GSC 4847_1513 (FASTT 448) — A NEW ECLIPSING VARIABLE

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GSC 4847_1513 = FASTT 448 was first reported as a possible variable by Henden and Stone (1998) in their table of suspected variable stars discovered during the FASTT survey. They noted that the star had an observation 1.37 magnitudes below the mean of all observations. This suggested to the authors that the star might be an eclipsing binary and we began a program to determine the nature of the variability using photographic, visual and CCD observations.

Hager examined 230 patrol plates from the Harvard plate stacks covering the periods 1929–1951 and 1968–1989 and found five minima. Guilbault initiated random visual observations of the star using a 0.32 meter reflector to try to find the period. Those observations permitted a rough determination of the period and additional minima could be predicted and confirmed by Guilbault's observations.

CCD observations commenced in 1999 with the goal of refining the period and the shape of the lightcurve. Those observations were made with the 0.51 meter Ritchey-Chretien reflector of the Western Connecticut State University (WCSU) Observatory and an ISI Systems CCD800 CCD camera using a V filter. Additional minima were observed and the times of minimum found by all methods of observation are listed in Table 1. Both the visual and the CCD times of minimum were determined using a computer program based on the Kwee–Van Woerden (1956) method.

All minima were fitted into a least squares solution with the CCD minima weighted as 10 and the visual and photographic minima weighted as 1. From that analysis we extracted the best period and combined it with the most accurate time of minimum to derive the following elements:

$$\text{Min. I} = \text{HJD } 2451621.55863 + 1\overset{d}{.}0797024 \times E.$$
$$\pm 0.00006 \quad \pm 0.0000001$$

The phased V lightcurve in the instrumental system is shown in Figure 1. Each point contains an error bar showing the estimated internal photometric error of each observation. The curve shows that the star fades from a maximum of $11\overset{m}{.}86 \pm 0.01$ to $13\overset{m}{.}77 \pm 0.04$ at primary minimum. A secondary eclipse with a depth of $0\overset{m}{.}14 \pm 0.01$ occurs at phase 0.50. Both eclipses are partial and their duration is about $0.2\ P$.

Table 1. Times of minimum, GSC 4847_1513 (FASTT 448)

| HJD 2400000 +	Epoch	$O - C$	Observer
25301.636	−24377	−0.017	Harvard ptg
25314.622	−25365	+0.012	Harvard ptg
25954.863	−23772	−0.010	Harvard ptg
26059.612	−23675	+0.008	Harvard ptg
27193.303	−22625	+0.011	Harvard ptg
51255.5346(4)	−339	−0.005	Guilbault vis
51490.9191(2)	−120	+0.004	Guilbault vis
51502.7906(4)	−110	−0.001	Guilbault vis
51502.7909(4)	−110	0.000	Hager ccd
51555.6977(2)	−61	+0.001	Hager ccd
51621.55863(6)	0	0.000	Hager ccd
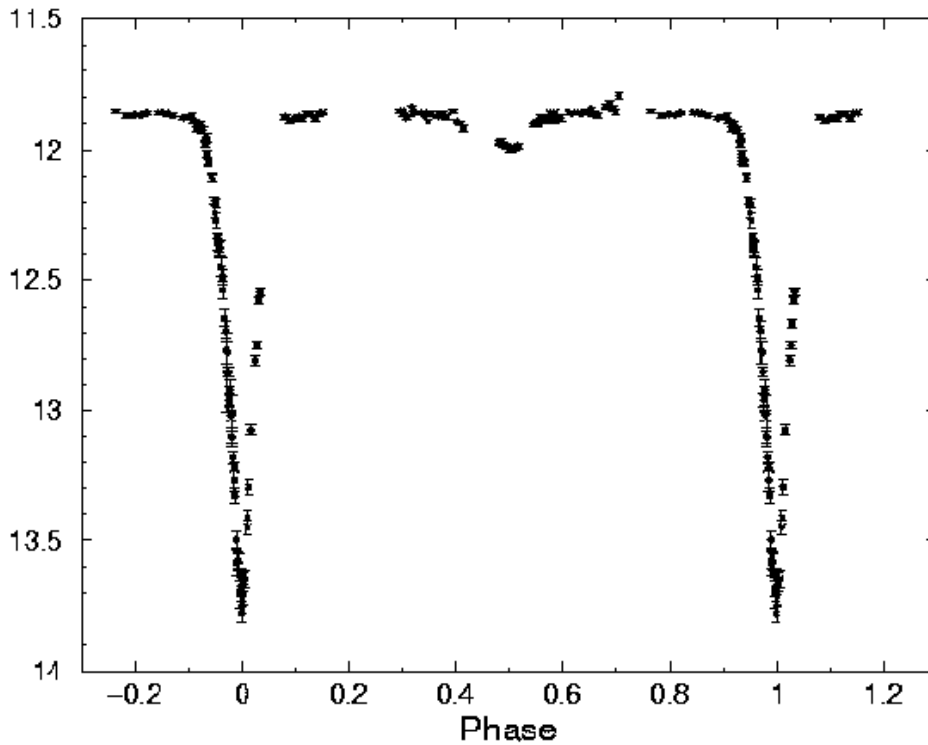
Figure 1. Phased lightcurve — V Filter

    The comparison and check stars are listed in Table 2. The V magnitude and $V - I$ color index of GSC 4847_1694 was taken from the *tenxcat* catalog produced by the TASS group (Richmond *et al.* 2000). The V magnitude and color indices for GSC 4847_1605 are from the average of two nights of all sky photometry using observations of Landolt standards (Landolt, 1992) in March 1998 with the Lowell 31 inch telescope of the National Undergraduate Research Observatory (NURO) in Flagstaff, Arizona.

Table 2. Comparison Stars

Star	V	$B - V$	$V - R$	$V - I$
Comp. GSC 4847_1694	11.565 ± 0.065			1.331 ± 0.165
Check GSC 4847_1605	14.182 ± 0.044	0.631 ± 0.038	0.362 ± 0.060	0.673 ± 0.060

References:

Henden, A. A., and Stone, R. C., 1998, *AJ*, **115**, 296

Kwee, K. K., and Van Woerden, H., 1956, *BAN*, **12**, No. 464, 327

Landolt, A. U., 1992, *AJ*, **104**, 340

Richmond, M. W., Droege, T. F., Gombert, G., Gutzwiller, M., Henden, A. A., Albertson, C., Beser, N., Molhant, N., Johnson, H., 2000, *PASP*, **112**, 397