COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 4235

Konkoly Observatory
Budapest
28 August 1995
HU ISSN 0374 – 0676

COMPLETE PHOTOELECTRIC U,B,V LIGHT CURVES OF THE SHORT PERIOD NEAR CONTACT SYSTEM: HL AURIGAE

The eclipsing variable, HL Aurigae (S4727 Aur), was discovered by Hoffmeister (1949) in a survey of Zone +40° Sonneberg plates for new variables. He gave the variable a probable classification of an Algol-type (EA) eclipsing system which displayed a 1.0 magnitude amplitude but he gave no period. Kippenhahn (1953) reclassified HL Aurigae as a Beta Lyrae-type binary from 96 plate estimates showing the primary and secondary eclipse depths to have 1.1 and 0.35 magnitude amplitudes respectively. He also reported the first orbital elements which are given in Equation 1.

$$\text{JD Hel Min. I} = 2426365.309 + 0^{\text{d}}.6225058 \times \text{E} \qquad (1)$$

Kippenhahn (1955) later published a photographic light curve and fifteen times of minimum light. Pfau (1955a, 1955b) published two lists which included fourteen new minima, a finder chart, and a photographic light curve. Since that time, HL Aurigae has been monitored by many individuals (BBSAG #21-#103) who give timings of minimum light for this system. Zhang et al. (1994) give an informative IBVS note which includes eleven epochs of minimum light, BV photoelectric light curves, and the improved ephemeris given in Equation 2.

$$\text{JD Hel Min. I} = 2447913.3470 + 0^{\text{d}}.62250590 \times \text{E} \qquad (2)$$

Our present U,B,V light curves of HL Aur were obtained, as part of our survey of the eccentric eclipsing binary (EEB) candidates of Hegedüs (1988). The observations were made on 1994, December 9-15 at Lowell Observatory, Arizona. The 0.79-m National Undergraduate Research Observatory (NURO) reflector was used in conjunction with a thermoelectrically cooled S-13 type PMT.

The approximate coordinates of the comparison, check, and variable stars are given in Table 1.

Table 1

Star	RA (2000)	D (2000)
HL Aurigae	$6^{\text{h}}19^{\text{m}}08^{\text{s}}.5$	49°42'22"
Comparison	$6^{\text{h}}19^{\text{m}}16^{\text{s}}.4$	49°21'53"
Check	$6^{\text{h}}18^{\text{m}}59^{\text{s}}.4$	49°24'59"

We determined four new precise epochs of minimum light from observations made during three primary and one secondary eclipse. The Hertzprung method (Hertzsprung, 1928) was used to determine the first two primary minima while the bisection of chords technique was used to determine the last primary epoch of minimum light. The secondary minimum was determined using the bisection of chords technique as well as a hybrid of this

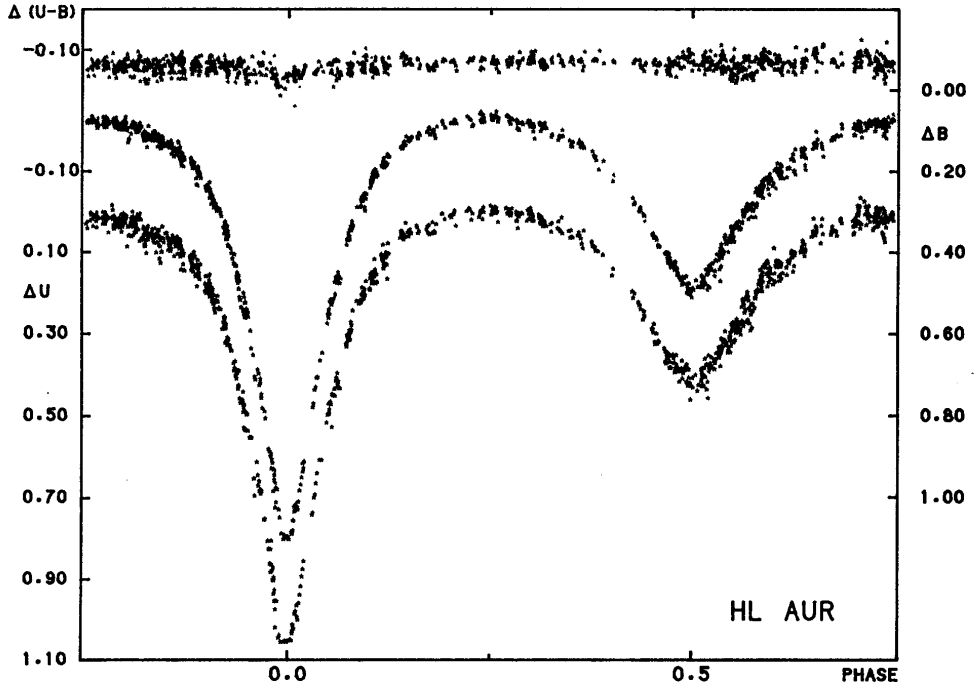

Figure 1. Photoelectric U, B light curves of HL Aurigae as defined by the individual observations.

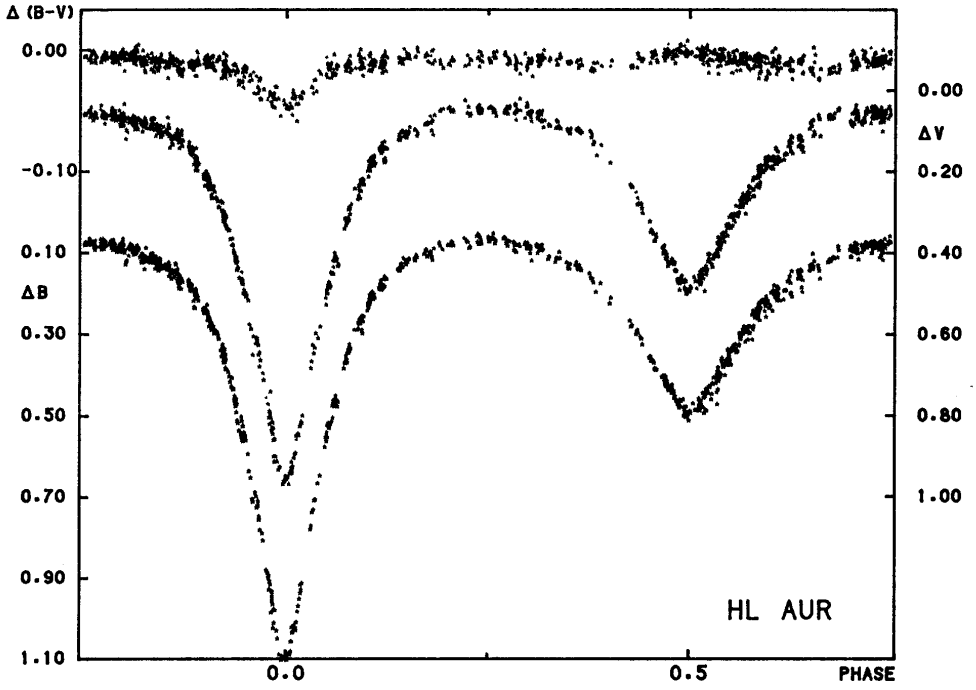

Figure 2. Photoelectric B, V light curves of HL Aurigae as defined by the individual observations.

method which allows analysis of asymmetric eclipses. These are listed in Table 2. In Table 2, values are accompanied by their probable errors in parentheses.

Table 2

JD Hel. 2400000+	Eclipse Type	Cycles	O−C
49695.8909(3)	II	−1.5	−0.0005
49695.8924(3)	II*	−1.5	0.0010
49696.8232(1)	I	0.0	−0.0019
49698.6900(7)	I	3.0	−0.0027
49701.8021(5)	I	8.0	−0.0031

* indicates minima determined with hybrid method

All available epochs of minima were introduced into a least squares solution to obtain a new ephemeris which best represents the present observations:

$$\begin{array}{c} \text{JD Hel Min.} = 2449696.8251 + 0^{\text{d}}.6225049 \times \text{E} \\ \qquad\qquad\quad \pm 12 \qquad\quad \pm 4 \end{array} \tag{3}$$

The O−C residuals calculated from Equation 3 are listed as O−C in Table 2.

The U, B, V light curves of HL Aurigae as defined by their individual observations are shown in Figures 1 and 2 as differential magnitudes (variable−comparison) versus phase. This system does not show a displaced secondary in either the present precision observations or those of Zhang et al. (1994). This casts doubt on the validity of this variable being classified as an EEB. A thorough analysis of the observations is in progress and will be reported on elsewhere.

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[2] This research was supported by funds from the National Science Foundation.
[3] This research was partially supported by funds from the Leighty Science Scholarship Program.

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