

**BI CV_n: A STUDY OF ITS PERIOD
 AND A NEW PHOTOELECTRIC LIGHT CURVE**

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BI CV_n (13^h03^m17^s; +36°37'1; 2000.0) is an eclipsing binary on which no detailed study is published even if the GCVS states that its period is suspected to be variable. For this reason the star was included in the observing programme carried out by the GEOS using the 76-cm telescope of Geneva Observatory located on the Jungfrauoch. 43 measurements were obtained in B and V filters of the Geneva system during several missions, devoted to the systematic observations of neglected variable stars. Moreover, the GEOS continued to monitor the star visually.

76 new minima were collected (13 photoelectric, 4 CCD in V-light, 4 CCD in white light, 43 visual, 12 photographic). 49 of them were already published (Vandenbroere 1996; a copy can be requested from the GEOS), 6 are reported by Liu and Tan (1988). Table 1 lists all the CCD and photoelectric minima observed photoelectrically by GEOS, by Franz Agerer using CCD with a V filter and by Anthon Paschke using CCD in white light.

Table 1. Recent photoelectric and CCD times of minima of BI CV_n

Type of minima	HJD 2400000+	Method	Type of minima	HJD 2400000+	Method
I	49137.486	CCD	I	49761.4375	CCD V
I	49479.430	CCD	II	49761.6308	CCD V
II	49516.508	CCD	II	50152.3673	CCD V
I	49722.6325	p.e.	I	50152.5589	CCD V
II	49810.4258	p.e.	I	50252.453	CCD

The GCVS reports a period of 0^d.3846 (see also Zhukov 1982 and 1986), but the related ephemeris cannot be used further to predict times of minima. Several attempts were made to rely on all the available minima (see Vandenbroere 1996 for a detailed discussion), but large O–C's were obtained, strongly suggesting a period change. In particular, two different periods are necessary to fit the minima before and after JD 24 445 760. The resulting ephemeris valid after this date is

$$\text{MinI} = \text{HJD } 2445769.538 \pm 0.002 + 0^{\text{d}}.3842059 \pm 0.0000004 \times E$$

while before this date a period of 0^d.3842120 was calculated. The difference between the depths of the primary and the secondary minima is very small and only the good-quality

photoelectric data collected at Jungfraujoch allowed us to distinguish between them (Figure 1). The above ephemeris predicts primary minima according to this distinction.

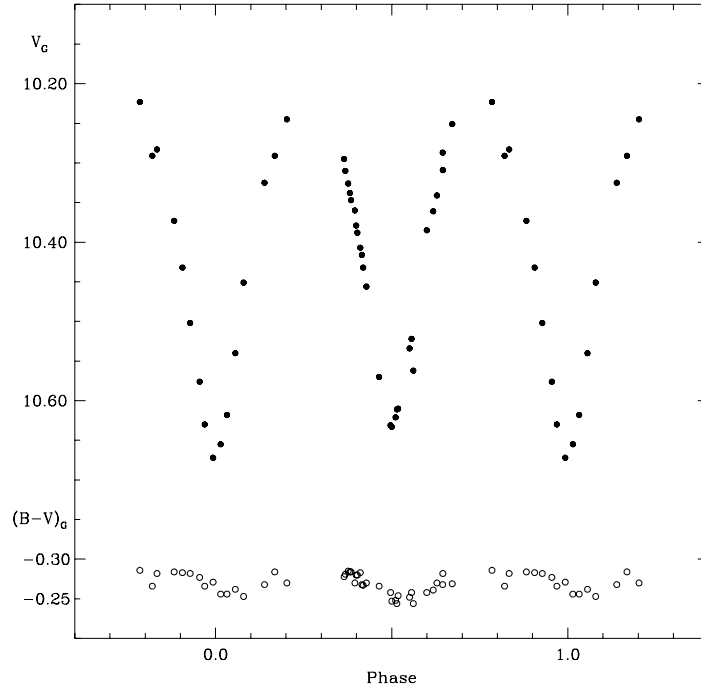


Figure 1. V and $B-V$ (Geneva system) phase curves of BI CVn

From the 43 new BV measurements carried out in the Geneva photometric system we found that BI CVn is ranging from 10^m22 to 10^m67 in V light (Minimum II 10^m63 at phase 0.5), while $(B-V)_G$ varies from -0^m29 to -0^m24 , which corresponds to a range 0^m55-0^m59 in $(B-V)_J$. The $B-V$ colour curve does not mimic perfectly the V light curve, suggesting some surface irregularities as spots. The comparison with the previous photoelectric curves also suggests some little changes in the shape; this fact, combined with the period change surely occurred in the past, makes BI CVn an interesting object for further studies. It should be noted that different classifications as a W UMa system can be found in the literature: W subclass according to Demircan (1987), A subclass according to Maceroni and Van't Veer (1996).

Recently Rucinski and Duerbeck (1997) supplied a M_V calibration for the W UMa stars based on the Hipparcos data. They emphasized that one of the limitations of the calibration is the inadequate quality of the ground-based photometric data, especially the $B-V$ index value. Since in our photometric run we always performed a careful transformation by measuring a lot of standard stars, the mean $(B-V)_J$ value we obtained (0^m57) is as good as the transformations from the Geneva to Johnson systems are. By the above quoted values, we derived $M_V=3.68$, in excellent agreement with the Rucinski and Duerbeck sample.

Table 2. New photoelectric measurements of BI CVn in the Geneva system

HJD 2440000+	V	B-V	HJD 2440000+	V	B-V
9715.5806	10.309	-0.282	9810.3762	10.326	-0.285
9721.6957	10.562	-0.244	9810.3779	10.338	-0.284
9721.7214	10.341	-0.270	9810.3793	10.347	-0.284
9722.5499	10.223	-0.286	9810.3835	10.360	-0.270
9722.5686	10.283	-0.282	9810.3849	10.379	-0.280
9722.5874	10.373	-0.284	9810.3862	10.388	-0.280
9722.5964	10.432	-0.283	9810.3894	10.407	-0.283
9722.6048	10.502	-0.282	9810.3911	10.416	-0.268
9722.6152	10.576	-0.277	9810.3925	10.432	-0.267
9722.6207	10.630	-0.266	9810.3960	10.456	-0.270
9722.6298	10.672	-0.271	9810.4099	10.570	-0.266
9722.6381	10.655	-0.256	9810.4224	10.631	-0.258
9722.6450	10.618	-0.256	9810.4237	10.633	-0.247
9722.6541	10.540	-0.262	9810.4279	10.621	-0.248
9722.6631	10.451	-0.253	9810.4293	10.611	-0.244
9722.6860	10.325	-0.268	9810.4307	10.610	-0.254
9722.6971	10.291	-0.284	9810.4432	10.534	-0.252
9722.7103	10.245	-0.270	9810.4453	10.522	-0.258
9807.3953	10.361	-0.261	9810.4619	10.385	-0.258
9807.4731	10.291	-0.266	9810.4793	10.287	-0.268
9810.3717	10.295	-0.278	9810.4897	10.251	-0.269
9810.3731	10.310	-0.281			

References:

- Demircan, O., 1987, *Astrophys. Space Sci.*, **135**, 169
Liu, X.F., Tan, H.S., 1988, *Acta Astronomica Sinica*, **29**, 23
Maceroni, C., Van't Veer, F., 1996, *Astron. Astrophys.*, **311**, 523
Rucinski, S.M., Duerbeck, H.W., 1997, submitted to AJ (astro-ph 9710214)
Vandenbroere, J., 1996, *GEOS Circular EB*, **23**
Zhukov, G.V., 1982, *IBVS*, No. 2191
Zhukov, G.V., 1986, *Trans. Kazan-Gorod. Astron. Obs.*, **50**