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PHOTOELECTRIC TIMES OF MINIMA FOR SELECTED ECLIPSING BINARIES AND UPDATED EPHEMERIDES

The following times of minima are derived from photoelectric V-filter observations during August-September of 1979 with the 40-cm reflector of the University of Montana. The observing procedure was identical to that described in IBVS No. 1478 (Margrave et al., 1978).

Each time of primary minimum in Table 1 was determined by the least-squares fitting of a parabola to the observations. Table 1 lists the heliocentric Julian Date for each primary minimum observed, the epoch number E, the O-C value, and N, the number of observations used in the determination (each observation is the average of three 10-second integrations). The ephemerides used to calculate the O-C values are given in Table 2.

Table 1. Heliocentric Times of Primary Minima

Star	Hel. JD - 2,440,000	E	O-C	N
KO Aql	4135.7568	785	$+0^d.0218$	36
RZ Cas	4096.7410	11,898	-0.0016	33
	4121.8392	11,919	-0.0036	52
	4127.8151	11,924	-0.0039	45
TV Cas	4094.9219	580	-0.0164	53
	4114.8601	591	-0.0169	70
TW Cas	4110.8729	1,472	-0.0109	32
	4123.7296	1,481	-0.0092	32
	4130.8694	1,486	-0.0110	42

Table 1. Heliocentric Times of Primary Minima (continued)

Star	Hel. JD - 2,440,000	E	O-C	N
DO Cas	4095.7981	14,853	-0.0026	66
XX Cep	4133.9256	2,495	+0.0162	52
AT Peg	4089.8201	3,186	-0.0534	76
	4128.7853	3,220	-0.0558	51
	4136.8079	3,227	-0.0559	32

Table 2. Ephemerides for Program Stars

Star	Hel. JD	Period (days)	Source
KO Aql	2,441,887.4714	2.86403	SAC 49
RZ Cas	2,429,875.6902	1.1952473	Herczeg and Friboes-Conde
TV Cas	2,443,043.6265	1.8126066	SAC 50
TW Cas	2,442,008.3850	1.428328	SAC 50
DO Cas	2,433,926.4573	0.68466595	SAC 50
XX Cep	2,438,302.3209	2.33731	SAC 50
AT Peg	2,440,438.383	1.146105	SAC 50

The residual of KO Aql has increased steadily since August 1975. A linear fit to the epoch given in SAC 50, the IBVS No. 1478 minimum, and that of this note yields

$$\text{Hel. JD (Min)} = 2{,}441{,}887.4733 + 2^{d}.864055 \cdot E,$$

which fits these minima with residuals of $-0^{d}.0019$, $+0^{d}.0001$, and $+0^{d}.0003$, respectively. Thus it appears that there has been an increase of $2^{d}.5 \times 10^{-5}$ in the period of KO Aql since 1973.

The residual behavior of RZ Cas will be discussed elsewhere, insofar as it is linked to the question of sudden period changes versus light travel time effects (Doolittle, 1976).

The provisional new ephemeris for TV Cas given by Margrave (1979) has been revised to include the minima of this note, with the following result:

$$\text{Hel. JD (Min)} = 2{,}441{,}595.3598 + 1^{d}.8125898 \cdot E.$$

This ephemeris gives residuals less than $\pm 0^{d}.0015$ (except for one in 1978 of $-0^{d}.0035$) for observations back to 1972. The above result reflects a decrease by $1^{d}.68 \times 10^{-5}$, or 1.45 seconds, relative to the period given in SAC 50.

The residuals for TW Cas have generally become more negative since 1975, with primary eclipses now occurring about 15 minutes early. The epoch in SAC 50, the minima of IBVS Nos. 1478 and 1631, and those of this note yield the following linear ephemeris:

$$\text{Hel. JD (Min)} = 2{,}442{,}008.3856 + 1^{d}.4283216 \cdot E.$$

The mean residual for the least-squares fit is $0^{d}.0026$. The new period reflects a decrease of $6^{d}.4 \times 10^{-6}$ with respect to the SAC 50 value.

The residual for XX Cep given here continues the trend to later eclipse occurrences evident in 1975 (Margrave et al., 1978). Increasing the SAC 50 period to $2^{d}.3373158$ reduces the residual of this note to $+0^{d}.0018$ and may perhaps be used for more accurate prediction over the next couple of years.

The situation of AT Peg presently appears to involve a continuous period decrease at the rather large rate of 19.3 seconds per century,

with primary minima being predictable by the following revised quadratic ephemeris:

$$\text{Hel. JD (Min)} = 2{,}440{,}407.4368 + 1^{d}.14611077 \cdot E - 7.0158 \times 10^{-9} \cdot E^{2}.$$

This ephemeris fits the observations from 1969 to the present with a mean residual of $0^{d}.0026$. The epoch number for the last minimum of AT Peg in Table 1 is E = 3254 for the quadratic ephemeris. Continued timing of this system is necessary to determine the duration of the present stage of continuous period decrease.

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