# THE Fe XIV BRIGHTNESS MEASUREMENTS: 30 JUNE 1973

*(Research Note)*

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Observations of the monochromatic corona were obtained outside of eclipse with the Sacramento Peak Observatory $\lambda 5303$ photoelectric coronal photometer on June 30, 1973. With this instrument, the Fe XIV line is isolated by a birefringent filter with a 0.58 Å full width at half maximum; the 40 cm coronagraph is used to produce a 100 mm solar image. A piezo-optical birefringent modulator (Kemp, 1969) is used to chop between a bandpass centered on the coronal emission line and two adjacent bandpasses in the sky continuum. The line is synchronously detected with a tuned amplifier phase-locked to the modulator drive voltage; the demodulated signal is proportional to the brightness of the emission line. This signal is recorded on magnetic tape for further reduction.

The corona is scanned by offsetting the spar guider through a programmed cycle. The scan aperture in the focal plane is a hole 1.1′ in diam. At fixed radii, (either 1.15, 1.35 or 1.55 $R/R_0$) 120 samples, separated by 3° in position angle, are obtained around the limb. A low resolution 'picture' of the green line corona is thus built up by this scan program. Integration time necessary for one sample is on the order of 1/100th of a second; a hundred samples are taken at each scan position. The complete scan program must be carried out rather slowly, however, in order to allow the guider servo to follow the programmed offset. A single scan at a given radius is accomplished in about 10 min.

The system is calibrated by introducing a known brightness signal into the detection system. A single calibrated neutral density filter, along with a diffuser plate and a reduced objective aperture are used to produce a signal proportional to a known brightness. By the use of other calibrated filters, it has been established that the detection system is linear over a range in brightness between $40.0 \times 10^{-6} I_0$ and $0.5 \times 10^{-6} I_0$. Although only the chopped signal is detected, the noise level is dependent upon the brightness level of the sky and instrumentally scattered light brightness. In the case of the observation presented below, the standard deviation about a mean brightness was $0.19 \times 10^{-6} I_0$. The amplitude of the noise level in the 1.55 $R/R_0$ scan is $\pm 0.37 \times 10^{-6} I_0$. A complete description of this instrument is given by Fisher (1973).

Data for 30 June 1973 are presented in Figure 1. Coronal brightness in the Fe XIV

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$\lambda$5303 line is plotted as a contour map over position angle along the abscissa and distance from the center of the solar disk, in units of $R/R_0$, along the ordinate. The contour levels are, in fact, linear interpolations between the data points. In this standard reduction, levels of 1, 2, 4, 8 and $16 \times 10^{-6}$ $I_0$ are used to display the distribution of brightness of the emission line. The designations $N$, $E$, etc. refer to geocentric north, east, etc. The heliocentric pole of rotation was offset about one sample step (3°) to the west.

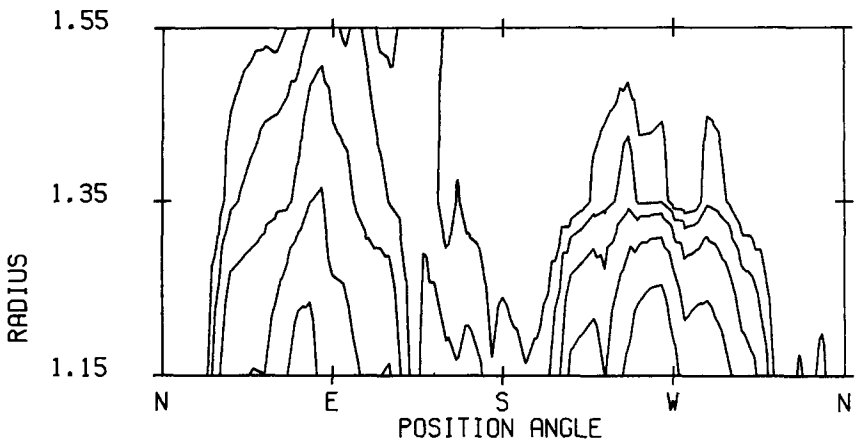


Fig. 1. Intensity of the $\lambda$5303 line is plotted as a function of position angle (abscissa) and height above the limb (ordinate). The contour levels are 1, 2, 4, 8 and $16 \times 10^{-6}$ $I_{\text{disk}}$.

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## Reference

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Fisher, R. R.: 1973, AFCRL Instrumentation Paper No. 205.