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MARIA MITCHELL OBSERVATORY
NANTUCKET, MASSACHUSETTS

August 28,1926

Mr.Leon Campbell
Harvard College Observatory
Cambridge, Massachusetts

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MARIA MITCHELL OBSERVATORY
NANTUCKET, MASSACHUSETTS

August 28,1926

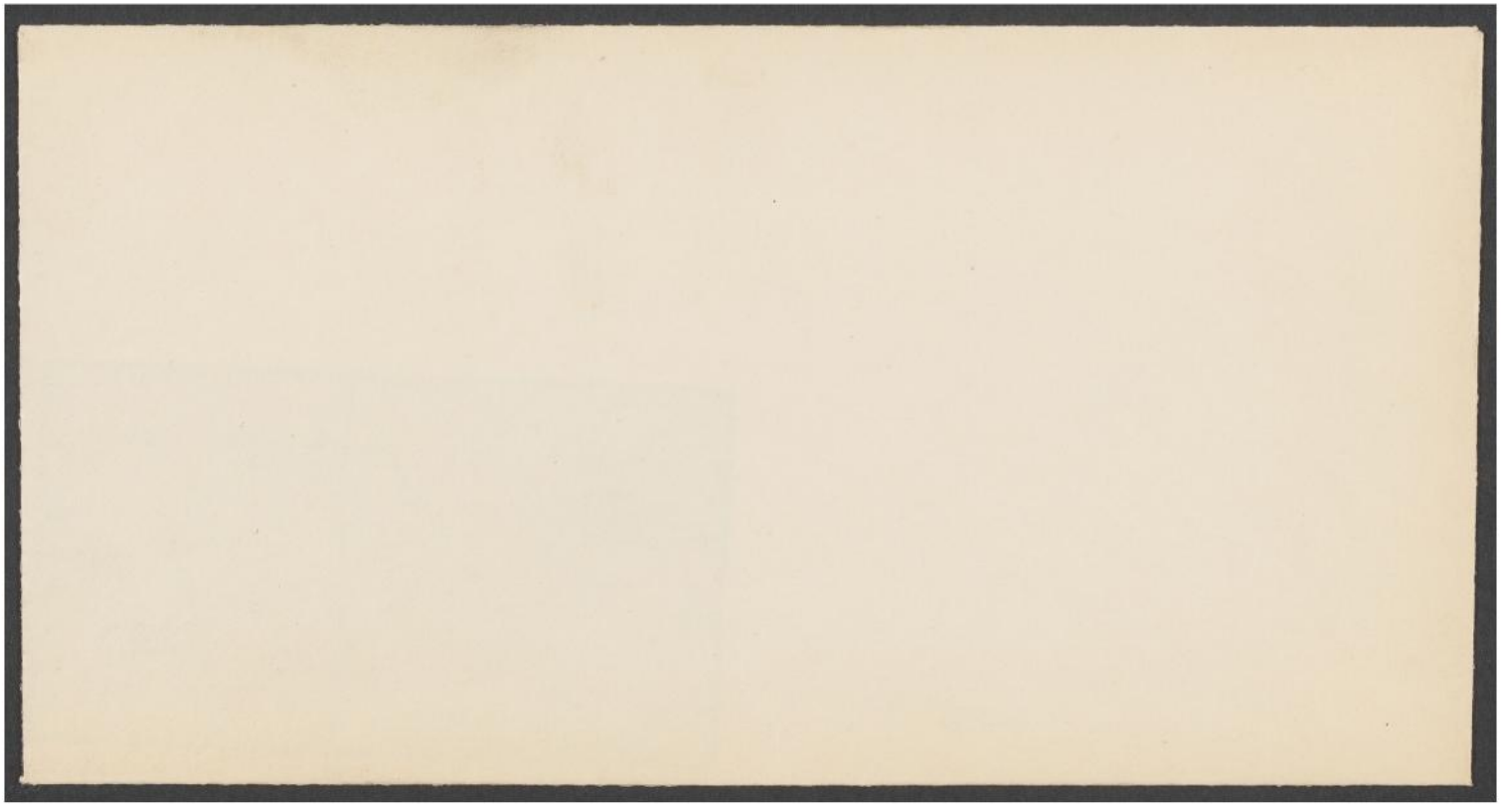
My dear Mr.Campbell,

I am very glad to hear that you are coming to the meeting of the American Astronomical Society,

I will engage a room for you,probably

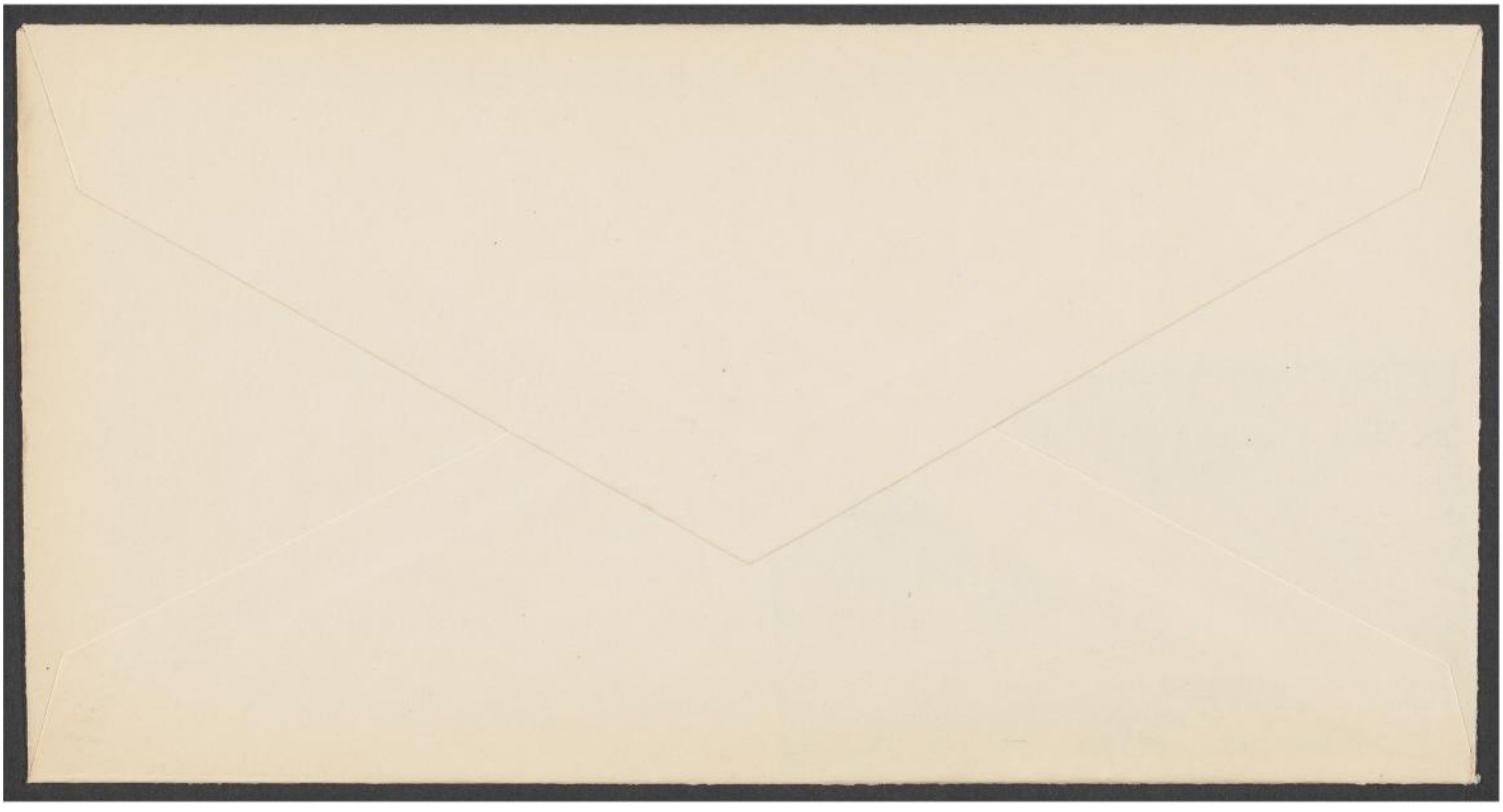
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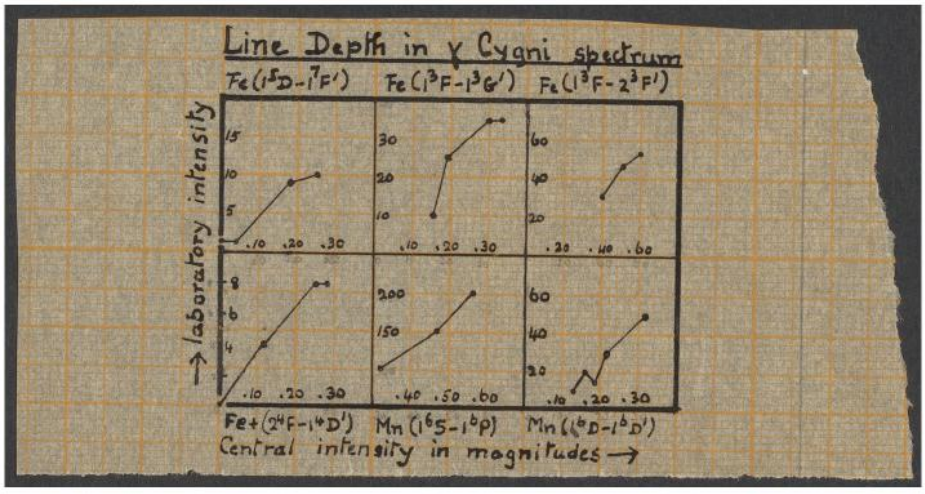
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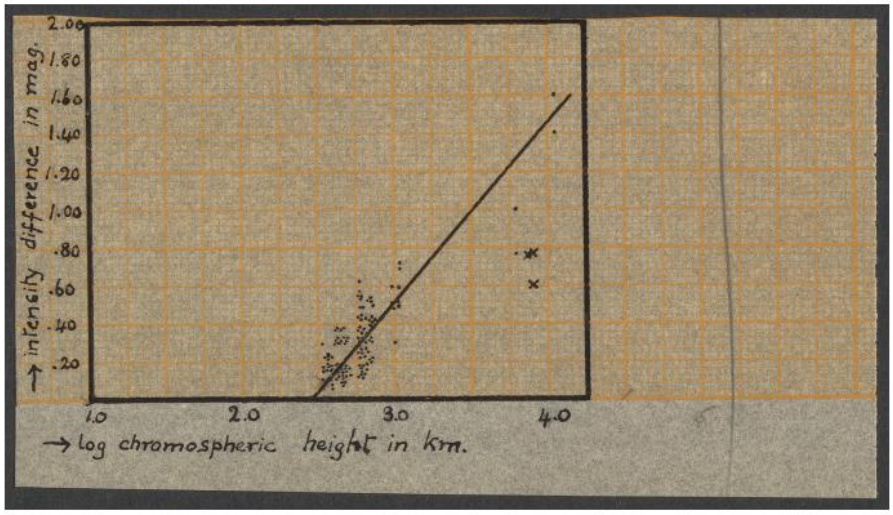
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Apertured spectra.

Measures & reductions.

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Identification and intensity of 96 lines in the spectrum of Arcturus.

Plate MC 20797, Apertures 1, 2, 3, with 16 inch Telescope

Microphotometer tracings 42, 43, 44.

For particulars of plate and tracings, see Book 3.

Identifications.

No.	Wave Length	No.	Wave Length	No.	Wave Length	No.	Wave Length
1	3933	25	4144	49	4275	73	4462
2	3970	26	4149-50	50	4281-2	74	4469
3	3982	27	4152-56	51	4289-90	75	4473?
3a	3986	27a	4161				
4	3998	28	4165	52	4299-4300	76	4481
5	4005	29	4169	53	4308	77	4490
6	4024	30	4172	54	4315	78	4494-7
7	4030-4035	31	4177	55	4326	79	4536
8	4041	32	4182	56	4330	80	4572
9	4046	33	4187	57	4340	81	4580
10	4050-4052	34	4191	58	4352	82	4647
11	4055-4057	35	4197	59	4359	83	4668
12	4067	36	4202	60	4367	84	4698-03
13	4071-72	37	4205	61	4374	85	4727
14	4077-4079	38	4210	62	4384	86	4754?
15	4077-79	39	4215	63	4391-2	87	4772
16	4082-87	40	4227	64	4395	88	4824
17	4089-92	41	4229	65	4401	89	4832
18	4097	42	4233	66	4405	90	4855
19	4101	43	4236	67	4408	91	4861
20	4105-6	44	4240	68	4415	92	
21	4117	45	4247	69	4422	93	
22	4124	46	4254-55	70	4430	94	
		47	4260-61				
23	4132	47a	4268	71	4435	95	
24	4135	48	4272	72	4444	96	

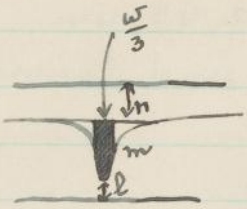
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Measurement of records.

l, m, n, at line center, as in Bk 3.

a_1 is measured thus:



Measurements are made in scale divisions of Scale 2, which is graduated in millimeters

d_1 is only measured for such lines as seem to run down to the continuous background so that their width can be measured.

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Arcturus

MC 20797

Jr. 44 Aperture 18

Line	l (deduced)	m	n	a_1	m + n
1	–	–	–		
2	16.3	2.2	0	–	2.2
3	15.7	1.5	1.3	–	2.8
3a	15.3	1.1	2.1	–	3.2
4	14.8	1.5	2.2		3.7
5	13.8	2.7	2.0	4	4.7
6	12.4	1.8	4.3	–	6.1
7	11.9	3.8	2.8	11	6.6
8	11.5	1.0	6.0	–	7.0
9	11.5	5.3	1.7	13	7.0
10	11.0	2.2	5.3	–	7.5
11	11.0	3.2	4.3	–	7.5
12	10.6	5.1	2.8	–	7.9
13	10.5	2.3	5.7	–	8.0
14	10.4	3.1	5.0	3	8.1
15	10.4	5.3	3.3	10	8.6
16	9.5	2.2	6.8	4.5	9.0
17	9.2	1.3	8.0	–	9.3
18	9.2	3.6	5.7	–	9.3
19	9.1	5.2	4.2	–	9.4
20	9.1	3.4	6.0	–	9.4
21	9.0	3.3	6.2	–	9.5
22	9.0	2.9	6.6	–	9.5
23	9.0	3.4	6.1	–	9.5
24	8.9	4.8	4.8	–	9.6
25	9.0	7.1	2.4	–	9.5
26	9.3	3.4	5.8	–	9.2
27	9.2	3.1	6.2	–	9.3
28	9.3	2.5	6.7	–	9.2
29	9.3	3.1	6.1	–	9.2

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1924phae.proj.1099p

NC 20797
In 44. Ap. 16

	l	m	n	a,	m+n
30	8.9	5.5	3.6		9.1
31	8.9	3.3	5.8		9.1
32	8.8	3.2	6.0		9.2
33	8.9	3.0	6.1		9.1
34	8.8	2.9	6.3		9.2
35	8.7	4.3	5.0		9.3
36	8.7	4.3	5.0		9.3
37	8.5	3.2	6.3		9.5
38	8.5	2.1	7.4		9.5
39	8.4	3.9	5.7		9.6
40	78.8	10.2	0		10.2
41	78.7	2.0	8.3		10.3
42	78.7	3.0	7.3		10.3
43	78.6	2.1	8.3		10.4
44	78.7	0.9	9.4		10.3
45	78.2	3.2	7.6		10.8
46	78.2	3.0	7.8		10.8
47	78.0	3.8	7.2		11.0
47a	–	–	–		–
48	6[illegible]8	5.8	5[illegible]4		1[illegible]2
49	6[illegible]7	4.5	6.8		11.3
50	6[illegible]4	2.6	9.0		11.6
51	6[illegible]2	3.2	8.6		12.2
52	6.0	5.3	6.7		12.0
53	6.6	7.4	5.0		12.4
54	6.0	9.0	4.0		13.0
55	5.9	6.1	7.0		13.1
56	5.8	1.0	12.2		13.2
57	5.6	4.2	9.2		13.4
58	5.3	3.2	10.5		13.7

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	l	m	n	a_1	m+n
59	5.4	1.4	11.2		12.6
60	5.2	1.4	11.4		12.8
61	5.0	3.0	10.0		13.0
62	4.8	7.0	6.2		13.2
63	4.9	1.7	11.4		13.1
64	4.7	1.7	11.6		13.3
65	4.5	1.7	11.8		13.5
66	4.4	4.0	9.6		13.6
67	4.3	2.5	11.2		13.7
68	4.2	2.2	11.6		13.8
69	4.1	1.5	12.4		13.9
70	4.0	1.4	12.6		14.0
71	4.0	2.1	11.9		14.0
72	3.9	1.7	12.4		14.1
73	3.6	2.4	12.0		14.4
74	3.7	1.1	13.2		14.3
75	3.7	1.1	13.2		14.3
76	3.1	1.4	13.5		14.9
77	3.0	1.1	13.9		15.0
78	3.0	1.2	13.8		15.0
79	2.6	0.8	14.6		15.4
80	2.7	1.5	13.8		15.3
81	2.6	0.5	14.9		15.4
82	2.2	0.8	15.0		15.8
83	2.3	1.0	14.7		15.7
84	2.4	1.3	14.3		15.6
85	2.5	0.5	15.0		15.5
86	2.5	0.6	14.9		15.5
90	3.3	1.7	13.0		14.7
91	3.5	1.1	13.4		14.5
92	3.8	1.2	13.0		14.2
94	4.6	1.4	12.0		13.4
95	5.8	0.4	11.8		12.2
96	7.2	1.2	9.6		10.8

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1924phae.proj.10999

MC 20797
ap. 1a

	l	m	n	a,	m+n
2	-	-	-		
3	16.2	1.8	1.0		2.8
4	15.0	1.8	2.2		3.0
5	14.4	2.0	2.6		4.6
6	13.3	1.5	4.2		5.7
7	12.8	3.5	2.7		6.2
8	12.2	0.2	6.6		6.8
9	12.0	4.7	2.3		7.0
10	11.8	1.2	6.0		7.2
11	11.7	2.5	4.8		7.3
12	11.0	4.7	3.3		8.0
13	11.0	1.8	6.2		8.0
14	10.9	2.5	5.6		8.1
15	10.6	4.8	3.6		8.4
16	10.1	2.2	6.7		8.9
17	9.7	0.7	8.6		9.3
18	9.4	3.4	6.2		9.6
19	9.0	5.2	4.8		10.0
20	8.5	4.3	6.2		10.5
21	8.2	4.3	6.5		10.8
22	8.2	3.8	7.0		10.8
23	8.1	5.5	5.4		10.9
24	8.1	6.3	4.6		10.9
25	8.1	8.0	2.9		10.9
26	8.1	4.9	6.0		10.9
27	8.1	4.9	6.0		10.9
28	8.2	4.4	6.4		10.8
29	8.2	4.4	6.4		10.8
30	8.52	6.8	4.0		10.8
31	8.2	4.7	6.1		10.8

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	l	m	n	a_1	m+n
32	8.3	4.4	6.3		10.7
33	8.3	4.6	6.1		10.7
34	8.2	4.0	6.8		10.8
35	8.4	5.6	5.0		10.6
36	8.4	5.6	5.0		10.6
37	8.3	3.7	7.0		10.7
38	8.3	2.7	8.0		10.7
39	8.2	4.4	6.4		10.8
40	8.2	10.6	0.2		10.8
41	8.1	2.9	8.0		10.9
42	8.0	3.3	7.7		11.0
43	7.8	2.2	9.0		11.2
44	7.6	1.8	9.6		11.4
45	7.2	3.7	8.1		11.8
46	7.1	3.1	8.8		11.9
47	6.9	4.1	8.0		12.1
48	6.4	6.6	6.0		12.6
49	6.4	4.6	8.0		12.6
50	6.0	3.3	9.7		13.0
51	5.9	3.8	9.3		13.1
52	5.9	5.6	7.5		13.1
53	5.5	7.7	5.8		13.5
54	5.2	9.8	4.0		13.8
55	4.7	6.6	7.7		14.3
56	5.8	1.0	11.2		12.2
57	5.6	4.0	8.4		12.4
58	5.5	3.0	9.5		12.5
59	5.5	1.2	11.3		12.5

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ap. 2.

		l	m	n	a,	m+n
	2	17.5	1.5	0	–	1.5
	4	17.0	0.9	1.1	–	2.0
	5	16.3	1.5	1.2	–	2.7
	6	15.8	1.2	2.0	–	3.2
	7	15.4	2.2	1.4	–	3.6
	8	15.0	1.0	3.0	–	4.0
	9	15.0	2.6	1.4	–	4.0
	10	15.0	1.4	2.6	–	4.0
	11	14.8	2.0	2.2	–	4.2
	12	14.6	3.1	1.3	–	4.4
	13	14.3	1.9	2.8	–	4.7
	14	14.3	2.5	2.2	–	4.7
	15	14.2	3.0	1.8	–	4.8
	16	14.0	1.9	3.1	–	5.0
	17	13.9	0.6	4.5	–	5.0
	18	13.9	2.3	2.8	–	5.1
	19	13.9	3.1	2.0	–	5.1
	20	14.0	2.1	2.9	–	5.0
?	21	13.9	1.9	3.2	–	5.1
?	22	14.0	1.7	3.3	–	5.0
	23	14.0	2.3	2.7	–	5.0
	24	14.0	2.8	2.2	–	5.0
	25	14.0	3.3	1.7	–	5.0
	26	14.0	2.0	3.0	–	5.0
	27	14.0	2.0	3.0	–	5.0
	28	14.1	1.9	3.0	–	4.9
	29	14.1	1.9	3.0	–	4.9
	30	14.0	3.1	1.9	–	5.0
	32	14.0	2.2	2.8	–	5.0
	~~33~~					

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	l	m	n	a_1	m+n
33	14.0	2.0	3.0	—	5.0
34	—	—	—	—	—
35	14.0	2.7	2.3	—	5.0
36	14.0	2.8	2.2	—	5.0
37	13.9	2.8	2.3	—	5.1
38	14.0	1.0	4.0	—	5.0
39	13.9	2.2	2.9	—	5.1
40	13.4	5.6	0	—	5.6
41	13.1	2.7	3.2	—	5.9
42	13.0	2.9	3.1	—	6.0
43	12.9	1.8	4.3	—	6.1
44	12.9	1.0	5.1	—	6.1
45	12.7	2.6	3.7	—	6.0
46	12.4	2.5	4.1	—	6.6
47	12.1	3.3	3.6	—	6.9
48	11.7	5.4	1.9	—	7.3
49	11.7	3.4	3.9	—	7.3
50	11.2	3.4	4.4	—	7.8
51	11.1	3.8	4.1	—	7.9
52	11.0	5.3	2.7	—	8.0
53	10.8	7.0	1.2	—	8.2
54	10.5	8.1	0.4	—	8.5
55	10.1	6.4	2.5	—	8.9
56	10.1	1.8	7.1	—	8.9
57	~~9.6~~ 10.0	~~4.4~~ 5.0	4.0	—	9.0
58	10.0	4.0	5.0	—	9.0
59	9.6	2.3	7.1	—	9.4
60	9.2	2.7	7.1	—	9.8
61	9.0	4.0	6.0	—	10.0
62	9.2	7.2	2.6	—	9.8
63	9.0	3.5	6.5	—	10.0

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		l	m	n	a_1	m+n
ap. 2	64	9.0	3.0	7.0	—	10.0
	65	9.0	2.6	7.4	—	10.0
	66	8.9	6.2	2.9	—	9.1
	67	8.4	3.6	6.0	—	9.6
	68	8.3	4.0	5.7	—	9.7
	69	8.0	3.5	6.5	—	10.0
	70	8.0	3.1	6.9	—	10.0
	71	8.0	4.0	6.0	—	10.0
	72	7.8	3.4	6.8	—	10.2
	73	7.5	4.5	6.0	—	10.5
	74	7.4	3.0	7.6	—	10.6
	75	7.4	3.0	7.6	—	10.6
	76	7.2	2.4	8.4	—	10.8
	77	6.7	2.3	9.0	—	11.3
	78	6.5	3.0	8.5	—	11.5
	79	5.9	3.2	8.9	—	12.1
	80	5.5	1.7	10.8	—	12.5
	81	5.2	1.8	11.0	—	12.8
	82	5.0	1.8	11.2	—	13.0
	83	5.0	2.1	10.9	—	13.0
	84	5.1	2.5	10.4	—	12.9
	85	5.2	1.8	11.0	—	12.8
	86	5.3	1.7	11.0	—	12.7
	87	5.7	2.4	10.9	—	13.3
	88	7.0	1.0	10.0	—	11.0
	89	7.9.0	1.1	9.9	—	11.0
	90	7.4	1.6	8.0	—	9.6
	91	8.6	1.9	7.5	—	9.4
	92	9.2	1.6	7.2	—	8.8
	93	9.8	0.9 3.7 2.1	7.3	—	8.2
	94	9.9		5.9	—	8.1
	95	10.6	1.8	4.6	—	6.4
	96	13.2	2.2	2.6	—	4.8

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1924phae.proj.10990

		l (deduced)	m	n	a_1	m+n
Ap. 3.	53	15.4	3.6	0	–	3.6
	54	15.1	3.9	0	–	3.9
	55	15.0	3.7	0.3	–	4.0
	56	15.0	1.6	2.4	–	4.0
	57	15.0	3.0	1.0	–	4.0
	58	15.0	2.4	1.6	–	4.0
	59	14.9	1.5	2.6	–	4.1
	60	14.7	1.7	2.6	–	4.3
	61	14.6	2.4	2.0	–	4.4
	62	14.5	3.7	0.8	–	4.5
	63	14.0	2.5	2.5	–	5.0
	64	14.0	1.8	3.2	–	5.0
	65	14.0	2.2	2.8	–	5.0
	66	14.0	3.5	1.5	–	5.0
	67	14.0	1.9	3.1	–	5.0
	68	13.9	2.4	2.7	–	5.1
	69	13.8	1.8	3.4	–	5.2
	70	13.6	1.8	3.6	–	5.4
	71	13.5	2.3	3.2	–	5.5
	72	13.0	2.2	3.8	–	6.0
	73	12.6	3.1	3.2	–	6.3
	74	12.6	2.2	4.2	–	6.4
	75	12.6	2.1	4.3	–	6.4
	76	11.8	2.2	4.5	–	6.7
	77	11.5	2.3	4.7	–	7.0
	78	11.5	2.5	4.5	–	7.0
	79	10.7	3.8	4.0	–	7.8
	80	10.2	2.1	5.9	–	8.0
	81	10.1	2.6	5.5	–	8.1
	82	10.0	1.6	6.4	–	8.0
	83	10.0	2.0	6.0	–	8.0

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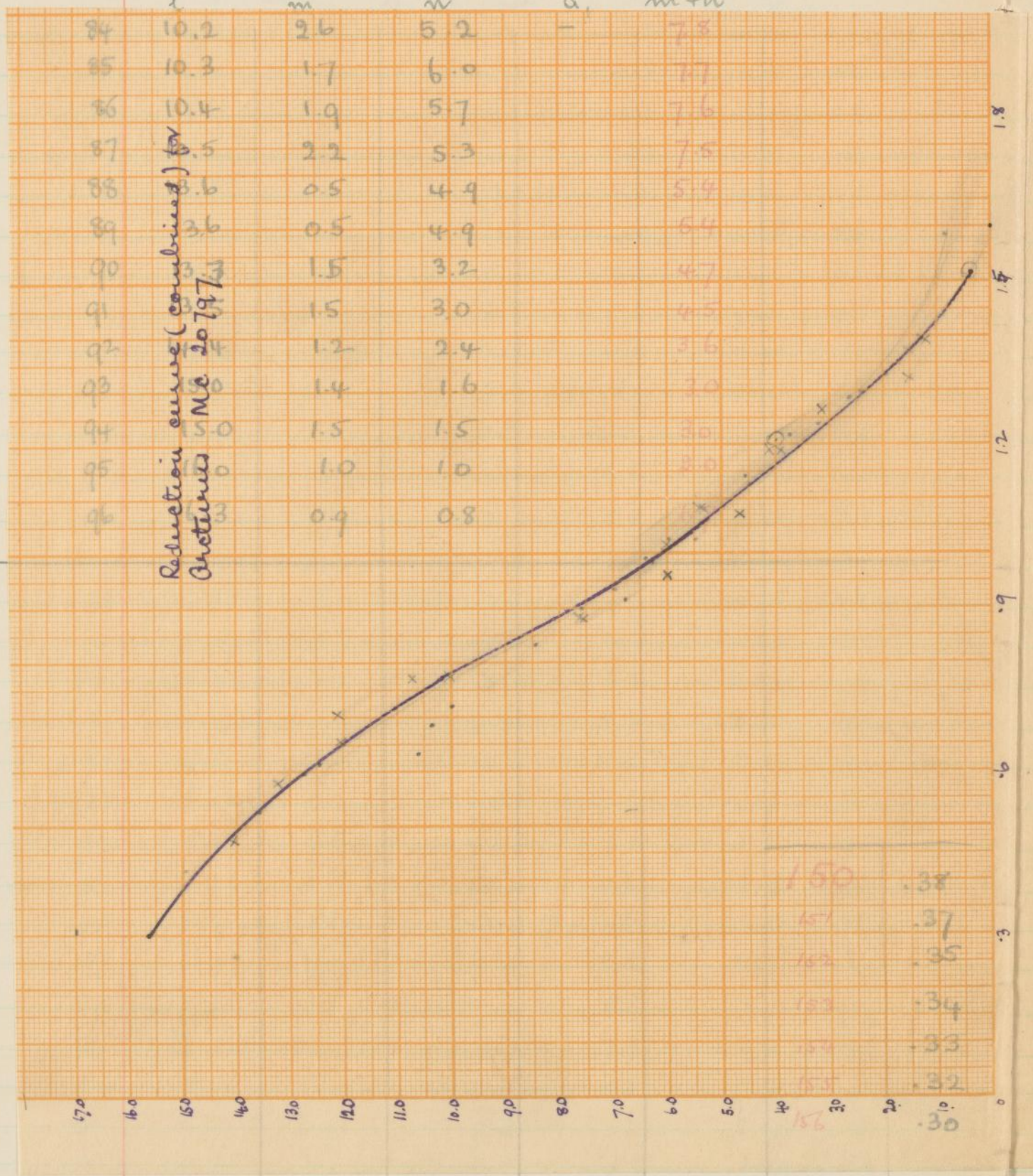
1924phae.proj.1099p

	l	m	n	a_1	m+n
84	10.2	2.6	5.2	–	7.8
85	10.3	1.7	6.0		7.7
86	10.4	1.9	5.7		7.6
87	10.5	2.2	5.3		7.5
88	13.6	0.5	4.9		5.4
89	13.6	0.5	4.9		5.4
90	13.7	1.5	3.2		4.7
91	13.5	1.5	3.0		4.5
92	14.4	1.2	2.4		3.6
93	15.0	1.4	1.6		3.0
94	15.0	1.5	1.5		3.0
95	16.0	1.0	1.0		2.0
96	16.3	0.9	0.8		1.7

150	.38
151	.37
152	.35
153	.34
154	.33
155	.32
156	.30

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Table for reduction of measures to ratio in aperture (Zero of log ap. arbitrary; see plot)

Scale div.	Log ap.	Scale div.	Log ap.	Scale div.	Log ap.	Scale div.	Log ap.	Scale div.	log ap.
0	1.60	30	1.24	60	1.01	90	.83	120	.65
1	-	31	1.23	61	1.00	91	.83	121	.64
2	-	32	1.23	62	1.00	92	.82	122	.64
3	-	33	1.22	63	0.99	93	.81	123	.63
4	1.57	34	1.21	64	.98	94	.81	124	.62
5	1.49	35	1.20	65	.98	95	.81	125	.62
6	1.48	36	1.19	66	.97	96	.80	126	.61
7	1.46	37	1.19	67	.96	97	.80	127	.60
8	1.45	38	1.18	68	.96	98	.79	128	.59
9	1.44	39	1.17	69	.95	99	.79	129	.59
10	1.43	40	1.16	70	.94	100	.78	130	.58
11	1.41	41	1.15	71	.94	101	.78	131	.57
12	1.40	42	1.15	72	.93	102	.77	132	.56
13	1.39	43	1.14	73	.92	103	.76	133	.55
14	1.38	44	1:13	74	.92	104	.75	134	.54
15	1.37	45	1.12	75	.91	105	.75	135	.54
16	1.37	46	1.11	76	.91	106	.74	136	.53
17	1.36	47	1.11	77	.90	107	.74	137	.52
18	1.35	48	1.10	78	.90	108	.73	138	.51
19	1.34	49	1.09	79	.89	109	.73	139	.50
20	1.33	50	1.08	80	.89	110	.72	140	.49
21	1.32	51	1.07	81	.88	111	.71	141	.48
22	1.31	52	1.07	82	.87	112	.71	142	.47
23	1.30	53	1.06	83	.87	113	.70	143	.46
24	1.29	54	1.05	84	.86	114	.69	144	.45
25	1.28	55	1.04	85	.86	115	.69	145	.44
26	1.27	56	1.03	86	.85	116	.68	146	.43
27	1.27	57	1.03	87	.85	117	.67	147	.42
28	1.26	58	1.02	88	.84	118	.67	148	.41
29	1.25	59	1.01	89	.84	119	.66	149	.40

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(n) Reductions. (m-n)

aperture Line		1a	1b	Mean	2	3	4	1a	1b	1	2	3	4
	2	–	2.2 1.3	0	0			–	2.2	2.2	1.5		
	3	1.0	2.8 2.1	1.1 2.1	XX			2.8	2.8 3.2	2.8 3.2	2.0		
	4	2.2	2.2	2.2	1.1			3.0	3.7	3.4	2.0		
	5	2.6	2.0	2.3	1.2			4.6	4.7	4.6	2.7		
	6	4.2	4.3	4.2	2.0			5.7	6.1	5.9	3.2		
	7	2.7	2.8	2.8	1.4			6.2	6.6	6.4	3.6		
	8	6.6	6.0	6.3	3.0			6.8	7.0	6.9	4.0		
	9	2.3	1.7	2.0	1.4			7.0	7.0	7.0	4.0		
	10	6.0	5.3	5.6	2.6			7.2	7.5	7.4	4.0		
	11	4.8	4.3	4.6	2.2			7.3	7.5	7.4	4.2		
	12	3.3	2.8	3.0	1.3			8.0	7.9	8.0	4.4		
	13	6.2	5.7	6.0	2.8			8.0	8.0	8.0	4.7		
	14	5.6	5.0	5.3	2.2			8.1	8.1	8.1	4.7		
	15	3.6	3.3	3.4	1.8			8.4	8.6	8.5	4.8		
	16	6.7	6.8	6.8	3.1			8.9	9.0	9.0	5.0		
	17	8.6	8.0	8.3	4.5			9.3	9.3	9.3	5.0		
	18	6.2	5.7	6.0	2.8			9.6	9.3	9.4	5.1		
	19	4.8	4.2	4.5	2.0			10.0	9.5	9.8	5.1		
	20	6.2	6.0	6.1	2.9			10.5	9.4	10.0	5.0		
	21	6.5	6.2	6.4	? 3.2			10.8	9.5	10.2	5.1		
	22	7.0	6.6	6.8	? 3.3			10.8	9.5	10.2	5.0		
	23	5.4	6.1	5.8	2.7			10.9	9.5	10.2	5.0		
	24	4.6	4.8	4.7	2.2			10.9	9.6	10.2	5.0		
	25	2.9	2.4	2.6	1.7			10.9	9.5	10.2	5.0		
	26	6.0	5.8	5.9	3.0			10.9	9.2	10.0	5.0		
	27	6.0	6.2	6.1	3.0			10.9	9.3	10.1	5.0		
	28	6.4	6.7	6.6	3.0			10.8	9.2	10.0	4.9		
	29	6.4	6.1	6.2	3.0			10.8	9.2	10.0	4.9		
	30	4.0	3.6	3.8	1.9			10.8	9.1	10.0	5.0		

no record at this λ aperture

no record with this aperture

no record at this λ

no record with this aperture

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Ratio in log aperture, background minus line

	Ap. 1	Diff.	2	Diff.	3	4
2	1.60-1.31	.29	1.60-1.37	.23		
3	1.41-1.26	15	- -	-		
3a	1.32-1.23	09	- -	-		
4	1.31-1.21	10	1.41-1.33	08		
5	1.30-1.11	19	1.40-1.27	13		
6	1.15-1.01	14	1.33-1.23	10		
7	1.26-.98	28	1.38-1.19	19		
8	0.99-.95	04	1.24-1.16	08		
9	1.33-.94	39	1.38-1.16	22		
10	1.03-.92	11	1.27-1.16	11		
11	1.11-.92	19	1.31-1.15	16		
12	1.24-.89	35	1.39-1.13	26		
13	1.01-.89	12	1.26-1.11	15		
14	1.06-.88	18	1.31-1.11	20		
15	1.21-.86	35	1.35-1.10	25		
16	.96-.83	13	1.23-1.08	15		
17	.87-.81	06	1.12-1.08	04		
18	1.01-.81	20	1.26-1.07	19		
19	1.12-.79	33	1.33-1.07	26		
20	1.00-.78	22	1.25-1.08	17		
21	.98-.77	21	?1.23-1.07	16		
22	.96-.77	19	?1.22-1.08	14		
23	1.02-.77	25	1.27-1.08	19		
24	1.11-.77	34	1.31-1.08	23		
25	1.27-.77	40	1.36-1.08	28		
26	1.01-.78	23	1.24-1.08	16		
27	1.00-.78	22	1.24-1.08	16		
28	.97-.78	19	1.24-1.09	15		
29	1.00-.78	22	1.24-1.09	15		
30	1.18-.78	40	1.34-1.08	26		

no measures

no measures

no measures

no measures

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	1a	1b	Mean	2	3		1a	1b	Mean	2	3
31	~~6.3~~	~~5.8~~	5.8	-			-	9.1	9.1	-	
32	6.3	6.0	6.2	2.8			10.7	9.2	10.0	5.0	
33	6.~~8~~1	6.1	6.1	3.0			10.7	9.1	9.9	5.0	
34	6.1	6.3	6.2	-			10.8	9.2	10.0	-	
35	5.0	5.0	5.0	2.3			10.6	9.3	9.9	5.0	
36	5.0	5.0	5.0	2.2			10.6	9.3	9.9	5.0	
37	7.0	6.3	6.7	2.3			10.7	9.5	10.1	5.1	
38	8.0	7.4	7.7	4.0			10.7	9.5	10.1	5.0	
39	6.4	5.7	6.0	2.9			10.8	9.6	10.2	5.1	
40	0.2	0.0	0.1	0			10.8	10.2	10.5	5.6	
41	8.0	8.3	8.2	3.2			10.9	10.3	10.6	5.9	
42	7.7	7.3	7.5	3.1			11.0	10.3	10.6	6.0	
43	9.0	8.3	8.6	4.3			11.2	10.4	10.8	6.1	
44	9.6	9.4	9.5	5.1			11.4	10.3	10.8	6.1	
45	8.1	7.6	7.8	3.7			11.8	10.8	11.3	6.0	
46	8.8	7.8	8.3	4.1			11.9	10.8	11.3	6.9	
47	8.0	7.2	7.6	3.6			12.1	11.0	11.6	6.9	
48	6.0	5.4	5.7	1.9			12.6	11.2	11.9	7.3	
49	8.0	6.8	7.4	3.9			12.6	11.3	11.9	7.3	
50	9.7	9.0	9.4	4.4			13.0	11.6	12.3	7.8	
51	9.3	8.6	9.0	4.1			13.1	12.2	12.6	7.9	
52	7.5	6.7	7.1	2.7			13.1	12.0	12.6	8.0	
53	5.6	5.0	5.4	1.2	0		13.5	12.4	13.0	8.2	3.6
54	4.0	4.0	4.0	0.4	0		13.8	13.0	13.4	8.5	3.9
55	7.7	7.0	7.4	2.5	0.3		13.3	13.1	13.2	8.9	4.0
56	11.2	12.2	11.7	7.1	2.4		12.2	13.2	12.7	8.9	4.0
57	8.4	9.2	8.8	4.0	1.0		12.4	13.4	12.8	9.0	4.0
58	9.5	10.5	10.0	5.0	1.6		12.5	13.7	13.1	9.0	4.0
59	11.3	11.2	11.2	7.1	2.6		12.5	12.6	12.6	9.4	4.1
60	-	11.4	11.4	7.1	2.6		-	12.8	12.8	9.8	4.3

No record of this

No record of this

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Ratio in log aperture

	Ap. 1.	Diff.	2		3		4	
31	1.02 - .83	.19	—	—				
32	1.00 - .78	22	1.26 - 1.08	18				
33	1.00 - .79	21	1.24 - 1.08	16				
34	1.00 - .78	22	— —	—				
35	1.08 - .79	29	1.30 - 1.08	22				
36	1.08 - .79	29	1.31 - 1.08	23				
37	.96 - .78	18	1.30 - 1.07	23				
38	.90 - .78	12	1.16 - 1.08	08				
39	1.01 - .77	24	1.25 - 1.07	18				
40	1.58 - .75	83	1.60 - 1.03	57				
41	.87 - .74	13	1.23 - 1.01	22				
42	.91 - .74	17	1.23 - 1.01	22				
43	.85 - .73	12	1.14 - 1.00	14				
44	.81 - .73	08	1.07 - 1.00	07				
45	.90 - .70	20	1.19 - 1.01	18				
46	.87 - .70	17	1.15 - .97	18				
47	.91 - .68	23	1.19 - .95	24				
48	1.03 - .66	37	1.34 - .92	42				
49	.92 - .66	26	1.17 - .92	25				
50	.81 - .63	18	1.13 - .90	23				
51	.83 - .61	22	1.15 - .89	26				
52	.94 - .61	33	1.27 - .89	38				
53	1.05 - .58	47	1.40 - .87	53	1.60 - 1.19	41		
54	1.16 - .54	62	1.57 - .86	65	1.60 - 1.17	43		
55	.92 - .56	36	1.28 - .84	44	1.53 - 1.16	37		
56	.67 - .60	07	.94 - .84	10	1.29 - 1.16	13		
57	.84 - .59	25	1.16 - .83	33	1.43 - 1.16	27		
58	.78 - .57	21	1.08 - .83	25	1.37 - 1.16	21		
59	.71 - .61	10	.94 - .81	13	1.27 - 1.15	12		
60	.69 - .59	10	.94 - .79	15	1.27 - 1.14	13		

No measures

No measures

No measures

No measures

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	1a	1b	Mean	2	3	1a	1b	Mean	2	3
61		10.0	10.0	6.0	2.0		13.0	13.0	10.0	4.4
62		6.2	6.2	2.6	0.8		13.2	13.2	9.8	4.5
63		11.4	11.4	6.5	2.5		13.1	13.1	10.0	5.0
64		11.6	11.6	7.0	3.2		13.3	13.3	10.0	5.0
65		11.8	11.8	7.4	2.3		13.5	13.5	10.6	5.0
66		9.6	9.6	2.9	1.5		13.6	13.6	9.1	5.0
67		11.2	11.2	6.0	3.1		13.7	13.7	9.6	5.0
68		11.6	11.6	5.7	2.7		13.8	13.8	9.7	5.1
69		12.4	12.4	6.5	3.4		13.9	13.9	10.0	5.2
70		12.6	12.6	6.9	3.6		14.0	14.0	10.0	5.4
71	λ	11.9	11.9	6.0	3.2		14.0	14.0	10.0	5.5
72		12.4	12.4	6.8	3.8		14.1	14.1	10.2	6.0
73		12.0	12.0	6.0	3.2		14.4	14.4	10.5	6.3
74		13.2	13.2	7.6	4.2		14.3	14.3	10.6	6.4
75		13.2	13.2	7.6	4.3		14.3	14.3	10.6	6.4
76		13.5	13.5	8.4	4.5		14.9	14.9	10.8	6.7
77		13.9	13.9	9.0	4.7		15.0	15.0	11.3	7.0
78		13.8	13.8	8.5	4.5		15.0	15.0	11.5	7.0
79		13.8	13.8	8.9	4.0		15.4	15.4	12.1	7.8
80		14.6	14.6	10.8	5.9		15.3	15.3	12.5	8.0
81		14.9	14.9	11.0	5.5		15.4	15.4	12.8	8.1
82		15.0	15.0	11.2	6.4		15.8	15.8	13.0	8.0
83		14.7	14.7	10.9	6.0		15.7	15.7	13.0	8.3
84		14.3	14.3	10.4	5.2		15.6	15.6	12.9	7.8
85		15.0	15.0	11.0	6.0		15.5	15.5	12.8	7.7
86		14.9	14.9	11.0	5.7		15.5	15.5	12.7	7.6
87		~~13.8~~	–	10.9	5.3		~~14.7~~	–	13.9	7.5
88		~~13.4~~	–	10.0	4.9		~~14.5~~	–	11.0	5.4
89		~~13.0~~	–	9.9	4.9		11	–	11.0	5.4
90		~~12.0~~ 13.0	13.0	8.0	3.2		14.7	14.7	9.6	4.7

No record at this temperature λ

No record at this λ

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Ratio in log aperture

	1		2		3		4
61	.78 - .58	.20	1.01 - .78	.23	1.33 - 1.13	.20	
62	1.00 - .56	44	1.27 - .79	48	1.45 - 1.12	33	
63	.69 - .57	12	.98 - .78	20	1.28 - 1.08	20	
64	.68 - .55	13	.94 - .78	16	1.23 - 1.08	15	
65	.67 - .54	13	.92 - .78	14	1.26 - 1.08	18	
66	.80 - .53	27	1.25 - .83	42	1.37 - 1.08	29	
67	.71 - .52	19	1.01 - .80	21	1.23 - 1.08	15	
68	.68 - .51	17	1.03 - .80	23	1.27 - 1.07	20	
69	.62 - .50	12	.98 - .78	20	1.21 - 1.07	14	
70	.61 - .49	12	.95 - .78	17	1.19 - 1.05	14	
71	.66 - .49	17	1.01 - .78	23	1.23 - 1.04	19	
72	.62 - .48	14	.96 - .77	19	1.18 - 1.01	17	
73	.65 - .45	20	1.01 - .75	26	1.23 - 0.99	24	
74	.56 - .46	10	.91 - .74	17	1.15 - .98	17	
75	.56 - .46	10	.91 - .74	17	1.14 - .98	16	
76	.54 - .40	14	.86 - .73	13	1.12 - .96	16	
77	.50 - .38	12	.83 - .70	13	1.11 - .94	17	
78	.51 - .38	13	.86 - .69	17	1.12 - .94	18	
79	.51 - .33	18	.84 - .64	20	1.16 - .90	26	
80	.43 - .34	09	.73 - .62	11	1.01 - .89	12	
81	.40 - .33	07	.72 - .59	13	1.04 - .88	16	
82	.38 - .26	12	.71 - .58	13	.98 - .89	09	
83	.42 - .27	15	.73 - .58	15	1.01 - .87	14	
84	.46 - .30	16	.75 - .59	16	1.07 - .90	17	
85	.38 - .32	06	.72 - .59	13	1.01 - .90	11	
86	.40 - .32	08	.72 - .60	12	1.03 - .91	12	
87	- -	-	.73 - .55	18	1.06 - .91	15	
88	- -	-	.78 - .72	06	1.09 - 1.05	04	
89	- -	-	.79 - .72	07	1.09 - 1.05	04	
90	.58 - .42	16	.89 - .80	09	1.23 - 1.11	12	

No measures

No measures

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	1a	1b	Mean	2	3	1a	1b	Mean	2	3
91	Not at this λ	13.4	13.4	7.5	3.0	Not at this λ	14.5	14.5	9.4	4.5
92		13.0	13.0	7.2	2.4		14.2	14.2	9.8	3.6
93		-	-	7.3	1.6		~~13.4~~	-	8.82	3.0
94		12.0	12.0	5.9	1.5		13.4	13.4	8.21	3.0
95		11.8	11.8	4.6	1.0		12.2	12.2	6.4	2.0
96		9.6	9.6	2.6	0.8		10.8	10.8	4.8	1.7

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	1	Diff.	2	Diff.	3	Diff.		
91	.54 - .44	.10	.91 - .81	.10	1.24 - 1.12	.12	No measures	No measures
92	.58 - .47	11	.93 - .84	09	1.29 - 1.19	10		
93	- -	-	.92 - .87	05	1.37 - 1.24	13		
94	.65 - .54	11	1.01 - .88	13	1.37 - 1.24	13		
95	.67 - .64	03	1.11 - .98	13	1.43 - 1.33	10		
96	.80 - .73	07	1.27 - 1.10	17	1.45 - 1.36	09		

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Quantities plus throughout. Reduction to magnitudes

Line ap. ↓	Log ap. in hundredths 1	2	3	4	In Mag. 1	2	3	4	Mean	Residuals h	Σh^2	μ
1	–	–	–	–	–	–	–	–	–			
2	29	23	–	–	72	58	–	–	.65	17,7	578	17
3	15	–	–	–	38	–	–	–	.38	–		
4	10	8	–	–	25	20	–	–	.22	3,2	13	2.5
5	19	13	–	–	48	32	–	–	.40	8,8	128	8
6	14	10	–	–	35	25	–	–	.30	5,5	50	5
7	28	19	–	–	70	48	–	–	.59	21,21	882	21
8	4	8	–	–	10	20	–	–	.15	5,5	50	5
9	39	22	–	–	98	55	–	–	.76	22,22	925	21.5
10	11	11	–	–	28	28	–	–	.28	0,0	0	0
11	19	16	–	–	48	40	–	–	.44	4,4	32	4
12	35	26	–	–	88	65	–	–	.76	12,11	265	11.5
13	12	15	–	–	30	38	–	–	.34	4,4	32	4
14	18	20	–	–	45	50	–	–	.48	3,2	13	3.5
15	35	25	–	–	88	62	–	–	.75	13,13	338	13
16	13	15	–	–	32	38	–	–	.35	3,3	18	3
17	6	4	–	–	15	10	–	–	.12	3,2	13	2.5
18	20	19	–	–	50	48	–	–	.49	1,1	2	1
19	33	26	–	–	82	65	–	–	.74	8,9	145	8.5
20	22	17	–	–	55	42	–	–	.48	7,6	85	6.5
21	21	16	–	–	52	40	–	–	.46	6,6	72	6
22	19	14	–	–	48	35	–	–	.42	6,7	85	6.5
23	25	19	–	–	62	48	–	–	.55	7,7	98	7
24	34	23	–	–	85	58	–	–	.72	13,14	365	13.5
25	40	28	–	–	100	70	–	–	.85	15,15	550	15
26	23	16	–	–	58	40	–	–	.49	9,9	162	9
27	22	16	–	–	55	40	–	–	.48	7,8	113	7.5
28	19	15	–	–	48	38	–	–	.43	5,5	50	5

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Line	Log ap in hundredths 1	2	3	4	In Mag. 1	2	3	4	Mean	Residuals ↙	Σh^2	μ
29	22	15	–	–	55	38	–	–	.46	9,8	145	8.5
30	40	26	–	–	100	65	–	–	.82	18,17	613	17.5
31	19	–	–	–	48	–	–	–	.48	–	–	
32	22	18	–	–	55	45	–	–	.50	5,5	50	5
33	21	16	–	–	52	40	–	–	.46	6,6	72	6
34	22	–	–	–	55	–	–	–	.55	–	–	
35	29	22	–	–	72	55	–	–	.64	8,9		8.5
36	29	23	–	–	72	58	–	–	.65	7,7		7
37	18	23	–	–	45	58	–	–	.52	7,6		6.5
38	12	8	–	–	30	20	–	–	.25	5,5		5
39	24	18	–	–	60	45	–	–	.53	7,8		7.5
40	83	>57	–	–	208	>142	–	–	.208	–		–
41	13	22	–	–	32	55	–	–	.44	12,11		11.5
42	17	22	–	–	42	55	–	–	.49	7,6		6.5
43	12	14	–	–	30	35	–	–	.32	2,3		2.5
44	8	7	–	–	20	18	–	–	.19	1,1		1
45	20	18	–	–	50	45	–	–	.48	2,3		2.5
46	17	18	–	–	42	45	–	–	.44	2,1		1.5
47	23	24	–	–	58	60	–	–	.59	1,1		1
48	37	42	–	–	92	105	–	–	.98	6,7		6.5
49	26	25	–	–	65	62	–	–	.64	1,2		1.5
50	18	23	–	–	45	58	–	–	.52	7,6		6.5
51	22	26	–	–	55	65	–	–	.60	5,5		5
52	33	38	–	–	82	95	–	–	.88	6,7		6.5
53	47	53	41	–	118	132	102	–	117	1,15,15	451	12.2
54	62	65	43	–	155	162	108	–	1.42	13,20,36	1865	24.9
55	36	44	37	–	90	110	92	–	.97	7,13,5	243	9.0
56	7	10	13	–	18	25	32	–	.25	7,0,7	98	5.7
57	25	33	27	–	62	82	68	–	.71	9,11,3	211	8.3

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	Log ap., hundredths				Mag (hundredths)				Mean	Residuals	Σh^2	μ
58	21	25	21	–	52	62	52	–	.55	3,7,3	67	4.6
59	10	13	12	–	25	32	30	–	.29	4,3,1	26	3
60	10	15	13	–	25	38	32	–	.32	7,6,0	85	5.2
61	20	23	20	–	50	58	50	–	.53	3,5,3	~~743~~ 43	3.7
62	44	48	33	–	110	120	82	–	1.04	6,16,22	743	15.7
63	12	20	20	–	30	50	50	–	.43	13,7,7	89	9.4
64	13	16	15	–	32	40	38	–	.37	5,3,1	35	3.4
65	13	14	18	–	32	35	45	–	.37	5,2,8	93	5.5
66	27	42	29	–	68	105	72	–	.82	14,23,10	825	16.5
67	19	21	15	–	48	52	38	–	.46	2,6,8	104	5.8
68	17	23	20	–	42	58	50	–	.50	8,8,0	128	6.5
69	12	20	14	–	30	50	35	–	.38	8,12,3	217	8.4
70	12	17	14	–	30	42	35	–	.36	6,6,1	73	4.8
71	17	23	19	–	42	58	48	–	.49	~~3~~,~~12~~,7,9,1	131	6.6
72	14	19	17	–	35	48	42	–	.42	7,6,0	85	5.2
73	20	26	24	–	50	65	60	–	.58	8,7,2	117	6.2
74	10	17	17	–	25	42	42	–	.36	11,6,6	193	8
75	10	17	16	–	25	42	40	–	.36	11,6,4	173	7.6
76	14	13	16	–	35	32	40	–	.36	1,4,4	33	3.3
77	12	13	17	–	30	32	42	–	.35	5,3,7	83	5.2
78	13	17	18	–	32	42	45	–	.40	~~4~~,~~6~~,8,2,5	93	5.5
79	18	20	26	–	45	50	65	–	.53	8,3,12	217	8.4
80	9	11	12	–	22	28	30	–	.27	5,1,3	35	3.4
81	7	13	16	–	18	32	40	–	.30	12,2,10	248	9.1
82	12	13	9	–	30	32	22	–	.28	2,4,6	56	4.3
83	15	15	14	–	38	38	35	–	.37	1,1,2	6	1.4
84	16	16	17	–	40	40	42	–	.41	1,1,1		1
85	6	13	11	–	15	32	28	–	.25	10,7,3	158	7.2
86	8	12	12	–	20	30	30	–	.27	7,3,3	67	4.6
87	–	18	15	–	–	45	38	–	.42	3,4		3.5

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	Log ap., hundredths				Mag ($\frac{1}{100}$)				Mean	Residuals	Σv^2	μ
88	–	6	4	–	–	15	10	–	.12	3, 2		2.5
89	–	7	4	–	–	18	10	–	.14	4, 4		4
90	16	9	12	–	40	22	30	–	.31	9, 9, 1	163	7.3
91	10	10	12	–	25	25	30	–	.27	2, 2, 3	17	2.4
92	11	9	10	–	28	22	25	–	.25	3, 3, 0	18	2.4
93	–	5	13	–	–	12	32	–	.22	10, 10		10
94	11	13	13	–	28	32	32	–	.31	3, 1, 1	11	2.0
95	3	13	10	–	8	32	25	–	.27	14, 10, 3	305	10.1
96	7	17	9	–	18	42	22	–	.27	9, 15, 5	331	10.5

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C 18416 Apertured spectrum of Arcturus taken with 2 prisms on 11-inch telescope, apertures

	Aperture	exposure m
C 18416	..	11.
	..	10
	..	10

Microphotometer tracings made from C 18416

μφ 1	Aperture 1 red to middle	June 14	1926
2	" " middle to violet	" "	"
3	Aperture red to middle	June 15	1926
4	" " middle to v.	Aperture .. red to middle.	
5	Aperture .. middle to violet	June 15,	1926
6			

Settings of microphotometer: Slit = 0.1 mm full length
~~Large~~ small wheel
Large magnification

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Identification of lines in the spectrum of Arcturus MC 18416

Line	λ	Line	λ	Line	λ	Line	λ
0a	3878	5d	4018	24a	4137	43	4238
0b	3883	5e	4020-22	24b	4140	44	4240
0c	3886	6	4024	25	4144	44a	4243
0d	3889	7	4030	25a	4149-50	45	4247
0e	3895	7a	4035	25b	4152	46	4254
0f	3899-900	8	4041	25c	4154	46a	4258
0g	3903	9	4046	27	4156	47	4260
0h	3905-6	10	4050-2	27a	4162	47a	4264
0i	3914	11	4055-7	28	4165	47b	4268
0j	3916	12	4064	29	4169	48	4272
0k	3918	13	4067	29a	4171	49	4275
0l	3920-21	14	4072	30	4172	50	4281
1	3933	15	4077	31	4177	50a	4286
1a	3944	16	4082-8	32	4182	51	4289
1b	3947-9	16a	4086	33	4187	52	4299
1c	3953	17	4089	34	4191	52a	4303
1d	3956-8	18	4097	34a	4196	53	4308
1e	3961	19	4101	34b	4198	53a	4309
2	3970	19a	4103	34c	4202	53b	4313
3	3982-90	19b	4105	34d	4205	54	4315
3a	3987	20	4106	34e	4207	54a	4318
3b	3987-90	20a	4112-13	38	4210	54b	4321
3c	3993						
	3998						
4	4005	21	4117	39	4215	54c	4324
4a	4001	22	4124	39a	4223	55	4326
5	4005	22a	4128	40	4227	56	4330
5a	4007 4009	22b	4129	40a		56a	4337
5b	4012	23	4132	41	4229	57	4340
5c	4018	24	4135	42	4233	57a	4344
					4236		

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57b	4348
58	4352
58a	4353-5
59	4359
59a	4363
60	4367
60a	4370-71
61	4374
61a	4379
62	4384
63	4391
64	4395
65	4401
66	4405
67	4408
67a	4412
68	4415
69	4422
69a	4425
69b	4427
70	4430
71	4435
72	4444
72a	4447
72b	4450
72c	4455
72d	4459
73	4462
73a	4469
73b	4476
76	4481
77	4490
78	4494-7
78a	4501
78b	4527-31
79	4536
79a	4584

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tracing #1 Measurement of microphotometer tracings of A

		l	m	n	w	m+n	m_2	m_2+n_2
Ap. 1	0a		2.5	1.0		3.0		
	0b		2.3	1.2		3.5		
	0c		2.9	1.0		3.9		
	0d		5.0	1.5		6.5		
	0e		2.7	5.1		7.8		
	0f		3.3	5.0		8.3		
	0g		2.6	5.9		8.5		
	0h		4.9	4.0		8.9		
	0i		0.9	8.5		9.4		
	0j		1.7	8.3		10.0		
	0k		1.7	8.0		9.7		
	0l		6.3	4.1		10.4		
	1		12.0	-1.0	40	11.0		
	1a		8.4	4.6		12.9		
	1b		4.3	9.7		14.0		
	1c		4.1	10.3		14.4		
	1d		4.0	11.0		15.0		
	1e		11.3	4.5		15.8		
	2		15.9	0.7	40	16.6		
	3		3.8	14.7		18.5	same as m	same as m+n
	3a		1.7	17.4		19.1		
	3b		3.4	16.8		20.2		
	3c		1.6	19.1		20.7		
	4		3.2	18.0		21.2		
	4a		1.1	20.9		22.0		
	5		6.7	16.0		22.7		
	5a		2.1	21.0		23.1		
	5b		2.4	21.0		23.4		
	5c		2.2	21.3		23.5		
	5d		3.9	20.9		24.8		

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Arcturus. c 18416

	l	m	n	w	l+m+n	m_2	$m+m_2$
5e		2.5	21.9		24.4		
6		~~2.5~~ 4.3	~~21.9~~ 20.2		24.5		
6a		—	—		—		
7		6.2	19.0		25.2		
7a		6.6	18.6		25.2		
8		2.7	22.4		25.1	3.2	25.6
9		12.2	13.0	8	25.2	13.2	26.2
10		3.7	21.7		25.4	4.8	26.5
11		4.9	20.4		25.3	6.2	26.6
12		10.9	15.0	8	25.9	12.4	27.4
13		3.9	22.1		26.0	5.7	27.8
14		6.6	19.5	6	26.1	8.3	27.8
16		3.5	25.5		29.0	4.0	29.5
16a		1.3	27.3		28.6	2.2	29.5
17		3.4	25.7		29.1	3.8	29.5
17a		—	—		—	—	—
18		5.4	23.4		28.8	5.9	29.3
19		7.7	20.9		28.6	8.4	29.3
19a		3.9	24.3		28.2	4.9	29.2
19b		3.3	24.7		28.0	4.4	29.1
20		4.0	24.0		28.0	5.1	29.1
20a		~~4.3~~ 1.8	~~23.2~~ 26.0		27.8	3.2	29.2
21		4.3	23.2		27.5	5.9	29.1
22		2.7	24.5		27.2	4.8	29.3
22a		0.5	26.8		27.3	~~4.8~~ 2.5	29.3
22b		2.2	~~25.0~~		27.2	~~5.7~~ 4.0	29.0
22c		3.2	24.0		27.2	5.1	29.1
23		5.0	22.1		27.1	7.8	29.4
24		4.5	22.5		27.0	6.9	29.4
24a		1.6	25.4		27.0	3.8	29.2
24b		0.9	26.0		26.9	3.1	29.1

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Arcturus measures

	l	m	n	w	m+n	m_v	
25		10.5	16.5	7.0	27.0	12.5	29.0
25a		3.4	23.6		27.0	5.7	29.3
25b		3.0	24.0		27.0	5.2	29.2
25c		2.6	24.3		26.9	4.9	29.2
27		3.6	23.3		26.9	5.7	29.0
27a		1.8	25.0		26.8	4.1	29.1
28		2.8	24.2		27.0	5.0	29.2
29		3.2	23.7		26.9	5.5	29.2
29a		2.1	24.9		27.0	4.2	29.1
30		7.0	20.0	2.5 x 2	27.0	9.0	29.0
31		3.8	23.3		27.1	5.8	29.1
32		3.3	23.9		27.2	5.0	28.9
33		4.6	23.0		27.6	6.0	29.0
34		4.1	25.7		27.8	5.8	29.5
34a		4.8	23.2		28.0	6.0	29.2
34b		5.7	22.4		28.1	6.7	29.1
34c		6.2	22.0		28.2	7.0	29.0
34d		4.1	24.1		28.2	5.0	29.0
34e		2.3	26.0		28.3	3.2	29.2
38		2.6	25.4		28.0	3.2	28.8
39		7.5	20.8	6.0	28.3	9.0	29.8
39a		0.6	28.0		28.6		
40		19.3	9.7	7.0	29.0		
40a		2.5	27.0		29.5		
41		3.3	26.3		29.6		
42		4.6	25.2		29.8		
43		2.9	26.9		29.8		
44		2.5	27.4		29.9		
44a		3.0	27.0		30.0		
45		5.5	24.7		30.2		
46		5.2	25.0		30.2		

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l	m	n	w	m+n
46a	3.5	26.7		30.2
47	6.1	24.2		30.3
47a	1.2	29.4		30.6
47b	2.8	28.0		30.8
48	10.0	20.8		30.8
49	6.6	24.2		30.8
50	4.4	26.6		31.0
50a	3.2	27.9		31.1
51	4.7	26.4		31.1
52	8.2	23.0		31.2
52a	3.2	27.1		30.3 ×
53	9.6	21.7		31.3
53a	7.2	24.2		31.4
53b	7.4	24.0		31.4
54	11.0	20.4		31.4
54a	4.9	26.9		31.8
54b	1.0	30.9		31.9
54c	2.2	29.8		32.0
55	9.9	22.1	3.5 × 2	32.0
56	2.5	29.5		32.0
56a	7.5	30.5		32.0
56b	4.0	28.0		32.0
57	6.0	26.0		32.0
57a	2.0	30.0		32.0
57b	1.9	30.1		32.0
58	5.0	27.0	2.5 × 2	32.0
58a	1.9	29.8		31.7
59	2.7	29.2		31.9
59a	1.3	30.7		32.0
60	2.4	29.5		31.9
61	4.0	27.9		31.9
61a	1.3	30.6		31.9

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Arcturus measures

	l	mv	nv	wv	mv + nv
62		9.5	18.4	6.0	28.9
63		2.7	26.4		29.1
64		2.7	26.4		29.1
65		2.4	26.6		29.0
66		5.8	23.2	2.5 x 2	29.0
67		3.1	26.0		29.0
68		3.0	26.1		29.1
69		1.8	27.2		29.0
69a		1.0	28.0		29.0
69b		1.3	27.8		29.1
70		2.1	27.0		29.1
71		2.8	26.3		29.1
72		2.7	27.4		29.1
72a		0.4	28.7		29.1
72b		0.9	28.4		29.3
72c		2.1	~~28.2~~ 27.2		29.3
72d		1.9	27.5		29.4
73		3.0	26.0		29.0
73a		1.0	28.0		29.0
73b		1.7	27.4		29.1
76		1.6	27.6		29.2
77		1.4	27.8		29.2
78		1.5	27.7		29.2
78a		1.1	28.2		29.3
78b		1.2	28.1		29.3
79		1.8	27.6		29.4
79a		2.3	27.1		29.4
79b		1.3	28.0		29.3
79c		1.3	28.0		29.3
79d		1.1	28.0		29.1
79e		1.1	28.0		29.1

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80	1.4	27.6	29.0
81	1.0	21.0	29.0

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Arcturus measures

tracing pq 3	l	m	n	w	m+n
1c		1.7	3.9		5.6
1d		2.8	3.7		6.5
1e		2.5	1.0		
2		9.3	−1.0	35	8.3
3		4.0	6.7		10.7
3a		2.3	9.0		11.3
3b		3.1	8.6		11.7
4		3.7	9.0		12.7
4a		1.3	12.0		13.3
5		6.1	7.9		14.0
5a		2.0	12.2		14.2
5b		2.0	12.0		14.0
5c		2.1	12.3		14.4
5d		2.6	12.0		14.6
5e		2.6	12.4		15.0
6		3.1	11.9		15.0
7		10.0	5.5		15.5
7a		6.0	9.7		15.7
8		2.6	13.4		16.0
9		9.7	6.5	8.0	16.2
10		4.2	12.8		17.0
11		5.8	11.2		17.0
12		9.1	8.2	7.5	17.3
13		4.5	13.0		17.5
14		6.4	11.1	6.5	17.5
15		8.3	9.7		18.0
16		3.5	14.9		18.4
16a		—	—		—
17		2.6	16.0		18.6
18		5.3	13.2		18.5

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l	m	n	w	m + n	m_2	m_2 + n
19	7.3	11.1		18.4		
19a	3.4	14.7		18.1		
19b	3.3	14.7		18.0		
20	3.6	14.2		17.8	3.8	18.0
20a	1.9	15.2		17.1	2.1	18.3
21	3.2	13.8		17.0	4.2	18.0
22	2.5	15.0		17.5	3.2	18.2
22a	—	—		—	—	—
22b	1.1	16.2		17.3	2.0	18.2
23	4.5	12.6		17.1	5.5	18.1
24	4.1	13.0		17.1	5.1	18.1
24a	0.7	16.5		17.2	1.7	18.2
24b	0.7	16.0		16.7	1.7	17.7
25	9.2	7.6	7.0	16.8	10.2	17.8
25a	3.4	13.6		17.0	4.4	18.0
25b	2.8	14.2		17.0	3.8	18.0
25c	2.6	14.4		17.0	3.6	18.0
27	2.8	14.2		17.0	3.8	18.0
27a	1.7	15.5		17.2	2.7	18.2
28	1.8	15.4		17.2	2.8	18.2
29	2.6	14.5		17.1	3.7	18.2
29a	—	—		—	—	—
30	5.7	11.4	2 x 3.5	17.1	6.8	18.2
31	2.8	14.3		17.1	3.9	18.2
32	2.8	14.4		17.2	3.9	18.3
33	3.0	14.2		17.2	4.1	18.3
38	3.3	9.9	Measures corrected for shift of zero 16.9	~~16.7~~ 20.2		w
39	6.8	6.7	13.7	20.5		2 x 3.5
39a	0.6	13.1	20.1	20.7		
40	9.5	4.5	11.5	21.0		11

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Arcturus measures

	Reductions.		measures corrected for shift of zero n	m+n	w
41	3.9	10.4	17.4	21.3	
42	4.6	9.7	16.7	21.3	
43	3.8	10.7	17.7	21.5	
44	2.7	11.9	18.9	21.6	
44a	4.4	10.4	17.4	21.8	
45	5.9	9.0	16.0	21.9	
46	5.5	9.7	16.7	22.2	
46a	4.7	10.6	17.6	22.3	
47	6.7	8.6	15.6	22.3	
47a	1.5	14.0	21.0	22.5	
47b	3.5	12.1	19.1	22.6	
49	7.2	8.8	15.8	23.0	
50	5.6	10.4	17.4	23.0	
50a	4.6	11.4	18.4	23.0	
51	5.9	10.4	17.4	23.3	
52	8.8	7.6	14.6	23.4	
52a	4.9	11.5	18.5	23.4	
53	11.0	5.8	12.8	23.8	
53a	8.8	8.1	15.1	23.9	
53b	9.0	8.0	15.0	24.0	
54	12.5	4.5	11.5	24.0	
54a	—	—	-	-	
54b	6.0	11.3	18.3	24.3	
54c	2.8	14.7	21.7	24.5	
55	11.0	6.7	13.7	24.7	2 x 4.5
56	3.6	14.1	21.1	24.7	
56a	2.2	15.5	22.5	24.7	
56b (?)	6.4	11.4	18.4	24.8	
57	7.3	9.6	16.6	24.9	
57a	3.2	9.5	16.5	2 .7	

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		—	measurements corrected for shift of zero n	m+n	w
57b	3.0	15.0	22.0	25.0	
58	7.1	11.0	18.0	25.1	2x2
58a	4.0	14.3	21.3	25.3	
59	4.7	13.7	20.7	25.4	
59a	2.6	15.9	22.9	25.5	
60	4.5	14.1	21.1	25.6	
60a	3.1	14.5	21.5	25.6	
61	6.7	12.0	19.0	25.7	
61a	3.0	15.8	22.8	25.8	
62	13.6	5.2	12.2	25.8	6
63	5.3	13.6	20.6	25.9	
64	5.0	14.0	21.0	26.0	
65	4.8	14.2	21.2	26.0	
66	8.9	10.3	17.3	26.2	2x2
67	6.2	13.1	20.1	26.3	
67a	—	—	—	—	
68	5.5	13.8	20.8	26.3	
68a(?)	2.8	16.7	23.7	26.5	
69(?)	4.3	15.2	22.2	26.5	
69a	2.9	16.6	23.6	26.5	
70	4.1	15.4	22.4	26.5	
71	5.7	14.0	21.0	26.7	
72	4.8	15.2	22.2	27.0	
72a	1.8	18.3	25.3	27.1	
72b	2.2	18.0	25.0	27.2	
72c	4.4	15.9	22.9	27.3	
72d	4.3	16.0	23.0	27.3	
73	5.7	14.6	21.6	27.3	
73a	2.8	17.6	24.6	27.4	
73b	3.4	17.0	24.0	27.4	

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Arcturus measures

			Measures corr. for shift of zero	
			N	mean
76	3.1	17.5	24.5	27.6
77	2.8	17.7	24.7	27.5
78	3.2	17.4	24.4	27.6
78a	1.9	18.9	25.9	27.8
79	3.2	17.9	24.9	28.1

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Arcturus measures

Tracing prep 5	l	m	n	w	m+n	m_2	m_2+n
2		3.8	0.7	40	4.5		
3		2.2	3.3		5.5		
3a		0.9	4.8		5.7		
3b		1.7	4.3		6.0		
4		2.3	4.6		6.9		
4a		0.8	6.4		7.2		
5		3.1	4.4		7.5		
5a		—	—		—		
5b		1.2	6.8		8.0		
5c		1.2	6.8		8.0		
5d		1.3	7.0		8.3		
5e		1.4	7.1		8.5		
6		1.7	7.0		8.7		
7		3.5	5.5		9.0		
7a		2.5	6.6		9.1		
8		1.5	8.1		9.6		
9		6.0	4.0	9	10.0		
10		3.8	7.2		11.0		
11		4.8	6.3		11.1		
12		6.3	5.1	7.	11.4		
13		3.6	7.9		11.5		
14		4.9	7.0	7.	11.9		
15		6.1	6.0		12.1		
16		3.0	9.5		12.5		
16a		3.0	9.5		12.5		
17		1.9	11.0		12.9		
18		4.5	8.1		12.6	4.5	12.6
19		5.5	7.1		12.6	5.5	12.6
19a		3.4	9.1		12.5	3.9	
19b		3.3	9.0		12.3	↓	12.9

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	l	m	n	w	m+n	m_2	m_2+n
20		3.2	9.0		12.2	3.9	12.9
20a		1.5	10.6		12.1	2.2	12.8
21		3.0	9.0		12.0	3.9	12.9
22		2.5	9.5		11.0	3.2	12.7
22a		0.7	11.0		11.7	2.0	13.0
22b		2.2	9.6		12.8	3.3	12.9
23		3.9	7.7		11.6	5.2	12.9
24		2.2	9.2		11.4	4.2	13.4
24a		0.4	11.0		11.4	2.0	13.0
24b		0.4	11.0		11.4	2.0	13.0
25		5.4	6.1	8.	11.5	7.0	13.1
25a		2.2	9.3		11.5		
25b		2.3	9.2		11.5		
27		2.2	9.5		11.5	3.9	13.4
27a		0.6 ~~1.4~~	11.2 ~~9.6~~		11.8	2.0	13.2
28		1.4	10.5		11.9	2.9	13.4
29		1.7	10.2		11.9	3.2	13.4
30		3.7	8.0	2x3.5	11.7	5.1	13.1
31		2.4	9.5		11.9	3.7	13.2
32		1.8	10.0		11.8	3.0	13.0
33		1.8	10.2		12.0	3.0	13.0
34		1.6	10.4		12.0	3.0	13.0
38		2.5	9.0		11.5		
39		4.9	7.1	2x3.5	12.0		
39a		0.7	11.5		12.2		
40		9.5	2.7	2x4.5	12.2		
40a		1.9	10.4		12.3		
41		2.7	9.8		12.5		
42		3.8	9.1		12.9		
43		2.8	10.0		12.8		

grave rules from here on

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Cd 8616
MQ 5
aperture 5

Arcturus measures

	l	m	n	w	m+n
44		1.5	11.5		13.0
45		4.2	9.1		13.3
46		4.4	9.1		13.5
46a		4.0	9.7		13.7
47		4.5	9.2		13.7
47a		0.6	13.4		14.0
47b		2.5	11.4		13.9
48		6.4	7.7		14.1
49		5.3	9.1		14.4
50		3.6	10.9		14.5
50a		~~3.4~~	~~10.6~~		–
51		4.6	10.0 ~~9.1~~		14.6
52		6.9	8.0		14.9
52a		4.0	11.1		15.1
53		8.5	6.5		15.0
53a		6.9	8.1		15.0
54		9.8	6.0		15.8
54a		7.2	9.1		16.3
54b		~~4.8~~	11.2		16.0
54c		1.4	14.6		16.0
55		8.1	8.0	2 x 4.5	16.1
56		1.9	14.2		16.1
56a		4.8	11.1		15.9
57		5.9	10.8		16.7
57a		~~2.0 14.5~~	14.5		16.5
57b		2.0	15.0		17.0
58		6.0	11.0	2 x 2.5	17.0
58a		3.0	14.0		17.0
59		3.4	13.6		17.0
59a		2.0	15.0		17.0

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1924phae.proj.109gp

C1846

	l	m	n	w	m + n
pq 5 / ap. 5	60	3.0	14.0		17.0
	61	5.0	12.0		17.0
	61a	2.1	14.9		17.0
	62	10.0	7.0	.6.	17.0
	63	4.5	12.5		17.0
	64	3.9	13.9		17.8
	65	4.0	14.0		18.0
	66	7.0	10.5	2x2	17.5
	67	5.0	13.0		18.0
	67a	2.5	16.5		19.0
	68	4.9	13.1	2x2.5	18.0
	69	3.4	14.6		18.0
	69a	—	—		—
	69b	2.8	15.2		18.0
	70	3.0	15.0		18.0
	71	4.2	13.8		18.0

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Arcturus measures

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Note on measurement of microphotometer tracings.

From the table on p. 61, comparing the results from two instruments, it will be seen that Plate C 18416, first setting, gave results that diverged systematically from those obtained from MC 20797. This was finally traced to differences in drawing the "background curve", and the following standard procedure is therefore adopted for the background curve.

Line ruled tangent to 0d–0e, 0h–0i–0j, 1c–1d, 3a–3b, 6–7, 16–17, 39a–40. Hence or the divergence appears less serious;

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Arcturus reductions

Reductions

Line	Aperture	1	3	5	1 m+n	3	5
	0a	1.0	-	-	3.0	-	-
	0b	1.2	-	-	3.5	-	-
	0c	1.0	-	-	3.9	-	-
	0d	1.5	-	-	6.5	-	-
	0e	5.1	-	-	7.8	-	-
	0f	5.0	-	-	8.3	-	-
	0g	5.9	-	-	8.5	-	-
	0h	4.0	-	-	8.9	-	-
	0i	8.5	-	-	9.4	-	-
	0j	8.3	-	-	10.0	-	-
	0k	8.0	-	-	9.7	-	-
	0l	4.1	-	-	10.4	-	-
	1	-1.0	-	-	11.0	-	-
	1a	4.6	-	-	12.9	-	-
	1b	9.1	-	-	14.0	-	-
	1c	10.3	3.9	-	14.4	5.6	-
	1d	11.0	3.7	-	15.0	6.5	-
	1e	4.5	1.0 ?	-	15.8	-	-
	2	0.7	-1.0	0.7	16.6	8.3	4.5
	3	14.7	6.7	3.3	18.5	10.7	5.5
	3a	17.4	9.0	4.8	19.1	11.3	5.7
	3b	16.8	8.6	4.3	20.2	11.7	6.0
	3c	19.1	-	-	20.7	-	-
	4	18.0	9.0	4.6	21.2	12.7	6.9
	4a	20.9	12.0	6.4	22.0	13.3	7.2
	5	16.0	7.9	4.4	22.7	14.0	7.5
	5a	21.0	12.2	-	23.1	14.2	-
	5b	21.0	12.0	6.8	23.4	14.0	8.0
	5c	21.3	12.3	6.8	23.5	14.4	8.0

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Ratio in log aperture

1	Δm	3/4	Δm	5	Δm	Mean
3.10						
3.00						
2.92						
2.40						
2.66 – 2.21	45					
2.68 – 2.14	54					
2.51 – 2.10	41					
2.90 – 2.04	86					
2.10 – 1.98	12					
2.14 – 1.92	22					
2.18 – 1.95	23					
2.88 – 1.87	101					
2.76 1.80	–					
2.01 1.59	117					
1.88 1.48	53					
1.80 1.44	44	2.92–2.56	36			
2.78 1.38	42	2.96–2.40	56			
1.30	148	–	–			
4.00?–1.23	> 3.00?	4.80?–2.14	> 2.66?	4.20	> 2.42?	Mean
1.41 – 1.06	35	2.37–1.84	53	3.04–2.78	46	45
1.16 – 1.01	15	2.02–1.77	25	2.72–2.58	18	19
1.22 – 0.94	28	2.09–1.73	26	2.83–2.54	33	29
1.01 – 0.90	11	– –	–	– – 2.50	–	11
1.10 – 0.87	23	2.02–1.61	39	2.76–2.34	42	35
0.89 – 0.82	07	1.70–1.55	15	2.42–2.29	13	12
1.28 – 0.77	51	2.19–1.48	71	2.81–2.25	56	59
0.86 – 0.74	14	1.68–1.46	22	– –	–	18
0.88 – 0.72	16	1.70–1.48	22	2.36–2.18	28	19
0.86 – 0.72	14	1.66–1.44	22	2.36–2.18	18	18

Resid.	Σh^2	μ
10, 8, 1	165	7.4
4, 7, 1	66	4.6
1, 3, 4	26	3.0
–	–	–
12, 4, 7	209	8.4
5, 3, 1	35	3.4
8, 12, 3	217	8.5
4, 4	32	4
3, 3, 1	19	2.4
4, 4, 0	32	3.3

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Arcturus reductions

Aperture / Line	1	3	5	1	3	5
5d	20.9	12.0	7.0	24.8	14.6	8.3
5e	21.9	12.4	7.1	24.4	15.0	8.5
6	20.2	11.9	7.0	24.5	15.0	8.7
7	19.0	5.8	5.5	25.2	15.5	9.0
7a	18.6	9.7	6.6	25.2	15.7	9.1
8	22.4	13.4	8.7	25.1	16.0	9.6
9	13.0	6.5	4.0	25.2	16.2	10.0
10	21.7	12.8	7.2	25.4	17.0	11.0
11	20.4	11.2	6.3	25.3	17.0	11.1
12	15.0	8.2	5.1	25.9	17.3	11.4
13	22.1	13.0	7.9	26.0	17.5	11.5
14	19.5	11.1	7.0	26.1	17.5	11.9
15	-	9.7	6.0	-	18.0	12.1
16	25.5	14.9	9.5	29.0	18.4	12.5
16a	27.3	-	9.5	28.6	-	12.5
17	25.7	16.0	11.0	29.1	18.6	12.9
18	23.4	13.2	8.1	28.8	18.5	12.6
19	20.9	11.1	7.1	28.6	18.4	12.6
19a	24.3	14.7	9.1	28.2	18.1	12.6
19b	24.7	14.7	9.0	28.0	18.0	12.3
20	24.0	14.2	9.0	28.0	17.8	12.2
20a	26.0	15.2	10.6	27.8	17.1	12.1
21	23.2	13.8	9.0	27.5	17.0	12.0
22	24.5	15.0	8.5	27.2	17.5	11.0
22a	26.8	-	11.0	27.3	-	11.7
22b	25.0	16.2	10.6	27.2	17.3	12.8
22c	24.0	-	-	27.2	-	-
23	22.1	12.6	7.7	27.1	17.1	11.6
24	22.5	13.0	9.2	27.0	17.1	11.4
24a	25.4	16.5	11.0	27.0	17.2	11.4
24b	26.0	16.0	11.0	26.9	16.7	11.4

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Ap.	1	Δm	3	Δm	5	Δm	Mean	Means - Residuals		
							Mean	Resid.	Eh^2	$\mu\alpha$
	0.89 - 0.62	27	1.70 - 1.42	28	2.32 - 2.14	18	24	3, 4, 6	61	4.4
	0.82 - 0.65	17	1.65 - 1.38	27	2.31 - 2.10	21	22	5, 5, 1	51	4.1
	0.94 - 0.64	30	1.71 - 1.38	33	2.32 - 2.07	26	29	1, 4, 4	33	3.3
	1.02 - 0.58	44	- 1.33		2.58 - 2.02	56	50	6, 6	72	6.8
	1.05 - 0.58	47	1.95 - 1.31	64	2.39 - 2.01	38	50	3, 14, 12	349	10.7
	0.79 - 0.59	20	1.54 - 1.28	16	2.07 - 1.96	01	16	4, 0, 5	41	3.7
	1.58 - 0.58	100	2.40 - 1.26	114	2.90 - 1.92	98	104	4, 10, 6	152	7.1
	0.84 - 0.57	27	1.60 - 1.20	40	2.29 - 1.80	49	39	12, 1, 10	245	9.0
	0.92 - 0.58	34	1.78 - 1.20	58	2.44 - 1.79	65	52	18, 6, 13	529	11.9
	1.38 - 0.53	85	2.15 - 1.17	98	2.66 - 1.76	90	91	6, 7, 1	86	5.3
	0.81 - 0.52	29	1.58 - 1.15	43	2.19 - 1.75	44	39	10, 4, 5	141	6.8
	0.98 - 0.51	47	1.79 - 1.15	64	2.32 - 1.71	61	57	10, 7, 4	164	7.4
	- -	-	1.95 - 1.10	85	2.50 - 1.69	81	83	2, 2	8	2
	0.56 - 0.30	26	1.39 - 1.07	32	1.98 - 1.64	24	27	1, 5, 3	35	3.4
	0.43 - 0.34	09	- -	-	1.98 - 1.64	34	?			
	0.55 - 0.29	26	1.28 - 1.05	23	1.80 - 1.59	21	23	3, 0, 2	13	2
	0.72 - 0.32	40	1.56 - 1.06	50	2.17 - 1.63	54	48	8, 2, 6	104	5.9
	0.89 - 0.34	55	1.79 - 1.07	72	2.31 - 1.63	68	65	10, 7, 3	158	7.2
	0.66 - 0.36	30	1.41 - 1.09	32	2.01 - 1.64	37	33	3, 1, 4	26	3.0
	0.62 - 0.38	24	1.41 - 1.10	31	2.02 - 1.66	36	30	6, 1, 6	73	4.8
	0.68 - 0.38	30	1.46 - 1.12	34	2.02 - 1.68	34	33	3, 1, 1	11	2
	0.52 - 0.40	12	1.36 - 1.19	17	1.85 - 1.69	16	15	3, 2, 1	14	2.2
	0.74 - 0.42	32	1.50 - 1.20	30	2.02 - 1.70	32	31	1, 1, 1	3	1
	0.64 - 0.44	20	1.38 - 1.15	18	2.10 - 1.80	30	22	2, 4, 8	84	5.2
	0.46 - 0.43	03	- -	-	1.80 - 1.73	07	05	2, 2	8	2
	0.60 - 0.44	16	1.26 - 1.17	09	1.85 - 1.60	15	13	3, 4, 2	29	3
	0.68 - 0.44	24	1.63 - 1.19	44	2.22 - 1.74	48	43	6, 1, 5	62	5.5
	0.81 - 0.44	37								
	0.78 - 0.45	33	1.58 - 1.19	39	2.00 - 1.76	24	32	1, 8, 8	129	6.5
	0.57 - 0.45	12	1.24 - 1.18	06	1.80 - 1.76	04	07	5, 1, 1	35	3.4
	0.52 - 0.46	06	1.28 - 1.22	06	1.80 - 1.76	04	05	1, 1, 1	3	1

For second setup measures + reductions see page 74

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Arcturus reductions

Aperture	n 1	n 3	n 5	m+n 1	m+n 3	m+n 5
25	16.5	7.6	6.1	27.0	16.8	11.5
25a	23.6	13.6	9.3	27.0	17.0	11.5
25b	24.0	14.2	9.2	27.0	17.0	11.5
25c	24.3	14.4	-	26.9	17.0	~~11.5~~
27	23.3	14.2	9.5	26.9	17.0	~~11.5~~
27a	25.0	15.5	11.2	26.8	17.2	11.8
28	24.2	15.4	10.5	27.0	17.2	11.9
29	23.7	14.5	10.2	26.9	17.1	11.9
29a	24.9	-	-	27.0	-	-
30	20.0	11.4	8.0	27.0	17.1	11.7
31	23.3	14.3	9.5	27.1	17.1	11.9
32	23.9	14.4	10.0	27.2	17.2	11.8
33	23.0	14.2	10.2	27.6	17.2	12.0
34	23.7		10.4	27.8		12.0
34a			-			-
34b			-			-
34c			-			-
34d			-			-
34e			-			-
38	Corrected 25.4	16.9 (13.7)	9.0	28.8	20.2	11.5
39	20.8	~~20.7~~	7.1	28.8	20.5	12.0
39a	28.0	20.1	11.5	28.6	20.7	12.2
40	9.7	11.5	2.7	29.0	21.0	12.2
40a	27.0	-	10.4	29.5	-	12.3
41	26.3	17.4	9.8	29.6	21.3	12.5
42	25.2	16.7	9.1	28.8	21.3	12.9
43	26.9	17.7	10.0	28.8	21.5	12.8
44	27.4	18.9	11.5	28.9	21.6	13.0
44a	27.0	17.4	-	29.0	21.8	-

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	1	Δm	3	Δm	5	Δm	Mean	Resid.	Eh² 469	μ
	1.24 -0.45	79	2.24 - 1.22	102	2.48-1.75	73	85	6, 17, 12		12.4
	0.78-0.45	33	1.52 - 1.26	32	1.99 1.75	24	30	3, 2, 6	49	4
	0.68 -0.45	23	1.46 -1.20	26	2.00 1.75	25	25	2, 1, 0	5	1.4
	0.66 -0.46	20	1.44 -1.20	24	- -	-	22	2, 2	8	2
	0.73 -0.46	27	1.46 -1.20	26	1.98-1.75	23	25	2, 1, 2	9	1.7
	0.60-0.46	14	1.33 -1.18	15	1.78-1.72	06	12	2, 3, 6	49	4
	0.66 -0.45	11	1.34 -1.18	16	1.87 -1.71	16	14	3, 2, 2	17	2.4
	0.70 -0.46	24	1.43 -1.19	24	1.89 -1.71	18	22	4, 2, 4	24	2.8
	0.61 -0.46	16	- -	—	- -	-	16	-	-	
	0.95 -0.45	50	1.76 -1.19	57	2.18 -1.73	45	51	1, 6, 6	73	4.8
	0.73 -0.44	29	1.45 -1.19	26	1.98 -1.71	27	27	2, 1, 0	5	1.4
	0.68 -0.44	24	1.44 -1.18	26	1.92 -1.72	20	23	1, 3, 3	19	2.4
	0.75-0.41	34	1.46 -1.18	28	1.89-1.70	19	26	7, 1, 8 / 8, 2, 7	114	6.1
	0.70 -0.40	30			1.87 -1.70	17	23			
					-					
					-					
					- -					
					- -					
					- -					
38	0.57 -0.32	25	1.21 -0.94	27	2.02-1.75	27	26			
39	0.90 -0.32	58	1.51 -0.92	59	2.31 -1.70	61	59			
39a	0.38 -0.34	04	0.94 -0.90	04	1.75-1.68	07	05			
40	1.95 -0.30	165	1.76 -0.88	87	3.17-1.68	149	133			
40a	0.45 -0.26	19	- -	-	1.87-1.66	21	20			
41	0.30 -0.25	25	1.16 -0.86	30	1.94-1.64	30	28			
42	0.58 -0.32	26	1.22 -0.86	36	2.01 -1.59	42	35			
43	0.46 -0.32	14	1.13 -0.85	48	1.92 -1.60	32	31			
44	0.42 -0.31	11	1.03 -0.84	19	1.75 -1.58	17	16			
44a	0.45 -0.30	15	1.16 -0.83	33	-		24			

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Arcturus reductions

	n			m+n		
	1	3	5	1	3	5
45	24.7	16.0	9.1	30.2	21.9	13.3
46	25.0	16.7	9.1	30.2	22.2	13.5
46a	26.7	17.6	9.7	30.2	22.3	13.7
47	24.2	15.6	9.4	30.3	22.3	13.7
47b	29.4 28.0	21.0 19.1	11.4	30.6 30.8	22.5 22.6	14.0 13.9
48	20.8	–	7.7	30.8	–	14.1
49	24.2	15.8	9.1	30.8	23.0	14.4
50	26.6	17.4	10.9	30.0	23.0	14.5
50a	27.9	18.4	–	31.1	23.0	–
51	26.4	17.4	10.0	31.1	23.3	14.6
52	23.0	14.6	8.0	31.2	23.4	14.9
52a	27.1	18.5	11.1	31.3	23.4	15.1
53	21.7	12.8	6.5	31.3	23.8	15.0
53a	24.2	15.1	8.1	31.4	23.9	15.0
53b	24.0	15.0	–	31.4	24.0	–
54	20.4	11.5	6.0	31.4	24.0	15.8
54a	26.9	–	9.1	31.8	–	16.3
54b	30.9 (26.5)	18.3	11.2	31.9	24.3	16.0
54c	29.8	21.7	14.6	32.0	24.5	16.0
55	22.1	13.7	8.0	32.0	24.7	16.1
56	29.5	21.1	14.2	32.0	24.7	16.1
56a	30.5	(22.5)	11.1	32.0	24.8	16.9
56b	28.0	18.4				
57	26.0	16.6 (21.5)	10.8	32.0	24.9	16.7
57a	30.0	16.5	14.5	32.0		16.5
57b	30.1	22.0	15.0	32.0	25.0	17.0
58	27.0	18.0	11.0	32.0	25.1	17.0
58a	29.8	21.3	14.0	31.7	25.3	17.0
59	29.2	20.7	13.6	31.9	25.4	17.0
59a	30.7	22.9	15.0	32.0	25.5	17.0

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	1			3		5		Mean Resid. μ
45	0.62	−0.20	42	1.28−0.82	46	2.01−1.55	46	44
46	0.60	−0.20	40	1.22−0.80	42	2.01−1.53	48	43
46a	0.47	−0.20	27	1.14 −0.80	34	1.95−1.51	44	35
47	0.66	−0.20	46	1.32 −0.80	52	2.00 −1.51	49	49
47a	0.27	−0.17	10	0.88 −0.78	10			
47b	0.38	−0.15	23	1.01 −0.78	23	1.76 −1.49	27	24
48	0.90	−0.15	75	− −	−	2.22 −1.47	75	75
49	0.66	−0.15	51	1.30 −0.75	55	2.01 −1.44	57	54
50	0.48	−0.13	35	1.16 −0.75	41	1.82 −1.43	39	38
50a	0.39	−0.12	27	1.07 −0.75	32	− −	−	30
51	0.49	−0.12	37	1.16 −0.73	43	1.92 −1.42	50	43
52	0.75	−0.12	63	1.42 −0.72	70	2.18 −1.39	79	71
52a	0.44	−0.11	33	1.06 −0.72	34	1.79 −1.37	42	36
53	0.84	−0.11	73	1.60 −0.72	88	2.40 −1.38	102	88
53a	0.66	−0.11	55	1.37 −0.69	68	2.17 −1.38	79	67
53b	0.68	−0.11	57	1.38 −0.68	70	− −	−	64
54	0.92	−0.11	81	1.75 −0.68	107	2.50 −1.30	120	103
54a	0.46	−0.09	37	− −	−	2.01 −1.26	75	
54b	0.48	−0.08	40	1.08 −0.66	42	1.78 −1.28	50	43
54c	0.24	−0.08	16	0.84 −0.64	20	1.42 −1.28	14	17
55	0.81	−0.08	73	1.51 −0.62	89	2.18 −1.27	91	84
56	0.26	−0.08	18	0.88 −0.62	26	1.46 −1.27	19	21
56a	0.18	−0.08	10	1.07 −0.62	45	1.79 −1.21	58	44
56b	0.38	−0.08	30					
57	0.52	−0.08	44	1.23 −0.61	62	1.83 −1.22	61	56
57a	0.22	−0.08	14	0.85 −0.61	23	1.43 −1.24	19	19
57b	0.21	−0.08	13	0.82 −0.60	22	1.38 −1.20	18	18
58	0.45	−0.08	37	1.10 −0.59	51	1.80 −1.20	60	49
58a	0.24	−0.09	15	0.86 −0.58	28	1.48 −1.20	28	24
59	0.28	−0.08	20	0.90 −0.57	33	1.52 −1.20	32	28
59a	0.16	−0.06	08	0.76 −0.56	20	1.38 −1.20	18	15

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Arcturus reductions

	n 1	n 3	n 5	m tn 1	m tn 3	m tn 5
60	29.5	21.1	14.0	31.9	25.6	17.0
60a	–	21.5	–	–	25.6	–
61	27.9	19.0	12.0	31.9	25.7	17.0
61a	30.6	22.8	14.9	31.9	25.8	17.0
62	18.4	12.2	7.0	28.9	25.8	17.0
63	26.4	20.6	12.5	29.1	25.9	17.0
64	26.4	21.0	13.9	29.1	26.0	17.8
65	26.6	21.2	14.0	29.0	26.0	18.0
66	23.2	17.3	10.5	29.0	26.2	17.5
67	26.0	20.1	13.0	29.0	26.3	18.0
67a	–	–		–	–	
68	26.1	20.8	13.1	29.1	26.3	18.0
69	27.2		14.6	29.0	26.5	18.0
69a	28.0		–	29.0	26.5	–
69b	27.8		15.2	29.1	26.5	18.0
70	27.0	22.4	15.0	29.1	26.5	18.0
71	26.3	21.0	13.8	29.1	26.9	18.0
72	27.4	22.2		29.1	27.0	
72a	28.7	25.3		29.1	27.1	
72b	28.4	25.0		29.3	27.2	
72c	27.2	22.9		29.3	27.3	
72d	27.5	23.0		29.4	27.3	
73	26.0	21.6		29.0	27.3	
73a	28.0	24.6		29.0	27.4	
73b	27.4	24.0		29.1	27.4	
74	27.6	24.5		29.2	27.6	
77	27.8	24.7		29.2	27.5	
78	27.7	24.4		29.2	27.6	
78a	28.2	25.9		29.3	27.8	

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Reduction to mag. difference

Aperture	1		3½		5		Mean Resid. μ
60	0.26 - 0.08	18	0.88 - 0.56	32	1.48 - 1.20	28	26
60a	- -		0.85 - 0.56	29	- -	-	29
61	0.39 - 0.08	31	1.02 - 0.55	47	1.70 - 1.20	50	43
61a	0.17 - 0.08	09	0.76 - 0.54	22	1.39 - 1.20	19	16
62	1.07 - 0.31	76	1.68 - 0.54	114	2.32 - 1.20	112	101
63	0.49 - 0.29	20	0.91 - 0.53	38	1.64 - 1.20	44	34
64	0.49 - 0.29	20	0.88 - 0.52	36	1.49 - 1.12	37	31
65	0.48 - 0.30	18	0.87 - 0.52	35	1.48 - 1.10	38	30
66	0.74 - 0.30	44	1.17 - 0.50	67	1.86 - 1.15	71	61
67	0.52 - 0.30	22	0.94 - 0.50	44	1.58 - 1.10	48	38
67a	- -	-	- -	-			-
68	0.51 - 0.29	22	0.90 - 0.50	40	1.57 - 1.10	47	36
69	0.44 - 0.30	14			1.42 - 1.10	32	23
69a	0.38 - 0.30	08			-		08
69b	0.40 - 0.29	11			1.36 - 1.10	26	18
70	0.45 - 0.29	16	0.79 - 0.48	31	1.38 - 1.10	26	24
71	0.50 - 0.29	21	0.88 - 0.47	41	1.50 - 1.10	26	29
72	0.42 - 0.29	13	0.80 - 0.45	35			24
72a	0.33 - 0.29	04	0.58 - 0.44	14			09
72b	0.35 - 0.29	06	0.60 - 0.44	16			11
72c	0.44 - 0.28	16	0.76 - 0.43	33			24
72d	0.42 - 0.28	14	0.75 - 0.43	32			23
73	0.52 - 0.27	25	0.84 - 0.43	41			33
73a	0.38 - 0.30	08	0.63 - 0.42	21			14
73b	0.42 - 0.30	12	0.68 - 0.42	26			19
76	0.41 - 0.29	12	0.64 - 0.41	23			18
77	0.40 - 0.28	12	0.62 - 0.42	20			16
78	0.40 - 0.28	12	0.65 - 0.41	24			18
78a	0.36 - 0.27	09	0.53 - 0.40	13			11

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Arcturus reductions

78b	28.1		29.3	
79	27.6	24.9	29.4	28.1
79a	27.1		29.4	
79b	28.0		29.3	
79c	28.0		29.3	
79d	28.0		29.1	
79e	28.0		29.1	
79f	28.0			

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	c				C
78b	0.37	−0.28	09		
79	0.41	−0.27	14	0.61 −0.37	24
79a	0.44	−0.27	17		
79b	0.38	−0.28	10		
79c	0.38	−0.28	10		
79d	0.38	−0.29	09		
79e	0.38	−0.29	09		

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Spectrum of Arcturus. Comparison from two instruments

Ident. auto λ. ~~MC 20797 C 18416~~

Line	λ
1	3933
2	3970
3	3982
3a	3990
4	3998
5	4005
6	4024
7	4030-35
8	4041
9	4046
10	4050-52
11	4055-57
12	4064
13	4067
14	4072
15	4077-9
16	4082-7
17	4089-92
18	4097
19	4101
20	4105-6
21	4117
22	4124
23	4132
24	4135
25	4144
26	4149-50
27	4152-56
27a	4161

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...ements.

MC 20797	C 18416 first setting	C 18416 second setting	MC 20797 − C 18416
−	−		
.65 ±.020	−		
.38	.45 ±.074		7
−	−		
.22 ±.07	.35 ±.08		13
.40 ±.08	.59 ±.08		19
.30 ±.05	.29 ±.03	✓	1
.59 ±.22	.50 ±.06	✓	9
.15 ±.05	.16 ±.04	✓	1
.76 ±.21	1.04 ±.07	✓	28
.28 ±0	.39 ±.09		11
.44 ±.04	.52 ±.12		8
.76 ±.12	.91 ±.05		15
.34 ±.04	.39 ±.07	✓	5
.48 ±.04	.57 ±.07	✓	19
.75 ±.13	.83 ±.02	✓	8
.35 ±.03	.27 ±.03	✓	8
.12 ±.03	.23 ±.02		11
.49 ±.01	.48 ±.06	✓	1
.74 ±.09	.65 ±.07	.67	7
.48 ±.06	.33 ±.02	.38	9
.46 ±.06	.31 ±.01	.43	3
.42 ±.07	.22	.38	4
.55 ±.07	.43 ±.05	.56	1
.72 ±.14	.32 ±.06	.47	25
.85 ±.15	.85 ±.12	.99	14
.49 ±.09		.45	4
.48 ±.08	.25 ±.02	.41	7
−			

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Arcturus. results from 2 insts

28	4165
29	4169
30	4172
31	4177
32	4182
33	4187
34	4191
35	4197
36	4202
37	4205
38	4210
39	4215
40	4227
41	4229
42	4233
43	4236
44	4240
45	4247
46	4254-5
47	4260-1
48	4272
49	4275
50	4281-2
51	4289-0
52	4299-00
53	4308
54	4315
55	4326
56	4330
57	4340
58	4352

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1924phae.proj.1099P

28	.43 ±.05	.14 ±.02	.32	11
29	.46 ±.08	.22	.37	9
30	.82 ±.17	.51	.65	17
31	.48 —	.27	.38	10
32	.50 ±.05	.23	.36	14
33	.46 ±.06	.26	.38	8
34	.55 —	.23	.36	19
35	.64 ±.08			
36	.65 ±.07			
37	.52 ±.06			
38	.25 ±.05	.26		1
39	.53 ±.08	.59		6
40	2.08 —	1.33		(65)
41	.44 ±.12	.28		16
42	.49 ±.06	.35		14
43	.32 ±.02	.31		1
44	.19 ±.01	.16		3
45	.48 ±.02	.44		4
46	.44 ±.02	.43		1
47	.59 ±.01	.49		10
48	.98 ±.06	.75		23
49	.64 ±.02	.54		10
50	.52 ±.06	.38		14
51	.60 ±.05	.43		17
52	.88 ±.06	.71		17
53	1.17 ±.12	.88		29
54	1.42 ±.25	1.03		39
55	.97 ±.09	.84		13
56	.25 ±.06	.21		4
57	.71 ±.08	.56		15
58	.55 ±.05	.49		6

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Arcturus. Results from 2 lists

59	4359
60	4367
61	4374
62	4384
63	4391-2
64	4395
65	4401
66	4405
67	4408
68	4415
69	4422
70	4430
71	4435
72	4444
73	4462
74	4469
75	4473
76	4481
77	4490-7
~~78~~	4494-7
79	4536
80	4572
81	4580
82	4647
83	4668
84	4698-03
85	4727
86	4754?
87	4772
88	4824
89	4832

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1924phae.proj.1099p

	MC 20797	C18416	
59	.29 ± .03	.28	1
60	.32 ± .05	.26	6
61	.53 ± .04	.43	10
62	1.04 ± .16	1.01	3
63	.43 ± .09	.34	9
64	.37 ± .03	.31	6
65	.37 ± .06	.30	7
66	.82 ± .16	.61	21
67	.46 ± .06	.38	8
68	.50 ± .06	.36	14
69	.38 ± .08	.23	15
70	.36 ± .05	.24 30	12
71	.49 ± .07	.29 41	20
72	.42 ± .05	35	
73	.58 ± .06	41	
74	.36 ± .08		
75	.36 ± .08		
76	.36 ± .03	23	
77	.35 ± .05	20	
78	.40 ± .05	24	
79	.53 ± .08		
80	.27 ± .03		
81	.30 ± .09		
82	.28 ± .04		
83	.37 ± .01		
84	.41 ± .01		
85	.25 ± .07		
86	.27 ± .05		
87	.42 ± .03		
88	.12 ± .02		
89	.14 ± .04		

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1924phae.proj.1099P

Arcturus. Results from 2 visits.

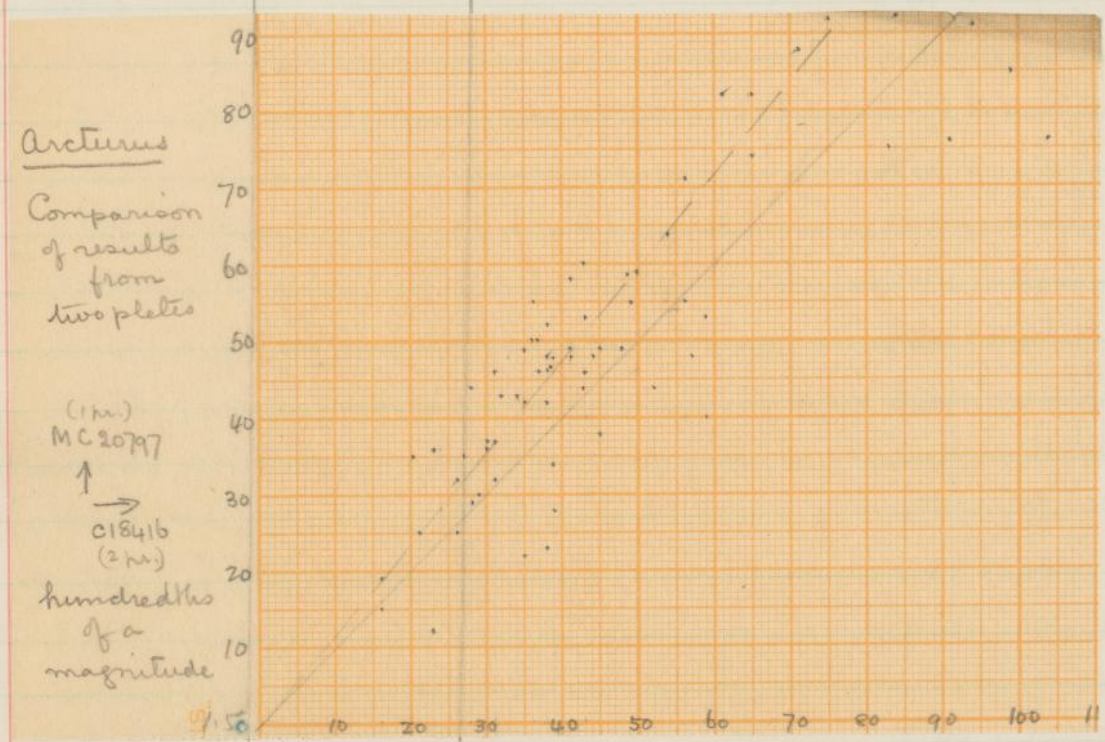
90	4855
91	4861
92	
93	
94	
95	
96	

Small systematic difference, MC 20797 giving stronger systematic lines. Error .15 mag at largest, about .07 mag at intensity of majority of lines

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1924phae.proj.10090

	MC 20797	C 18416
90	.31 ± .07	
91	.27 ± .02	
92	.25 ± .02	
93	.22 ± .10	
94	.31 ± .02	
95	.22 ± .10	
96	.27 ± .10	



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1924phae.proj.1099p

Scale of 2 prism C plates

Measures for scale of 2 prism C plates. from C 18416

	Line	
Measured by E.A.B.	1	0.0
	1a	1.6
	1b	2.3
	1c	3
	1d	3.7
	1e	4.5
3970	2	5.6
	2a	7
3982	3	7.8
	3a	8.7
	3b	9.1
	3c	9.8
3998	4	10.3
	4a	10.8
4005	5	11.5
	5a	11.8
	5b	12.3
	5c	12.7
	5d	13.2
	5e	13.8
4024	6	14.2
4030	7	15.2
	7a	15.6
4041	8	16.7
4046	9	17.4
4050	10	18.8
4055	11	19.2
4064	12	20.0
4067	13	20.6

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4072	14	21.2	
4077-9	15	22.2	
4082-87	16	23.3	
4089-92	17	24.3	
4097	18	25.8	
4101	19	25.5	
	19a	26.0	
	19b	26.7	
4105-6	20	27.0	
	20a	27.5	(4.2)
4117	21	27.8	(4.5)
4124	22	28.8	(5.2)
	22a	29.2	(5.8)
	22b	29.3	(6.0)
4132	23	29.6	(6.3)
4135	24	30.0	(6.7)
	24a	30.3	(7.0)
	24b	30.7	(7.4)
4144	25	31.3	(8.0)
	25a	32.0	(8.7)
	25b	32.4	(9.1)
	25c	32.6	(9.3)
	27.0	32.9	(9.6)
	27a	33.5	(10.2)
4165	28	34.	(10.7)
4169	29	34.3	(11.0)
	29a	34.6	(11.3)
4172	30	35.	(11.7)
4177	31	35.6	(12.3)
4182	32	36.	(12.8)

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1924phae.proj.1099p

Scale of 2 prism C plate

		36.8	
4187	33	~~13.5~~	(13.5)
4191	34	37.3 ~~14.~~	(14.0)
	34a	38 ~~14.7~~	(14.7)
	34b	38.3 ~~15~~	(15)
	34c	38.8	(15.5)
	34d	39.	(15.8)
	34e	39.3	(16.0)
4210	38	39.8	(16.5)
4213	39	40.5	(17.2)
	39a	40.9	(17.6)
4227	40	41.8	(18.5)
	40a	42.3	(19.0)
4229	41	42.7	(19.4)
4233	42	43.0	(19.7)
4236	43	43.5	(20.2)
4240	44	43.8	(20.5)
	44a	44.5	(21.2)
4247	45	44.8	(21.5)
4254-5	46	45.3	(22.0)
~~4260-61~~	46a	45.8	(22.5)
4260-61	47	46.	(22.8)
	47a	46.5	(23.2)
	47b	46.9	(23.6)
4272	48	47.3	(24)
4275	49	47.7	(24.4)
4281-2	50	48.4	(25.1)
~~4289-90~~	50a	48.6	(25.3)
4289-90	51	49.	(25.7)
4299-00	52	49.5	(26.2)
	52a	50.0	(26.7)

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4308	53	50.7	(27.4)
	53a	51.0	(27.8
	53b	51.5	(28.2
4315	54	51.7	(28.4
	54a	52.4	(0.7)
	54b	53.2	(1.5)
	54c	53.5	(1.8)
4326	55	53.7	(2.0)
4330	56	54.2	(2.5)
	56a	55.0	(3.4)
4340	57	55.3	(3.6)
	57a	55.7	(4.0)
	57b	56.0	(4.3)
4352	58	56.5	(4.8)
	58a	56.9	(5.2)
4359	59	57.4	(5.7)
	59a	57.8	(6.1)
4367	60	58.2	(6.5)
4374	61	59.0	(7.4)
	61a	59.5	(7.8)
4384	62	60.0	(8.3)

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72 Scale div. to mag. for Arcturus c 1846

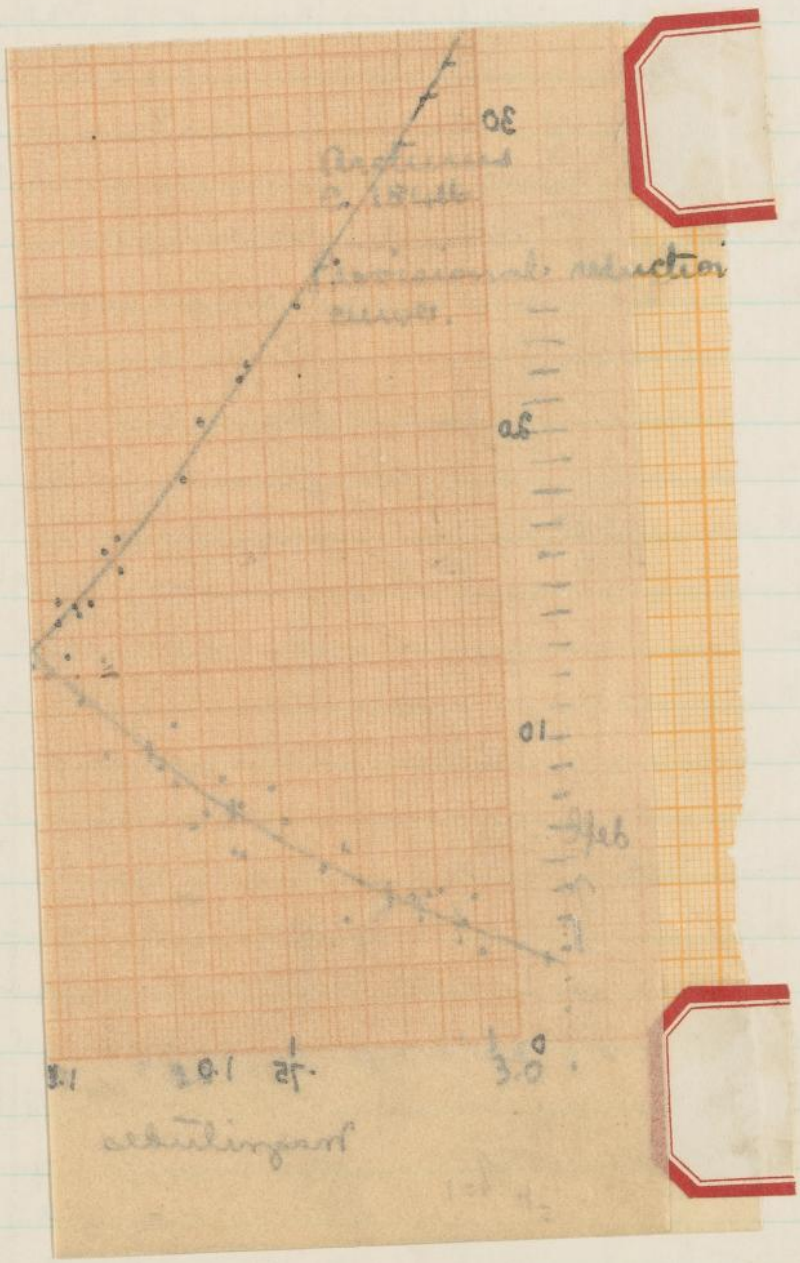
	26	3.18	51	2.66	76	2.24	101	1.91	126	1.63	151	1.37	176	1.14	201	0.94	226	0.78
2	27	3.17	52	2.64	77	2.22	102	1.89	127	1.62	152	1.36	177	1.13	202	0.94	227	0.77
3	28	3.16	53	2.62	78	2.21	103	1.88	128	1.60	153	1.35	178	1.12	203	0.93	228	0.76
4	29	3.16	54	2.60	79	2.19	104	1.87	129	1.59	154	1.34	179	1.11	204	0.92	229	0.76
5	30	3.10	55	2.58	80	2.18	105	1.86	130	1.58	155	1.33	180	1.10	205	0.92	230	0.75
6	31	3.08	56	2.56	81	2.17	106	1.85	131	1.57	156	1.32	181	1.09	206	0.91	231	0.74
7	32	3.06	57	2.54	82	2.15	107	1.84	132	1.56	157	1.31	182	1.08	207	0.90	232	0.74
8	33	3.04	58	2.53	83	2.14	108	1.83	133	1.55	158	1.30	183	1.08	208	0.90	233	0.73
9	34	3.02	59	2.51	84	2.12	109	1.82	134	1.54	159	1.29	184	1.07	209	0.89	234	0.72
10	35	3.00	60	2.50	85	2.10	110	1.80	135	1.53	160	1.28	185	1.06	210	0.88	235	0.72
11	36	2.98	61	2.48	86	2.09	111	1.79	136	1.52	161	1.27	186	1.05	211	0.88	236	0.71
12	37	2.96	62	2.46	87	2.07	112	1.78	137	1.51	162	1.26	187	1.04	212	0.87	237	0.70
13	38	2.94	63	2.44	88	2.06	113	1.77	138	1.50	163	1.26	188	1.04	213	0.86	238	0.69
14	39	2.92	64	2.42	89	2.04	114	1.76	139	1.49	164	1.25	189	1.03	214	0.86	239	0.68
15	40	2.90	65	2.40	90	2.02	115	1.75	140	1.48	165	1.24	190	1.02	215	0.85	240	0.68
16	41	2.88	66	2.39	91	2.01	116	1.74	141	1.47	166	1.24	191	1.01	216	0.84	241	0.67
17	42	2.86	67	2.37	92	2.00	117	1.73	142	1.46	167	1.22	192	1.00	217	0.84	242	0.66
18	43	2.83	68	2.36	93	1.99	118	1.72	143	1.45	168	1.22	193	1.00	218	0.83	243	0.66
19	44	2.81	69	2.34	94	1.98	119	1.71	144	1.44	169	1.21	194	0.99	219	0.82	244	0.65
20	45	2.78	70	2.32	95	1.98	120	1.70	145	1.43	170	1.20	195	0.98	220	0.82	245	0.64
21	46	2.76	71	2.31	96	1.96	121	1.69	146	1.42	171	1.19	196	0.98	221	0.81	246	0.63
22	47	2.74	72	2.29	97	1.95	122	1.68	147	1.41	172	1.18	197	0.97	222	0.80	247	0.62
23	48	2.72	73	2.28	98	1.94	123	1.66	148	1.40	173	1.17	198	0.96	223	0.80	248	0.62
24	49	2.70	74	2.26	99	1.93	124	1.65	149	1.39	174	1.16	199	0.96	224	0.79	249	0.61
25	50	2.68	75	2.25	100	1.92	125	1.64	150	1.38	175	1.15	200	0.95	225	0.78	250	0.60

3.20

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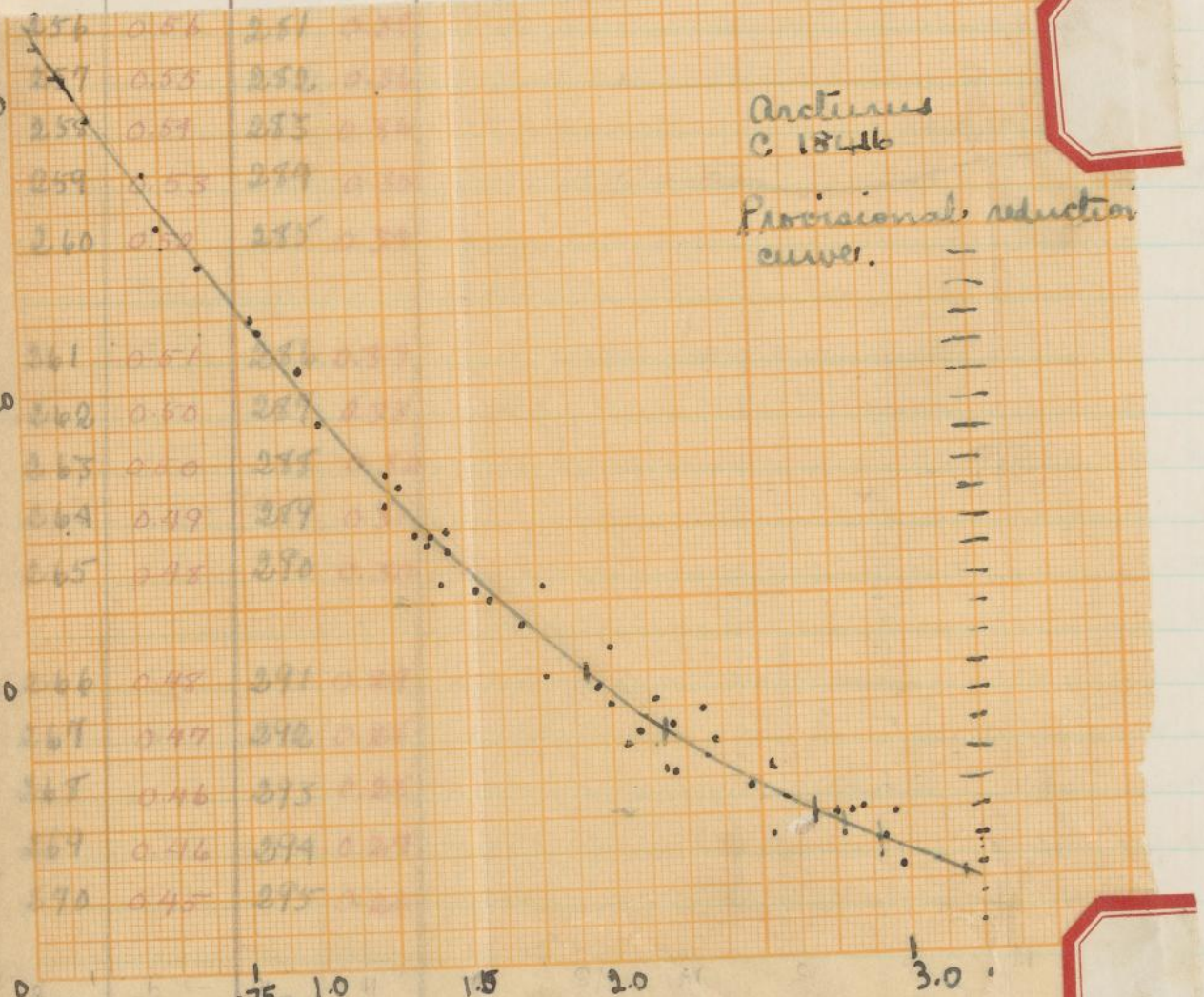
78	251	0.59	276	0.41
77	252	0.58	277	040
76	253	0.58	278	0.40
.76	254	0.57	279	0.39
75	255	0.56	280	0.38
74	256	0.56	281	0.37
.74	257	0.55	282	0.36
73	258	0.54	283	0.36
72	259	0.53	284	0.35
72	260	0.52	285	0.34
71	261	0.51	286	0.34
70	262	0.50	287	0.33
69	263	0.50	288	0.32
68	264	0.49	289	0.31
68	265	0.48	290	0.30
.67	266	0.48	291	0.29
66	267	0.47	292	0.28
.66	268	0.46	293	0.28
.65	269	0.46	294	0.27
64	270	0.45	295	0.26
63	271	0.44	296	0.25
.62	272	0.44	297	0.24
.62	273	0.43	298	0.24
.61	274	0.42	299	0.23
.60	275	0.42	300	0.22



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0.77	251	0.59	276	0.41
0.77	252	0.58	277	040
0.76	253	0.58	278	0.40
0.76	254	0.57	279	0.39
0.75	255	0.56	280	0.38



0.63	271	0.44	296	
0.62	272	0.43	297	
0.62	273	0.43	298	
0.61	274	0.42	299	0.23
0.60	275	0.42	300	0.22

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1924phae.proj.1099p

Arcturus Second Setting reductions

Aperture	n = 1	n = 3	n = 5	m+n = 1	m+n = 3	m+n = 5
19	20.9			29.3	18.4	12.6
19a				29.2	18.1	–
19b				29.1	18.0	12.9
20				29.1	18.0	12.9
20a				29.2	18.3	12.8
21				29.31	18.0	12.9
22				29.3	18.2	12.7
22a				29.3	–	13.0
22b				29.0	18.2	12.9
22c				29.1	~~18.1~~	~~13.4~~ 12.9
23				29.1	18.1	13.4
24				29.4	18.2	13.0
24a				29.2	18.2	13.0
24b				29.1	17.7	13.0
25				29.0	17.8	13.1
25a				29.3	18.0	–
25b				29.2	18.0	–
25c				29.2	18.0	~~13.4~~
27				29.0	18.0	13.4
27a				29.1	18.2	13.4
28				29.2	18.2	13.4
29				29.2	18.2	13.4
29a				29.1	–	–
30				29.0	18.2	13.1
31				29.1	18.2	13.2
32				28.9	18.3	13.0
33				29.0	18.3	13.0
34				29.5	–	13.0

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19	0.89	−0.28	61	1.29	−1.09	72	2.31	−1.63	68	67
19a	0.66	−0.28	38	1.41	−1.09	32	2.01	—	40?	38
19b	0.62	−0.29	33	1.41	−1.10	31	2.02	−1.59	43	36
20	0.68	−0.29	39	1.46	−1.10	36	2.02	−1.59	43	39
20a	0.52	−0.28	24	1.36	−1.08	28	1.85	−1.60	25	26
21	0.74	−0.29	45	1.50	−1.10	40	2.02	−1.59	43	43
22	0.64	−0.28	36	1.38	−1.08	30	2.10	−1.61	49	38
22a	0.46	−0.28	18	—	—	—	1.80	−1.58	22	20
22b	0.60	−0.30	30	1.26	−1.08	28	1.85	−1.59	26	25
22c	0.68	−0.29	49	—	—	—	—	—	—	49
23	0.81	−0.29	52	1.63	−1.09	54	2.22	−1.59	63	56
24	0.78	−0.27	51	1.58	−1.09	49	2.00	−1.58	42	47
24a	0.57	−0.28	29	1.24	−1.08	16	1.80	−1.58	22	22
24b	0.52	−0.29	23	1.28	−1.13	15	1.80	−1.58	22	20
25	1.24	−0.30	94	2.24	−1.12	112	2.48	−1.57	91	99
25a	0.78	−0.28	50	1.52	−1.10	42	1.99	—	44?	45
25b	0.68	−0.28	40	1.46	−1.10	36	2.00	—	45?	40
25c	0.66	−0.28	38	1.44	−1.10	34	—	—	—	36
27	0.73	−0.30	43	1.46	−1.10	36	1.98	−1.54	44	41
27a	0.60	−0.29	31	1.33	−1.08	25	1.78	−1.56	22	39
28	0.66	−0.28	38	1.34	−1.08	26	1.87	−1.54	33	32
29	0.70	−0.28	42	1.43	−1.08	35	1.89	−1.54	35	37
29a	0.61	−0.29	32	—	—	—	—	—	—	32
30	0.95	−0.30	65	1.76	−1.08	68	2.18	−1.57	61	65
31	0.73	−0.29	34	1.45	−1.08	37	1.98	−1.56	42	38
32	0.68	−0.29	39	1.44	−1.08	36	1.92	−1.58	34	36
33	0.75	−0.31	44	1.46	−1.08	38	1.89	−1.58	31	38
34	0.70	−0.26	44				1.87	−1.58	29	36

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Line widths in spectrum of Arcturus, in mm

λ		MC 20790 1	MC 20790 3	MC 20790 5	C 18416 1	C 18416 3	C 18416 5		Reduced Width in Angstroms		Ratio 18416/20790	Remarks
3933	1				40			40:	–	21.6	–	
3970	2	30.		30.	40	35	40	38	30.5 ~~162~~	20.5	1.3	very difficult on MC
4046	9	7.5	7.0	7.2	8	8	9	8.3	8.7	5.4	1.2	blend in MC
4064	12	5.0	3.5	4.2	8	7.5	7	7.5	5.3	5.0	1.8	✓ blend in MC
4072	14	4.0	2.5	3.2	6	6.5	7	6.5	4.1	4.4	2.0	✓ good
4144	25	6.0	4.0	5.0	7	7	8	7.3	7.0	5.5	1.4	good
4172	30	3.5	4.0	3.8	5	7	7	6.3	5.6	4.9	1.7	✓ good one side
4215	39	4.0	3.0	3.5	6	7	7	6.6	5.45	5.5	1.8	✓ good
4227	40	7.0	6.0	6.5	7	11	9	9	10.5	7.5	1.4	good. blend in MC
4326	55	5.5	6.0	5.8	7	9	9	8.6	9.8	7.8	1.5	blend in MC
4352	58	3.5	3.0	3.2	5	4	5	4.8	5.4	4.1	1.4	medium
4384	62	4.0	6.0	5.0	6	6	6	6	8.5	5.5	1.2	blend in MC
4405	66	–	3.0	3.0	5	4	4	4.3	4.1	3.9	1.4	poor
4415	68	2.5	2.5	2.5	–	–	5	5	4.2	4.5	2.0	✓ poor
										Mean	1.6	

Distance, 2 to 40, on MC 20790 = 190 mm
on C 18416 = 362 mm

Ratio = $\frac{362}{190}$ = 1.9

The best agreement is not, however, for the widest lines

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	NC 20797 Depth	Width	Intensity Angstrom-mag.	C 18416 Depth	Width	Intensity Angstrom-mag.	20797-18416
NC	.38	30.5	11.59	.45	20.5	9.25	2.3
	.76	8.7	6.6	1.04	5.4	5.6	1.0
	.76	5.3	4.0	.91	5.0	4.5	-0.5
	.48	4.1	2.0	.57	4.4	2.5	-0.5
	.85	7.0	5.9	.99	5.5	5.5	0.4
	.82	5.6	4.6	.65	4.9	3.2	1.4
	.53	5.45	2.9	.59	5.5	3.2	-0.3
NC	(2.08)	10.5	—	1.33	7.5	9.97	
	.97	9.8	9.6	.84	7.8	6.6	3.0
	.55	5.4	3.0	.49	4.1	2.0	1.0
	1.04	8.5	8.5	1.01	5.5	5.6	2.9
	.82	4.1	3.4	.61	3.9	2.4	1.0
	.50	4.2	2.1	.36	4.5	1.6	0.5

Mean +0.9

Reid, 14, 1, 14, 14, 5, 5, 12, 21, 1, 20, 1, 4

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3950-4000	9.0
4000-4050	8.3
4050-4100	7.6
4100-4150	6.3
4150-4200	6.2
4200-4250	6.3
4250-4300	5.9
4300-4350	5.9
4350-4400	5.0

λ	A per mm	mm per A
3950	6.25	.16
3960	.65	1.5
3970		
3980		
3990		
4000	.65	1.5
4010		
4020		
4030		
4040		
4050	.87	1.1
4060		
4070		
4080		
4090		
4100	1.9	0.9
4110		
4120		
4130		
4140		

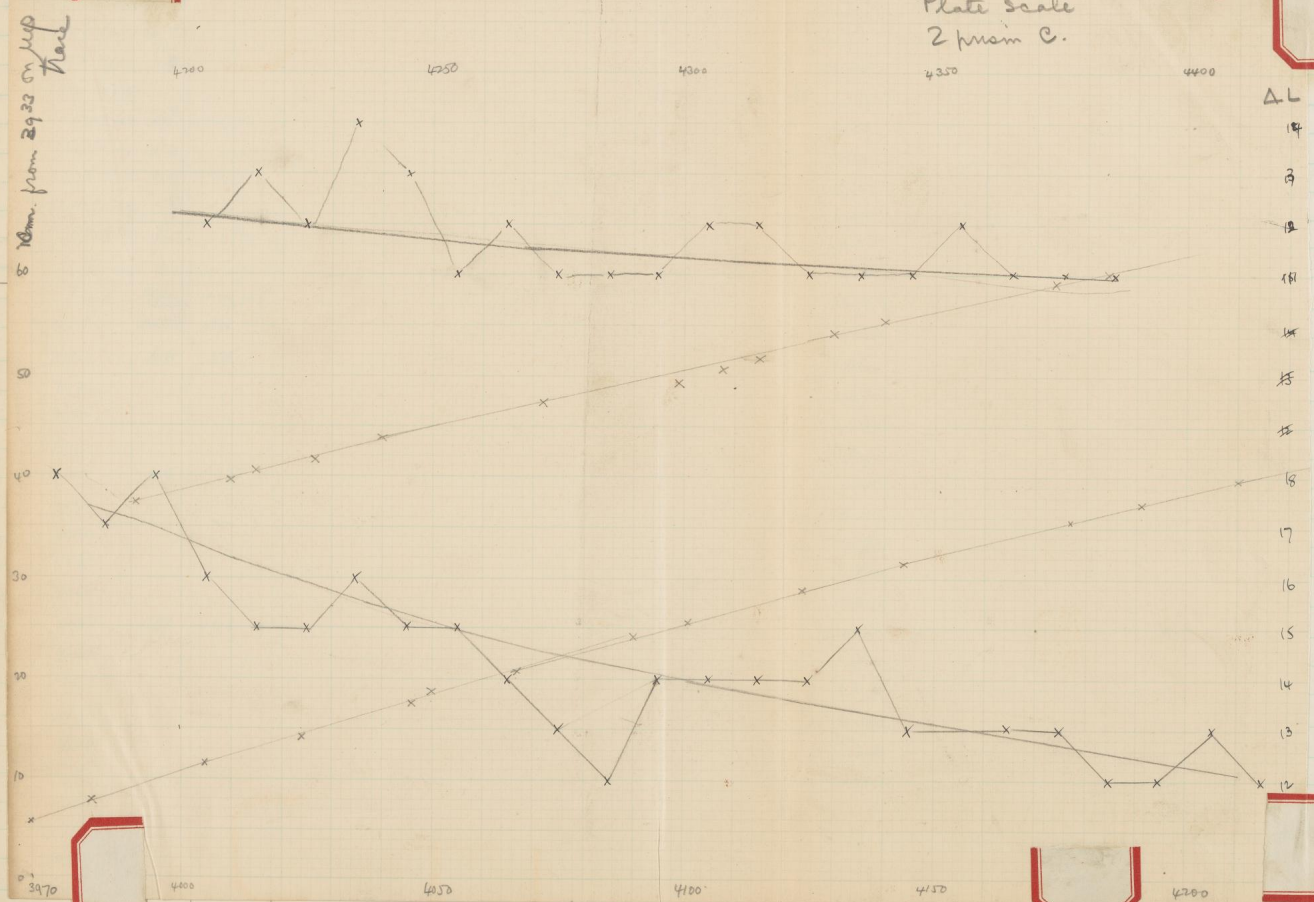
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λ	A per mm	mm per A
4150	2.8	
4160		
4170		
4180		
4190		
4200		
4210		
4220		
4230		
4240		
4250		
4260		
4270		
4280		
4290		
4300		
4310		
4320		
4330		
4340		
4350		
4360		
4370		
4380		
4390		
4400		

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Plate scale
2 mm = 1 A.



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Scale of the C plates from page 78.

λ	Measure L mm	Δλ	λ L	mean	A per mm	mean	mm per A
3970	5.5.						
		10	18	18	.54	.54	1.8
3980	7.3.						
		10	17	17	.58	.56	1.7
3990	9.0.						
		10	18	17	.58	.58	1.7
4000	108						
		10	16	17	.58	.60	1.7
4010	124						
		10	15	16	.62	.61	1.6
4020	139						
		10	15	16	.62	.62	1.6
4030	154						
		10	16	16	.62	.63	1.6
4040	170						
		10	15	15	.66	.65	1.5
4050	185						
		10	15	15	.66	.66	1.5
4060	200						
		10	14	15	.66	.67	1.5
4070	214						
		10	13	15	.66	.68	1.5
4080	227						
		10	12	14	.71	.69	1.4
4090	239						
		10	14	14	.71	.70	1.4
4100	253						
		10	14	14	.71	.71	1.4
4110	267						
		10	14	14	.71	.72	1.4
4120	281						
		10	14	14	.71	.73	1.4
4130	295						
		10	15	13	.77	.74	1.3
4140	310						
		10	13	13	.77	.75	1.3
4150	323						
		10		13	.77	.76	1.3
4160	334						
		10	13	13	.77	.77	1.3
4170	347						
		10	13	13	.77	.78	1.3
4180	360						
		10	12	13	.77	.79	1.3
4190	372						
		10	14	12	.83	.80	1.2
4200	386						
		10	12	12	.83	.81	1.2
4210	398						
		10	13	12	.83	.82	1.2
4220	411						
		10	12	12	.83	.83	1.2
4230	423						
		10	14	12	.83	.84	1.2
4240	437						
		10	13	12	.83	.85	1.2
4250	450						
		10	11	11	.91	.80	1.1

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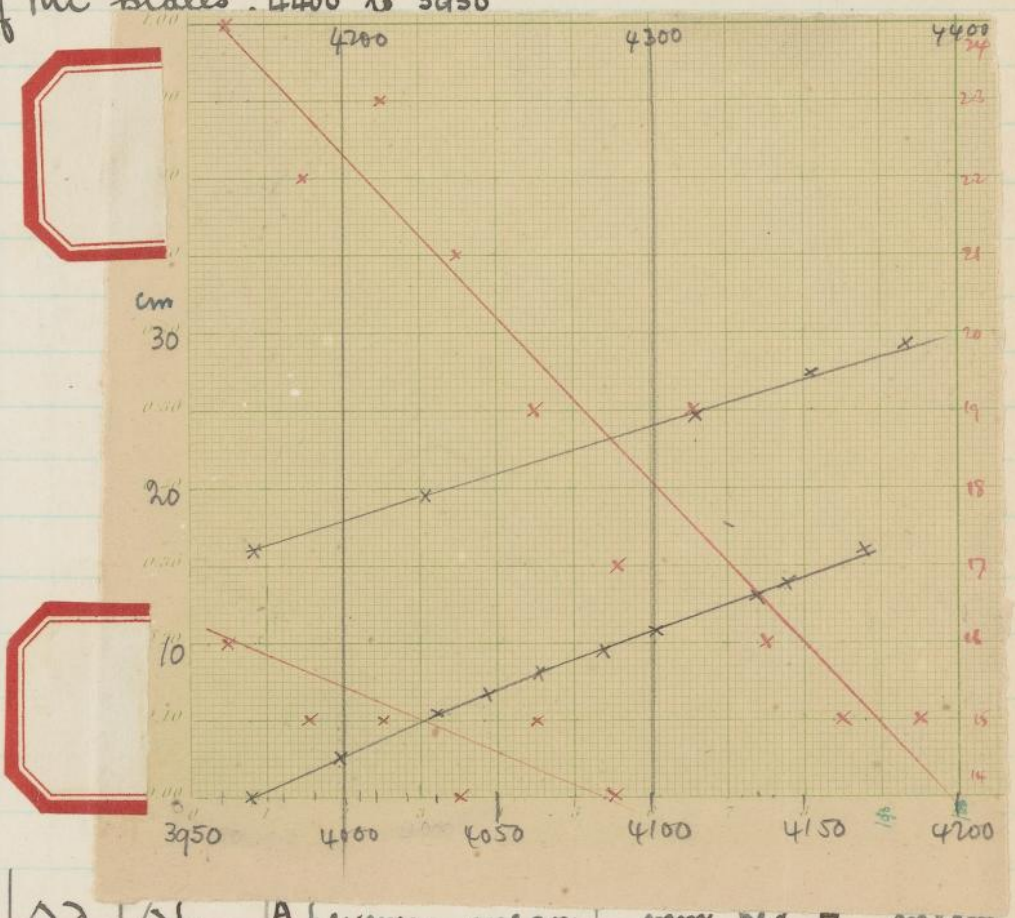
4260	461	10	12	11	.91	.87	1.1
4270	473	10	11	11	.91	.88	1.1
4280	484	10	11	11	.91	.89	1.1
4290	495	10	11	11	.91	.90	1.1
4300	506	10	11	11	.91	.91	1.1
4310	517	10	12	11	.91		1.1
4320	529	10	12	11	.91		1.1
4330	542	10	11	11	.91		1.1
4340	552	10	11	11	.91		1.1
4350	563	10	11	11	.91		1.1
4360	574	10	12	11	.91		1.1
4370	586	10	11	11	.91		1.1
4380	597	10	11	11	.91		1.1
4390	608	10	11	11	.91		1.1
4400	619						

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Scale of MC plates. 4400 to 3950

	line	
3970	2	0
3998	4	2.6
4030	7	5.5
4046	9	6.6
4064	12	8.0
4082-7	16	9.5
4101	19	10.9
4135	24	13.0
4144	25	13.9
4172	30	16.0
4227	40	19.6
4315	54	24.7
4352	56	27.3
4384	62	29.2



	L mm	Δλ	ΔL	mean	A per mm	mean	mm per A	mean
3950	-20							
3975	+04	25	24	24	1.0	same	.96	.96
4000	+26	25	22	23	1.1	"	.92	.92
4025	+49	25	23	22	1.1	"	.88	.88
4050	+70	25	21	21	1.2	"	.84	.84
4075	+89	25	19	20	1.2	"	.80	.80
4100	+106	25	17	19	1.3	"	.76	.76
4125	+125	25	19	18	1.4	"	.72	.72
4150	+141	25	16	17	1.5	"	.68	.68
4175	+160	25	19	16	1.6	"	.64	.66
4200	+179	25	19	16	1.6	"	.64	.64
4225	+195	25	16	16	1.6	"	.64	.62
4250	+210	25	15	15	1.7	"	.60	.61
4275	+225	25	15	15	1.7	"	.60	.60

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λ	L mm	Δλ	Δ l mean	Aper mm	mean	mm per A	
4300	+240						
4325	+255	25	15 15	1.7	"	.60	.60
4350	+269	25	14 15	1.7	"	.60	.60
4375	+284	25	15 14	1.8	"	.52	.58
4400	+298	25	14 14	1.8	"	.52	.56

From Book 7, p. 44

4400				1.7		.58	.55
4450				1.8			.54
4500				1.9		.53	.53
4550				2.0			.50
4600				2.1		.48	.48
4650				2.2			.46
4700				2.3		.43	.43
4750				2.4			.40
4800				2.5		.38	.38
4850				2.6			.36
4900				2.7		.33	.33

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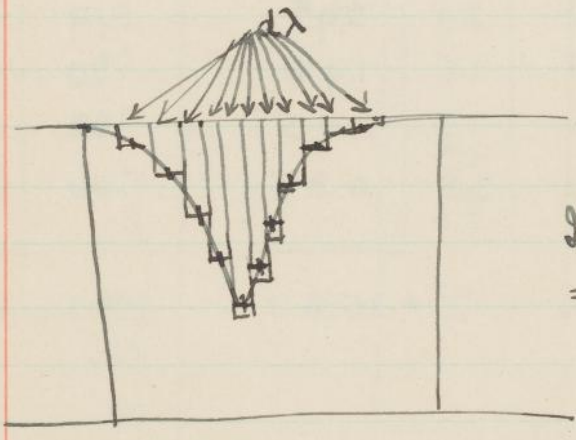
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Spectrum of Vega
Comparison of C and MC plates
MC plate direct from Bk 6 and H.R. 28

Intensity $\underline{I}_\lambda$ of lines, measured in Angstrom-magnitudes



$\underline{I} = \sum d\lambda\, dm$

or $dE = \sum d\lambda\, dl$ where dl = light loss

$\underline{E}_\lambda$ energy of cont. background

$= \sum d\lambda\, dE_\lambda$ for each λ,

energy absorbed by line

$$= \sum d\lambda\, dl / d\lambda\, dE_\lambda = \sum \frac{dl}{dE_\lambda}$$

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1924ohae.proj.1099p

Vega. Hβ. MC 20790. From H.R. 28. *

λ	Δm	Resid.	Σh²	μ	Intensity °A-mag.	dl	dλdl
4877	.11	4,4	32	4	.55	.10	.50
4872	.23	3,2	13	2.5	1.15	.19	1.14
4866	.50	-	-	-	2.50	.37	1.85
4861	.95	-	-	-	4.75	.58	2.90
4856	.73	3,2	13	2.5	3.65	.49	2.45
4851	.38	2,1	5	1.5	1.90	.30	1.50
4846	.19	1,1,2	6	1.4	0.95	.23	1.38
4840	.07	0,3,2	13	2.5 2.0	0.35	.06	.36
					Σ = 15.80	2.32	12.08

* Rup. 67

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1924phae.proj.1099p

C1842B
λ

Δm	Resid.	Σh²	μ	dl	Σdl	dλdl
.03			-	.03		
.04			-	.04		
.06			-	.05		
.06			6	.05		
.10	0		7	.09		
.10			6	.09		
.11	11		9	.10		
.17			4	.14		
.25	23		7	.20		
.30			6	.24		
.50	50		4	.37		
.80			4	.52		
1.10	95		1	.64		
.74			4	.49		
.47	73		1	.35		
.25			2	.21		
.18	38		2	.15		
.12			3	.10		
.09	19		3	.08		
.06			3	.05		
.04	07		4	.04		
~~.01~~			-	4.03		
	0			× 3.25		
				= 13.1 = Σdλdl		

5.47 × 3.42
= 18.7
August 1 mean magnitudes

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1924mae.proj.1099p

Vega Hγ MC 20790

λ	Δm	Resid	Σh²	μ	Int. Δm	dλ/dl	dλ db
4358	.10	8,17	113	7.5	.40	.09	.36
4354	.27	5,5	50	5	1.35	.22	1.10
4349	.52	7,8	113	7.5	2.08	.38	1.52
4345	.86	6,16,11	413	11.7	4.30	.55	2.75
4340	1.62	–	–		6.48	.78	3.12
4336	.92	8,17,5,3	387	9.8 ~~11.4~~	4.60	.57	2.85
4331	.55	0,15,10,7	374	9.6 ~~11.1~~	2.20	.40	1.60
4327	.29	9,9,11,8	347	9.3 ~~10.8~~	1.45	.23	1.15
4322	.17	7,7,8,5	187	6.9 ~~7.9~~	.68	.14	.56
					23.54		15.01

Check 5.30×4.5

$(\sum \Delta m) \times \frac{\text{mean}}{d\lambda} = 23.85$

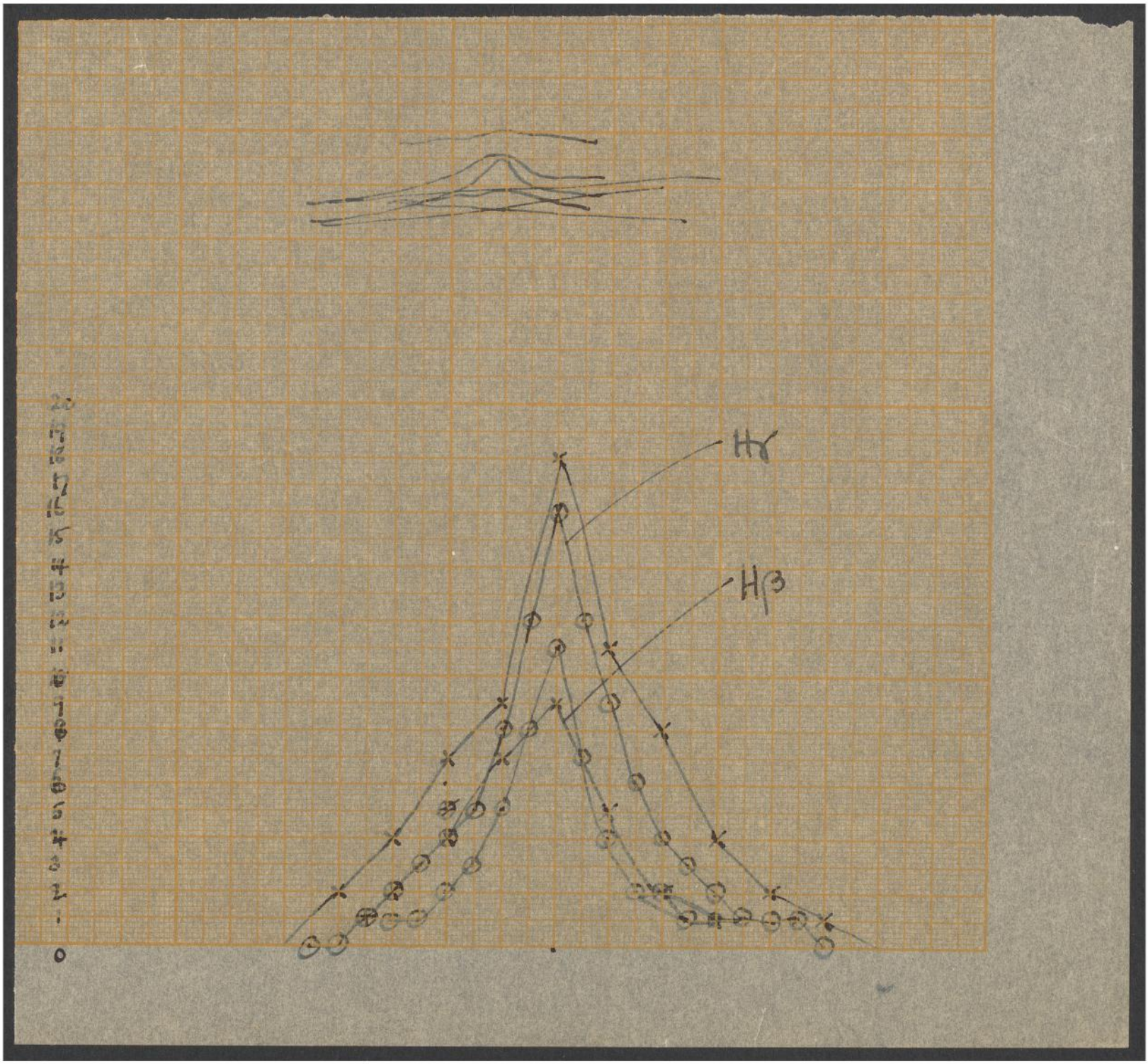
3.37 ×4.5
~~36~~
15.16

1924phae.proj.1099P

λ	Δm	Read	Σh^2	μ	Int.	dl	dλdl
	00					.00	
	02					.02	
	04					.04	
	14					.12	
	16	27				.14	
	22					.18	
	27	52				.22	
	39	27				.30	
	57	86				.41	
	90	84				.56	
	134	162				.71	
	90	92				.56	
	61	92				.43	
	48					.36	
	36	55				.28	
	30					.24	
	20	24				.17	
	14					.12	
	12	17				.11	
	06					.05	
Σ						5.02	14.4

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Vega H8 — Mc 20790

λ	Δm.	Resid.	Σh²	μ	Lwr Am	dl	dλ dl
4116	.19	±1,3	13	2.5	.76	.16	.64
4112	.37	±1,3	13	2.5	1.11	.29	.87
4109	.67	±5,5	50	5	2.68	.46	1.84
4105	.92	18,17		17.5	2.76	.57	1.71
4102	1.82	=		-	7.28	.81	3.24
4098	1.11	-		-	3.33	.64	1.92
4095	.80	0,0		0	3.20	.52	2.08
4091	.36	4,±4		4	1.08	.28	.84
4088	.22	±2,±5,8	93	5.6	.66	.18	.72
4084	.15	±5,±5,10	150	7	.60	.13	.52
					23.46	4.04	14.38

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		Σh^2	u	$\Delta u t$	dl	$d\lambda dl$
~~03~~ 03					.03	
06					.05	
11	14				.10	
16					.14	
25	37				.21	
31					.25	
43	67				.33	
56					.40	
89	92				.56	
121					.67	
161	182				.77	
114					.65	
81	111				.53	
51					.37	
38	80				.29	
26					~~.25~~ .21	
17	36				~~.17~~ .14	
10					~~.11~~ .09	
02	22				~~.07~~ .02	
00					~~.02~~ .00	
	15				~~.00~~	
					5.81	10.5

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Vega He

MC 20790

λ	Δw	Resid.	Σh²	μ	Int Arm	dl	dI/dl
3986	.11	1, 1	2	1	.33	.10	.30
3983	.23	1, 8, 7, 4	130	5.7	.69	.19	.57
3980	.48	3, 8, 4, 7	138	5.9	1.92	.36	1.44
3976	.80	–	–	–	2.40	.52	1.56
3973	1.17	–	–	–	3.51	.66	1.98
3970	1.60	–	–	–	4.80	.77	2.21
3967	(1.17)	–	–	–	3.51	.66	1.98
3964	.62	–	–	–	2.48	.44	1.76
3960	.65	5, 5	50	5	1.95	.45	1.35
3957	.32	2, 7, 8	117	5.4	.96	.26	1.78
3954	.13	3, 3, 1, 7	68	4.1	.39	.11	.33
					23.94	4.52	14.26

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		dl	
02		.02	
02		.02	
05		.05	
07		.06	
11	11	.10	10
12		.10	
20	23	.17	19
30		.24	
39	48	.30	36
50		.37	~~51~~
62	80	.44	52
~~82~~		.53	~~64~~
110	117	.64	66
148		.74	77
180	160	.81	77
155		.76	
111	117	.64	66
82		.53	
56	62	.40	44
46		.35	
37	65	.29	45
21		.18	
15	32	.13	26
07		.06	
05	13	.05	11
01		.01	
-02		.02	
		8.01	10.8
		~~×2.75~~	
		~~= 22.03~~	

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Vega K, H3 MC I 0790

λ	Δm	Resid.	Sh²	μ	Int.	dl	dλ/dl
3936	.05	0,0	0	0	.15	.05	.15
3933	.23	1,3,3,7	68	4.1	.69	.19	.57
3930	.11	1,4,4,4,4	65	3.6	.33	.10	.30
					1.17	.34	1.02
3899	.50	–	–	–	2.00	.37	1.48
3895	.77	–	–	–	2.21	.51	1.53
3892	1.07	–	–	–	3.21	.63	1.89
3889	*(1.42)	–	–	–	2.84	.73	1.46
3887	1.10	–	–	–	3.30	.64	1.92
3884	.75	–	–	–	2.25	.50	1.50
3880	.42	–	–	–	1.68	.32	.96
					17.49	3.70	9.74

*not a "plotted mean" difference

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	μ	dl
04	4	.04
08	3	.07
12	2	.10
14	4	.12
21	4	.18
32	7	.26
41	5	.31
49		.46
67		.55
86		.55
103		.61
135		.71
170		~~.85~~ .78
204		.85 73
162		.78
119		.67
94		.58
71		.48
58		.41
48		.36
37		.29
31		.25
22		.18
16		.14
09		.08
03		~~04~~ .03
02		.02
01		.01
00		.00
		9.87

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Vega Hγ

	μ	dl
09	1	.08
18	2	.15
15	1	.13
26	2	.21
34	3	.27
41	4	.31
57	6	.41
69	3	.47
87	3	~~.64~~ .55
112	0	~~.73~~ .64
144	0	~~.83~~ .73
193?	2	~~.93~~ .83
223?	2	.87
178?	2	.81
135?	2	.71
90	0	.56
68	2	.47
53	1	.39
~~50~~	2	.31
30	2	.24
24	0	.20
18	3	.15
12	4	~~.07~~ .10
08	5	.07
07	5	.06
04	4	.04
08	8	.07
04	4	.04
04	4	.04
03	3	.03
91	1	9965 .01

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1924phae.proj.1099p

Spectra of Vega, 11-inch, 2 prisms.

Background conventionally inserted by drawing a straight line tangent at the wings.
Half mm. scale used in measuring.

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Grating	μφ	l	m	n	w	m+n	l+m+n = 138
ap. 1.	45	65	9	64		73	
(Scale div. from line center: negative to violet)	40	62	13	63		76	
	35	61	16	61.5		77.5	
	30	57	21.5	60		81.5	
	25	53	26	59		85	
	20	48	32	58		90	
	15	41	41	56.5		97.5	
	10	34	49	55		104	
	5	26	58	54		112	
Hη	0	23	63	52.5	140?	115.5	w wing incomplete
	5	28	59	51		110	
	10	39	49	50		99	
	15	43	36	49		85	
	20	64	27	47.5		74.5	
	25	71	21	46		67	
	30	77	16	45		61	
	35	83	11	44		55	
	40	88	8	42.5		50.5	
	45	92	5	41		46	
	50	95	3	40		43	
	55	99	1	38		39	
	65	100	1	37		38	
	60		1.5	26		27.5	
	55		2	25		27	
	50		3	24.5		27.5	
	45		4.5	24		28.5	
	40		7	23.5		30.5	
	35		9.5	23		32.5	
	30		13	22.5		35.5	
	25		18	22		40.0	

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l	m	n	w	m+n
20	24.5	21.5		46.0
15	33	21		54
10	44 ~~58~~	20		64
5	58	19.5		77.5
H3 0	65	19	115	84
5	56	18.5		74.5
10	40	18		58
15	29.5	17.5		47
20	21	17		38
25	16	16.5		32.5
30	11.5	16		27.5
35	8.5	15.5		24
40	6	15		21
45	4	14.5		18.5
50	2.5	14		16.5
55	1.0	13.5		14.5
60	0.0	13		13
5	2.5	8		10.5
K 0	3	8	14	11
5	0	8		8
70	1	6		7
65	1	6		7
60	1.5	6		7.5
55	1.5	6		7.5
50	2	6		8
45	2	6		8
40	3	6		9
35	3	6		9
30	5	6		11
25	7	6		13
20	10	6		16

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	l	m	n	w	m+n
	15	13	6		19
	10	21	6		27
	5	34	6		40
	Hε 0	41	6	90	47
	−5	31	6		37
	−10	19	6		25
	−15	12	6		18
	−20	8	6		14
	−25	6	6		12
	−30	4	6		10
	−35	2.5	6		8.5
	−40	1.5	6		7.5
	−45	1	6		7
	−50	0.5	6		6.5
	−55	0.2	6		6.2
	−60	0.0	6		6.0
μφ 12	50	0	0		0
	45	0.2	0		0.2
	40	0.5	0		0.5
	35	1	0		1
	30	1.5	0		1.5
	25	2	0		2
	20	3	0		3
	15	4	0		4
	10	7	0		7
	5	14	0		14
	Hδ 0	22	0	80	22
	−5	12	0		12
	−10	7	0		7
	−15	3.5	0		35

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	l	m	n	w	m+n
	- 20	2.5	0	~~2.5~~	2.5
	- 25	1.5	0	~~1.5~~	1.5
	- 30	1	0	~~1~~	1
	- 35	0.5	0		0.5
	- 40	0.2	0		0.2
μφ13.	40	0	4		4
	35	1	4		5
	30	1	4		5
	25	1.3	4		5.3
	20	2	4		6
	15	3	4		7
	10	5	4		9
	5	9	4		13
Hγ	0	17	4	80	21
	- 5	10	4		14
	- 10	5.5	4		9.5
	- 15	4	4		8
	- 20	2.5	4		6.5
	- 25	2	4		6
	- 30	1	4		5
	- 35	1	4		5
	- 40	0.5	4		4.5
	- 45	0.2	4		4.2
μφ15.	40	1	10		11
	35	1	10		11
	30	0.5	10.5		11
	25	2.3	10.7		13
	20	3	11		14
	15	4.5	11		15.5
	10	8	11		19

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	l	m	n	w	m + n
5		15	11		26
Hβ 0		25	11	85	36
−5		14	11		25
−10		8	11		19
−15		5	11		16
−20		3	11.5		14.5
−25		1.5	11.5		13
−30		1	11.5		12.5
−35		0.5	12		12.5
−40		0	12		12

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1924phae.proj.1099p

Vega
Aperture 2
Tracing 4016

l	m	n	w	m+n
	0			
70	~~65~~	38		38
65	1	37		38
60	2	36.5		38.5
55	4.5	36.		40.5
50	4.5	35.5		40
45	6.	34.5		40.5
40	9.	34		43
35	14.	34		48
30	15.	33		48
25	~~29~~. 21.	32.5		53.5
20	~~36~~. 29.	32		61
15	~~47~~. 36.	31.5		67.5
10	~~47~~. 47.	31		78
5	~~65~~. 61.	30.5		91.5
~~H 3~~ 0	68.	30	130	98
-5	55	29		84
-10	40	29		69
-15	29	28		57
-20	21	27.5		48.5
-25	16	27		43
-30	(13)	26.5		39.5
-35	(10.5)	26		36.5
-40	(8)	25.5		33.5
-45	6	25		31
-50	3	24		27
-55	1	24		25
-60	1	23		24
-65	0	22.5		22.5

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1924phae.proj.1099p

	l	m	n	w	m+n
5			125⁻		125⁻
K 0			118		125⁻
-5			121		125⁻
70					—
65					—
60					—
55			127		127
50			126		127
45			125⁻		127
40			124		127
35			123		127
30			121		127
25			119		127
20			115⁻		127
15			111		127
10			102		126
5			87		126
He 0			79	120	126
-5			89		126
-10			103		126
-15			112		126
-20			115⁻?		126
-25			116?		126
-30			118?		126
-35			120?		126
-40			122		125⁻
-45			124		125⁻
-50			124		125⁻
-55			125⁻		125⁻
-60			125⁻		125⁻

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1924phAe..proj.1099P

	l	m	n	w	m+n
50			5⁻		6
45			"		7
40			"		7
35			"		7.5⁻
30			"		9
25			"		9
20			"		11
10			"		13.
15			"		18.
5			"		25.
Hδ 0			"		35.
-5			"		24
-10			"		17
-15			"		12
-20			"		10
-25			"		8
-30			"		6
-35			"		6
-40			"		5⁻
-45			"		5⁻
40					
35					
30					
25					
20					
15					
10					
5					
Hγ 0					

useless

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1924phae.proj.1099p

	l	m	n	w	m+w
	−5				
	−10				
	−15				
	−20				
	−25				
	−30	useless			
	−35				
	−40				
	−45				
	40		45		45
	35		46		46
	30		46		47
	25		47		48
	20		47		50
	15		48		58
	10		48		61
	5		49		64
Hβ	0		49		73
	−5		50		65
	−10		51		60
	−15		51		56
	−20		52		54
	−25		52		53
	−30		53		53
	−35		53		54
	−40		54		54
	−45		54		55

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Aperture	l	m	n	w	m+n
4 ϕ 19	90		~~3~~ 74		75
	85		72		75
	80		71		74
	75		70		73
	70		67		72
	65		65		71
	60		66		70
	55		64		69
	50		60		68
	45		57		67
	40		53		66
	35		52		65
	30		49		64
	25		45		63
	20		40		62
	15		33		61
	10		28		61
	5		24		60
H ~~4~~ 19	0		19	123	59
	-5		22		58
	-10		24		57
	~~-15 -20~~		27		54
	-20		30		55
	-25		33		54
	-30		35		53
	-35		39		52
	-40		40		51
	-45		42		50
	-50		45		49
	-55		44		49
	-60		46		48

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aperture 3	l	m	n	w	m+n
	70	1	49.5		50.5
	65	1	49		50
	60	3	48		51
	55	5	47		52
	50	5	46		51
	45	8.	45		53
	40	13	44.5		57.5
	35	17	43.5		60.5
	30	22	43.		65
	25	32	42.		74
	20	35.	41		76
	15	41	40.5		81.5
	10	53	39.5		92.5
	5	63	38.5		101.5
H3	0	69.	38		107
	-5	60	37		97
	-10	45	36		81
	-15	36	35.5		71.5
	-20	27	35.		62
	-25	20	34		54
	-30	16	33		49
	-35	12	32.5		44.5
	-40	9	31.5		40.5
	-45	6	30.5		36.5
	-50	5	30		35
	-55	3	29		32
	-60	1	28		29
	-65	0	27.5		27.5
	-70	0	27		27

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Aperture 4	C	m	n	w	m+n
	5		113		114
K	0		103	15	115
	-5		104		115
	60		19 ~~21~~		123
	#55		21		123
	50		21		123
	45		23		122
	40		27		122
	35		30		122
	30		34		122
	25		40		122
	20		41		121
	15		56		121
	10		69		121
	5		89		121
H E	0		97	130	121
	-5		82		120
	-10		65		120
	-15		59		120
	-20		47		120
	-25		41		120
	-30		38		119
	-35		35		119
	-40		32		119
	-45		30		119
	-50		29		119
	-55		28		119
	-60		28		118
	-65		26		118

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Oph. 3

l	m	n	w	m+n
~~50~~		6		6
45		"		6
40		"		7
35		"		8
30		"		9
25		"		11
20		"		13
15		"		17
10		"		25
5		"		38
Hδ 0		"		48
-5		"		32
-10		"		22
-15		"		16
-20		"		12
-25		"		11
-30		"		9
-35		"		-
-40		"		-
-45		"		-

40
35
30
25
20
15
10
5
Hγ 0

Useless

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l	m	n	w	m+n
-5				
-10				
-15				
-20				
-25				
-30				
-35				
-40				
-45				
40				
35				
30				
25				
20				
15				
10				
5				
Hβ 0				
-5				
-10				
-15				
-20				
-25				
-30				
-35				
-40				
-45				

useless

useless

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~~Apt~~

Aperture	ℓ	m	n	w	m+n
3	Hγ				
50			64		70
45			65		74
40			67		78
35			68		82
30			69		88
25			70		93
20			71		99
15			73		107
10			74		114
5			75		120
0			76	130	124
-5			77		121
-10			79		116
-15			80		111
-20			81		108
-25			82		104
-30			83		100
-35			85		97
-40			86		93
-45			87		90
-50			88		88

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1924phae.proj.1099p

Aperture	l	m	n	w	m+n
70			63		63
65			62		66
60			61.5		67
55			60.5		67
50			60		67
45			59		69
40			58		72
35			57		75
30			56		78
25			55		82
20			54		88
15			53.5		95
10			52.5		103
5			51.5		110
H 3 0			51		114
-5			50		108
-10			49		97
-15			48		87
-20			47		77
-25			46		~~72~~
-30			45.5		66
-35			44.5		60
-40			43.5		57
-45			43		52
-50			42		49
-55			41		47
-60			40		42
-65			39		41
-70			38		40
-75			37.5		39

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Aperture 3 He

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	l	m	n	w	m + n
	50		14		14
	45		"		15
	40		"		16
	35		"		17
	30		"		18
	25		"		19
	20		"		20
	15		"		25
	10		"		31
	5		"		43
Hγ	0		"		59
	-5		"		44
	-10		"		32
	-15		"		26
	-20		"		23
	-25		"		21
	-30		"		19
	-35		"		17
	-40		"		17
	-45		"		16
	60		21		22
	55		21.5		23
	50		22		24
	45		23		25
	40		23		27
	35		23.5		27
	30		24		29
	25		25		30
	20		25.5		34

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	l	m	n	w	m+n
15			25.5		37
10			27		46
5			27		38
HB 0			28		69
-5			28		57
-10			29		46
~~-15~~			29		41
-20			30		37
-25			30.5		35
-30			31		34
-35			31.5		34
-40			32		34
-45			32.5		34

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1924phae.proj.10999

Hη

Vega C

Reductions

n	1	2	3	4	m+n	1	2	3	4
				164 ~~74~~					63 ~~75~~
				166 ~~72~~					63 ~~75~~
				167 ~~71~~					64 ~~74~~
				168 ~~70~~					65 ~~73~~
				171 ~~67~~					66 ~~72~~
				170 ~~68~~					67 ~~71~~
				172 ~~66~~					68 ~~70~~
			88	174 ~~64~~				88	69
			87	178 ~~60~~		73		90	70 ~~68~~
	64		86	181 ~~57~~		76		93	73 ~~67~~
	63		85	183 ~~56~~		77.5		97	72 ~~66~~
	61.5		83	186 ~~52~~		81.5		100	73 ~~66~~
	60		82	189 ~~49~~		85		104	74 ~~64~~
	59		81	193 ~~45~~		90		108	75 ~~63~~
	58		80	198 ~~40~~		97.5		111	76 ~~62~~
	56.5		79	205 ~~33~~		104		116	77 ~~61~~
	55			210 ~~28~~					78 ~~61~~
	54		77	214 ~~24~~		112		121	78 ~~60~~
				219					
0	52.5		76	219 ~~21~~		115.5		124	79 ~~57~~
	51		75	216 ~~22~~		110		120	80 ~~58~~
	50		74	214 ~~24~~		99		114	81 ~~57~~
	49		73	211 ~~27~~		85		107	82 ~~56~~
	47.5		71	208 ~~30~~		74.5		99	83 ~~55~~
	46		70	205 ~~33~~		67		93	84 ~~54~~
	45		69	203 ~~35~~		61		88	85 ~~53~~
	44		68	199 ~~39~~		55		82	86 ~~52~~
	42.5		67	198 ~~40~~		50.5		78	87 ~~51~~
	41		65	196 ~~42~~		46		74	88 ~~50~~
	40		64	193 ~~45~~		43		70	89 ~~49~~
	38			194 ~~44~~		39			89 ~~49~~ 44
	37			192 ~~46~~		38			90 48

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SR²	μ.	1	Δm	2	Δm	3 Δm To be averaged	Inverted 4	Δm	Mean	Inverted Resid.
4	1					00,02	2.13 – 2.11	02	01	1, 1
3	3					00,06	2.13 – 2.07	06	03	3, 3
3.5	3.5					00,07	2.11 – 2.04	07	04	4, 3
4	4					00,08	2.09 – 2.01	08	04	4, 4
7.5	7.5					00,15	2.07 – 1.92	15	08	8, 7
	4.5					00,09	2.04 – 1.95	09	04	4, 5
	5					02,12	2.01 – 1.89	12	07	5, 5
	5					03,13	1.98 – 1.85	13	08	5, 5
	4					08,16	1.95 – 1.79	16	12	4, 4
	3	2.11 – 1.87	24			15,21	1.92 – 1.71	21	18	3, 3
	0.5	2.13 – 1.82	31			23,24	1.89 – 1.65	24	24	1, 0
	1.5	2.17 – 1.80	37			28,31	1.87 – 1.56	31	30	2, 1
	2.5	2.22 – 1.70	52			43,38	1.85 – 1.47	38	40	3, 2
	1	2.25 – 1.59	66			54,52	1.84 – 1.32	52	53	1, 1
	2.5	2.28 – 1.44	84			70,65	1.82 – 1.17	65	68	2, 3
	0	2.32 – 1.20	112			90,90	1.80 – 0.90	90	90	0, 0
		2.36 – .93	143			135,114	1.80 – 0.66	114	(135)	(0, 21)
		2.38 – 0.45	193			178,152	1.79 – 0.27	152	(178)	0, 26
		2.42 – 0.19	223			223 —	1.77 – <0.00	>177	(223)	0, —
		2.44 – 0.66	178			193,164	1.74 – 0.10	164	(193)	0, 1
	0.5	2.46 – 1.11	135			143,144	1.71 – 0.27	144	144	1, 0
	0.5	2.49 – 1.59	90			112,111	1.68 – 0.57	111	112	0, 1
	3	2.54 – 1.84	70			84,90	1.65 – 0.75	90	87	3, 3
	3	2.58 – 2.04	54			66,72	1.62 – 0.90	72	69	3, 3
	5.5	2.61 – 2.18	43			52,63	1.59 – 0.96	63	57	5, 6
	4	2.64 – 2.36	28			37,45	1.56 – 1.11	45	41	4, 4
	3	2.68 – 2.45	23			31,36	1.53 – 1.17	36	34	4, 2
	1.5	2.73 – 2.58	15			24,27	1.50 – 1.23	27	26	2, 1
	—	2.75 – 2.67	08			—,15	1.47 – 1.32	15	15	—, 0
	—	2.81 – 2.78	03			—,18	1.47 – 1.29	18	18	—, 0
	—	2.83 – 2.81	02			—,09	1.44 – 1.35	09	09	—, 0

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43

	n 1	2	3	4	mrw 1	2	3	4
65		37	49.5	62		38	50	66
60	26	36.5	48	61.5	27.5	38.5	51	67
55	25	36	47	60.5	27	40.5	52	67
50	24.5	35.5	46	60	27.5	40	51	67
45	24	34.5	45	59	28.5	40.5	53	69
40	23.5	34	44.5	58	30.5	43	57.5	72
35	23	34	43.5	57	32.5	48	60.5	75
30	22.5	33	43	56	35.5	48	65	78
25	22	32.5	42	55	40.0	53.5	74	82
20	21.5	32	41	54	46.0	61	76	88
15	21	31.5	40.5	53.5	54	67.5	81.5	95
10	20	31	39.5	52.5	64	78	92.5	103
5	19.5	30.5	38.5	51.5	77.5	91.5	101.5	1.0
0	19	30	38	51	84	98	107	114
-5	18.5	29	37	50	74.5	84	97	108
-10	18	29	36	49	58	69	81	97
15	17.5	28	35.5	48	47	57	71.5	87
20	17	27.5	35	47	38	48.5	62	77
25	16.5	27	34	46	32.5	43	54	72
30	16	26.5	33	45.5	27.5	39.5	49	66
35	15.5	26	32.5	44.5	24	36.5	44.5	60
40	15	25.5	31.5	43.5	21	33.5	40.5	57
45	14.5	25	30.5	43	18.5	31	36.5	52
50	14	24	30	42	16.5	27	35	49
55	13.5	24	29	41	14.5	25	32	47
60	13	23	28	40	13	24	29	42
65	-	22.5	27.5	39	-	22.5	27.5	41
			27				27	40
								39

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First (red) reductions made with wrong table.
Ink entries not corrected. Should be × 3.
Correct entries are pencil.

1	Δm	2	Δm	3	Δm	4	Δm	Mean	Res.	$\frac{\Sigma h^2}{n}$	μ
~~1.06~~	—	0.94 − 0.94	~~00~~ 00	0.83 − 0.82	~~01~~ 03	0.72 − 0.69	~~03~~ 09	04	−, 4, 1, 5	14	4
1.06 − 1.04	~~02~~ 06	0.95 − 0.94	~~01~~ 03	0.84 − 0.81	~~03~~ 09	0.72 − 0.68	~~04~~ 12	08	2, 5, 1, 4	12	3
1.08 − 1.04	~~04~~ 12	0.95 − 0.92	~~03~~ 09	0.85 − 0.81	~~04~~ 12	0.73 − 0.68	~~05~~ 15	12	0, 3, 0, 3	4	2
1.08 − 1.04	~~04~~ 12	0.95 − 0.92	~~03~~ 09	0.86 − 0.81	~~05~~ 15	0.74 − 0.68	~~06~~ 18	14	2, 5, 1, 4	13	4
1.09 − 1.03	~~07~~ 21	0.96 − 0.91	~~05~~ 15	0.87 − 0.80	~~07~~ 21	0.75 − 0.66	~~09~~ 27	21	0, 6, 0, 6	18	4
1.10 − 1.00	~~10~~ 30	0.96 − 0.89	~~07~~ 21	0.88 − 0.76	~~12~~ 36	0.76 − 0.63	~~13~~ 39	32	2, 11, 4, 7	47	7
1.10 − 0.98	~~12~~ 36	0.96 − 0.84	~~12~~ 36	0.88 − 0.73	~~15~~ 45	0.77 − 0.61	~~16~~ 48	41	5, 5, 4, 7	29	5
1.10 − 0.95	~~15~~ 45	0.98 − 0.84	~~14~~ 42	0.89 − 0.70	~~19~~ 57	0.78 − 0.60	~~18~~ 54	49	1, 7, 8, 5	39	6
1.11 − 0.92	~~19~~ 57	0.99 − 0.80	~~19~~ 57	0.90 − 0.62	~~28~~ 84	0.79 − 0.56	~~23~~ 69	67	10, 10, 17, 7	134	12
1.12 − 0.86	~~26~~ 78	0.99 − 0.72	~~27~~ 81	0.91 − 0.61	~~30~~ 90	0.79 − 0.50	~~29~~ 87	86	8, , 5, 4, 1	26	5
1.12 − 0.79	~~33~~ 99	1.00 − 0.68	~~32~~ 96	0.92 − 0.57	~~35~~ 105	0.80 − 0.42	~~38~~ 114	103	4, 7, 2, 11	48	7
1.14 − 0.70	~~44~~ 132	1.00 − 0.60	~~40~~ 120	0.92 − 0.44	~~48~~ 144	0.80 − 0.32	~~48~~ 144	135	3, 15, 9, 9	99	10
1.15 − 0.60	~~55~~ 165	1.00 − 0.46	~~54~~ 162	0.93 − 0.34	~~59~~ 177	0.81 − 0.22	~~59~~ 177	170	5, 8, 7, 7	47	7
1.16 − 0.54	~~62~~ 186	1.01 − 0.39	~~72~~ 216	0.94 − 0.27	~~67~~ 201	0.81 − 0.10	~~71~~ 213	204	18, 12, 3, 9	140	12
1.17 − 0.61	~~56~~ 168	3.06 − 1.62	144	2.83 − 1.20	163	2.46 − 0.75	171	162	6, 18, 1, 9	110	10
1.18 − 0.76	~~42~~ 126	3.06 − 1.98	108	2.85 − 1.71	114	2.49 − 1.20	129	119	7, 11, 5, 10	74	9
1.19 − 0.85	~~34~~ 102	3.09 − 2.31	78	2.86 − 1.90	96	2.52 − 1.53	99	94	8, 16, 2, 5	87	9
1.20 − 0.94	~~26~~ 78	3.10 − 2.50	60	2.86 − 2.16	70	2.55 − 1.80	75	71	7, 11, 1, 4	47	7
1.21 − 0.98	~~23~~ 69	3.12 − 2.67	45	2.88 − 2.38	50	2.58 − 1.89	69	58	11, 13, 8, 11	119	11
1.22 − 1.04	~~18~~ 54	3.15 − 2.76	39	2.94 − 2.49	45	2.60 − 2.07	53	48	6, 9, 3, 5	38	6
1.23 − 1.09	~~14~~ 42	3.18 − 2.84	34	2.96 − 2.62	34	2.62 − 2.22	40	37	5, 3, 3, 3	13	4
1.24 − 1.12	~~12~~ 36	3.21 − 2.91	30	2.98 − 2.76	22	2.66 − 2.31	35	31	5, 1, 9, 4	31	6
1.24 − 1.17	~~07~~ 21	3.24 − 3.00	24	3.02 − 2.84	18	2.67 − 2.43	24	22	1, 4, 4, 2	9	3
1.25 − 1.21	~~04~~ 12	3.27 − 3.12	15	3.03 − 2.86	17	2.70 − 2.49	21	16	4, 1, 1, 5	11	3
1.26 − 1.24	~~02~~ 06	3.27 − 3.24	03	3.06 − 2.97	9	2.73 − 2.55	18	09	3, 6, 0, 9	32	6
1.27 − 1.27	~~00~~ 00	3.30 − 3.27	03	3.09 − 3.06	3	2.75 − 2.70	5	03	3, 0, 0, 2	3	2
—	—	3.34 − 3.32	02	3.10 − 3.10	0	2.78 − 2.73	5	02	0, 2, 3	4	2
				3.12 − 3.12	0	2.75	3	01	, 1, 2	2	1
						2.78	0	00	0	0	0

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He	n	1	(m+n) 2	3	4	m+n	1	This is m 2	3	4	N 1
								13		22	
K											
								13		23	
	6					7		13		23	4.23
	6					7				add 5	4.23
	6				26	7.5				15	4.23
	6		11		28	7.5		11		15	4.2
	6		12		28	8		11		15	4.2
	6		13		29	8		11		16	4.2
	6		14		30	9		11		16	4.2
	6		15		32	9		11		16	4.2
	6		17		35	11		11		16	4.2
	6		19		38	13		11		16	4.2
	6		23		41	16		11		17	4.2
	6		27		47	19		11		17	4.2
	6		36		59	27		12		17	4.2
	6		51		65	40		12		17	4.2
O	6		59		82	47		12		17	4.2
	6		49	no tracing	97	37		12	no tracings	18	4.2
	6		35		89	25		12		18	4.2
	6		26		69	18		12		18	4.2
	6		23		56	14		12		18	4.2
	6		22		41	12		12		18	4.2
	6		20		40	10		12		19	4.2
	6		18		34	8.5		12		19	4.2
	6		16		30	7.5		13		19	4.2
	6		14		27	7		13		19	4.2
	6		14		23	6.5		13		19	4.2
	6		13		21	6.2		13		19	4.2
	6		13		21	6.0		13		20	4.2
					19					20	

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Inverted

1	Δm	2	Δm	4 3	Δm		mean	Res	Sh²	M
		3.81		3.33						
		3.81		3.30						
		3.81								
4.23 -4.17	06			3.30		Values to be averaged	02			
4.23 -4.17	06	inverted		inverted			02			
4.23 -4.16	07	3.93 - 3.93		3.42 - 3.48	06	00, 00, 06	02	2, 2, 4	8	3
4.23 -4.16	07	3.93 - 3.87	00	3.42 - 3.39	03	01, 00, 03	01	0, 1, 2	2	1
4.23 -4.14	09	3.93 - 3.81	06	3.42 - 3.36	06	03, 06, 06	05	2, 1, 1	2	1
4.23 -4.14	09	3.93 - 3.75	12	3.33 - 3.30	03	06, 12, 03	07	1, 5, 4	13	4
4.23 -4.05	18	3.93 - 3.72	18	3.33 - 3.12	21	07, 18, 21	15	3, 3, 6	36	6
4.23 -4.05	18		21	3.33 - 3.03	30	13, 21, 30	21	8, 0, 9	48	7
4.23 -3.93	30	3.93 - 3.60	33	3.33 - 2.88	45	27, 33, 45	37	10, 4, 8	60	8
4.23 -3.81	42	3.93 - 3.48	45	3.33 - 2.75	58	36, 45, 58	46	10, 1, 12	60	8
4.23 - 3.66	57	3.93 - 3.30	63	3.30 - 2.73	57	48, 63, 57	56	8, 7, 1	38	6
4.23 - 3.48	75	3.93 - 3.12	81	3.30 - 2.34	96	68, 81, 96	82	14, 1, 14	131	11
4.23 - 3.12	111	3.87 - 2.86	101	3.30 - 1.98	132	99, 101, 132	111	12, 10, 21	228	15
4.23 - 2.75	148	3.87 - 2.44	143	3.30 - 1.47	183	140, 143, 183	155	15, 12, 28	384	20
4.23 - 2.55	168	3.87 - 2.25	162	3.30 - 1.20	210	168, 162, 210	180	12, 18, 30	459	21
4.23 - 2.83	140	3.87 - 2.49	138	3.27 - 1.68	159	148, 138, 109	148	0, 10, 11	74	9
4.23 - 3.24	99	3.87 - 2.86	101	3.27 - 2.09	118	111, 101, 118	110	1, 9, 8	49	7
4.23 - 3.54	68	3.87 - 3.18	69	3.27 - 2.25	102	75, 69, 102	82	7, 13, 20	206	14
4.23 - 3.75	48	3.87 - 3.30	57	3.27 - 2.55	72	57, 57, 72	62	5, 5, 10	50	7
4.23 - 3.87	36	3.87 - 3.33	54	3.27 - 2.73	54	42, 54, 54	50	8, 4, 4	32	6
4.23 - 3.96	27	3.87 - 3.42	45	3.24 - 2.81	43	30, 45, 43	39	9, 6, 4	44	7
4.23 - 4.10	13	3.87 - 3.54	33	3.24 - 2.86	38	18, 33, 38	30	12, 3, 8	78	9
4.23 - 4.16	07	3.81 - 3.66	15	3.24 - 2.97	27	18, 15, 27	20	2, 5, 7	26	5
4.23 - 4.17	06	3.81 - 3.75	06	3.24 - 3.03	21	09, 06, 21	12	3, 6, 9	42	6
4.23 - 4.20	03	3.81 - 3.75	06	3.24 - 3.06	18	09, 06, 18	11	3, 5, 7	15	4
4.23 - 4.22	01	3.81 - 3.81	00	3.24 - 3.09	15	07, 00, 15	07	0, 7, 8	38	6
4.23 - 4.23	00	3.81 - 3.81	00	3.18 - 3.09	09	07, 00, 09	05	2, 5, 4	15	4
				3.18 - 3.18	00	06, 00, 00	02	4, 2, 3	8	3
						06, 00, 00	02	4, 3, 2	8	3

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48

	n				m + n				
	1	2	3	4	1	2	3	4	1
50	0	5	6	–	0	6	6	–	4.98
45	0	5	6	–	0.2	7	6	–	4.98
40	0	5	6	–	0.5	7	7	–	4.98
etc.	0	5	6	–	1	7.5	8	–	4.98
30	0	5	6	–	1.5	9	9	–	4.99
	0	5	6	–	2	9	11	–	4.9
20	0	5	6	–	3	11	13	–	4.9
	0	5	6	–	4	13	17	–	4.9
10	0	5	6	–	7	18	25	–	4.98
	0	5	6	–	14	25	38	–	4.98
0	0	5	6	–	22	35	48	–	4.99 1.66
	0	5	6	–	12	24	32	–	4.98
10	0	5	6	–	7	17	22	–	4.97
	0	5	6	–	3.5	12	16	–	4.97
20	0	5	6	–	2.5	10	12	–	4.98
	0	5	6	–	1.5	8	11	–	4.98
30	0	5	6	–	1	6	9	–	4.98
	0	5	6	–	0.5	6	–	–	4.97
40	0	5	6	–	0.2	5	–	–	4.98
						5	–	–	

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1	Δm	2	Δm	3	Δm	4	Δm	Mean	Plates	Σh²	μ
4.98 − 4.98	00	4.32 − 4.23	9	4.23 − 4.23	0			03	3, 6, 3	18	4
4.98 − 4.94	04	4.32 − 4.17	15	4.23 − 4.23	0			06	2, 9, 6	40	6
4.98 − 4.86	12	4.32 − 4.17	15	4.23 − 4.17	6			11	1, 4, 5	14	4
4.98 − 4.74	24	4.32 − 4.16	16	4.23 − 4.14	9			16	8, 0, 7	38	6
4.98 − 4.68	30	4.32 − 4.05	27	4.23 − 4.05	18			25	5, 2, 7	26	5
4.98 − 4.62	36	4.32 − 4.05	27	4.23 − 3.93	30			31	5, 4, 1	14	4
4.98 − 4.50	48	4.32 − 3.93	39	4.23 − 3.81	42			43	5, 4, 1	14	4
4.98 − 4.44	54	4.32 − 3.81	51	4.23 − 3.60	63			56	2, 5, 7	26	5
4.98 − 4.17	81	4.32 − 3.54	78	4.23 − 3.24	109			89	8, 11, 20	195	14
4.98 − 3.75	123	4.32 − 3.24	108	4.23 − 2.81	132			121	2, 13, 11	98	10
4.98 − 3.33	165	4.32 − 2.86	146	4.23 − 2.52	171			161	4, 15, 10	114	11
~~1.66 − 1.11~~	~~55~~	~~1.44 − 0.95~~	~~49~~	1.41 − 0.84	57						
4.98 − 3.87	111	4.32 − 3.27	105	4.23 − 2.97	126			114	3, 9, 12	78	9
4.98 − 4.17	81	4.32 − 3.60	72	4.23 − 3.33	90			81	0, 9, 9	54	7
4.98 − 4.47	~~51~~ ##	4.32 − 3.87	45	4.23 − 3.66	57			51	0, 6, 6	24	5
4.98 − 4.56	42	4.32 − 3.96	36	4.23 − 3.87	36			38	4, 2, 2	8	3
4.98 − 4.68	30	4.32 − 4.14	18	4.23 − 3.93	30			26	4, 8, 4	32	6
4.98 − 4.74	24	4.32 − 4.23	#9	4.23 − 4.05	18			17	7, 8, 1	38	6
4.98 − 4.86	12	4.32 − 4.23	#9	4.23 − −	18			10	2, 1	2	1
4.98 − 4.94	4	4.32 − 4.32	#0	−	18			02	2, 2	4	2
		4.32 − 4.32	0	−	8			00	0	0	0

no tracing

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Hr	n 1	2	3	4	m+n 1	2	3	4	1
50		–	–	14				14	
45		–	–	14				15	
40	4	–	–	14	4			16	4.4
35	4	–	–	14	5			17	
30	4	–	–	14	5			18	
25	4	–	–	14	5.3			19	
20	4	–	–	14	6			20	
15	4	–	–	14	7			25	
10	4	–	–	14	9			31	
5	4	–	–	14	13			43	
0	4	–	–	14	21			59	6.44
-5	4	–	–	14	14			44	
-10	4	–	–	14	9.5			32	
-15	4	–	–	14	8			26	
-20	4	–	–	14	6.5			23	
	4	–	–	14	6			21	
30	4	–	–	14	5			19	
	4	–	–	14	5			17	
40	4	–	–	14	4.5			17	
	4	–	–	14	4.2			16	

no tracing

no tracing

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1	Δm	2	Δm	3	Δm	4	Δm	Mean	Res.	Σh²	μ
						3.75 – 3.75	00	00	0	0	0
						– 3.72	03	02	1	1	1
4.44 – 4.44	00					– 3.66	09	04	4, 5	20	4
4.32	12					– 3.60	15	14	2, 1	2	1
4.32	12					– 3.54	21	16	4, 5	20	4
4.28	16					– 3.48	27	22	6, 5	30	5
4.23	21	tracing				– 3.42	33	27	6, 6	36	6
4.17	27					– 3.24	51	39	12, 12	144	12
4.05	39					– 3.00	75	57	18, 18	324	18
3.81	63					– 2.67	118	90	27, 28	756	27
4.44 – 3.36	118					– 2.25	150	134	16, 16	256	16
~~1.48~~	~~36~~	~~4.215 – 61 115~~				~~1.25 0.75 60~~					
~~1.10 1.25~~											
3.75	69					– 2.64	111	90	21, 21	441	21
4.00	44					– 2.97	78	61	17, 17	289	17
4.14	30	no		no		– 3.18	67	48	18, 19	342	18
4.20	24					– 3.27	48	36	12, 12	144	12
4.23	21					– 3.36	39	30	9, 9	81	9
4.32	12					– 3.48	27	20	8, 7	56	7
4.32	12					– 3.60	15	14	2, 3	6	2
4.38	104					– 3.60	15	12	2, 3	6	2
4.38	04					– 3.66	09	06	3, 3	6	2

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Hβ

	n 1	2	3	4	m+n 1	2	3	4	
60				21				22	
55				21.5				23	
50				22				24	
45				23				25	
40	10	45		23	11			27	3.9
	10	46		23.5	11			27	3.9
30	10.5	46		24	11			29	3.9
	10.7	47		25	13			30	3.9
20	11	47		25.5	14			34	3.9
	11	48		25.5	15.5			37	
10	11	48		27	19			46	
	11	49		27	26			58	
0	11	49		28	36			69	3.93 1.31
	11	50		28	25			57	
	11	51		29	19			46	
	11	51		29	16			41	
	11.5	52		30	14.5			37	3.90
	11.5	52		30.5	13			35	
	11.5	53		31	12.5			34	
	12	53		31.5	12.5			34	3.8
	12	54		32	12			34	
		54		32.5				34	

no tracing

no tracing

no tracing

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1	Δm	2	Δm	3	Δm	4	Δm	Mean	Res.	Σh²	μ
						3.36 - 3.33	03	03	0	0	0
						3.34 - 3.30	04	04	0	0	0
						3.33 - 3.27	06	06	0	0	0
						3.30 - 3.24	06	06	0	0	0
3.96 - 3.93	03					3.30 - 3.12	18	10	7, 8	56	7
3.96 - 3.93	03					3.28 - 3.12	16	10	7, 6	42	6
3.95 - 3.93	02					3.27 - 3.06	21	11	9, 9	81	9
3.94 - 3.81	13					3.24 - 3.03	21	17	4, 4	16	4
3.93 - 3.75	18					3.20 - 2.88	32	25	7, 7	49	7
- 3.69	24					3.20 - 2.83	37	30	6, 7	42	6
- 3.48	45					3.12 - 2.58	54	50	5, 4	20	4
- 3.18	75					3.12 - 2.28	84	80	5, 4	20	4
3.93 - 2.84	109					3.09 - 2.98	111				
~~1.31 - 0.95~~	~~36~~					~~1.03 - 0.66~~	~~37~~	110	1, 1	1	1
- 3.24	69					3.09 - 2.31	78	74	5, 4	20	4
- 3.48	45	none		none		3.06 - 2.58	48	46	1, 2	2	1
- 3.66	27					3.06 - 2.73	33	25	2, 2	4	2
3.90 - 3.74	16					3.03 - 2.83	20	18	2, 2	4	2
- 3.81	09					3.02 - 2.86	16	12	3, 4	12	3
- 3.84	06					3.00 - 2.88	12	09	3, 3	9	3
3.87 - 3.84	03					2.98 - 2.88	10	06	3, 4	12	3
- 3.87	00					2.97 - 2.88	09	04	4, 5	20	4
						2.96 - 2.88	08	04	4, 4	16	4

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Vega
α

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List of C apertured spectra analyzed

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Table for reduction of $\Delta \log ap.$ to Δ Mag.

$\Delta \log ap$	ΔM	$\Delta \log ap$	ΔM	$\Delta \log ap$	ΔM	$\Delta \log ap$	Δm
0	0.00	.30	0.75	.60	1.50	.90	2.25
.01	0.02	31	0.78	61	1.52	91	2.28
2	0.05	32	0.80	62	1.55	92	2.30
3	0.08	33	0.82	63	1.58	93	2.32
4	0.10	34	0.85	64	1.60	94	2.35
5	0.12	35	0.88	65	1.62	95	2.38
6	0.15	36	0.90	66	1.65	96	2.40
7	0.18	37	0.92	67	1.68	97	2.42
8	0.20	38	0.95	68	1.70	98	2.45
9	0.22	39	0.98	69	1.72	99	2.48
.10	0.25	.40	1.00	.70	1.75	1.00	2.50
11	0.28	.41	1.02	71	1.78	101	2.52
12	0.30	42	1.05	72	1.80	102	2.55
13	0.32	43	1.08	73	1.82	103	2.58
14	0.35	44	1.10	74	1.85	104	2.60
15	0.38	45	1.12	75	1.88	105	2.62
16	0.40	46	1.15	76	1.90	106	2.65
17	0.42	47	1.18	77	1.92	107	2.68
18	0.45	48	1.20	78	1.95	108	2.70
19	0.48	49	1.22	79	1.98	109	2.72
.20	0.50	.50	1.25	.80	2.00	1.10	2.75
.21	0.52	51	1.28	81	2.02	1.20	3.00
22	0.55	52	1.30	82	2.05	1.30	3.25
23	0.58	53	1.32	83	2.08	1.40	3.50
24	0.60	54	1.35	84	2.10	1.50	3.75
25	0.62	55	1.38	85	2.12	2.00	5.00
26	0.65	56	1.40	86	2.15	3.00	7.50
27	0.68	57	1.42	87	2.18		
28	0.70	58	1.45	88	2.20		
29	0.72	59	1.48	89	2.22		

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