COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 4633

Konkoly Observatory
Budapest
17 September 1998
HU ISSN 0374 – 0676

PHOTOELECTRIC AND CCD TIMES OF MINIMA OF SEVERAL ECLIPSING BINARY SYSTEMS

TAMÁS BORKOVITS, IMRE BARNA BÍRÓ

Baja Astronomical Observatory of Bács-Kiskun County, Baja, Szegedi út, P.O. Box 766, H–6500 Hungary
E-mail: borko@electra.bajaobs.hu

We present CCD and photoelectric photometric minima observations of 21 eclipsing binary systems. Most of them are stars with apsidal motion or at least eccentric binary systems, selected from the list of Hegedüs (1988). The other stars (mostly W UMa type) also show period changes. Some minima observations (e.g. for VW Cephei) are part of complete light curve coverages.

The only photoelectric observation was carried out at Piszkéstető Mountain Station of the Konkoly Observatory of the Hungarian Academy of Sciences with a 20 in. f/15 Cassegrain telescope. The photometer used was equipped with an unrefrigerated EMI 9058QB photomultiplier tube and Schott UG2 (for U), BG12+GG13 (for B) and GG11 (for V) filters. This system is referred to as Pi50 in Table 1. The CCD measurements (either with or without filter) were made at Baja Astronomical Observatory with an SBIG ST-7 camera, equipped with Kron-Cousins V,B,R filters, mounted on the 20 in. f/8.4 Ritchey-Chrétien telescope (Ba50 in Table 1).

The observations were made in the first eight months of 1998. The average accuracy is about 0.01 mag for the CCD data. Reduction of the photoelectric data was made by standard procedures. For the reduction of the CCD frames we used the IRAF package. Most of the minima times were computed using the parabola fitting method. In some cases (extended plateaus) we calculated the minimum by fitting lines to the descending and ascending branches. (In those cases the fifth column of the table is left empty.)

Table 1 presents the derived minima times. The content of the first two columns is self-explaining. The error in the last digit appears in the third column. In the fourth column the types of minima are marked (I for primary, and II for secondary ones), while in the fifth column the number of individual data involved in the parabolic fit is given. Columns from sixth to eighth describe the filters used, the first three letters of the observers' names and the codes of the instrumentation. The last column contains the comparisons used, identified by their BD, GSC or HD numbers.

Table 1

Star	Min. HJD +2400000	error ±	Min. type	Points used	Filter	Obs.'s name	Instr.	Comp.
RT And	50964.5073	2	I	51	V	Bir	Ba50	HD 218915
AB And	50966.5525	3	II	30	V	Bir	Ba50	GSC 2763-0683
	50984.4725	4	II		V	Bir	Ba50	
	51016.5015	1	I	41	V	Bor	Ba50	
OO Aql	50950.481:	1	I	19	V	Bor	Ba50	HD 187146
	50956.5604:	2	I	61	V	Bir	Ba50	
	50967.4608	1	II	45	V	Bor	Ba50	
Y Cam	50872.4601	3	I	77	-	Bor	Ba50	GSC 4527-1983
AS Cam	50900.346	1	II	163	V	Bor	Ba50	GSC 4347-0466
RZ Cas	50871.4266	3	I	414	-	Bor	Ba50	GSC 4317-1578
TV Cas	51005.45:	1	II	190	V	Bir	Ba50	GSC 3665-0026
PV Cas	51015.5270	5	I	55	V	Bir	Ba50	GSC 4010-1432
VW Cep	50871.6230	5	I	102	-	Bor	Ba50	GSC 4585-2387
	50900.5689	3	I	54	V	Bor	Ba50	
	50941.3418	3	II	51	V,B,R	Bor	Ba50	
	50941.4834	3	I	61	V,B,R	Bor	Ba50	
	50942.4549	5	II	59	V,B,R	Bir	Ba50	
	50942.5966	5	I	28	V,B,R	Bir	Ba50	
XX Cep	51018.520:	6	II	91	V	Bor	Ba50	GSC 4288-0186
CQ Cep	50948.5421	6	I	200	V	Bir	Ba50	GSC 3991-1316
DL Cyg	51038.487	3	I	170	V,R	Bor	Ba50	GSC 3595-0816
MR Cyg	50962.4964	1	II	87	V	Bir	Ba50	GSC 3609-1220
	51014.4840	5	II	124	V	Bir	Ba50	
V477 Cyg	50974.4021	2	I	53	V	Bor	Ba50	GSC 2674-0910
AK Her	50865.6038	2	I	53	V,B	Bir	Pi50	BD+16°3123
	50866.6560	1	II	78	-	Bor	Ba50	GSC 1536-0928
	50884.5662	2	I	82	V	Bor	Ba50	
	50903.5338	3	I	78	V	Bir	Ba50	
	50971.4000	3	I	266	R	Bor	Ba50	
GU Her	50970.429	2	I	215	-	Bor	Ba50	GSC 2581-2418
	50983.4640	3	I	200	-	Bir	Ba50	
	51033.424	4	II		-	Bir	Ba50	
HS Her	50945.4690	2	I	283	V	Bir	Ba50	GSC 2113-2242
	50972.4898	3	II	343	V	Bir	Ba50	
	50981.4969	3	I	125	V	Bir	Ba50	
MM Her	50940.5600	5	I	182	V	Bir	Ba50	GSC 1565-2199
SW Lac	50961.518	1	II	49	V	Bir	Ba50	GSC 3215-0906
	50986.5360	1	II	54	V	Bir	Ba50	
	51017.4840	1	I	35	V	Bor	Ba50	
UV Leo	50899.3944	1	II	60	V	Bir	Ba50	GSC 0845-0121
GP Vul	50946.4597	8	II	65	V	Bir	Ba50	GSC 2151-2731

Remarks on some of the variables:
HS Her: We suspect the star GSC 2113-1658 in the field of HS Herculis to be variable.
PV Cas: In our last minima list (Bíró et al., 1998) we reported that 'GSC 4010-1432 showed variations of about 0.8 mag against the check star GSC 4010-1545, and some other fainter stars in the CCD frame'. On the night 21/22 July we couldn't find any variability in its brightness.
This work was partly supported by the Local Government of Bács-Kiskun County.

References:

Hegedüs T., 1988, *CDS Bull.*, **35**, 15
Bíró I. B., Borkovits T., Hegedüs T., Paragi Zs., 1998, *IBVS* No. 4555

ERRATA

In IBVS Nos. 4555 and 4633 we presented CCD photometric minima observations (together with photoelectric ones) of several eclipsing binary systems. Due to an unfortunate programming bug most of the minimum times have an error in the third decimal place of JD. This erratum contains the corrected moments of minima. Table 1 shows the corrigenda to IBVS No. 4555. Table 2 should be used as a total replacement of the Table of IBVS No. 4633.

Table 1

Star	Min. HJD +2400000	Star	Min. HJD +2400000
AS Cam	50519.5238	V453 Cyg	50235.4843
PV Cas	50244.4435	V477 Cyg	50237.4480
GK Cep	50210.453	V1136 Cyg	50270.4694
	50225.4297	DI Her	50238.4929
MR Cyg	50230.4608	UV Leo	50513.5487

Table 2

Star	Min. HJD +2400000	error ±	Min. type	Points used	Filter	Obs.'s name	Instr.	Comp.
RT And	50964.5050	2	I	51	V	Bir	Ba50	HD 218915
AB And	50966.5525	3	II	30	V	Bir	Ba50	GSC 2763-0683
	50984.4721	4	II		V	Bir	Ba50	
	51016.5005	1	I	41	V	Bor	Ba50	
OO Aql	50950.486:	1	I	19	V	Bor	Ba50	HD 187146
	50956.5658:	2	I	61	V	Bir	Ba50	
	50967.4659	1	II	45	V	Bor	Ba50	
Y Cam	50872.4672	3	I	77	-	Bor	Ba50	GSC 4527-1983
AS Cam	50900.351	1	II	163	V	Bor	Ba50	GSC 4347-0466
RZ Cas	50871.4318	3	I	414	-	Bor	Ba50	GSC 4317-1578
TV Cas	51005.45:	1	II	190	V	Bir	Ba50	GSC 3665-0026
PV Cas	51015.5244	5	I	55	V	Bir	Ba50	GSC 4010-1432
VW Cep	50871.6279	5	I	102	-	Bor	Ba50	GSC 4585-2387
	50900.5736	3	I	54	V	Bor	Ba50	
	50941.3443	3	II	51	V,B,R	Bor	Ba50	
	50941.4859	3	I	61	V,B,R	Bor	Ba50	
	50942.4573	5	II	59	V,B,R	Bir	Ba50	
	50942.5990	5	I	28	V,B,R	Bir	Ba50	
XX Cep	51018.517:	6	II	91	V	Bor	Ba50	GSC 4288-0186
CQ Cep	50948.5431	6	I	200	V	Bir	Ba50	GSC 3991-1316
DL Cyg	51038.485	3	I	170	V,R	Bor	Ba50	GSC 3595-0816
MR Cyg	50962.4954	1	II	87	V	Bir	Ba50	GSC 3609-1220
	51014.4830	5	II	124	V	Bir	Ba50	
V477 Cyg	50974.4054	2	I	53	V	Bor	Ba50	GSC 2674-0910
AK Her	50865.6038	2	I	53	V,B	Bir	Pi50	BD+16°3123
	50866.6601	1	II	78	-	Bor	Ba50	GSC 1536-0928
	50884.5722	2	I	82	V	Bor	Ba50	
	50903.5413	3	I	78	V	Bir	Ba50	
	50971.4060	3	I	266	R	Bor	Ba50	

Table 2 (cont.)

Star	Min. HJD +2400000	error ±	Min. type	Points used	Filter	Obs.'s name	Instr.	Comp.
GU Her	50970.434	2	I	215	-	Bor	Ba50	GSC 2581-2418
	50983.4675	3	I	200	-	Bir	Ba50	
	51033.421	4	II		-	Bir	Ba50	
HS Her	50945.4749	2	I	283	V	Bir	Ba50	GSC 2113-2242
	50972.4946	3	II	343	V	Bir	Ba50	
	50981.5011	3	I	125	V	Bir	Ba50	
MM Her	50940.5670	5	I	182	V	Bir	Ba50	GSC 1565-2199
SW Lac	50961.518	1	II	49	V	Bir	Ba50	GSC 3215-0906
	50986.5358	1	II	54	V	Bir	Ba50	
	51017.4831	1	I	35	V	Bor	Ba50	
UV Leo	50899.4051	1	II	60	V	Bir	Ba50	GSC 0845-0121
GP Vul	50946.4643	8	II	65	V	Bir	Ba50	GSC 2151-2731

T. Borkovits, I.B. Bíró