ORBIT OF BOSS 1082

BY J. B. CANNON, M.A.

Boss 1082 ($\alpha = 4^h\ 33^m$, $\delta = +52°\ 54'$, mag. 5·3, type G5) was found to be a spectroscopic binary at Mount Wilson. Three plates taken there in 1914 and 1915 gave velocities of −38, −66 and 0 km. Forty-two plates were taken here in 1916, 1917 and 1918, and from these the following orbit was obtained.

The Mount Wilson observations follow. They lie on an average about 6 km. more positive than our observations and if this amount be subtracted from each observation they fit the curve fairly well.

MOUNT WILSON OBSERVATIONS

Date	Julian Day	Phase	Velocity	Residual
1914, Dec. 2·820................	2,420,469·820	58·27	−38 km.	+ 6·0 km.
" 24·786................	491·786	80·24	−66	+ 1·2
1915, Mar. 2·646................	559·646	27·10	0	+12·2

The lines used are given in the table below, the wave-lengths being found by means of corrections obtained from the line-residual in each plate.

4571·970	4415·316	4325·809	4271·775
4549·796	4404·956	4314·919	4233·331
4523·099	4352·165	4294·615	4215·808
4501·794	4340·734	4289·815	4143·776

The observations are as follows:

OTTAWA OBSERVATIONS OF BOSS 1082

Plate	Julian Day	Phase	Velocity	Residual
7819...........................	2,421,132·81	116·26	−38·5	+ 1·5
7833...........................	138·85	1·30	−23·9	+ 7·4
7852...........................	141·82	4·27	−19·2	+ 8·3
7861...........................	143·81	6·25	−33·1	− 8·7
7874...........................	148·81	11·25	−21·9	− 1·8
7894...........................	173·87	36·32	−15·5	+ 1·5
7901...........................	182·76	45·21	−25·0	+ 1·3
7907...........................	188·76	51·21	−41·3	− 7·3
7917...........................	190·63	53·08	−35·2	+ 1·7
7968...........................	227·56	90·01	−61·4	+ 6·6
7992...........................	244·55	107·00	−49·0	+ 4·4
8005...........................	248·51	110·96	−44·8	+ 3·4
8008...........................	251·51	113·96	−40·8	+ 2·3
8018...........................	259·64	1·09	−40·3	− 9·1
8033...........................	262·60	4·05	−31·0	− 3·0
8068...........................	281·57	23·02	−17·0	− 4·8
8075...........................	287·62	29·07	−12·8	+ 0·1
8088...........................	290·52	31·97	−12·1	+ 1·9
8103...........................	297·57	39·02	−20·5	− 1·2
8107...........................	300·58	42·03	−21·2	+ 0·8
8115...........................	304·58	46·02	−29·0	− 4·9
8118...........................	307·58	49·03	−24·8	+ 6·4
8131...........................	317·59	59·04	−47·1	− 2·0
8328...........................	527·86	27·31	−12·0	+ 0·1
8332...........................	537·84	37·29	−18·7	− 1·3
8340...........................	540·84	40·29	−23·4	− 2·8
8350...........................	545·83	45·28	−31·2	− 4·9
8358...........................	547·77	47·22	−32·9	− 3·9
8366...........................	559·84	59·29	−45·7	− 0·3
8369...........................	562·69	62·14	−41·8	+ 7·7
8371...........................	565·62	65·07	−56·6	− 3·5
8377...........................	569·78	69·23	−58·9	− 0·5
8380...........................	574·61	74·06	−59·7	+ 3·2
8389...........................	588·60	88·05	−74·3	− 5·9
8403...........................	593·61	93·06	−72·1	− 5·2
8406...........................	597·58	97·03	−65·6	− 1·2
8432...........................	618·54	117·99	−33·0	− 4·6
8434...........................	621·67	0·12	−41·9	− 9·0
8440...........................	633·59	12·04	−18·3	± 0·0
8441...........................	635·63	14·08	−16·9	− 0·4
8444...........................	642·62	21·07	−10·2	+ 2·1
8455...........................	646·53	24·98	− 4·5	+ 7·6

MEASURES OF BOSS 1082

λ	7819		7833		7852		7852*		7852*		7861		7874	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4571·970	− 61·8	½	−40·63	½	−44·10	½	−58·22	½	−40·88	½	−43·62	¼	−37·60	½
4549·796	−49·75	¼	−61·58	¼	−33·49	½	−33·36	½	−35·77	¼	−35·20	¼	−46·82	½
4523·099	−65·33	¼	−66·46	¼	−45·92	½	−60·16	¼	−51·88	....	....	....	....	....
4501·794	−55·62	¼	−26·79	¼	....	....	....	....	....	....	....	....	....	....
4415·316	−51·22	¼	−38·94	½	−31·58	½	−40·40	¼	−35·29	½	−55·15	¼	−44·20	½
4404·956	−64·34	¼	−44·50	½	−44·42	¼	−49·01	¼	−41·31	½	−59·62	¼	−48·50	½
4352·165	−68·45	¼	....	....	....	....	....	....	....	....	−76·02	¼	....	....
4340·734	−83·70	¼	−46·60	¼	−49·20	¼	−47·21	¼	−36·82	¼	−73·20	¼	−43·58	¼
4325·809	....	....	−56·20	½	−38·22	¼	−35·53	½	....	....	....	....	−42·22	½
4314·919	−65·90	¼	−48·96	½	−43·22	¼	−41·20	¼	−45·46	½	−50·40	¼	−32·35	¼
4289·815	−58·62	¼	−49·42	¼	−45·22	½	−47·90	½	−47·15	¼	−44·42	¼	−58·42	¼
4271·775	....	....	....	....	....	....	....	....	−48·95	¼	....	....	....	....
4233·331	....	....	−49·10	¼	−39·82	¼	−43·21	¼	....	....	....	....	....	....
4215·808	....	....	−37·47	¼	−39·18	¼	−28·51	¼	−41·14	¼	−57·10	¼	−26·53	¼
4143·776	....	....	....	....	....	....	....	....	....	....	−57·30	¼	....	....
Weighted mean	− 62·47		− 46·93		− 40·86		− 43·61		− 40·51		− 55·20		− 42·82	
V_a	+ 24·19		+ 23·25		+ 22·69		+ 22·69		+ 22·69		+ 22·28		+ 21·13	
V_d	+ 0·10		+ 0·03		+ 0·05		+ 0·05		+ 0·05		+ 0·05		+ 0·05	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	− 38·5		− 23·9		− 18·4		− 21·1		− 18·0		− 33·1		− 21·9	

* Check measurement

MEASURES OF BOSS 1082—*Continued*

λ	7894		7901		7907		7917		7968		7992		8005	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4571·970	−30·01	½	−43·50	¼	−48·02	½	−45·20	¼	−56·20	¼	−39·15	½	−22·62	¼
4549·796	....	...	−27·44	½	−57·10	½	−42·63	½	....	...	−24·42	½	−31·00	½
4523·099	−24·85	¼	....	...	....	...	−45·00	¼	−29·58	¼	−20·20	¼	....	...
4501·794	−35·13	½	− 2·70	¼	−40·67	¼	−67·97	¼	....	...	....	...	....	...
4415·316	....	...	−46·60	¼	....	...	−52·04	½	−55·25	½	−50·95	¼	−25·25	¼
4404·956	....	...	−30·85	½	−54·16	¼	−33·30	¼	−64·60	½	−32·82	½	....	...
4352·165	−20·53	¼	....	...	....	...	....	...	....	...	....	...	−26·98	¼
4340·734	−24·12	½	−51·10	¼	−39·56	½	−25·90	½	−50·75	¼	−17·18	½	−33·25	¼
4325·809	....	...	−37·00	¼	....	...	....	...	−49·80	¼	....	...	....	...
4314·919	−29·76	¼	....	...	−48·65	¼	−28·20	½	−47·10	½	−40·95	¼	−30·48	¼
4294·615	....	...	....	...	....	...	....	...	−42·40	¼	−34·67	½	−16·10	¼
4289·815	....	...	....	...	....	...	−44·38	¼	....	...	−27·19	¼	....	...
4215·808	....	...	....	...	....	...	....	...	−41·78	½	....	...	....	...
Weighted mean	− 28·26		− 34·17		− 48·03		− 41·28		− 50·93		− 31·95		− 26·53	
V_s	+ 13·13		+ 9·56		+ 7·01		+ 6·20		− 10·25		− 16·80		− 18·14	
V_t	− 0·11		− 0·09		− 0·03		+ 0·12		+ 0·09		+ 0·05		+ 0·09	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	− 15·5		− 25·0		− 41·3		− 35·2		− 61·4		− 49·0		− 44·8	

MEASURES OF BOSS 1082—*Continued*

λ	8008 Vel.	Wt.	8018 Vel.	Wt.	8033 Vel.	Wt.	8068 Vel.	Wt.	8075 Vel.	Wt.	8088 Vel.	Wt.	8103 Vel.	Wt.
4571·970	−18·66	½	......	.....	− 2·38	¼	+ 7·87	¼	+14·00	½	+14·53	½	+15·46	¼
4549·796	−20·62	½	− 8·82	¼	−17·87	¼	+10·26	¼	+13·48	¼	+10·07	½	+ 3·77	½
4501·794	−19·81	¼	−29·32	¼	− 8·05	¼	+15·13	¼	+14·17	½	+19·06	½	......	.....
4415·316	−17·25	¼	−10·54	½	− 8·29	¼	+ 7·13	¼	+ 9·39	½	+16·02	½	+ 9·03	½
4404·956	−30·22	½	......	.....	......	.....	...	...	...	...	...	...	+10·09	½
4352·165	−12·14	½	......	.....	......	.....	...	...	...	...	...	...	......	.....
4340·734	−15·72	¼	−24·42	¼	−12·43	¼	+19·35	¼	+21·95	½	+ 9·39	¼	+17·31	½
4314·919	−29·58	½	−16·12	½	− 6·72	½	− 1·07	¼	+ 5·81	½	+ 7·03	½	− 7·50	½
4289·815	−20·98	¼	−20·31	¼	−11·39	¼	+ 1·02	¼	+14·73	¼	+21·58	¼	+ 0·36	½
4215·808	......	.....	−24·35	⅓	− 0·88	½	......	.....	+14·72	¼	+ 4·46	¼	−13·38	¼
Weighted mean	− 21·52		− 18·49		− 8·50		+ 8·53		+ 13·30		+ 13·23		+ 5·68	
V_a	− 19·08		− 21·37		− 22·10		− 25·25		− 25·68		− 25·78		− 25·75	
V_d	+ 0·07		− 0·12		− 0·09		+ 0·04		− 0·18		− 0·09		− 0·16	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	− 40·8		− 40·3		− 31·0		− 17·0		− 12·8		− 12·1		− 20·5	

MEASURES OF BOSS 1082—*Continued*

λ	8107		8115		8118		8131		8328		8332		8340	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4571·970	+ 9·61	½	− 3·11	¼	− 2·71	¼	−30·08	½	−23·44	¼	−42·46	¼	−46·43	½
4549·796	− 4·48	¼	−17·81	¼	....	....	−25·10	½	−11·58	¼	−28·11	¼	−45·92	¼
4415·316	+ 5·30	½	− 1·60	½	+ 2·21	½	−18·08	½	−32·30	½	−27·05	½	−31·22	½
4404·956	+ 4·62	¼	− 2·35	½	− 5·60	¼	−17·06	½	−37·58	¼	−25·01	½	−40·79	½
4340·734	+13·49	¼	+ 5·72	¼	+ 8·53	¼	−10·05	½	−28·82	¼	−24·54	½	−30·19	½
4314·919	+ 8·62	¼	− 5·74	½	− 0·21	¼	−20·72	½	−30·47	¼	−28·90	¼	−33·68	½
4294·615	....	....	....	....	....	....	....	....	....	....	−41·54	½	−34·99	¼
4289·815	−11·42	¼	+15·12	¼	....	....	−28·60	¼	−31·10	½	−36·10	½	−38·16	½
4233·331	....	....	....	....	....	....	....	....	−29·97	½	−35·68	½	−22·37	½
4215·808	+ 7·76	¼	−15·72	¼	....	....	−37·89	¼	....	....	....	....	....	....
Weighted mean	+ 4·84		− 3·20		+ 0·74		− 22·05		− 28·75		− 31·95		− 35·53	
V_a	− 25·63		− 25·35		− 25·06		− 24·54		+ 17·15		+ 13·62		+ 12·46	
V_d	− 0·16		− 0·14		− 0·18		− 0·20		− 0·09		− 0·09		− 0·09	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	− 21·2		− 29·0		− 24·8		− 47·1		− 12·0		− 18·7		− 23·4	

MEASURES OF BOSS 1082—Continued

λ	8350 Vel.	Wt.	8358 Vel.	Wt.	8366 Vel.	Wt.	8369 Vel.	Wt.	8371 Vel.	Wt.	8377 Vel.	Wt.	8380 Vel.	Wt.
4571·970	−30·09	¼	−39·15	½	−41·80	¼	−54·76	½	....	....	−63·04	¼	−54·82	
4549·796	−35·44	½	−48·06	¼	−53·30	½	−45·03	½			−68·90	¼	−55·90	½
4533·099	−47·61	¼	−34·70	¼	−66·00	¼	....	....			−53·79	½	−57·91	½
4415·316	−44·25	½	−50·60	¼	−49·87	½	−42·01	¼	−43·91	¼	−59·30	¼	−58·60	¼
4404·956	−56·43	¼	−27·13	¼	−47·09	½	−30·69	¼	−68·21	¼	−53·60	¼	−47·55	¼
4340·734	−34·70	¼	−35·29	¼	−55·86	¼	−52·24	¼	−82·85	¼	−68·22	¼	−58·72	¼
4314·919	−43·22	¼	−49·57	¼	−51·42	½	−33·16	¼	−37·22	¼	−60·98	¼	−71·78	¼
4294·615	....	....	−48·65	¼	−42·32	¼	....	....			....	....		¼
4289·815	....	....	....	....	−53·00	¼	....	....			−54·25	½	....	....
4233·331	−41·58	¼	−50·38	¼	−41·99	¼	....	....	−50·14	¼	....	....	....	....
Weighted														
mean	− 41·30		− 42·27		− 49·74		− 44·71		− 56·47		− 58·43		− 57·33	
V$_a$	+ 10·47		+ 9·66		+ 4·44		+ 3·17		+ 0·01		− 0·04		− 2·23	
V$_d$	− 0·09		− 0·03		− 0·14		+ 0·03		+ 0·10		− 0·11		+ 0·09	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial														
Velocity	− 31·2		− 32·9		− 45·7		− 41·8		− 56·6		− 58·9		− 59·7	

MEASURES OF BOSS 1082—*Continued*

λ	8389		8403		8406		8432		8434		8440		8441	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4571·970	−62·15	½	−75·60	¼	−56·25	½	−31·62	½	−22·50	½	+13·06	½	+ 5·74	½
4549·796	−62·72	¼	−57·21	¼	−50·40	½	−29·40	¼	−22·99	½	− 7·77	¼	+ 9·02	½
4533·099	−68·70	½	−52·50	¼	−50·02	¼	+14·38	¼	−19·25	½	− 1·99	¼	+16·94	¼
4501·794	. . . . .		. . . . .		−60·61	¼	−34·04	¼	−11·70	¼	. . . . .		+ 2·29	¼
4415·316	−87·78	¼	. . . . .		−42·83	¼	− 3·75	¼	−32·91	¼	. . . . .		+ 9·64	¼
4404·956	−69·32	¼	−75·55	¼	−67·68	¼	−25·09	¼	. . . . .		. . . . .		+14·72	½
4340·734	−55·85	½	−60·62	¼	−50·20	½	. . . . .		−14·58	¼	. . . . .		−12·96	¼
4314·919	−52·05	½	−50·05	¼	−48·75	½	+ 8·45	½	. . . . .		+10·58	¼	+ 3·58	½
4294·615	−65·88	¼	−57·48	¼	−58·58	¼	− 7·16	¼	. . . . .		. . . . .		. . . . .	
4289·815	. . . . .		. . . . .		. . . . .		. . . . .		. . . . .		. . . . .		+12·23	¼
4233·331	−76·75	½	. . . . .		. . . . .		. . . . .		. . . . .		. . . . .		. . . . .	
4215·808	−58·41	¼	. . . . .		. . . . .		. . . . .		. . . . .		. . . . .		− 4·56	¼
Weighted mean	− 65·66		− 61·29		− 53·15		− 13·14		− 20·96		+ 5·39		+ 7·27	
V_a	− 8·45		− 10·58		− 12·21		− 19·61		− 20·52		− 23·34		− 23·72	
V_d	+ 0·07		+ 0·02		+ 0·04		+ 0·03		− 0·14		− 0·04		− 0·14	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	− 74·3		− 72·1		− 65·6		− 33·0		− 41·9		− 18·3		− 16·9	

MEASURES OF BOSS 1082—*Concluded*

λ	8444		8455											
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4571·970	+26·65	½	+17·46	½	......	....								
4549·796	+16·51	½	+33·68	½	......	....								
4533·099	− 0·32	¼	+42·04	¼	......	....								
4501·794	+18·15	¼	+26·52	¼	......	....								
4415·316	+11·18	½	+17·64	½	......	....								
4404·956	+ 5·94	¼	......	....	......	....								
4340·734	+13·12	¼	+ 3·17	½	......	....								
4314·919	+13·90	½	+19·96	½	......	....								
4233·331	+21·42	¼	......	....	......	....								
Weighted mean	+ 14·98		+ 21·03											
V_a	− 24·79		− 25·22											
V_d	− 0·14		− 0·05											
Curv.	− 0·28		− 0·28											
Radial Velocity	− 10·2		− 4·5											

The observations were grouped into twelve normal places.

NORMAL PLACES

No.	Julian Day	Phase	Velocity	Residual	Weight
1.	2,421,372·84	118·28	− 38·9	− 1·8	2
2.	171·77	3·97	− 26·8	+ 0·6	2
3.	472·67	12·46	− 19·0	− 1·3	1
4.	524·65	24·10	− 10·9	+ 1·2	2
5.	250·67	32·45	− 13·5	+ 1·0	1
6.	419·21	39·66	− 20·9	− 0·5	2
7.	344·39	45·51	− 28·3	− 1·2	1
8.	308·68	50·13	− 33·5	− 0·3	2
9.	480·04	60·16	− 44·9	+ 2·3	1
10.	570·01	69·46	− 58·4	+ 0·3	1
11.	501·84	92·04	− 68·3	− 1·0	2
12.	246·53	108·98	− 46·9	+ 4·0	1

Preliminary values for the elements were found graphically.

$$P = 121 \text{ days}$$
$$e = \cdot 05$$
$$\omega = 280°$$
$$K = 29 \text{ km.}$$
$$\gamma = -40 \cdot 35 \text{ km.}$$
$$T = \text{J.D. } 2{,}421{,}136 \cdot 05$$

A least-squares solution was carried through giving the following corrections:—

$$\delta\gamma = - \cdot 12 \text{ km.}$$
$$\delta K = - \cdot 81 \text{ km.}$$
$$\delta e = - \cdot 031$$
$$\delta\omega = +5°$$
$$\delta T = +1 \cdot 5 \text{ days}$$

This gave the final values of the elements to which are appended the probable errors:—

$$P = 121 \text{ days}$$
$$K = 28 \cdot 19 \text{ km.} \quad \pm \quad 1 \cdot 2 \text{ km.}$$
$$e = \cdot 019 \quad \pm \quad \cdot 042$$
$$\omega = 285° \quad \pm \quad 42° \cdot 68$$
$$\gamma = -40 \cdot 47 \text{ km.} \pm \quad \cdot 81 \text{ km.}$$
$$T = \text{J.D. } 2{,}421{,}137 \cdot 55 \pm 14 \cdot 26 \text{ days}$$
$$a \sin i = 46{,}900{,}000 \text{ km.}$$
$$\frac{m_1{}^3 \sin^3 i}{(m + m_1)^2} = \cdot 28 \; \odot$$

Dominion Observatory
    Ottawa
        March, 1918.

Radial Velocity Curve of Boss 1082