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Measures of  $\sigma$  Leonis

BY

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## MEASURES OF $\sigma$ LEONIS.

BY J. B. CANNON, M.A.

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Eighty-seven plates have been taken here of  $\sigma$  Leonis, extending over a period of five years—1908 to 1912. Eleven measures were published by Frost and Lee giving a range of 21 km.—from  $-17$  to  $+4$ . The range obtained in the eighty-seven plates measured here was over 40 km.—from  $-19.6$  to  $+23.8$ . However, if we exclude plates 2344, 4061, 4090, 4769 and 4905, the range is reduced as will be seen from the measures following to 23 km. In plate 2344 three lines were used; in 4061, two lines; in 4090, four lines; in 4769, three lines; in 4905, one line. It will also be seen that 4768, taken the same night as 4769, gives a velocity of  $-0.3$  km., whereas 4769 gives  $+14.4$  km. Eighty-one plates give a range of only 23 km., or approximately the same as the Yerkes results give.

The star is of type A and, although other lines appear, the lines on which the measures depend chiefly are  $\lambda 4481$ ,  $H_\gamma$  and  $K$ . These are usually good and give fairly accordant results. The small range—for it must be considered small for an A-type star—makes it very difficult to obtain a period of oscillation. It is certainly a binary, but what its period may be is as yet unknown. Many values of the period were tried and, although a fraction over 17 days suits the majority of the observations fairly well, yet none of the values tried satisfy them all.

The measures are all given below and may be of assistance to anyone working on this star to use in conjunction with his own measures, or to one who has time to give to the possible determination of a period from these alone.

SUMMARY OF MEASURES OF  $\sigma$  LEONIS.

Plate.	Julian Day.	Vel.	Plate.	Julian Day.	Vel.
1354.....	2,417,996.56	-10.6	4242.....	2,419,150.70	- 3.9
1379.....	8,005.74	+ 1.9	4249.....	151.68	- 6.6
1387.....	010.75	- 2.8	4257.....	152.64	- 2.0
1487.....	047.63	-12.3	4265.....	153.68	+ 6.3
2233.....	341.86	-11.0	4274.....	155.70	- 9.3
2258.....	346.76	+10.6	4274.....	155.70	-12.2
2344.....	374.85	-19.6	4288.....	161.71	+ 2.1
2356.....	378.78	- 2.3	4302.....	172.64	- 7.1
2452.....	397.77	+ 0.7	4311.....	176.65	- 0.3
2539.....	430.68	$\pm$ 0.0	4311.....	176.65	- 2.6
3114.....	686.90	- 3.7	4320.....	182.61	- 7.8
3216.....	720.85	+ 6.0	4327.....	183.65	- 0.6
3217.....	720.85	+ 3.1	4332.....	186.63	$\mp$ 8.1
3250.....	731.77	- 1.1	4337.....	187.63	+ 7.5
3251.....	731.77	+ 0.2	4362.....	197.59	+ 5.0
3298.....	740.78	- 1.9	4768.....	412.90	- 0.3
3299.....	740.78	- 2.0	4769.....	412.90	+14.4
3323.....	742.73	- 1.2	4784.....	414.88	+ 6.9
3343.....	749.72	-11.8	4798.....	418.90	+11.3
3344.....	749.72	-12.1	4807.....	421.87	+ 4.3
3382.....	773.73	+ 8.6	4808.....	421.87	- 4.4
3382.....	773.73	+ 7.2	4815.....	427.84	+ 9.7
3409.....	789.73	- 0.8	4827.....	433.82	+ 8.3
3424.....	797.63	-12.2	4845.....	447.75	- 0.9
3436.....	802.66	- 9.0	4862.....	461.78	- 2.1
3444.....	804.64	+ 0.6	4876.....	472.75	- 1.9
3444.....	804.64	- 4.1	4888.....	475.71	- 2.6
3453.....	811.62	- 2.4	4896.....	480.76	+ 9.3
3464.....	826.57	- 5.4	4905.....	482.71	+17.4
4043.....	9,098.83	+ 6.6	4909.....	484.71	+ 5.9
4061.....	102.76	+20.5	4917.....	487.64	+ 6.0
4061.....	102.76	+23.8	4925.....	491.74	+10.2
4090.....	106.69	+22.4	4935.....	496.70	+ 4.2
4103.....	109.72	- 0.7	4942.....	501.63	+ 3.6
4104.....	109.72	+ 0.8	4947.....	502.70	+ 4.4
4124.....	112.81	+11.8	4954.....	505.69	+ 7.7
4125.....	112.81	+14.1	4963.....	510.69	- 7.4
4132.....	114.76	- 9.3	4966.....	512.58	- 1.2
4132.....	114.76	- 5.5	4977.....	516.60	+ 8.1
4139.....	120.69	+ 8.1	4999.....	525.63	+ 8.3
4139.....	120.69	- 2.9	5005.....	526.61	- 2.7
4158.....	129.79	-12.5	5014.....	537.61	+ 4.4
4206.....	145.75	+ 0.2	5022.....	544.61	+ 0.4
4207.....	145.75	- 1.7	5031.....	557.61	- 5.9
4213.....	146.64	- 4.5	5039.....	561.59	+ 2.4
4214.....	146.64	- 4.3	5039.....	561.59	+ 2.2
4241.....	150.70	+ 9.3	5048.....	567.57	- 3.4
4241.....	150.70	+ 8.6	5056.....	572.62	+ 7.5

MEASURES OF  $\sigma$  LEONIS.

$\lambda$	1354		1379		1387		1487		2233		2258		2344	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527	- 29.02	$\frac{1}{2}$												
4549.766	- 19.26	1	- 5.18	1	+ 7.46	$\frac{1}{2}$			- 30.64	$\frac{1}{2}$	+ 9.55	$\frac{1}{2}$		
4522.855			+ 10.65	1	- 6.08	$1\frac{1}{2}$								
4481.400	- 6.44	2	+ 4.26	$2\frac{1}{2}$	- 2.42	$1\frac{1}{2}$			- 25.41	$1\frac{1}{2}$	- 9.37	$1\frac{1}{2}$	- 24.74	1
4340.634	- 30.17	1	- 2.19	$1\frac{1}{2}$	- 6.05	$1\frac{1}{2}$	+ 10.44	2	- 26.68	$\frac{1}{2}$	- 4.20	$\frac{1}{2}$	- 15.16	1
4101.890	- 18.33	$\frac{1}{2}$	- 21.35	$1\frac{1}{2}$	- 18.05	2	+ 4.34	$2\frac{1}{2}$	- 36.67	1	+ 2.10	$\frac{1}{2}$	- 16.17	$\frac{1}{2}$
3933.825			+ 7.79	$2\frac{1}{2}$	+ 7.04	$1\frac{1}{2}$	+ 7.11	$2\frac{1}{2}$	- 22.30	$1\frac{1}{2}$				
Weighted mean	- 17.25		+ 0.11		- 1.92		+ 6.05		- 27.02		- 3.43		- 19.19	
$V_a$	+ 6.77		+ 2.08		- 0.51		- 17.98		+ 16.43		+ 14.23		+ .07	
$V_d$	+ .16		- .04		- .10		- .09		- .10		+ .09		- .21	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 10.6		+ 1.9		- 2.8		- 12.3		- 11.0		+ 10.6		- 19.6	

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	2356		2452		2539		3114		3216		3217		3250	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527							- 28.91	$\frac{1}{2}$						
4549.766			+ 9.19	$\frac{1}{2}$	+ 28.91	$\frac{1}{2}$								
4522.855														
4481.400	- 1.28	$\frac{1}{2}$	+ 10.70	1	+ 20.89	1			+ 4.72	1	+ 7.39	$\frac{1}{2}$		
4340.634	- 2.20	1	+ 3.47	$1\frac{1}{2}$	+ 27.62	$\frac{1}{2}$	- 35.64	1	+ 4.51	1	- 0.69	1	+ 0.11	$\frac{1}{2}$
4101.890	+ 6.07	$\frac{1}{2}$	+ 23.47	$\frac{1}{2}$			- 15.99	$\frac{1}{2}$	+ 13.68	$\frac{1}{2}$	+ 0.87	$\frac{1}{2}$	- 4.23	$\frac{1}{2}$
3933.825							- 24.63	1	- 15.15	1	- 10.15	$1\frac{1}{2}$	- 7.23	$1\frac{1}{2}$
Weighted mean	+ 0.10		+ 12.62		+ 24.58		- 27.57		- 0.48		- 3.37		- 5.16	
$V_0$	- 1.96		- 11.40		- 24.10		+ 24.21		+ 6.91		+ 6.91		+ 4.39	
$V_z$	- .13		- .21		- .20		- .09		- .17		- .17		- .04	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 2.3		+ 0.7		$\pm$ 0.0		- 3.7		+ 6.0		+ 3.1		- 1.1	

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	3251		3298		3299		3323		3343		3344		3382	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527			- 15.42	$\frac{1}{2}$										
4549.766			- 12.67	$\frac{1}{2}$										
4481.400			- 10.59	$\frac{1}{2}$	+ 8.55	$\frac{1}{2}$	- 5.10	$\frac{1}{2}$	- 1.66	$\frac{1}{2}$	- 6.38	$\frac{1}{2}$	+ 29.68	1
4340.634	- 4.28	1	+ 11.11	1	- 0.58	1	+ 7.75	$\frac{1}{2}$	- 6.71	1	- 14.81	1	+ 28.09	1
4101.890	- 2.69	$\frac{1}{2}$	+ 6.64	$\frac{1}{2}$	- 4.91	1	- 3.46	$\frac{1}{2}$	- 14.73	$\frac{1}{2}$	+ 2.12	$\frac{1}{2}$	+ 18.66	$\frac{1}{2}$
3933.825			- 6.57	$\frac{1}{2}$	- 9.32	$\frac{1}{2}$	+ 0.66	$\frac{1}{2}$	- 2.83	$\frac{1}{2}$	+ 5.66	$\frac{1}{2}$	+ 5.40	$\frac{1}{2}$
Weighted mean	- 3.75		- 1.22		- 1.36		+ 0.45		- 6.53		- 6.84		+ 23.27	
$V_s$	+ 4.39		- .28		- .28		- 1.29		- 4.87		- 4.87		- 16.18	
$V_d$	- .09		- .12		- .12		- .03		- .13		- .13		- .17	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+ 0.2		- 1.9		- 2.0		- 1.2		- 11.8		- 12.1		+ 8.6	

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	3382*		3409		3424		3436		3444		3444*		3453	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527	.....													
4549.766	.....													
4481.400	+ 27.37	1½	+ 19.75	1	+ 9.79	1	.....	.....	+ 31.80	1½	+ 29.00	1	+ 27.73	1
4340.634	+ 24.28	1	+ 23.47	1	+ 14.77	1	+ 21.23	1	+ 25.85	1	+ 19.27	1	+ 26.77	1
4101.890	+ 16.83	½	+ 31.94	½	.....	.....	.....	.....	.....	.....	.....	.....	+ 19.49	½
3933.825	+ 15.12	¼	+ 17.45	1	.....	.....	+ 16.08	½	+ 15.92	½	+ 15.76	½	+ 25.62	1
Weighted mean	+ 23.86		+ 21.90		+ 12.80		+ 17.34		+ 27.17		+ 22.46		+ 25.68	
$V_a$	- 16.18		- 22.21		- 24.57		- 25.84		- 26.27		- 26.27		- 27.63	
$V_d$	- .17		- .25		- .13		- .19		- .02		- .02		- .17	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+ 7.2		- 0.8		- 12.2		- 9.0		+ 0.6		- 4.1		- 2.4	

\*Check measures.

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	3464		4043		4061		4061*		4090		4103		4104	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527			+ 8.83	$\frac{1}{2}$							- 0.80	$\frac{1}{2}$		
4549.766														
4481.400	+ 23.02	1			+ 22.97	$\frac{1}{2}$	+ 26.24	$\frac{1}{2}$	+ 32.13	$\frac{1}{2}$	+ 2.42	1	- 0.63	$\frac{1}{2}$
4340.634	+ 25.27	1	+ 1.62	$\frac{1}{2}$	+ 22.21	$\frac{1}{2}$	+ 12.69	$\frac{1}{2}$	+ 12.15	$\frac{1}{2}$	+ 8.09	$\frac{1}{2}$	+ 7.28	$\frac{1}{2}$
4101.890	+ 24.00	$\frac{1}{2}$	- 3.47	$\frac{1}{2}$					+ 26.81	$\frac{1}{2}$	- 8.18	$\frac{1}{2}$		
3933.825	+ 24.37	1	+ 2.83	1					+ 23.55	1				
Weighted mean	+ 24.19		+ 3.58		+ 22.71		+ 19.46		+ 23.28		+ 1.79		+ 3.33	
$V_a$	- 29.18		+ 3.45		+ 1.41		+ 1.41		- .63		- 2.18		- 2.18	
$V_d$	- .15		- .19		- .07		- .07		+ .04		- .04		- .09	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 5.4		+ 6.6		+ 23.8		+ 20.5		+ 22.4		- 0.7		+ 0.8	

\*Check measures.



MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	4124		4125		4132		4132*		4139		4139*		4158	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527	+ 24.89	$\frac{1}{2}$	+ 12.85	$\frac{1}{2}$	- 8.35	$\frac{1}{2}$	+ 13.32	$\frac{1}{2}$	.....	.....	.....	.....	- 9.47	$\frac{1}{2}$
4549.766	+ 6.27	$\frac{1}{2}$	.....	.....	- 2.53	$\frac{1}{2}$	- 7.33	$\frac{1}{2}$	.....	.....	.....	.....	- 4.93	$\frac{1}{2}$
4481.400	+ 17.48	1	+ 25.14	1	- 4.84	$1\frac{1}{2}$	- 8.92	$\frac{1}{2}$	+ 20.67	$\frac{1}{2}$	+ 10.46	1	- 4.85	$\frac{1}{2}$
4340.634	+ 14.69	$\frac{1}{2}$	+ 13.19	$\frac{1}{2}$	- 1.97	1	+ 3.70	$\frac{1}{2}$	+ 18.28	$\frac{1}{2}$	+ 4.97	$\frac{1}{2}$	+ 1.62	$\frac{1}{2}$
4101.890	.....	.....	+ 15.89	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3933.825	+ 15.47	1	+ 9.40	$\frac{1}{2}$	- 4.08	$\frac{1}{2}$	+ 9.23	$\frac{1}{2}$	+ 11.73	1	+ 1.68	$1\frac{1}{2}$	+ 5.49	1
Weighted mean	+ 16.03		+ 18.34		- 4.18		- 0.31		+ 16.14		+ 5.17		+ 0.11	
$V_s$	- 3.78		- 3.78		- 4.77		- 4.77		- 7.75		- 7.75		- 12.11	
$V_d$	- .20		- .21		- .12		- .12		- .03		- .03		- .24	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+ 11.8		+ 14.1		- 9.3		- 5.5		+ 8.1		- 2.9		- 12.5	

\*Check measures.

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	4206		4207		4213		4214		4241		4241*		4242	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527	.....		+ 20.56	$\frac{1}{2}$	.....		.....		+ 24.72	$\frac{1}{2}$	+ 20.22	1	.....	
4549.766	.....		.....		.....		.....		.....		.....		.....	
4481.400	+ 35.85	$\frac{1}{2}$	+ 14.93	$\frac{1}{2}$	+ 14.40	1	+ 17.20	1	+ 24.35	$\frac{1}{2}$	+ 23.84	1	.....	
4340.634	+ 13.88	1	+ 20.25	$\frac{1}{2}$	.....		+ 11.57	$\frac{1}{2}$	+ 47.67	$\frac{1}{2}$	+ 45.46	$1\frac{1}{2}$	+ 17.93	1
4101.890	.....		.....		.....		.....		+ 28.44	$\frac{1}{2}$	.....		+ 14.90	$\frac{1}{2}$
3933.825	+ 14.98	$\frac{1}{2}$	+ 15.14	$\frac{1}{2}$	+ 16.60	$\frac{1}{2}$	.....		+ 26.43	$\frac{1}{2}$	+ 24.60	$1\frac{1}{2}$	+ 19.55	$\frac{1}{2}$
Weighted mean	+ 19.65		+ 17.72		+ 15.13		+ 15.32		+ 30.54		+ 29.83		+ 17.30	
$V_a$	- 18.92		- 18.92		- 19.26		- 19.26		- 20.75		- 20.75		- 20.75	
$V_d$	- .22		- .23		- .06		- .06		- .19		- .19		- .20	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+ 0.2		- 1.7		- 4.5		- 4.3		+ 9.3		+ 8.6		- 3.9	

\*Check measures.

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	4249		4257		4265		4274		4274*		4288		4302	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527			+ 19.07	$\frac{1}{2}$										
4549.766														
4481.400	+ 15.68	$\frac{1}{2}$	+ 19.46	$\frac{1}{2}$	+ 22.06	$\frac{1}{2}$	+ 11.99	1	+ 8.93	$1\frac{1}{2}$	+ 26.90	$\frac{1}{2}$	+ 22.06	$\frac{1}{2}$
4340.634	+ 14.33	$\frac{1}{2}$	+ 19.32	1	+ 39.80	$\frac{1}{2}$	+ 15.12	1	+ 13.30	1	+ 17.92	$\frac{1}{2}$		
4101.890											+ 33.73	$\frac{1}{2}$		
3933.825	+ 15.14	1	+ 20.89	1	+ 19.22	$\frac{1}{2}$					+ 29.62	1		
Weighted mean	+ 14.98		+ 19.83		+ 28.58		+ 13.56		+ 10.67		+ 26.87		+ 22.06	
$V_a$	- 21.09		- 21.42		- 21.78		- 22.44		- 22.44		- 24.25		- 28.68	
$V_s$	- .16		- .10		- .18		- .16		- .16		- .25		- .19	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 6.6		- 2.0		+ 6.3		- 9.3		- 12.2		+ 2.1		- 7.1	

\*Check measures.

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	4311		4311*		4320		4327		4332		4337		4362	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527														
4549.766	+ 38.44	$\frac{1}{2}$					+ 18.35	$\frac{1}{2}$			+ 27.40	$\frac{1}{2}$	+ 34.71	$\frac{1}{2}$
4481.400	+ 35.70	$\frac{1}{2}$	+ 30.73	$\frac{1}{2}$	+ 15.56	$\frac{1}{2}$	+ 28.31	1	+ 36.46	1	+ 41.18	$\frac{1}{2}$	+ 34.17	1
4340.634					+ 20.34	$\frac{1}{2}$	+ 33.76	$\frac{1}{2}$	+ 51.33	$\frac{1}{2}$			+ 28.21	$\frac{1}{2}$
4101.890					+ 23.16	$\frac{1}{2}$								
3933.825	+ 18.55	1	+ 22.88	1	+ 25.29	$\frac{1}{2}$			+ 35.11	1	+ 37.45	$\frac{1}{2}$	+ 38.69	1
Weighted mean	+ 27.81		+ 25.49		+ 21.08		+ 28.45		+ 37.51		+ 36.93		+ 34.77	
$V_s$	- 27.60		- 27.60		- 28.44		- 28.56		- 28.85		- 28.93		- 29.29	
$V_d$	- .22		- .22		- .19		- .25		- .24		- .24		- .22	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 0.3		- 2.6		- 7.8		- 0.6		+ 8.1		+ 7.5		+ 5.0	

\*Check measures.

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	4768		4769		4784		4798		4807		4808		4815	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527									- 21.04	$\frac{1}{2}$	- 19.11	$\frac{1}{2}$		
4549.766					- 20.87	$\frac{1}{2}$								
4481.400			- 8.04	$\frac{1}{2}$	- 9.19	$\frac{1}{2}$					- 7.40	$\frac{1}{2}$	- 14.29	$\frac{1}{2}$
4340.634	- 24.64	1	- 14.35	$\frac{1}{2}$	- 12.63	$\frac{1}{2}$	- 9.60	1	- 13.42	$\frac{1}{2}$	- 32.40	$\frac{1}{2}$	- 7.98	$\frac{1}{2}$
4101.890					- 23.40	$\frac{1}{2}$					- 47.96	$\frac{1}{2}$		
3970.177											- 13.93	$\frac{1}{2}$		
3933.825	- 27.21	$\frac{1}{2}$	- 6.91	$\frac{1}{2}$	- 25.29	1	- 22.21	$\frac{1}{2}$	- 24.54	$\frac{1}{2}$	- 31.87	1	- 9.32	$\frac{1}{2}$
Weighted mean	- 25.49		- 10.11		- 18.78		- 12.12		- 18.11		- 26.78		- 10.53	
$V_s$	+ 25.56		+ 25.56		+ 24.98		+ 23.72		+ 22.71		+ 22.71		+ 20.50	
$V_d$	- .04		- .07		- .02		- .06		- .04		- .07		- .01	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	- 0.3		+ 14.4		+ 6.9		+ 11.3		+ 4.3		- 4.4		+ 9.7	

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	4827		4845		4862		4876		4888		4896		4896*	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527	- 0.64	$\frac{1}{2}$	- 21.20	$\frac{1}{2}$	- 14.93	$\frac{1}{2}$	- 8.35	$\frac{1}{2}$	.....	.....	+ 0.16	$\frac{1}{2}$	.....	.....
4549.766	.....	.....	.....	.....	+ 1.47	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4481.400	.....	.....	- 0.89	$\frac{1}{2}$	- 8.17	$1\frac{1}{2}$	+ 2.30	$\frac{1}{2}$	- 2.55	$\frac{1}{2}$	+ 19.75	1	+ 14.91	1
4340.634	- 1.04	$\frac{1}{2}$	- 11.69	$\frac{1}{2}$	- 4.51	1	+ 0.46	$\frac{1}{2}$	+ 3.47	$\frac{1}{2}$	+ 12.13	$\frac{1}{2}$	.....	.....
4233.328	.....	.....	.....	.....	- 13.47	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4131.047	.....	.....	.....	.....	- 2.47	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4128.211	.....	.....	.....	.....	- 11.51	$\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....
4101.890	- 13.29	$\frac{1}{2}$	.....	.....	- 8.96	$\frac{1}{2}$	- 6.07	$\frac{1}{2}$	+ 3.08	$\frac{1}{2}$	+ 7.89	$\frac{1}{2}$	.....	.....
3933.825	- 14.06	1	- 16.14	1	+ 0.25	$\frac{1}{2}$	+ 2.58	$\frac{1}{2}$	- 1.08	$\frac{1}{2}$	- 5.15	1	- 2.83	$\frac{1}{2}$
Weighted mean	- 9.50		- 12.32		- 6.38		- 0.47		+ 0.39		+ 15.94		+ 14.91	
$V_0$	+ 18.06		+ 11.69		+ 4.63		- 1.05		- 2.60		- 5.16		- 5.16	
$V_d$	$\pm$ .00		+ .06		- .09		- .09		- .09		- .14		- .14	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+ 8.3		- 0.9		- 2.1		- 1.9		- 2.6		+ 10.4		+ 9.3	

\*Check measures.

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	4905		4909		4917		4925		4935		4942		4947	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527					+ 7.54	$\frac{1}{2}$	+ 1.60	$\frac{1}{2}$	+ 24.85	$\frac{1}{2}$	+ 11.54	$\frac{1}{2}$		
4481.400	+ 23.82	$\frac{1}{2}$	+ 16.18	$\frac{1}{2}$	+ 14.90	$\frac{1}{2}$	+ 31.73	$\frac{1}{2}$	+ 24.08	$\frac{1}{2}$	+ 12.37	$\frac{1}{2}$	+ 11.73	$\frac{1}{2}$
4340.634			+ 10.63	$\frac{1}{2}$	+ 19.52	$\frac{1}{2}$	+ 30.26	$\frac{1}{2}$	+ 17.21	$\frac{1}{2}$	+ 22.41	$\frac{1}{2}$	+ 21.14	$\frac{1}{2}$
4101.890					+ 12.02	$\frac{1}{2}$	+ 25.40	$\frac{1}{2}$	+ 18.66	$\frac{1}{2}$	+ 24.43	$\frac{1}{2}$	+ 24.72	$\frac{1}{2}$
3933.825			+ 6.23	$\frac{1}{2}$	+ 15.46	$\frac{1}{2}$	+ 9.39	$\frac{1}{2}$	+ 6.73	$\frac{1}{2}$	+ 19.86	$\frac{1}{2}$	+ 26.09	$\frac{1}{2}$
Weighted mean	+ 23.82		+ 11.40		+ 14.92		+ 21.22		+ 17.44		+ 18.99		+ 20.38	
$V_s$	- 6.14		- 7.14		- 8.59		- 10.57		- 12.89		- 15.08		- 15.54	
$V_d$	- .04		- .05		- .02		- .15		- .12		+ .01		- .14	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+ 17.4		+ 3.9		+ 6.0		+ 10.2		+ 4.2		+ 3.6		+ 4.4	

MEASURES OF  $\sigma$  LEONIS—Continued.

$\lambda$	4954		4963		4966		4977		4999		5005		5014	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861.527			+ 9.30	$\frac{1}{2}$					+ 21.16	$\frac{1}{2}$			+ 33.82	$\frac{1}{2}$
4549.766	+ 21.58	$\frac{1}{2}$	+ 3.60	$\frac{1}{2}$										
4481.400	+ 26.90	$\frac{1}{2}$	+ 18.74	$\frac{1}{2}$	+ 13.13	$\frac{1}{2}$	+ 47.95	$\frac{1}{2}$	+ 35.87	$\frac{1}{2}$	+ 34.34	$\frac{1}{2}$	+ 19.97	$\frac{1}{2}$
4340.634	+ 40.19	$\frac{1}{2}$	+ 18.71	$\frac{1}{2}$	+ 29.80	$\frac{1}{2}$	+ 30.81	$\frac{1}{2}$	+ 23.89	$\frac{1}{2}$	+ 18.69	$\frac{1}{2}$	+ 46.39	$\frac{1}{2}$
4101.890	+ 13.95	$\frac{1}{2}$	+ 21.36	$\frac{1}{2}$	+ 21.84	$\frac{1}{2}$	+ 15.07	$\frac{1}{2}$	+ 37.06	$\frac{1}{2}$			+ 26.69	$\frac{1}{2}$
3933.825	+ 15.79	$\frac{1}{2}$	- 1.25	$\frac{1}{2}$	+ 8.56	$\frac{1}{2}$	+ 17.16	$\frac{1}{2}$	+ 25.04	$\frac{1}{2}$	+ 17.16	1	+ 33.66	$\frac{1}{2}$
Weighted mean	+ 24.86		+ 11.85		+ 18.61		+ 29.35		+ 32.54		+ 21.84		+ 31.56	
$V_a$	- 16.80		- 18.81		- 19.85		- 20.98		- 23.87		- 24.16		- 26.89	
$V_d$	- .12		- .16		- .04		- .01		- .12		- .09		- .08	
Curv.	- .28		- .28		- .28		- .28		- .28		- .28		- .28	
Radial Velocity	+ 7.7		- 7.4		- 1.2		+ 8.1		+ 8.3		- 2.7		+ 4.4	



MEASURES OF  $\sigma$  LEONIS—*Concluded.*

$\lambda$	5022		5031		5039		5039*		5048		5056					
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.		
4861.527	+ 17.64	$\frac{1}{4}$	.....										+ 23.71	$\frac{1}{4}$	.....	
4549.766	.....															
4481.400	+ 32.92	$\frac{1}{2}$	+ 27.35	$\frac{1}{2}$	+ 29.89	$\frac{1}{2}$	+ 27.10	$\frac{1}{2}$	+ 26.71	$\frac{1}{2}$	+ 36.90	$\frac{1}{2}$	.....			
4340.634	+ 32.09	$\frac{1}{2}$	+ 20.31	$\frac{1}{2}$	+ 35.69	$\frac{1}{2}$	+ 39.35	$\frac{1}{2}$	+ 32.73	$\frac{1}{2}$	.....					
4101.890	.....															
3933.825	.....		.....		+ 30.99	$\frac{1}{2}$	+ 25.60	$\frac{1}{2}$	+ 15.25	$\frac{1}{4}$	.....					
Weighted mean	+ 28.89		+ 23.83		+ 32.19		+ 32.01		+ 26.31		+ 36.90					
$V_a$	- 28.02		- 29.20		- 29.29		- 29.29		- 29.16		- 28.83					
$V_d$	- .18		- .23		- .22		- .22		- .24		- .29					
Curv.	- .28		- .28		- .28		- .28		- .28		- .28					
Radial Velocity	+ 0.4		- 5.9		+ 2.4		+ 2.2		- 3.4		+ 7.5					

\*Check measures.

Dominion Observatory,  
Ottawa,  
March, 1913.