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PHOTOMETRY OF AI Phe

AI Phe (BV 1513, HD 6980) was found to be a late-type eclipsing binary by Strohmeier (1972, IBVS 665), who noted that the period was probably several days. In order to determine the period and characteristics of the lightcurve for possible inclusion in the eclipsing binary program at the Copenhagen University Observatory, a search for eclipses was carried out between Sept. 1976 and Jan. 1977. The observations were performed with the 50 cm Danish Telescope at the European Southern Observatory, La Silla, Chile, equipped with a four-channel spectrophotometer. Filters of the Strömberg uvby system were employed.

Observations on 42 nights gave parts of 4 eclipses, and from a preliminary ephemeris B. Helt (private communication) obtained part of an eclipse in Sept. 1977 with the same instrument.

The final ephemeris is

$$\text{HJD } 2443410.6885 + 24.5923 \cdot n.$$

Primary minimum has a depth in u,v,b,y in the instrumental system (which is very close to the standard system) of $1^{\text{m}}.24$, $1^{\text{m}}.05$, $0^{\text{m}}.83$ and $0^{\text{m}}.74$, respectively. The eclipse lasts almost 13 hours, which is a fraction of 0.02 of the period, and shows a totality of approximately 80 minutes duration. Only parts of the sides of the secondary minimum were observed. Their extension gives a depth in y of about $0^{\text{m}}.28$. Secondary minimum is displaced to phase 0.46, indicating an accentric orbit. The standard uvby indices outside eclipse are $V=8.609$, $b-y=0.424$, $m_1=0.219$ and $c_1=0.357$, with b-y increasing by about $0^{\text{m}}.1$ during primary minimum.

AI Phe is a double-lined spectroscopic binary. M. Imbert (private communication) has found, from spectra taken with the ESO 1.5 meter telescope at La Silla, that the primary component is of spectral type G2V, showing rather broad lines, and that the secondary component is of somewhat later type, possibly G5.

This is consistent with the uvby colours and their variation during primary minimum. The difference in spectral type between the components seems insufficient to explain the large difference in the depths of the two minima, which is therefore presumably due to the variation of the separation between the components in an eccentric orbit with $e \cos \omega$ close to zero.

Since relatively few late-type long-period eclipsing binaries have been studied, a full lightcurve will be obtained.

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