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CCD TIMES OF MINIMA OF FAINT ECLIPSING BINARIES

The list of times of minima of 24 eclipsing binaries is presented. The minima have been obtained with the SBIG ST-6 CCD camera and a 18-cm f/5.6 Maksutov reflector at the Ondřejov Observatory in January and February 1993. Although the camera is mainly used for solar system studies, a part of observational time was devoted to eclipsing binaries too.

The aim of the present observations was to derive the times of minima of relatively faint stars (11.5–13.5 mag in maximum) with the precision of about 5 minutes. As stars with large amplitudes (0.8 mag or more) and relatively rapid light changes were chosen, nearly 10 measurements during the eclipse were sufficient to reach the desired precision. This enabled to observe more (up to four) stars simultaneously.

The camera was used without any filter and only magnitudes in the instrumental, red sensitive (close to the R band) system could be obtained. The exposure times were 60–120 s. The relative precision of a single measurement was 0.03 mag for stars brighter

Table 1: Times of minima of eclipsing binaries.

star	minimum HJD– 2 400 000	error	n	O–C (GCVS)	O–C (2)	Ref.	d [h]
CI Aur*	49 028.400	0.003	13	+0.082	–0.013	[1]	0
EQ Aur	49 004.438	0.003	14	–0.362			3.0
LV Aur	49 018.502	0.008	13		–0.189	[2]	
MO Aur*	49 004.449	0.002	10				0
QT Aur	49 018.379	0.004	11		+0.020	[2]	0
TY Cnc	49 006.507	0.002	8	–0.163			
AE Cnc	49 006.495	0.004	8	–0.007			
RY CMi	49 031.385	0.002	9	–0.822			0.3:
AE Cas	49 031.556	0.001	8	+0.068			0
AV Cep	49 031.420	0.002	12	+1.087	+0.018	[3]	0
AN Gem*	49 018.468	0.002	11	–1.613			1.7
CX Gem	49 002.520	0.001	12	–0.007			0
EG Gem	49 006.511	0.001	8	+0.205	–0.011	[1]	
HI Gem*	49 004.397	0.005	12		+0.014	[4]	5.5
AG Lac	49 018.261	0.002	8	–0.310			0:
RY Lyn	49 020.558	0.002	11	–0.024			0
VX Mon	49 029.364	0.003	8	–0.601			
BZ Mon	49 005.384	0.003	10	–0.117	–0.019	[1]	1:
NN Mon*	49 002.541	0.002	13	+0.468			0
V456 Mon	49 005.434	0.002	7	–0.051			
QT Ori	49 002.336	0.003	10	–0.497			0.7
FQ Per	49 005.479	0.003	13	+0.556			3.0
LS Per	49 005.338	0.002	12	–0.306	+0.013	[1]	0
TW UMa	49 020.554	0.002	12	–0.075			1.1

References: [1] Borovička (1993a); [2] Splittgerber (1985); [3] Mánek (1992); [4] Borovička (1993b)

than 14th mag and typically 0.09 mag for stars between 14–15th mag.

The results are given in Table 1. All minima are primary. The following data are given: The star name, the heliocentric time of minimum, the error of minimum, the number of images used, the O–C value relative to the linear light elements from the 4th edition of the General Catalogue of Variable Stars (GCVS), the O–C relative to more recent light elements (if any), the reference to the recent elements. In one case (MO Aur) only the present observation enabled the first determination of the period. Besides the time of minimum, also the duration of the constant phase in minimum could be determined for several stars. As these values are poorly known for the stars in question, they are given in the last column (in hours). An asterisk after the star name refers to the remarks.

The importance of the observations is demonstrated by the fact that only two stars (AE Cnc and CX Gem) met their GCVS elements satisfactorily. Often the O–C reaches a substantial part of period. A number of stars from the table was occasionally observed visually in the recent years, mainly by the amateur groups B.B.S.A.G. and B.R.N.O. Further minima are, of course, desirable for period improvements.

Remarks: *CI Aur*. Period changes are frequent in this interacting binary. See Borovička (1993a) for the O–C diagram. The parabolic elements are, however, excluded by the present minimum.

MO Aur. The period unknown. Using also of Geßner's (1973) and Borovička's (1993b) minima, a period of 5.266723 days was derived. An additional image taken at 49 020.258 showed the star near minimum and confirmed the period. The duration of the eclipse is 12 hours. The amplitude in the instrumental system was 12.4–13.4 mag.

AN Gem. The formal value of O–C is +0.419 (the period being $P = 2.032$), but in 1989 the O–C was +0.53 (see Contrib. Brno 30) and is therefore decreasing. It seems probable that O–C in fact exceeds $P/2$.

HI Gem. The normal minimum derived from the observations in 49 004 and 49 018 is given in Table 1. The elements $47967.537 + 4.691610 E$ (Borovička 1993b) were used for reduction.

NN Mon. The formal value of O–C is –0.444 (the period being $P = 0.912$), but in 1990 the O–C was +0.44 (see Contrib. Brno 31) and it is therefore clear that O–C just exceeded $P/2$.

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