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**Orbit of the Spectroscopic Binary
Boss 6142**

BY

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ORBIT OF THE SPECTROSCOPIC BINARY BOSS 6142

By REYNOLD K. YOUNG, Ph.D.

The binary character of Boss 6142 ($\alpha, 1900, = 23^h 50^m .5, \delta = +56^\circ 23'$, type Bp, mag. 6.05) was announced by Adams in the *Astrophysical Journal*, April, 1912. Plates taken here indicate that the *H* and *K* lines do not shift their position with the others and remain fixed. Fifty-three spectrograms have been used in determining an orbit. On seven of these the secondary spectrum was measured. There are indications of its presence on many plates where it could not be used. On those plates where the lines due to the primary and those due to the secondary are just separating, the spectral lines are very diffuse, and the spectrum is sometimes almost continuous. Where the stars are moving across the line of sight, the lines are fair. Table I gives a list of all those which were used in reducing the measures.

TABLE I

Element	Wave-Length	Element	Wave-Length
Calcium.....	3933.825	Hydrogen.....	4340.634
Calcium.....	3968.625	Helium.....	4388.100
Helium.....	4026.352	Helium.....	4471.676
Hydrogen.....	4101.890	Silicon.....	4552.750
Helium.....	4143.928	Silicon.....	4567.950

Difficulty was encountered in obtaining a period which would satisfy the observations taken on Mount Wilson. The interval covered by our own series is about four hundred and six days, while the Mount Wilson observations cover three hundred and thirty-three, and three of their observations out of four lie within a space of time of sixty-seven days. These intervals give little latitude for adjusting the period. The first of their observations seems to be inconsistent with the others. Of course, several velocities obtained here are nearly forty kilometres in error and it may be that the residual of sixty-eight kilometres in the first observation taken on Mount Wilson is accidental and does not indicate any departure from elliptic motion. Dr. Adams reports that the spectrum is

certainly composite on the plate taken November first, and that the settings were made on the most intense parts of the absorption lines. A remeasure of this plate yielded practically the same result as published.

The period finally adopted was 13.435 days and then the observations were grouped into normals, preliminary elements obtained and corrected in the usual manner. The different steps in the solution follow.

MOUNT WILSON OBSERVATIONS OF BOSS 6142

Date	Julian Date	Phase from J.D. 2,420,800	Vel.	O-C
1911, Nov. 1.....	2,419,342.758	7.03	- 53	+68
1912, Jan. 6.....	406.662	3.76	- 11	-26
1912, Jan. 9.....	409.633	6.73	-133	-15
1912, Sept. 30.....	675.811	4.21	- 23	-13

OBSERVATIONS OF BOSS 6142

Plate	Observer*	Date	Julian Date	Phase from J. D. 2,420,800	Velocity Primary	Wt.	Velocity from H and K	O-C	Velocity Secondary
1915									
6747	H	Jan. 28..	2,420,526.535	8.67	-133	1	-16	- 4	+105
6756	C	" 29..	527.528	9.66	-120	1	-23	- 9	
6766	C	Feb. 3..	532.599	1.30	+ 81	1	-38	-19	
6773	H	" 4..	533.541	2.24	+104	1	.....	+19	
7077	Y	June 27..	676.720	11.07	- 39	½	.....	+12	
7085	H-Y	July 1..	680.742	1.66	+108	1	.....	+11	-189
7093	C	" 9..	688.699	9.61	- 93	½	.....	+19	
7103	C	" 14..	693.818	1.30	.....	.....	-24	.....
7113	Y-H	" 20..	699.745	7.22	-108	1	.....	+ 4	
7116	Y	" 22..	701.754	9.23	-126	1	-21	- 5	
7125	C	" 26..	705.833	13.31	+ 59	½	-21	- 9	
7128	Y-H	" 27..	706.726	0.77	+ 93	1	-30	- 3	-155
7130	C	" 28..	707.824	1.87	+ 95	1	-29	+ 2	
7137	Y	Aug. 1..	711.764	5.81	- 75	1	-22	+11	
7141	Y	" 5..	715.772	9.82	-104	1	-40	+ 1	
7148	Y	" 10..	720.677	1.29	+102	1	-28	+ 2	-168
7157	Y	" 14..	724.764	5.37	- 35	1	.....	+32	
7159	Y	" 17..	727.677	8.29	-124	1	.....	+ 8	+170
7160	Y	" 17..	727.820	8.43	-130	1	-30	0	+133
7170	Y	" 26..	736.650	3.82	- 16	1	-18	-28	
7171	Y	" 26..	736.706	3.88	- 19	1	- 2	-28	

OBSERVATIONS OF BOSS 6142—Concluded

Plate	Observer*	Date	Julian Date	Phase from J. D. 2,420,800	Velocity Primary	Wt.	Velocity from H and K	O-C.	Velocity Secondary
1915									
7188	P ¹¹	Sept. 1..	2,420,742.694	9.87	-106	$\frac{1}{2}$	.....	- 2	
7222	H	" 9..	750.687	4.43	- 34	1	.....	-15	
7237	Y	" 11..	752.765	6.50	-120	$\frac{1}{2}$	-30	-11	
7262	C-P ¹¹	" 17..	758.747	12.49	- 13	1	.....	-41	
7269	Y	" 19..	760.663	0.97	+102	1	-33	+ 4	-165
7275	Y	" 21..	762.670	2.97	+ 56	1	-26	- 3	
7292	Y	" 23..	769.547	9.85	-105	$\frac{1}{2}$	.....	- 1	
7301	Y	" 29..	770.611	10.92	- 39	1	-24	+20	
7309	H	" 30..	771.563	11.87	- 38	1	.....	-30	
7318	Y	Oct. 3..	774.555	1.42	+ 99	1	.....	0	-197
7328	Y	" 10..	781.601	8.47	-132	1	-20	- 1	
7329	Y	" 10..	781.672	8.54	-147	1	.....	-17	
7341	Y	" 15..	786.534	13.40	+100	1	-17	+29	-141
7343	Y	" 15..	786.660	0.10	+ 71	$\frac{1}{2}$	.....	- 6	
7356	Y	" 21..	792.525	5.96	- 80	1	.....	+11	
7370	Y-H	" 28..	799.753	13.19	+ 47	$\frac{1}{2}$	-26	-12	
7405	Y	Nov. 13..	815.697	2.26	+ 86	1	-19	+ 2	
7410	Y	" 16..	818.514	5.08	- 49	1	.....	+ 3	
7411	Y	" 16..	818.597	5.16	- 46	1	-20	+10	
7413	C	" 17..	819.500	6.07	-118	1	-25	-23	
7426	Y	" 24..	826.526	13.09	+ 41	$\frac{1}{2}$	.....	-17	
7436	P	Dec. 1..	833.595	6.72	-119	$\frac{1}{2}$	-28	- 4	
7456	Y	" 28..	860.482	6.74	- 76	$\frac{1}{2}$	.....	+39	
1916									
7473	H	Jan. 6..	869.506	2.33	+ 57	1	.....	-26	
7484	Y	" 14..	877.483	10.31	-110	1	-20	-23	
7485	Y	" 14..	877.531	10.36	- 67	$\frac{1}{2}$	.....	+17	
7489	C	" 17..	880.531	13.36	+ 73	$\frac{1}{2}$	.....	+ 3	
7491	Y	" 23..	886.515	5.91	- 68	1	-19	+22	
7493	Y	" 28..	891.519	10.91	- 74	1	-23	-14	
7499	P	" 29..	892.507	11.90	- 19	1	.....	-13	
7503	Y	Feb. 10..	904.521	10.48	- 56	$\frac{1}{2}$	- 3	+23	
7541	H	Mar. 9..	932.514	11.60	- 23	1	.....	0	

* H=Harper: C=Cannon: P=J. S. Plaskett: P¹¹=H. Plaskett: Y=Young

MEASURES OF BOSS 6142—Continued

λ	7085		7093		7103		7113		7116		7125			
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.		
3933.825							-41.6	$\frac{1}{2}$	-46.9	$\frac{1}{2}$	-38.1	$\frac{1}{2}$	-40.5	$\frac{1}{2}$
3968.625									-36.2	$\frac{1}{2}$	-39.5	$\frac{1}{2}$	-35.3	$\frac{1}{2}$
4026.352											-94	$\frac{1}{2}$	+69	$\frac{1}{2}$
4101.890									-106	$\frac{1}{2}$	-138	$\frac{1}{2}$	+30	$\frac{1}{2}$
4340.634	+ 86	$\frac{1}{2}$			-106	$\frac{1}{2}$			-160	$\frac{1}{2}$	-165	$\frac{1}{2}$	+25	$\frac{1}{2}$
4388.100					-77	$\frac{1}{2}$								
4471.676	+111	$\frac{1}{2}$	-189	$\frac{1}{2}$	-155	$\frac{1}{2}$			-120	$\frac{1}{2}$			+40	$\frac{1}{2}$
4552.750	+ 60	$\frac{1}{2}$									-156	$\frac{1}{2}$		
Weighted mean	+ 90.8		-189.0		-111.0		- 41.6		-126.5		-144.4		+ 41.0	
V_a	+ 17.14		+ 17.14		+ 17.94		+ 18.20		+ 18.41		+ 18.43		+ 18.40	
V_d	+ 0.17		+ 0.17		+ 0.18		+ 0.10		+ 0.12		- 0.12		+ 0.03	
Curv.	- 0.28		- 0.28		- 0.28		- 0.28		- 0.28		- 0.28		- 0.28	
Radial Velocity H and K	+108.		-172.		- 93.		- 24.		-108.		-126.		+ 59.	
									- 23.		- 21.		- 21.	

MEASURES OF BOSS 6142—Continued

λ	7128		7130		7137		7141		7148					
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.				
3933.825	-51.3	$\frac{1}{2}$	.....	.....	-40.0	$\frac{1}{2}$	-54.8	$\frac{1}{2}$	.....	.....	-48.5	$\frac{1}{2}$	.....
3968.625	-42.7	$\frac{1}{2}$	.....	.....	-60.1	$\frac{1}{2}$	-25.5	$\frac{1}{2}$	-57.5	$\frac{1}{2}$	-42.7	$\frac{1}{2}$	.....
4026.352	+74	$\frac{1}{2}$	-152	$\frac{1}{2}$	+86	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....
4101.890	.....	.....	.....	.....	.....	.....	-40	$\frac{1}{2}$	-133	$\frac{1}{2}$	.....	.....	.....
4143.928	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	+93	$\frac{1}{2}$	.....
4340.634	+72	$\frac{1}{2}$	-179	$\frac{1}{2}$	+59	$\frac{1}{2}$	-115	$\frac{1}{2}$	-140	$\frac{1}{2}$	+93	$\frac{1}{2}$	-195	$\frac{1}{2}$
4388.100	.....	.....	.....	.....	+94	$\frac{1}{2}$	-78	$\frac{1}{2}$	.....	.....	.....	.....	.....
4471.676	+99	$\frac{1}{2}$	-191	$\frac{1}{2}$	+68	$\frac{1}{2}$	-107	$\frac{1}{2}$	-102	$\frac{1}{2}$	+67	-176	$\frac{1}{2}$
4552.750	+76	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4567.950	.....	.....	.....	.....	.....	.....	.....	.....	-95	$\frac{1}{2}$	.....	.....	.....
Weighted mean	+ 74.4		-174.0		+ 76.8		- 93.3		-122.0		+ 84.3		-185.5	
V_a	+ 18.38		+ 18.38		+ 18.36		+ 18.21		+ 17.97		+ 17.57		+ 17.57	
V_z	+ 0.12		+ 0.12		+ 0.04		+ 0.09		+ 0.04		+ 0.12		+ 0.12	
Curv.	- 0.28		- 0.28		- 0.28		- 0.28		- 0.28		- 0.28		- 0.28	
Radial Velocity	+ 93.		-155.		+ 95.		- 75.		-104.		+102.		-168.	
H and K	- 30.		.....		- 29.		- 22.		- 40.		- 28.		.....

MEASURES OF BOSS 6142—Continued

λ	7157		7159				7160				7170		7171			
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.		
3933·825							- 60	$\frac{1}{2}$					-33	$\frac{1}{2}$	-17·5	$\frac{1}{2}$
3968·625							- 33	$\frac{1}{2}$								
4026·352													-38	$\frac{1}{2}$		
4101·890	-36	$\frac{1}{2}$											-34	$\frac{1}{2}$	-20	$\frac{1}{2}$
4143·928	-55	$\frac{1}{2}$											-29	$\frac{1}{2}$		
4340·634	-66	$\frac{1}{2}$	-140	1	+153	$\frac{1}{2}$	-124	$\frac{1}{2}$	+147	$\frac{1}{2}$			-47	$\frac{1}{2}$	-40	$\frac{1}{2}$
4388·100							-134	$\frac{1}{2}$							-37	$\frac{1}{2}$
4471·676	-42	$\frac{1}{2}$	-141	$\frac{1}{2}$			-171	$\frac{1}{2}$					-35	$\frac{1}{2}$	-34	$\frac{1}{2}$
4552·750	-75	$\frac{1}{2}$					-155	$\frac{1}{2}$	+ 85	$\frac{1}{2}$			0	$\frac{1}{2}$	-33	$\frac{1}{2}$
4567·950													- 4	$\frac{1}{2}$	-33	$\frac{1}{2}$
Weighted mean	- 52·2		-140·5		+153·0		-146·7		+116·0				- 30·9		- 34·2	
V_a	+ 17·15		+ 16·79		+ 16·79		+ 16·79		+ 16·79				+ 15·45		+ 15·45	
V_d	+ 0·04		+ 0·11		+ 0·11		+ 0·11		+ 0·11				+ 0·12		+ 0·08	
Curv.	- 0·28		- 0·28		- 0·28		- 0·28		- 0·28				- 0·28		- 0·28	
Radial Velocity	- 35·		-124·		+170·		-130·		+133·				- 16·		- 19·	
H and K							- 30·						- 18·		- 2·	

MEASURES OF BOSS 6142—Continued

λ	7188		7222		7237		7262		7269		7275			
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.		
3933·825					- 47	$\frac{1}{2}$			- 42·5	$\frac{1}{2}$			- 45·3	$\frac{1}{2}$
3968·625					- 37	$\frac{1}{2}$			- 42·7	$\frac{1}{2}$			- 24·6	$\frac{1}{2}$
4026·352			- 55	$\frac{1}{2}$					+ 94	$\frac{1}{2}$			+ 38	$\frac{1}{2}$
4101·890			- 56	$\frac{1}{2}$					+ 84	$\frac{1}{2}$			+ 28	$\frac{1}{2}$
4143·928			- 10	$\frac{1}{2}$	- 118	$\frac{1}{2}$	- 23	$\frac{1}{2}$	+ 110	$\frac{1}{2}$	- 146	$\frac{1}{2}$	+ 67	$\frac{1}{2}$
4340·634	- 120	$\frac{1}{2}$	- 32	$\frac{1}{2}$					+ 99	$\frac{1}{2}$	- 203	$\frac{1}{2}$	+ 49	$\frac{1}{2}$
4388·100									+ 114	$\frac{1}{2}$				
4471·676			- 56	1	- 156	$\frac{1}{2}$	- 23	$\frac{1}{2}$	+ 61	$\frac{1}{2}$			+ 36	$\frac{1}{2}$
4552·750					- 123	$\frac{1}{2}$								
Weighted mean	- 120·0		- 46·4		- 132·3		- 23·0		+ 91·8		- 174·5		+ 46·2	
V_s	+ 14·32		+ 12·62		+ 12·10		+ 10·65		+ 10·14		+ 10·14		+ 9·61	
V_z			+ 0·05		+ 0·11		- 0·04		+ 0·05		+ 0·05		+ 0·04	
Curv.	- 0·28		- 0·28		- 0·28		- 0·28		- 0·28		- 0·28		- 0·28	
Radial Velocity H and K	- 106·		- 34·		- 120·		- 13·		+ 102·		- 165·		+ 56·	
					- 30·				- 33·				- 26·	

MEASURES OF BOSS 6142—Continued

λ	7292		7301		7309		7318				7328			
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
3933.825			-31.0	$\frac{1}{2}$							-28.0	1		
3968.625											-19.3	1		
4026.352	-106	$\frac{1}{4}$	-30	$\frac{1}{2}$							-108	$\frac{1}{2}$		
4101.890					-32	$\frac{1}{2}$	+113	$\frac{1}{4}$					+86	$\frac{1}{4}$
4143.928			-16	$\frac{1}{4}$							-119	$\frac{1}{2}$	+95	$\frac{1}{2}$
4340.634	-112	$\frac{1}{4}$	-74	$\frac{1}{2}$	-64	1	+98	$\frac{1}{4}$	-197	$\frac{1}{2}$	-139	$\frac{1}{2}$		
4388.100	-105	$\frac{1}{4}$			-69	$\frac{1}{2}$					-80	$\frac{1}{4}$		
4471.676	-121	$\frac{1}{2}$	-48	$\frac{1}{2}$	-38	1	+70	$\frac{1}{2}$	-210	$\frac{1}{4}$	-163	$\frac{1}{2}$	+135	$\frac{1}{4}$
4552.750					-14	$\frac{1}{2}$	+102	$\frac{1}{2}$			-149	$\frac{1}{2}$		
Weighted mean	-113.0		-45.7		-45.7		+92.5		-203.5		-135.6		+102.7	
V_0	+7.67		+7.36		+7.08		+6.19				+4.01			
V_2	-0.12		+0.08		+0.12		+0.12				+0.08			
Curv.	-0.28		-0.28		-0.28		-0.28				-0.28			
Radial Velocity <i>H and K</i>	-105.		-39.		-38.		+99.		-197.		-132.		+106.	
			-24.								-20.			

MEASURES OF BOSS 6142—Continued

λ	7329		7341		7343		7356		7370		7405			
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.		
3933.825			- 20.8	1							- 24.2	$\frac{1}{2}$	- 8.8	$\frac{1}{2}$
3968.625			- 18.1	$\frac{1}{2}$									- 14.9	$\frac{1}{2}$
4026.352			+117	$\frac{1}{4}$					- 53	$\frac{1}{4}$			+105	$\frac{1}{4}$
4101.890									- 62	$\frac{1}{4}$				
4143.928			+103	$\frac{1}{4}$										
4340.634	-162	$\frac{1}{2}$	+ 98	$\frac{1}{2}$	-143	$\frac{1}{2}$			-113	$\frac{1}{2}$			+ 80	$\frac{1}{2}$
4388.100	-100	$\frac{1}{2}$	+ 87	$\frac{1}{2}$					- 76	$\frac{1}{2}$				
4471.676	-152	$\frac{1}{2}$					+ 69	$\frac{1}{2}$	- 75	$\frac{1}{2}$	+ 49	$\frac{1}{2}$	+109	$\frac{1}{2}$
4552.750	-162	$\frac{1}{2}$							- 96	$\frac{1}{2}$				
4567.950	-152	$\frac{1}{2}$							- 61	$\frac{1}{2}$				
Weighted mean	-150.7		+ 98.3		-143.0		+ 69.0		- 80.0		+ 49.0		+ 93.5	
V_s	+ 3.99		+ 2.32		+ 2.32		+ 2.29		+ 0.50		- 1.84		- 6.93	
V_d	+ 0.03		+ 0.10		+ 0.10		- 0.03		+ 0.03		- 0.14		- 0.12	
Curv.	- 0.28		- 0.28		- 0.28		- 0.28		- 0.28		- 0.28		- 0.28	
Radial Velocity H and K	-147.		+100.		-141.		+ 71.		- 80.		+ 47.		+ 86.	
			- 17.								- 26.		- 19.	

MEASURES OF BOSS 6142—Continued

λ	7410		7411		7413		7426		7436		7456		7473	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
3933.825	.....	.....	- 8.8	$\frac{1}{2}$	- 22.4	$\frac{1}{2}$	.....	.....	- 15.2	$\frac{1}{2}$	.....	.....	.....	.....
3968.625	.....	.....	- 13.6	$\frac{1}{2}$	- 10.7	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4026.352	- 35	$\frac{1}{2}$	.....	.....	- 114	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4101.890	.....	.....	- 46	$\frac{1}{2}$	- 82	$\frac{1}{2}$	.....	.....	- 129	$\frac{1}{2}$	.....	.....	+ 54	$\frac{1}{2}$
4143.928	.....	.....	- 21	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4340.634	- 44	$\frac{1}{2}$	- 34	$\frac{1}{2}$	- 88	$\frac{1}{2}$	+ 33	$\frac{1}{2}$	- 113	$\frac{1}{2}$	- 60	$\frac{1}{2}$	+ 96	$\frac{1}{2}$
4388.100	.....	.....	- 18	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4471.676	- 42	$\frac{1}{2}$	- 71	$\frac{1}{2}$	- 125	$\frac{1}{2}$	+ 98	$\frac{1}{2}$	- 74	$\frac{1}{2}$	.....	.....	+ 73	$\frac{1}{2}$
4552.750	- 44	$\frac{1}{2}$	- 42	$\frac{1}{2}$	- 138	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4567.950	.....	.....	- 29	$\frac{1}{2}$	.....	.....	+ 41	$\frac{1}{2}$	- 103	$\frac{1}{2}$	.....	.....	.....	.....
Weighted mean	- 41.2		- 37.5		- 109.4		+ 51.2		- 106.4		- 60.0		+ 74.3	
V_s	- 7.74		- 7.81		- 8.09		- 10.21		- 12.04		- 15.86		- 16.81	
V_z	+ 0.03		- 0.03		+ 0.04		0.00		- 0.09		0.00		- 0.06	
Curv.	- 0.28		- 0.28		- 0.28		- 0.28		- 0.28		- 0.28		- 0.28	
Radial Velocity	- 49.		- 46.		- 118.		+ 41.		- 119.		- 76.		+ 57.	
H and K	.....		- 20.		- 25.		.....		- 28.		.....		.....

MEASURES OF BOSS 6142—Concluded

λ	7484		7485		7489		7491		7493		7499		7503	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
3933·825	- 11·2	$\frac{1}{2}$					- 6·4	$\frac{1}{2}$	- 4	$\frac{1}{2}$			+ 4·0	$\frac{1}{2}$
3968·625	+ 6·6	$\frac{1}{2}$					+ 7·4	$\frac{1}{2}$					+ 23·8	$\frac{1}{2}$
4026·352							- 65	$\frac{1}{2}$						
4101·890	-116	$\frac{1}{2}$							- 74	$\frac{1}{2}$				
4340·634	- 86	$\frac{1}{2}$	- 41	$\frac{1}{2}$	+ 66	$\frac{1}{2}$	- 50	$\frac{1}{2}$	- 42	$\frac{1}{2}$	- 5	$\frac{1}{2}$		
4388·100	- 68	$\frac{1}{2}$												
4471·676	- 36	$\frac{1}{2}$	- 65	$\frac{1}{2}$	+116	$\frac{1}{2}$	- 44	$\frac{1}{2}$	- 27	$\frac{1}{2}$	+ 4	$\frac{1}{2}$	- 26·8	$\frac{1}{2}$
4552·750	- 97	$\frac{1}{2}$					- 37	$\frac{1}{2}$	- 98	$\frac{1}{2}$	- 1	$\frac{1}{2}$		
4567·950									- 61	$\frac{1}{2}$	+ 3	$\frac{1}{2}$	- 51·5	$\frac{1}{2}$
Weighted mean	- 91·7		- 49·0		+ 91·0		- 49·2		- 55·6		+ 0·2		- 39·1	
V_s	- 17·75		- 17·75		- 18·06		- 18·71		- 18·88		- 18·75		- 16·68	
V_d	- 0·08		- 0·08		- 0·10		- 0·08		- 0·11		- 0·11		- 0·16	
Curv.	- 0·28		- 0·28		- 0·28		- 0·28		- 0·28		- 0·28		- 0·28	
Radial Velocity	-110·		- 67·		+ 73·		- 68·		- 74·		- 19·		- 56·	
H and K	- 20·						- 19·		- 23·				- 27·	

NORMAL PLACES

	Julian Date	Phase from J.D. 2,420,800	Observed Velocity	Weight	Computed Velocity Preliminary	Computed Velocity Final	O-C Pre- liminary	O-C Final
1.....	2,420,800.50	0.50	+ 94.4	1.2	+ 88.4	+ 89.4	+6.0	+ 5.0
2.....	801.42	1.42	+ 97.5	1.3	+ 98.4	+ 99.5	-0.9	- 2.0
3.....	802.17	2.17	+ 85.5	1.3	+ 84.9	+ 85.2	+0.6	+ 0.3
4.....	802.97	2.97	+ 56.0	0.4	+ 55.1	+ 53.3	+0.9	+ 2.7
5.....	804.62	4.62	- 33.2	2.0	- 25.4	- 30.3	-7.8	- 2.9
6.....	805.89	5.89	- 74.3	1.0	- 80.7	- 85.4	+6.4	+11.1
7.....	806.63	6.63	-112.2	1.1	-105.0	-108.6	-7.2	- 3.6
8.....	808.48	8.48	-133.2	1.7	-131.0	-130.6	-2.2	- 2.6
9.....	809.46	9.46	-119.7	0.8	-120.5	-118.5	+0.8	- 1.2
10.....	809.84	9.84	-104.8	0.7	-111.4	-109.1	+6.6	+ 4.3
11.....	810.55	10.55	- 81.8	1.0	- 86.5	- 84.1	+4.7	+ 2.3
12.....	811.69	11.69	- 27.5	1.8	- 27.9	- 26.6	+0.4	- 0.9
13.....	813.25	13.25	+ 56.1	0.6	+ 62.2	+ 62.6	-6.1	- 6.5

PRELIMINARY ELEMENTS

$$\begin{aligned}
 P &= 13.435 \text{ days} \\
 T &= \text{J. D. } 2,420,800.336 \\
 e &= 0.10 \\
 \omega &= 330^\circ \\
 K &= 115 \text{ km.} \\
 \gamma &= -26.06 \text{ km.}
 \end{aligned}$$

OBSERVATION EQUATIONS

	x	y	z	p	q	$-n$	Weight
1.....	1.000	+0.996	+0.948	-0.466	-0.503	-6.0	1.2
2.....	1.000	+1.083	+0.754	-0.042	+0.108	+0.9	1.3
3.....	1.000	+0.965	+0.029	-0.428	+0.529	-0.6	1.3
4.....	1.000	+0.706	-0.701	-0.736	+0.808	-0.9	0.4
5.....	1.000	+0.006	-0.729	-0.947	+0.886	+7.8	2.0
6.....	1.000	-0.475	+0.169	-0.777	+0.685	-6.4	1.0
7.....	1.000	-0.686	+0.667	-0.584	+0.515	+7.2	1.1
8.....	1.000	-0.913	+0.835	+0.081	-0.026	+2.2	1.7
9.....	1.000	-0.821	+0.198	+0.468	-0.371	-0.8	0.8
10.....	1.000	-0.742	-0.127	+0.610	-0.512	-6.6	0.7
11.....	1.000	-0.525	-0.708	+0.841	-0.770	-4.7	1.0
12.....	1.000	-0.016	-1.005	+1.045	-1.079	-0.4	1.8
13.....	1.000	+0.768	+0.411	+0.782	-0.879	+6.1	0.6

where $x = d\gamma$

$y = dK$

$z = Kde$

$p = Kd\omega$

$q = \frac{K\mu}{(1-e^2)^{\frac{3}{2}}} dT$

NORMAL EQUATIONS

$$\begin{aligned}
 14.900x + 0.101y + 0.539z + 0.471p - 0.368q + 6.670 &= 0 \\
 +7.840y + 0.670z - 0.310p + 0.320q - 3.384 &= 0 \\
 +7.244z - 0.657p + 0.760q - 3.744 &= 0 \\
 +6.975p - 6.811q - 21.883 &= 0 \\
 +6.719q + 20.244 &= 0
 \end{aligned}$$

whence $x = -0.67$

$y = +0.50$

$z = +0.55$

$p = +19.2$

$q = +16.3$

$d\gamma = -0.67$ km.

$dK = +0.50$ km.

$de = +0.005$

$d\omega = +9^\circ.56$

$dT = +0.30$ day

FINAL ELEMENTS

$$\begin{aligned}
 P &= 13.435 \text{ days} \\
 T &= \text{J. D. } 2,420,800.634 \quad \pm 0.271 \text{ day} \\
 e &= 0.105 \quad \pm 0.013 \\
 \omega &= 339^\circ.56 \quad \pm 7^\circ.1 \\
 K &= 115.5 \text{ km.} \quad \pm 1.33 \text{ km.} \\
 \gamma &= -26.7 \text{ km.} \quad \pm 0.90 \text{ km.} \\
 a \sin i &= 21,200,000 \text{ km.} \\
 \frac{m_1^3 \sin^3 i}{(m + m_1)^2} &= 2.11 \odot
 \end{aligned}$$

The residuals which these elements give for the individual observations are shown in the tables of observations under the heading O-C. The probable error of an average plate is eleven kilometres.

SECONDARY SPECTRUM

The above elements rest entirely on measures of the primary. The measures of the secondary were grouped into two normal places as follows:—

Phase	Velocity	Weight	O-C
2.03	-169	5	0
8.46	+136	3	0

A value of K_1 was determined which would best harmonize these with the elements of the primary. It was possible to adjust the value of K_1 so as to leave no residuals, but, nevertheless, we must regard the value of the amplitude of the secondary given as only roughly approximate. We have the following additional elements:—

$$\begin{aligned}
 K_1 &= 167 \text{ km.} \\
 K:K_1 &= 1:1.45 \\
 a_1 \sin i &= 30,700,000 \text{ km.} \\
 m \sin i &= 18.5 \odot \\
 m_1 \sin i &= 12.7 \odot
 \end{aligned}$$

H AND K LINES

The phenomenon that these lines present in this star is quite similar to that presented in several other stars of this type. There seems to be no evidence of variation in their position. On many plates the spectrum is too faint to show *H* and *K*, and on others the measurement of the *H* line is interfered with by the presence of *H_ε*, but in general the lines are narrow and sharp in striking contrast to the other lines of the star. Regarding their position as fixed, they yield a velocity - 24.0 km. \pm 4.9 km.

Dominion Observatory

Ottawa

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