THE ELLIPSOIDAL VARIABILITY OF HR 4646

The Eighth Catalogue of the Orbital Elements of Spectroscopic Binary Systems (Batten et al., 1988) lists the star HR 4646 ($\alpha(2000)=3^h57^m3\overset{s}{.}8$, $\delta(2000)= +77°36'\ 58"$, V=$5\overset{m}{.}1$) as a single-lined spectroscopic binary with a period of $1\overset{d}{.}2709334$. This is based on spectroscopy due to Abt (1961).

HR 4646 was included in a recent campaign of potential ellipsoidal variables. Observations have been made with the Devon Astronomical Observatory 0.5 m telescope using a recently installed CCD imaging system. Photometry was carried out on HR 4646 over the 6 nights, January 21-24 and February 10-13 1995. The data consist of $\sim$1500 V filter observations. Integrations were 0.35 - 0.70 seconds at approximately 2 minute intervals ($\sim$0.001 in phase).

The star SAO 7521 (V=$6\overset{m}{.}6$) was used as a comparison with SAO 7519 (V=$8\overset{m}{.}9$) serving as a check star. The data were phased with the $1\overset{d}{.}2709334$ period given by Abt (1961) and computed from his epoch of maximum radial velocity T_0=JD 2436758.245. The results were averaged in 100 equal phase bins. The data, as presented have not been transformed from the local to the standard UBV system.

A Fourier series of the form

$$l = A_0 + \sum(A_i \cos \theta_i + B_i \sin \theta_i)$$

where l is flux and θ is the orbital phase measured from the time of maximum velocity was fitted to the data. Linear regression analysis was used to perform a Fourier least-squares fit for the first 4 terms. The coefficients along with standard errors are presented in Table 1. The residual error in the fit is roughly 0.010 in flux which is typical of scatter in the observations. The Fourier series is plotted in Figure 1 along with the data. The dominance of the $\cos 2\theta$ term supports the suggestion that HR 4646 is an ellipsoidal binary system and the phase relationship between the photometric and spectroscopic data is consistent with that interpretation.

A complete discussion of this system which includes analysis of the spectroscopic data will be published as part of the M.Sc. thesis of E.S..

Table 1

Fourier Coefficents

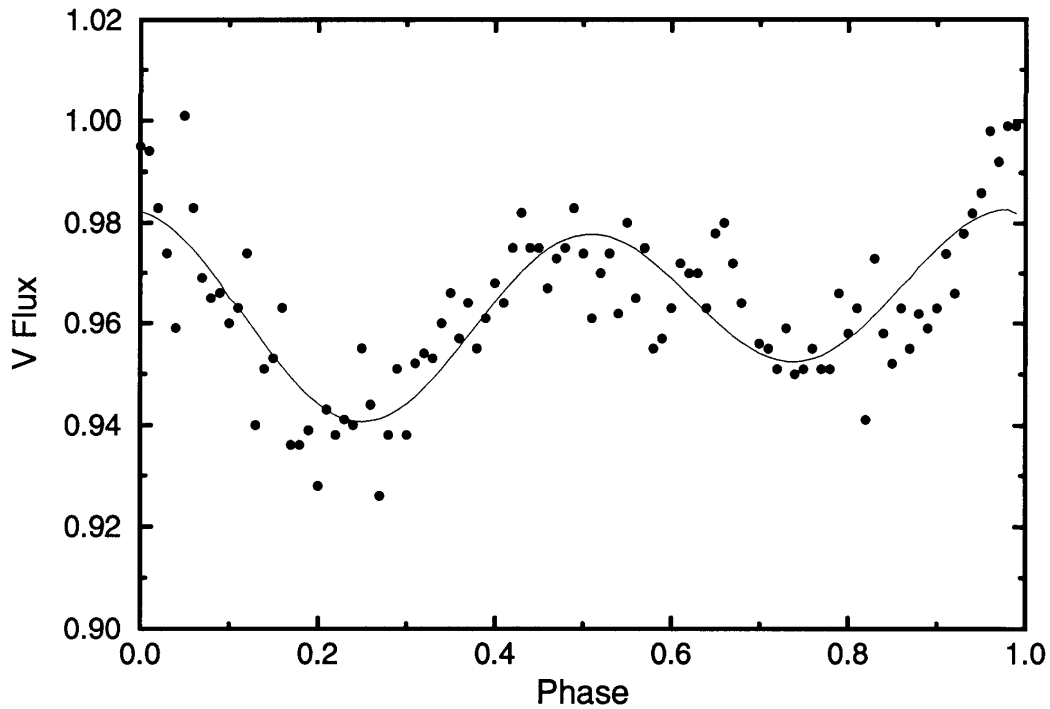| A_0	A_1	A_2	B_1	B_2
0.963	0.002	0.017	−0.006	−0.001

standard error of coefficients = ±0.001

Figure 1 - V filter flux observations of HR 4646 phased in bins of width 0.01. Phasing is with respect to a period of $1\overset{d}{.}2709334$ and from epoch date $T_0=$ JD 2436758.245. The solid line represents a least-squares, fourth-order Fourier fit to the data.

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