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PHOTOMETRIC DETECTION OF ECLIPSE IN THE SPECTROSCOPIC BINARY HD 116 093

Quite recently Griffin (1988) pointed out the possibility of an eclipse in the spectroscopic binary HD 116 093. According to his prediction we carried out BV photoelectric observations of the system during the night of March 19, 1989, and successfully obtained an eclipsing light variation. These BV observations were made independently at two different places in Japan, Tamashima in Okayama Prefecture and Kakuda in Miyagi Prefecture.

Table I shows the individual instruments used. Throughout the observations BD+24°2570 ( $V=8^m.88$ ,  $B-V=0^m.97$ ,  $U-B=0^m.69$ ) was used as the comparison star, and it was occasionally checked against HD 116 234 (as a check star). Figure 1 shows the finding chart. In the photometric reduction, extinction correction and transformation to the standard BV system were made in a similar way as in our previous reports (Ohshima 1988, Ito 1988).

The individual observations obtained are listed in Table II where the magnitude differences are given in the sense  $m_{var} - m_{comp}$ . The  $\Delta(B-V)$ ,  $\Delta B$  and  $\Delta V$  values are all plotted in Figure 2, where filled circles

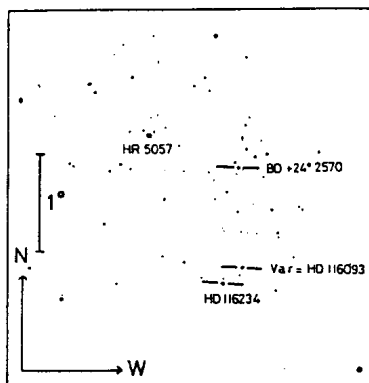


Figure 1. Finding chart of HD 116 093

Name	R.A.	(1950.0)	Dec.	Sp.
Var. star: HD 116 093 = BD+23°2562	13 <sup>h</sup> 18 <sup>m</sup> 39 <sup>s</sup>		22°44'1"	F3+F8
Comp. star: SAO 82 795 = BD+24°2570	13 18 45		23 45.4	KO
Check star: HD 116 234 = BD+23°2564	13 19 33		22 34.3	F8

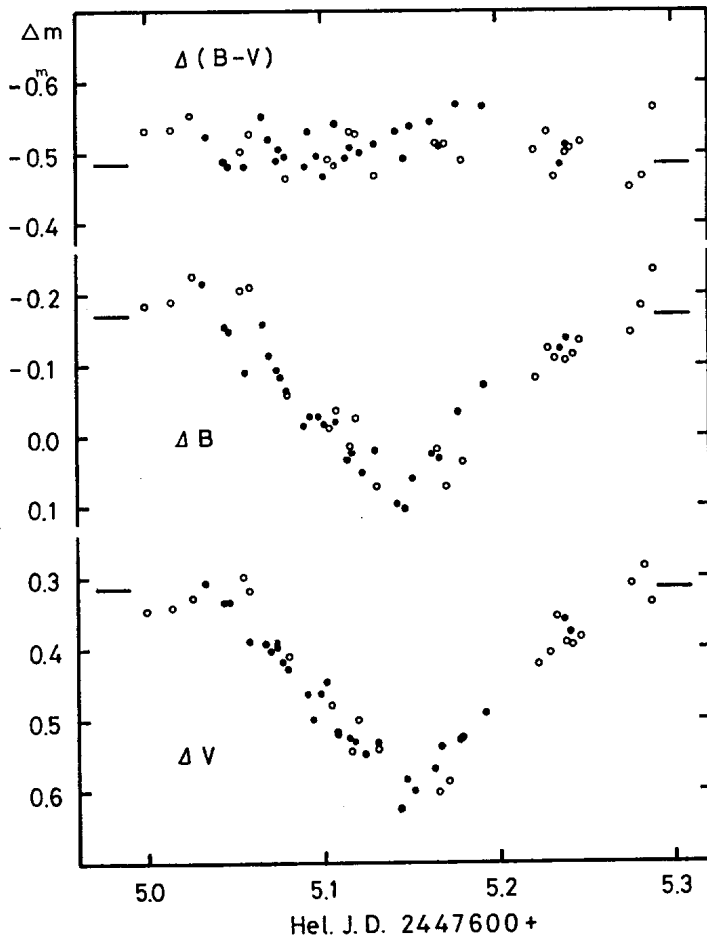


Figure 2. BV observations of the eclipse of HD 116 093  
on March 19, 1989

Table I. Instrumentation

Observer:	O. Ohshima	Y. Ito
Telescope:	20-cm reflector	15-cm refractor
PMT:	R 647-04 (Hamamatsu)	1P21 (Hamamatsu)
Filters:	GG 495 (2-mm) for V	
	GG 385 (2-mm) + BG 12 (1-mm) for B	
Data acquisition:	Photon counter + PC	D.C. amplification + A/D converter + PC
Site:	Tamashima	Kakuda Girls Senior H.S.

Table II. Individual observations

No.	Hel. J. D.	Delta V	Delta B	Delta(B-V)	Observer*
	2447600+				
1	4.9986	0.347	-0.185	-0.532	I
2	5.0139	0.343	-0.191	-0.534	I
3	5.0259	0.328	-0.225	-0.553	I
4	5.0327	0.309	-0.215	-0.524	O
5	5.0429	0.336	-0.153	-0.489	O
6	5.0463	0.334	-0.148	-0.482	O
7	5.0538	0.299	-0.204	-0.503	I
8	5.0577	0.319	-0.211	-0.530	I
9	5.0595	0.273	-0.198	-0.471	O
10	5.0662	0.393	-0.158	-0.551	O
11	5.0694	0.404	-0.115	-0.520	O
12	5.0725	0.398	-0.094	-0.492	O
13	5.0759	0.419	-0.084	-0.503	O
14	5.0791	0.430	-0.064	-0.494	O
15	5.0798	0.410	-0.058	-0.463	I
16	5.0899	0.462	-0.017	-0.479	O
17	5.0931	0.500	-0.029	-0.529	O
18	5.0979	0.469	-0.029	-0.497	O
19	5.1012	0.448	-0.019	-0.467	O
20	5.1039	0.479	-0.012	-0.491	I
21	5.1076	0.517	-0.036	-0.481	I
22	5.1080	0.521	-0.022	-0.543	O
23	5.1143	0.525	0.033	-0.492	O
24	5.1160	0.546	0.016	-0.530	I
25	5.1172	0.530	0.022	-0.508	O
26	5.1198	0.499	-0.027	-0.526	I
27	5.1234	0.550	0.051	-0.499	O
28	5.1298	0.533	0.020	-0.513	O
29	5.1312	0.541	0.073	-0.468	I
30	5.1432	0.627	0.097	-0.530	O
31	5.1467	0.585	0.102	-0.483	O
32	5.1514	0.602	0.062	-0.539	O
33	5.1619	0.569	0.025	-0.544	O
34	5.1651	0.604	0.022	-0.513	I
35	5.1655	0.539	0.030	-0.509	O
36	5.1704	0.586	0.072	-0.513	I
37	5.1768	0.529	-0.038	-0.567	O
38	5.1795	0.526	0.037	-0.489	I
39	5.1917	0.491	-0.071	-0.562	O
40	5.2216	0.421	-0.082	-0.503	I
41	5.2283	0.405	-0.124	-0.529	I
42	5.2328	0.356	-0.111	-0.467	I
43	5.2371	0.361	-0.122	-0.482	O
44	5.2384	0.395	-0.106	-0.501	I
45	5.2407	0.376	-0.136	-0.511	O
46	5.2424	0.394	-0.115	-0.509	I
47	5.2469	0.384	-0.134	-0.518	I
48	5.2773	0.307	-0.145	-0.452	I
49	5.2827	0.284	-0.182	-0.466	I
50	5.2883	0.335	-0.228	-0.563	I

\* O = Ohshima; I = Ito

Table III. Observational results

Minimum:	2447605.150 $\pm$ 0.001 (Hel. J.D.)
Depth:	0.265 mag in B , 0.297 mag in V
Duration:	0.210 days
Out of eclipse:	delta V = 0. <sup>m</sup> 314 $\pm$ 0.010 (s.d.) for n=9 delta B-V = -0.484 $\pm$ 0.011 (s.d.) for n=9

represent Ohshima's observations while open circles Ito's ones. Figure 2 clearly indicates that the eclipse is partial. The characteristics of the eclipse is shown in Table III where the minimum epoch was determined with Hertzsprung's method (Henden and Kaitchuck 1982).

Combining the observed epoch of minimum in Table III with Griffin's (1988) time of conjunction J.D.2446328.619 , we can obtain a new ephemeris as follows:

$$\text{Min.} = \text{Hel.J.D. } 2447\ 605.150 + 53.<sup>d</sup>1887\text{-E}$$

In the present observations we used BD+24<sup>o</sup>2570 as the comparison star. However, HD116 234 (see Figure 1) may be a better comparison for future observations because its position is nearer to the variable and its colour is also similar.

According to Griffin (1989), the secondary eclipse is also expected to occur in the following dates in 1990 and 1991:

Jan. 12.05 , March 6.23 , Apr. 28.42 , 1990,

Jan. 19.36 , March 13.54 , 1991 ,

for which photometric observations are highly desirable, as well.

We would like to express our gratitude to Dr. R.F. Griffin (the Observatories, University of Cambridge), for his suggestion of photometric observation and to Prof. M. Kitamura (National Astronomical Observatory of Japan) for his encouragement.

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