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ORBIT OF THE SPECTROSCOPIC BINARY BOSS 3511

BY W. E. HARPER, M.A.

This star ($\alpha=13^{\text{h}} 30^{\text{m}}$, $\delta=37^{\circ} 42'$) was announced a spectroscopic binary by Wright and Allen in *Lick Observatory Bulletin*, No. 173, from four plates which showed a range of about 12 km. For a single-prism instrument, this range is rather small for successful work on the star but in this case the small variation in velocity is offset by an excellent F-type spectrum, the lines of which can be very accurately measured. For this reason it was placed on the programme. The star's photographic magnitude is 5.3. Thirty-two plates were secured in 1917 and six in 1918, and upon these the orbit is based. A preliminary value of the period was arrived at from a comparison of the 1917 observations with the early Lick observations. There was some uncertainty in the exact number of cycles elapsing between the two sets of observations, and the period, accepted as best at that time, required a small correction in order to suit the 1918 observations. While the period of 1.61100 days here determined suits our own observations and the 1908 and 1909 observations of the Lick Observatory, it fails to suit their 1905 observation, so that even yet some uncertainty exists though this value seems to be the only possible one from the observations.

About 15 or 20 lines were measured on each plate. Their wave-lengths are given in the following table, which shows how often they were measured, with the residuals, numerical and algebraic. These are taken in the sense, mean of plate minus line velocity. There are a few whose values should in future be adjusted but such has not been done in the case of this star.

LINES USED IN BOSS 3511

λ	n	Residual		λ	n	Residual	
		Numerical	Algebraic			Numerical	Algebraic
4584.018.....	14	11.2	+ 4.2	4290.053.....	13	6.7	+ 2.6
4572.190.....	28	9.2	+ 6.1	4271.675.....	38	4.0	+ 0.2
4549.743.....	38	5.1	+ 0.2	4260.537.....	25	3.6	+ 1.3
4534.158.....	12	7.3	- 0.2	4250.586.....	18	3.5	- 2.6
4501.417.....	18	9.9	- 6.0	4236.000.....	16	6.5	+ 0.2
4481.477.....	30	10.4	- 8.0	4233.425.....	30	6.8	- 4.7
4468.663.....	7	6.4	- 2.3	4227.107.....	5	7.4	+ 2.7
4415.345.....	33	5.0	- 1.9	4215.733.....	26	4.1	- 0.8
4404.861.....	22	5.5	- 2.1	4202.366.....	16	12.0	+11.5
4395.155.....	5	20.0	-17.5	4198.677.....	9	5.7	- 3.2
4351.977.....	17	9.5	- 1.4	4143.839.....	28	5.7	+ 1.0
4340.645.....	29	6.6	- 1.7	4071.865.....	14	4.0	+ 2.8
4325.698.....	25	6.2	+ 2.8	4063.730.....	23	5.7	+ 3.0
4307.974.....	29	5.1	- 0.9	4045.940.....	34	3.4	+ 1.4
4294.359.....	14	8.0	+ 5.4				

SUMMARY OF MEASURES OF BOSS 3511

Plate	Date	Julian Date	Phase	Velocity	O-C
	1905				
Mt. Wilson	June 20.....	2,417,017.738	1.329	+ 7.43	+ 8.0
	1908				
"	Jan. 7.....	7,948.049	0.482	+ 9.90	- 3.3
	1909				
"	April 17.....	8,414.913	0.156	+ 2.06	+ 1.3
"	" 19.....	8,416.867	0.499	+13.74	- 0.1
	1917				
8049	Feb. 11.....	2,421,271.906	0.846	+14.0	- 1.0
8055	" 12.....	272.860	0.189	+16.7	+14.9
8065	" 18.....	278.747	1.243	- 1.5	- 4.0
8080	" 27.....	287.940	0.770	+17.7	+ 2.0
8087	Mar. 1.....	289.869	1.088	+ 5.2	- 3.0
8095	" 2.....	290.879	0.487	+16.7	+ 3.7
8134	" 30.....	318.785	1.006	+ 0.9	-10.2
8140	April 8.....	327.710	0.265	+ 4.0	- 1.0
8144	" 10.....	329.784	0.728	+16.4	+ 0.2
8148	" 16.....	335.809	0.309	- 4.1	-10.9
8149	" 18.....	337.706	0.595	+12.9	- 2.4
8151	" 21.....	340.716	0.383	+ 9.0	- 0.6
8154	" 22.....	341.784	1.451	- 6.5	- 3.2
8160	" 24.....	343.731	0.176	- 1.0	- 2.3
8162	May 3.....	352.747	1.137	+ 6.8	+ 0.4
8165	" 13.....	362.656	1.380	- 7.1	- 5.1
8176	" 20.....	369.755	0.424	+13.4	+ 2.2
8185	" 29.....	378.758	1.372	+ 2.8	+ 4.6
8186	" 30.....	379.616	0.619	+17.2	+ 1.6
8190	June 3.....	383.736	1.517	- 2.8	+ 0.9
8191	" 5.....	385.582	0.141	0.0	- 0.1
8197	" 16.....	396.678	1.571	- 4.1	- 0.4
8200	" 18.....	398.598	0.269	+ 8.4	+ 3.2
8209	" 27.....	407.617	1.233	+12.3	+ 9.5
8213	July 2.....	412.598	1.391	+ 5.9	+ 7.8
8220	" 6.....	416.619	0.569	+15.7	+ 1.0
8226	" 16.....	426.608	0.892	+17.6	+ 3.5
8241	" 25.....	435.582	0.200	+ 4.8	+ 2.4
8244	" 27.....	437.588	0.593	+15.6	+ 0.3
8253	Aug. 2.....	443.625	0.188	- 0.9	- 2.7
8259	" 6.....	447.570	0.911	+13.5	- 0.2
8263	" 10.....	451.577	0.085	- 0.4	+ 1.2
	1918				
8448	Feb. 17.....	642.777	1.187	+ 4.7	+ 0.2
8462	" 26.....	651.790	0.534	+ 9.3	- 4.8
8467	Mar. 8.....	661.677	0.755	+14.1	- 2.0
8479	" 22.....	675.664	0.243	+ 4.3	+ 0.2
8486	April 2.....	686.633	1.545	- 3.4	+ 0.4
8493	" 4.....	2,421,688.701	0.392	+ 7.1	- 2.9

MEASURES OF BOSS 3511

λ	8049		8055		8065		8080		8087		8095		8134	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4534	0.0	$\frac{1}{2}$	.....	.....	- 9.0	1	.....	.....	.....	.....	.....	.....	.....	.....
4572	- 8.0	$\frac{1}{2}$	+13.3	1	-15.7	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4549	- 4.0	$\frac{2}{3}$	+ 2.2	1	-13.1	1	+ 5.0	1	+ 4.4	1	+19.1	1	+ 6.6	1
4534	+ 7.4	$\frac{1}{2}$	+ 3.9	$\frac{1}{2}$	-10.9	1	+ 3.0	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....
4528	.....	.....	.....	.....	-13.0	1	.....	.....	.....	.....	.....	.....	.....	.....
4501	.....	.....	.....	.....	-11.4	$\frac{1}{2}$	+ 5.6	$\frac{1}{2}$	+12.6	$\frac{1}{2}$	.....	.....	+ 8.4	$\frac{1}{2}$
4481	- 7.8	$\frac{1}{2}$	- 2.7	1	+ 7.8	$\frac{1}{2}$	+23.1	$\frac{1}{2}$	- 5.5	$\frac{1}{2}$	.....	.....	+25.5	$\frac{1}{2}$
4468	+ 2.6	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4415	+16.2	$\frac{1}{2}$	+17.2	1	-11.8	1	+ 9.6	1	+ 4.8	1	.....	.....	+ 0.8	$\frac{1}{2}$
4404	.....	.....	+ 3.2	1	-18.4	1	+16.4	1	+ 4.7	1	.....	.....	-12.0	$\frac{1}{2}$
4383	- 0.7	$\frac{1}{2}$	- 6.0	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4351	.....	.....	.....	.....	-24.1	1	+16.7	$\frac{1}{2}$	.....	.....	.....	.....	+11.0	1
4340	.....	.....	- 0.8	$\frac{1}{2}$	-18.5	$\frac{1}{2}$	+10.8	1	+ 4.5	1	.....	.....	+ 3.3	$\frac{1}{2}$
4325	.....	.....	+ 3.7	$\frac{1}{2}$	-25.9	1	+ 5.8	1	+ 2.2	1	6.8	$\frac{2}{3}$	.....	.....
4307	+ 4.7	$\frac{1}{2}$	+ 6.9	1	-11.9	$\frac{1}{2}$	+16.0	1	- 1.3	1	1.2	$\frac{2}{3}$	+ 3.2	1
4290	.....	.....	-12.6	1	-22.0	1	+24.8	1	-11.3	1	.....	.....	- 4.2	$\frac{1}{2}$
4271	-18.9	$\frac{1}{4}$	+ 0.5	1	-19.4	1	+ 7.4	1	- 9.2	1	7.7	1	+ 7.4	1
4260	.....	.....	.....	.....	.....	.....	+ 7.6	1	- 9.6	1	2.4	1	- 5.6	1
4250	.....	.....	.....	.....	-13.6	1	.....	.....	- 4.7	1	.....	.....	+12.1	1
4236	.....	.....	.....	.....	-25.4	1	.....	.....	- 3.4	1	.....	.....	.....	.....
4233	+ 6.2	$\frac{1}{2}$	+ 8.5	1	0.0	1	+12.9	1	+ 1.5	1	+17.8	1	- 2.1	1
4227	.....	.....	.....	.....	- 6.3	1	+ 1.0	1	.....	.....	.....	.....	.....	.....
4215	-15.0	$\frac{1}{2}$	- 1.7	1	-15.0	$\frac{1}{2}$	+12.0	1	- 0.6	1	.....	.....	+ 2.6	$\frac{1}{2}$
4202	.....	.....	.....	.....	-24.0	1	0.0	1	-12.7	1	.....	.....	-17.0	1
4198	.....	.....	.....	.....	+ 6.0	$\frac{1}{2}$	.....	.....	- 1.0	1	.....	.....	.....	.....
4143	0.0	$\frac{2}{3}$	+ 8.0	1	- 8.9	1	+ 2.5	1	- 8.8	1	.....	.....	.....	.....
4101	.....	.....	.....	.....	-12.3	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4077	.....	.....	.....	.....	.....	.....	+ 5.2	1	- 6.0	1	.....	.....	.....	.....
4071	- 8.6	$\frac{1}{2}$	- 3.4	1	.....	.....	+10.0	1	- 6.1	1	.....	.....	.....	.....
4063	.....	.....	.....	.....	- 6.8	1	+ 6.3	1	- 6.7	1	.....	.....	- 4.5	$\frac{1}{2}$
4045	+ 0.2	$\frac{2}{3}$	+ 7.2	1	-13.0	1	+11.9	1	- 4.9	1	.....	.....	- 5.3	$\frac{1}{2}$
4005	.....	.....	.....	.....	.....	.....	0.0	1	.....	.....	.....	.....	.....	.....
Weighted mean	± 0.00		+ 2.84		-13.68		+ 9.01		- 2.90		+ 8.80		+ 1.75	
V_d	+14.35		+14.07		+12.25		+ 9.16		+ 8.48		+ 8.14		- 2.24	
V_d	- .03		+ .03		+ .17		- .15		- .07		+ .09		- .06	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+14.0		+16.7		- 1.5		+17.7		+ 5.2		+16.7		- 0.8	

MEASURES OF BOSS 3511—Continued

λ	8134		8140		8144		8148		8148		8149		8151	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4584							+11.6	$\frac{1}{2}$	+0.7	1	+0.3	$\frac{1}{2}$		
4572					+14.1	$\frac{1}{2}$			-13.3	$\frac{1}{2}$	+7.0	$\frac{1}{2}$	+3.6	$\frac{1}{2}$
4549	+10.0	1	+9.5	$\frac{1}{2}$	13.5	1	-6.0	1	-3.9	1	+17.1	$\frac{1}{2}$	+3.0	$\frac{1}{2}$
4501							+22.1	1	+28.4	$\frac{1}{2}$	+19.0	$\frac{1}{2}$	+45.7	$\frac{1}{2}$
4481	+14.2	$\frac{1}{2}$	-2.0	$\frac{1}{2}$	37.6	$\frac{1}{2}$	+15.0	$\frac{2}{3}$	+17.5	$\frac{2}{3}$	+22.6	$\frac{1}{2}$	+44.6	$\frac{1}{2}$
4468					25.8	$\frac{1}{2}$	-4.7	$\frac{2}{3}$						
4415	+2.4	1	+10.0	1	21.0	$\frac{2}{3}$	+1.9	1	+6.0	1	+21.0	1		
4404					20.6	$\frac{2}{3}$			+6.8	1	+15.2	$\frac{1}{2}$	+23.2	$\frac{1}{2}$
4395					16.5	$\frac{1}{2}$								
4351					47.4	$\frac{1}{2}$					+23.5	$\frac{1}{2}$		
4340	+0.3	$\frac{1}{2}$	+8.6	$\frac{1}{2}$	29.0	$\frac{1}{2}$	+13.1	1	+13.9	1			+32.3	$\frac{1}{2}$
4325			-4.0	$\frac{2}{3}$							+14.9	1		
4307	+6.9	1	+21.2	$\frac{2}{3}$	18.1	$\frac{1}{2}$	-1.4	1	+4.2	1			+4.8	$\frac{1}{2}$
4290					26.6	$\frac{2}{3}$	-3.1	1	-12.3	1				
4271	+10.3	1	+9.6	$\frac{2}{3}$	26.2	$\frac{2}{3}$	+5.6	$\frac{2}{3}$	+8.8	1	+20.3	1	-1.0	$\frac{1}{2}$
4260	-2.1	1	+9.0	$\frac{2}{3}$	19.2	1					+23.1	1		
4250	+6.4	$\frac{1}{2}$			29.6	$\frac{2}{3}$	+11.6	$\frac{2}{3}$			+28.6	$\frac{1}{2}$		
4236							+3.0	$\frac{1}{2}$			+29.5	1		
4233	+0.2	1			40.9	$\frac{2}{3}$	+4.6	1	-0.2	1	+26.5	$\frac{1}{2}$	+10.4	$\frac{1}{2}$
4227											+25.2	$\frac{1}{2}$		
4215	+11.3	1	+18.3	$\frac{1}{2}$			+4.5	1	-1.1	1				
4202	-20.3	1			15.2	1	-12.2	1	-13.6	1				
4198							+9.6	1						
4143	+7.0	$\frac{1}{2}$	+11.9	$\frac{1}{2}$	15.1	1	+4.6	1	+4.4	1	+33.2	1		
4063	+16.4	$\frac{1}{2}$	+13.6	$\frac{1}{2}$	18.1	1	+9.2	1	+17.6	1				
4045	-5.6	$\frac{1}{2}$	+13.7	$\frac{1}{2}$	+23.8	1	+4.2	1	+10.7	1				
Weighted mean	+3.45		+9.79		+23.00		+5.28		+4.14		+22.22		+19.00	
V_a	-2.24		-5.52		-6.27		-8.36		-8.36		-9.01		-9.99	
V_d	-.06		-.02		-.12		-.19		-.19		-.07		-.03	
Curv.	-.28		-.28		-.28		-.28		-.28		-.28		-.28	
Radial Velocity	+0.9		+4.0		+16.3		-3.5		-4.7		+12.9		+8.7	

MEASURES OF BOSS 3511—Continued

λ	8154		8160		8162		8165		8176		8185		8186	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4584	+ 5.2	1	.....	.....	.....	.....	.....	.....	0.0	$\frac{1}{2}$	+14.7	$\frac{1}{2}$	+34.0	$\frac{1}{2}$
4572	.....	.....	+ 9.0	1	+ 6.7	1	- 2.7	$\frac{1}{2}$	.....	.....	12.3	$\frac{1}{2}$	35.4	$\frac{1}{2}$
4549	.....	.....	+18.0	1	+20.6	1	+ 8.9	1	+27.5	$\frac{1}{2}$	33.6	1	27.2	$\frac{1}{2}$
4534	- 5.1	1	+13.0	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4522	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25.7	$\frac{1}{2}$	.....	.....
4481	+20.2	1	+30.0	1	.....	.....	+13.0	1	46.0	$\frac{1}{2}$	26.6	$\frac{1}{2}$	44.8	$\frac{1}{2}$
4468	+ 8.1	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	55.8	$\frac{1}{2}$
4415	+ 7.0	1	+ 3.2	1	+20.2	1	+ 7.3	1	25.0	$\frac{1}{2}$	27.5	1	26.3	1
4404	.....	.....	.....	.....	.....	.....	.....	.....	36.7	$\frac{1}{2}$	27.2	$\frac{1}{2}$	.....	.....
4395	+42.3	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4351	+13.2	1	.....	.....	+37.6	1	.....	.....	.....	.....	.....	.....	.....	.....
4340	+11.3	1	+16.1	1	.....	.....	+ 5.7	$\frac{1}{2}$	32.4	$\frac{1}{2}$	.....	.....	.....	.....
4325	- 1.9	1	+ 3.8	1	+28.3	1	+11.5	$\frac{1}{2}$	37.0	$\frac{1}{2}$	17.8	$\frac{1}{2}$	.....	.....
4307	+ 6.5	1	.....	.....	+25.8	1	+12.6	1	29.2	$\frac{1}{2}$	21.3	$\frac{1}{2}$	.....	.....
4290	- 3.7	1	+ 9.8	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4282	.....	.....	+ 6.2	1	.....	.....	+21.9	1	62.0	$\frac{1}{2}$	.....	.....	.....	.....
4271	+ 1.7	1	+14.5	1	+24.5	1	+10.2	1	38.6	$\frac{1}{2}$	21.5	1	30.0	$\frac{1}{2}$
4260	.....	.....	+ 6.2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4250	+ 4.7	1	+12.4	1	+22.9	1	+14.2	1	31.3	$\frac{1}{2}$	.....	.....	41.8	$\frac{1}{2}$
4236	.....	.....	+ 1.4	1	+12.3	1	.....	.....	.....	.....	.....	.....	.....	.....
4233	+ 7.3	1	.....	.....	+29.6	1	+11.6	1	30.7	$\frac{1}{2}$	24.4	1	.....	.....
4227	.....	.....	- 2.0	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4215	+ 5.1	1	+12.7	1	+25.0	1	+13.1	1	31.1	1	30.0	1	46.6	1
4202	-21.8	1	- 7.8	1	+16.8	1	- 2.6	1	.....	.....	.....	.....	30.7	1
4198	.....	.....	+19.7	1	.....	.....	.....	.....	24.7	$\frac{1}{2}$	.....	.....	35.1	$\frac{1}{2}$
4143	+ 4.2	1	+14.5	1	+17.4	1	+ 4.0	1	34.8	1	9.1	1	.....	.....
4071	.....	.....	.....	.....	+24.0	1	+ 8.0	1	26.4	1	.....	.....	.....	.....
4063	- 4.6	1	+13.6	1	+ 9.4	1	+ 6.0	1	26.7	$\frac{1}{2}$	22.8	$\frac{1}{2}$	47.8	$\frac{1}{2}$
4045	+ 1.5	1	+11.2	1	+14.1	1	+10.8	1	+32.6	1	+15.4	$\frac{1}{2}$	+34.9	$\frac{1}{2}$
Weighted mean	+ 4.22		+ 10.28		+ 20.95		+ 9.50		+ 31.68		+ 22.65		+ 37.11	
V_a	- 10.32		- 10.96		- 13.66		- 16.23		- 17.79		- 19.39		- 19.52	
V_d	- .14		- .08		- .16		- .03		- .19		- .21		- .06	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 6.5		- 1.0		+ 6.8		- 7.0		+ 13.4		+ 2.8		+ 17.2	

MEASURES OF BOSS 3511—Continued

λ	8190		8191		8197		8200		8209		8213		8220	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4572	+ 6.6	1	.....	.....	+23.5	$\frac{1}{2}$	.....	.....	+27.5	$\frac{1}{2}$	+24.9	$\frac{1}{2}$	+28.2	$\frac{1}{2}$
4549	13.7	1	+13.5	$\frac{1}{2}$	22.6	$\frac{1}{2}$	+38.3	$\frac{1}{2}$	37.0	1	16.5	$\frac{1}{2}$	32.1	$\frac{1}{2}$
4534	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29.1	$\frac{1}{2}$
4501	27.4	1	.....	.....	.....	.....	.....	.....	46.7	$\frac{1}{2}$	11.9	$\frac{1}{2}$	36.6	$\frac{1}{2}$
4481	.....	.....	.....	.....	40.5	$\frac{1}{2}$	22.2	$\frac{1}{2}$	30.3	$\frac{1}{2}$	.....	.....	57.3	$\frac{1}{2}$
4415	.....	.....	.....	.....	12.1	1	32.1	1	42.0	1	29.8	1	33.0	1
4404	28.4	1	23.2	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	32.6	1	.....	.....
4351	.....	.....	.....	.....	.....	.....	.....	.....	25.3	$\frac{1}{2}$	.....	.....	22.7	1
4340	9.8	1	.....	.....	19.3	$\frac{1}{2}$	50.3	$\frac{1}{2}$	38.9	$\frac{1}{2}$	19.7	$\frac{1}{2}$	43.5	$\frac{1}{2}$
4325	.....	.....	28.2	$\frac{1}{2}$	.....	.....	.....	.....	28.9	1	29.7	$\frac{1}{2}$	.....	.....
4307	20.2	1	15.7	$\frac{1}{2}$	17.7	1	.....	.....	30.5	$\frac{1}{2}$	32.2	$\frac{1}{2}$	37.3	1
4294	.....	.....	.....	.....	22.2	$\frac{1}{2}$	18.9	1	.....	.....	.....	.....	.....	.....
4290	.....	.....	.....	.....	19.2	1	.....	.....	26.6	1	.....	.....	.....	.....
4271	16.2	1	34.7	$\frac{1}{2}$	16.0	1	26.7	1	36.4	$\frac{1}{2}$	28.9	$\frac{1}{2}$	35.7	1
4260	20.3	1	26.0	$\frac{1}{2}$	19.2	1	30.6	1	31.7	$\frac{1}{2}$	26.1	1	.....	.....
4250	.....	.....	.....	.....	20.8	1	.....	.....	.....	.....	.....	.....	38.3	1
4236	.....	.....	.....	.....	4.9	1	38.2	$\frac{1}{2}$	38.3	1	.....	.....	.....	.....
4233	24.6	1	26.5	$\frac{1}{2}$	17.2	1	34.0	$\frac{1}{2}$	38.2	1	44.1	1	54.1	1
4227	.....	.....	.....	.....	.....	.....	31.3	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....
4215	.....	.....	.....	.....	16.8	$\frac{1}{2}$	37.9	$\frac{1}{2}$	38.3	$\frac{1}{2}$	27.2	1	45.9	$\frac{1}{2}$
4202	.....	.....	.....	.....	6.0	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	27.7	$\frac{1}{2}$
4198	.....	.....	.....	.....	11.8	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	39.9	1
4143	.....	.....	6.0	$\frac{1}{2}$	17.8	$\frac{1}{2}$	13.2	$\frac{1}{2}$	28.3	$\frac{1}{2}$	18.2	1	40.4	1
4071	.....	.....	13.7	$\frac{1}{2}$	18.0	$\frac{1}{2}$	.....	.....	36.2	$\frac{1}{2}$	.....	.....	27.3	1
4063	13.1	1	+18.8	$\frac{1}{2}$	.....	.....	16.7	$\frac{1}{2}$	27.0	$\frac{1}{2}$	.....	.....	41.7	$\frac{1}{2}$
4045	+15.6	1	.....	.....	+16.8	$\frac{1}{2}$	+33.7	1	36.8	$\frac{1}{2}$	+30.5	1	+35.9	1
4005	.....	.....	.....	.....	.....	.....	.....	.....	+30.4	$\frac{1}{2}$	.....	.....	.....	.....
Weighted mean	+ 17.81		+ 20.63		+ 17.50		+ 30.10		+ 34.14		+ 27.60		+ 37.17	
V_a	- 20.09		- 20.31		- 21.22		- 21.30		- 21.39		- 21.23		- 20.99	
V_d	- .21		- .03		- .19		- .10		- .16		- .15		- .21	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 2.8		\pm 0.0		- 4.1		+ 8.4		+ 12.3		+ 5.9		+ 15.7	

MEASURES OF BOSS 3511—Continued

λ	8226		8241		8244		8253		8259		8263		8448	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4584							+21.0	1	+38.7	$\frac{1}{2}$			-20.5	$\frac{1}{2}$
4572	+22.9	$\frac{1}{2}$			+30.8	$\frac{1}{2}$	21.0	1	13.3	$\frac{1}{2}$	+10.6	1	-15.4	$\frac{1}{2}$
4549	32.3	$\frac{1}{2}$	+2.9	$\frac{1}{2}$	28.2	$\frac{1}{2}$	24.1	1	32.0	1	13.5	1	-1.6	1
4534	53.8	$\frac{1}{2}$	15.7	$\frac{1}{2}$			25.0	1			22.0	1	-26.2	$\frac{1}{2}$
4522													-1.9	$\frac{1}{2}$
4501			31.3	$\frac{1}{2}$					47.5	$\frac{1}{2}$			+1.3	1
4481	45.4	$\frac{1}{2}$			48.0	$\frac{1}{2}$	21.8	1	34.2	$\frac{1}{2}$	10.9	1		
4468					39.3	$\frac{1}{2}$								
4415	41.2	1			42.0	$\frac{1}{2}$			30.6	$\frac{1}{2}$	15.7	1	-6.6	1
4404			38.0	$\frac{1}{2}$			27.9	1	28.4	$\frac{1}{2}$	17.2	1		
4395									51.3	$\frac{1}{2}$				
4351	38.7	$\frac{1}{2}$			38.7	$\frac{1}{2}$			31.5	$\frac{1}{2}$	16.1	1	-25.8	$\frac{1}{2}$
4340	58.7	$\frac{1}{2}$			48.7	$\frac{1}{2}$	4.2	1	26.0	$\frac{1}{2}$	6.2	1	+5.5	$\frac{1}{2}$
4325	45.8	$\frac{1}{2}$	49.3	$\frac{1}{2}$	18.5	$\frac{1}{2}$	9.6	1	27.4	$\frac{1}{2}$				
4307					23.7	$\frac{1}{2}$			11.6	$\frac{1}{2}$	19.5	1	-2.8	$\frac{1}{2}$
4294	32.6	$\frac{1}{2}$			22.4	$\frac{1}{2}$					7.0	1	-7.4	1
4290	28.8	$\frac{1}{2}$	24.5	$\frac{1}{2}$							12.5	1	-11.8	$\frac{1}{2}$
4271	47.8	$\frac{1}{2}$	14.9	$\frac{1}{2}$	37.8	$\frac{1}{2}$	19.4	1	27.4	$\frac{1}{2}$	3.4	1	-3.9	$\frac{1}{2}$
4260	29.0	$\frac{1}{2}$	29.0	$\frac{1}{2}$	35.4	$\frac{1}{2}$	20.3	1	27.7	$\frac{1}{2}$	4.3	1	-10.6	$\frac{1}{2}$
4250			14.8	$\frac{1}{2}$							16.6	1		
4236											24.4	1	-0.6	1
4233	40.8	$\frac{1}{2}$			34.2	$\frac{1}{2}$			19.5	$\frac{1}{2}$	24.6	1	-4.8	1
4215	30.3	$\frac{1}{2}$					7.3	1	22.4	$\frac{1}{2}$			-5.2	1
4202	15.8	$\frac{1}{2}$												
4198					37.8	$\frac{1}{2}$								
4143			18.3	$\frac{1}{2}$	36.8	$\frac{1}{2}$			42.0	$\frac{1}{2}$	18.0	1	-11.9	1
4077							12.8	1						
4071													-8.0	1
4063					28.0	$\frac{1}{2}$	8.2	1						
4045	+41.4	$\frac{1}{2}$			+32.7	$\frac{1}{2}$	+9.6	1	+28.2	$\frac{1}{2}$	+17.0	1	-5.6	1
Weighted mean	+38.03		+23.87		+34.27		+16.60		+30.09		+14.42		-7.76	
V_a	-19.99		-18.61		-18.24		-17.01		-16.09		-14.33		+12.63	
V_d	-.20		-.19		-.18		-.23		-.21		-.22		+.13	
Curv.	-.28		-.28		-.28		-.28		-.28		-.28		-.28	
Radial Velocity	+17.6		+4.8		+15.6		-0.9		+13.5		-0.4		+4.7	

MEASURES OF BOSS 3511—*Concluded*

λ	8462		8467		8479		8486		8493		Vel.	Wt.	Vel.	Wt.
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.				
4584	-19.8	$\frac{1}{2}$	.....	.....	.....	.....	+19.6	$\frac{1}{2}$	-1.7	$\frac{1}{2}$	.....	.....	.....	.....
4572	-25.0	$\frac{1}{2}$	+6.7	$\frac{1}{2}$	-7.2	1	+16.6	$\frac{1}{2}$	+8.0	$\frac{2}{3}$	.....	.....	.....	.....
4563	.....	.....	.....	.....	-6.0	1	.....	.....	.....	.....	.....	.....	.....	.....
4549	+2.6	1	+9.9	1	+3.3	1	-9.5	1	+7.9	1	.....	.....	.....	.....
4528	+13.0	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4501	-14.6	$\frac{1}{2}$	.....	.....	+9.0	$\frac{1}{2}$	.....	.....	+18.3	$\frac{1}{2}$	.....	.....	.....	.....
4481	+11.9	1	.....	.....	+26.6	$\frac{1}{2}$	+13.5	$\frac{1}{2}$	+6.7	1	.....	.....	.....	.....
4468	.....	.....	.....	.....	+3.0	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4415	+6.0	$\frac{1}{2}$	+17.8	1	+11.0	1	-11.1	$\frac{1}{2}$	+20.6	1	.....	.....	.....	.....
4404	+3.5	$\frac{1}{2}$	+3.9	1	+9.2	1	-3.5	1	+8.7	1	.....	.....	.....	.....
4395	.....	.....	+22.8	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4383	.....	.....	.....	.....	+4.7	1	.....	.....	.....	.....	.....	.....	.....	.....
4351	-13.0	1	.....	.....	.....	.....	+10.0	1	.....	.....	.....	.....	.....	.....
4340	-3.5	$\frac{1}{2}$	+6.4	1	.....	.....	.....	.....	+7.8	1	.....	.....	.....	.....
4325	-2.8	1	+7.2	$\frac{1}{2}$	.....	.....	+2.0	1	+3.1	1	.....	.....	.....	.....
4307	+4.7	$\frac{1}{2}$	.....	.....	.....	.....	+16.9	$\frac{1}{2}$	+13.8	1	.....	.....	.....	.....
4294	.....	.....	-6.3	1	-10.8	$\frac{1}{2}$	-22.6	$\frac{1}{2}$	+22.4	1	.....	.....	.....	.....
4290	.....	.....	.....	.....	.....	.....	+0.2	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....
4271	+2.6	1	+18.1	$\frac{1}{2}$	-0.3	1	-2.7	1	+19.1	1	.....	.....	.....	.....
4260	.....	.....	.....	.....	+2.6	1	+5.0	1	+16.0	1	.....	.....	.....	.....
4250	+0.6	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	+14.3	1	.....	.....	.....	.....
4236	+11.2	$\frac{1}{2}$	+10.0	$\frac{1}{2}$	.....	.....	.....	.....	+9.2	1	.....	.....	.....	.....
4233	+11.1	$\frac{1}{2}$	.....	.....	+10.4	$\frac{1}{2}$	+4.2	1	+21.8	1	.....	.....	.....	.....
4215	+2.0	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4202	.....	.....	+9.1	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4198	.....	.....	.....	.....	.....	.....	+6.3	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....
4143	+4.2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4071	+1.5	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	+3.8	$\frac{1}{2}$	.....	.....	.....	.....
4063	.....	.....	.....	.....	.....	.....	.....	.....	+2.5	1	.....	.....	.....	.....
4045	+0.5	$\frac{1}{2}$	+5.4	$\frac{1}{2}$	.....	.....	-26.1	1	+7.0	1	.....	.....	.....	.....
Weighted mean	-0.17		+8.38		+3.47		-0.08		+11.32		.....	.....	.....	.....
V_a	+9.64		+6.11		+0.89		-3.22		-3.97		.....	.....	.....	.....
V_d	+0.08		-0.11		+0.20		+0.15		+0.07		.....	.....	.....	.....
Curv.	-0.28		-0.28		-0.28		-0.28		-0.28		.....	.....	.....	.....
Radial Velocity	+9.3		+14.1		+4.3		-3.4		+7.1		.....	.....	.....	.....

The Ottawa observations were grouped according to phase, using the period 1.61100 days, into 9 normal places of equal weight and, after preliminary elements had been obtained graphically, a least-squares solution was carried through to derive corrected values. The preliminary elements adopted were:

$$\begin{aligned}
 P &= 1.61100 \text{ days} \\
 e &= .05 \\
 \omega &= 195^\circ \\
 K &= 10.5 \text{ km.} \\
 \gamma &= +7.10 \text{ km.} \\
 T &= \text{J.D. } 2,417,018.020
 \end{aligned}$$

The most satisfactory solution was obtained when T , the time of periastron passage, was considered fixed and corrections determined for the remaining four elements, e , ω , K and γ . The period was considered determined from the early observations taken in conjunction with our own.

NORMAL PLACES

	Mean Phase	Mean Velocity	O-C
1.....	1.130	+ 5.98	- .71
2.....	1.344	- 0.02	+ .81
3.....	1.521	- 4.20	- .29
4.....	.148	- 0.58	-1.05
5.....	.246	+ 5.70	+1.44
6.....	.444	+11.10	- .68
7.....	.594	+15.35	+ .04
8.....	.751	+16.07	- .09
9.....	.883	+15.03	+ .62

Making the substitutions,

$$\begin{aligned}
 x &= \delta\gamma \\
 y &= \delta K \\
 z &= K \cdot \delta e \\
 u &= K \cdot \delta \omega
 \end{aligned}$$

in the Lehmann-Filhés formula, the following observation equations resulted:

OBSERVATION EQUATIONS FOR BOSS 3511

No.	x	y	z	u	$-n$
1.....	1.000	+ .088	+ .848	- .978	+2.04=0
2.....	1.000	- .693	+ .434	- .751	- .16=0
3.....	1.000	-1.040	- .869	- .112	+ .37=0
4.....	1.000	- .672	- .018	+ .794	+ .62=0
5.....	1.000	- .308	+ .729	+ .978	-1.84=0
6.....	1.000	+ .449	+ .706	+ .881	+ .71=0
7.....	1.000	+ .832	- .322	+ .487	+ .48=0
8.....	1.000	+ .950	- .940	- .055	+1.00=0
9.....	1.000	+ .812	- .696	- .497	+ .59=0

NORMAL EQUATIONS

$$9.000x + .418y - .128z + .747u + 3.810 = 0$$

$$4.572y - .945z + .060u + 2.202 = 0$$

$$4.163z + .504u - 1.016 = 0$$

$$4.381u - 2.902 = 0$$

From these there resulted the small corrections,

$$\delta\gamma = -.46 \text{ km.}$$

$$\delta K = -.44 \text{ km.}$$

$$\delta e = +.004$$

$$\delta\omega = +4^\circ.05$$

so that the final values of the elements are:

$$P = 1.61100 \text{ days}$$

$$e = .054$$

$$\omega = 199^\circ.05$$

$$K = 10.06 \text{ km.}$$

$$\gamma = +6.64 \text{ km.}$$

$$T = \text{J.D. } 2,417,018.020$$

$$a \sin i = 222,500 \text{ km.}$$

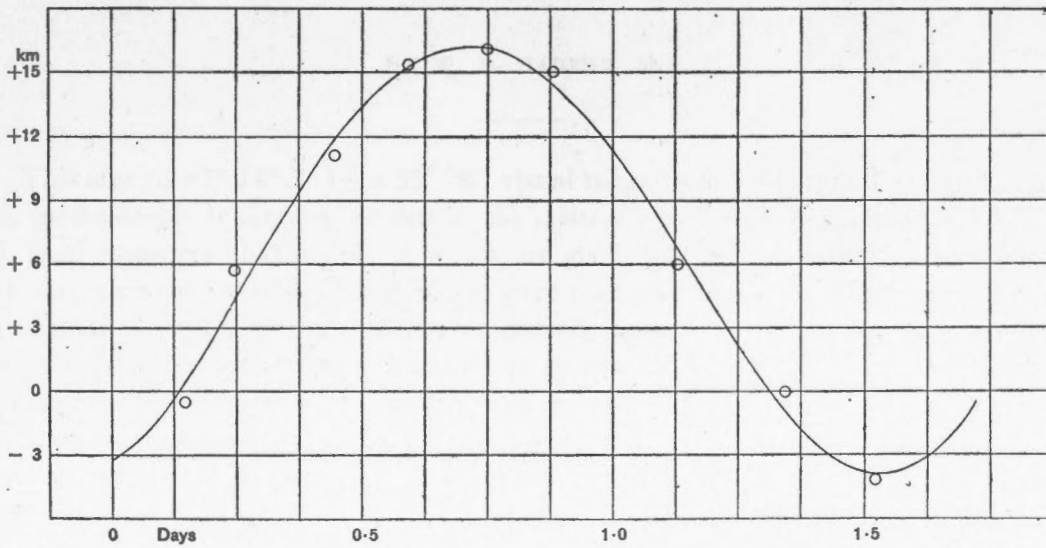
$$\frac{m_1 \sin^3 i}{(m+m_1)^2} = .0002 \odot$$

Dominion Observatory

Ottawa

April, 1918.

PUBLICATIONS
 OF THE
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Radial Velocity Curve of Boss 3511