

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

Number 5399

Konkoly Observatory
Budapest

1 April 2003

HU ISSN 0374 – 0676

NEW TIMES OF MINIMA OF ECLIPSING BINARY SYSTEMS

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Observatory and telescope:

40-cm f/10 Meade Cassegrain-Schmidt telescope of the Çanakkale Onsekiz Mart
University Ulupinar Astrophysics Observatory
30-cm f/3.3 Meade Cassegrain-Schmidt telescope of the Çanakkale Onsekiz Mart
University Ulupinar Astrophysics Observatory

Method of data reduction:

Reduction of the CCD frames was made with MUNIPACK¹ software, and reduction
of photoelectric observations was made by ATMEX² software.

Method of minimum determination:

Kwee – van Woerden method (Kwee & van Woerden, 1952), and in some cases,
depending on the nature of the data set, several procedures written by A. Gaspani
(1995) based on artificial neural networks were used.

Observed star(s):							
Star name	GCVS type	Coordinates (J2000)		Comp. star	Ephemeris		Source
		RA	Dec		E 2400000+	P [day]	
RT And	EA	23 11 10	+53 01 34	GSC 3998:1794	36697.8570	0.63893088	1
WZ And	EB	01 01 43	+38 05 46	GSC 2799:0396	46025.7264	0.69566096	1
TT Aur	EB	05 09 42	+39 35 10	GSC 2899:0492	21242.2517	1.33273455	1
IU Aur	EB	05 27 52	+34 46 58	GSC 2411:1292	38448.4050	1.81147464	1
TY Boo	EW	15 00 47	+35 07 52	GSC 2568:0997	47612.6035	0.31714910	1
UW Boo	EA	14 20 59	+47 06 43	GSC 3472:0388	42404.7175	1.00471105	1
CK Boo	EW	14 35 03	+09 06 54	GSC 0910:0447	46183.5950	0.35515320	1
RZ Cas	EA	02 48 56	+69 38 03	GSC 4312:1101	48960.2260	1.19524980	1
DK Cep	EA	21 58 33	+60 56 53	GSC 4262:2154	33590.5578	0.98590874	1
EG Cep	EB	20 15 57	+76 48 36	GSC 4589:2757	40050.4491	0.54462274	2
SW Cyg	EA	20 06 28	+46 17 59	GSC 3559:0857	43692.3967	4.57294500	1
V859 Cyg	EW	19 27 12	+28 56 50	GSC 2137:1452	34629.4119	0.40499999	1

¹Hroch, F., Novák, R., 1997, MUNIPACK, <http://munipack.astronomy.cz/>

²Keskin, V., 2001, ATMEX, <http://astronomy.sci.ege.edu.tr/keskinv/>

Observed star(s):							
Star name	GCVS type	Coordinates (J2000)		Comp. star	Ephemeris		Source
		RA	Dec		E 2400000+	P [day]	
AX Dra	EB	12 40 14	+66 17 08	GSC 4168:0342	26767.6886	0.56816285	1
UX Eri	EW	03 09 53	-06 53 50	GSC 4714:0029	41922.3338	0.44528205	1
RX Gem	EA	06 50 11	+33 14 21	GSC 2440:1031	40555.8370	12.2085250	1
AP Leo	EW	11 05 05	+05 09 06	GSC 0268:0779	39536.5429	0.43035716	1
PY Lyr	EW	19 20 26	+28 56 44	GSC 2136:3105	34980.4372	0.38576273	1
ER Ori	EW	05 11 14	-08 33 23	GSC 5330:0364	43090.5300	0.42339943	1
BN Peg	EA	21 28 02	+05 00 12	GSC 5370:0247	33896.3700	0.71329807	1
II Per	EB	04 29 37	+44 25 32	GSC 2891:2911	30257.5500	0.47985400	3
V432 Per	EW	03 10 10	+42 51 21	GSC 2855:0535	48601.3776	0.38330910	1
XY Sct	EW	18 41 07	-06 04 31	USNO 0825:12607174	28729.5293	0.7852563	3
AH Tau	EW	03 47 12	+25 07 02	GSC 1804:2309	31822.3653	0.33267368	1
XY UMa	EB	09 09 56	+54 29 26	GSC 3805:0479	35216.5018	0.47899493	1
RU UMi	EB	13 38 57	+69 48 12	GSC 4402:1049	41596.3365	0.52492618	1

Source(s) of the ephemeris:

1. Kreiner et al., 2001;
2. Demircan et al., IBVS, 5364, 2003;
3. GCVS 4th edition, electronic version 2001.

Times of minima:

Star name	Time of min.	Error	Type	Filter	$O - C$	Rem.
	HJD 2400000+					
RT And	52577.3991	7	II	—	-0.0192	ccd
WZ And	52577.4507	1	I	—	-0.0107	ccd
TT Aur	52595.5079	9	II	—	0.0096	ccd
IU Aur	52699.2737	2	I	—	-0.0023	ccd
	52698.3748	7	II	—	0.0045	ccd
TY Boo	52707.4509	1	I	—	0.0057	ccd
UW Boo	52710.5313	5	II	—	-0.0098	ccd
CK Boo	52462.3796	6	I	<i>B, V, R</i>	0.0312	pe
RZ Cas	52539.4113	7	II	<i>B, V</i>	0.0097	pe
DK Cep	52553.5256	1	I	—	-0.0009	ccd
EG Cep	52654.3718	7	II	—	-0.0112	ccd
SW Cyg	52509.2909	2	I	—	0.2562	ccd
V859 Cyg	52577.2311	8	II	—	0.0384	ccd
AX Dra	52721.3642	1	I	—	-0.0034	ccd
UX Eri	52569.5092	7	I	—	0.0363	ccd
RX Gem	52654.6485	7	I	—	0.1632	ccd
AP Leo	52713.4024	1	II	—	-0.0312	ccd
PY Lyr	52476.3842	2	I	—	0.0641	ccd
	52477.3479	6	II	—	0.0634	ccd
ER Ori	52656.3972	4	I	—	0.0038	ccd
BN Peg	52551.2478	5	I	—	-0.0066	ccd
II Per	52552.4762	2	I	—	-0.0504	ccd
V432 Per	52578.4229	2	II	—	0.0218	ccd
XY Sct	52474.3912	3	II	—	-0.1107	ccd
AH Tau	52578.4707	1	I	—	-0.0662	ccd
XY UMa	52707.2102	11	II	—	-0.0310	ccd
RU UMi	52656.5193	6	I	—	-0.0118	ccd

Remarks:

The 25 stars, whose details are listed in Table 1, were observed using either conventional filtered Johnson standard (*BVR*) photoelectric photometry with the SSP-5A or unfiltered with the ST-237. 27 times of minima, primary and some secondary, are listed in Table 2, together with $O - C$ values corresponding to the Table 1 ephemerides. The remarks column of Table 2 gives an identification of which system was used; thus “ccd” refers to the 30 cm + ccd combination and “pe” means the single channel photometer on the 40 cm telescope.

The RS CVn binaries RT And and XY UMa show distorted light curves, so the determination of their minima may be subject to apparent variations due to maculation effect (cf. Olah, 2003), however Demircan (1999) has argued that these effects can be separated from genuine period changes over sufficiently long intervals of time. The classical Algols RX Gem and SW Cyg could be expected to follow inverted parabolic trends corresponding to the evolution of these systems. SW Cyg seems to have a cyclic variation superimposed on this, however, (cf. Kreiner et al., 2001) the remaining binaries in this sample generally show more complex variations of period which call for ongoing close attention to characterize.

Availability of the data:

Upon request

Acknowledgements:

This work was partly supported by the Research Found of Çanakkale Onsekiz Mart University.

References:

- Demircan, O., 1999, *Tr.J. of Physics*, **23**, 425
 Demircan et al., 2003, *IBVS*, 5364
 Gaspani, A., 1995, *3rd GEOS workshop on variable star data acquisition and processing techniques*, 13-14 May 1995, S. Pellegrino Terme, Italy
 Kreiner, M. J., Kim, C.-H. and Nha, I.-S., 2001, *An Atlas of O - C Diagrams of Eclipsing Binaries*, Kraków.
 Kwee, K. K., & van Woerden, H., 1956, *Bull. Astron. Inst. Neth.*, **12**, 327.
 Oláh, K., Proc. Workshop, New Directions in Close Binary Studies “*The Royal Road to the stars*”, Kluwer, (in press).

ERRATUM FOR IBVS 5399

Time of minimum of AH Tau was given as 52578.4707, but it should be 52578.5104.