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LD 347: A NEW ECLIPSING BINARY

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LD 347 = GSC 3120.1794 = USNO 1275-1075 0202 is located at $19^{\text{h}}05^{\text{m}}33^{\text{s}}.82$, $+39^{\circ}20'04''.40$ (J2000) and was discovered to be variable by Dahlmark (2000). In the discovery report it was classified as an eclipsing variable having a range between $12^{\text{m}}.3$ and $13^{\text{m}}.4$ (m_v) with an uncertain period of about 307 days. No further investigations have been published until today.

In order to determine first light elements for the system, we decided to use the plate archives held at the Harvard College Observatory (Guilbault) and the Sonneberg Observatory (Berthold), see Tables 1 and 2.

Table 1: Observational material

Observatory/Series	Number of plates	time-span (J.D.)
Harvard RH	78	2425327–2434072
Harvard Damon	301	2440067–2447823
Sonneberg Sky-Patrol	338	2435698–2450285

Table 2: Comparison stars

Designation	Sonneberg	Harvard	<i>B</i> magnitude
a	USNO 1275-1074 3996	USNO 1275-1074 3996	12.4
b	USNO 1275-1075 0296	USNO 1275-1075 0296	12.9
c	USNO 1275-1075 4169	USNO 1275-1075 4169	13.4
d	—	USNO 1275-1075 5124	13.8
e	—	USNO 1275-1074 8354	14.2

This survey has yielded a series of 32 new minima. They are listed together with that one published by Dahlmark (2000) in Table 3.

Table 3: Minima of LD 347 according to ephemeris (1)

HJD 24. . .	Epoch	$O - C$	Weight	Observer
26919.590	-1029	0.603	1	Guilbault
28056.617	-928	0.564	1	Guilbault
29812.640	-772	0.325	1	Guilbault
30251.547	-733	0.167	1	Guilbault
35779.286	-242	0.187	1	Berthold
36792.425	-152	0.097	1	Berthold
36837.357	-148	-0.002	2	Berthold
37028.617	-131	-0.130	1	Berthold
37659.230	-75	0.031	2	Berthold
38503.584	0	0.028	2	Berthold
39021.359	46	-0.068	1	Berthold
39055.319	49	0.117	1	Berthold
40023.462	135	0.065	1	Berthold
40383.468	167	-0.188	1	Berthold
40507.326	178	-0.169	2	Berthold
41982.314	309	0.009	1	Berthold
43659.742	458	-0.017	1	Guilbault
43670.744	459	-0.273	1	Guilbault
44346.554	519	0.052	1	Berthold
45089.755	585	0.219	1	Guilbault
45494.698	621	-0.129	1	Guilbault
45618.490	632	-0.175	1	Guilbault
45911.425	658	0.049	2	Berthold
45990.285	665	0.103	1	Berthold
46001.271	666	-0.170	1	Berthold
46237.742	687	-0.118	1	Guilbault
46260.459	689	0.082	1	Berthold
46316.628	694	-0.039	1	Guilbault
46699.545	728	0.103	1	Guilbault
46733.468	731	0.252	2	Guilbault
48095.440	852	-0.005	1	Berthold
50279.445	1046	-0.068	1	Berthold
51101.310	1119	-0.043	1	Dahlmark (2000)

Assuming a constant period from J.D. 2435000 until the end of our observations, the following ephemeris can be derived by least squares fitting:

$$\text{Min I} = \text{HJD } 2438503.556 + 11^{\text{d}}258085 \times E. \quad (1)$$

± 31 ± 59

The points in the lightcurves given in Figures 1 and 2 are sliding means ($N = 3$) of the individual estimates, their magnitudes refer to the B values given in the USNO-A2.0 catalogue (Monet et al. 1998). Taking into consideration that the star was not visible on the Sonneberg plates in the very central part of the primary minimum, an estimation of the photographic amplitude from 12^m85 to 13^m80 can be made. The duration of the primary minimum can be estimated to $D = 0^{\text{p}}1$. Furthermore, a secondary minimum

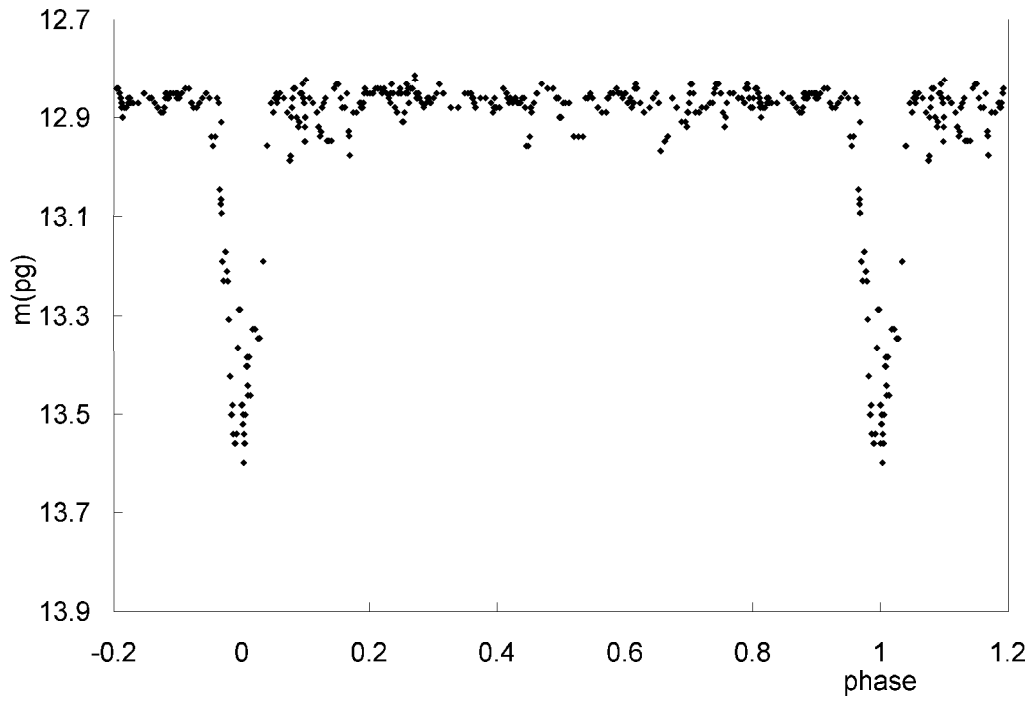


Figure 1. Photographic observations on Sonneberg Sky Patrol plates folded with the ephemeris given in Eq. (1)

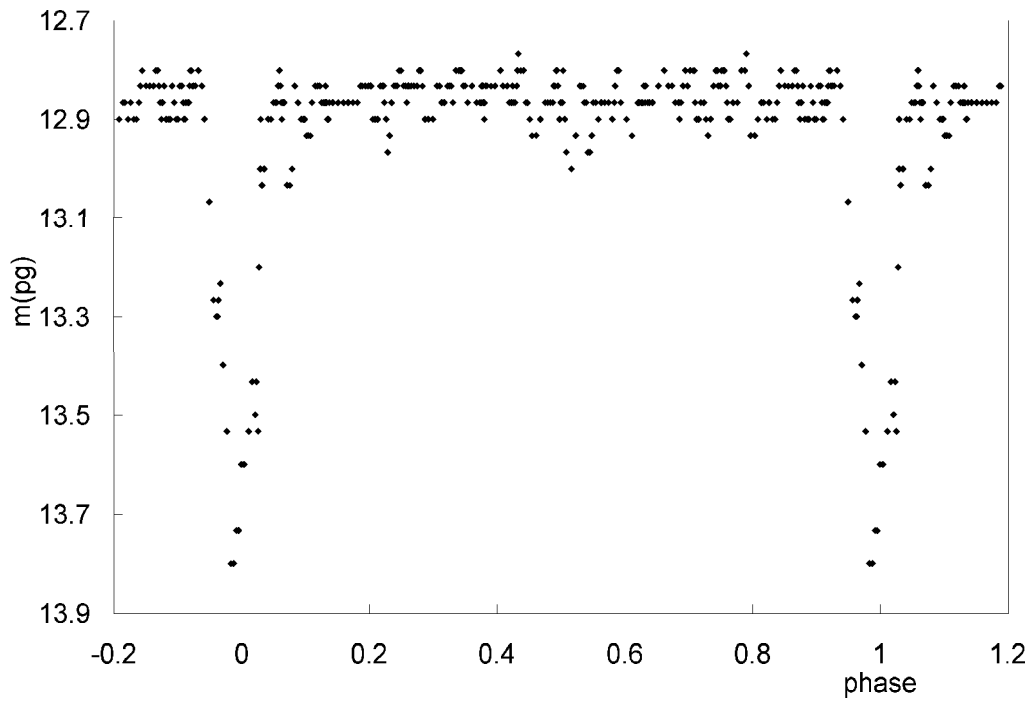


Figure 2. Photographic observations on Harvard Damon and RH series plates folded with the ephemeris given in Eq. (1)

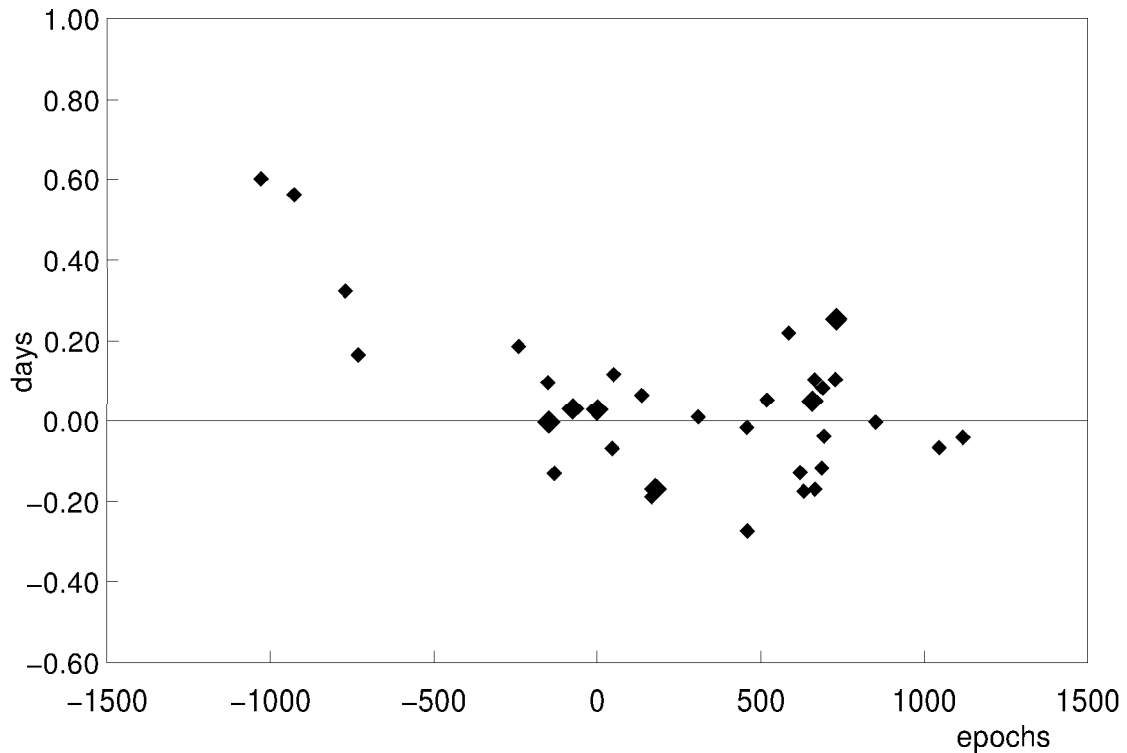


Figure 3. $O - C$ diagram of the available minima according to ephemeris (1)

of about $0^m.1$ depth is indicated especially in the Harvard observations. The data are available from the IBVS website as 5022-t4.txt.

Figure 3 gives the $O - C$ diagram according to ephemeris (1), larger symbols refer to the minima with higher weight (see Table 3). At least the first four minima in our list may point to a shorter value of the period or a possible quadratic term in the elements effective in the past. But as the observational material is not numerous enough at this time, a further study on the older Harvard AC series plates will be undertaken to investigate the long-term behaviour of the star. Ephemeris (1) agrees as well with the unpublished observational material of Dahlmark.

We suggest spectroscopy and multicolour CCD photometry of this obviously well detached system to enable the determination of the fundamental parameters of the probably less distorted components.

Guilbault would like to thank Dr. Martha Hazen, Curator of the Astronomical Photograph Collection of the Harvard College Observatory, for the use of the plates on this and other variable star projects.

References:

- Dahlmark, L., 2000, *IBVS*, No. 4898
 Monet, D. et al., 1998, <http://ftp.nofs.navy.mil/projects/pmm/a2.html>