standardisierung, Messwesen und Warenprüfung, Berlin, Deutsche Demokratische Republik
ATC	Australian Telecommunications Commission, Melbourne, Australia
AUS	Consortium of laboratories in Australia
BEV	Bundesamt für Eich - und Vermessungswesen, Wien, Oesterreich
BAO	Beijing Observatory, Beijing, China
CAO	Astronomical Observatory of Cagliari University, Cagliari, Italy
CH	Consortium of laboratories in Switzerland (see Table 12)
CSAO	Shaanxi Astronomical Observatory, Lintong, China
DDR	Consortium of laboratories in Deutsche Demokratische Republik
DNM	Division of National Mapping, Canberra, Australia
F	Commission Nationale de l'Heure, Paris, France (see Table 12)
FTZ	Fernmeldetechnisches Zentralamt, Darmstadt, Bundesrepublik Deutschland
IEN	Istituto Elettrotecnico Nazionale, Torino, Italia
IFAG	Institut für Angewandte Geodäsie, Frankfurt am Main, Bundesrepublik Deutschland
IGMA	Instituto Geografico Militar, Buenos-Aires, Argentina
ILOM	International Latitude Observatory, Mizusawa, Japan
INTI	Instituto Nacional de Tecnologia Industrial, Buenos-Aires, Argentina
IPL	National Physical Laboratory, Jerusalem, Israel
KSRI	Korea Standards Research Institute, Korea
MSSD	Measurement Standards and Services Division, Colombo, Sri Lanka
NBS	National Bureau of Standards, Boulder, USA
NIM	National Institute of Metrology, Beijing, China
NIS	National Institute for Standards, Cairo, Arab Republic of Egypt
NML	National Measurement Laboratory, CSIRO, Australia
NPL	National Physical Laboratory, Teddington, U.K.
NPLI	National Physical Laboratory, New-Delhi, India
NPRL	National Physical Research Laboratory, Pretoria, South Africa
NRC	National Research Council of Canada, Ottawa, Canada
NRLM	National Research Laboratory of Metrology, Tsukuba, Japan
OAB	Observatoire Astronomique Bouzaréah, Alger, République Algérienne
OMH	Orszagos Mérésügyi Hivatal, Budapest, Hungary
OMSF	Instituto y Observatorio de Marina, San Fernando, España
ONBA	Observatorio Naval, Buenos-Aires, Argentina
ONRJ	Observatorio National, Rio de Janeiro, Brazil
OP	Observatoire de Paris, Paris, France
ORB	Observatoire Royal de Belgique, Bruxelles, Belgique
PAGA	Philippine Atmospheric, Geophysical and Astronomical Services Administration, Philippines
PEL	Physics and Engineering Laboratory, New-Zealand
PKNM	Polski Komitet Normalizacji Miar I Jakości, Warszawa, Polska
PTB	Physikalisch-Technische Bundesanstalt, Braunschweig, Bundesrepublik Deutschland

TABLE 11 - Atomic time, collaborating laboratories (cont.)

RGO	Royal Greenwich Observatory, Herstmonceux, U.K.
RO	Royal Observatory, Hong-Kong
RRL	Radio Research Laboratory, Tokyo, Japan
SIS	Singapore Institute of Standards and Industrial Research, Singapore
SO	Shanghai Observatory, Shanghai, China
STA	Swedish Telecommunications Administration, Stockholm, Sweden
SU	Laboratoire d'état de l'étalon de temps et de fréquences, URSS
TAO	Tokyo Astronomical Observatory, Tokyo, Japan
TID	Tidbinbilla Deep Space Communications Center, Australia
TL	Telecommunication Laboratories, Taiwan, China
TP(1)	Ústav Radiotechniky a Electroniky, Praha, Československo Astronomický Ústav, Praha, Československo
TPC	Telecommunication Public Corporation, Indonesia
TUG	Technische Universität Graz, Oesterreich
USNO	U.S. Naval Observatory, Washington D.C., USA
VSL	Van Swinden Laboratorium, Den Haag, Nederland
YUZM	Bureau Fédéral des Mesures et Métaux Précieux, Belgrade, République Socialiste Fédérative de Yougoslavie
ZIPE	Zentralinstitut Physik der Erde, Potsdam, Deutsche Demokratische Republik

(1) Both laboratories cooperate in the derivation of UTC(TP).

TABLE 12 - Laboratories keeping an independent local atomic time

Laboratories (i)	Equipment in atomic standards (1)	Information on TA(i) - UTC(i) Interval of validity (in MJD at 0 h UTC)	TA(i) - UTC(i) in s
CH	14 Ind. Cs (2)	46429-46523	23.000 032 516 $+28\times10^{-9}\times(MJD-46429)$
		46523-46693	23.000 035 154 $+24\times10^{-9}\times(MJD-46523)$
		46693-	23.000 039 237 $+22\times10^{-9}\times(MJD-46693)$
DDR	3 Ind. Cs (3)	year 1986	TA(DDR)-UTC(ASMW) is sent to BIH
F	20 Ind. Cs (4)	year 1986	TA(F)-UTC(OP) is published in bulletin H by OP (LPTF)
NBS	16 Ind. Cs 2 Lab. Cs 2 H Masers (5)	year 1986	TA(NBS)-UTC(NBS) is published in the NBS T and F Bulletin
NRC	1 Ind. Cs 1 2.1 m Lab. Cs 3 1 m Lab. Cs (6)	year 1986	22.999 968 931
PTB	9 Ind. Cs 2 Lab. Cs (7)	year 1986	23.000 363 400
RGO	6 Ind. Cs	year 1986	22.999 926 09
RRL	1 Lab. Cs 10 Ind. Cs 3 H Masers	year 1986	published in RRL Standard Frequency and Time Bulletin
SO	1 Lab. Cs 4 Ind. Cs 3 H Masers	year 1986	TA(SO)-UTC(SO) is published by the SO Atomic Time Bulletin

Table 12 - (cont.)

Laboratories (i)	Equipment in atomic standards (1)	Information on TA(i) - UTC(i): Interval of validity (in MJD at 0 h UTC)	TA(i) - UTC(i) in s
SU	2 Lab. Cs 2 Ind. Cs 4 H Masers 4 H Clocks	year 1986	20.172 750 000
USNO	60 Ind. Cs 2 H Masers (2 VLG II B serial # 18,19) Prototype Mercury Ion freq. Std (8)	year 1986	A.1(MEAN)-UTC(USNO,MC) values are available upon request. (9)

Notes of Table 12

(1) Ind. Cs designates an industry made Cs standard; Lab. Cs a laboratory Cs standard and H Maser an Hydrogen Maser.

(2) The standards are located as follows (at the end of 1986).

Office Fédéral de Métrologie (Berne)	7 Cs
Observatoire de Neuchâtel (Neuchâtel)	5 Cs
Direction Générale des PTT (Berne)	2 Cs

They are intercompared by the TV method and linked to the foreign laboratories through the Office Fédéral de Métrologie.

(3) The standards are located as follows : ASMW, 2Cs ; ZIPE, 1 Cs.

(4) The standards are located as follows (at the end of 1986).

Centre Electronique de l'Armement (Rennes)	2 Cs
Centre National d'Etudes Spatiales	2 Cs
Centre National d'Etudes des Télécommunications	3 Cs
Centre d'Etudes et de Recherches Géodynamiques et Astronomiques	3 Cs
Electronique Serge Dassault (Trappes)	1 Cs
Hewlett-Packard (Orsay)	1 Cs
Observatoire de Paris : Laboratoire Primaire du Temps et des Fréquences (LPTF)	5 Cs
Observatoire de Besançon	2 Cs
Lab. de Physique et de Métrologie des Oscillateurs (Besançon)	1 Cs

They are intercompared by the TV method and linked to the foreign laboratories through OP (LPTF) (see Table 13).

Notes of Table 12 (cont.)

(5) The laboratory primary standards control TA(NBS) via an accuracy algorithm. Three of the commercial standards provide the reference for WWV and WWVB but do not contribute directly to TA(NBS); they are available for NBS time scales back-up and are compared to TA(NBS) to within 0.1μ s. The hydrogen masers are passively operated.

(6) The 2.1 meter primary cesium clock, CsV, operated continuously during 1986 producing the scale of proper time PT(NRC CsV).
The time scales UTC(NRC) and TA(NRC) were derived from PT(NRC CsV) according to the following expressions given in microseconds :

UTC(NRC) = PT(NRC CsV) - (MJD - 43144) x 0.000 97 + 52.041

TA(NRC) = PT(NRC CsV) - (MJD - 43144) x 0.000 97 + 20.972

with integral seconds disregarded.

Three 1 meter laboratory cesium clocks, CsVIA, -B, and -C, operated continuously as primary standards during 1986 producing the scales of proper time PT(NRC CsVIA), PT(NRC CsVIB) and PT(NRC CsVIC).

(7) The two Lab. Cs are functionning continuously (primary clocks).
TA(PTB) and UTC(PTB) are derived directly from a local oscillator monitored by the primary clock CS1.
MEZ(D) = UTC(PTB) + 1 h or MESZ(D) = UTC(PTB) + 2 h (summer time) is the legal time of the Federal Republic of Germany.

(8) The time scales UTC(USNO) and TA(USNO) depend on nominally 25 Cs selected clocks (selected on the basis of observed 5-day stability).

(9) TA(USNO) is designated by A.1 (MEAN) by USNO.

Table 13 - Equipment and links of the collaborating laboratories in 1986

Laboratory (i)	Equipment (1)	Source of UTC(i)	LORAN-C reception (2)	Television link with	GPS reception
AOS	1 Ind. Cs	1 Cs		TP, ZIPE	
APL	1 Ind. Cs 4 H Masers	1 H Maser		USNO	*
ASMW	2 Ind. Cs	corrected mean of 2 Cs	7970-W	ZIPE, TP, PTB	
ATC	7 Ind. Cs	1 Cs + microstepper		other lab. in Australia	* (since Sept.1986)
BEV	1 Ind. Cs	1 Cs	7970-W 7990-M 7990-X 7990-Y (3)	OMH, TUG, lab. in Czechoslovakia	
CAO	2 Ind. Cs	1 Cs	7990-M 7990-X 7990-Z	IEN, other lab. in Italy	
CH	see Table 12	all the Cs	7970-W 7990-Z	other lab. in Switzerland	* (4)
CSAO	4 Ind. Cs 3 H Masers	all the Cs	9970-Y	lab. in China	
DNM	5 Ind. Cs	all the Cs		other lab. in Australia	*
FTZ	7 Ind. Cs	1 Cs	7970-W		
IEN	5 Ind. Cs	1 Cs + microstepper	7990-M 7990-Z	CAO, other lab. in Italy	*
IFAG	4 Ind. Cs 2 H Masers	1 Cs + microstepper	7970-W		*
IGMA	4 Ind. Cs	1 Cs + microstepper		ONBA, other lab. in Argentina	* (since Aug.1986)

Table 13 - (cont.)

Laboratory (i)	Equipment (1)	Source of UTC(i)	LORAN-C reception (2)	Television link with	GPS reception
ILOM	5 Ind. Cs	1 Cs	9970-M	RRL, TAO, NRLM	
KSRI	4 Ind. Cs	1 Cs	9970-Y		
NBS	see Table 12	13 Cs 1 Lab. Cs 2 H Masers	9940-M 9960-Z		*
NIM	3 Ind. Cs	1 Cs + microstepper	9970-Y	lab. in China	
NML	2 Ind. Cs 2 H masers	all the Cs		other lab. in Sydney region	*
NPL	7 Ind. Cs 1 Lab. Cs	1 Cs	7970-W	transmitting station at Rugby	* (since Feb.1986)
NPLI	3 Ind. Cs	1 Cs			* (4) (since Aug.1986)
NPRL(5)	2 Ind. Cs	1 Cs			
NRC	see Table 12	Cs V	9960-M		*
NRLM	3 Ind. Cs 2 Lab. Cs	1 Cs	9970-M	ILOM, RRL, TAO	
OMH	1 Ind. Cs	1 Cs		BEV, SU, TP	
OMSF	6 Ind. Cs	all the Cs	7990-Z		* (4)
ONBA	2 Ind. Cs	2 Cs		IGMA other lab. in Argentina	
ONRJ(6)	2 Ind. Cs	2 Cs		other lab. in Brasil	
OP	5 Ind. Cs	1 Cs	7970-W 7990-Z	16 Lab. in France.	*

Table 13 - (cont.)

Laboratory (i)	Equipment (1)	Source of UTC(i)	LORAN-C reception (2)	Television link with	GPS reception
ORB	2 Ind. Cs	1 Cs	7970-W		* (4)
PKNM	4 Ind. Cs	corrected mean of 4 Cs	7970-W (3)		
PTB	see Table 12	Ind. Cs + microstepper steered by PTB primary standard	7970-W	ASMW, TP, ZIPE and other lab.	*
RGO	see Table 12	selection of the Cs	7970-M 7970-W 7990-Z 9980-X		* (4)
RRL	see Table 12	1 Cs + microstepper	9970-M	ILOM, TAO, NRLM	*
SO	see Table 12	1 Cs + microstepper	9970-Y	lab. in China	
STA	3 Ind. Cs	1 Cs	7970-W	other lab. in Sweden	
SU	see Table 12	2 Lab. Cs 1 Cs 4 H Masers 4 H Clocks	7970-W 7990-X 7990-Y 9970-X	other lab. in URSS, TP, OMH	
TAO	5 Ind. Cs	1 Cs + microstepper	9970-M 9970-Y	ILOM, RRL, NRLM	*
TL	4 Ind. Cs	1 Cs + microstepper	9970-M 9970-Y (7)		
TP	1 Ind. Cs	1 Cs + microstepper		PTB, AOS, SU, ZIPE, ASMW, OMH	
TUG	2 Ind. Cs	1 Cs	7970-W 7990-M	BEV	*
USNO(8)	see table 12	Master clock is H Maser + freq. synthesizer steered to UTC(USNO) (see table 12)	(9)	APL	*

Table 13 - (cont.)

Laboratory (i)	Equipment (1)	Source of UTC(i)	LORAN-C reception (2)	Television link with	GPS reception
VSL	4 Ind. Cs	Cs	7970-M 7970-W 9980-X	other Lab. in Holland	*
YUZM	1 Ind. Cs	Cs	7990-M		
ZIPE	1 Ind. Cs	1 Cs	7970-W	AOS, ASMW, TP, PTB	

Notes of Table 13

(1) Ind. Cs designates an industry made Cs standard;
Lab. Cs a laboratory Cs standard, H. Maser an Hydrogen Maser, and Rb designates a Rubidium standard.

(2) LORAN-C stations :

7970-M	Norwegian Sea chain,	Ejde
7970-W	.. ..	Sylt
7990-M	Mediterranean chain,	Simeri Crichi
7990-X	.. ..	Lampedusa
7990-Y	.. ..	Kargabarun
7990-Z	.. ..	Estartit
9940-M	West Coast chain,	Fallon
9960-M	Northeast Coast chain,	Seneca
9960-X	.. ..	Nantucket
9960-Z	.. ..	Dana
9970-M	Northwest Pacific chain,	Iwo Jima
9970-X	.. ..	Hokkaido
9970-Y	.. ..	Gesashi
9980-M	North Atlantic chain,	Angissog
9980-X	.. ..	Ejde

Notes of Table 13 (cont.)

(3) Reception of the Soviet Union LORAN chain 8000.

(4) Data not available for BIH computations in 1986

(5) VLF link.

(6) ONRJ is linked to the other laboratories by VLF receptions, OMEGA and GOES satellites.

(7) TL : reception of 9970-M until end of Aug. 1986
9970-Y since Sept. 1986.

(8) USNO Time Service Publication, Series 16, entitled Precise Time Transfer Report, lists UTC(USNO MC) - UTC(Reference Clock). Difference from Satellite Communication terminals and international timing centers using the Global Positioning System are reported. USNO Time Service Publication, Series 17, entitled Transit Satellite Reports, lists UTC(USNO MC) - UTC(Satellite Clock) and also the frequency offset of each satellite. Series 17 is available via the Automated Data Service and the General Electric Mark 3 international computer network (RC28 catalog).

(9) The daily phase values (published weekly, Series 4 of USNO) gives the values of UTC(USNO MC) - transmitting station for :

the LORAN-C chains	the US TV Network NBC
the OMEGA stations A, H, L, ND	the GPS satellite systems
the VLF station GBR	

These data are also available via the Automated Data Service (ADS) and the General Electric Mark 3 international computer network (RC28 catalog).
The ADS may be accessed on :

BELL 103/212 (300 or 1200 Baud)	202-653-1079
CCITT V.21 (300 Baud)	202-653-1095
CCITT V.22/V.22 bis (1200 or 2400 Baud)	202-653-1783

* Laboratories with GPS receiver equipment.

TABLE 14 - TIME COMPARISONS BETWEEN LABORATORIES BY CLOCK TRANSPORTATION IN 1986

UNLESS OTHERWISE STATED,THE TRANSPORTATION WAS CARRIED OUT BY THE FIRST MENTIONED LABORATORY

DATE	MJD	TIME COMPARISONS		UNCERT.	SOURCE
1986		(UNIT : 1 MICROSECOND)			
JAN 22	46452.04	UTC(TAO) - UTC(RRL) =	-10.350	0.005	TAO letter
JAN 30	46460.0	UTC(SU) - UTC(NPL) =	-28.04	0.01	SU telex
FEB 13	46474.31	UTC(USNO) - UTC(ATC) =	-15.86	0.20	USNO DPV 996 (1)
FEB 14	46475.22	UTC(USNO) - UTC(DNM) =	-41.92	0.20	USNO DPV 996 (2)
FEB 26	46487.05	UTC(RRL) - UTC(TAO) =	9.223	0.01	RRL letter
MAR 11	46500.02	UTC(TAO) - UTC(NRLM) =	-14.945	0.010	TAO letter
MAR 24	46513.18	UTC(TAO) - UTC(RRL) =	-8.351	0.005	TAO letter
MAR 27	46516.99	UTC(TAO) - UTC(ILOM) =	-24.025	0.035	TAO letter
APR 9	46529.5	UTC(OMH) - UTC(BEV) =	-6.3	0.1	OMH letter
APR 22	46542.1	UTC(USNO) - UTC(RRL) =	0.28	0.03	USNO DPV 1010
APR 23	46543.0	UTC(USNO) - UTC(TAO) =	7.80	0.04	USNO DPV 1010
APR 24	46544.04	UTC(RRL) - UTC(TAO) =	7.439	0.005	RRL message
MAY 20	46570.1	UTC(TAO) - UTC(RRL) =	-6.380	0.005	TAO message
JUN 3	46584	UTC(SU) - UTC(ZIPE) =	-28.22	0.05	SU letter
JUN 4	46585	UTC(SU) - UTC(ASMW) =	-28.16	0.05	SU letter
JUN 13	46594.0	UTC(OMH) - UTC(SU) =	20.07	0.02	OMH letter
JUN 24	46605.05	UTC(RRL) - UTC(TAO) =	5.392	0.005	RRL letter
JUL 22	46633.05	UTC(TAO) - UTC(RRL) =	-4.653	0.003	TAO letter
SEP 2	46675.06	UTC(RRL) - UTC(TAO) =	3.625	0.005	RRL letter
SEP 24	46697.02	UTC(TAO) - UTC(RRL) =	-3.188	0.004	TAO message
OCT 1	46704.54	UTC(PKNM) - UTC(ASMW) =	2.928		PKNM telex
OCT 28	46731.12	UTC(RRL) - UTC(TAO) =	2.677	0.005	RRL letter
OCT 30	46733.54	UTC(PKNM) - UTC(SU) =	30.077		PKNM telex
NOV 4	46738.09	UTC(USNO) - UTC(RRL) =	3.50	0.06	USNO DPV 1042
NOV 5	46739.01	UTC(USNO) - UTC(TAO) =	6.02	0.06	USNO DPV 1042
NOV 18	46752.00	UTC(TAO) - UTC(ILOM) =	-30.321	0.020	TAO message
NOV 25	46759	UTC(SU) - UTC(BEV) =	-32.83	0.05	SU letter
NOV 25	46759.05	UTC(TAO) - UTC(RRL) =	-2.211	0.003	TAO message
NOV 28	46762.10	UTC(TAO) - UTC(NRLM) =	-15.492	0.008	TAO message
NOV 28	46762	UTC(SU) - UTC(STA) =	-24.14	0.05	SU letter
DEC 22	46786.22	UTC(RRL) - UTC(TAO) =	1.795	0.005	RRL letter

COMPLEMENTARY RESULTS FOR THE PREVIOUS YEAR

1985					
MAY 31	46216	UTC(SU) - UTC(OMH) =	-23.67	0.05	SU letter
DEC 7	46406	UTC(SU) - UTC(ASMW) =	-29.28	0.02	SU letter

(1) USNO. UTC(USNO) stands for UTC(USNO MC)
DPV : Daily Phase Values, Series 4, published by USNO.
ATC . The clock transportation provides UTC(USNO) - UTC(AUS) = 0.99

(2) DNM stands for Cs205; that provides UTC(USNO) - UTC(AUS) = 1.60

TABLE 15 - INDEPENDENT ATOMIC TIMES

TA(i) DENOTES THE ATOMIC TIME OF THE LABORATORY i

UNIT IS ONE MICROSECOND

DATE 1986	MJD	TAI - TA(i) CH	DDR (1)	F (2)	NBS (2)
JAN 9	46439	-32.55	-9.92	15.319	-45085.189
JAN 19	46449	-32.83	-9.98	15.807	-45085.438
JAN 29	46459	-32.97	-10.05	16.279	-45085.676
FEB 8	46469	-33.03	-10.10	16.711	-45085.912
FEB 18	46479	-33.22	-10.22	17.142	-45086.177
FEB 28	46489	-33.43	-10.03	17.618	-45086.423
MAR 10	46499	-33.95	-10.08	18.081	-45086.637
MAR 20	46509	-34.22	-10.16	18.551	-45086.869
MAR 30	46519	-34.43	-10.19	19.035	-45087.097
APR 9	46529	-34.60	-10.32	19.468	-45087.348
APR 19	46539	-34.84	-10.39	19.937	-45087.632
APR 29	46549	-35.09	-10.47	20.392	-45087.919
MAY 9	46559	-35.18	-10.64	20.874	-45088.191
MAY 19	46569	-35.43	-10.90	21.354	-45088.481
MAY 29	46579	-35.66	-11.12	21.844	-45088.757
JUN 8	46589	-35.88	-11.30	22.325	-45089.024
JUN 18	46599	-36.09	-11.48	22.856	-45089.301
JUN 28	46609	-36.29	-11.63	23.399	-45089.558
JUL 8	46619	-36.54	-11.81	23.922	-45089.814
JUL 18	46629	-36.76	-11.95	24.462	-45090.072
JUL 28	46639	-37.03	-12.22	25.003	-45090.341
AUG 7	46649	-37.24	-12.50	25.505	-45090.621
AUG 17	46659	-37.46	-12.75	26.035	-45090.863
AUG 27	46669	-37.67	-12.98	26.580	-45091.114
SEP 6	46679	-37.91	-13.22	27.116	-45091.381
SEP 16	46689	-38.13	-13.41	27.590	-45091.649
SEP 26	46699	-38.34	-13.56	28.123	-45091.907
OCT 6	46709	-38.59	-13.74	28.627	-45092.183
OCT 16	46719	-38.81	-13.99	29.145	-45092.444
OCT 26	46729	-38.96	-14.19	29.638	-45092.701
NOV 5	46739	-39.17	-14.28	30.137	-45092.947
NOV 15	46749	-39.40	-14.38	30.605	-45093.212
NOV 25	46759	-39.57	-14.47	31.054	-45093.467
DEC 5	46769	-39.73	-14.54	31.504	-45093.743
DEC 15	46779	-39.94	-14.55	31.933	-45094.012
DEC 25	46789	-40.04	-14.54	32.396	-45094.298

TABLE 15 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1986	MJD	TAI - TA(i) NRC (2)	PTB (2)	RGO	RRL
JAN 9	46439	21.714	-359.775	63.91	-4.098
JAN 19	46449	21.793	-359.700	64.02	-4.096
JAN 29	46459	21.862	-359.671	64.05	-4.121
FEB 8	46469	21.929	-359.614	63.93	-4.089
FEB 18	46479	21.970	-359.577	63.89	-4.050
FEB 28	46489	22.005	-359.507	63.91	-4.021
MAR 10	46499	22.063	-359.507	64.03	-3.957
MAR 20	46509	22.101	-359.485	64.10	-3.909
MAR 30	46519	22.152	-359.446	64.09	-3.868
APR 9	46529	22.214	-359.429	64.14	-3.774
APR 19	46539	22.274	-359.391	64.25	-3.730
APR 29	46549	22.327	-359.353	64.18	-3.644
MAY 9	46559	22.418	-359.338	64.20	-3.618
MAY 19	46569	22.467	-359.351	64.20	-3.519
MAY 29	46579	22.559	-359.360	64.21	-3.530
JUN 8	46589	22.645	-359.354	64.23	-3.487
JUN 18	46599	22.693	-359.323	64.32	-3.452
JUN 28	46609	22.740	-359.325	64.42	-3.360
JUL 8	46619	22.775	-359.352	64.49	-3.260
JUL 18	46629	22.815	-359.340	64.58	-3.229
JUL 28	46639	22.877	-359.381	64.69	-3.219
AUG 7	46649	22.816	-359.412	64.77	-3.186
AUG 17	46659	22.818	-359.417	64.86	-3.107
AUG 27	46669	22.802	-359.405	64.92	-3.088
SEP 6	46679	22.806	-359.418	65.06	-3.083
SEP 16	46689	22.757	-359.414	65.00	-3.095
SEP 26	46699	22.794	-359.390	64.91	-3.126
OCT 6	46709	22.797	-359.422	64.93	-3.116
OCT 16	46719	22.788	-359.404	64.96	-3.127
OCT 26	46729	22.843	-359.415	64.97	-3.161
NOV 5	46739	22.947	-359.385	65.05	-3.178
NOV 15	46749	23.013	-359.393	65.11	-3.204
NOV 25	46759	23.096	-359.376	65.22	-3.202
DEC 5	46769	23.128	-359.361	65.26	-3.202
DEC 15	46779	23.126	-359.342	65.34	-3.210
DEC 25	46789	23.134	-359.389	65.36	-3.214

TABLE 15 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1986	MJD	TAI - TA(i) SO	SU (3)	USNO (2)
JAN 9	46439	-45.71	2827277.95	-34515.199
JAN 19	46449	-45.81	2827277.79	-34515.621
JAN 29	46459	-45.89	2827277.82	-34516.050
FEB 8	46469	-45.94	2827277.52	-34516.509
FEB 18	46479	-45.95	2827277.42	-34516.959
FEB 28	46489	-46.00	2827277.11	-34517.381
MAR 10	46499	-46.07	2827277.03	-34517.823
MAR 20	46509	-46.13	2827277.05	-34518.268
MAR 30	46519	-46.39	2827277.15	-34518.704
APR 9	46529	-46.41	2827276.98	-34519.155
APR 19	46539	-46.30	2827276.93	-34519.592
APR 29	46549	-46.17	2827277.45	-34520.031
MAY 9	46559	-46.29	2827277.19	-34520.475
MAY 19	46569	-46.43	2827277.16	-34520.947
MAY 29	46579	-46.59	2827276.92	-34521.402
JUN 8	46589	-46.66	2827276.22	-34521.873
JUN 18	46599	-46.78	2827276.60	-34522.347
JUN 28	46609	-46.82	2827276.43	-34522.808
JUL 8	46619	-46.88	2827276.42	-34523.276
JUL 18	46629	-46.87	2827276.35	-34523.758
JUL 28	46639	-46.93	2827276.57	-34524.232
AUG 7	46649	-47.08	2827276.07	-34524.701
AUG 17	46659	-47.11	2827276.00	-34525.147
AUG 27	46669	-47.23	2827276.06	-34525.597
SEP 6	46679	-47.28	2827275.79	-34526.071
SEP 16	46689	-47.18	2827275.62	-34526.539
SEP 26	46699	-47.23	2827275.60	-34526.990
OCT 6	46709	-47.32	2827275.52	-34527.469
OCT 16	46719	-47.60	2827275.55	-34527.935
OCT 26	46729	-47.55	2827275.31	-34528.413
NOV 5	46739	-47.75	2827275.30	-34528.878
NOV 15	46749	-47.76	2827275.34	-34529.355
NOV 25	46759	-47.67	2827275.25	-34529.830
DEC 5	46769	-47.80	2827275.11	-34530.299
DEC 15	46779	-47.84	2827275.02	-34530.800
DEC 25	46789	-47.73	2827274.93	-34531.339

TABLE 15 - (CONT.)

NOTES

(1) DDR . The apparent time step of TAI-TA(DDR) between MJD=46429 and MJD=46439 of about -0.81 μs, is due to the adoption by BIH of the television link between PTB and ASMW, instead of the LORAN-C receptions.

(2) F, NBS, NRC, PTB, USNO

On account of changes of delay corrections for GPS receivers, the following steps of the TAI-TA(i) appear between MJD=46429 and MJD=46439 :

laboratory	step(new-old)
F	5 ns
NBS	13 ns
NRC	13 ns
PTB	4 ns
USNO	-12 ns

(3) SU . The time link used in 1986 to compute TAI-TA(SU) is the television link between SU and TP. The values of TAI-TA(SU) for the month of December are provisional.

TABLE 16 - PRIMARY STANDARDS USED AS CLOCKS

Unit is one microsecond

TAI-LAB.STD.

DATE 1986	MJD	PTB (1)		NRC (2)			
		CS1 (3)	CS2	CsV (3)	CsVI A (3)	CsVI B (3)	CsVI C (3)
JAN 9	46439	3.634	-	39.489	27.890	37.815	30.823
JAN 19	46449	3.680	-	39.559	28.065	37.977	30.839
JAN 29	46459	3.735	-	39.618	28.151	38.127	30.857
FEB 8	46469	3.797	-	39.675	28.164	38.323	30.878
FEB 18	46479	3.828	-	39.707	28.171	38.374	30.861
FEB 28	46489	3.862	-	39.732	28.173	38.393	30.825
MAR 10	46499	3.898	-	39.781	28.189	38.660	30.825
MAR 20	46509	3.908	-	39.809	28.213	38.921	30.821
MAR 30	46519	3.946	-	39.849	28.282	38.938	30.791
APR 9	46529	3.985	-	39.902	28.352	39.023	30.744
APR 19	46539	4.026	-	39.952	28.428	39.105	30.819
APR 29	46549	4.042	-	39.997	28.426	39.280	30.890
MAY 9	46559	4.042	-	40.076	28.419	39.301	30.981
MAY 19	46569	4.036	-	40.117	28.359	39.310	31.036
MAY 29	46579	4.039	-	40.199	28.446	39.451	31.078
JUN 8	46589	4.061	-	40.275	28.510	39.456	31.099
JUN 18	46599	4.063	-	40.314	28.545	39.480	31.114
JUN 28	46609	4.058	-	40.351	28.517	39.649	31.199
JUL 8	46619	4.060	-	40.376	28.570	39.715	31.278
JUL 18	46629	4.030	-	40.406	28.655	39.778	31.330
JUL 28	46639	4.019	-	40.459	28.755	39.880	31.404
AUG 7	46649	3.993	3.971	40.387	28.839	39.917	31.407
AUG 17	46659	3.996	3.943	40.379	28.975	40.018	31.492
AUG 27	46669	3.986	3.893	40.354	29.104	40.132	31.580
SEP 6	46679	3.986	3.860	40.348	29.265	40.196	31.627
SEP 16	46689	3.992	3.821	40.290	29.460	40.300	31.691
SEP 26	46699	3.987	3.789	40.317	29.631	40.403	31.834
OCT 6	46709	3.988	3.741	40.310	29.761	40.523	31.950
OCT 16	46719	3.994	3.708	40.291	29.861	40.650	32.021
OCT 26	46729	3.997	3.709	40.337	29.940	40.752	32.082
NOV 5	46739	4.019	3.717	40.431	30.012	40.839	32.059
NOV 15	46749	4.024	3.688	40.488	30.082	40.919	32.095
NOV 25	46759	4.032	3.668	40.560	30.163	41.018	32.162
DEC 5	46769	4.026	3.658	40.583	30.146	41.078	32.234
DEC 15	46779	4.036	3.658	40.572	30.155	41.141	32.321
DEC 25	46789	4.030	3.637	40.570	30.158	41.203	32.410

TABLE 16 - (CONT.)

NOTES

(1) The time scales under the headline PTB are coordinate time scales at sea level derived from the scales of proper time produced by standards CS1 and CS2 of PTB. The gravitational correction is -0.00066 μs/d .

(2) The time scales under the headline NRC are the scales of proper time PT(NRC Cs V), PT(NRC Cs VI A), PT(NRC Cs VI B), PT(NRC Cs VI C) produced directly by standards Cs V, Cs VI A, Cs VI B, Cs VI C of NRC. The gravitational frequency correction to these time scales of proper time to obtain coordinate times at sea level is -0.00097 μs/d .

(3) On account of changes of delay corrections for GPS receivers, the following steps of the TAI - LAB.STD. appeared between MJD=46429 and MJD=46439 :

Laboratory	step(new-old)
NRC	13 ns
PTB	5 ns

TABLE 17 - COORDINATED UNIVERSAL TIME

UTC(i) DENOTES THE APPROXIMATION TO UTC KEPT BY THE LABORATORY i

UNIT IS ONE MICROSECOND

DATE 1986	MJD	UTC - UTC(i) AOS (1)	APL (2)(*)	ASMW (1)	AUS	BEV	CAO (3)
JAN 9	46439	-0.91	-0.085	0.03	-1.743	-6.59	-4.14
JAN 19	46449	-0.77	-0.163	0.21	-1.683	-5.44	-4.16
JAN 29	46459	-0.62	-0.229	0.29	-1.709	-4.14	-4.24
FEB 8	46469	-0.46	-0.388	0.39	-1.733	-2.57	-4.14
FEB 18	46479	-0.43	-0.418	0.44	-1.815	-1.55	-4.11
FEB 28	46489	-0.39	-0.746	0.65	-1.813	0.05	-4.01
MAR 10	46499	-0.44	-0.851	0.66	-1.788	1.23	-3.78
MAR 20	46509	-0.57	-0.954	0.65	-1.861	1.42	-3.64
MAR 30	46519	-0.70	-1.010	0.57	-1.862	1.29	-3.50
APR 9	46529	-0.80	-1.059	0.30	-2.094	1.09	-3.32
APR 19	46539	-0.78	-1.093	0.07	-2.201	0.82	-3.11
APR 29	46549	-0.82	-1.142	-0.16	-2.318	0.72	-2.99
MAY 9	46559	-0.87	-1.117	-0.40	-2.490	0.18	-2.85
MAY 19	46569	-0.98	-1.115	-0.75	-2.611	-0.20	-2.68
MAY 29	46579	-1.08	-1.092	-1.06	-2.650	-0.62	-2.49
JUN 8	46589	-1.00	-1.061	-1.25	-2.761	-1.23	-2.39
JUN 18	46599	-0.98	-1.055	-1.28	-2.926	-1.51	-2.56
JUN 28	46609	-0.87	-1.047	-1.39	-3.079	-2.17	-2.50
JUL 8	46619	-0.72	-1.044	-1.56	-3.159	-2.84	-2.51
JUL 18	46629	-0.75	-1.040	-1.69	-3.349	-2.91	-2.49
JUL 28	46639	-0.71	-1.076	-1.75	-3.540	-3.26	-2.51
AUG 7	46649	-0.63	-1.044	-1.83	-3.578	-3.66	-2.50
AUG 17	46659	-0.50	-1.073	-1.89	-3.802	-3.94	-2.56
AUG 27	46669	-0.43	-1.065	-1.90	-4.052	-4.39	-2.73
SEP 6	46679	-0.45	-1.074	-1.85	-4.335	-4.67	-2.89
SEP 16	46689	-0.45	-1.074	-1.63	-4.476	-5.02	-3.00
SEP 26	46699	-0.40	-1.064	-1.38	-4.598	-5.41	-3.06
OCT 6	46709	-0.40	-1.078	-1.16	-4.733	-5.77	-3.16
OCT 16	46719	-0.44	-1.060	-1.17	-4.878	-6.16	-3.09
OCT 26	46729	-0.48	-1.079	-1.09	-5.032	-6.57	-3.11
NOV 5	46739	-0.51	-1.056	-0.90	-5.196	-6.98	-3.29
NOV 15	46749	-0.57	-1.055	-0.69	-5.379	-7.40	-3.45
NOV 25	46759	-0.60	-1.040	-0.48	-5.495	-7.80	-3.45
DEC 5	46769	-0.61	-1.039	-0.50	-5.630	-8.11	-3.48
DEC 15	46779	-0.64	-1.029	-0.45	-5.755	-8.37	-3.43
DEC 25	46789	-0.53	-1.015	-0.37	-5.854	-8.48	-3.60

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1986	MJD	UTC - UTC(i) CH	CSAO	FTZ (4)	IEN (5)(*)	IFAG (6)	ILOM (7)
JAN 9	46439	0.25	3.48	3.50	-20.577	-0.86	-16.83
JAN 19	46449	0.25	3.48	3.55	-20.739	-0.93	-17.23
JAN 29	46459	0.40	3.48	3.69	-20.898	-1.11	-17.64
FEB 8	46469	0.61	3.49	3.86	-21.030	-1.29	-18.06
FEB 18	46479	0.70	3.58	4.07	-21.124	-1.83	-18.53
FEB 28	46489	0.77	3.53	4.18	-21.093	-2.29	-18.88
MAR 10	46499	0.54	3.43	4.36	-21.037	-3.16	-19.34
MAR 20	46509	0.54	3.45	4.41	-20.951	-3.86	-19.82
MAR 30	46519	0.61	3.56	4.53	-20.811	-4.37	-20.32
APR 9	46529	0.70	3.55	4.66	-20.788	-4.44	-20.77
APR 19	46539	0.70	3.55	4.75	-20.748	-4.48	-21.27
APR 29	46549	0.69	3.51	4.83	-20.710	-4.81	-21.66
MAY 9	46559	0.84	3.38	4.94	-20.616	-5.19	-22.07
MAY 19	46569	0.83	3.30	5.25	-1.502	-5.28	-22.58
MAY 29	46579	0.84	3.24	5.38	-1.324	-5.04	-23.00
JUN 8	46589	0.85	3.18	5.46	-1.218	-4.96	-23.46
JUN 18	46599	0.89	2.96	5.65	-1.138	-4.89	-23.80
JUN 28	46609	0.93	2.81	5.88	-1.054	-4.79	-24.20
JUL 8	46619	0.92	2.80	6.11	-0.941	-4.589	-24.62
JUL 18	46629	0.94	2.66	6.33	-0.718	-4.499	-
JUL 28	46639	0.91	2.56	6.48	-0.467	-4.532	-
AUG 7	46649	0.94	2.18	6.66	-0.287	-4.648	-25.57
AUG 17	46659	0.96	2.04	6.83	-0.057	-4.930	-25.91
AUG 27	46669	0.99	1.86	6.91	0.126	-5.120	-26.26
SEP 6	46679	0.99	1.66	6.99	0.316	-5.325	-26.61
SEP 16	46689	1.01	1.55	7.07	0.502	-5.506	-27.02
SEP 26	46699	1.02	1.58	7.17	0.721	-5.656	-27.34
OCT 6	46709	1.00	1.20	7.41	0.944	-5.767	-27.60
OCT 16	46719	1.00	0.98	7.63	1.193	-5.977	-28.01
OCT 26	46729	1.06	0.78	7.92	1.236	-5.927	-28.55
NOV 5	46739	1.08	0.51	8.19	1.175	-5.568	-28.98
NOV 15	46749	1.06	0.24	8.39	1.110	-5.274	-29.15
NOV 25	46759	1.13	0.11	8.53	1.112	-4.934	-29.44
DEC 5	46769	1.18	-0.17	8.76	1.017	-4.571	-29.63
DEC 15	46779	1.19	-0.33	8.99	0.943	-4.141	-29.79
DEC 25	46789	1.31	-0.32	9.16	0.856	-3.712	-30.04

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1986	MJD	UTC - UTC(i) KSRI (8)	NBS (*)	NIM	NPL (9)	NRC (*)
JAN 9	46439	-10.97	-0.729	9.91	-0.08	-9.355
JAN 19	46449	-11.53	-0.720	10.36	-0.03	-9.276
JAN 29	46459	-12.04	-0.695	10.48	0.04	-9.207
FEB 8	46469	-12.53	-0.679	10.96	0.14	-9.140
FEB 18	46479	-13.06	-0.696	10.94	0.23	-9.099
FEB 28	46489	-13.64	-0.716	11.18	0.34	-9.064
MAR 10	46499	-14.22	-0.706	11.63	0.51	-9.006
MAR 20	46509	-14.91	-0.699	11.91	0.65	-8.968
MAR 30	46519	-15.70	-0.699	12.24	0.79	-8.917
APR 9	46529	-15.97	-0.696	12.35	0.939	-8.855
APR 19	46539	-15.83	-0.725	12.54	1.027	-8.795
APR 29	46549	-15.51	-0.745	12.83	1.114	-8.741
MAY 9	46559	-15.10	-0.754	12.87	1.155	-8.651
MAY 19	46569	-14.86	-0.789	13.08	1.166	-8.602
MAY 29	46579	-14.91	-0.807	13.29	1.184	-8.510
JUN 8	46589	-14.97	-0.803	13.56	1.204	-8.424
JUN 18	46599	-15.14	-0.819	13.84	1.272	-8.375
JUN 28	46609	-15.35	-0.797	14.01	1.324	-8.329
JUL 8	46619	-	-0.783	14.12	1.365	-8.294
JUL 18	46629	-	-0.766	14.46	1.407	-8.254
JUL 28	46639	7.78	-0.752	14.49	1.445	-8.192
AUG 7	46649	7.61	-0.734	14.57	1.467	-8.253
AUG 17	46659	7.59	-0.679	14.65	1.527	-8.251
AUG 27	46669	7.57	-0.631	14.66	1.567	-8.267
SEP 6	46679	7.50	-0.606	14.63	1.613	-8.263
SEP 16	46689	7.61	-0.577	14.77	1.625	-8.312
SEP 26	46699	7.62	-0.534	14.76	1.653	-8.275
OCT 6	46709	7.65	-0.506	14.75	1.707	-8.272
OCT 16	46719	7.70	-0.467	14.58	1.753	-8.281
OCT 26	46729	7.70	-0.429	14.48	1.810	-8.226
NOV 5	46739	7.65	-0.387	14.31	1.869	-8.122
NOV 15	46749	7.60	-0.365	13.89	1.919	-8.056
NOV 25	46759	7.62	-0.328	13.99	1.987	-7.973
DEC 5	46769	7.59	-0.318	13.76	2.032	-7.941
DEC 15	46779	7.29	-0.306	13.37	2.095	-7.943
DEC 25	46789	7.42	-0.299	13.14	2.184	-7.935

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1986	MJD	UTC - UTC(i) NRLM	OMH	OMSF	OP (*)	ORB
JAN 9	46439	-10.13	6.52	1.38	0.309	-18.34
JAN 19	46449	-10.27	6.70	1.25	0.425	-18.36
JAN 29	46459	-10.39	6.30	1.21	0.594	-17.84
FEB 8	46469	-10.49	6.10	0.93	0.602	-17.50
FEB 18	46479	-10.58	5.69	1.18	0.549	-17.23
FEB 28	46489	-10.66	5.98	0.89	0.548	-17.44
MAR 10	46499	-10.73	6.51	1.05	0.495	-
MAR 20	46509	-10.85	6.07	0.87	0.439	-
MAR 30	46519	-10.96	6.51	0.71	0.369	-21.52
APR 9	46529	-11.05	6.86	0.71	0.260	-21.77
APR 19	46539	-11.15	6.73	0.70	0.166	-22.02
APR 29	46549	-11.24	6.75	0.81	0.065	-22.35
MAY 9	46559	-11.31	6.23	1.09	-0.018	-22.70
MAY 19	46569	-11.46	6.10	1.24	-0.159	-23.07
MAY 29	46579	-11.58	6.22	1.67	-0.303	-23.30
JUN 8	46589	-11.74	7.06	1.95	-0.425	-23.69
JUN 18	46599	-11.92	6.91	2.07	-0.591	-24.58
JUN 28	46609	-12.09	7.30	1.97	-0.728	-25.54
JUL 8	46619	-12.27	7.19	1.90	-0.780	-26.43
JUL 18	46629	-12.44	7.03	1.86	-0.745	-27.58
JUL 28	46639	-12.60	6.49	1.69	-0.703	-28.40
AUG 7	46649	-12.78	6.14	1.64	-0.626	-29.27
AUG 17	46659	-12.92	6.26	1.53	-0.503	-30.04
AUG 27	46669	-13.09	6.42	1.46	-0.401	-29.91
SEP 6	46679	-13.27	6.39	1.59	-0.327	-30.55
SEP 16	46689	-13.46	6.43	1.78	-0.304	-30.70
SEP 26	46699	-13.66	6.75	1.78	-0.214	-31.05
OCT 6	46709	-13.80	6.91	1.72	-0.150	-31.02
OCT 16	46719	-14.01	6.83	1.79	-0.115	-31.18
OCT 26	46729	-14.19	6.81	1.54	-0.228	-31.03
NOV 5	46739	-14.33	6.99	1.50	-0.162	-31.13
NOV 15	46749	-14.47	7.20	1.98	-0.186	-30.95
NOV 25	46759	-14.64	7.12	1.93	-0.359	-31.15
DEC 5	46769	-14.80	7.41	1.80	-0.595	-31.22
DEC 15	46779	-14.98	7.43	2.32	-0.835	-31.35
DEC 25	46789	-15.13	7.60	2.26	-1.008	-31.57

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1986	MJD	UTC - UTC(i) PKNM	PTB (*)	RGO	RRL	SO	STA
JAN 9	46439	-0.83	3.625	-10.00	-5.708	-11.64	1.10
JAN 19	46449	-0.76	3.700	-9.89	-5.616	-11.64	0.23
JAN 29	46459	-0.62	3.728	-9.85	-5.461	-11.62	-0.64
FEB 8	46469	-0.30	3.786	-9.98	-5.269	-11.65	-1.76
FEB 18	46479	-0.34	3.823	-10.02	-5.060	-11.68	-2.72
FEB 28	46489	-0.18	3.893	-10.00	-4.841	-11.77	-3.66
MAR 10	46499	-0.16	3.892	-9.88	-4.607	-11.93	-4.64
MAR 20	46509	-0.14	3.915	-9.81	-4.409	-12.08	-5.56
MAR 30	46519	-0.20	3.954	-9.82	-4.218	-12.45	-5.71
APR 9	46529	-0.29	3.971	-9.77	-3.964	-12.48	-5.21
APR 19	46539	-0.24	4.009	-9.66	-3.740	-12.34	-4.81
APR 29	46549	-0.26	4.046	-9.73	-3.444	-12.16	-4.43
MAY 9	46559	-0.29	4.062	-9.71	-3.178	-12.30	-3.96
MAY 19	46569	-0.72	4.049	-9.71	-2.879	-12.48	-3.56
MAY 29	46579	-1.05	4.040	-9.70	-2.730	-12.70	-3.16
JUN 8	46589	-1.36	4.045	-9.68	-2.497	-12.77	-2.65
JUN 18	46599	-1.82	4.076	-9.59	-2.262	-12.84	-2.10
JUN 28	46609	-2.04	4.075	-9.49	-2.010	-12.81	-1.56
JUL 8	46619	-2.27	4.048	-9.42	-1.890	-12.86	-1.00
JUL 18	46629	-2.50	4.060	-9.33	-1.809	-12.88	-0.50
JUL 28	46639	-2.58	4.019	-9.22	-1.739	-12.97	0.02
AUG 7	46649	-2.71	3.988	-9.14	-1.646	-13.16	0.49
AUG 17	46659	-2.70	3.983	-9.05	-1.527	-13.22	1.03
AUG 27	46669	-2.91	3.995	-8.99	-1.468	-13.38	1.36
SEP 6	46679	-3.27	3.981	-8.85	-1.403	-13.46	1.60
SEP 16	46689	-3.66	3.986	-8.91	-1.365	-13.39	1.71
SEP 26	46699	-3.99	4.010	-9.00	-1.346	-13.46	1.77
OCT 6	46709	-4.36	3.978	-8.98	-1.316	-13.54	1.85
OCT 16	46719	-4.48	3.996	-8.95	-1.327	-13.78	1.93
OCT 26	46729	-4.49	3.985	-8.94	-1.371	-13.68	1.90
NOV 5	46739	-4.40	4.015	-8.86	-1.388	-13.83	1.83
NOV 15	46749	-4.23	4.007	-8.80	-1.404	-13.78	1.85
NOV 25	46759	-4.02	4.023	-8.69	-1.392	-13.64	1.87
DEC 5	46769	-3.82	4.039	-8.65	-1.402	-13.71	1.86
DEC 15	46779	-3.61	4.058	-8.57	-1.400	-13.68	1.83
DEC 25	46789	-3.47	4.010	-8.55	-1.404	-13.51	1.81

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1986		MJD	UTC - UTC(i) SU (10)	TAO (11)	TL	TP (12)	TUG (13)(*)
JAN	9	46439	27.95	4.984	163.96	-0.68	3.853
JAN	19	46449	27.79	4.859	165.23	-0.36	4.181
JAN	29	46459	27.82	4.752	166.47	-0.23	-4.509
FEB	8	46469	27.52	4.627	167.68	-0.58	-4.188
FEB	18	46479	27.42	4.468	168.82	-0.64	-3.886
FEB	28	46489	27.11	4.335	170.00	-0.49	-3.586
MAR	10	46499	27.03	4.233	171.19	-0.37	-3.302
MAR	20	46509	27.05	4.100	172.57	-0.15	-3.014
MAR	30	46519	27.15	3.983	173.94	0.05	-2.704
APR	9	46529	26.99	3.953	175.34	0.19	-2.408
APR	19	46539	26.93	3.910	176.77	0.43	-2.117
APR	29	46549	27.45	3.810	178.13	0.67	-1.853
MAY	9	46559	27.19	3.702	179.56	0.96	-1.585
MAY	19	46569	27.16	3.561	180.89	1.01	-1.323
MAY	29	46579	26.92	3.481	182.37	1.09	-1.075
JUN	8	46589	26.22	3.427	183.82	1.44	-0.822
JUN	18	46599	26.60	3.342	185.33	1.88	-0.557
JUN	28	46609	26.43	3.246	186.87	2.23	-0.301
JUL	8	46619	26.42	3.108	188.46	2.60	-0.052
JUL	18	46629	26.35	2.944	190.14	2.74	0.180
JUL	28	46639	26.57	2.787	191.73	2.86	0.416
AUG	7	46649	26.07	2.618	193.16	2.74	0.656
AUG	17	46659	26.00	2.482	194.48	2.80	0.945
AUG	27	46669	26.06	2.317	195.76	2.88	1.197
SEP	6	46679	25.80	2.150	197.14	2.75	1.465
SEP	16	46689	25.62	1.996	198.52	2.82	1.710
SEP	26	46699	25.60	1.822	199.75	3.05	1.979
OCT	6	46709	25.52	1.683	200.96	3.12	2.233
OCT	16	46719	25.55	1.502	202.06	3.12	2.476
OCT	26	46729	25.31	1.330	203.39	3.11	2.704
NOV	5	46739	25.30	1.171	204.47	3.22	2.951
NOV	15	46749	25.34	0.995	205.39	3.40	3.188
NOV	25	46759	25.25	0.825	206.34	3.33	3.456
DEC	5	46769	25.11	0.670	207.30	3.48	3.76
DEC	15	46779	25.02	0.513	208.08	3.44	4.14
DEC	25	46789	24.93	0.360	209.25	3.56	4.51

TABLE 17 - (CONT.)

UNIT IS ONE MICROSECOND

DATE 1986	MJD	UTC - UTC(i) USNO (*)	VSL (*)	YUZM	ZIPE (1)
JAN 9	46439	-3.035	4.059	-85.71	-0.91
JAN 19	46449	-3.135	4.228	-86.48	-0.77
JAN 29	46459	-3.221	4.491	-87.26	-0.62
FEB 8	46469	-3.315	4.586	-87.94	-0.46
FEB 18	46479	-3.427	4.413	-88.87	-0.43
FEB 28	46489	-3.505	4.577	-89.86	-0.39
MAR 10	46499	-3.620	4.766	-90.77	-0.44
MAR 20	46509	-3.733	4.814	-91.66	-0.57
MAR 30	46519	-3.824	4.749	-92.37	-0.70
APR 9	46529	-3.886	4.737	-92.77	-0.80
APR 19	46539	-3.933	4.786	-93.37	-0.78
APR 29	46549	-4.000	5.043	-93.89	-0.82
MAY 9	46559	-4.072	5.023	-94.21	-0.87
MAY 19	46569	-4.173	4.619	-94.51	-0.98
MAY 29	46579	-4.242	4.313	-94.45	-1.08
JUN 8	46589	-4.323	4.111	-94.64	-1.01
JUN 18	46599	-4.417	3.828	-94.86	-0.98
JUN 28	46609	-4.511	3.685	-94.75	-0.87
JUL 8	46619	-4.611	3.787	-94.97	-0.72
JUL 18	46629	-4.701	3.845	-95.25	-0.75
JUL 28	46639	-4.792	3.923	-95.48	-0.71
AUG 7	46649	-4.900	3.975	-95.43	-0.63
AUG 17	46659	-4.974	4.051	-95.50	-0.50
AUG 27	46669	-5.054	4.083	-95.76	-0.43
SEP 6	46679	-5.067	4.105	-95.99	-0.45
SEP 16	46689	-5.038	4.081	-96.20	-0.45
SEP 26	46699	-5.000	4.099	-96.47	-0.40
OCT 6	46709	-4.955	4.141	-97.02	-0.40
OCT 16	46719	-4.900	4.197	-97.58	-0.44
OCT 26	46729	-4.884	4.155	-98.20	-0.48
NOV 5	46739	-4.848	4.144	-98.78	-0.51
NOV 15	46749	-4.831	4.111	-99.41	-0.57
NOV 25	46759	-4.807	4.080	-100.02	-0.60
DEC 5	46769	-4.802	4.036	-100.75	-0.61
DEC 15	46779	-4.817	4.030	-101.57	-0.64
DEC 25	46789	-4.836	4.028	-102.26	-0.53

TABLE 17 - (CONT.)

NOTES

(1) AOS, ASMW, ZIPE
The apparent time step of UTC-UTC(i) between MJD=46429 and MJD=46439 of about -0.81 μs, is due to the adoption by BIH of the television link between PTB and ASMW, instead of the LORAN-C receptions.

(2) APL . Time step of UTC(APL) of -1.42 μs on MJD=46429

(3) CAO . Time step of UTC(CAO) of 10 μs on MJD=46431.00

(4) FTZ . Changes of master clock on MJD=46439 and on MJD=46734

(5) IEN . Time step of UTC(IEN) of -19.000 μs on MJD=46563.5

(6) IFAG. Introduction of GPS time link on MJD=46619

(7) ILOM. Change of master clock on MJD=46734

(8) KSRI. Change of master clock on MJD=46618

(9) NPL . Introduction of GPS time link on MJD=46529

(10) SU . On MJD = 46429, UTC - UTC(SU) = 27.44 μs
The time link used in 1986 to compute UTC-UTC(SU) is the television link between SU and TP. The values of UTC-UTC(SU) for the month of December are provisional.

(11) TAO . The UTC-UTC(TAO) values have been corrected by 100 ns on 1986 January 1st to restore agreement with the clock transportations.

(12) TP . Time step of UTC(TP) of 7 μs on MJD=46431.00

(13) TUG . Time step of UTC(TUG) of 9 μs on MJD=46453.64
LORAN-C receptions have been used for the month of December.

(*) APL, IEN, NBS, NRC, OP, PTB, TUG, USNO, VSL
On account of changes of delay corrections for GPS receivers, the following steps of the UTC-UTC(i) appear between MJD=46429 and MJD=46439 :

Lab.	step(new-old)	Lab.	step(new-old)
APL	-12 ns	PTB	5 ns
IEN	31 ns	TUG	10 ns
NBS	13 ns	USNO	-12 ns
NRC	13 ns	VSL	30 ns
OP	5 ns		

TABLE 17 - COORDINATED UNIVERSAL TIME (VLF)

UTC(i) DENOTES THE APPROXIMATION TO UTC KEPT BY THE LABORATORY i

UNIT IS ONE MICROSECOND

DATE 1986	MJD	UTC - UTC(i) IGMA (1)	INTI (2)	NPRL (3)	ONBA (4)
JAN 9	46439	-9	25	5.3	-2047
JAN 19	46449	-8	22	4.9	-
JAN 29	46459	-15	15	4.5	-2054
FEB 8	46469	-	-	4.0	-
FEB 18	46479	-18	16	3.6	-2058
FEB 28	46489	-18	17	3.2	-2059
MAR 10	46499	-10	21	2.8	-2052
MAR 20	46509	-12	21	2.4	-2053
MAR 30	46519	-16	17	1.9	-2059
APR 9	46529	-18	14	1.5	-2062
APR 19	46539	-14	16	1.1	-2058
APR 29	46549	-15	16	0.7	-2060
MAY 9	46559	-16	15	0.2	-2061
MAY 19	46569	-15	16	-0.2	-2062
MAY 29	46579	-14	17	-0.6	-2062
JUN 8	46589	-14	17	-1.0	-2063
JUN 18	46599	-14	17	-1.5	-2064
JUN 28	46609	-14	18	-1.9	-2065
JUL 8	46619	-15	18	-15.5	-2066
JUL 18	46629	-16	18	-16.0	-2068
JUL 28	46639	-16	17	-16.4	-2070
AUG 7	46649	-16	17	-16.8	-2070
AUG 17	46659	-13	17	-17.2	-2069
AUG 27	46669	-12.22	18	-17.6	-2052.34
SEP 6	46679	-12.32	17	-18.0	-2053.38
SEP 16	46689	-12.59	13	-18.5	-2054.48
SEP 26	46699	-12.74	13	-18.9	-2055.50
OCT 6	46709	-12.97	14	-19.3	-2056.57
OCT 16	46719	-13.27	17	-19.7	-2057.63
OCT 26	46729	-13.50	18	-20.2	-2058.69
NOV 5	46739	-13.59	16	-20.6	-2059.79
NOV 15	46749	-13.41	18	-21.0	-2060.61
NOV 25	46759	-13.37	23	-21.4	-2061.39
DEC 5	46769	-13.24	20	-21.9	-2062.24
DEC 15	46779	-13.18	21	-22.3	-2063.17
DEC 25	46789	-13.11	22	-22.7	-2063.99

TABLE 17 A - (CONT.)

NOTES

(1) IGMA . Since MJD = 46669, provisional results from GPS tracking (computed by IGMA).

(2) INTI . Since MJD = 46669, the listed values use the GPS receptions at IGMA.

(3) NPRL . Values computed by NPRL based on VLF until MJD=46784, on GPS afterwards. The GPS observations from MJD=46784 to MJD=46813, have been used to extrapolate UTC-UTC(NPRL) back to 1986 January 1.
A first discontinuity of UTC-UTC(NPRL) at MJD=46431.0 is due to the change in VLF calibration system.
A second discontinuity at MJD=46612.0 was caused by clock stoppage.

(4) ONBA . Referred to clock ONBA1. Uncertainties on the origin.

TABLE 18 - COMPARISONS BETWEEN THE CLOCK TRANSPORTATIONS AND THE BIH RESULTS

THE TABLE GIVES THE DIFFERENCES BETWEEN THE CLOCK TRANSPORTATION RESULTS AND THOSE DERIVED FROM THE DATA OF TABLE 17 (BEFORE ROUNDING-OFF)

DATE 1986	MJD	TIME COMPARISONS	DIFFERENCE CLOCK TR. - BIH (UNIT : 1 MICROSECOND)	
JAN 22	46452.04	UTC(TAO) - UTC(RRL)	0.045	
JAN 30	46460.0	UTC(SU) - UTC(NPL)	-0.30	
FEB 13	46474.31	UTC(USNO) - UTC(AUS)	-0.61	(1)
FEB 14	46475.22	UTC(USNO) - UTC(AUS)	0.00	(1)
FEB 26	46487.05	UTC(RRL) - UTC(TAO)	-0.022	
MAR 11	46500.02	UTC(TAO) - UTC(NRLM)	0.017	
MAR 24	46513.18	UTC(TAO) - UTC(RRL)	0.029	
MAR 27	46516.99	UTC(TAO) - UTC(ILOM)	0.198	
APR 9	46529.5	UTC(OMH) - UTC(BEV)	-0.5	
APR 22	46542.1	UTC(USNO) - UTC(RRL)	-0.03	
APR 23	46543.0	UTC(USNO) - UTC(TAO)	-0.03	
APR 24	46544.04	UTC(RRL) - UTC(TAO)	-0.011	
MAY 20	46570.1	UTC(TAO) - UTC(RRL)	0.035	
JUN 3	46584	UTC(SU) - UTC(ZIPE)	-0.61	
JUN 4	46585	UTC(SU) - UTC(ASMW)	-0.49	
JUN 13	46594.0	UTC(OMH) - UTC(SU)	0.65	
JUN 24	46605.05	UTC(RRL) - UTC(TAO)	-0.001	
JUL 22	46633.05	UTC(TAO) - UTC(RRL)	0.008	
SEP 2	46675.06	UTC(RRL) - UTC(TAO)	-0.019	
SEP 24	46697.02	UTC(TAO) - UTC(RRL)	0.018	
OCT 1	46704.54	UTC(PKNM) - UTC(ASMW)	-0.005	
OCT 28	46731.12	UTC(RRL) - UTC(TAO)	0.006	
OCT 30	46733.54	UTC(PKNM) - UTC(SU)	0.319	
NOV 4	46738.09	UTC(USNO) - UTC(RRL)	0.03	
NOV 5	46739.01	UTC(USNO) - UTC(TAO)	0.00	
NOV 18	46752.00	UTC(TAO) - UTC(ILOM)	-0.137	
NOV 25	46759	UTC(SU) - UTC(BEV)	0.21	
NOV 25	46759.05	UTC(TAO) - UTC(RRL)	0.005	
NOV 28	46762.10	UTC(TAO) - UTC(NRLM)	-0.025	
NOV 28	46762	UTC(SU) - UTC(STA)	-0.80	
DEC 22	46786.22	UTC(RRL) - UTC(TAO)	-0.010	

COMPLEMENTARY RESULTS FOR THE PREVIOUS YEAR

1985				
MAY 31	46216	UTC(SU) - UTC(OMH)	1.59	
DEC 7	46406	UTC(SU) - UTC(ASMW)	-1.52	

(1) From clock transportations to ATC and DNM (see Table 14).

TABLE 19 - INTERNATIONAL ATOMIC TIME, BI-MONTHLY RATES OF TAI-CLOCK FOR 1986

The rates are averaged over intervals of two months ending at the given dates.

Unit is ns/day, 0.0 denotes that the clock was not used.

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
APL	14 773	-123.07	-118.49	-138.29	-145.88	-147.94	-133.53
APL	14 793	235.17	245.08	247.72	0.0	0.0	0.0
APL	42 6	-3.62	3.12	1.32	1.58	-0.05	0.95
APL	42 13	0.0	0.0	0.0	0.0	-0.37	1.44
APL	42 14	0.0	0.0	0.0	0.0	-0.07	4.66
ASMW	16 76	15.11	15.79	-13.48	-22.95	-16.39	7.97
ASMW	16 165	0.0	17.79	7.73	0.44	6.07	15.71
AUS	11 288	-12.64	-15.93	-29.10	-23.99	-17.35	0.0
AUS	12 590	122.85	106.72	117.03	108.80	113.87	114.08
AUS	12 1195	0.0	-148.77	0.0	0.0	0.0	0.0
AUS	12 1708	0.0	0.0	0.0	0.0	0.0	-158.73
AUS	12 1823	0.0	0.0	0.0	0.0	0.0	-11.10
AUS	12 2196	0.0	0.0	-25.33	-22.24	0.0	0.0
AUS	14 902	0.0	0.0	0.0	0.0	0.0	-105.10
AUS	14 1363	40.36	43.08	42.29	0.0	0.0	0.0
AUS	14 1443	0.0	0.0	0.0	0.0	-8.37	-3.71
AUS	14 1719	29.14	25.86	25.82	22.48	21.29	22.30
AUS	14 1777	-139.17	-139.28	0.0	0.0	0.0	25.55
AUS	14 1844	0.0	0.0	36.39	40.07	33.10	40.65
AUS	14 2010	-40.96	-42.63	-54.03	-69.21	-46.60	-47.20
AUS	14 2020	-68.36	-63.88	-57.74	-55.68	0.0	0.0
AUS	44 1	20.70	23.90	25.21	25.04	26.04	28.04
AUS	44 2	35.07	35.89	35.64	34.04	33.75	36.82
BEV	16 71	130.48	3.13	-46.56	-34.35	-36.72	-32.90
CAO	16 52	0.0	0.63	-12.81	-8.03	0.0	-12.26
CAO	16 183	2.78	16.94	8.29	-2.80	-6.01	-6.41
CH	12 285	0.0	0.0	23.03	4.86	-13.41	-25.40
CH	12 863	-29.49	-35.16	-31.66	-44.19	-35.41	-27.91
CH	13 14	4.49	-10.07	-37.36	0.31	-37.20	-8.40
CH	14 1156	0.0	0.0	0.0	8.22	6.74	-13.94
CH	16 64	-0.31	-21.42	-47.62	-48.31	-38.05	-8.18
CH	16 69	-86.60	-93.82	-93.07	-97.12	-100.58	-94.21
CH	16 77	22.48	12.12	17.67	15.06	14.99	14.86
CH	16 114	-10.74	-6.65	19.10	-3.72	-6.62	-20.58
CH	16 140	113.79	94.38	13.27	-30.97	-14.26	60.15
CH	17 206	61.79	50.89	58.23	54.01	55.77	59.38
CH	17 208	-151.80	-157.96	0.0	0.0	-42.41	-37.29
CH	21 179	-56.28	-66.34	-67.29	-68.15	-66.73	-63.65
CH	21 194	149.15	133.25	130.02	123.17	120.01	118.71
CH	21 217	-160.01	-171.19	-160.33	-157.20	-153.44	-144.04

TABLE 19 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
CH	99 1	362.04	378.38	401.02	412.48	424.38	0.0
CSAO	12 1646	0.0	0.0	0.0	51.06	50.66	48.78
CSAO	12 1647	-235.92	-229.67	0.0	0.0	129.40	99.49
CSAO	12 1648	-2.51	-0.71	-2.85	-7.43	-5.63	16.82
F	12 158	-258.72	-241.20	-219.91	-203.21	-202.37	-211.17
F	12 347	-85.75	-94.82	0.0	0.0	0.0	0.0
F	12 475	210.04	239.73	252.00	238.37	227.32	222.15
F	12 2405	-27.92	0.0	0.0	0.0	-277.74	-312.93
F	14 134	-5.19	-2.77	-2.43	-1.46	-3.88	-9.25
F	14 195	0.0	0.0	0.0	0.0	-81.01	-99.53
F	14 500	0.0	0.0	-10.72	-3.28	-10.06	0.0
F	14 753	172.98	178.84	193.04	196.74	201.73	201.04
F	14 1120	0.0	0.0	0.0	0.0	-56.63	-63.05
F	14 1407	-136.58	-132.44	-134.14	-133.43	-131.62	-136.40
F	14 1645	-84.19	-87.50	-80.44	-77.90	-83.44	-91.77
F	14 1712	-27.43	-31.78	-37.07	-41.33	-39.65	0.0
F	16 106	0.0	0.0	-121.77	-133.42	-139.01	0.0
F	16 187	-49.99	-55.76	-52.91	-48.10	-44.02	0.0
FTZ	14 312	12.34	10.51	15.80	15.57	16.59	25.16
FTZ	14 895	12.88	11.01	16.43	13.09	8.33	10.03
FTZ	14 1217	19.20	0.0	0.0	0.0	14.58	-25.53
FTZ	14 1482	13.00	10.70	17.04	17.52	16.57	0.0
FTZ	14 1656	7.03	4.85	11.69	0.0	0.0	0.0
FTZ	14 1674	12.00	7.56	12.13	9.94	4.41	11.66
FTZ	16 130	13.28	8.32	13.01	14.67	16.86	21.75
IEN	12 303	127.69	127.83	125.22	125.69	121.93	120.89
IEN	12 609	60.73	62.65	70.03	77.18	79.27	75.13
IEN	14 893	16.09	16.07	21.85	30.92	31.39	25.87
IEN	16 84	150.80	138.32	116.27	110.34	119.07	146.83
IFAG	14 1105	0.0	-124.30	-114.69	0.0	0.0	-127.28
IFAG	16 131	127.95	97.50	110.20	106.41	111.56	119.30
IFAG	16 138	-6.09	-31.88	-11.36	-1.10	10.70	140.75
IFAG	16 173	69.39	74.38	75.19	55.78	0.0	88.39
ILOM	11 176	3449.74	3888.43	4765.57	5354.48	5967.14	5093.59
ILOM	14 614	-143.44	-152.76	-186.93	-151.28	-159.49	-219.73
ILOM	14 885	-49.96	-49.87	-52.22	0.0	-29.34	-17.95
ILOM	14 1315	-88.23	-94.59	-90.16	-81.23	-84.30	0.0
ILOM	14 2146	-21.86	-27.13	-28.20	-19.88	-21.88	-31.11
KSRI	12 1403	-301.76	-262.44	-252.65	0.0	-304.13	-321.88
KSRI	12 1406	351.11	397.83	388.84	0.0	252.73	218.17
KSRI	12 1903	1.36	31.91	50.01	0.0	2.85	-5.51
KSRI	14 1516	-51.57	-35.28	1.16	0.0	0.0	0.0
NBS	11 137	0.0	0.0	0.0	0.0	0.0	88.66
NBS	11 169	87.75	84.21	80.63	74.83	81.14	95.32
NBS	12 352	0.0	-255.51	-253.08	-262.73	-254.61	-252.51

TABLE 19 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
NBS	12 1375	-334.70	-336.89	-337.93	-343.28	0.0	0.0
NBS	13 61	-100.69	-119.01	-142.11	-149.72	-130.34	-91.52
NBS	14 323	-99.51	0.0	0.0	-176.29	-177.11	-171.52
NBS	14 324	9.55	5.59	20.27	25.67	26.71	1.74
NBS	14 601	-76.97	-79.39	-81.84	-79.90	-84.83	-92.75
NBS	14 1316	-106.34	-105.38	-106.61	-106.33	-105.55	-106.00
NBS	14 2165	83.23	73.13	0.0	0.0	0.0	0.0
NBS	16 217	0.0	0.0	-101.77	-90.55	-83.28	-78.62
NBS	18 8	254.77	255.75	252.37	271.46	257.89	254.58
NBS	18 113	0.0	0.0	0.0	-260.98	0.0	0.0
NBS	40 4	-755.23	0.0	0.0	0.0	0.0	0.0
NIM	12 1615	-77.04	-90.67	-33.23	-12.12	-65.28	-49.87
NIM	12 1633	19.67	24.06	20.03	16.46	19.14	0.06
NIM	12 1640	2.46	0.39	1.91	-17.02	-0.60	0.25
NPL	12 316	0.0	0.0	0.0	0.0	-248.22	-214.61
NPL	12 418	-109.35	-84.77	-94.96	-84.68	-99.63	-105.76
NPL	12 832	-317.29	-319.12	-317.05	-312.81	-308.27	-313.28
NPL	14 1334	0.0	-7.03	-32.72	0.0	-28.56	0.0
NPL	14 1813	15.82	18.99	9.31	10.04	9.91	12.09
NPL	14 2064	-12.12	-0.14	-3.37	-9.33	-12.21	-14.92
NRC	14 267	-21.71	-25.40	-28.45	-23.36	-25.59	-27.42
NRC	90 5	5.07	4.40	6.07	0.01	-0.50	3.87
NRC	90 61	7.08	4.92	2.43	9.86	14.32	3.60
NRC	90 62	13.62	13.05	5.77	7.85	10.70	7.58
NRC	90 63	0.85	0.39	4.51	5.92	9.14	5.90
NRLM	14 906	-60.13	-63.49	-66.52	-69.68	-72.41	-73.43
NRLM	14 1632	-10.08	-9.85	-14.41	-16.51	-18.26	-15.86
OMH	12 1067	-8.44	12.63	14.28	-19.27	9.03	12.41
OMSF	12 1223	190.52	188.83	212.17	163.80	185.73	172.84
OMSF	14 896	9.53	35.49	71.63	25.16	0.0	0.0
OMSF	14 1569	-38.75	-37.84	-2.76	-23.86	-12.88	-2.04
OMSF	16 121	43.00	21.13	24.78	19.27	25.38	17.46
OMSF	16 177	-68.75	7.53	9.33	-14.88	-12.29	-7.51
ORB	12 205	0.0	0.0	-159.41	-188.77	-126.82	-118.31
ORB	12 804	-63.82	0.0	0.0	0.0	0.0	0.0
PKNM	14 1144	-30.48	-38.06	-34.32	-14.16	-36.21	-27.01
PKNM	16 124	45.74	17.23	-27.32	-21.90	-25.51	25.78
PKNM	16 125	8.79	0.0	0.0	0.0	0.0	0.0
PKNM	16 154	-27.09	-46.34	-95.58	-63.07	-104.03	-37.86
PTB	12 320	-49.48	-52.41	-58.76	-61.90	-56.19	-56.80

TABLE 19 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
PTB	12 462	3.23	20.73	-1.46	-2.31	22.24	14.52
PTB	14 394	-30.38	-27.99	-24.87	-23.58	-24.25	-26.46
PTB	14 867	-189.15	-188.26	-184.12	-181.16	-181.96	-185.09
PTB	14 1103	-14.01	-10.70	-11.22	-9.99	-9.86	-3.92
PTB	14 2379	68.19	0.0	0.0	0.0	0.0	-49.85
PTB	16 119	-42.42	-35.62	-50.53	-56.12	-13.99	-1.03
PTB	92 1	4.99	3.13	0.43	-1.33	0.17	0.51
PTB	92 2	0.0	0.0	0.0	0.0	-3.33	-1.28
RGO	12 348	-51.75	-47.31	-48.87	-45.31	-43.45	-42.85
RGO	12 484	-203.62	-196.48	-195.86	-185.11	-204.13	-188.43
RGO	14 202	-626.23	-634.99	-635.08	-618.32	-599.05	-594.50
RGO	14 560	-69.60	-67.42	-68.34	-62.67	-66.50	-64.22
RGO	14 868	-129.33	-122.16	-125.45	-126.02	-130.69	-127.17
RGO	20 133	-402.93	-384.33	-373.98	-375.18	-364.08	-353.32
RRL	12 189	74.53	98.70	0.0	0.0	0.0	0.0
RRL	12 290	-82.89	-74.93	-82.78	0.0	0.0	0.0
RRL	12 1725	8.12	-8.39	-15.48	-35.66	-54.47	-45.47
RRL	14 764	-107.60	-100.05	-98.47	-109.73	-115.20	-109.75
RRL	14 865	-309.02	-307.65	-304.65	-299.78	-303.48	-308.57
RRL	14 932	-147.24	-141.46	-140.83	-146.83	-153.74	-155.95
RRL	14 1729	-134.65	-133.92	-134.87	-143.23	-142.13	-148.06
RRL	14 2456	-58.02	-56.97	-56.76	-56.62	-59.39	-58.53
RRL	45 3	36.30	43.27	44.97	46.29	55.38	62.11
SO	12 67	8.35	28.15	65.95	58.32	10.59	13.24
SO	12 997	-99.82	-87.89	-92.54	-87.93	-96.92	-98.75
SO	14 574	0.0	0.0	0.0	-13.69	0.0	0.0
SO	16 180	2.18	0.38	1.83	8.35	5.98	11.04
STA	14 900	-63.85	-62.87	-67.95	-59.44	-65.98	-71.40
STA	14 1376	-95.96	-94.96	-92.78	-87.07	-76.44	-85.94
STA	16 137	8.54	24.65	24.67	41.52	0.0	0.0
SU	40 381	0.0	0.0	0.0	0.0	-10.00	-6.96
SU	40 382	0.0	0.0	0.0	0.0	-9.99	-6.79
TAO	12 204	127.57	146.87	210.81	200.61	235.98	268.25
TAO	14 390	-85.80	-81.65	-77.79	-71.08	-68.65	-65.10
TAO	14 1075	-27.23	-24.29	-28.97	-31.14	-30.82	-31.23
TAO	14 1498	-117.49	-113.02	-113.64	-120.14	-120.87	-120.81
TAO	14 2494	0.52	-0.69	-3.37	-6.86	-7.64	-8.29
TL	12 115	-15.27	-101.35	0.0	0.0	0.0	0.0
TL	12 477	134.35	180.83	0.0	0.0	0.0	0.0
TL	12 1145	121.34	136.93	145.38	148.98	125.65	95.35

TABLE 19 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
TL	12 1455	0.0	0.0	0.0	129.33	123.95	115.04
TP	12 335	2.36	19.32	24.87	8.41	6.16	6.82
TUG	12 524	89.39	89.61	94.96	95.31	103.37	99.19
TUG	14 1654	31.11	29.20	25.77	24.91	25.26	29.83
USNO	12 444	377.19	368.46	360.29	366.95	397.64	406.38
USNO	12 583	-611.72	-638.51	-636.65	-625.94	-617.81	-598.83
USNO	12 752	-121.47	-120.93	-155.95	-163.14	-143.16	-105.39
USNO	12 778	227.66	229.00	234.61	236.79	235.32	232.84
USNO	12 873	-4.24	-2.16	6.35	0.0	0.0	0.0
USNO	14 547	0.0	0.0	0.0	70.54	0.0	0.0
USNO	14 571	-116.04	-124.53	-114.08	-96.37	0.0	0.0
USNO	14 573	40.28	41.93	22.84	-7.71	-11.28	-10.67
USNO	14 653	43.31	37.37	36.18	18.73	24.67	28.36
USNO	14 656	0.0	0.0	0.0	-152.05	-145.83	0.0
USNO	14 787	-7.78	-1.92	-8.15	0.0	0.0	0.0
USNO	14 834	-108.79	-107.84	-104.70	-124.36	-120.78	-118.20
USNO	14 837	-19.28	-14.17	-4.37	-1.14	-3.48	-6.15
USNO	14 862	205.24	207.45	211.85	215.25	216.24	211.03
USNO	14 871	99.71	101.02	104.62	94.03	101.84	88.52
USNO	14 875	-130.28	-130.50	-135.19	-134.15	-131.43	-128.70
USNO	14 1025	0.0	0.0	0.0	-320.52	0.0	0.0
USNO	14 1035	-102.66	-101.30	-97.67	-115.80	-115.74	-110.85
USNO	14 1094	-51.16	-33.45	-40.39	-49.36	-38.06	0.0
USNO	14 1117	0.0	-65.58	-63.41	-64.86	-65.74	-65.19
USNO	14 1300	-328.57	-312.56	-313.95	-305.40	-302.83	-295.08
USNO	14 1301	-142.94	-141.77	-143.13	-141.44	-141.07	-145.73
USNO	14 1305	0.0	0.0	0.0	-28.83	-27.47	-32.33
USNO	14 1343	-27.40	-20.86	0.0	0.0	0.0	0.0
USNO	14 1362	-528.15	-518.60	-522.06	-504.98	-523.52	0.0
USNO	14 1423	-43.73	-41.04	-41.84	-45.17	-44.73	-44.11
USNO	14 1452	36.10	32.34	27.22	0.0	41.70	44.00
USNO	14 1550	0.0	0.0	-364.36	-348.02	0.0	0.0
USNO	14 1586	-92.26	-90.99	-93.60	-89.02	-87.55	-95.01
USNO	14 1605	36.81	33.29	28.85	27.52	27.73	26.95
USNO	14 1809	-116.70	-120.58	-124.47	-138.15	-140.38	-137.61
USNO	14 1846	-22.16	-25.30	-28.17	-20.47	-20.60	-26.96
USNO	14 2081	0.0	-114.86	0.0	0.0	0.0	0.0
USNO	14 2098	-14.56	-10.19	-10.12	3.44	7.43	3.93
USNO	14 2100	-127.78	-132.39	-129.35	-112.21	-119.37	-113.67
USNO	14 2157	-108.00	-109.65	-103.51	-104.03	0.0	0.0

TABLE 19 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
USNO	14 2277	-109.41	-111.97	-118.57	-140.56	0.0	0.0
USNO	14 2285	0.0	-100.13	0.0	0.0	0.0	0.0
USNO	14 2312	48.21	39.86	17.45	-83.94	-72.06	-77.88
USNO	14 2313	0.0	0.0	0.0	-30.82	0.0	0.0
USNO	14 2314	-26.64	-43.43	0.0	0.0	0.0	0.0
USNO	14 2315	-47.80	-64.27	-39.04	-51.42	0.0	0.0
USNO	14 2481	-27.89	-29.69	-33.07	-35.77	-38.01	-34.36
USNO	14 2482	-42.19	-41.51	-42.10	-43.59	-39.39	-39.11
USNO	14 2483	-31.92	-44.06	-42.12	-46.07	-47.03	-50.53
USNO	14 2484	0.0	0.0	0.0	-70.02	-72.84	-73.99
USNO	14 2485	0.0	-136.65	-145.06	-145.21	-156.40	-160.65
USNO	14 2486	31.16	-3.44	-16.26	-37.85	-23.18	-18.00
USNO	14 2487	-24.88	-29.51	-36.40	-38.96	-29.53	-25.85
USNO	14 2488	0.0	0.0	0.0	-64.90	-74.57	-67.07
USNO	14 2489	0.0	-72.19	0.0	0.0	0.0	0.0
USNO	18 107	584.28	-722.94	-751.80	-664.91	-608.93	-411.28
USNO	18 133	-74.87	-84.64	-86.71	0.0	0.0	-144.85
USNO	18 159	-13.90	-8.91	69.08	18.70	85.92	190.30
USNO	40 18	0.0	0.0	0.0	-9.64	3.79	0.03
USNO	40 19	0.0	0.0	0.0	-6.44	56.63	0.93
USNO	43 8	-17.65	-19.62	-0.48	0.0	2.91	6.07
VSL	12 1489	-378.61	-374.35	-381.83	-375.59	-377.45	-391.25
VSL	14 503	-118.58	-132.32	-157.68	-141.02	-146.20	-145.09
VSL	14 1034	-88.40	-86.86	-82.98	-78.46	-79.95	-81.45
VSL	14 1190	134.77	0.0	0.0	0.0	-11.66	0.0
YUZM	12 1189	-81.97	-65.72	-14.32	-15.36	-40.40	-68.18
ZIPE	12 979	-165.29	-183.99	-181.34	-169.68	-180.31	-182.69

The clocks are designated by their type (2 digits) and serial number in the type.

The codes for the types are

11 HEWLETT-PACKARD 5060A
12 HEWLETT-PACKARD 5061A
13 EBAUCHES, OSCILLATOM B5000
14 HEWLETT-PACKARD 5061A OPT.4
16 OSCILLOQUARTZ 3200
17 OSCILLOQUARTZ 3000
18 FREQ. AND TIME SYSTEMS INC. 4000
19 ROHDE AND SCHWARZ XSC
20 FREQ. AND TIME SYSTEMS INC. 5000
21 OSCILLOQUARTZ 3210
25 HEWLETT-PACKARD 5062C
30 HEWLETT-PACKARD 5061B
31 HEWLETT-PACKARD 5061B OPT. 4
4x HYDROGEN MASERS
9x PRIMARY CLOCKS AND PROTOTYPES

TABLE 20 - INTERNATIONAL ATOMIC TIME, WEIGHTS OF THE CLOCKS FOR 1986

The weights are given for intervals of two months ending at the given dates.

*** denotes that the clock was not used.

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
APL	14 773	200	200	135	78	56	69
APL	14 793	184	184	200	***	***	***
APL	42 6	200	200	200	200	200	200
APL	42 13	***	***	***	***	0	0
APL	42 14	***	***	***	***	0	0
ASMW	16 76	69	73	64	36	31	33
ASMW	16 165	***	0	124	97	155	176
AUS	11 288	25	40	54	75	200	***
AUS	12 590	60	59	59	111	157	200
AUS	12 1195	***	0	***	***	***	***
AUS	12 1708	***	***	***	***	***	0
AUS	12 1823	***	***	***	***	***	0
AUS	12 2196	***	***	0	200	***	***
AUS	14 902	***	***	***	***	***	0
AUS	14 1363	0	200	200	***	***	***
AUS	14 1443	***	***	***	***	0	200
AUS	14 1719	0	200	200	200	200	200
AUS	14 1777	77	103	***	***	***	0
AUS	14 1844	***	***	0	200	198	195
AUS	14 2010	60	124	172	72	72	92
AUS	14 2020	171	200	200	200	***	***
AUS	44 1	185	196	200	200	200	200
AUS	44 2	122	200	200	200	200	200
BEV	16 71	0	0	0	0	1	2
CAO	16 52	***	0	69	156	***	0
CAO	16 183	172	95	117	112	102	118
CH	12 285	***	***	0	39	22	18
CH	12 863	36	66	63	122	190	196
CH	13 14	73	120	54	45	30	30
CH	14 1156	***	***	***	0	200	47
CH	16 64	18	19	18	21	22	24
CH	16 69	119	155	200	200	200	200
CH	16 77	142	158	200	200	200	200
CH	16 114	70	96	89	90	87	57
CH	16 140	3	3	0	3	3	0
CH	17 206	188	178	197	200	200	200
CH	17 208	145	139	***	***	0	200
CH	21 179	200	182	200	200	200	200
CH	21 194	0	49	69	68	69	77
CH	21 217	0	98	178	200	200	124

TABLE 20 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
CH	99 1	0	0	1	4	8	***
CSAO	12 1646	***	***	***	0	200	200
CSAO	12 1647	25	28	***	***	0	14
CSAO	12 1648	184	200	200	200	200	122
F	12 158	29	70	39	17	13	19
F	12 347	16	17	***	***	***	***
F	12 475	20	22	15	17	25	45
F	12 2405	113	***	***	***	0	10
F	14 134	200	200	200	200	200	200
F	14 195	***	***	***	***	0	37
F	14 500	***	***	0	195	199	***
F	14 753	22	24	27	37	48	68
F	14 1120	***	***	***	***	0	200
F	14 1407	200	200	200	200	200	200
F	14 1645	199	200	198	200	200	192
F	14 1712	195	200	200	200	200	***
F	16 106	***	***	0	96	93	***
F	16 187	117	151	181	200	200	***
FTZ	14 312	195	200	200	200	200	190
FTZ	14 895	177	200	200	200	200	200
FTZ	14 1217	142	***	***	***	0	8
FTZ	14 1482	176	200	200	200	200	***
FTZ	14 1656	199	200	199	***	***	***
FTZ	14 1674	175	200	200	200	200	197
FTZ	16 130	183	200	200	200	200	200
IEN	12 303	110	120	200	200	200	200
IEN	12 609	187	183	196	196	179	165
IEN	14 893	198	199	198	187	200	200
IEN	16 84	19	31	34	36	40	33
IFAG	14 1105	***	0	137	***	***	0
IFAG	16 131	200	78	80	72	72	90
IFAG	16 138	160	42	65	65	48	0
IFAG	16 173	14	8	7	10	***	0
ILOM	11 176	0	0	0	0	0	0
ILOM	14 614	54	45	15	20	32	0
ILOM	14 885	42	46	57	***	0	97
ILOM	14 1315	169	100	103	188	200	***
ILOM	14 2146	200	200	200	191	200	187
KSRI	12 1403	92	24	13	***	0	40
KSRI	12 1406	32	2	8	***	0	11
KSRI	12 1903	200	49	19	***	0	180
KSRI	14 1516	78	113	31	***	***	***
NBS	11 137	***	***	***	***	***	0
NBS	11 169	45	33	30	52	113	163
NBS	12 352	***	0	200	186	193	200

TABLE 20 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
NBS	12 1375	15	24	34	41	***	***
NBS	13 61	23	31	23	20	20	19
NBS	14 323	200	***	***	0	200	200
NBS	14 324	125	127	60	40	44	86
NBS	14 601	164	123	139	200	200	194
NBS	14 1316	200	200	200	200	200	200
NBS	14 2165	0	121	***	***	***	***
NBS	16 217	***	***	0	97	83	80
NBS	18 8	200	200	200	137	166	200
NBS	18 113	***	***	***	0	***	***
NBS	40 4	0	***	***	***	***	***
NIM	12 1615	15	11	0	10	0	12
NIM	12 1633	54	43	42	84	200	139
NIM	12 1640	83	86	165	88	152	181
NPL	12 316	***	***	***	***	0	11
NPL	12 418	49	65	88	91	108	92
NPL	12 832	140	122	142	200	200	200
NPL	14 1334	***	0	19	***	0	***
NPL	14 1813	200	200	185	200	200	200
NPL	14 2064	102	154	200	200	200	200
NRC	14 267	0	8	8	8	8	200
NRC	90 5	200	200	200	200	200	200
NRC	90 61	176	185	189	166	200	180
NRC	90 62	69	58	90	176	200	200
NRC	90 63	171	200	200	183	187	200
NRLM	14 906	0	200	200	200	200	200
NRLM	14 1632	200	200	200	200	200	200
OMH	12 1067	67	66	94	49	54	51
OMSF	12 1223	83	90	112	0	34	36
OMSF	14 896	200	97	16	4	***	***
OMSF	14 1569	0	200	17	29	37	37
OMSF	16 121	0	26	52	69	101	115
OMSF	16 177	1	0	1	1	9	12
ORB	12 205	***	***	0	15	0	8
ORB	12 804	12	***	***	***	***	***
PKNM	14 1144	135	89	82	77	76	129
PKNM	16 124	10	10	8	9	8	0
PKNM	16 125	0	***	***	***	***	***
PKNM	16 154	14	14	0	10	7	0
PTB	12 320	161	186	192	200	200	200

TABLE 20 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
PTB	12 462	200	147	123	133	81	81
PTB	14 394	200	200	200	200	200	200
PTB	14 867	200	200	200	200	200	200
PTB	14 1103	200	200	200	200	200	200
PTB	14 2379	183	***	***	***	***	0
PTB	16 119	24	23	42	90	24	21
PTB	92 1	200	200	200	200	200	200
PTB	92 2	***	***	***	***	0	200
RGO	12 348	72	67	63	200	200	200
RGO	12 484	152	173	169	157	138	155
RGO	14 202	88	67	69	71	55	32
RGO	14 560	200	200	200	200	200	200
RGO	14 868	200	198	200	200	200	200
RGO	20 133	0	4	4	4	6	34
RRL	12 189	200	77	***	***	***	***
RRL	12 290	200	194	194	***	***	***
RRL	12 1725	88	150	110	41	19	17
RRL	14 764	200	196	200	178	200	200
RRL	14 865	195	200	200	200	200	200
RRL	14 932	200	200	200	200	198	200
RRL	14 1729	64	73	163	192	200	200
RRL	14 2456	200	200	200	200	200	200
RRL	45 3	0	0	0	0	0	0
SO	12 67	6	5	8	11	0	15
SO	12 997	175	174	146	172	176	200
SO	14 574	***	***	***	0	***	***
SO	16 180	200	200	200	200	200	200
STA	14 900	15	17	35	74	172	200
STA	14 1376	200	200	200	200	180	184
STA	16 137	57	28	22	27	***	***
SU	40 381	***	***	***	***	0	200
SU	40 382	***	***	***	***	0	200
TAO	12 204	29	26	0	6	4	4
TAO	14 390	174	171	158	115	108	154
TAO	14 1075	200	200	200	200	200	200
TAO	14 1498	200	200	200	200	200	200
TAO	14 2494	0	200	200	200	200	200
TL	12 115	0	0	***	***	***	***
TL	12 477	4	3	***	***	***	***
TL	12 1145	6	10	13	17	85	26

TABLE 20 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
TL	12 1455	***	***	***	0	200	138
TP	12 335	72	105	111	133	112	129
TUG	12 524	200	200	200	200	193	200
TUG	14 1654	200	200	200	200	200	200
USNO	12 444	0	161	100	168	43	29
USNO	12 583	11	15	17	26	32	43
USNO	12 752	18	12	13	16	29	19
USNO	12 778	178	200	200	200	200	200
USNO	12 873	125	144	191	***	***	***
USNO	14 547	***	***	***	0	***	***
USNO	14 571	179	144	156	104	***	***
USNO	14 573	194	200	138	30	18	15
USNO	14 653	200	200	200	87	79	119
USNO	14 656	***	***	***	0	200	***
USNO	14 787	45	52	63	***	***	***
USNO	14 834	151	200	200	136	163	153
USNO	14 837	89	137	176	190	191	199
USNO	14 862	63	72	200	200	200	200
USNO	14 871	165	200	200	181	194	167
USNO	14 875	200	200	200	200	200	200
USNO	14 1025	***	***	***	0	***	***
USNO	14 1035	129	169	200	144	161	162
USNO	14 1094	48	68	126	128	110	***
USNO	14 1117	***	0	200	200	200	200
USNO	14 1300	200	154	200	140	97	75
USNO	14 1301	200	200	200	200	200	200
USNO	14 1305	***	***	***	0	200	200
USNO	14 1343	200	200	***	***	***	***
USNO	14 1362	8	10	20	51	68	***
USNO	14 1423	200	200	200	200	200	200
USNO	14 1452	90	200	200	***	0	200
USNO	14 1550	***	***	0	46	***	***
USNO	14 1586	190	200	200	200	200	196
USNO	14 1605	200	200	200	200	200	200
USNO	14 1809	0	200	200	95	80	94
USNO	14 1846	200	200	200	194	200	200
USNO	14 2081	***	0	***	***	***	***
USNO	14 2098	200	200	200	165	101	114
USNO	14 2100	200	200	200	147	177	135
USNO	14 2157	200	200	200	200	***	***

TABLE 20 - (CONT.)

LAB.	CLOCK	46489	46549	46609	46669	46729	46789
USNO	14 2277	106	61	52	26	***	***
USNO	14 2285	***	0	***	***	***	***
USNO	14 2312	0	175	28	0	2	3
USNO	14 2313	***	***	***	0	***	***
USNO	14 2314	189	116	***	***	***	***
USNO	14 2315	123	56	57	58	***	***
USNO	14 2481	200	200	200	200	200	200
USNO	14 2482	195	200	200	200	200	200
USNO	14 2483	0	84	169	200	200	200
USNO	14 2484	***	***	***	0	200	200
USNO	14 2485	***	0	178	200	123	96
USNO	14 2486	19	22	20	14	17	18
USNO	14 2487	200	200	154	139	186	200
USNO	14 2488	***	***	***	0	134	196
USNO	14 2489	***	0	***	***	***	***
USNO	18 107	0	0	0	0	0	0
USNO	18 133	112	184	200	***	***	0
USNO	18 159	19	26	0	0	0	0
USNO	40 18	***	***	***	0	0	0
USNO	40 19	***	***	***	0	0	0
USNO	43 8	0	0	0	***	0	0
VSL	12 1489	10	14	73	112	200	165
VSL	14 503	124	120	43	39	42	55
VSL	14 1034	177	200	200	200	200	200
VSL	14 1190	0	***	***	***	0	***
YUZM	12 1189	20	18	0	13	13	12
ZIPE	12 979	93	52	54	130	139	164

The clocks are designated by their type (2 digits) and serial number in the type.

The codes for the types are

11 HEWLETT-PACKARD 5060A
12 HEWLETT-PACKARD 5061A
13 EBAUCHES, OSCILLATOM B5000
14 HEWLETT-PACKARD 5061A OPT.4
16 OSCILLOQUARTZ 3200
17 OSCILLOQUARTZ 3000
18 FREQ. AND TIME SYSTEMS INC. 4000
19 ROHDE AND SCHWARZ XSC
20 FREQ. AND TIME SYSTEMS INC. 5000
21 OSCILLOQUARTZ 3210
25 HEWLETT-PACKARD 5062C
30 HEWLETT-PACKARD 5061B
31 HEWLETT-PACKARD 5061B OPT. 4
4x HYDROGEN MASERS
9x PRIMARY CLOCKS AND PROTOTYPES

TABLE 21 - MEASUREMENTS OF THE EAL AND TAI FREQUENCY

GRAVITATIONAL FREQUENCY CORRECTIONS ARE APPLIED. THE FREQUENCIES ARE EXPRESSED AT SEA LEVEL.

f(EAL) - f(STANDARD) IN 10**-13

INTERVAL MJD	CENTRAL DATE	NRC CsV	NRC CsVIA	NRC CsVIB	NRC CsVIC	PTB CS1	PTB CS2
45309-45389	1983 JAN15	7.86	6.36	6.26	6.10	8.62	
45389-45469	1983 APR 5	8.32	7.37	8.55	8.11	8.52	
45469-45549	1983 JUN24	7.15	6.35	8.62	6.96	8.06	
45549-45629	1983 SEP12	7.44	6.94	7.17	6.62	7.98	
45629-45699	1983 NOV25	7.54	6.97	7.05	6.95	8.10	
45699-45759	1984 JAN30	8.58	8.50	8.36	8.23	8.59	
45759-45819	1984 MAR30	8.49	8.43	8.21	8.26	8.65	
45819-45879	1984 MAY29	-	5.78	7.41	7.38	8.43	
45879-45939	1984 JUL28	7.18	7.30	6.84	6.57	7.91	
45939-45999	1984 SEP26	7.04	7.45	8.08	6.38	8.19	
45999-46059	1984 NOV25	6.40	7.07	8.20	6.95	8.43	
46059-46119	1985 JAN24	7.19	8.81	8.45	7.72	8.66	
46119-46179	1985 MAR25	7.51	7.52	8.05	7.82	8.19	
46179-46239	1985 MAY24	8.27	8.03	6.52	8.17	8.36	
46239-46299	1985 JUL23	8.47	8.04	7.03	7.08	8.17	
46299-46369	1985 SEP26	8.58	6.86	7.55	7.03	7.93	
46369-46429	1985 NOV30	8.47	9.22	9.90	6.74	8.57	
46429-46489	1986 JAN29	8.70	8.93	9.69	8.21	8.58	
46489-46549	1986 MAR30	8.62	8.68	9.62	8.16	8.36	
46549-46609	1986 MAY29	8.81	8.39	8.78	8.63	8.05	
46609-46669	1986 JUL28	8.11	9.25	9.02	8.80	7.85	
46669-46729	1986 SEP26	8.05	9.77	9.35	9.17	8.02	7.61
46729-46789	1986 NOV25	8.56	8.53	8.99	8.79	8.06	7.85

TABLE 21 - (CONT.)

f(EAL) - f(STANDARD) IN 10**-13

INTERVAL MJD	CENTRAL DATE	NBS NBS6	RRL CS1	SU MCsR 101	SU MCsR 102
45731-44872	1981 JUL17			9.31	
45082-45120	1982 MAY12			7.79	
45264-45277	1982 OCT29				7.50
45428-45449	1983 APR15				8.16
45457-45474	1983 MAY12				7.13
45489-45569	1983 JUL14	7.34			
45579-45585	1983 SEP 5				7.59
45702-45722	1984 JAN13			6.02	
45789-45849	1984 APR29		6.45		
45794-45836	1984 APR25			6.74	
45889-45949	1984 AUG17	7.24			
45949-45967	1984 SEP15				6.22
45959-46019	1984 OCT16	7.70			
45983-46004	1984 OCT21				5.93
45999-46059	1984 NOV25		7.53		
46005-46034	1984 NOV16				6.12
46054-46059	1984 DEC23				6.37
46079-46139	1985 FEB13		7.54		
46080-46096	1985 JAN23				6.14
46100-46110	1985 FEB 9				5.78
46156-46159	1985 APR 3				6.23
46201-46216	1985 MAY24			5.87	
46230-46244	1985 JUN21			7.04	
46247-46277	1985 JUL16			6.39	
46279-46300	1985 AUG13			5.75	
46312-46335	1985 SEP16			6.84	
46339-46367	1985 OCT15			5.90	
46370-46381	1985 NOV 7			5.83	
46502-46516	1986 MAR20				5.87
46509-46569	1986 APR19		7.22		
46521-46543	1986 APR12				5.61
46563-46580	1986 MAY22				5.76
46585-46600	1986 JUN11				5.28
46684-46732	1986 OCT 5			5.99	

TABLE 21 - (CONT.)

f(TAI) - f(STANDARD) IN 10**-13

INTERVAL MJD	CENTRAL DATE	NRC CsV	NRC CsVIA	NRC CsVIB	NRC CsVIC	PTB CS1	PTB CS2
45309-45389	1983 JAN15	0.06	-1.44	-1.54	-1.70	0.82	
45389-45469	1983 APR 5	0.52	-0.43	0.75	0.31	0.72	
45469-45549	1983 JUN24	-0.65	-1.45	0.82	-0.84	0.26	
45549-45629	1983 SEP12	-0.36	-0.86	-0.63	-1.18	0.18	
45629-45699	1983 NOV25	-0.26	-0.83	-0.75	-0.85	0.30	
45699-45759	1984 JAN30	0.78	0.70	0.56	0.43	0.79	
45759-45819	1984 MAR30	0.49	0.43	0.21	0.26	0.65	
45819-45879	1984 MAY29	-	-2.22	-0.59	-0.62	0.43	
45879-45939	1984 JUL28	-0.82	-0.70	-1.16	-1.43	-0.09	
45939-45999	1984 SEP26	-0.96	-0.55	0.08	-1.62	0.19	
45999-46059	1984 NOV25	-1.60	-0.93	0.20	-1.05	0.43	
46059-46119	1985 JAN24	-0.81	0.81	0.45	-0.28	0.66	
46119-46179	1985 MAR25	-0.49	-0.48	0.05	-0.18	0.19	
46179-46239	1985 MAY24	0.27	0.03	-1.48	0.18	0.36	
46239-46299	1985 JUL23	0.47	0.04	-0.97	-0.92	0.17	
46299-46369	1985 SEP26	0.58	-1.14	-0.45	-0.97	-0.07	
46369-46429	1985 NOV30	0.47	1.22	1.90	-1.26	0.57	
46429-46489	1986 JAN29	0.70	0.93	1.69	0.21	0.58	
46489-46549	1986 MAR30	0.62	0.68	1.62	0.16	0.36	
46549-46609	1986 MAY29	0.81	0.39	0.78	0.63	0.05	
46609-46669	1986 JUL28	0.11	1.25	1.02	0.80	-0.15	
46669-46729	1986 SEP26	0.05	1.77	1.35	1.17	0.02	-0.39
46729-46789	1986 NOV25	0.56	0.53	0.99	0.79	0.06	-0.15

TABLE 21 - (CONT.)

f(TAI) - f(STANDARD) IN 10**-13

INTERVAL MJD	CENTRAL DATE	NBS NBS6	RRL CS1	SU MCsR 101	SU MCsR 102
45731-44872	1981 JUL17			0.91	
45082-45120	1982 MAY12			-0.41	
45264-45277	1982 OCT29				-0.30
45428-45449	1983 APR15				0.36
45457-45474	1983 MAY12				-0.67
45489-45569	1983 JUL14	-0.46			
45579-45585	1983 SEP 5				-0.21
45702-45722	1984 JAN13			-1.78	
45789-45849	1984 APR29		-1.55		
45794-45836	1984 APR25			-1.26	
45889-45949	1984 AUG17	-0.76			
45949-45967	1984 SEP15				-1.78
45959-46019	1984 OCT16	-0.30			
45983-46004	1984 OCT21				-2.07
45999-46059	1984 NOV25		-0.47		
46005-46034	1984 NOV16				-1.88
46054-46059	1984 DEC23				-1.63
46079-46139	1985 FEB13		-0.46		
46080-46096	1985 JAN23				-1.86
46100-46110	1985 FEB 9				-2.22
46156-46159	1985 APR 3				-1.77
46201-46216	1985 MAY24			-2.13	
46230-46244	1985 JUN21			-0.96	
46247-46277	1985 JUL16			-1.61	
46279-46300	1985 AUG13			-2.25	
46312-46335	1985 SEP16			-1.16	
46339-46367	1985 OCT15			-2.10	
46370-46381	1985 NOV 7			-2.17	
46502-46516	1986 MAR20				-2.13
46509-46569	1986 APR19		-0.78		
46521-46543	1986 APR12				-2.39
46563-46580	1986 MAY22				-2.24
46585-46600	1986 JUN11				-2.72
46684-46732	1986 OCT 5			-2.01	

TABLE 22 - MEAN DURATION OF THE TAI SCALE INTERVAL IN SI SECOND AT SEA LEVEL.

FOR THE MONTHS	MEAN DURATION	UNCERTAINTY (one sigma)
1980 JAN - FEB	1 - 0.3*10**-13	0.5*10**-13
1980 MAR - APR	- 0.5	0.5
1980 MAY - JUN	- 0.1	0.5
1980 JUL - AUG	+ 0.3	0.5
1980 SEP - OCT	+ 0.5	0.5
1980 NOV - DEC	+ 0.1	0.5
1981 JAN - FEB	1 - 0.3*10**-13	0.5*10**-13
1981 MAR - APR	- 0.4	0.5
1981 MAY - JUN	+ 0.0	0.5
1981 JUL - AUG	+ 0.6	0.5
1981 SEP - OCT	+ 0.8	0.5
1981 NOV - DEC	+ 0.5	0.5
1982 JAN - FEB	1 + 0.1*10**-13	0.5*10**-13
1982 MAR - APR	+ 0.0	0.5
1982 MAY - JUN	+ 0.2	0.5
1982 JUL - AUG	+ 0.5	0.5
1982 SEP - OCT	+ 0.5	0.5
1982 NOV - DEC	+ 0.3	0.5
1983 JAN - FEB	1 - 0.1*10**-13	0.5*10**-13
1983 MAR - APR	- 0.2	0.5
1983 MAY - JUN	- 0.1	0.5
1983 JUL - AUG	+ 0.1	0.5
1983 SEP - OCT	+ 0.1	0.5
1983 NOV - DEC	+ 0.0	0.5
1984 JAN - FEB	1 - 0.2*10**-13	0.5*10**-13
1984 MAR - APR	- 0.0	0.5
1984 MAY - JUN	+ 0.2	0.5
1984 JUL - AUG	+ 0.3	0.5
1984 SEP - OCT	+ 0.5	0.5
1984 NOV - DEC	+ 0.4	0.5
1985 JAN - FEB	1 + 0.3*10**-13	0.5*10**-13
1985 MAR - APR	+ 0.3	0.5
1985 MAY - JUN	+ 0.2	0.5
1985 JUL - AUG	+ 0.2	0.5
1985 SEP - OCT	+ 0.2	0.5
1985 NOV - DEC	- 0.0	0.5
1986 JAN - FEB	1 - 0.2*10**-13	0.5*10**-13
1986 MAR - APR	- 0.2	0.5
1986 MAY - JUN	- 0.1	0.5
1986 JUL - AUG	- 0.1	0.5
1986 SEP - OCT	- 0.1	0.5
1986 NOV - DEC	- 0.1	0.5

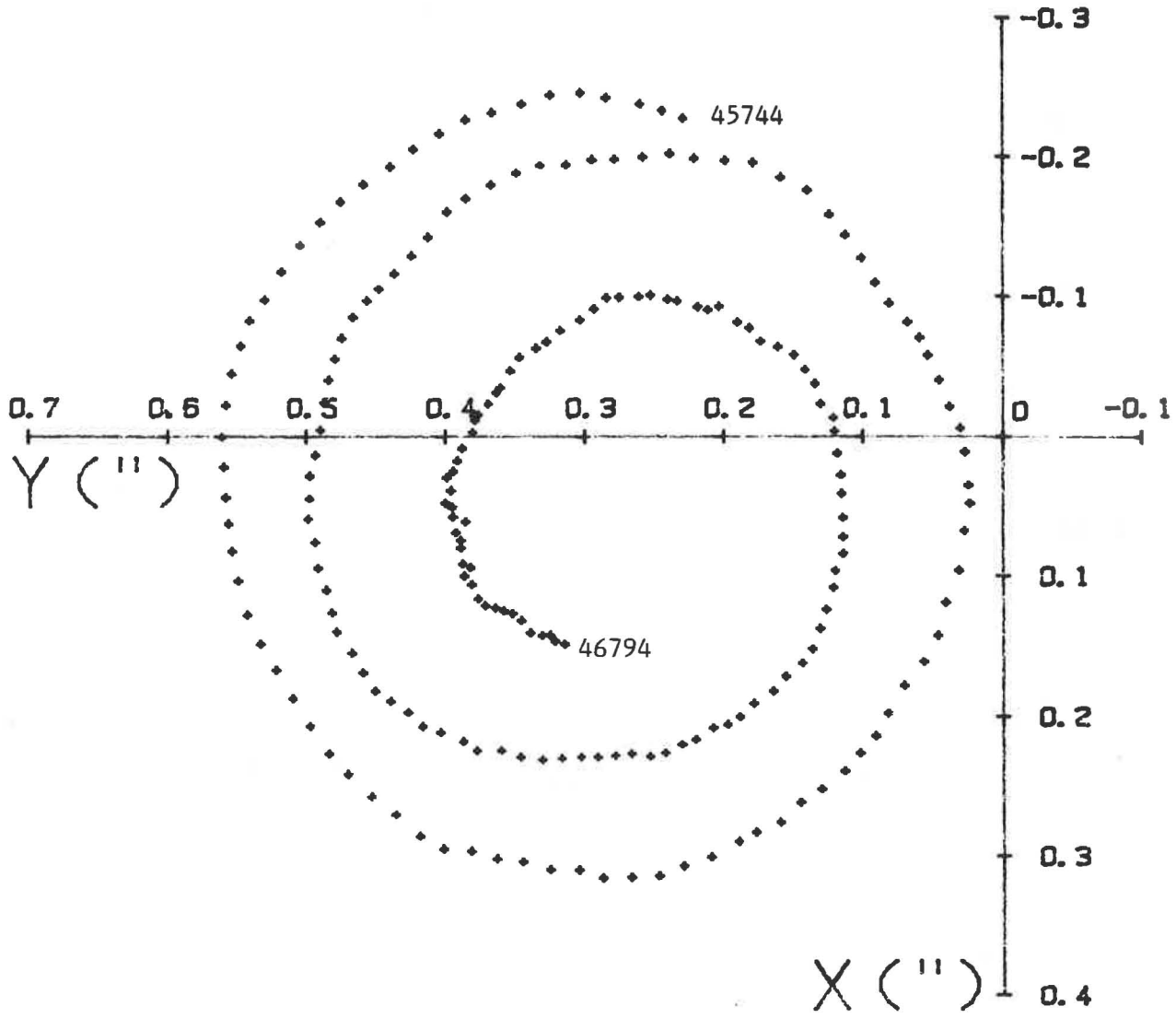

Figure 1 - Path of the pole from 1984 Feb.14 to 1986 Dec.30 (MJD 45744 - 46794). Raw values of Table 6.

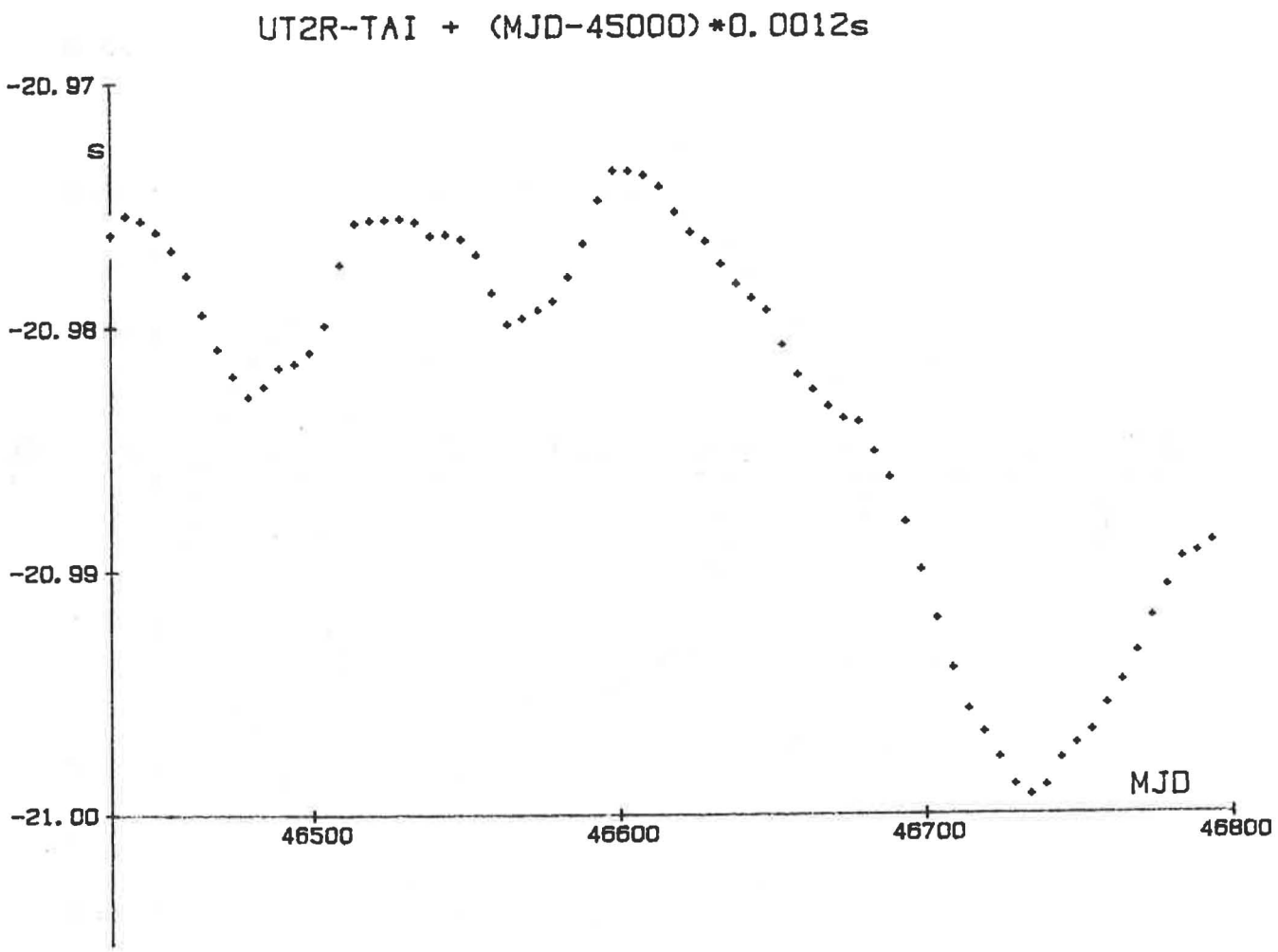

Figure 2 - Universal time from 1986 Jan.4 to Dec.30
(MJD 46434 - 46794). Raw values of Table 6.

The following conventional formula is used :

UT2-UT1 = 0.0220 sin2πt-0.0120 cos2πt-0.0060 sin4πt+0.0070 cos4πt,
the unit being the second and t being the date in besselian years.
UT2R is corrected for the effect of zonal tides for periods up to
35 days.

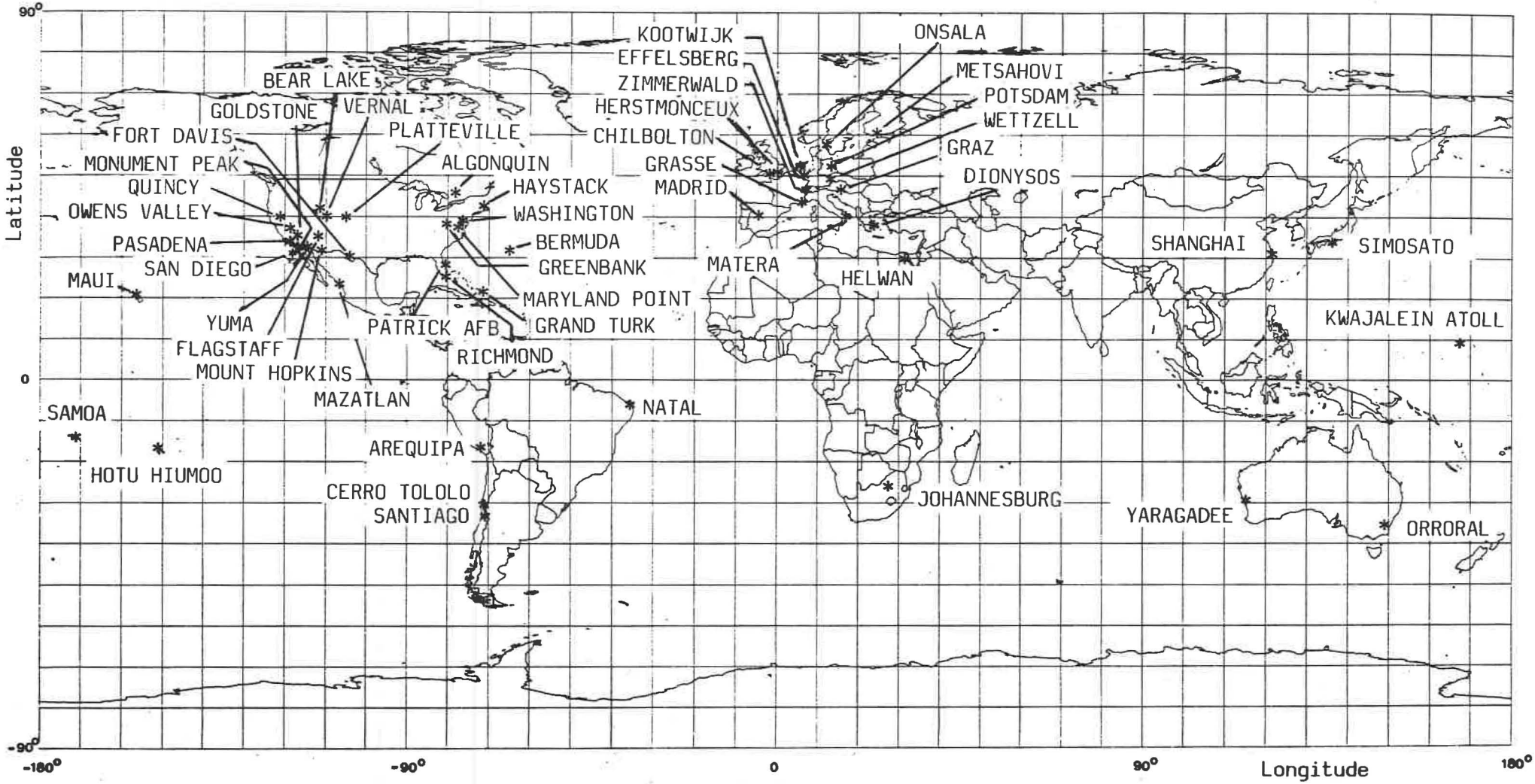

Figure 3 - Sites in the BIH Terrestrial System (1986).

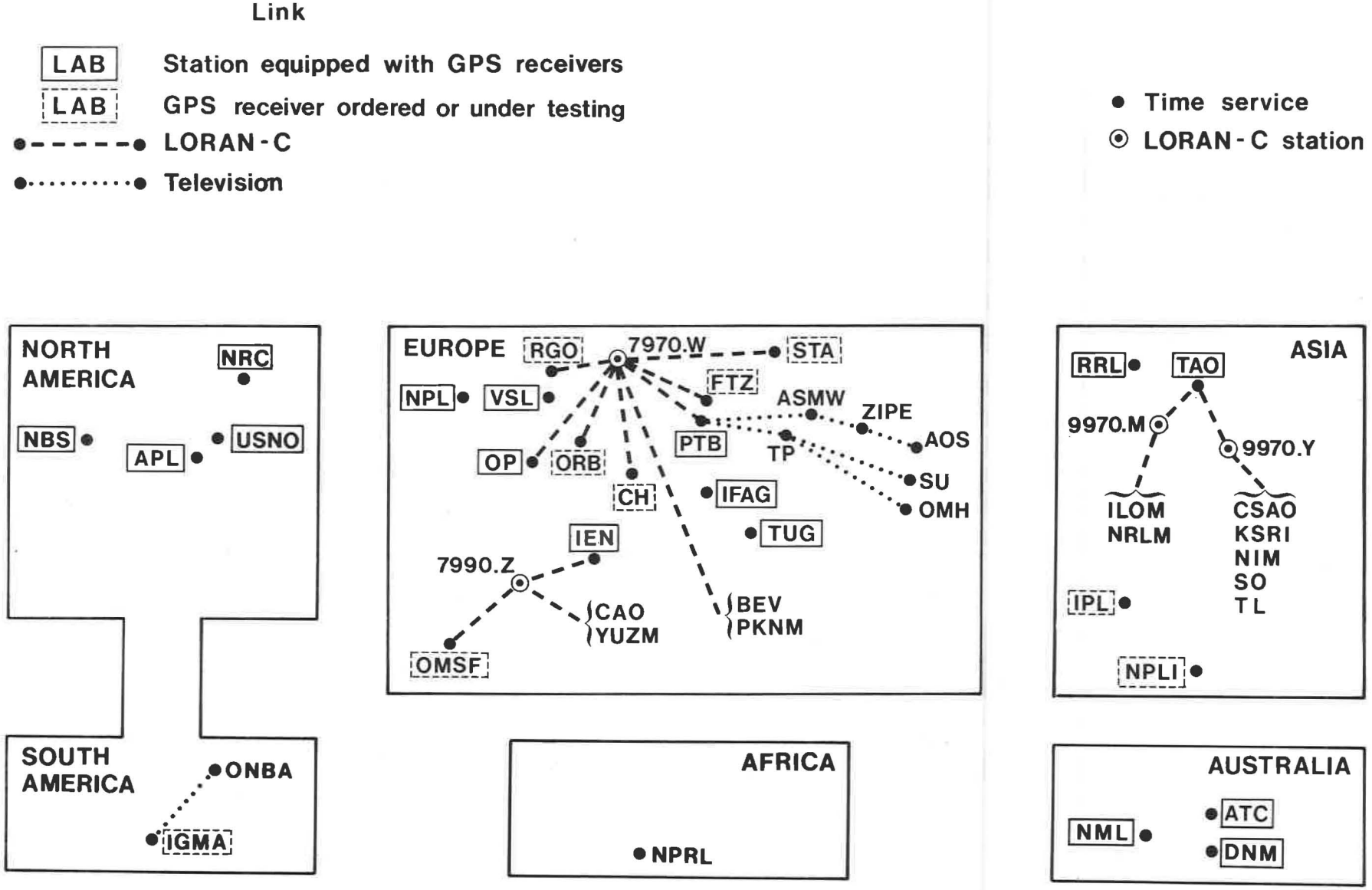

Fig. 4.- Time links used by BIH (31 December 1986)

The link GPS - 7970-W is established through OP or PTB, depending on the laboratories.

PART C

TIME SIGNAL (1987)

The time signal emissions reported thereafter follow the UTC system, in accordance with the Recommendation 460-3 of the International Radio Consultative Committee (CCIR), unless otherwise stated.

Their maximum departure from the Universal Time UT1 is thus 0.9 second.

AUTHORITIES RESPONSIBLE FOR THE TIME SIGNAL EMISSIONS

Signal	Authority
ATA	National Physical Laboratory Hillside Road New Delhi - 110012, India
BPM	Shaanxi Astronomical Observatory Academia Sinica P.O. Box 18 - Lintong Shaanxi, China
BSF	Telecommunication Laboratories Directorate General of Telecommunications Ministry of Communications P.O. Box 71 - Chung-Li 32099 Taiwan, R.O.C.
CHU	National Research Council, Time and Length Standards Section Physics Division (M-36) Ottawa K1A OR6, Ontario, Canada Attn : Dr. J. Vanier
DCF77	Physikalisch-Technische Bundesanstalt, Laboratorium 4.41 Bundesallee 100 D33 Braunschweig Federal Republic of Germany
DGI, Y3S	Amt für Standardisierung, Messwesen und Warenprüfung Zeit - und Frequenzdienst der DDR Fürstenwalder Damm 388 DDR 1162 Berlin
EBC	Instituto y Observatorio de Marina San Fernando Cadiz, Spain

Signal	Authority
HBG	Service horaire HBG Observatoire Cantonal CH - 2000 Neuchâtel, Suisse
HLA	Time and Frequency Laboratory Korea Standards Research Institute P. O. Box 3, Taedok Science Town Taejon, Ch'ungnam 300-31 Republic of Korea
IAM	Istituto Superiore delle Poste e delle Telecomunicazioni Ufficio 8°, Rep.2° - Viale Europa 190 00144 - Roma, Italy
IBF	Istituto Elettrotecnico Nazionale Galileo Ferraris Strada delle Cacce, 91 10135 - Torino, Italy
JJY, JG2AS	Standards and Measurements Division The Radio Research Laboratory Ministry of Posts and Telecommunications Koganei, Tokyo 184, Japan
LOL	Director Observatorio Naval Av. Espana 2099 1107 - Buenos-Aires, Republica Argentina
MSF	National Physical Laboratory Electrical Science Division Teddington, Middlesex TW11 OLW United Kingdom

Signal	Authority
OLB5, OMA	1/ Time information : Astronomický Ústav ČSAV, Budecsksá 6 120 23 Praha 2, Vinohrady, Czechoslovakia. TELEX : 122 486 2/ Standard frequency information : Ústav radiotechniky a electroniky ČSAV, Lumumbova 1, 182 51 Praha 8, Kobylisy, Czechoslovakia. TELEX : 122 646
PPE, PPR	Serviço da hora Observatorio Nacional (CNPq) Rua General Bruce, 586 20921 Rio de Janeiro - RJ, Brasil
RBU, RCH, RID, RTA, RTZ, RWM, UNW3, UPD8, UQC3, USB2, UTR3	Comité d'Etat des Normes Conseil des Ministres de l'URSS Moscou 117049, URSS, Leninski prosp., 9
TDF	Centre National d'Etudes des Télécommunications PAB - STC - Etalons de fréquence et de temps 196 avenue Henri Ravera - 92220 Bagneux, France
VNG	Telecom Australia Research Laboratories Reference Measurements Section Box 249 - Clayton, Victoria 3168, Australia
WWV,WWVH **WWVB**	Time and Frequency Division, 524.00 325 Broadway National Bureau of Standards Boulder, Colorado 80303, U.S.A.
YVTO	Direccion de Hidrografia y Navegacion Observatori Cagigal Apartado Postal No 6745 Caracas, Venezuela
Y3S	See DGI
ZUO	National Physical Research Laboratory P.O. Box 395 - Pretoria 0001 South Africa

TIME - SIGNALS EMITTED IN THE UTC SYSTEM

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of time signals
ATA	Greater Kailash New Delhi India 28° 34'N 77° 19'E	5 000 10 000 15 000	12 h 30 m to 3 h 30 m continuous 3 h 30 m to 12 h 30 m	Second pulses of 5 cycles of a 1 kHz modulation. Minute pulses of 100 ms duration. (the time signals are advanced by 50 ms on UTC).
BPM	Pucheng China 35° 0'N 109° 31'E	2 500 5 000 10 000 15 000	10 h to 22 h 9 h to 1 h continuous 1 h to 9 h	UTC time signals (the signals are emitted in advance on UTC by 20 ms). Second pulses of 10 ms of 1 kHz modulation. Minute pulses of 300 ms of 1 kHz modulation. From minutes 0 to 10, 15 to 25, 30 to 40, 45 to 55. UT1 time signals are emitted from minutes 25 to 29, 55 to 59.
BSF	Chung-Li Taiwan ROC 24° 57'N 121° 9'E	5 000 15 000	continuous except interruption between minutes 35 and 40	(a) From min. 5 to 10, 15 to 20, 25 to 30, 45 to 50, 55 to 60, second pulses of 5 ms duration without 1 kHz modulation. (b) From min. 0 to 5, 10 to 15, ..., 50 to 55, second pulses of 5 ms duration with 1 kHz modulation. The 1 kHz modulation is interrupted 40 ms before and after the pulses. (c) Minute pulses are extended to 300 ms. (d) DUT1, CCIR code by lengthening.
CHU	Ottawa Canada 45° 18'N 75° 45'W	3 300 7 335 14 670	continuous	Second pulses of 300 cycles of a 1 kHz modulation, with 29th and 51st to 59th pulses of each minute omitted. Minute pulses are 0.5 s long. Hour pulses are 1.0 s long, with the following 1st to 10th pulses omitted. A bilingual (Fr. Eng.) announcement of time (UTC-5 hours) is made each minute following the 50th second pulse. FSK time code after 10 cycles of 1 kHz on the 31st to 39th seconds. Broadcast is single sideband; upper sideband with carrier reinsert. DUT1 : CCIR code by split pulses.
DCF77	Mainflingen Germany, F.R. 50° 1'N 9° 0'E	77.5	continuous	At the beginning of each second (except the 59th second) the carrier amplitude is reduced to about 25 % for a duration of 0.1 s or 0.2 s. Coded transmission of year, month, day, hour, minute and day of the week in a BCD code from second marker No 21 to No 58 (the second marker durations of 0.1 s or 0.2 s correspond to a binary 0 or a binary 1 respectively). The coded time information is related to legal time of FRG and second markers 17 and 18 indicate if the transmitted time refere to UTC(PTB) + 2 h (summer time) or UTC(PTB) + 1 h. Second marker No 15 is prolonged to 0.2 s, if the reserve antenna is in use. No transmission of DUT1.
DGI	Oranienburg Germ.Dem.Rep. 52° 48'N 13° 24'E	182	5 h 59 m 30 s to 6 h 00, 11 h 59 m 30 s to 12 h 00, 17 h 59 m 30 s to 18 h 00	A2 type second pulses of 0.1 s duration for seconds 30-40, 45-50, 55-60. The last pulse is prolonged. (one hour earlier in summer time)
EBC	San Fernando Spain 36° 28'N 6° 12'W	12 008 6 840	10 h 00 m to 10 h 25 m 10 h 30 m to 10 h 55 m	Second pulses of 0.1 s duration of a 1 kHz modulation. Minute pulses of 0.5 s duration of 1 250 Hz modulation. DUT1, CCIR code, double pulse. Type A3H.
HBG	Prangins Switzerland 46° 24'N 6° 15'E	75	continuous	Interruption of the carrier at the beginning of each second, during 100 ms. The minutes are identified by a double pulse, the hours by a triple pulse. No transmission of DUT1. Time code and other coded information.

Notes : see p. C-10

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of time signals
HLA	Taedok Science Town Republic of Korea 36° 23'N 127° 22'E	5 000	1 h to 8 h on Monday to Friday	Pulses of 9 cycles of 1800 Hz modulation. 59th and 29th second pulses omitted. Hour identified by 0.5 second long 1500 Hz tone. Beginning of each minute identified by 0.5 second long 1800 Hz tone. Voice announcement of hours and minutes each minute following 52nd second pulse. BCD time code given on 100 Hz subcarrier. DUT1 : CCIR code by double pulse.
IAM (1)	Rome Italy 41° 47'N 12° 27'E	5 000	7 h 30 m to 8 h 30 m 10 h 30 m to 11 h 30 m except Sat. afternoon, Sund., and national holidays. Advanced by 1 hour in summer.	Second pulses of 5 cycles of 1 kHz modulation. Minute pulses of 20 cycles. Voice announcements every 15 m beginning at 0 h 0 m. Time announcement by Morse code beginning at 0 h 5 m. DUT1 : CCIR code by double pulse.
IBF	Torino Italy 45° 2'N 7° 42'E	5 000	During 15 m preceding 7 h, 9 h, 10 h, 11 h, 12 h, 13 h, 14 h, 15h, 16 h, 17 h, 18 h. Advanced by 1 hour in summer.	Second pulses of 5 cycles of 1 kHz modulation. These pulses are repeated 7 times at the minute. Voice announcements at the beginning and end of each emission. Time announcement (C.E.T.) by Morse code every ten minutes beginning at 0 h 0 m. DUT1 : CCIR code by double pulse.
JG2AS	Sanwa Ibaraki Japan 36° 11'N 139° 51'E	40	continuous, except interruptions during communications.	A1 type second pulses of 0.5 s duration. Second 59 is of 0.1 s. No DUT1 code.
JJY	Sanwa Ibaraki Japan 36° 11'N 139° 51'E	2 500 5 000 8 000 10 000 15 000	continuous, except interruption between minutes 35 and 39.	Second pulses of 8 cycles of 1 600 Hz modulation Minute pulses are preceded by a 600 Hz modulation. DUT1 : CCIR code by lengthening.
LOL1 (1)	Buenos-Aires Argentina 34° 37'S 58° 21'W	5 000 10 000 15 000	11 h to 12 h, 14 h to 15 h, 17 h to 18 h, 20 h to 21 h, 23 h to 24 h	Second pulses of 5 cycles of 1 000 Hz modulation. Second 59 is omitted. Announcement of hours and minutes every 5 minutes, followed by 3 m of 1 000 Hz or 440 Hz modulation. DUT1 : CCIR code by lengthening.
LOL2 **LOL3** (1)	Buenos-Aires Argentina 34° 37'S 58° 21'W	4 856 8 030 17 180	1 h, 13 h, 21 h	A1 second pulses during the 5 minutes preceding the indicated times. Second 29 is omitted. Minute pulses are prolonged. DUT1 : CCIR code by double pulse.
MSF	Rugby United Kingdom 52° 22'N 1° 11'W	60	continuous except for an interruption for maintenance from 10 h 0 m to 14 h 0 m on the first Tuesday in each month.	Interruptions of the carrier of 100 ms for the second pulses, of 500 ms for the minute pulses. The signal is given by the beginning of the interruption. BCD NRZ code, 100 bits/s (month, day of month, hour, minute), during minute interruption. BCD PWM code, 1 bit/s (year, month, day of month, day of week, hour, minute) from seconds 17 to 59 in each minute. DUT1 : CCIR code by double pulse.
MSF (2)	Rugby United Kingdom 52° 22'N 1° 11'W	2 500 5 000 10 000	between minutes 0 and 5, 10 and 15, 20 and 25, 30 and 35, 40 and 45, 50 and 55.	second pulses of 5 cycles of 1 kHz modulation. Minute pulses are prolonged. DUT1 : CCIR code by double pulse.
OLB5	Liblice Czechoslovakia 50° 4'N 14° 53'E	3 170	continuous except from 9 h to 14 h on the first Wednesday of every month	A1 type, second pulses. No transmission of DUT1.
OMA (3)	Liblice Czechoslovakia 50° 4'N 14° 53'E	50	continuous (from 6 h to 12 h on the first Wednesday in each month, emitted from Podebrady with reduced power)	Interruption of the carrier of 100 ms at the beginning of every second, of 500 ms at the beginning of every minute. The precise time is given by the beginning of the interruption. Phase coded announcement of date, UT and local civil time. No DUT1 code.

Notes : see p. c-10

Station	Location Latitude Latitude	Frequency (kHz)	Schedule (UTC)	Form of time signals
OMA	Liblice Czechoslovakia 50° 4'N 14° 53'E	2 500	continuous except from 9 h to 14 h on the first Wednesday of every month	Pulses of 100 cycles of 1 kHz modulation (prolonged for the minutes) No DUT1 code.
PPE	Rio-de-Janeiro Brasil 22° 54'S 43° 13'W	8 721	0 h 30 m, 11 h 30 m, 13 h 30 m, 19 h 30 m, 20 h 30 m, 23 h 30 m	Second ticks, of A1 type, during the five minutes preceding the indicated times. The minute ticks are longer. DUT1 : CCIR code by double pulse.
PPR	Rio-de-Janeiro Brasil 22° 59'S 43° 11'W	435 4 244 8 634 13 105 17 194.4 22 603	1 h 30 m, 14 h 30 m, 21 h 30 m	Second ticks, of A1 type, during the five minutes preceding the indicated times. The minute ticks are longer.
RBU (4)	Moscow USSR 55° 48'N 38° 18'E	66 2/3	continuous	DXXXW type signals. The time of day in hours, minutes and seconds is transmitted in BCD code
RCH (4)	Tashkent USSR 41° 19'N 69° 15'E	 2 500 5 000 10 000	between minutes 0 and 10, 30 and 40 0 h to 3 h 40 m 5 h to 23 h 40 m 0 h to 3 h 40 m 14 h to 23 h 40 m 5 h to 13 h 10 m	A1X type second pulses. The pulses at the beginning of the minute are prolonged to 0.5 s.
RID (4)	Irkutsk USSR 52° 26'N 104° 2'E	5 004 10 004 15 004	The station simultaneously operates on three frequencies between minutes 20 and 30, 50 and 60	A1X type second pulses. The pulses at the beginning of the minute are prolonged to 0.5 s.
RTA (4)	Novosibirsk USSR 55° 4'N 82° 58'E	 10 000 15 000	between minutes 0 and 10, 30 and 40, 0 h to 5 h 10 m, 14 h to 23 h 40 m, 6 h 30 m to 13 h 10 m	A1X type second pulses. The pulses at the beginning of the minute are prolonged to 0.5 s.
RWM (4)	Moscow USSR 55° 48'N 38° 18'E	4 996 9 996 14 996	The station simultaneously operates on three frequencies between 10 and 20, 40 and 50	A1X type second pulses. The pulses at the beginning of the minute are prolonged to 0.5 s.
RTZ (4)	Irkutsk USSR 52° 26'N 104° 2'E	50	between minutes 0 and 5 0 h to 20 h 05 m 22 h to 23 h 05 m in winter 0 h to 19 h 05 m 21 h to 23 h 05 m in summer	A1X type second pulses. The pulses at the beginning of the minute are prolonged to 0.5 s.
TDF	Allouis France 47° 10'N 2° 12'E	162	continuous except every Tuesday from 1 h to 5 h	Phase modulation of the carrier by + and - 1 radian in 0.1 s every second except the 59th second of each minute. This modulation is doubled to indicate binary 1. The numbers of the minute, hour, day of the month, day of the week, month and year are transmitted each minute from the 21st to the 58th second, in accordance with the French legal time scale. In addition a binary 1 at the 17th second indicates that the local time is 2 hours ahead of UTC(summer time), a binary 1 at the 18th second indicates when the local time is one hour ahead of UTC(winter time) ; a binary 1 at the 14th second indicates that the current day is a public holiday (Christmas, 14 July, etc...); a binary 1 at the 13th second indicates that the current day is a day before a public holiday.

Notes : see p. c-10

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of time signals
UNW3	Molodechno USSR 54° 26'N 26° 48'E	25	7 h 43 m to 7 h 52 m 19 h 43 m to 19 h 52 m in winter 7 h 43 m to 7 h 52 m 20 h 43 m to 20 h 52 m in summer	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
UPD8	Arkhangelsk USSR 64° 24'N 41° 32'E	25	8 h 43 m to 8 h 52 m 11 h 43 m to 11 h 52 m	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
UQC3	Chabarovsk USSR 48° 30'N 134° 51'E	25	0 h 43 m to 0 h 52 m 6 h 43 m to 6 h 52 m 17 h 43 m to 17 h 52 m in winter 2 h 43 m to 2 h 52 m 6 h 43 m to 6 h 52 m 18 h 43 m to 18 h 52 m in summer	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
USB2	Frunze USSR 43° 04'N 73° 39'E	25	4 h 43 m to 4 h 52 m 9 h 43 m to 9 h 52 m 21 h 43 m to 21 h 52 m in winter 4 h 43 m to 4 h 52 m 10 h 43 m to 10 h 52 m 22 h 43 m to 22 h 52 m in summer	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s. 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
UTR3	Gorki USSR 56° 11'N 43° 58'E	25	5 h 43 m to 5 h 52 m 13 h 43 m to 13 h 52 m 18 h 43 m to 18 h 52 m in winter 7 h 43 m to 7 h 52 m 14 h 43 m to 14 h 52 m 19 h 43 m to 19 h 52 m in summer	A1N type 0.1 second pulses of 0.025 s duration. Second pulses are prolonged to 0.1 s 10 second pulses are prolonged to 1 s and minute pulses are prolonged to 10 s. No transmission of DUT1 code.
VNG	Shepparton Australia 36° 20'S 145° 25'E	4 500 7 500 12 000	9 h 45 m to 21 h 30 m continuous except 22 h 30 m to 22 h 45 m 21 h 45 m to 9 h 30 m	Second markers of 50 cycles of 1 kHz modulation ; 5 cycles only for second markers 55 to 58 ; second marker 59 is omitted ; 500 cycles for minute markers. During the 5th, 10th, 15th, etc... minutes, 5 cycles for second markers 50 to 58. Coded transmission of minutes, hours and day of year in a BCD code from second markers 20 to 46 (the second marker durations of 100 or 200 cycles of 1 kHz modulation correspond to a binary 0 or binary 1 respectively).Identification by voice announcement during 15th, 30th, 45th and 60th minutes. DUT1 : CCIR code by 45 cycles of 900 Hz modulation immediately following the normal second markers.
WWV	Fort-Collins USA 40° 41'N 105° 2'W	2 500 5 000 10 000 15 000 20 000	continuous	Pulses of 5 cycles of 1 kHz modulation. 59th and 29th second pulses omitted. Hour is identified by 0.8 second long 1 500 Hz tone. beginning of each minute identified by 0.8 second long 1 000 Hz tone. DUT1 : CCIR code by double pulse. BCD time code given on 100 Hz subcarrier, includes DUT1 correction.
WWVB	Fort-Collins USA 40° 40'N 105° 3'W	60	continuous	Second pulses given by reduction of the amplitude of the carrier. Coded announcement of the date, time, correction to obtain UT1, daylight savings time in effect and leap year. No CCIR code.

Notes : see p. C-10

Station	Location Latitude Longitude	Frequency (kHz)	Schedule (UTC)	Form of time signals
WWVH	Kauai USA 21° 59'N 159° 46'W	2 500 5 000 10 000 15 000	continuous	Pulses of 6 cycles of 1 200 Hz modulation. 59th and 29th second pulses omitted. Hour identified by 0.8 second long 1 500 Hz tone. Beginning of each minute identified by 0.8 second long 1 200 Hz tone. DUT1 : CCIR code by double pulse. BCD time code given on 100 Hz subcarrier, includes DUT1 correction.
YVTO	Caracas Venezuela 10° 30'N 66° 56'W	6 100	continuous	Second pulses of 1 kHz modulation with 0.1 s duration. The minute is identified by a 800 Hz tone and a 0.5 s duration. Second 30 is omitted. Between seconds 40 and 50 of each minute, voice announcement of the identification of the station. Between seconds 52 and 57 of each minute, voice announcement of hour, minute and second.
Y3S (5)	Nauen Germ. Dem. Rep. 52° 39'N 12° 55'E	4 525	continuous except from 8 h 15 m to 9 h 45 m for maintenance if necessary	A1 type second pulses of 0.1 s duration. Minute pulses prolonged to 0.5 s. DUT1 : CCIR code by double pulse.
ZUO	Olifantsfontein South Africa 25° 58'S 28° 14'E	2 500 5 000	18 h to 4 h continuous	Pulses of 5 cycles of 1 kHz modulation. Second 0 is prolonged.
ZUO	Johannesburg South Africa 26° 11'S 28° 4'E	100 000	continuous	Pulses of 5 cycles of 1 kHz modulation. Second 0 is prolonged.

Notes : see p. C-10

NOTES ON THE CHARACTERISTICS OF THE SIGNALS

(1) No recent information on these time signals.

(2) MSF. The services on 2.5, 5 and 10 MHz will be withdrawn as from 1988 February 29.

(3) OMA, 50 kHz

a. The main transmitter in Liblice radiates approx. 7 kW and the stand-by transmitter in Podebrady (50° 9'N, 15° 9'E) approx. 50 W.

b. The details of the time code were published in Nomenclature des stations de radiorepérage et des stations effectuant des services spéciaux - Liste VI, Volume I, édition 7 de U.I.T. in Geneva in July 1980.

c. The transmission OLB5 was relocated from Podebrady to Liblice as from May 1986.

(4) The radiostations of the USSR emit DUT1 information in accordance with the CCIR code. Furthermore they give an additional information dUT1 specifying more precisely the difference UT1 - UTC down to multiples of 0.02 s, the total value of the correction being DUT1 + dUT1. Positive values of dUT1 are transmitted by the marking of p second markers within the range between the 21th an 24th second so that dUT1 = + 0.02 s x p. Negative values of dUT1 are transmitted by the marking of q second markers within the range between the 31th and the 34th second, so that dUT1 = -0.02 s x q.

(5) DUT1 information in CCIR code.
dUT1 information. This additional information specifies more precisely the difference UT1 - UTC down to multiples of 0.02 s, the total value of the correction being DUT1 + dUT1.

A positive value of dUT1 is indicated by doubling a number (p) of consecutive seconds markers from second marker 21 to second marker (20 + p) inclusive ; (p) being an integer from 1 to 5 inclusive.

$$dUT1 = p.0.02 \text{ s.}$$

A negative value of dUT1 is indicated by doubling a number (q) of consecutive seconds markers following the minute marker from second marker 31 to second marker (30 + q) inclusive ; (q) being an integer from 1 to 5 inclusive.

$$dUT1 = -(q.0.02) \text{ s.}$$

The second marker 28 following the minute marker is doubled as parity bit, if the value of (p) or (q) is an even number or if dUT1 = 0.

Time-information. During the last 20 seconds of each minute in a BCD-Code an information about the value "minute" and "hour" in the UTC time scale of the following minute marker is given.

UNCERTAINTY OF THE CARRIER FREQUENCY

The carriers of the following time signals are standard frequencies.

Station	Relative uncertainty of the carrier frequency in 10^{-10}
ATA	0.1
BPM	0.1
BSF	0.2
CHU	0.05
DCF77	0.005
EBC	0.1
HBG	0.005
HLA	0.1
IAM	0.5
IBF	0.1
JJY, JG2 AS	0.1
LOL1	0.1
MSF (60KHz)	0.02
MSF (h.f.)	0.02
OMA (all frequencies)	0.5
RBU, RTZ	0.05
RCH, RID, RTA, RWM	0.5
TDF	0.02
UNW3, UPD8, UQC3, USB2, UTR3	0.05
VNG	0.1
WWV	0.1
WWVB	0.1
WWVH	0.1
ZUO	0.1

TIME OF EMISSION OF THE TIME SIGNALS IN THE UTC SYSTEM, IN 1986

The following deviations of the time of emission of the time signals, from UTC, have been reported to the BIH, or observed.

ATA	UTC-ATA = -0.0500 s
BPM	UTC-BPM = -0.0200 s
OLB5	UTC-OLB5= 0.0008 s