

COMMISSION 27 OF THE I. A. U.
 INFORMATION BULLETIN ON VARIABLE STARS

Number 3293

Konkoly Observatory
 Budapest
 21 February 1989
 HU ISSN 0374 - 0676

WBVR PHOTOMETRY OF DI HERCULIS

The first photoelectric observations of DI Her (HD 175 227, B4V + B5V, P = 10^d.55) were made in 1963 (Semiuk, 1968). Martynov and Khaliullin (1978, 1980) have determined the photometric elements and apsidal motion period using their own UBVR measurements. A significant discrepancy between the observed and the theoretically expected apsidal motion rate was found. To get more precise parameters of DI Her, new multicolour observations were carried out at the Tian-Shan (altitude 3000 m) and Moscow Observatories in 1986-1987. The 48 cm reflector with the WBVR photometer (EMI 9863) was used in Tian-Shan and the 70 cm reflector with UBVR photometer (PMT-79, Soviet) was used in Moscow. "V" bands of both photometers are close to each other. BD+24° 3555 served as the standard star, and BD+24° 3556 as control. Observations were corrected for the atmospheric extinction and reduced to the standard WBVR system. WBVR standards HD 174 262 and HD 168 913 (Khaliullin et al. 1985) were used to derive the stellar magnitudes and colours of the comparison stars and the variable. Table I presents these data.

Table I. Stellar magnitudes

Star	W	B	V	R	W-B	B-V	B-R
BD +24°3555	8.309 ±5	8.718 ±4	8.600 ±3	8.506 ±5	-0.409	0.118	0.212
BD +24°3556	9.701 ±9	9.704 ±8	9.496 ±6	9.363 ±9	-0.003	0.208	0.341
DI Her plateau	7.708 ±5	8.486 ±4	8.397 ±3	8.310 ±5	-0.778	0.089	0.176
Min I	8.474 ±7	9.217 ±5	9.103 ±4	9.011 ±6	-0.743	0.107	0.206
Min II	8.229 ±6	9.056 ±4	8.976 ±3	8.892 ±5	-0.827	0.080	0.164

Table II. Moments of photoelectric minima of DI Her

JD hel	E	O-C	Reference	
Min I				
2438245.3838	-865	-0.00004	Semeniuk 1968	
38308.6847	-859	-0.00014	"	
42233.3476	-487	0.00026	Martynov, Khaliullin 1980	
42602.605	-452	0.002	Koch 1977	
42623.7035	-450	-0.00005	"	
43309.467	-385	0.0025	Guinan, Maloney 1985	
45883.7069	-141	0.001	"	
45894.2519	-140	-0.0037	"	
46643.31758	-69	0.00003	Khodykin, Volkov	
47371.27909	0	-0.00005	"	
47424.0300	5	0.00002	"	
47445.13045	7	0.00014	"	
Min II				
2438306.2454	-860	0.0003	Semeniuk 1968	
40363.5280	-665	-0.0011	Battistini et al. 1974	
40511.2314	-651	-0.0002	Martynov, Khaliullin	*
41882.7545	-521	0.0001	Koch 1977	
42642.366	-449	-0.0009	Martynov, Khaliullin	*
42937.7685	-421	-0.003	Koch 1977	
43264.8256	-390	-0.0017	"	
43296.4789	-387	0.001	Ebersberger et al. 1978	
43676.2843	-351	0.0002	Guinan, Maloney 1985	
43718.4845	-347	-0.0002	Martynov, Khaliullin	*
44024.4399	-318	0.00004	Pohl, Gulmen 1981	
45807.4195	-149	0.0001	Guinan, Maloney 1985	
45944.5734	-136	0.0017	"	
46535.3815	-80	0.0001	Khodykin, Volkov	
46630.3333	-71	0.00013	"	**
46651.4332	-69	-0.0002	Diethelm 1986	
47263.3434	-11	-0.00016	Khodykin, Volkov	
47432.1462	5	-0.00015	"	

* - found by Guinan and Maloney (1985)

** - found here on the Metlov's observations (Crimea)

We have obtained a new linear ephemeris for DI Her using our eight minima in V band in addition to all known photoelectric times of minima (see Table II):

$$\text{Min I J.D.hel.} = 2447\,371.27914 + 10^d.5501680 \cdot E$$

$$\begin{array}{ccc} & \pm 8 & \pm 2 \end{array}$$

$$\text{Min II J.D.hel.} = 2447\,379.39548 + 10^d.5501749 \cdot E$$

$$\begin{array}{ccc} & \pm 9 & \pm 2 \end{array}$$

$$E_{II} - E_I = 8^d.1163 = 0^p.76931, \Delta P = P_{II} - P_I = 0^d.000\,0069 = 0^s.60$$

$$\begin{array}{ccc} \pm 1 & \pm 1 & \begin{array}{cc} \pm 2 & \pm 2 \end{array} \end{array}$$

Assuming that the period difference ΔP is caused only by the periastron advance, we found from Roudkjobing's relationship (1959) the apsidal motion period $U = 29300 \pm 900$ years, in agreement with the value yielded by Martynov and Khaliullin (1978).

We thank Dr. V.G. Metlov for presenting his observational data before publication.

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