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FIRST PHOTOELECTRIC LIGHTCURVES IN TWO COLORS AND IMPROVED ELEMENTS FOR V482 PERSEI AND V651 CASSIOPEIAE

(BAV Mitteilung Nr.55)

In this paper we report on results of our photoelectric work on two variables in Perseus and Cassiopeia. The observations were made at the private observatory of F. Agerer with an 0.35m automatic photoelectric telescope. For a description see Agerer (1988). The photometer was equipped with an uncooled EMI 9781 B PMT. Schott Filters BG12 1mm + GG 385 2mm were used for B and GG 495 1mm for V. The diaphragm measured 32". Instrumental magnitude differences were converted to the international UBV-system. Minimum timings are calculated with the Kwee - van Woerden method.

V 482 Persei

V 482 Per = BD+47°961($9^m.4$) = S8552 = NSV01525 was announced as variable by Hoffmeister (1966). He published time of one significant plate weakening and classified the type of variability as probably irregular. First investigation of V482 Per was conducted by Harvig and Leis (1981). They studied the variable on 237 plates from the Tartu observatory, discovered the eclipsing nature of variability with a range between $10^m.90$ and gave a first lightcurve. From four normal minima, together with the plate minimum by Hoffmeister, they give first elements as

$$\text{Min I} = \text{JD } 2428327.653 + 2^d.446798 \cdot E.$$

The variable got its definitive name in the 67th name-list of variable stars (Kholopov et al. 1985). V 482 Per is not comprised in the fourth edition of the General Catalogue of Variable Stars (Kholopov et al. 1987). The small extent of the observational material made us put V 482 Per on our program.

We observed V 482 Per on 18 nights between Nov. 1988 and Nov. 1990 in B and V. BD+46°860 = SAO 039439 (F8) served as comparison star and BD+47°962 to check its constancy. Five primary and one secondary minima could be secured (Table I). Using the method of (weighted) least squares, we calculated from these timings, together with the normal minima by Harvig and Leis, the following refined elements:

$$\text{Min I} = \text{JD } 2428327.764 + 2^d.4467549 \cdot E.$$

± 2 ± 3

The lightcurve is reduced with these elements from almost 900 measurements in each colour (Fig. 1).

V 651 Cassiopeiae

V 651 Cas = BV326 = CSV8883 = NSV14717 was discovered by Strohmeier and Knigge (1960). They classify it as an eclipsing binary in the range between $11^m.1$ and $11^m.6$ and give a finding chart. The variable was studied again by Berthold (1983) on 193 Hartha sky-patrol plates. The author suspected W UMa type variability and a sudden change of period occurring in Oct. 1965. First elements and a mean lightcurve with photographic magnitudes between $10^m.5$ and $11^m.0$ were communicated. The variable got its current name in the 67th name-list of variable stars (Kholopov et al. 1985). V651 Cas is not comprised in the fourth edition of the General Catalogue of Variable Stars (Kholopov et al. 1987). Extensive spectroscopy of the variable by Wenxian Lu (1986) showed that the period has to be doubled. New elements were given as:

$$\text{Min} = \text{JD } 2446430.3159 + 0^d.996864 \cdot E.$$
$$\pm 22 \qquad \pm 41$$

Lu also questioned the W UMa type classification. As a consequence, Berthold (1988) re-examined the star on all Hartha sky-patrol plates and amplified this material with plates from the Sonneberg sky-patrol, covering a timespan of 54 years. From 23 deep minima Berthold published new elements:

$$\text{Min} = \text{JD } 2446430.305 + 0^d.9968089 \cdot E.$$
$$\pm 4 \qquad \pm 4$$

To get a complete photoelectric lightcurve, we put V 651 Cas on our program. V 651 Cas was observed on 11 nights between Nov. 1988 and Nov. 1990 in B and V. BD+57^{o}2816 (K0) was used as comparison star and BD+56^{o}3093 was used to check its constancy. Three primary and three secondary minima could be observed (Table II). The depth of primary minimum is $0^m.80$ and that of secondary minimum is $0^m.31$. Using the 23 photographic minima from the revised list of Berthold (1988), the mean spectrographic epoch given by Lu and our own 6 photoelectric epochs, we calculated the new elements with the method of (weighted) least squares:

$$\text{Min} = \text{JD } 2448205.6322 + 0^d.9968096 \cdot E. \bullet$$
$$\pm 8 \qquad \pm 8$$

The lightcurve (Fig. 2) was reduced with these elements, which are almost identical with the elements given by Berthold (1988). The slope in normal light (Fig. 3) measured on Nov. 4, 1988, which is not due to variations of the comparison star, and also the increased scatter in some parts of the lightcurve, may be due to the RS CVn characteristics of V 651 Cas, which was

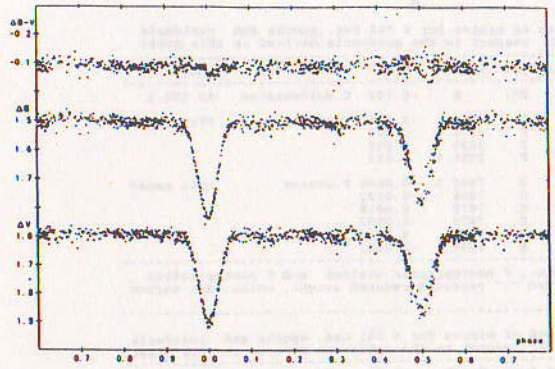

Figure 1

Differential B and V light and B-V color curves of V482 Per

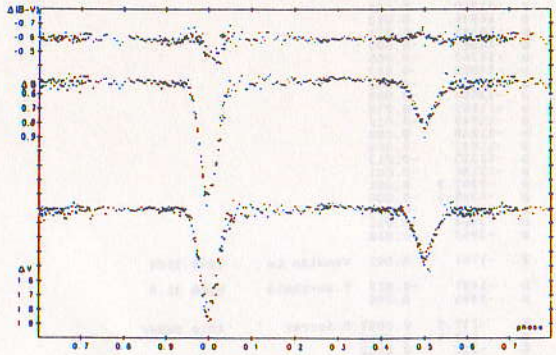

Figure 2

Differential B and V light and B-V color curves of V651 Cas

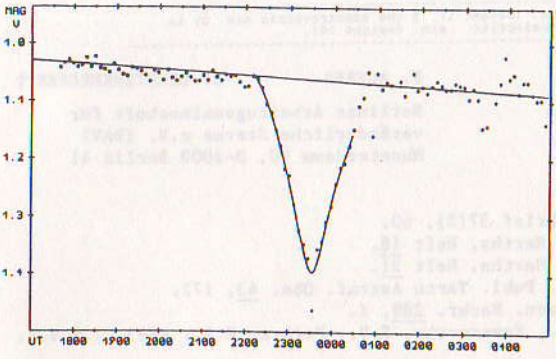

Figure 3

Minimum of V651 Cas, observed on Nov. 4/5, 1988

indicated by Lu (1986). Further monitoring will be necessary to ascertain the possible presence of a low amplitude distortion wave in the light curve.

Table 1. Observed times of minima for V 482 Per, epochs and residuals computed with respect to the ephemeris derived in this paper

No.	JD helioc.	Weight	Type	Epoch	(O-C)	Observer	Source
1	2428327.655	0	p::	0	-0.109	C.Hoffmeister	AN 289.1
2	34070.291	1	F	2347	-0.006	Harwig & Leis	PTAO 48.175
3	34149.608	1	F	2379.5	-0.009		
4	35239.850	1	F	2825	0.004		
5	35321.826	1	F	2858.5	0.013		
6	2447565.3737	10	E	7862.5	-0.0006	F.Agerer	this paper
7	47823.5048	10	E	7968	-0.0022		
8	47840.636	5	E:	7975	0.0018		
9	47850.4210	10	E	7979	-0.0003		
10	47943.4012	10	E	8017	0.0032		
11	48222.3268	10	E	8131	-0.0012		

p denotes pg plate min., F photographic minimum and E photoelectric min. The minimum marked ":" received reduced weight, while that marked "::" was discarded.

Table 2. Observed times of minima for V 651 Cas, epochs and residuals computed with respect to the ephemeris derived in this paper

No.	JD helioc.	Weight	Type	Epoch	(O-C)	Observer	Source
1	2426743.311	1	p	-21531	-0.013	T.Berthold	MHAR 21.9
2	27060.327	1	p	-21213	0.017		
3	27063.324	1	p	-21210	0.024		
4	31413.389	1	p	-16846	0.012		
5	31673.534	1	p	-16585	-0.011		
6	33864.527	1	p	-14387	-0.005		
7	33888.451	1	p	-14363	-0.005		
8	34191.498	1	p	-14059	0.013		
9	35509.265	1	p	-12737	-0.003		
10	35551.624	1	p	-12694.5	-0.009		
11	36378.470	1	p	-11865	-0.016		
12	36394.419	1	p	-11849	-0.016		
13	36395.440	1	p	-11848	0.008		
14	36400.421	1	p	-11843	0.005		
15	37016.431	1	p	-11225	-0.013		
16	37045.351	1	p	-11196	-0.001		
17	39027.509	1	p	-9207.5	0.001		
18	39029.501	1	p	-9205.5	-0.000		
19	40152.403	1	p	-8079	-0.004		
20	44254.268	1	p	-3964	-0.011		
21	44256.256	1	p	-3962	-0.016		
22	2446430.316	5	S	-1781	0.002	Wenxian Lu	IBVS 2868
23	46713.391	1	p	-1497	-0.017	T.Berthold	MHAR 21.9
24	46714.411	1	p	-1496	0.006		
25	2447470.4858	10	E	-737.5	0.0007	F.Agerer	this paper
26	47769.5299	10	E	-437.5	0.0020		
27	47975.3689	10	E	-231	-0.0002		
28	47983.3450	10	E	-223	0.0014		
29	48093.4913	10	E	-112.5	0.0002		
30	48205.6326	10	E	0	0.0004		

p denotes pg plate min. (weight 1), S the spectroscopic min. by Lu (weight 5) and E photoelectric min. (weight 10).

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