KG
11366
v.418

Circle Readings for
α Ursae Minoris
δ "
λ
51 H Cephei
From 1877 Jan 30 to 1877 Dec 31

Observations for inclination & declination axes

Charles W. Sever, University Bookstore, Cambridge.

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55	4	50.1	35.8	2.6
		53.8	38.6	8.6
		0.1	44.7	12.1
		58.7	43.4	11.1

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8 Ursa Min. h 18 m 15 $9\frac{3}{2}$ 25 1877 Jan. 30 J. T. M.

	′	′	″						
E	55	1	18.2	11.5	5.6	56.4	0	46.4	41.9
F			20.2	13.5	7.4	57.8		47.5	43.4
G			27.2	20.2	12.9	4.1		54.2	49.2
H			21.8	15.0	8.8	59.6		49.6	45.1
			74	602	347	2379		1977	196
			21.85	15.05	8.68	59.48		49.42	44.90

three alike

three alike

~~L.h.?~~

β Ursa Min. h 14 m 51 ° 74 ′ 40 Feb. 3 J. T. M.

	′	′	″	″	′	″	′	″	
E	55	4	50.1	35.8	4	2.6	3	45.0	
F			53.8	38.6		5.6		48.4	M
G			0.1	44.7		12.1		55.1	
H			58.7	43.4		11.1		53.5	
			2227	1625		314		2020	
			55.68	40.62		7.85		50.50	

48 H. Cephei h 3 m 4 h 77 m 16 Feb. 3 J. T. M.

E	0	1	22.9	34.4	2 4.9	19.2
F			25.0	36.5	6.2	20.6
G			33.7	45.0	14.2	29.9
H			35.9	47.0	17.1	33.0
			1175	1629	424	1027
			29.38	40.72	10.60	25.68

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η Ursa Min. 16h 21m 103° 58′ 1877, Feb. 3 J.F.M.

E	20	2′	39.4″	22.4″	1′	46.2″	26.0″
F			43.4	26.1		49.0	29.2
G			50.2	33.9		56.9	36.1
H			49.7	33.0		56.0	36.1
			18 27	11 54		20 81	12 74
			45.68	28.85		52.02	31.85

δ Ursa Min. 6h 12m 93° 25′ Feb. 3 J.F.M.

E	55	0	43.2	40.8	35.6	30.6
F			44.7	42.4	37.2	32.6 last 3 wires of A + A_{+1}
G			53.5	50.6	45.4	41.0
H			51.2	49.4	42.9	38.1
			19 26	18 32	16 11	14 23
			48.15	45.80	40.28	35.58

δ Ursa Min. 6h 12m 93° 25′ Feb. 4 J.F.M.

E	55	1	12.5	5.1	0	59.1	51.1	45.0	38.6
F			13.2	5.9		0.1	51.6	45.9	39.8
G			20.7	13.4		7.0	0.3	54.0	48.8
H			17.1	9.9		5.0	56.6	50.9	44.9

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51 Cephei 6h 41m 87° 14′ 1877 Feb. 4 J.F.M.

E	0 4	28.2	33.9	41.5	45.5	54.4	56.4	45 0	45	6.8
F		30.1	35.3	42.1	46.6	55.9	57.0		4.6	7.5
G		36.8	42.1	49.5	53.9	2.1	3.9		12.6	15.8
H		35.0	41.9	48.2	53.9	0.8	2.9		11.9	15.9
		13 01	15 32	213	1999	2332	2402		336	460
		32.52	38.30	45.32	49.98	58.30	0.05		8.40	11.55

δ Ursa Min. 6h 12m 93° 25′ L.C. 1877 Feb. 5 J.F.Mc.

E	55 1	9.1	0.6	0 53.5	45.1	37.9	32.4
F		10.0	1.1	53.8	45.9	38.6	33.5
G		15.9	8.2	2.1	54.3	46.9	40.9
H		14.9	8.3	58.1	49.6	43.2	38.1
		529	152	2275	1949	1666	1449
		13.22	3.80	56.88	48.72	41.65	36.22

51 Cephei 6 41 87 14 L.C. 1877 Feb. 5 J.F.Mc

E	0 4 59.9	5 0 7.6	12.4	15.9	21.6
F	1.4	7.9	13.4	17.3	22.5
G	7.4	15.8	21.1	25.2	30.5
H	7.9	15.0	21.0	24.6	29.4
	2566	463	679	830	1040
	5 4.15	11.58	16.98	20.75	26.00

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35 Draconis 17h 55m 108° 1′ 1877 Feb. 6 J. F. M.

E	15′ 3′ 56″.4	43″.9	3′ 9″.9	2′ 56″.5
F	57.2	46.5	12.4	58.8
G	3.7	52.5	19.1	5.1
H	4.1	52.2	17.9	4.2
	24′ 0″.4	19′ 5″.1	5′ 9″.3	24′ 4″.6
	19′ 0″.10	18′ 48″.78	18′ 14″.82	18′ 1″.75

Feb. 6

S Ubrs. Min. 6h 12m Gr. 93 25 J. F. M. Feb. 6

E	55′ 1′ 6″.2	0″.4	55″.5	50″.4	44″.8	38″.8
F	7.1	1.6	6.6	51.5	46.1	40.1
G	15.5	1.2	5.0	0.4	55.0	49.1
H	12.1	6.7	1.6	57.6	57.8	55.5
	409	99	87	2199	1977	1735
	10.22	2.48	2.18	54.98	49.42	43.38

S Ubrs. Min. 6 12 93 25 Feb. 8 J. F. M.

E	55′ 1′ 17″.9	9″.9	3″.3	56″.7	49″.2	42″.4
F	19.2	11.7	4.5	57.7	50.3	43.0
G	27.2	19.0	12.1	5.4	58.1	51.2
H	21.8	13.7	6.9	0.5	52.2	46.0
	861	543	268	2403	98	1826
	21.52	13.58	6.70	60.08	52.45	45.65

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Feb. 8

51 Cephei 18 41 +87 14 U.C. J.F.M.

E	0 4 31.1	37.4	44.8	5′ 0′ 0″.6	8.5	12.8
F	33.1	38.9	46.4	1.2	9.6	13.3
G	39.5	45.5	53.1	9.9	17.3	20.8
H	38.5	43.4	51.8	6.5	14.2	19.0
	222	52	1961	182	496	659
	35.55	41.30	49.02	4.55	12.40	16.48

Feb. 11

δ Ueo. Min. 6 12 93 25 L.C. J.F.M.

E	55′ 1′ 7″.6	2″.2	0′ 54″.5	48″.1	42″.6	37″.6
F	8.7	3.3	56.1	49.5	43.2	38.9
G	17.4	11.5	3.7	59.1	53.0	47.6
H	13.2	8.6	0.4	58.7	47.4	43.0
	469	266	2347	2104	1862	1671
	11.72	6.65	58.68	52.60	46.55	41.78

51 Cephei 18 41 +87 14 J.F.M.

Feb. 11

E	0 4 58.5	5 0 5.6	12.0	12.1	20.5	23.9	25.9
F	0.4	6.7	13.8	12.8	22.6	25.1	27.9
G	7.9	16.0	21.3	23.3	32.4	34.4	36.2
H	6.9	14.9		21.2	29.3	32.2	34.3
	25 37	432		694	1048	1156	1243
	5′ 3′.42	10.80		17.35	26.20	28.90	31.08

2 Latter

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1877phae.proj.1422M

1877, Feb. 14

	h	m						
5 Uras. Min.	6	12	93	25				J.F.M.
	′	′	″	″	′	″	″	″
E	55 1	20.9	13.0	6.2	0	59.9	52.4	45.7
F		22.2	14.9	8.0		1.4	54.0	47.5
G		31.5	23.1	16.0		8.8	3.5	57.1
H		23.1	15.7	9.2		2.6	56.0	48.2
		9 77	6 67	3 94		2 53 7	2 25 9	1 98 5
		24.42	16.68	9.85		63.42	56.48	49.62

Feb. 14

51 Cephei 6 41 87 14 J.F.M.

lost 1st 3 wires

5	0	5.0	10.4	14.1	17.2	+ 20.1	25.8
		7.1	12.0	15.9	18.9	22.9	27.2
		15.7	21.4	24.9	27.4	31.1	36.0
		11.7	17.0	19.9	23.1	26.8	31.4
		3 95	6 08	7 48	8 66	10 09	12 04
		9.88	15.20	18.70	21.65	25.22	30.10

Feb. 15 J.F.M.

50 H. Cephei 4 37 80 57

15	3	46.2	4 2.7	13.4	28.9	50.1	0 2.9	17.0	24.0
		48.6	6.0	16.9	32.1	53.5	(7.9)	20.5	27.9
		57.9	12.2	24.8	39.3	0.9	(13.5)	27.8	35.5
		56.6	13.4	25.5	38.9	59.9	13.9	29.0	36.4
		20 93	3 43	8 06	13 92	23 44		9 43	12 38
		50.32	8.58	20.15	34.80	58.60		23.58	30.95

read past the 5 minutes

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1877, Feb. 15

δ Ursa Min. Gle. 6 12 93 25 J. T. M.

55 0 35.4	33.8	29.0	25.5	
38.1	36.3	31.2	28.8	Clouds, lost 1st 3 wires
46.9	45.6	39.9	37.1	
45.9	43.5	39.1	36.1	
16 6 3	15 9 2	13 9 2	12 7 5	
41.58	39.80	34.80	31.88	

δ Ursa Min. Gle. T-Sh. 20 1877 NPR.

55 1	28.7	16.6	7.3	0 54.3	38.7	29.7
	29.2	17.3	7.3	53.7	39.3	30.4
	38.5	26.3	15.9	8.6	48.4	39.0
	38.3	26.4	17.2	4.3	48.8	38.8
	13 4 7	8 6 6	4 7 7	23 5 9	17 5 2	13 7 4
	33.68	21.65	11.92	58.98	43.80	34.35

ε Cephei T-Sh. 20 1877 J. T. M.

5 0	11.7	15.4	20.4	22.4	25.1	27.1
	12.1	17.8	22.1	24.1	26.2	28.8
	22.0	26.5	30.4	32.4	34.7	37.2
	22.9	28.0	31.9	33.9	36.6	38.4
	6 8 7	8 7 7	10 4 8	11 2 8	12 2 6	13 1 5
	17.18	21.92	26.20	28.20	30.65	32.88

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1877 Feb. 21

L.b.?

35 Draconis 17 55 +76 58 J.F.M.

E	15 4 11.4	56.4	1 58.9	2 41.4
F	15.5	0.4	2.9	45.0
G	22.9	7.1	8.8	52.5
H	24.2	8.6	10.5	53.8
	7 40	25 25	26 11	19 27
	18.50	3.12	5.28	48.18

Feb. 21

δ Ceo. Min L b. 6 12 98 25 J.F.M.

55 0 53.1	43.9	37.8	34.1	28.9	24.2	
54.9	46.0	39.6	36.1	31.1	27.0	
3.5	54.9	48.4	44.1	39.1	35.0	
4.9	55.4	48.9	45.8	40.8	36.6	
23 64	20 02	17 47	16 01	13 99	1 28	
59.10	50.05	43.68	40.02	34.98	30.70	

Feb. 21

51 Cephei 6h 41m 87° 15′ J.F.M.

E	0 4 56.6	5 0 3.6	10.5	13.4	16.8	19.8
F	59.3	5.2	12.6	15.9	18.9	21.5
G	6.5	12.6	21.1	24.2	27.5	30.4
H	10.9	19.0	25.2	28.6	31.9	35.3
	25 33	4 04	6 94	8 12	9 51	10 70
	3.32	10.10	17.35	20.30	23.78	26.75

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1877, Feb. 27

Gr. 966 h 5 m 23 J. F. M.

~~30 3 36.~~

E	20° 0′ 31′.6	51″.1	1′ 15″.6	1′ 32″.6
F	40.1	58.5	23.1	40.4
G	50.6	9.0	33.3	50.5
H	57.6	16.7	41.3	58.8
	17 99	25 53	11 33	18 23
	44.98	3.82	28.32	45.58

δ Ursa Min 4.6 Feb 27 J. F. M.

5 E	55′ 1′ 25″.9	0′ 51″.9	0′ 43″.1	39″.1	33″.7	29″.9
F	3.2	58.8	50.8	46.9	41.4	37.1
G	4.8	6.8	59.8	55.8	51.1	45.6
H	5.5	14.0	5.9	2.1	56.5	53.0
	16 04	24 15	21 96	20 39	18 27	16 56
	40.10	0.12	54.90	50.98	45.68	41.40

51 Cephei 6.41 87° 15′ Feb. 27 J. F. M.

E	0° 4′ 2″.05	50.1	56.9	5° 0′ 4.1	8.6	11.9
F	2.88	59.1	5.2	11.6	15.8	1′ 8.5
G	3.61	6.1	13.1	20.4	25.2	29.6
H	4.52	14.2	22.6	29.5	34.3	37.2
	13 06	24 95	27 78	6 56	8 39	9 52
	32.65	2.38	9.45	16.40	20.98	23.80

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1877 March

ζ1 Cephei	6h 41m	87° 15′	~~Feb 27~~				J. F. M.
E	0′ 4″	48.8″	56.9″	59.9″ (5′ 0″)	4′ 0″	10′ 1″	11′ 8″
F		57.4	5.0	8.9	11.6	18.4	20.6
G		5.1	12.9	16.1	21.4	28.4	30.3
H		17.9	26.0	30.9	34.4	41.9	43.0
		26 92	28 08	29 58	7 14	9 88	10 57
		2.30	10.20	13.95	17.85	24.70	26.42

1877, March 4

δ Ucs. Min.	6h 12	93 25					J. F. M.
E	5′ 5′ 1″	10′ 7″	6′ 1″	0′ 5″	0′ 56″ 3	0′ 51″ 4	47′ 1
F		18.2	14.6	8.2	4.2	58.9	54.9
G		28.9	24.6	19.1	14.2	9.2	5.3
H		43.0	38.9	33.4	28.4	23.6	19.1 lost last wire
		10 08	8 42	6 12	2 831	2 631	2 464
		25.20	21.05	15.30	10.78	5.78	1.60

1877 March 4

χ Draconis	18	23	L.C.2			J. F. M.
E	0′ 1″	32.8	14.9	0′ 26.4	2.4	
F		41.2	23.2	35.6	11.2	
G		48.8	31.1	43.2	20.3	
H		4.9	45.1	58.0	34.6	
		18 77	11 43	16 32	6 85	
		46.92	28.57	40.80	17.12	

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1877 March 8 Cephei 6 41 J. T. McC.

E	0 4 16.6	23.2	28.6	52.9	58.3	
F	24.1	31.1	36.6	1.2	6.0	Left
G	33.8	40.1	45.2	8.5	14.2	
H	50.0	56.5	62.1	26.4	31.6	—
	12 45	15 19	17 25	26 90	29 01	
	31.12	37.98	43.12	7.25	12.52	

lost 1st wire

93° 25′ Shelmuth 6. Mar 6 1877 J. T. M.

E	55 1 22.2	12.1	6.5	0 59.5	53.8	48.8	
F	29.9	20.4	13.8	7.9	2.4	57.9	lost last wire
G	39.3	30.4	23.3	16.4	11.4	6.9	
H	52.8	43.2	35.6	29.1	23.8	18.1	
	14 42	10 61	7 92	29 29	27 14	25 27	
	36.05	26.52	19.80	13.22	7.85	3.18	

~~lost l~~

March 6 J. T. M.

χ Draconis 1823 L.P.?

E	0 1 39.4	18.9	0 20.1	7.4
F	48.0	28.4	28.9	15.5
G	55.3	35.8	36.1	23.6
H	9.5	48.9	49.8	36.8
	21 22	13 20	13 49	8 33
	53.05	33.00	33.72	20.82

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51 Cephei Mar 6 1877 G.F.Tu 87° 15'

E	0 4 17.9	25.6	31.4	36.1	
F	26.1	33.5	39.8	43.4	
G	33.5	41.4	47.4	51.6	
H	50.0	58.1	2.9	8.2	
	1275	1586	1815	1993	
	31.88	39.65	45.38	49.82	

S Ursæ Min Lo. May 7 1877 G.F.Tu

E	55 1 3.6	0 55.9	48.1	41.7	37.2	32.8
F	11.9	5.2	56.9	50.4	45.7	40.8
G	21.8	14.4	6.8	0.9	56.4	51.5
H	35.1	28.2	20.0	13.4	10.4	5.9
	724	2837	2518	2264	2097	1900
	18.10	10.92	2.95	56.60	52.42	47.50

51 Cephei 87 15

E	0 4 50.9	55.9	59.4	~~50~~	0 4.4	10.1	12.5
F	0.3	5.1	8.4		12.8	19.2	21.1
G	8.1	13.0	15.9	12.8	22.6	28.9	30.5
H.	25.2	29.7	33.0	42t	40.5	47.1	49.5
	2564 5	2837	2967		806	1053	1136
	~~3.62~~ 6.12	10.92	14.18		20.15	26.32	28.40

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1877, March

δ Ursæ Min. L. C. 93° 24′ ? J. F. M.

55 0	42.2	34.7	29.3	23.6	17.2	11.6
	50.4	42.2	37.2	32.1	25.2	19.4
	0.4	52.8	47.0	41.1	34.8	29.4
	16.5	7.9	3.0	57.5	51.6	45.5

Dry Day

1877, March 11

δ Ursæ Min L. C. 93 25 J. F. M.

E	55′ 1″	15.4	7.0	0.5	0 55.5	50.0	42.5
F		24.8	15.8	9.1	4.5	59.2	51.4
G		33.1	25.8	18.8	13.0	7.8	0.8
H		48.9	41.1	33.6	29.1	23.4	16.2
		1222	897	620	2821	2604	2809
		30.55	22.42	15.50	10.52	5.10	~~55.22~~ 57.72

March 11

51 Cephei 8h 15m J. F. M.

			three strokes			
0 4	50.6	56.8	5 0 3.6	8.2	10.8	14.4
	59.5	5.2	11.9	16.1	19.1	22.0
	8.1	13.6	21.5	26.0	28.8	31.4
	27.3	33.0	40.1	45.1	48.4	51.8
	2655	2886	771	954	1071	1196
	6.38	12.15	19.28	23.85	26.78	29.90

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1877 March 11

λ Ursæ Min. L.C. 91° 6' 1 J.T.M.

E	~~55 2 8.4~~	15 0 13.1	11.8	12.2	9.9	10.5	9.5
F	15.6	20.6	19.3	19.4	16.9	17.1	15.9
G	24.6	30.0	28.4	28.9	26.6	27.1	25.9
H	41.7	49.1	47.2	47.9	45.4	46.7	44.9
		112.8	106.7	108.4	98.8	101.4	96.2
		28.20	26.68	27.10	24.70	25.35	24.05

51 Cephei 87° 15' March 15, 1877 J.T.M.

E	0 4 49.5	56.5	5 0 1.0	5.2	9.7	12.1
F	56.6	4.2	7.8	13.2	16.7	19.2
G	5.0	12.3	17.2	21.6	25.1	27.5
H	26.4	34.1	37.9	42.4	46.8	48.0
	257.5	287.1	639	824	983	1068
	4.38	~~6.8~~ 11.78	15.98	20.60	24.58	26.70

March 20, 1877

51 Cephei h 6 m 41 87.15 J.T.M.

E	0 4 ~~47.4~~	56.5	5 0 1.1	4.7	8.7	12.3	15.6
F	~~54.2~~	5.6	8.9	13.2	16.4	20.7	24.4
G	~~2.2~~	14.8	19.6	23.5	27.3	31.3	34.1
H	~~24.3~~	34.5	37.6	41.9	46.1	50.8	54.9
		291.4	672	833	985	1151	1290
		12.85	16.80	20.82	24.62	28.78	32.25

Perhaps stroke omitted for 2nd S. Lost 1st wire

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1877, March 20

η Ursa Min. 9 1 6 Flo. J. F. M.

E	15 0 8.2	7.5	7.1	5.7	4.9	3.4
F	15.4	14.5	13.4	12.2	11.6	10.4
G	25.4	25.3	23.9	22.4	21.4	20.4
H	44.0	43.9	44.1	42.3	41.5	40.8
	9 3 0	9 1 2	8 8 5	8 2 6	7 9 4	7 5 0
	23.25	22.80	22.12	20.65	19.85	18.75

A_{+1} 2+1

σ² Ursa Maj 8 5 9 March 24 J. F. M.

E	40 0 0.2	15.9	1 4.9	20.4
F	7.9	23.5	11.9	28.8
G	19.8	35.4	24.1	39.5
H	46.3	21	50.4	6.7
	7 4 2	13 6 9	9 1 3	15 5 4
	18.55	34.22	22.82	38.85

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1877. April 9

λ Ubas. Mid. L 91° 6′ J.F.M.

E	15′ 0′ 11.9″	0′ 9.1″	0′ 7.8″	0′ 5.2″	10′ 4′ 3.8″	4′ 2.6″
F	17.6	14.4	13.8	11.1	8.8	7.9
G	14.9	12.2	10.1	12.6	5.9	3.9
H	22.4	18.9	17.7	14.8	12.6	10.7
	66.8	54.6	49.4	43.7	31.1	25.1
	15.70	13.65	12.35	10.92	7.78	6.28

Last 3 wires of A. + A_1, 2+3

Polaris April 9–10 morning J.F.M.

E	40′ 0′ 4.8″	0′ 6.4″	0′ 9.8″	0′ 11.1″	0′ 13.0″
F	12.9	14.1	17.2	19.4	21.1
G	8.3	10.0	13.4	14.7	16.4
H	17.2	19.7	23.1	24.6	26.2
	43.2	50.2	63.5	69.8	76.7
	10.80	12.55	15.87	17.45	19.18

A 6, 7, 8, 9 + A_1, 1

Polaris Apr. 10–11 morning

				2	2	2		Last 3		
35′ 4′ 44.1″	47.6	50.6	52.1	55.7		52.5	40′ 0′ 10.5″	13.9	15.6	
51.5	54.9	57.5	59.5	2.9		0.4	18.4	21.4	23.3	
48.0	51.2	53.9	55.3	58.2		55.9	13.5	17.1	18.7	
58.1	1.8	4.9	6.1	9.5		6.9	24.5	28.2	30.1	
2017	2155	2269	2330	63		2357	669	806	877	
50.42	53.88	56.72	58.25	1.58		58.92	16.72	20.15	21.92	

Wires A1 — A_1 1 2 + 3

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April 12 morning J.F.M.

Polaris 1h 12m

E 35′ 4′ 36″.2	39″.5	46″.6	50″.8	53″.9	54″.9
F 56.5	58.9	5.5	10.2	11.8	13.9
G 52.2	55.1	1.5	6.9	8.9	10.3
H 3.0	5.5	12.3	16.7	19.1	20.0
207.9	219.0	5.9	21.6	33.7	39.1
51.98	54.75	1.48	6.15	8.42	9.78

Seeing very bad.

Polaris 1h 12m April 22 Morning? (JSR)

E 35′ 4′ 30″.2	33″.9	36″.6	38″.9	41″.6	44″.1	~~47.1~~	55″.1
F 48.7	52.4	54.1	57.0	0.1	2.4	~~6.9~~	13.1
G 46.5	50.0	51.9	55.4	57.3	59.8	~~4.3~~	9.9
H 58.8	1.6	4.8	6.4	9.9	11.9	16.7	23.6
184.2	197.9	207.4	217.7	228.9	238.2		41.7
46.05	49.48	51.85	54.42	57.22	59.55		10.42

Polaris Apr. 25 1877 J.F.M. (Morning? JSR)

45′ 4′ 55.4	59.1	50′ 0′ 2.5	3.9	8.4	9.1	13.4	15.7
4.4	6.1	10.4	12.1	16.2	17.8	21.8	24.6
2.2	6.2	12.4	14.1	18.3	19.3	22.9	25.8
48.4	51.8	57.9	58.2	2.9	3.8	8.1	10.2
230.4	3.2	23.2	28.3	45.8	50.0	66.2	76.3
57.60	0.80	5.80	7.08	11.45	12.50	16.55	19.08

Spiral for mid wires

Spiral after last wire

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1877 May 12

Ursa Min. L.C. h 13 m 6 +91 20 J.T.M.

E	5 4	0.9	3 56.9	52.0	50.6	49.1	45.9
F		6.7	3.4	0.4	56.5	53.6	52.1
G		7.6	4.1	0.0	57.7	55.5	52.8
H		49.8	46.3	43.5	40.9	39.0	35.3
		2450	2307	2159	57	1972	1861
		1.25	57.67	53.97	51.42	49.30	46.52

Ursa Min. L.C. 13 6 +91 20 (May 13) J.T.M.

E	5′ 4′	0″.4	3′ 55″.3	52″.9	49″.6	46″.9	44″.4
F		7.1	3.0	59.1	55.2	51.9	49.8
G		8.2	3.6	0.5	56.9	54.8	51.2
H		51.2	46.0	43.6	39.6	37.1	34.2
		69	2279	2161	2013	1907	1796
		1.72	56.97	54.03	50.32	47.67	44.90

Polaris L.C. h 1 m 6 +91° 20′ 1877 May 16 J.T.M.

	5′ 3′	59″.9	3′ 57″.8	55″.0	52″.5	47″.5	45″.1
		5.9	4.0	0.5	56.9	52.9	50.8
		10.9	9.0	4.9	1.2	57.6	55.2
		51.9	50.2	47.0	43.5	38.9	38.4
		2486	10	2274	2141	1969	1895
		2.15	0.25	56.85	~~56.02~~ 53.52	49.22	47.37

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α Polaris 1h 6m +88° 40′ 1877 May 16, Morning J. F. M.

E	50′	0′	4.2″	6.6″	9.9″	13.2″	14.0″	17.1″
F			11.4	14.1	17.1	21.2	22.9	25.6
G			17.2	20.3	23.0	28.1	28.3	30.7
H			59.2	1.1	5.7	9.5	10.4	13.1
			27.20	4.21	5.57	7.20	7.56	8.65
			8.00	10.52	13.92	18.00	18.90	21.62

α Ursæ Min. 1h 6m +88° 40′ May 23 morning J. F. M.

~~50~~	~~0~~	~~13.7~~	~~17.0~~	50	0	25.8	27.5	28.3	29.8
		~~22.3~~	~~25.7~~			34.3	35.9	37.1	38.8
		~~27.2~~	~~30.3~~			39.9	40.8	42.3	43.8
		~~9.0~~	~~12.1~~			21.2	22.6	24.3	25.8
						12.12	12.68	13.20	13.82
						30.30	31.70	33.00	34.55

α Polaris L.C. 1h 6m 91° 20′ 1877 May 28 J. F. M.

5	3	40.6	27.1	22.4	22.3	20.8	19.9
		49.6	36.1	31.8	31.1	29.5	28.1
		53.4	39.7	35.9	35.1	33.1	31.5
		36.6	24.0	19.6	19.1	17.2	16.2
		18.02	12.69	10.97	10.76	10.06	9.57
		45.05	31.72	27.42	26.90	25.15	23.92

Wires 4. 5. 6 ∫'s scattered over several minutes

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Polaris May 28 1877 Morning (3) N.P.R.

50 0	4.5	14.8	18.5	22.7	24.5
	13.6	24.2	28.4	30.2	33.8
	19.2	29.7	32.6	34.4	39.6
	14.7	16.5	18.5	21.5	24.8
	5 2 0	8 5 2	9 8 1	10 8 3	12 2 7
	13.00	21.30	24.52	27.07	30.67

1877 May 29 Polaris L.S. 91 20 f.7.m

5 8	58.1	54.3	52.8	49.9	35.9	34.0
	6.4	8.3	19	59.5	43.7	42.4
	10.2	6.4	4.5	2.1	47.5	45.7
	54.8	51.3	49.8	48.2	32.1	30.7
	24 9 5	23 5 3	22 9 0	22 9 7	15 9 2	15 2 8
	2.37	58.82	57.25	57.42	39.80	38.20

Last 2 wires Polaris May 29 Morning N.P.R.

May 30 1877 Morning

Polaris 50.0	0.7	5.6	6.3	8.7	13.0	18.7
	15.5	15.6	18.2	19.7	24.5	13.3
	16.7	20.7	21.4	23.7	28.2	34.4
	0.7	5.3	6.7	8.9	14.1	20.7
	3 3 6	4 7 2	5 2 6	6 1 0	7 9 8	8 7 4
	8.40	11.80	13.15	15.25	19.95	21.74

Perhaps 2nd N.?

718

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1877 May 30

∠ Wires Min. L.C. - 91° 20′ J. T. McC.

5 4	22.3	18.4	16.1	3 5 27	41.4	34.6
	31.1	28.2	25.1	0.6	49.9	43.1
	33.5	29.3	26.3	2.3	52.9	46.0
	17.4	13.9	11.5	48.8	36.6	29.2
	1043	898	770	2254	1808	1529
	26.07	22.45	19.25	56.35	45.20	38.22

Wires 4.5.8.9

1877 May. 31

∠ Wires Min L.C. 91° 20′ J. T. McC.

5 3	52.1	48.9	45.6	42.1	39.2	37.1
	1.7	58.7	55.9	51.2	49.1	46.0
	5.1	0.9	58.1	53.9	52.1	49.8
	49.0	46.4	43.8	39.2	37.1	34.6
	2279	2149	2034	1864	1775	1675
	56.97	53.72	50.85	46.60	44.37	41.87

1877 June 2

∠ Wires Min L.C. 91° 20′ J. T. M

E 5 4	21.3	17.5	12.8	3 50.6	40.7	33.6
F	31.4	27.9	23.2	0.3	49.2	43.2
G	34.4	30.4	27.2	4.4	53.7	47.5
	18.9	14.9	11.8	49.8	38.7	32.1
	1060	907	750	2251	1823	1564
	26.50	22.67	18.75	56.27	45.57	39.10

wires 3.4.5.8 + 9

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1877, June 4

α Ursa. Min. L.C. 91° 20′ J.F.M.

5 4 21	3 5 9.2	5 38	5 27	4 95	4 72
10.3	7.4	3.3	2.2	5 90	5 71
16.0	13.0	8.8	6.8	3.5	1.1
59.1	55.1	5 70	48.9	4 70	44.8
26 75	25 47	23 69	23 04	21 90	20 72
6.84	6.11	59.22	57.60	54.75	52.58
	3.68				

Wires 8, 9.

1877 June 17 J.F.M.

α Ursa. Min. L.C. 91° 20′

E	5 3	54.1	48.8	46.4	42.2	40.2	37.4	38.2
F		2.7	57.9	54.9	50.9	47.8	45.7	42.9
G		12.9	7.9	3.5	59.5	57.0	55.1	52.2
H		49.7	44.2	40.9	37.4	35.2	32.6	29.8
		23 94	21 88	20 87	19 00	18 02	17 08	16 31
		59.85	54.70	51.42	47.50	45.05	42.70	40.77

perhaps omitted stroke

last pair

α Ursa. Min. L.C. J.F.M.

E	5 3 45.5	42.7	39.1	37.1	33.1	31.5
F	54.1	51.1	47.9	45.6	41.9	40.6
G	1.4	58.9	56.0	53.8	49.9	48.4
H	39.3	36.4	33.7	31.9	28.0	26.9
	5 3 26.9	25.1	43.1	20.4		

1877phae.proj.1422M

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1877phae.proj:1422M

α Ursa Min. L.C. 91 20 1877, June 18 J.F.M.

	5 3	26.9	25.3	25.7	24.3	24.2	23.1
		35.1	35.1	34.4	32.9	33.1	31.3
		43.1	42.4	41.7	40.5	40.9	39.9
A_{+1} 1.42		20.4	20.8	20.1	18.8	18.2	17.0
		12.55	12.36	12.19	11.65	11.64	11.13
		28.87	30.90	30.47	29.12	29.10	27.32
		31.38					

1877, June 19

α Ursa Min. L.C. 91 20 J.F.M.

	5 3	44.9	43.8	39.1	35.6	32.9	29.6
		57.2	54.9	49.8	46.2	44.5	40.3
		6.1	3.1	58.1	55.1	57.6	48.1
Lost 2nd wire		42.8	40.2	35.1	32.2	29.3	25.8
		21.10	20.20	18.21	16.91	15.83	14.38
		52.75	50.50	45.52	54.77	49.07	35.95
					42.28	39.58	

perhaps false 8 before this

1877, June 20

α Ursa Min. L.C. 91 20 J.F.M.

	5 3	27.9	3 26.1	25.0	24.4	23.4	21.9
		38.1	35.8	34.3	34.1	32.1	30.3
		45.4	44.0	42.3	42.2	40.9	38.8
A_{+1} 1.42		23.3	21.2	19.6	19.1	17.0	16.1
		13.47	12.71	12.12	11.98	11.34	10.71
		33.67	31.77	30.30	29.95	28.35	26.77

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α Ursa. Min. L.C. 91° 20′ 1877, June 24 J.F.Mc.

5 3	23.3	21.9	20.7	19.9	18.9	18.1
	34.1	32.3	31.1	29.9	29.1	28.3
A_{+2} + A_{+1} 1	42.9	40.1	39.2	38.4	37.6	36.9
	19.9	17.9	16.8	16.2	15.1	14.6
	12 02	22	1078	1044	1007	979
	30.05	28.05	26.95	26.10	25.17	24.47

α Ursa. Min. L.C. 91° 20′ 1877, June 25 J.F.M.

5 3	30.9	29.3	27.6	25.2	22.1	17.2
Lost 1st	43.1	41.3	39.4	37.1	33.6	33.9
2 wires	51.8	49.7	47.1	45.3	41.9	42.7
	28.4	27.3	26.1	22.9	19.2	20.3
	15 42	1476	14 02	1305	1128	1141
	38.55	36.90	35.05	32.62	29.20	28.52

α Ursa Min L.C. 91° 20′ 1877, June 27 J.F.Mc.

5 3	22.9	17.6	17.2	18.1	16.8	17.3
A_{+1} 1	34.3	28.4	28.2	28.9	27.1	27.5
A_{+2} 1, 2, 3, 5	43.1	38.1	36.8	37.7	35.6	36.7
	21.1	14.4	14.9	15.9	13.9	14.7
	12 14	985	971	1006	934	902
	31.34	24.62	24.27	25.15	23.35	24.05

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δ Ves Min 18 12 July 24 1877 W.D.R.

~~50 1 54.3 59.2 56.3 58.4~~

50 1	54.3	2 9.2	15.4	33.0	39.1
	59.2	12.2	20.8	38.6	44.6
	56.3	8.7	19.7	34.8	41.5
	58.4	11.2	20.8	38.4	44.4
	282	393	747	248	196
	57.05	9.82	18.67	36.20	42.40

6 Cephei δ. C. July 25 1877 W.A.R.

40 3	32.5	22.1	23	55.4	2 50.2
	38.0	28.8	8.4	1.3	55.7
	33.7	23.3	3.6	56.5	51.7
	34.3	23.3	5.2	54.5	52.2
	185	175	19.5	23.07	9.8
	34.62	24.37	4.87	57.67	52.45

δ Ves. Min. 18 12 +86 36 July 29. 1877 J.F.M.

	50 1	40.4	47.2	53.9	2′ 2″.6	9.1	15.8
3 strokes		47.7	54.8	1.2	9.3	16.1	22.9
for each δ		45.1	53.1	58.1	6.3	13.6	19.9
		47.8	55.6	1.9	10.0	16.8	23.0
		210	107	23 51	282	556	816
		45.25	52.67	58.77	8.05	13.90	21.40

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1877phae.proj.1422M

1877 Aug. 6

δ Ursa Min. 18h 12m +86° 36′ J. F. M.

50′	1′	53″.4	2′	1″.2	9″.2	16″.1	21″.6	2′	28″.5
		0.4		8.8	16.1	23.3	29.2		35.3
		56.1		5.2	13.4	20.5	25.5		31.9
		57.9		5.9	14.1	20.5	25.9		33.1
		227.8		21.1	52.8	80.4	102.2		128.8
50′	1′	56″.950	2′	5″.275	13.200	20.100	25.550		32.200

1877 Aug. 6

51 Cephei 18h 42m +91° 26′ (L.C. 12.9.2) J. F. M.

Lost wires 4, 5, 6

40′	3′	34″.2	27″.5	21″.7	14″.3	8″.2	3′	1″.0
		41.1	33.7	28.4	21.2	14.9		7.4
		37.4	30.5	24.2	17.4	10.7		3.4
		35.8	28.9	22.8	15.1	9.6		2.2
		148.5	120.6	97.1	68.0	43.4		14.0
40′	3′	37″.125	30″.150	24″.275	17″.000	10″.850	3′	3″.500

Stubbs [illegible] [illegible]

1877 Aug. 8

δ Ursa Min. 18h 12m +86° 36′ J. F. M.

Lost wires 7, 8 + 9

50′	2′	2″.6	7″.6	13″.4	20″.5	23″.2
		8.6	13.2	19.3	27.0	29.4
		5.5	10.8	16.8	23.0	26.2
		7.9	12.6	19.3	25.9	29.0
		24.6	44.2	68.8	96.4	107.8
		6″.15	11″.05	17″.20	24″.10	26″.95

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1877 Aug. 11

δ Ursa Min. 18 12 +86 36 J. F. M.

50′ 2′ 10″.8	13″.9	20″.9	26″.6	30″.7	35″.8
17.9	21.1	27.3	33.5	38.3	41.8
15.9	19.3	25.7	30.8	34.9	39.2
16.9	20.9	27.9	32.7	37.5	41.8
215	752	218	36	214	1586
15.37	18.80	25.45	30.90	35.35	39.65

1877 Aug. 11

51 Cephei 18 42 +91 47 J. F. M.

40′ 3′ 31″.0	25″.7	18″.6	12″.2	7″.2	2″.3
37.1	32.1	25.2	18.1	13.1	8.3
33.5	29.3	21.9	15.8	9.5	4.9
33.6	28.4	21.2	14.6	8.6	4.8
152	1155	69	207	384	198
33.80	28.87	21.72	15.17	9.60	4.95

51 Cephei L. C. 18 40 92 47 Aug. 12, 1877 J. F. M.

~~δ Ursa Min 18 12 +86 36~~

~~0 4 7.5~~ 40′ 8″ 34.1	30.4	26.4	18.6	15.6	10.3
~~14.5~~	40.5	37.1	31.6	25.9	22.1	16.8
~~12.2~~	37.5	34.4	30.2	23.1	19.5	14.8
~~12.9~~	37.2	33.0	28.0	22.3	18.2	13.6
	1496	149	1162	899	754	155
	37.40	33.72	29.05	22.47	18.85	13.87

1877phae.proj.1422M

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1877phae.proj.1422M

1877 Aug. 16

δ Ursa. Min 18 12 +88 36 J.F.M.

E	50 2	7.1	9.5	12.9	18.5	21.0	23.9
F		12.1	14.5	18.2	23.8	26.2	29.8
G		10.9	13.6	17.7	22.5	25.3	28.1
H		12.0	15.2	18.7	23.9	26.3	29.1
		10.52	13.20	16.88	22.18	24.70	27.88

Aug. 16

51 Cephei L.C. 18 42 +19 46 J.F.M.

	E	40 3	33.5	30.3	26.8	24.0	19.9	17.0
A 2+1	F		38.6	36.1	31.9	28.3	25.6	22.2
+2	G		36.1	33.9	30.3	27.3	23.2	20.0
+A.9	H.		34.0	33.1	28.9	25.1	22.2	18.6
			35.55	33.35	29.48	26.18	22.72	19.45

Aug. 16

λ Ursa. Min 19 50

E	30 2	45.0	47.1	48.9	49.1	49.9	51.5	51.9
F		50.4	52.2	54.0	54.1	54.8	56.2	56.8
G		49.3	50.6	52.6	52.5	53.5	54.5	55.0
H		49.6	51.9	53.3	54.7	55.8	55.5	56.9
		48.58	50.45	52.20	52.60	53.50	54.42	55.15

Rejected omitted

2 nullpoints

52.9
57.6
56.2
58.2
56.22

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1877, Aug. 22

δ Hes. Min 18 12 +86 36 f.F.M.

E	50	2	4.0	10.1	13.5	17.7	21.8	24.2
F			9.8	15.4	19.8	23.1	27.8	30.1
G			7.9	14.8	17.9	22.1	26.1	28.8
H			8.9	15.0	18.5	23.1	26.9	29.4
			7.65	13.82	17.42	21.50	25.65	28.12

Aug. 22

51 Cephei LB. 18 42 +92 46 f.F.M.

	40	3	35.0	29.5	27.2	23.5	19.3	6.6
			40.6	36.1	32.8	29.9	26.1	12.7
A 2,1			38.7	34.7	31.1	27.8	23.8	11.0
↓A.9			37.1	32.2	28.9	25.6	21.9	9.1
8+7.			37.85	33.12	30.00	26.70	22.78	9.70

Aug. 22

λ Hes. Min 19 50 +88 54 f.F.M.

	30	2	45.6	~~45.6~~	47.8	48.1	48.4	49.9
A 8+9			51.4	51.4	53.2	53.2	54.1	55.4
			50.1	50.9	52.4	52.0	52.9	53.7
			50.3	50.7	52.8	52.5	52.5	53.8
			49.35	49.65	51.55	51.45	51.98	53.70

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1877phae.proj.1422M

1877 Aug. 23

δ Ursa Min 18 12 +86 36 J. F. Du

50 2	11.9	16.6	19.0	22.0	25.9	27.8
	17.9	22.8	24.5	27.8	32.0	33.3
	17.1	22.0	23.9	26.4	31.0	32.5
	17.9	22.2	24.8	27.9	31.4	34.2
	16.20	20.90	23.05	26.02	30.08	31.95

51 Cephei 18 42 +92 46 Aug 23

Lost 1st	40′ 3	31″.4	27″.7	25″.7	22″.5	12″.8	2′ 5 8″.7
3 wires		37.1	33.4	32.2	28.3	18.2	4.3 rej. last stroke
		36.4	32.1	30.9	27.4	17.9	2.4 for δ if there are 2
		34.8	30.0	28.7	25.1	14.8	0.6
		34.92	30.80	29.38	25.82	15.92	1.50

λ Ursa Min 19 50 +88 54

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1877 Aug. 27

51 Cephei L. C. 18h 42m 92° 46′ J.F.M.

	E	43.3	23.9	40.3	26.5	23.2	[illegible]	8.5	6.4
	F	~~32.9~~	32.9		33.8	29.3	17.9	14.7	11.6
3.72	G		32.9		31.5	28.1	23.3	13.5	10.5
	H.		33.1		30.2	25.9	22.7		
							20.9	10.8	8.5
					30.50	26.62	21.20	11.88	9.25

E	40 3	2.7	
F		8.4	
G		7.1	51 Cephei
H		4.6	
		5.70	

1877, Aug. 27

λ Ursa Min, 19 50 +88 54 J.F.M.

	E	~~30.2~~	30 2	47.7	48.9	50.9
A	F	~~47.7~~		53.0	53.6	56.4
1	G	~~53.0~~		52.0	52.9	55.0
	H.	~~52.0~~	[52.9]	59.9	53.9	56.4
			51.40	53.15	52.32	54.68

1877phae.proj.1422M

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1877phae.proj.1422M

1877, Aug. 28

δ Ursa. Min. 18 12 +86 36 J.F.M.

E	50	1	28.5	34.4	39.2	42.9	47.2
			35.4	40.9	45.0	48.8	53.0
A_2	N3		34.8	40.5	45.5	48.9	53.0
			34.9	41.1	45.5	48.8	53.9
			33.40	39.2~~5~~7	43.80	47.35	51.78

1877, Aug. 28

51 Cephei L.C. 18 42 +92 46 J.F.M.

E	40	3	33.5	28.8	25.3	23.1	18.6
			29.4	35.0	31.2	28.6	24.9
A_2	2+1		38.5	34.2	30.6	28.7	24.0
A_1	3		36.4	30.9	28.3	26.3	21.9
			36.95	32.22	28.85	26.68	22.35

1877 Aug. 28

λ Ursa. Min. 19 50 +88 54 J.F.M.

E

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1877 Aug. 30

δ Ursa Min. 18 12 +86 36 J.F.M.

E	50 1	26.6	29.6	35.1	39.3	43.1
F		33.0	36.4	41.3	45.1	48.8
G		31.1	35.6	41.1	45.7	48.6
H		31.9	34.8	40.7	45.4	48.0
		30.65	34.10	39.55	43.72	47.12

A −2 1+2

1877 Aug. 30

51 Cephei L.C. 18 42 +92 46 J.F.M.

E	40 3	57.1	53.9	34.8	31.9	26.6	21.7
		1.7	0.3	40.9	37.3	32.1	27.5
		0.4	58.2	39.8	36.9	31.6	25.9
		58.9	56.5	37.8	33.9	28.9	23.9
		59.52	57.22	38.32	34.00	29.80	24.75

A −2 4, 3, 2, 1 & A −1, 3 2+1

1877 Aug. 30

λ Ursa Min. 19 50 +88 54 J.F.M.

E

1877phae.proj.1422M

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1877phae.proj.1422M

~~1877, Sept. 11~~

~~δ Ursa Min 18h 12m +86 36~~ ~~J.T.M.~~

~~ε 26.4 22.9 27.0~~
~~31.9 31.9~~
~~27.1~~
~~28.9~~

1877 Sept. 11

51 Cephei L.C. 18 42 +92 46 J.T.M.

40 3	31.6	25.5	23.4	20.4	18.7	14.6
	39.9	33.7	31.8	28.1	26.2	22.2
	36.4	30.1	27.7	24.6	22.5	19.9
	35.4	29.1	26.3	23.7	22.3	18.6
	35.82	29.60	27.30	24.20	22.42	18.82

A-2

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1877phae.proj.1422M

1877, Sept. 12

δ Ursa Min 18h 12m +86°.36′ J.T.M.

50 2	22.1	25.7	27.2	30.6	33.5	35.1
	30.6	33.2	34.5	38.8	41.0	43.0
A_1	27.5	30.7	32.4	35.8	37.6	39.9
	29.7	32.8	34.1	39.1	40.3	42.0
	27.48	30.60	32.05	36.08	38.08	40.00

1877 Sept. 12

51 Cepheï L.C. 18 42 +92 46 J.T.M.

40 3	32.8	28.8	26.3	23.6	19.5	16.9
A_2	40.0	36.4	33.2	31.0	26.9	25.0
	37.0	33.2	30.0	28.0	23.5	22.0
	36.6	33.0	30.2	26.9	23.4	21.0
	36.60	32.85	29.92	27.38	23.32	21.22

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1877, Sept. 13

δ. Ursæ min. L 18 12 +86 36 f. T. M.

A_1	E	50 2	21.7	27.6	30.1	31.4	33.2
	F		28.9	34.8	36.8	38.4	40.8
	G		27.3	32.4	35.0	36.3	38.9
	H		25.4	30.9	34.0	35.8	37.1
			25.82	31.42	33.98	35.48	37.50

1877, Sept. 13

51 Cephei L. C. 18 42 +92 46 f. T. M.

A_2		40 3	31.8	30.4	27.2	24.6	21.5	17.9	~~40 3~~	~~31.4~~	~~28.9~~	~~26.4~~
			38.9	37.9	33.4	30.8	27.5	24.3		~~37.5~~	~~34.7~~	~~32.5~~
			35.9	34.9	30.5	27.9	25.1	22.1		~~35.2~~	~~32.5~~	~~29.9~~
			32.8	31.2	27.1	23.9	21.4	18.1		~~33.9~~	~~31.3~~	~~28.9~~
			34.85	33.60	29.55	26.80	23.88	20.60				

1877phae.proj.1422M

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1877, Sept. 15

δ Ceo. Min. 18 12 +86 36 J.F.M.

E	50 2	8.9	12.4	17.6	18.9	21.5	24.9
F		16.4	19.1	24.1	25.2	28.9	32.7
G		14.4	17.1	22.3	22.9	26.4	29.6
H		14.9	17.3	23.5	24.8	27.4	30.3
		13.65	16.48	21.88	22.95	26.05	29.38

1877, Sept. 15

51 Cephei L.C. 18 41 +92° 46′ J.F.M.

	40 3	31.4	28.9	26.4	22.5	4.1	1.9
		37.5	34.7	32.5	28.6	9.6	8.0
		35.2	32.5	29.9	25.8	7.4	5.0
		33.9	31.3	28.9	24.9	6.0	3.9
		34.50	31.85	29.42	25.45	6.78	4.70

1877phae.proj.1422M

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1877phae.proj.1422M

1877, Sept 16

51 Cephei L. C. 18h 40m +92 46 J.F.M.

40	3	28.8	25.8	21.9	8.1	5.3⁻	3.0
		33.1	31.6	27.9	13.9	10.7	7.7
		33.2	30.5⁻	24.5⁻	12.5⁻	8.5⁻	5.9
		31.8	29.2	24.6	11.2	7.9	5.5⁻
		32.22	29.28	25.22	11.42	8.15	5.52

rej. stroke before 2nd S

1877, Sept. 18

51 Cephei L. C. 18h 40m +92° 46′ J.F.M.

E	40	3	17.4	12.9	10.1	3′ 5.0″	2′ 58.5″⁻	58.4
			23.1	18.6	15.4	11.2	4.3	1.4
			20.9	15.7	12.9	7.9	1.3	58.3
			19.2	13.9	10.5⁻	5.9	59.5⁻	6.9
			20.15	15.28	12.22	7.50	1.90	0.50

1877, Sept. 19

51 Cephei L. C. 18 42′ +92 46 J.F.M.

	40	3	22.7	19.9	12.4	8.3	6.1	3.1
			31.2	33.1	19.2	15.9	12.9	10.4
			25.3	22.4	14.4	10.0	7.8	4.3
			26.6	23.4	16.2	11.2	8.4	6.8
			26.45	24.70	15.85	11.35	8.80	6.15

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1877 Sept. 20

51 Cephei L.C. 18h 40m +92° 46′ J.F.M.

ε	40′	3′	16″.9	14″.8	9″.8	6″.2	3′	3″.6	2′ 56″.2
η			24.6	22.1	17.1	15.6	11.5		3.8
ζ			20.3	17.8	12.7	9.1	6.6		59.4
η			20.2	17.9	12.5	9.0	6.2		58.9

1877. Sept. 22

51 Cephei L.C. 18 40 +92 46 J.F.M.

ε	40′.3	6″.5	5″.4	3′ 2″.0	2″	58″.4	52″.8	57.0
η		14.7	13.2	9.4		6.5	0.4	59.1
ζ		6.9	6.1	3.1		0.0	53.9	52.2
η		10.0	8.2	5.7		1.6	55.4	54.1
		9.52	8.28	5.05		1.62	55.62	54.10

1877, Sept 23

51 Cephei L.C. 18 40 +92 46 J.F.M.

40′	3′	13″.9	11″.9	8″.4	5″.9	3′	1″.7	2′ 58″.1
		22.8	20.4	16.4	13.9		9.9	5.9
		17.6	16.3	11.9	8.7		4.1	0.7
		17.1	15.1	11.3	8.9		4.3	0.0
		17.85	15.92	12.00	9.35		5.00	1.18

1877phae.proj.1422M

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Sept 24 1877 J.A.R.

Nice Min last 4 m.

50 2	21.8	36.4	41.8	46.1	47.8
	29.2	42.7	47.8	52.2	54.8
	25.3	39.3	44.3	49.6	57.2
	27.8	41.8	46.3	51.3	53.7
	26.02	39.80	45.05	49.80	51.88

1877, Sept. 25

51 Cephei L.C. 18 40 +92 46 f.T.m

40 3	10.9	15.7	3.26	2 59.9	55.9	53.0
	17.9	12.1	9.9	7.1	2.3	58.9
	15.9	8.9	7.0	4.5	58.7	56.0
	13.1	7.1	5.1	2.9	57.9	54.6
	14.45	10.80	6.15	3.60	58.70	55.62

1877, Sept 26

51 Cephei L.C. 18 40 +92 46 f.T.m

40 2	46.2	42.5	39.1	38.1	33.7	31.5
	55.9	52.6	49.9	47.3	43.5	42.2
	53.0	49.9	47.3	45.7	40.1	39.1
	50.4	47.0	44.5	42.6	38.2	37.0
	51.12	48.00	45.20	43.42	38.88	37.45

1877phae.proj.1422M

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1877phae.proj.1422M

30

5 Cephei Sept. 29 1877 J. H. R.

40	2	45.5	33.8	29.2	26.9	22.6	20.9
		86.0	41.0	39.5	38.0	23.7	31.8
		82.0	40.1	35.3	32.9	29.4	27.3
		51.8	40.0	34.6	34.0	28.6	27.4

1877 Oct. 6

λ Ceti. Min. 19 50 +88° 54′

J. F. M.

	E	30 2	44.9	45.1	46.2	46.1	47.9	48.3
A_1	F		55.2	56.2	56.6	56.3	58.9	58.5
2+3	G		49.4	50.1	51.1	50.4	52.1	51.6
A_2.1	H		52.3	54.0	53.5	54.3	56.2	56.2
3+4			50.45	51.35	52.35 ~~51.85~~	51.82	53.78	53.65

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1877phae.proj.1422M

1877. Oct. 7

λ Ursa Min. 19 50 +88 54 J. F. M.

	30.2	26.5	26.9	28.1	35.5	35.1	41.0
A 1, 4, 5, 6 + 9		37.5	37.4	38.2	45.4	45.2	51.1
		30.1	31.4	32.5	39.2	38.6	45.1
		34.5	35.6	36.2	43.8	43.1	48.4
		32.15	32.82	33.75	40.98	40.50	46.40

1877. Oct. 13 J. F. M.

λ Ursa Min. 19 50 +88 54

	30.2	32.1	35.9	38.3	38.1	39.7	42.2
A 6, 7, 9 +		45.0	48.4	49.5	50.0	50.9	53.2
A −1, 1, 2, 3		37.9	41.9	43.9	43.9	43.9	47.4
		42.9	45.5	48.1	47.9	49.9	52.1
		39.48	42.92	44.95	44.98	46.10	48.72

Rattle after A −1, 2

1877. Oct. 15

λ Ursa Min. 19 50 +88 54 J. F. M.

	30.2	40.5	42.3	43.1	42.8	44.1	44.5
A −1 2+3		52.1	53.1	54.1	54.6	55.2	53.5
A −2 1+2		47.7	48.8	48.4	49.3	49.4	49.9
		49.6	50.3	52.1	52.1	54.4	54.1

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1877phae.proj.1422M

1877. Oct. 17

λ Ursa. Min. 19 50 +88 55 — J. F. M.

	30	2	22.8	25.1	30.6	34.6	37.1	37.7
A 1, 2, 5, 6, 7, 9			34.9	37.1	41.3	45.2	47.3	48.5
			26.9	29.8	35.4	38.5	41.9	43.1
			31.9	34.0	39.3	41.9	45.1	46.2
			29.12	31.50	36.65	40.05	42.85	43.88

~~1877 Oct. 13~~ 1877 Oct. 18

λ Ursa. Min. 19 50 +88 55 — J. F. M.

	30	2	14.1	17.5	24.9	25.9	29.1	32.4
A 1, 4, 5, 6, 9			26.1	30.4	37.1	37.8	41.1	44.2
			21.4	24.1	31.1	32.6	35.7	39.6
			23.1	26.9	33.1	35.1	38.1	41.9
			21.18	24.72	31.55	32.85	36.60	39.52

λ Ursa. Min. 19 50 +88 54 1877. Oct. 27 — J. F. M.

A, 4, 5 & A 1, 2, 3

	30	2	15.5	27.3	35.5	42.2	42.4	43.0
			27.8	38.9	46.9	53.0	53.2	54.3
			18.1	29.2	36.6	43.9	44.5	46.0
			23.9	34.9	42.1	50.4	50.1	50.1
			85.3	130.3	161.1	189.5	190.2	193.4
			21.32	32.57	40.27	47.37	47.55	48.35

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1877phae.proj.1422M

1877 Oct. 28

λ Ursæ Min. 19h 50m +88° 54′ J.J.M.

~~A 1.4~~	30	2	26.5	32.2	34.2	39.1	40.1	40.3
A 1. 4,5,6,9			39.1	43.9	45.9	51.2	52.1	51.8
			29.9	33.7	36.6	42.4	43.4	42.9
			34.2	39.9	42.8	47.9	48.4	49.9
			1297	1497	1595	1806	1840	1849
			32.42	37.42	39.87	45.15	46.00	46.22

Oct 30 1877

λ Urs. Min 19h 50m +88° 54

False stroke before 1st 5	30	2	25.0	37.4	37.5	41.5	41.9	42.1
A 1,5,8			36.0	47.8	48.8	52.0	52.1	54.8
A-1 2,3			29.9	41.7	42.0	46.1	46.9	49.1
			36.8	47.9	47.2	52.1	52.4	54.7
			1277	1748	1755	1917	1933	2007
			31.92	43.70	43.87	47.92	48.32	50.18

1877 Oct. 30

α Ursæ Min. 7h 12m +88° 40 J.J.M.

	45	4	1.2	2.4	5.6	6.8	8.3	9.5
A+1			11.1	12.5	15.9	16.2	18.9	20.0
			2.9	3.5	6.9	7.5	10.2	11.2
			10.4	10.1	13.9	14.8	17.1	17.9
			256	285	423	453	545	586
			6.40	7.12	10.58	11.32	13.63	14.65

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1877 Nov. 3

α Urs Min h 1 m 12 + 88° 40′

45 4	29.3	31.5	32.9	34.9	33.9	35.6
A–1	40.4	42.2	43.2	44.9	44.1	46.9
	30.5	32.9	33.9	35.4	34.8	37.1
	37.7	39.6	39.9	42.2	40.9	44.0
	1379	1462	1499	1574	1537	1636
	34.47	36.55	37.47	39.35	38.42	40.90

1877 Nov. 4

λ Urs. Min h 19 m 50 + 88° 54′

30 2	43.9	44.7	45.0	45.6	46.5	48.1
	55.2	56.4	56.1	58.6	59.1	0.1
	46.8	47.9	46.9	48.8	49.8	50.9
	53.3	53.7	54.1	56.1	56.1	57.9
	1992	2041	21	91	115	2170
	49.82	51.03	50.52	52.28	52.87	54.25

1877 ~~Nov.~~ 4

α Urs. Min h 1 m 12 + 88° 40′ J. F. M.

45 4	~~25.6~~	32.2	32.7	35.9	36.8	38.1	38.9
~~Mit wie [illegible]~~		43.1	44.2	46.1	47.2	47.8	50.1
A–1, 12		31.4	32.6	34.8	35.9	37.1	37.6
		40.4	39.7	42.2	43.1	44.9	44.1
		1471	1492	1590	80	79	1707
		~~39.27~~	37.30	39.75	40.75	41.97	42.68
		36.78					

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1877 Nov 6

α Ursa Min 1h 12m + 88° 40′

First-last 2 wires	45-4	13.4	16.6	18.5	20.1	22.1	23.1
		23.1	25.7	28.8	30.4	31.1	34.2
		10.0	13.1	15.6	16.6	18.9	20.5
		18.4	20.3	21.6	24.8	25.7	27.3
		649	757	845	919	972	1051
		16.22	18.93	21.12	22.97	24.30	26.27

1877 Nov. 7.

α Ursa Min. 1h 12m + 88° 40′

False strike for 1st 8

	45-4	11.8	13.4	14.5	18.0	19.6	21.5
First-last 2 wires		21.8	24.4	25.2	28.7	30.5	32.4
		10.1	12.9	13.8	16.5	18.6	19.8
		17.8	20.7	21.1	23.9	25.6	27.5
		615	714	746	871	943	1012
		15.37	17.85	18.65	21.77	23.58	25.30

1877 Nov. 13

α Ursa Min 1 12 + 88 40

	45-4	9.6	14.4	15.4	18.2	17.4	19.4
		20.9	24.7	26.2	27.7	28.2	30.1
		7.0	11.5	14.0	15.0	15.9	17.5
		14.7	20.6	20.5	21.5	23.1	24.0
		522	712	761	824	846	910
		13.05	17.80	19.12	20.60	21.15	22.75

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1877, Nov. 14

α Ursa Min. 1h 12m +88 40 J. T. M.

45 4	7.7	10.2	12.3	14.0	16.1	16.7
	18.1	21.2	23.4	24.7	26.4	28.0
	6.4	8.8	11.1	12.9	15.5	16.4
	16.1	16.7	20.1	22.4	22.9	24.1
	483	569	669	7640	869	852
	12.07	14.23	16.72	16.00 18.50	20.22	21.30

1877, Dec. 1

α Ursa. Min 1 12 +88 40 J. T. M.

45 4	24.1″	25.0″	26.9″	26.8″
	33.1	33.2	35.4	36.1
	17.4	19.3	20.3	21.2
	24.1	26.1	28.1	29.0
	987	1036	1107	1131
	24.67	25.90	27.67	28.28

The last 3 wires

1877, Dec. 2

α Ursa. Min 1 12 +88 40 J. T. M.

45 4	24.0	26.9	30.1	29.7
	32.4	35.3	37.3	36.8
	17.7	20.9	21.9	22.3
	23.5	26.9	28.8	28.8
	976	1100	1181	1176
	24.40	27.50	29.52	29.40

The last 3 wires

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1877 Dec 3

α Urs. Min 1h 12m +88° 40′

Last 1st 2 wire 45 4

17.5	18.3	19.4	20.5	22.1	23.6
26.4	28.1	28.9	28.5	31.5	31.9
10.4	12.1	13.4	14.1	15.9	17.8
18.5	19.0	20.8	20.8	23.5	24.8
728	775	825	839	930	981
18.20	19.37	20.63	20.97	23.25	24.52

1877 Dec. 9

α Urs Min 1h 12m +88° 40′

3 last wire & foll

45 4

14.9	15.9	19.1	19.9	21.9
24.5	25.9	28.1	29.3	32.1
9.1	10.2	13.1	13.8	16.8
17.4	19.6	21.1	22.1	24.8
654	716	814	851	956
16.35	17.90	20.35	21.27	23.90

1877 Dec 12

α Urs Min 1h 12m +88.° 40°

Mid wire & foll 45.4

15.9	17.5	17.6	19.1	20.5	20.8	For the last wire
25.2	27.5	27.9	29.1	30.3	30.8	δ is short & wire long.
11.2	13.0	13.9	14.9	16.1	16.1	
18.6	20.4	21.6	22.3	24.0	23.9	
709	784	810	854	909	916	
17.72	19.60	20.25	21.35	22.72	22.90	

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Dec. 13, 1877

α Urs. Min 1 $12^h\ 12^m$ +88° 40′

45 4	9.5	11.1	13.1	15.0	15.9	16.4
First Set 3 wires	20.5	22.2	24.6	25.2	26.1	27.4
	7.1	8.4	9.8	11.8	12.4	13.2
	14.8	16.1	18.1	19.0	19.6	20.9
	519	548	656	710	740	779
	12.97	14.45	16.40	17.75	18.50	19.48

α Urs. Min 1 12^m +88 40′ Dec 15, 1877

45 3	47.5	50.8	52.2	53.9	57.8	58.9
At, 1.2.3	58.1	1.4	2.4	5.0	8.2	9.1
	45.2	48.0	49.9	50.9	54.8	55.5
	52.1	56.9	57.1	58.9	3.1	4.9
	2029	2171	2216	2287	2439	2484
	50.72	54.28	55.40	57.18	0.97	2.10

α Urs Min 1 12^m +88 40 Dec 16, 1877

At 1.2.3.	45 3	48.0	51.5	53.4	56.2	58.0	4 0.0
		58.2	2.0	3.9	6.5	8.9	10.2
		48.4	51.3	52.6	55.2	56.4	58.9
		54.7	58.0	59.9	3.6	4.5	6.9
		2093	2228	2298	2415	2478	2560
		52.32	55.70	57.45	0.37	1.95	4.00

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1877 Dec 17

α Urs. Min ~~88~~ $1^h\ 12^m + 88°\ 40'$

45	3	57.1	59.4	4 0.8	2.2	5.1
First 3 wires		9.5	10.3	12.8	13.4	16.2
		56.5	58.7	0.1	2.2	4.2
		3.9	7.0	6.4	8.7	9.8
		2470	2554	201	265	353
		1.75	3.85	5.02	6.38	8.82

α Urs. Min. $1^h\ 12^m + 88°\ 40'$ Dec 18 1877

45.4	2.5	5.9	5.8	9.5	9.2	12.5
	12.2	15.5	15.1	19.2	18.9	22.2
	59.0	1.9	1.5	4.3	4.9	7.8
	5.2	10.0	8.1	11.9	13.1	16.8
	2589	833	305	449	461	593
	4.72	8.33	7.62	11.23	11.52	14.83

1877 Dec 20

α Urs. Min $1^h\ 12^m + 88°\ 40'$

45.4	9.4	13.0	13.7	14.8
Lost 1st 3 wires	19.9	22.8	23.6	25.0
	9.2	12.4	13.8	14.7
	15.9	18.2	19.2	19.9
	544	664	703	744
	13.60	16.60	17.58	18.60

Lost the last wire

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JFM

1877 Dec 25

α Urs. Min. $1^h\ 12^m + 88°.\ 40'$

Lost 1st 1, 2 &
~~Lost~~ last wire

~~Lost 1st 2 wires~~

45.4	9.9	11.2	13.0	14.1	15.2
	20.1	21.9	23.9	24.9	25.9
	6.9	8.1	11.1	11.6	12.6
	14.7	16.0	17.2	18.8	20.1
	516	572	652	694	738
	12.90	14.30	16.30	17.35	18.45

1877 Dec 26

α Urs Min $1^h\ 12^m + 88°\ 40'$

45.5	~~3~~ 4	2.3	4.2	45.4	10.0	18.9	19.9	20.5
A 1.4.5 A-1 1.3		10.9	12.4		18.2	28.1	29.1	29.9
		59.1	0.3		6.4	15.9	16.5	17.5
		6.5	8.4		14.1	22.6	24.1	24.8
		2588	253		487	855	896	927
		4.70	6.33		12.18	21.37	22.40	23.17

1877 Dec. 27

α Urs Min $1^h\ 12^m + 88°\ 40'$

45.5	3	59.5	3.9	45.4	17.8	19.9	22.7
A 1 A-1 1.3		9.9	13.9		28.4	30.1	32.4
		59.1	1.4		17.5	19.4	20.9
		6.2	8.4		23.9	26.8	28.7
		2537	276		876	952	1047
		3.43	6.90		21.90	23.80	26.18

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1877 Dec 31.

α Ursa Min 1h 12m +88° 40′

A+1 1	45°	3′	53″.8	55.2	57.1	4′	6″.9	9.1	20.5
A1+2			1.6	4.0	6.1		16.0	18.1	30.2
A−,1			46.7	48.9	50.5		59.9	21	14.6
			53.1	55.8	57.6		7.4	9.8	21.9
			2142	2239	2313		2702	391	873
			53.55	55.98	57.82		7.55	9.78	21.82

1878. Jan. 1

α Ursa. Min 1h 12m +88° 40′

	45°	3′	53″.1	+.22	55″.1	+.21	57″.5	+.20	4′	6″.9	+.26	20.3 +.51	21.6 +.52
A+,12			2.9	+.17	4.8	+.19	8.6	+.19		16.4	+.17	30.0 +.02	32.1 +.02
A+2			47.4	−.50	49.1	−.49	52.6	−.38		0.2	+.16	15.0 −.24	15.8 −.26
A−,1			53.1	+.06 −.06	55.3	+.04 −.05	59.9	+.04 +.05		7.1	+.22 .81	21.4 +.20 .49	22.9 +.21 .49
			54.12		56.08		2406 $60.15			7.65		21.68	23.10

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2 H Camel L.b. June 17 1877 A+2

20 1 49.4 1.9 7.9 42.2 1 26.7 40.2 45.8 20.5

9 H Camel L.b. June 17 1877

45 4 34.9 44.6 49.9 25.3 45 3 54.7 4.8 10.1 45.9

45 3 24.8 35.2 39.9 15.6

June 18, 1877

η Persei 14 42 5 hr

55 2 52.7 3.7 6.9 43.9

55 2 28.9 40.4 43.5 21.1

28 H. Camel. L.b. 15h 19m June 18, 1877

20 2 49.9 1.1 5.4 41.5

20 2 15.4 27.2 30.6 7.1

20 1 39.6 50.4 54.8 30.9

20 1 22.1 32.7 39.3 13.7

9 H. Camel L.b. 15 46 June 18

15 2 18.0 29.4 33.5 9.5 15 1 51.7 3.4 6.9 41.1

29.

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1877, June 19

η Persei L.C. 14h 42m

55 3 23.2 35.5 40.9 16.9
55 2 34.6 47.1 52.5 28.8
55 2 4.9 17.6 2/3 59.3

f.S.m.

Mdw. & fall

June 19

2 H. Camel. 15 19

20 2 7.8 19.8 26.9 1.0
20 1 51.0 4.1 10.5 44.5
20 1 17.2 30.3 37.1 11.2

η Persei L.C. 14h 42m 124° 37' (1877 June 20

55 3 38.7 48.0 52.6 29.4
55 3 1.4 11.4 14.3 52.2
55 2 21.9 33.1 35.9 14.2

f.F.m.

1877, June 24

η Persei L.C. 124° 37' 14 42

55 3 27.2 38.4 42.9 20.2
55 2 33.9 45.8 49.1 28.0

1877phae.proj.1422M

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1877phae.proj.1422M

2 H. Camel. L. C. 15 h 19 m 27 s 1877 June 24

20	2	45.0	59.0	3.6	40.1
20	1	51.6	5.4	10.6	47.1
20	1	19.1	33.8	40.1	14.4

9 H. Camel. L. C. 1877 June 24

15	2	4.75	1.1	3.9	41.7
15	2	11.8	26.7	30.5	6.4
15	1	39.5	53.8	58.4	34.5
15	1	26.7	40.3	45.1	20.9

2 H. Camel. L. C. 1877, June 27

20	3	48.1	3	20.7	2	53.7	
		1.1		34.4		8.6	
		6.9		40.1		13.9	
		42.9		16.2		48.9	

9 H. Camel. L. C. 1877, June 20

15	2	57.3	2	26.4	2	6.5	1	27.0
		4.4		40.1		20.8		41.4
		10.4		45.4		25.1		46.8
		45.9		20.8		1.0		22.9

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1877, July 4

	h	m			
2 H Camel	15	19			
20	1	57.9	7.7	16.9	47.8
20	1	31.0	41.9	51.1	22.3

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