

Diss. Nr. 5056

**Helligkeit, Polarisationsgrad
und Elektronendichte der Sonnenkorona**

ABHANDLUNG

zur Erlangung
des Titels eines Doktors der Naturwissenschaften
der
**EIDGENÖSSISCHEN TECHNISCHEN HOCHSCHULE
ZÜRICH**

vorgelegt von

JOHANNES DÜRST
Dipl. Physiker ETH
geboren am 11. Mai 1941
von Sool (Kt. Glarus)

Angenommen auf Antrag von
Prof. Dr. M. Waldmeier, Referent
Prof. Dr. W. F. Berg, Korreferent

Juris Druck + Verlag Zürich
1973

ABSTRACT

During the eclipse of 1952 February 25 the corona was photographed at an effective wavelength of 5300 \AA . The reduction of 33 of these photographs yields the brightness distribution up to $r = 6$ and polarisations and electron densities up to $r = 3$. The brightness of the corona is given in units of the mean brightness of the solar disk (\bar{B}_\odot) by calibrating a neutral density filter.

The sunlight scattered twice by the atmosphere gives a sky brightness of $(16 \pm 3) 10^{-10} \bar{B}_\odot$ in the neighbourhood of the sun. This radiance is constant within 2 % up to $r = 7$. The light of the innermost corona, scattered by the atmosphere and the camera, is deduced from the brightness distribution across the image of the moon. It decreases $\sim r^{-0.8}$ for $r > 2$ and amounts to $(5 \pm 2) 10^{-10} \bar{B}_\odot$ at $r = 6$.

In regions of the corona without streamers the degree of polarisation is about 25 % at $r = 1.1$, reaches a maximum of about 40 % at $r = 1.3$ and decreases to 10 % at $r = 3$. On the 3 bright streamers polarisation is increased. Maximum polarisation of 55 % - 60 % occurs between $r = 1.5$ and $r = 2.5$. For $r > 2$ the influence of the scattered light on measured coronal polarisation is important.

The separation of K - corona and F - corona is made at 25 position angles in regions without streamers, assuming local spherical symmetry for the K - corona. For $r < 3$ the F - corona is spherical within the limits of 10 %.

The electron density of the bright streamer at 70° is determined from the brightness distribution across the streamer. For $r > 2$ the density decreases exponentially with the square of the distance from the streamer axis. For $r < 1.5$ the density has a minimum near the axis. Up to $r = 4$ the inclination of the streamer axis against the plane of the sky is $24^\circ \pm 2^\circ$ and the ratio of the size of the streamer in heliographic longitude and latitude lies between 1/2 and 2. Assuming circular cross section, at $r = 1.4$ the electron density on the streamer axis has 10 times the value in the undisturbed corona. This ratio increases with increasing r up to $r = 4$, where it is 160.