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v.603

Zone Observations & Reductions

C 41.

From Dec 1 1877 to Feb 2 1878 inclu

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1877phae.proj.16[illegible]R

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1877phae.proj.10078

Adopted values of i for 1877 and 1878.

	i	tang i	For circle Readings 15 tang i	For Declinations 15 tang i
1877. July 5 to Dec 31	+5° 3.9"		.12260	.12260 n
1878. Jan 1 to Feb. 6	+5 4.40		.12478	.12478 n

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1877phae.proj.tif/R

1877, Dec. 1, Dec. 2. Obs. W.A.R. Rec. J.F.M.

	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	1 35 25.34	1 37 52.36	1 42 41.41	1 43 45.42	1 45 18.44	1 46 18.45	13.3
δ	54° 59'	54° 7'	51° 58'	51° 43'	54° 58'	53° 16'	

Dec. 1

Add +0.28 to (ΔT+m) Dec 1 & two have been added to sum of the constants and to final +0.28 R.A.

35 42.8	38 27.4	43 0.3	44 4.2	45 38.4	46 36.2	
46.4	30.9	3.4	7.5	41.9	39.5	
50.0	34.4	6.9	10.6	45.8	43.0	
53.9	38.0	10.2	14.1	49.0	46.6	
57.4	41.7	13.6	17.4	52.8	50.1	
06	05	44	538	2279	2154	
35 50.12	38 44.10	43 6.88	44 10.76	45 45.58	46 43.08	
+ 1.78 8 +0.26	+ 1.78 8 +1.78 +.25	+ 1.78 8 +.3711	+ 1.78 8 +.3642	+ 1.76 8 +.25	+ 1.78 8 +.2935	
- 1.38	- 1.33 - 1.33	- 1.24	- 1.23	- 1.38	- 1.29	
- .17	- .17 - .17	- .16	- .16	- .16	- .17	
35 50.67 -769	38 48.37 34.75 -768	43 7.24 -763	44 11.13	45 46.79 -784	46 43.38 -775	
- 5.14 -3666	- 5.15 - 5.16 -3650	- 5.13 -3614	- 5.14 -3606	- 5.32 -3594	- 5.23 -3586	
35 45.24 4	38 13.28 6 29.68 3	43 2.16	44 6.08 4	45 40.49 5.1	46 38.15 8	

8.0 | 8.7 | 8.4 | 6.3 | 7.0 | 8.5

34 10.8	37 46.0 37 49.2	42 27.3	43 34.7	44 0.6	46 18.0	
13.8	49.4 2.0	30.7	37.4	4.0	22.4	
17.2	53.0 6.0	32.7	38.9	6.7	24.4	
119	14.14 72	07	220	112	58	
35 13.97	38 54.59 54.69 49.13 240	42 30.23	52 0 1602	43 37.33	51 45 2540	45 3.73
+36.15	- .33 +28.97 +32.08 8 29.91 26.64	+3665	- .35 +3343	- .30	+41.85	- .45 +21.15
1.55811	- 62 1.46105 1.50623	1.56407	- 53 1.52414	- 51	1.62170	- 62 1.32531
9.75859	+ 13.86 9.76765 9.76765	9.78934	+ 1049 9.79160	+1021	9.75859	+ 13.85 9.77643
1.43930	+ 40 1.35226 1.39648	1.47601	+ 30 1.43834	+ 30	1.50289	+ 40 1.23434
25	- 36.80 15	25	-3600 40	-36.40 25	-35.70	-3620 10

2 45.2	59 28.11 3 47.8	2 21.6	59 46.59 2 15.0	44 55.86 2 45.9	59 23.69 0 16.1	17 6.85
43.5	46.6	19.6	12.4	43.4	15.2	
87	1.44	12	74	9.3	113	
27 41.35	18 47.20	27 20.68	112 13.70	27 44.65	10 15.65	
55 4.00	4 1.15	55 27.75	40 3.465	55 3.70	12 3.270	
55 0 22.19	54 9 19.34	52 0 45.94	51 45 52.84	55 0 21.89	53.17 50.89	
- 27.50	-22.50	- 29.92	- 27.44	- 31.84	- 16.76	
	-24.92 7 52.6					
35 37.55	58 51.2 38 5.58 7 50.1	42 54.53	59 10.4 43 58.41	44 19.8	45 32.67 58 47.8	46 30.43 16 31.0
+13.52	21.95 +12.35 +12.32	+10.07		+9.97	+13.52	+12.11

n=-.97
c=, -.10
+5 18.19
R.A.=-.23

Dec. 2

Add +0.18 to (ΔT+m) Dec 2 & two have been added to sum of the constants and to final +0.18 R.A.

34 42.0	38 9.27 9.27	42 59.5	6.99 44 8.3	6.89	41 37.1 10.44	46 8.3 9.03
43.9	10.1 26.4	2.8	6.6		41.2	38.6
49.2	13.8 30.0	6.1	10.0		44.7	42.1
53.0	17.0 33.6	7.5	13.2		48.3	45.5
58.6	20.8 36.8	12.7	16.6		51.8	49.2
467	24.4 40.1	306	497		2236	2107
35 49.34	861 1676	43 6.12	44 11.94		45 44.72	46 42.14
+ 2.254 +1.03 +1.03	17.22 33.52	+ 2.254 +1.03	+ 2.254 +1.03		+ 2.254 +1.04	+ 2.254 +1.04
- 1.21 +1.05	+ 2.254 + 2.254 +1.03	- 1.08	- 1.04		- 1.21	- 1.13 +1.13
35 50.36	- 1.17 - 1.17	43 7.29	44 11.12		45 45.76	46 43.26
- 5.13	38 18.30 34.00 -768	- 5.12	- 5.13		- 5.21	- 5.24
35 45.24 6	- 5.14 - 5.15 -3650	43 2.18 8	44 6.00		45 40.44 5	46 38.0x 3
-769	38 13.15 7 29.54 6	-763	-763		-784	-775
-3666	46	-3614	-3606		-3594	-3586

8.0 | 8.7 | 8.7 | 6.5 | 8.3 | 8.3

34 12.1	37 42.5 33 46.7	42 25.7	48 42.8	45 9.3	46 9.6	
14.1	45.2 48.9	32.0	45.7	12.5	12.7	
18.9	49.4 3.9	36.9	49.0	15.9	16.3	
17154 -3.08	175 05	66	175	77	86	
35 15.70	59 53.74 45.88 0.17	42 32.20	52 0 1398	43 45.83	51 45 2659	45 12.57
+ 3364	- 29 +31.39 +3355 8 29.07 27.62	+3392	- 31 +24.11	- 15	+32.15	- 26 +29.24
1.52686	- 64 1.49679 1.52310	1.53046	- 55 1.38220	- 53	1.50718	- 67 1.46642
9.75859	+ 14.05 9.76765 9.76765	9.78934	+ 1063 9.79160	+1035	9.75859	+ 1405 9.77643
1.40805	+ 40 1.38704 1.41335	1.44240	+ 30 1.29640	+ 30	1.38837	+ 40 1.36545
25	- 37.00 15	25	-3620 40	-3610 25		-3640 10

2 49.6	59 27.18 3 47.9	2 24.3	59 44.71 2 21.9	44 57.38 2 53.9	59 24.36 0 10.2	17 7.61
45.9	44.3	26.5	19.5	50.7	8.0	
155	12.2	108	14	46	182	
27 47.75	18 46.10	27 25.40	42 20.70	27 52.30	10 9.10	
55 0.60	4 2.25	55 22.95	40 2.765	54 56.05	12 3.925	
55 0 19.33	54 9 20.98	52 0 41.68	51 45 46.38	55 0 14.78	53.17 57.98	
- 25.69	- 24.38	- 27.70	- 19.79	- 24.46	- 23.20	
	- 25.90					
35 37.57	58 50.5 38 5.49 7 52.6	42 54.58	59 8.6 43 58.34	44 21.3	45 32.61 58 48.4	46 30.28 16 51.8
	21.75 +12.35 +12.32					

n=-.85
+5 18.73

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1877phae.proj:1877R

597 598

1877, Dec. 1, Dec. 2)

	h m s		h m s	
α	1 47 17	46 124	1 49 21	48 15.9
δ	54° 51′	45.9	54° 44′	39.5
		8.6		9.2

Dec. 1

+12.51 +13.26

47 37.2 9.47 49 40.6 9.92
40.8 44.1
44.2 47.5
48.0 51.1
41.7 35.0
2219 2383
47 44.38 49 47.66
+ 1.78 8 +7.27 + 1.78 8 +7.28
− 1.37 − 1.36
− .17 − .17
47 44.60 49 47.89
− 5.34 −7.86 − 5.38 −7.89
47 39.28 −35.78 49 42.58 −35.62
31

8.8 9.1

47 7.8 48 58.8
10.6 3.7
12.5 6.7
09 89
47 10.30 54 53 11.74 49 2.94 54 46 30.31
+3408 − 30 44.69 − 51
1.532 50 − 1.03 1.650 21 − 23
9.75985 +13.74 9.76093 +13.60
1.41495 + 40 1.53374 + 40
30 −3610 40 −3600

4 29.9 52 9.511 1 3.6 46 4.23
27.7 0.5
17.6 4.1
34 28.80 41 2.05
48 19.55 41 46.30
54 53 37.74 54 47 4.49
− 26.00 − 34.18

47 31.45 52 9.3 49 34.67 45 28.6
Dec. 2 +13.06 +13.67

47 36.3 9.98 49 38.6 10.53
39.8 43.0
43.6 46.9
47.0 50.2
40.8 54.1
2176 2337
47 43.52 49 46.74
+ 2.28 4 +1.06 + 2.28 4 +1.07
− 1.20 − 1.19
47 42.60 49 47.80
− 5.33 −7.86 − 5.36 −7.89
47 39.28 5 −35.78 49 42.43 5 −35.62

8.5 9.1

47 11.0 49 8.9
14.8 13.3
18.3 16.5
151 87
47 15.03 54 53 11.70 49 12.90 54 46 31.70
+28.49 − 21 +33.84 − 30
1.445469 − 1.06 1.529443 − 28
9.759815 +13.93 9.76093 +13.79
1.33714 + 40 1.41296 + 40
30 −3630 40 −3620

4 35.4 52 9.538 1 11.1 46 6.03
31.9 7.9
7.3 19.0
34 33.65 41 9.50
48 14.70 41 38.85
54 53 33.43 54 46 57.58
− 21.73 − 25.88

47 31.39 52 9.6 49 34.56 45 30.74

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1877phae.proj.1617R

1877, Nov. 28, Dec. 8. Obs. W.A.R. Rec. J. F. M.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	3 45 45	44 29.3	3 50 40	49 23.3	3 52 40	51 23.0	3 53 21	52 44.3	3 54 42	53 25.1	3 56 10	54 5.27
δ	53° 30′	268 9.0	52° 1′	16.3 9.3	54° 6′	3.5 9.0	54° 22′	18.6 8.7	54° 39′	35.8 8.5	53° 14′	11.3 8.4

Nov. 28

	+1.43		+6.95		+12.39		+11.74		+12.09		+10.99	
	7.76		6.28		8.72		8.07		8.42		7.32	
	46 18.54		51 20.25		53 5.42		55 14.08		56 40.46			
	+ 1.63	+0.25	+ 1.63	+0.31	+ 1.63 + 1.63	+0.22 +0.22	+ 1.63	+0.21	+ 1.63	+0.19	+ 1.63	+0.26
	− 1.38		− 1.32		− 1.41 − 1.41		− 1.42		− 1.44		− 1.37	
	46 18.79		51 20.56		53 11.56 12.60		53 53.63		55 14.27		56 40.72	
	− 6.79	−9.16 −22.14	− 6.72	−9.07 −21.42	− 6.91 − 6.91	−9.29 −21.12	− 6.95	−9.32 −21.02	− 6.98	−9.37 −20.80	− 6.86	−9.22 −20.60
	46 12.00		51 13.84		53 4.65 5.69		53 46.68		55 7.28		56 33.86	
	46 2.44											
	8.7				9.38.9		8.6		8.5		8.3	
	156	−3.67	107		17		46		444		577	
	45 55.20	53 31 3.95	51 33.57	52 20 28.14	4953	54 7 13.65	53 41.53	54 23 1.21	54 48.13	54 38 37.89	56 19.23	53 15 37.61
	+23.34	− 14	− 13.32	− 5	+21.81	− 13	+11.89	− 4	+25.95	− 14	+21.23	− 12
	1.36810	− 39	1.12450	− 641	1.33866	− 14	1.07518	− 1.15	1.41114	− 97	1.32695	− 51
	9.77422	+ 1161	9.78609	+ 1034	9.76800	+1226	9.76519	+1253	9.76236	+1283	9.77677	+1132
	1.26492	+ 35	1.03319	+ 30	1.22926	+ 40	0.86297	+ 40	1.29910	+ 40	1.22632	+ 30
	55	−22.00	5	−22.60	20	−22.40	0	−22.30	45	−22.10	10	−21.90
	1 41.3	30 49.71	2 46.2	20 11.82	0 33.4	6 59.97	4 55.7	22 46.98	4 6.1	38 24.21	2 8.9	15 23.03
	47.9		53.0		39.3		1.2		12.2		16.1	
n=-.102	42		992		127		1169		18.3		250	
+5 18.60	56 44.60		7 49.60		20 36.35		4 58.215		49 9.15		12 12.50	
	26 375		14 3875		2 1200		17 4990		33 3920		10 2585	
Rx=-.23	53 31 22.35		52 20 17.35		54 7 30.60		54 23 8.50		54 38 57.80		53 15 54.45	
	− 18.40		+ 10.79		− 16.95		− 7.29		− 19.91		− 16.84	
	46 2.44	30 27.6	51 4.77	19 50.4	52 55.36	6 38.8	53 37.36	22 26.0	54 57.92	38 3.4	56 24.64	15 2.4
Dec. 8		+11.55		+10.06	56.40	+12.64		+11.94		+12.29		+11.03
Add +0.25 to last two digits	46 7.10	7.90	51 8.8	6.41	8.99		53 41.8	8.29	54 2.4	8.64	56 29.3	7.38
1st-hour beam added to sum of the constants	10.7		12.4		8.6		45.7		6.0		32.4	
	14.0		14.7		4.7		49.2		9.7		36.0	
	17.7		19.1		8.2		52.6		13.2		39.6	
	21.1		22.6		11.6		56.2		16.9		43.1	
Send to final R.A.	705		786		14.2 14.2		2456		482		1805	
+.025	46 14.10		51 15.72		3352 405		53 49.12		55 9.64		56 36.12	
	+ 5.93	+4.64	+ 5.93	+4.78	+ 5.93	+ 5.93 +4.78	+ 5.93	+4.67	+ 5.93	+4.63	+ 5.93	+4.74
	− 1.19		− 1.14		−1.21 −1.21		− 1.22		− 1.24		− 1.18	
	46 18.84		51 20.51		53 11.76 12.82		53 53.83		55 14.33		56 40.85	
	− 6.88	−9.16 −22.14	− 6.82	−9.07 −21.42	− 7.01 − 7.01	−9.29 −21.12	− 7.05	−9.32 −21.02	− 7.08	−9.37 −20.80	− 6.94	−9.22 −20.60
	46 11.96		51 13.69		53 4.75 5.79		53 46.78		55 7.25		56 33.91	
	8.8		9.3		9.38.9		8.7		8.8		8.4	
	45 37.7		50 35.1		52 38.4		53 32.8		54 38.0		56 24.4	
	41.2		43.4		42.8		34.4		41.2		29.4	
	44.3		47.1		44.1		38.7		44.0		32.7	
	32	−3.65	1300		64		171		32		1775	
	45 41.07	53 31 5.86	50 43.33	52 20 27.66	42.13	54 7 16.07	53 35.70	54 23 0.85	54 41.07	54 38 39.64	56 59.17	53 15 39.42
	+33.03	− 28	+32.39	− 28	+25.97	− 18	+13.42	− 5	+ 28.57	− 21	+36.93	− 36
	1.51891	− 40	1.51041	− 55	1.41447	− 12	1.12775	− 1.22	1.45591	− 1.02	1.56738	− 50
	9.77422	+ 1188	9.78609	+ 1059	9.76808	+ 1254	9.76519	+ 1281	9.76236	+ 13.12	9.77677	+ 11.59
	1.41573	+ 35	1.41910	+ 30	1.30507	+ 40	1.01554	+ 40	1.34087	+ 40	1.46675	+ 30
	55	+24.10	5	−24.60	20	−24.50	0	−24.40	45	+24.20	10	−24.00
	1 34.1	30 49.66	2 11.7	20 9.47	0 29.5	7 0.56	4 55.8	22 44.74	4 5.8	38 27.73 24.08	1 37.9	15 22.80
	35.5		13.9		31.4		55.2		4.5		38.1	
	96		56		09		10		103		160	
	56 34.80		7 12.80		20 30.415		4 55.82		49 5.15		11 38.00	
Rx=-.25	26 1355		15 3555		2 1790		17 5285		33 43.20		10 5035	
	53.31 31.91		52 20 53.91		54 7 36.26		54 23 11.21		54 39 1.56		53 16 8.41	
n=-.88	= − 26.05		− 26.25		− 20.19		− 10.36		− 21.92		− 29.29	
+5 18.36	46 2.77	30 27.5	51 4.61	19 48.0	52 55.44	6 39.4	53 37.45	22 23.7	54 57.86	38 3.3	56 24.65	15 2.2
					56.50							

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1877 Nov. 28, Dec. 8 — 596 600 — 5

α	3 59 15	57 58.2	4 0 13	3 58 56.6	4 3 3	1 45.2	4 5 18	4 0.0	4 7 45	6 26.8	4 9 37	8 19.0
δ	54° 29′	25.9 6.0	54° 41′	38.3 9.0	53° 25′	21.6 8.5	53° 8′	5.3 9.5	54° 9′	6.3 8.2	52° 33′	30.9 8.7

Nov. 28

+12.41		+12.88		+11.38		+10.38		+11.81		+10.00	
59 39.9	8.74	0 39.9	9.21	3 25.8	7.61	5 42.7	6.71	8 10.0	8.14	10 1.3	6.33
43.5		43.5		29.3		46.2		13.4		4.5	
47.0		46.9		32.9		49.6		16.7		8.0	
50.8		50.5		36.1		52.5		20.3		11.6	
54.0		54.0		39.8		56.3		24.1		15.0	
2347		2348		1640		477		845		404	
59 46.94		0 46.96		3 32.80		5 49.54		8 21.12		10 8.08	
+ 1.63	+0.21	+ 1.63	+0.19	+ 1.62	+0.24	+ 1.62	+0.26	+ 1.62	+0.21	+ 1.62	+0.28
− 142	−9.39	− 144		− 138		− 136		− 141		− 134	
59 47.13	−20.14	0 47.15		3 33.04		5 49.80		8 17.11		10 8.36	
− 7.01		− 7.04	−9.42	− 6.93	−9.29	− 6.93	−9.28	− 7.05	−9.41	− 6.90	−9.24
59 40.14		0 40.11	−19.98	3 26.11	−19.56	5 42.87	−19.22	8 10.06	−18.82	10 1.46	−18.54

6.6		9.2		8.7		9.5		8.1		8.5	
59 30.7		0 26.5		3 15.6		5 12.7		7 43.5		9 30.2	
33.3		29.7		18.5		17.4		47.2		33.8	
36.9		32.8		21.7		20.7		49.5		37.0	
109		890		558		508		202		110	
59 33.63	54 30 17.00	0 29.67	54 41 29.44	3 18.60	53 25 29.23	5 16.93	53 9 0.06	7 46.73	54 9 56.03	9 33.67	52 35 0.47
+ 13.31	− 4	+ 17.29	− 7	+ 14.20	− 3	+ 32.61	− 28	+ 30.17	− 24	+ 34.41	− 31
1.12418	− 62	1.23779	− 32	1.15229	− 55	1.51335	− 85	1.47958	− 64	1.53668	− 60
9.76395	+ 1267	9.76200	+ 1287	9.77507	+ 1151	9.77795	+ 1121	9.76747	+ 1229	9.78362	+ 10.61
1.01073	+ 40	1.12239	+ 40	1.04996	+ 35	1.41390	+ 30	1.36965	+ 40	1.44290	+ 30
55	−21.50	45	−21.30	0	−21.00	15	−20.70	15	−20.30	50	−20.10
2 36.4	30 4.24	1 21.2	41 17.35	2 22.9	25 15.84	3 37.4	8 46.07	2 44.0	9 43.87	2 35.4	34 46.70
43.0		27.3		30.1		44.5		51.0		42.1	
794		85		530		819		950		775	
+5 18.60 57 39.70		46 24.25		2 26.50		18 40.95		17 47.50		52 38.75	
25 8.65		36 24.10		20 21.85		4 7.40		5 0.85		30 9.60	
54 30 27.25		54 41 42.70		53 25 40.45		53 9 26.00		54 10 19.45		52 35 28.20	
− 10.25		− 13.26		− 11.22	1 27.8 235	− 25.94		− 23.42		− 27.73	

Dec. 8

59 30.75	29 44.1	0 30.69	40 57.4	3 16.82	1 45.2 21.6	5 33.59	8 26.8	8 0.65	9 25.0	9 52.22	34 28.2
	+12.55		+13.19	24 56.3	+11.92 +11.37		+10.68		+12.02		+10.26
59 35.5	8.90	0 35.4	9.54	2.7 21.4	8.27 7.72	5 38.3	7.03	8 5.4	8.37	9 56.8	6.61
38.9		38.3		9.2 24.9		41.7		9.1		0.4	
42.7		42.8		12.5 28.3		45.4		12.5		3.8	
46.2		46.2		16.1 31.9		48.8		16.0		7.0	
49.8		49.8		19.8 35.2		52.0		19.7		10.6	
2131		2135		633 1417		2261		627		186	
59 42.62		0 42.70		12.66 28.34		5 45.22		8 12.54		10 3.72	
+ 5.93	89+4.69	+ 5.92	89+4.68	+ 5.92 + 5.92	89+4.78 +4.78	+ 5.92	89+4.72	+ 5.92	89+4.68 70	+ 5.92	87+4.74
− 122		− 124		− 119 − 1.19		− 117		− 1.21		− 1.15	
59 47.33	−9.39	0 47.38		3 17.39 33.07	−9.29 −19.56	5 40.97		8 17.25		10 8.49	
− 7.12	−20.14	− 7.16		− 7.04 − 7.04		− 7.04		− 7.18		− 7.02	
59 40.17		0 40.19	−9.42 −19.98	3 10.32 26.00	−9.29 −19.56	5 42.90	−9.28 −19.22	8 10.04	−9.41 −18.82	10 1.44	−9.24 −18.54

6.5		9.3		9.08.0		9.5		8.41		8.7	
59 11.3		0 28.0		49.7 40.0		5 16.2		7 37.8		9 30.0	
13.0		31.3		52.0 43.1		19.2		41.3		32.9	
15.0		34.2		54.8 46.3		22.6		43.8		35.8	
93		45		75 96		580		29		87	
59 13.10	54 30 18.18	0 31.50	54 41 31.87	52.50 43.20	27 17.59 30.10	5 19.32	53 9 1.27	7 40.94	54 9 56.60	9 32.90	52 35 32.4
+ 29.52	− 22	+ 11.26	− 3	+ 20.16 + 14.86	− 10 − 6	+ 25.89	− 18	+ 31.57	− 26	+ 30.82	− 26
1.47012	− 60	1.04922	− 35	1.30446 1.17202	− 15 − 70	1.41313	− 92	1.49927	− 70	1.48883	− 65
9.76395	+ 1297	9.76200	+ 1317	9.77490 9.77507	+ 1182 + 1178	9.77795	+ 1148	9.76747	+ 12.58	9.76362	+ 1086
1.35667	+ 40	0.93382	+ 40	1.20199 1.06969	+ 35 + 35	1.31368	+ 30	1.38934	+ 40	1.37505	+ 30
55	−23.60	45	−23.50	0 0	−23.10 −23.10	15	−22.70	15	−22.40	50	−22.10
2 25.0	30 3.48	1 26.4	41 17.91	0 32.2 2 48.4	27 2.76 14.72	3 44.6	8 45.60	2 45.1	9 42.57	2 38.9	34 47.75
26.6		26.1		34.2 48.3		45.1		46.1		40.6	
116		5		64 7		97		112		795	
57 25.80		46 26.25		0 33.20 2 48.35		18 44.85		17 45.60		52 39.75	
25 22.55		36 22.10		22 15.15 28 0.00		4 3.50		5 2.75		30 8.60	
54 30 40.91		54 41 40.46		53 27 33.51 15 18.36		53 9 21.86		54 10 21.11		52 35 26.96	
− 22.73		− 8.59		− 15.92 + 11.74		− 20.59		− 24.51		− 23.72	
+5 18.36 59 30.80	29 43.3	0 30.80	40 57.9	3 1.05 16.73	26 43.2 24 55.2	5 33.65	8 26.4	8 0.65	9 23.8	9 52.23	34 29.2

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1877phae.proj.10f7R

1877 Nov. 28. Dec. 8. Obs. W.A.R. Rec. J.F.M.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	4 11 19	10 0.6	4 11 24	10 6.1	4 15 42	14 34.0	4 16 12	14 54.2	4 18 37	17 18.3	4 22 17	20 57.9
δ	53° 23′	20.5 8.0	53° 23′	19.9 9.3	53° 30′	26.7 8.0	53° 19′	16.4 8.4	54° 45′	41.7 7.5	53° 58′	54.8 9.5

Nov. 28

		+10.92		+10.37		+11.14				+12.06		+11.18
	11 43.1	7.25	11 49.0	6.70	16 17.0	7.47			18 8.4	8.39	22 42.2	7.51
	47.2		52.6		20.8				6.8		45.6	
	50.6		53.9						10.6		49.0	
	54.1		57.4		27.7				14.1		52.7	
	57.3		3.0		30.8				17.8		56.0	
	27		2799		964				526		2455	
	11 50.90	54	11 53.98		16 24.10	+04			19 10.52		22 49.10	
	+ 1.62	+0.24	+ 1.62	+0.24	+ 1.62	+0.24			+ 1.62	+0.17	+ 1.62	+0.21
	— 1.38		— 1.38		— 1.38				— 1.45		— 1.41	
	50.78		56.22		24.34				10.69		49.31	
	— 6.99		— 7.00		— 7.04				— 7.20		— 7.15	
	11 43.79	-9.35 -18.28	11 49.22	-9.35 -18.26	16 17.34	-9.39 -17.56			19 3.49	-9.56 -17.12	22 42.16	-9.49 -16.56
	77		83		94				77		93	
	11 30.6		11 10.7		16 42.0				18 31.2		22 14.8	
	32.6		13.1		45.6				34.2		17.2	
	34.4		16.6		48.0				37.6		21.6	
	76	-3.67	104		156				133		636	
	11 32.53	53 24 24.61	11 13.47	53 23 25.29	15 55.20	53 30 8.25			18 34.43	54 43 32.27	22 17.87	53 57 59.34
	+18.01	— 8	+42.51	— 47	+28.90	— 22			+36.09	— 33	+31.23	— 25
	1.25551	— 80	1.62849	— 94	1.46060	— 60			1.55739	— 94	1.49457	— 1.08
	9.77541	+ 11.50	9.77541	+ 11.48	9.77439	+ 11.61			9.76146	+1293	9.76957	+ 12.17
	1.15352	+ 30	1.52650	+ 30	1.35789	+ 35			1.44145	+ 40	1.38674	+ 40
	0	— 19.90	0	— 19.80	55	— 19.20			40	— 18 80	25	— 18.30
	3 24.7	24 11.96	4 4.7	23 12.19	2 32.8	29 56.52			4 4.4	43 21.86	4 40.6	57 48.55
	31.5		11.4		39.0				9.7		45.9	
	562		161		118				141		65	
	3 28.10		4 8.05		57 35.90				141 7.05		29 43.25	
	19 20.25		18 40.30		25 1245				38 4430		53 5.10	
	53 24 3885		53 23 58.90		53 30 31.05				54 43 57.90		53 58 23.70	
	— 1424		— 3361		— 2280				— 27.63		— 24.36	
	11 34.44	23 53.7	11 32.87	22 53.9	16 7.95	29 39.0			18 53.93	43 4.74	22 32.67	57 32.0

Dec. 8

		+11.14		+10.58		+11.31		+10.82		+11.97		+11.39
	11 39.0	7.49	11 44.1	6.93	16 12.7	7.66	16 33.2	7.17	18 6.8	8.32	22 37.7	7.74
	42.8		47.0		16.2		36.6		2.1		41.2	
	46.3		51.7		19.5		40.0		6.0		44.4	
	49.7		54.8		23.2		43.3		9.5		48.0	
	52.9		58.4		26.8		47.0		13.1		51.7	
	2307		83		984		03		303		2280	
	11 46.11		11 51.66		16 19.68		16 40.06		19 6.06		22 44.60	
	+ 5.92	89 +4.72	+ 5.92	89 +4.73	+ 5.92	89 +4.72	+ 5.92	89 +4.74	+ 5.92	89 +4.66	+ 5.92	80 +4.72
	— 1.19		— 1.19		— 1.19		— 1.18		— 1.25		— 1.21	
	11 56.84		11 56.39		16 24.41		16 44.80		19 10.73		22 49.31	
	— 7.12	-9.35 -18.28	— 7.12	-9.35 -18.26	— 7.18	-9.39 -17.56	— 7.16	-9.37 -17.50	— 7.33	-9.56 -17.12	— 7.29	-9.49 -16.56
	11 43.72	4	11 49.27	7	16 17.20	2	16 37.64	4	19 3.37	9	22 42.02	3
	72		92		85		86		70		96	
	11 28.7		11 7.2		13 49.6		16 47.4		18 11.3		22 13.0	
	32.3		10.3		46.2		3.0		14.8		16.8	
	34.1		12.7		49.7		6.8		17.7			
	65	-3.65	02		175		93		138			
	11 32.17	53 24 25.71	11 10.07	53 23 27.37	15 45.83	53 30 10.26	17 3.10	53 19 18.51	18 14.60	54 43 33.51	22 14.40	53 58 26.5
	+13.97	— 5	+41.54	— 45	+33.85	— 30	— 23.04	— 14	+51.46	— 68	+ 30.20	— 23
	1.14526	— 88	1.61899	— 1.02	1.52956	— 62	1.36248	— 1.02	1.71142	— 98	1.48001	— 1.18
	9.77541	+ 11.77	9.77541	+ 11.75	9.77439	+ 11.88	9.77626	+ 11.68	9.76146	+13.23	9.76957	+ 12.40
	1.04321	+ 30	1.51700	+ 30	1.42655	+ 35	1.26134	+ 30	1.59553	+ 40	1.37218	+ 40
	0	— 21.90	0	— 21.90	55	— 21.30	5	— 21.20	40	— 20.90	25	— 20.30
	3 29.4	24 11.30	4 7.0	23 12.40	2 30.0	29 56.62	4 7.1	19 4.48	3 54.2	43 20.93	4 41.5	57 50.9
	30.5		5.9		29.5		5.8		53.4		39.5	
	599		129		595		129		76		10	
	3 29.95		4 6.45		57 29.75		9 645		43 53.80		29 40.50	
	19 18.40		18 41.90		25 18.60		13 41.90		38 54.55		53 7.85	
	53 24 3676		53 24 0.26		53 30 36.96		53 19 0.26		54 44 12.91		53 58 26.21	
	— 1105		— 3289		— 2670		+ 1825		— 39.40		— 23.56	
	11 34.39	23 53.0	11 39.92	22 54.1	16 7.83	29 39.06	16 28.27	18 47.0	18 53.83	43 3.8	22 32.84	57 33.8

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1877phae..proj..1687R

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1877, Dec. 1, Dec. 13. Ob. W.A.R. Rec. of F.M.

7

	h m s			h m s			h m s			h m s			h m s			h m s		
α	2 38 30	37	19.7	2 41 29	40	17.1	2 42 44	41	3.23	2 43 49	42	37.3	2 45 30	44	18.5	2 47 39	46	27.0
δ	53° 24′		19.8	52° 49′		44.6	52° 29′		24.9	52° 29′		24.5	52° 52′		47.2	54° 41′		37.5
			6.8			9.5			7.0			7.0			8.8			8.8
Dec. 1		+11.54	+11.90		+11.12			+10.98			+10.53		Ex				+12.47	
Add +.028[s] to (M+m) Dec. 1 2h has been added to each of the comparisons and the final M.A. +.028[s]	38 33.2 56.6 0.6 3.7 7.3	38 58.6 57.0 1.0 4.1 7.7	8.50	8.56	41 48.2 52.5 33.6 6.3 8.8		7.78	43 3.6 6.7 10.2 13.9 16.8		7.64	44 8.3 11.4 14.8 18.2 21.7		7.19	45 52.6 56.0 58.7 2.6 6.0			48 4.1 7.8 11.2 14.5 18.5		9.13
	39 14 0.28	34 0.68			41 27.94 55.88			43 5.08 10.16			44 7.45 14.90			45 46.9 59.38			48 5.61 11.22		
	+ 1.74	+ 1.78	40.32		+ 1.74	7 + 0.36		+ 1.74	7 + 0.38		+ 1.74	7 + 0.38		+ 1.74	7 + 0.38		+ 1.74	7 + 0.25	
	− 1.31	− 1.31			− 1.28			− 1.26			− 1.26			− 1.28			− 1.38		
	− .17	− .17			− .16			− .16			− .16			− .17			− .17		
			−8.45 −30.88																
	39 0.55	0.95	−8.45 −30.88	41 56.78		−8.43 −30.54	43 10.48		−8.42 −30.40	44 15.22		−8.43 −30.28	45 59.67		−8.48 −30.06	48 11.41		−8.67 −29.82
	− 6.03	−6.03		− 6.02			− 6.02			− 6.03			− 6.08			− 6.25		
	38 54.52	54.94		41 50.76			43 4.46			44 9.22			45 53.62			48 5.16		
		−3.34																
	8.0 92	58 25	53 47 59 23	9.5			7.8			7.7 7.7			9.0			9.0		
	38	38	− 11 − 5	41			42			43						47		
	40.0	47.1			26.8			41.0			46.5					28.3		
			− 44 − 44		30.9			43.6			30.8					31.0		
			+1209 +1209		33.7			48.0			34.0					34.8		
			+ 30 + 30		11			145			13					41		
	38 44.76	47.70	−31.70 −31.70	41 30.37	52 50 38.76		42 44.83	52 31 41.71		43 50.43	52 29 48.79					47 31.37	54 42 53.91	
	+20.28 +12.98	25 30.27	3.09	+25.51	− 17		+25.33	− 17		+24.47	− 16					+39.85	− 41	
	1.30707	1.11327		1.40671	− 48		1.40364	− 25		1.38863	− 69					1.60043	− 1.08	
	9.77507	9.77507		9.78077	+ 11.47		9.78412	+ 11.10		9.78445	+ 11.08					9.76164	+ 13.56	
	1.20474	1.01094		1.31028	+ 30		1.31036	+ 30		1.29568	+ 30					1.48467	+ 40	
N_0 = −.23	0			35	−31.30		55	−31.20		55	−31.10		35	−30.90		40	−30.80	
	1 58.2			2 8.6	50 15.24		1 5.0	31 18.15		2 59.5	29 24.88		0 40.1			41 44.8	42 32.24	
n = −.97	55.9			5.9			3.8			56.5			38.5			39.41		
C = −.10	141			145			88			160			786			42		
+5 18.19	1 57.05			37 7.25			56 4.40			57 58.00			35 39.30			44 42.10		
	20 51.30			45 41.10			26 43.95			24 50.35			47 9.05			38 6.25		
	53 26 9.49			52 50 59.29			52 32 21.4			52 30 8.54			52 52 27.24			54 43 24.49		
	−16.02			− 21.53			− 20.43			− 19.75						− 30.53		
	−10.26	24 59.4																
Dec. 13	38 46.12	25 5.2		41 41.79	49 44.7		42 56.10	30 47.8		44 0.82	28 54.6		45 45.16			47 56.55	42 2.4	
	46.52	+10.97	+11.03		+10.21			+10.13			+9.75			+10.73			+11.63	
	38	38	7.27 7.35 40	41	40.6	6.45	42	44.4	6.37	44	0.0	5.99	45	49.4	6.97	47	55.8	7.87
	48.8	49.2			44.3			48.8			3.3			47.8			57.5	
	52.2	52.5			42.6			52.8			6.7			51.3			2.9	
	55.5	55.8			37.0			56.8			10.0			54.6			6.5	
	59.1	59.4			44.6			5.2			13.4			58.0			10.1	
	2609	2626		2381			3106			334			2561			3148		
	38 52.18	52.52		41 47.62			43 2.12			41 6.68			45 11.22			48 2.96		
	+ 9.26	+ 9.26	8.29 +8.29	+ 9.26		+ 8.31	+ 9.26		+ 8.33	+ 9.26		+ 8.33	+ 9.26		+ 8.31	+ 9.26		+ 8.24
	− .97	− .97		− .95			− .93			− .93			− .95			− 1.02		
	43.89	0.81	−8.45 −30.88	41 55.93			43 10.45			44 15.01			45 55.52			48 11.20		
	39 0.47	−5.98		− 5.97		−8.43 −30.54			−8.42 −30.40	− 5.99		−8.43 −30.28	− 6.04		−8.48 −30.06	− 6.20		−8.67 −29.82
	38 54.49	54.84	−8.46 −30.88	41 49.96			43 4.46			44 9.02			45 53.49			48 5.00		
	8.2 8.0			9.3			7.3	8.6 8.2		8.6 8.2			8.8			8.9		
	38	38		41	10.7		42	20.4		43	6.4		45	21.3		47	28.2	
	23.8	27.4			42.7			23.3			38.7			23.6			32.6	
			−3.76 26		15.9			26.4			41.5			26.6			34.3	
	35.00	44.30	25 57.45	45.2	9.3			10.1			11.6			11.5			6.0		
	41.64	51.47																
	+17.18 +8.22	+28.38	+25.12 − 2.18	41 13.10	52 49 40.97		42 23.37	52 31 45.91		43 39.20	52 29 51.58		45 23.83	52 52 8.59		47 32.54	42 56.60	
	1.23502	1.45301	1.00082	− 49	− 49	1.53807	− 52	1.58822	− 39	− 21	+27.48	− 20	+27.39	− 20		+30.96	− 25	
	9.77507	9.77507	9.77507	+11.37	+11.37	9.78077	+ 10.74	9.78412	+ 1043	9.78445	+ 1040	9.78080	+ 10.79	9.76164		+ 12.73		
	1.13269	0.81284	1.35066	1.29764	+ 30	+ 30	1.44164	+ 30	1.49499	+ 30	1.34607	+ 30	1.34099	+ 30		1.37504	+ 40	
	0		−34.00	−34.00	35		55	−33.50		55	−33.40	55	−33.30	35	−33.20	40	−33.20	
	1 55.1	25 4.81	24.43	1 57.7		50 13.92	0 46.1		31 18.88	2 52.1		29 24.27	0 35.2		57 42.36	46.5		42 31.29
	55.7		30.79 31.92	57.9			50.4			53.2			36.6			45.7		
	8			16			98.5			5.3			11.8			12.2		
	1 55.40			36 57.80			55 49.25			57 52.65			35 35.90			44 46.10		
	20 52.95			45 50.55			26 59.10			24 55.70			47 12.45			38 2.25		
Rs = −.26	53 26 11.02			52 50 8.62			52 32 17.17			52 30 13.77			52 52 30.52			54 43 20.32		
n = −.72	−22.42	−13.57		− 27.65			− 31.26			− 22.19			− 21.93			− 23.72		
	−17.95	−6.49																
+5 18.07	38 46.42	24 59.9		41 41.53	49 42.4		42 56.06	30 48.5		44 0.59	28 54.0		45 45.01	51 12.3		47 56.33	42 1.4	
	46.39	25 5.6	4.5															

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597 633

8

77 Dec. 1, Dec. 13. Obs. W.A.R. Rec. J. F. Mc.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	2 48 55	47 43.4	2 50 40	49 28.5	2 53 27	52 15.0	2 58 36	57 24.4	3 0 31	2 59 19.1	3 2 16	1 3.5
δ	54° 40	35.9 / 9.0	54° 41	37.0 / 8.0	53° 46	42.0 / 8.5	53° 54	49.6 / 9.4	53° 41	37.5 / 8.4	53° 49	45.4 / 9.5

Dec. 1

+13.49 +13.50 +13.82

	48 18.0	10.15	51 2.1	10.16	53 41.0	9.48						
	21.8		5.7		37.3							
	25.4		9.3		37.8							
	24.3		12.7		1.3							
	32.3		16.3		4.9							
	1265		461		2894							
	49 26.30		51 9.22		53 57.88							
	+ 1.747	+0.25	+ 1.746	+0.24	+ 1.786	+0.29						
	− 1.38		− 1.38		− 1.33							
	− .17		− .17		− .17							
	49 25.49	−8.68 / −29.66	51 9.41	−8.71 / −39.46	53 58.22	−8.66 / −29.14						
	−6.26		−6.29		−6.25							
	49 19.23		51 3.12		53 51.89							
	89		75		88						84	
	48 42.4		50 48.2		53 44.1							
	44.1		33.0		47.6							
	48.4		37.3		47.2							
	153	−3.34	105		1433							
	48 45.10	54 41 40.53	50 33.50	54 42 53.2	53 47.77	53 47 37.57						
	+ 40.20	− 25	+ 35.72	− 32	+ 10.11	− 3						
	1.604 23	− 21	1.552 91	− 14	1.004 75	− 9						
	9.76182	+ 1355	9.76182	+ 1356	9.77130	+ 1254						
	1.48865	+ 40	1.43733	+ 40	0.89865	+ 40						
	45	−30.70	45	−30.50	40	−30.20					35	
	0 56.8	41 19.98	0 35.5	41 44.98	0 22.0	47 16.85					1 47.4	
	53.6		32.2		20.1						41.4	
	104		77		21						121	
	45 55.20		45 33.85		40 21.05						36 46.05	
	36 53.15		37 14.50		42 27.30						46 2.30	
	54 42 11.34		54 42 32.69		53 47 45.49						53 51 20.19	
	− 30.81		− 27.37		− 7.92							
	49 10.61	40 50.3	50 54.46	41 5.5	53 43.26	46 47.7						

Dec. 13

+12.64 +12.68 +10.60 +11.44 +10.59 +11.54

	48 10.1	8.88	50 53.8	8.92	53 42.5	6.84	58 41.3	7.68	0 44.1	6.89	2 31.0	7.78
	13.5		57.6		46.3		43.8		47.5		34.4	
	17.2		1.2		49.8		47.4		51.5		38.1	
	20.7		4.8		53.3		0.8		55.0		41.7	
	24.4		8.2		56.7		4.4		58.3		45.0	
	859		57		489		2867		70		1899	
	49 17.18		51 1.14		53 49.78		58 57.34		0 51.40		2 37.98	
	+ 9.26	+8.24	+ 9.26	+8.24	+ 9.26	+8.27	+ 9.26	+8.27	+ 9.26	+8.27	+ 9.26	+8.27
	− 102		− 102		− 99		− 99		− 99		− 99	
	49 25.42	−8.68 / −29.66	51 9.38	−8.71 / −39.46	53 58.05	−8.66 / −29.14	59 5.61	−8.73 / −28.50	0 59.67	−8.73 / −28.26	2 46.25	−8.76 / −28.04
	− 6.22		− 6.25		− 6.22		− 6.30		− 6.32		− 6.35	
	49 19.20		51 3.13		53 51.83		58 59.31		0 53.35		2 39.90	
	92		70		85		94		84		95	
	48 44.6		50 32.7		53 12.5		58 22.0		0 14.7		2 3.6	
	48.7		35.5		16.2		24.1		17.8		7.0	
	47.3		28.6		15.4		24.6		20.8		10.2	
	1446	−3.76	172		114		177		533		208	
	48 48.20	54 41 44.36	50 25.73	54 42 8.38	53 15.80	53 47 42.66	58 25.90	53 55 23.61	0 17.77	53 43 1.58	2 6.93	53 50 58.76
	+ 2.898	− 22	+ 35.41	− 32	+ 33.98	− 30	+ 31.44	− 26	+ 33.63	− 29	+ 31.05	− 25
	1.46210	− 26	1.54913	− 13	1.53122	− 1.27	1.49748	− 60	1.52673	− 1.20	1.49206	− 44
	9.76182	+ 1272	9.76182	+ 1273	9.77130	+ 11.77	9.77009	+ 11.90	9.77216	+ 1168	9.77078	+ 11.63
	1.34652	+ 40	1.43355	+ 40	1.42512	+ 46	1.39017	+ 40	1.42149	+ 40	1.38544	+ 40
	45	−33.20	45	−32.90	35	−32.50	30	−32.00	40	−31.70	35	−31.60
	1 0.3	41 20.24	0 30.4	41 44.40	4 58.2	47 17.50	2 17.9	54 59.29	4 39.3	42 36.71	1 42.9	50 34.96
	39.4		31.4		56.1		18.6		37.6		43.8	
	1497		18		143		165		169		67	
	48 59.85		45 30.90		39 57.15		32 18.25		44 38.15		36 43.35	
	356 48.50		37 17.45		42 51.20		50 30.10		38 9.90		46 5.00	
	54 42 6.57		54 42 35.52		53 48 9.27		53 55 48.17		53 43 27.97		53 51 23.07	
	− 22.21		− 27.14		− 26.61		− 24.56		− 24.39		− 24.29	
	49 10.52	40 50.4	50 54.42	41 4.9	53 43.17	46 47.9	58 50.58	54 30.8	0 44.62	42 8.4	2 31.14	50 6.9

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9

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	3 3 27	2 14.1	3 4 28	3 15.4	3 9 19	8 5.1	3 10 8	8 55.4	3 11 46	10 21.8	3 13 14	11 59.0		
δ	54° 16′	12.5	54° 16′	12.3	54° 56′	51.7	53° 14′	11.2	53° 40′	34.4	54° 3′	53 58.2		
		9.0		8.7		8.4		8.0		8.8				

Dec. 1

	+13.28		+13.33		+13.87		+11.71		+12.10		+12.12			
	3 48.9	9.94	4 54.4	9.99	9 42.7	10.53	10 52.0	8.37	12 7.4	8.76	13 38.4	8.78		
	53.4		57.8		46.2		55.4		10.9		41.8			
	56.8		1.6		50.1		38.8		14.4		45.2			
	0.1		5.0		53.5		42.3		18.0		48.7			
	4.0		-8.5		56.8		46.0		21.5		52.4			
	2846		73		24.94		1949		722		2265	-.01		
	3 36.93		5 1.46		9 49.88		10 38.95		12 14.44		13 45.30			
	+ 1.786	+0.276	+ 1.786	+0.27	+ 1.786	+0.24	+ 1.786	+0.32	+ 1.786	+0.29	+ 1.786	0.28		
	- 1.35		- 1.35		- 1.38		- 1.30		- 1.33		- 1.34			
	- .17		- .17		- .17		- .17		- .17		- .17			
	3 57.14	-8.82	5 1.68	-8.83	9 50.06	-8.95	10 39.22	-8.79	12 14.67	-8.85	13 45.52	-8.90		
	- 6.42	-27.90	- 6.44	-27.78	- 6.56	-27.14	- 6.42	-27.06	- 6.47	-26.84	- 6.52	-26.64		
	3 50.72	6	4 55.26	6	9 43.58	6	10 32.80	6	12 8.23	6	13 39.03	5		
			55.27											
	8.8		9.0		8.7		8.4		8.8		8.6			
	3 22.7		4 38.8		9 18.0		10 13.0		11 23.1		13 10.2			
	26.2		42.3		21.8		17.0		26.2		13.7			
	29.7		45.3		25.7		21.0		29.4		16.0			
	186		64		55		510		188		96			
	3 26.20	54 17 39.12	4 42.13	54 17 28.98	9 21.83	54 56 59.68	10 17.00	53 16 3.86	11 26.27	53 41 56.57	13 13.20	54 3 29.31		
								12				61		
	+30.72	- 24	+19.33	- 9	+28.05	- 20	+21.480	- 13	+48.17	- 61	+32.10	- 27		
	1.488742	- 80	1.28623	- 9	1.44793	- 18	1.342034	- 41	1.68278	- 12	1.50651	- 97		
	9.76607	+ 1312	9.76607	+ 13.11	9.75913	+ 1385	9.77677	+ 11.95	9.77233	+ 1243	9.76852	+ 1336		
	1.37609	+ 40	1.17490	+ 40	1.32966	+ 40	1.24140	+ 30	1.57771	+ 40	1.39763	+ 40		
	10	-29.10	10	-29.00	30	-28.50	10 1.23981	-28.30	45	-28.20	20	- 2800		
	0 4.9	17 19.96	0 23.6	17 9.97	0 47.1	56 41.71	1 47.2	15 43.13	0 33.8	41 37.13	4 14.1	3 10.57		
	2.4		21.6		43.9		44.9		30.5		10.4	39		
	7.3		52		110		12.1		43		45			
	10 36.5		10 22.60		30 45.50		11 46.05		45 32.15		24 12.25	117		
	12 44.0		12 25.75		52 28.5		11 2.30		37 16.20		58 36.10			
	54 18 28.9		54 17 43.94		54 57 21.04		53 16 20.49		53 42 34.39		54 3 54.29			
	- 23.77		- 14.96		- 21.36		- 17.43		- 37.82		- 24.98			
								37						
	3 41.94	16.52.1	4 46.46	16 42.2	9 34.61	56 14.6	10 24.01	15 16.1	11 59.41	41 10.3	13 30.15	243.7		

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	+11.03		+12.36		+12.41		+10.93		+11.58		+11.09			
	3 41.6	7.27	4 46.1	8.60	9 34.7	9.15	10 23.9	7.17	11 39.3	7.82	13 29.1	7.33		
	45.3		49.8		38.0		27.4		2.8		33.5			
	48.8		53.3		41.8		30.7		6.3		37.0			
	52.4		56.6		45.4		34.3		9.8		40.5			
	56.0		0.3		49.1		37.7		13.4		44.0			
	441		2661		88		40		316		1849			
	3 48.82		4 53.22		9 41.76		10 30.80		12 6.32		13 36.98			
	+ 9.26	+8.26	+ 9.26	+8.26	+ 9.25	+8.23	+ 9.25	+8.29	+ 9.25	+8.26	+ 9.25	+8.26		
	- 100		- 100		- 102		- 96		- 99		- 99			
	3 57.08		5 1.48		9 49.99		10 39.09		12 14.58		13 45.24			
	-16.41	-8.82	-6.43	-8.83	-6.56	-8.95	-6.42	-8.79	-6.48	-8.85	-6.53	-8.90		
	3 50.67	-27.90	4 56.05	-27.78	9 43.43	-27.14	10 32.67	-27.06	12 8.10	-26.84	13 38.71	-26.64		
	8.8		8.9		8.3		8.0		8.3		8.4			
	3 3.4		4 15.9		9 2.8		10 4.9		11 28.2		13 1.3			
	9.1		19.4		5.3		7.2		32.0		5.8			
	11.8		22.6		8.5		10.4		34.4		7.9			
	263		579		166		225		46		152			
	3 8.77	54 17 45.18	4 19.30	54 17 31.62	9 55.3	54 57 3.28	10 7.50	53 16 6.84	11 31.53	53 42 0.86	13 5.07	54 3 33.44		
	+40.65	- 42	+33.92	- 30	+36.23	- 33	+23.30	- 14	+34.74	- 32	+31.91	- 27		
	1.60260	- 1.25	1.53046	- 3	1.55907	- 16	1.36736	- 44	1.54145	- 16	1.50393	- 1.07		
	9.76607	+ 1230	9.76607	+ 1229	9.75913	+ 1300	9.77677	+ 1121	9.77233	+ 1166	9.76852	+ 1203		
	1.49124	+ 40	1.41913	+ 40	1.44680	+ 40	1.26673	+ 30	1.43638	+ 40	1.39505	+ 40		
	5	-31.50	10	-31.40	30	-30.90	10	-30.60	45	-30.50	20	- 30.40		
	4 50.5	17 20.95	0 7.2	17 8.82	0 35.2	56 41.53	1 40.3	15 43.41	0 38.0	41 38.18	4 8.8	3 14.37		
	50.0		7.9		35.9		41.9		38.5		7.5			
	5		11		11		2		5		3			
	9 50.25		10 7.55 +1″		30 35.55		11 41.10		45 38.25		24 8.15			
	12 58.10		12 4.80		52 12.80		11 7.25		37 10.10		58 40.20			
	54 18 16.17		54 17 58.87		54 57 30.87		53 16 25.32		53 42 28.17		54 3 58.27			
	- 30.99		- 26.25		- 27.59		- 18.48		- 27.31		- 24.83			
	3 41.85	16 53.0	4 46.22	16 41.0	9 34.48	56 14.4	10 23.88	15 16.4	11 59.25	41 11.3	13 29.81	243.4		

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1877 Dec. 1, Dec. 13. Ob. W.A.R. Rec. J.F.M.

10

	h m s	h m s	h m s	h m s	h m s	h m s
α	3 15 6	3 16 15	3 16 54	3 19 14	3 20 46	3 22 57
	13 52.0	15 0.9	15 39.0	17 59.4	19 31.2	21 41.6
δ	53° 8′	53° 29′	53° 6′	53° 45′	53° 51′	53° 58′
	38	246	24	41.0	468	542
	8.7	6.3	9.5	8.7	8.7	9.2

Dec. 1

+11.96 +11.57 +11.48 +12.45 +12.64 +12.01 +11.99

15 28.6	8.62	16 36.3	8.28	17 —	8.44	19 36.8	9.11	21 10.6	9.30	23 18.0	8.67
32.0		40.0		—		40.5		13.7		22.7	
34.4		43.3		26.3	22.5	43.7		17.4		26.0	
38.9		46.8		29.6	22.8	47.2		20.9		29.7	
42.4		50.3				51.0		24.2		33.0	
1772		2167				2192		867		1304	
15 35.44		16 43.34		17 22.65		19 43.84		21 17.34		23 26.08	
+ 1.736	+0.33	+ 1.736	+0.31	+ 1.736	+0.33	+ 1.736	+0.29	+ 1.736	+0.28	+ 1.736	+0.28
— 1.29		— 1.31		— 1.29		— 1.33		— 1.33		— 1.34	
— .17		— .17		— .17		— .17		— .17		— .17	
15 35.71	8.83	16 43.59	8.88	17 23.12	8.85	19 44.07	8.93	21 17.57	8.96	23 26.30	
−6.47	2640	−6.51	2624	−6.49	2616	−6.57	2586	−6.60	2564	−6.63	
15 29.24		16 37.18	4	17 16.63	49	19 37.68	6	21 10.97	2	23 19.67	3
30											
8.6		8.8		8.5		8.8		8.7		8.9	
15 12.0		16 6.0		17 42.0		19 10.9		20 34.5		22 46.7	
13.3		12.8				13.7		38.3		52.8	
18.3		19.2				16.7		41.0		55.0	
160	−3.34	70				113		1138		75	
15 15.32	53 7 43.14	16 12.33	53 29 27.77	17 40.00	53 7 28.18	19 13.77	53 46 37.88	20 37.93	53 52 33.33	22 52.50	53 58 51.40
+20.11	− 10	+31.01	− 25	− 19.15	− 9	+30.07	− 26	+39.41	− 41	+33.58	− 29
1.303 41	− 2	1.491 50	− 74	1.282 17	− 21	1.478 13	− 25	1.595 61	− 0	1.526 08	− 87
9.778 12	+ 11.78	9.774 56	+ 12.21	9.778 12	+ 11.78	9.771 47	+ 12.53	9.770 43	+ 12.65	9.769 39	+ 12.77
1.204 13	+ 30	1.388 66	+ 35	1.182 89	+ 30	1.372 20	+ 40	1.488 64	+ 40	1.418 07	+ 40
20	−27.80	55	−27.60	20	−27.60	40	−27.30	35	−27.10	25	−26.90
0 8.6	7 23.96	3 16.1	29 8.40	0 54.7	7 9.02	1 6.6	46 19.69	0 3.8	52 15.53	3 50.9	58 32.17
6.2		12.5		52.5		3.6		1.0		47.0	
1.48		8.6		7.2		1.02		4.8		9.79	
20 7.40		58 11.30		20 53.60		41 5.10		35 2.40		28 48.95	
2 40.95		24 34.05		1 54.75		41 43.25		47 48.95		53 59.40	
53 7 59.14		53 29 52.24		53 7 12.94		53 47 1.44		53 53 41.4		53 59 17.59	
− 16.00		− 24.47		+ 15.24		− 23.56		− 30.81		− 26.19	
15 20.47	6 57.6	16 28.26	28 42.2	17 7.64	6 42.9	19 28.63	45 53.8	21 2.06	51 49.9		

Dec. 13

+9.40 +10.70 +11.22 +11.62 +10.59 +11.09

15 20.3	5.94	16 28.3	6.94	17 7.5	7.46	19 28.7	7.86	21 2.2	6.83	23 11.3	7.33
23.8		31.8		11.2		32.2		2.7		14.5	
27.3		33.2		14.3		34.7		9.1		18.0	
30.7		38.7		17.8		39.3		12.6		21.4	
34.0		42.1		21.2		42.8		16.2		25.1	
1361		1761		720		1787		458		900	
15 27.22		16 35.22		17 14.40		19 35.14		21 9.16		23 18.02	
+ 9.25	+8.24	+ 9.25	+8.28	+ 9.25	+8.29	+ 9.25	+8.26	+ 9.25	+8.26	+ 9.25	+8.26
— .96		— .97		— .96		— .99		— .99		— .99	
15 35.51	8.83	16 43.50	8.88	17 22.69	8.85	19 44.00	8.93	21 17.42	8.96	23 26.26	
−6.47	2640	−6.52	2624	−6.50	2616	−6.58	2586	−6.62	2564	−6.66	
15 29.04		16 36.98		17 16.19		19 37.42		21 10.80		23 19.60	
8.7		8.3		9.6		8.6		8.7		8.9	
14 44.0		15 48.4		17 2.2		19 0.2		20 28.8		22 42.3	
47.8		1.6				2.9		32.1		44.4	
40.3		3.9				6.8		34.4		48.1	
1421	−3.76	39				100		56		148	
14 47.37	53 7 48.56	16 1.30	53 29 30.85	17 22.05	53 7 34.41	19 3.33	53 46 41.27	20 31.87	53 52 38.67	22 44.93	53 58 54.68
+39.85	− 42	+ 33.92	− 30	+ 12.20	− 4	+32.41	− 27	+37.29	− 37	+33.07	− 28
1.600 43	− 1.25	1.530 46	− 81	1.086 36	− 10	1.510 68	− 26	1.571 59	− 130	1.519 43	− 99
9.778 12	+ 11.07	9.774 56	+ 11.46	9.778 12	+ 11.06	9.771 47	+ 11.75	9.770 43	+ 11.86	9.769 39	+ 11.96
1.501 15	+ 30	1.427 62	+ 35	0.987 08	+ 30	1.404 75	+ 40	1.464 62	+ 40	1.411 42	+ 40
15	−30.10	55	−30.00	20	−29.90	40	−29.70	30	−30.60	25	−29.30
4 45.8	7 24.40	3 9.2	29 7.79	0 21.7	7 11.97	1 0.2	46 19.43	4 59.1	52 14.90	3 45.8	58 32.71
46.5		8.4		22.9		59.3		58.1		46.1	
12.3		1.76		46		19.5		1.72		11.9	
19 46.15		58 8.80		20 22.30		40 59.75		34 58.60		28 45.95	
3 2.20		24 39.55		2 26.05		41 48.60		47 49.75		54 2.40	
53 8 20.27		53 29 57.62		53 7 44.82		53 47 6.67		53 53 7.82		53 59 24.47	
− 31.71		− 26.77		− 9.71		− 25.40		= 29.15		− 25.79	
15 20.21	6 58.0	16 28.10	28 41.6	17 7.34	6 45.8	19 28.49	45 53.6	21 1.84	51 49.3		

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1877 Dec. 1, Dec. 13.

	h m s		h m s	
α	3 25 14	23 59.2	3 27 27	26 11.9
δ	53° 31′	270 88	53° 33′	292 84

Dec. 1

	24 37.8	+1207 8.73	27 49.1	+1166 8.32
	41.0		53.2	
	44.6		56.8	
	48.1		0.1	
	51.6		3.4	
	2231		2834	
	25 44.62		27 56.68	
	+ 1.786	+0.31	+ 1.786	+0.31
	− 1.31		− 131	
	− .17		− .17	
	25 44.87		27 56.93	
	−662	−8.97	−666	−9.00
	25 38.25 31	−2504	27 50.303	−2474
8.9			8.6	
	24 8.3		27 16.2	
	12.3		19.0	
	16.4		21.8	
	70		570	
	25 12.33	53 31 3509	27 1400	53 34 41.73
	+32.29	− 27	+3768	− 37
	1.509 07	− 25	1.576 11	− 67
	9.774 85	+ 12.24	9.773.53	+ 12.30
	1.405 72	+ 35	1.472 24	+ 40
	55	−26.60	50	−26.30
	1 7.8	31 17.222	57.2	34 23.75
	4.2		53.1	
	120		103	
	56 6.00		52 55.15	
	26 42.35		29 5320	
	53 32 0.54		53 35 11.39	
	− 2545		− 2966	

Dec. 13

	25 29.34	30 52.2	27 41.33	33 59.0
		+1420		+1059
	25 29.6	7.44	27 41.7	7.13
	33.0		45.2	
	36.6		48.6	
	40.1		52.0	
	43.5		55.5	
	1827		431	
	25 36.54		27 48.62	
	+ 9.25	+8.28	+ 9.25	+8.28
	− 97		− 97	
	25 44.82		27 56.90	
	−664	−8.97	− 6.68	−9.00
	25 38.18	−2504	27 50.22	−2474
8.8			8.0	
	24 34.8		27 11.8	
	47.3		14.7	
	0.2		17.1	
	1723		136	
	24 57.43	53 31 3919	27 1453	53 34 41.28
	+39.11	− 40	+34.09	− 30
	1.592 26	− 23	1.532 63	− 75
	9.774 05	+ 11.48	9.773 53	+ 11.54
	1.488 94	+ 38	1.428 76	+ 40
	55	− 29.00	50	− 28.70
	0 56.1	31 17.68	2 55.5	34 22.71
	56.7 8		55.1 6	
	55 56.40		52 55.30	
	26 57.95		29 5305	
	53 32 10.02		53 35 11.12	
	− 3083		− 2684	
	25 29.21	30 52.6	27 41.22	33 58.0

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1877phae.proj.1607R

1877, Dec. 9 Dec. 12. Obs. W. A. R. Rec. & F. M.

12

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	23 11 52	11 7.6	23 24 35	23 58.3	23 25 50	25 3.2	23 27 20	26 34.7	23 28 38	27 52.6	23 28 46	27 55.0 / 3.2		
δ	55° 1′	55.1 / 9.2	54° 37′	31.3 / 8.6	52° 24′	18.6 / 9.0	51° 27′	22.2 / 8.2	51° 54′	48.5 / 7.9	51° 58′	5.2.9 / 8.5		
Dec. 9		+13.57		+13.49		+10.57		+9.30		+10.02		+10.44		
	11 56.0	10.39	27 48.6	10.01	25 57.8	7.09	27 27.6	5.82	28 44.9	6.54	28 47.6	6.96		
	58.4		53.0		58.5		31.0		48.5		50.8			
	3.1		46.5		1.6		33.8		51.8		54.2			
	6.8		0.1		5.0		37.6		55.1		57.8			
	10.4		3.7		8.6		40.7		58.4		1.0			
	21.58		28.29		8.6		1707		87		2715			
	12 3.16		24 56.58		26 1.72		27 34.14		28 51.74		28 54.30			
	+ 6.54	+5.31	+ 6.54	+5.33	+ 6.54	+5.47	+ 6.54	+5.46	+ 6.54	+5.44	+ 6.54	+5.44		
	− 1.23		− 1.21		− 1.12		− 1.08		− 1.10		− 1.10			
	12 8.47		25 1.91		26 7.14		27 39.60		28 57.18		28 59.74			
	−2.29	−5.35	−2.54	−5.57	−2.64	−5.63	−2.69	−5.67	−2.70	−5.68	−2.70	−5.68		
	12 6.18	−39.24	24 59.37	−39.64	26 4.50	−39.66	27 36.91	−39.70	28 54.48	−39.74	28 57.04	−39.74		
	12 0.83		8.9		8.7		6.6		7.8		9.3			
	20		24 34.2		25 48.3		27 24.8		28 20.8		29 9.2			
	10.6		37.5		50.9		28.2		23.3		13.1			
	43.7		40.7		53.4		31.2		26.2		17.4			
	46.6		1124		26		8.43		103		417			
	46	−3.48												
	11 42.20	55 2 19.72	24 37.47	54 37 31.87	25 50.87	52 25 53.29	27 28.10	51 30 42.5	28 23.43	51 56 22.47	29 12.90	51 58 2.27		
	+19.96	− 10	+19.41	− 9	+10.85	− 3	+ 6.04	− 1	+28.31	− 21	−19.60	− 11		
	1.30016	− 12	1.28126	− 8	1.03543	− 52	0.78104	− 75	1.45194	− 35	1.29226	− 8		
	9.75805	+1369	9.76271	+ 13.26	9.78510	+ 10.82	9.79415	+ 9.81	9.79131	+ 1028	9.78969	+ 10.33		
	1.18081	+ 40	1.16657	+ 40	0.94313	+ 30	0.69779	+ 25	1.36485	+ 30	1.20485	+ 30		
	#25	−38.10 50		−38.60 0		−38.20 55		−38.10 30		−38.30 30		−38.30		
Rs=−.25	10 33.2	1 52.02	0 55.4	37 3.28	2 28.1	25 22.16	2 52.9	29 31.97	3 33.8	55 50.71	2 4.9	57 20.93		
n=−.86	31.9		55.9		30.0		54.1		34.8		5.2			
	51		13		581		70		6		1			
+5′ 18.44	25 32.55		50 55.65		2 29.05		57 53.50		33 34.30		32 5.05		27 52.6	
	57 1580		31 52.70		20 1930		24 548.5		49 1405		50 4330		48.5	
	55 2 31.24		54 37 11.14		52 25 37.74		51 30 13.29		51 54 32.49		51 56 1.74			
	− 14.01		+ 20.89		+ 14.51		− 10.27		− 8.38		+ 20.96		27 52.6	
	12 0.83	1 12.8	24 53.80	36 23.6	25 58.87	24 42.5	27 31.24	28 52.3	28 48.80	55 1[illegible]	28 51.36		48.5	
Dec. 12		+13.69		+13.44		+10.20		+9.12		+9.42		+9.70		
	11 53.6	9.67	27 47.2	9.02	25 —	6.18	27 25.3	5.10	28 27.7	5.40	28 42.8	5.68		
	57.7		50.6		—		28.4		31.0		46.2			
	0.7		54.2		—		31.8		34.4		49.7			
	4.4		57.8		2.8	59.4	35.2		37.6		52.9			
	8.1		1.5		6.0	59.2	38.5		40.9		56.3			
	37		2713				1592		1716		476			
	11 12 0.74		24 54.26		25 59.30		27 31.84		28 34.32		28 4.82			
	+ 8.67	+7.54	+ 8.66	+7.55	+ 8.66	+7.63	+ 8.66	+7.67	+ 8.66	+7.65	+ 8.66	+7.65		
	− 1.13		− 1.11		− 1.03		− .99		− 1.01		− 1.01			
	12 8.28		25 1.81		26 6.93		27 39.51		28 41.97		28 57.17			
	− 2.20	−5.85	−2.46	−5.87	−2.56	−5.63	−2.62	−5.67	−2.62		−2.62	−5.68		
	12 6.08	−39.24	24 59.35	−39.64	26 4.37	−39.66	27 36.89	−39.70	28 39.35		28 54.53	−39.74		
	9.0		9.0		9.0		6.5		9.2		6.5			
	11 38.1		28 18.6		26 16.2		27 46.4		28 20.0		28 11.9			
	42.1		20.8		18.7		19.0		23.8		14.6			
	45.3		23.0		21.2		22.8		25.4		19.0			
	69	−4.02	644		556		582		122		155			
	11 42.30	55 2 20.23	25 2.47	54 37 32.03	26 18.53	52 25 52.25	27 19.40	51 30 3.82	28 24.07	51 54 24.11	29 15.17	51 56 22.70		
	+ 18.44	− 8	−27.21	− 19	−19.23	− 10	+12.44	− 4	+10.25	− 3	−25.65	− 18		
	1.26576	− 13	1.43473	− 23	1.28398	− 65	1.09482	− 75	1.01072	− 94	1.40902	− 56		
	9.75805	+13.50	9.76271	+ 1306	9.78510	+ 1065	9.79415	+ 966	9.78988	+ 1009	9.78967	+ 1013		
	1.14641	+ 40	1.32904	+ 40	1.16168	+ 30	1.01157	+ 25	0.92315	+ 30	1.32136	+ 30		
	25	−38.10 50		−38.60 0		−38.30 55		−38.20 30		−38.30 30		−38.30		
#	0 31.9	1 51.80	0 20.1	37 24.5	2 5.3	25 24.15	2 57.9	29 29.92	1 21.1	53 51.21	0 19.9	55 57.08		
	32.6		21.1		4.9	20.13	57.9		21.9		21.9			
	5		12		2						418			
	25 32.25		50 20.64		2 5.10		57 57.90		31 21.57		30 20.90			
	57 1610		32 2475		20 4325		24 5045		51 2685		62 2745			
Rs=−.26	55 2 34.89		54 37 46.54		52 26 20.4		51 30 9.24		51 56 45.64		51 57 46.24			
n=−.79	− 1516		− 1467		− 877		− 499		− 23.17		+ 16.03			
+5′ 18.79	12 0.73	1 12.6	24 53.78	36 22.8	25 58.74	24 40.5	27 31.22	25 50.2			28 45.87	55 10.3		

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1877. Dec. 9 Dec. 12

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	23 30 10	29 230	23 35 6	34 200	23 42 4	41 16.9	23 43 24	42 35.9	23 44 17	43 28.4	23 46 37	45 47.2		45 268 28.3
δ	53° 46	400 8.4	53° 2	52 566 8.6	55° 15	90 9.1	52° 4	51 585 9.1	51° 11	60 9.0	53° 34	28.3 9.0		

Dec. 9

	+4.32		+10.57		+4.01		+10.24		+8.75				+11.71	+11.43
	30 15.6 16.2 22.7 26.0 28.6	7.84	35 12.8 16.0 19.7 23.2 26.5	7.09	42 11.8 14.7 19.3 22.9 26.6	10.63	43 30.9 34.2 37.5 40.9 44.3	6.76	44 23.7 27.0 30.3 33.7 36.9	5.30	46 22.6 26.0 29.4 33.0 36.4	46.6 47.0 50.5 54.0 57.4	8.23	7.95
	1131		982		960		378		16		473	27		
	30 22.62 + 6.53 − 1.18	+5.35	35 19.64 + 6.53 − 1.14	+5.39	42 19.20 + 6.53 − 1.24	+5.29	43 37.56 + 6.53 − 1.10	+5.43	44 30.32 + 6.53 − 1.08	+5.45	46 29.46 + 6.53 − 1.17	50.54 + 6.53 − 1.17	+5.36	+5.36
	30 27.97 − 2.67		35 25.03 − 2.78		42 24.49 − 2.86		43 42.99 − 2.96		44 35.77 − 2.99		46 34.82 − 2.97	55.90 − 2.98		
	30 25.30	−5.67 −39.78	35 22.25	−5.76 −39.88	42 21.63	−5.85 −39.98	43 40.03	−5.90 −40.00	44 32.78	−5.92 −40.02	46 31.85	52.92		−5.94 −40.04
	5.8		5.4		9.0		9.2		8		7.0			
	21 47.9 47.4 47.7 140		34 42.7 42.2 47.7 156		41 52.5 55.8 55.8 164		43 5.3 5.8 11.3 259		44 15.6 18.8 23.3 577		46 43.6 47.2 51.4 194	53 35 51.63		31.91 − 28 − 50 + 12.14 + 35 − 39.30
	29 54.52	47 53.20	34 45.20	53 3 51.95	41 55.47	55 16 46.57	43 8.63	52 6 23.37	44 19.23	51 14 12.16	46 47.47	393		393
	+27.95 1.44638 9.77130 1.34028 40	− 20 − 1.22 + 12.35 + 40 −38.70	+34.44 1.53706 9.77879 1.43845 20	− 31 − 95 + 11.53 + 30 −38.80	+23.78 1.37530 9.75551 1.25341 10	− .15 − 25 + 14.01 + 40 −39.40	+28.93 1.46135 9.78837 1.37232 20	− 22 − 32 + 10.48 + 30 −38.90	+11.09 1.00386 9.79668 0.92317 10	− 3.32.44 − 95 + 9.51 + 25 −38.70	+46.61 1.51838 9.77336 1.41434 50	1.66448 9.77336 1.56444		1.56 2.
	0 11.2 5.0 9.2 40 4.64 42 43.75	47 22.55 34 95	41 2.4 1.6 40 24 2.00 35 58 46.35	3 20.24	0 57.3 57.9 12 10 57.60 95 11 50.75	16 17.70	1 16.5 17.4 2 21 17.40 1 31.25	5 51.23	3 33.1 33.9 10 13 33.20 85 9 14.85	13 38.76	1 19.0 20.5 395 51 19.79.75 31 28.60	20.10		
	53 48 2.19 − 10.24		53 4 4.79 − 12.93		55 17 9.19 − 23.24		52 6 49.69 − 26.79		51 14 33.29 − 21.60		53 36 47.04 − 28.28			45472 28.3
	30 19.63	46 42.6	35 16.49	2 40.4	42 15.78	15 37.7	43 34.13	5 11.2	44 26.86	12 58.7	46 25.92	46.98	34 30.5	+11.495

Dec. 12

	+12.48		+10.53		+13.64		+9.98		+5.48					
	30 13.6 16.7 20.4 24.0 27.6	8.46	35 10.6 14.0 17.4 20.8 24.3	6.51	42 8.0 13.4 17.0 20.5 24.3	9.65	43 28.7 32.0 35.3 38.7 42.4	5.96	44 21.5 24.3 28.0 31.3 34.8	4.46	46 41.3 44.7 48.0 51.6 55.1	7.60		
	10.25		871		847		1771		1404		2407			
	30 20.50 + 8.66 − 1.08	+7.58	35 17.42 + 8.66 − 1.05	+7.61	42 16.94 + 8.66 − 1.14	+7.52	43 35.42 + 8.66 − 1.01	+7.65	44 28.08 + 8.66 − .99	+7.67	46 48.14 + 8.66 − 1.08	+7.58		−5.93 −40.04
	30 28.08 −2.60	−5.67 −39.78	35 25.03 −2.71	−5.76 −39.88	42 24.46 −2.78	−5.85 −39.98	43 43.07 −2.88	−5.90 −40.00	44 35.75 −2.92	−5.92 −40.02	46 55.72 −2.91			−5.94 −40.04
	30 25.48		35 22.32		42 21.68		43 40.19		44 32.83		46 52.81			
	3		4		8.9		8.9		9.0		7.4			
	30 4.8 7.1 9.8 22.1		34 58.2 1.1 3.3 36		41 43.2 46.4 48.9 185		42 59.7 2.6 5.3 76		43 58.8 2.3 5.1 6.2		46 8.9 12.2 14.4 66			304
	30 7.37	53 47 51.90	35 1.20	53 3 51.86	41 46.17	55 16 45.95	43 2.53	52 6 22.90	44 20.71	51 14 11.69	46 12.20		53 35	+11.7
	+13.13 1.11826 9.77130 1.01216 35	− 5 − 3 + 12.16 + 40 −38.80	+16.22 1.21005 9.77879 1.11144 20	− 7 − 104 + 11.34 + 30 −38.80	+30.77 1.48813 9.75551 1.36624 10	− 25 − 24 + 13.78 + 40 −39.50	+32.89 1.51706 9.78837 1.42803 20	− 29 − 34 + 10.31 + 30 −38.90	+26.01 1.41514 9.79668 1.33442 10	− 18 − 94 + 9.35 + 25 −38.80	+35.94 1.55558 9.77336 1.45154 50		− 34 − 34 + 11.95 + 35 − 39.30	
	4 52.7 51.4 41 39 52.65 42 56.30	47 21.56	3 47.5 48.0 155 23 47.75 35 59 0.60	3 19.57	1 3.2 2.1 5.3 11 2.75 40 11 4.570	16 16.10	1 18.9 19.5 41 21 19.20 85 1 29.15	5 44.96	3 46.1 47.1 132 13 46.64 25 9 1.78	13 37.35	1 59.9 59.2 11 51 59.65 20 30 48.80		35 47.06	51 1202
	53 48 15.09 − 21.89		53 4 19.39 − 24.44		55 17 4.49 − 17.92		52 6 47.94 − 23.57		51 14 20.54 − 8.38		53 36 7.59 − 23.96 − 36.68			
	30 19.81	46 41.8	35 16.56	2 39.7	42 15.83	15 36.1	43 34.29	5 10.0	44 26.91	12 57.3	46 46.87		35 7.0	

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1877, Dec. 9, Dec. 12. Obs. W. A. R. Rec. of F. M.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	23 50 27	49 38.9	23 51 14	50 26.3	23 52 34	51 45.7	23 53 40	52 52.9	23 54 10	53 20.3	23 58 8	57 18.1
δ	55° 8′	2.0 7.5	55° 11′	5.4 8.8	55° 15′	8.8 8.5	55° 0′	54 54.0 9.0	55° 0′	54 53.9 9.0	50° 49′	43.5 8.2

Dec. 9

	50 34.7 38.0 41.7 45.3 48.9	9.85	51 22.3 26.0 29.7 33.2 36.8	9.65	52 42.3 46.0 49.6 53.3 56.8	10.42	53 48.9 52.7 56.4 59.8 3.4		54 16.7 20.5 24.0 27.8 31.4	10.57	58 16.0 19.6 22.6 26.0 29.3	5.40
	86		479		480		2812		1206		1135	
	50 41.72 +.653 − 1.23	+5.30	51 29.58 +.652 − 1.24	+5.28	52 49.60 +.652 − 1.24	+5.26	53 56.24 +.652 − 1.23	+5.29	54 24.12 +.652 − 1.23	+5.29	58 22.70 +.652 − 1.06	+5.46
	50 47.02		51 34.86		52 54.88		54 1.53		54 29.41		58 28.16	
	−3.02	−5.99 −4.008	−3.04	−6.00 −4.008	−3.06	−6.02 −4.008	−3.09	−6.04	−3.10	−6.05 −4.010	−3.23	−6.12 −4.010
	50 44.00		51 31.82		52 51.82		53 58.44		54 26.31		58 24.93	
	6.5 7.1		8.0		8.5		9.0 E4.		8.6		9.0 8.5	
	50 8.4 12.1 14.5 50	−3.48	51 6.3 9.6 12.8 28.7		52 18.3 15.8 18.7 178				54 7.1 11.3 14.4 46		57 62.0 63.5 63.9 164	
	50 11.67	55 9 51.13	51 9.57	55 13 19.55	52 15.93	55 16 46.36			54 11.53	55 2 45.18	57 65.47	50 51 30.10
	+3.005	− 23	+2.001	− 10	+33.67	− 29			+12.59	− 5	+2.723	− 19
	1.477 84	− 72	1.301 25	− 1.12	1.527 24	− 22			1.100 03	− 5	1.435 05	− 30
	9.756 78	+ 1388	9.756 24	+ 13.95	9.755 51	+ 1401	9.75841		9.758 05	+ 13.75	9.800 12	+ 9.12
	1.357 22	+ .40	1.180 09	+ .40	1.405 35	+ .40			0.980 68	+ .40	1.357 77	+ .25
	15	−39.60	10	−39.40	10	−39.70	25	−39.70	25	−39.70	35	−38.90
	2 46.9 47.2 1	9 21.38	4 37.0 36.6 136	12 49.50	0 50.1 51.1 12	16 17.08	1 18.9 19.1 180		0 14.9 16.2 111	2 16.05	1 4.6 6.1 104	50 56.60
	17 47.05 5 1.30	40	14 36.80 8 11.55	37.15	10 50.60 11 57.75	95	26 19.00 56 29.35	35	25 1.555 57 3280	90	36 5.35 46 4300	70
	55 10 19.74 − 27.85		55 13 29.99 − 10.96		55 17 1619 − 28.90		55 1 47.19 − 24.98		55 2 51.24 − 6.13		50 52 1.44 − 3.14	
	50 38.01	8 41.3 +12.97	51 25.82	12 9.4 +12.88	52 45.80	15 37.0 +13.60	53 52.40	+13.29	54 20.26	1 36.0 +13.53	58 18.81	50 16.5 +8.57

Dec. 12

	50 32.2 35.8 39.6 43.1 46.8	8.93	51 20.0 23.8 27.6 31.0 34.8	8.86	52 40.3 43.8 47.4 51.0 54.7	9.58	53 46.9 50.4 54.0 57.8 1.3	9.27	54 17.7 18.4 22.0 25.7 29.3	9.81	58 14.0 17.4 20.4 23.9 27.0	4.55
	1975		1871		2372		2704		1100		1027	
	50 39.50 + .866 − 1.13	+7.53	51 27.42 + .866 − 1.14	+7.52	52 47.44 + .866 − 1.14	+7.52	53 54.08 + .866 − 1.13	+7.53	54 22.00 + .866 − 1.13	+7.53	58 20.54 + .865 − .97	+7.68
	50 47.03		51 34.94		52 54.96		54 1.61		54 29.53		58 28.22	
	−2.95	−5.99 −4.008	−2.96	−6.00 −4.008	−2.98	−6.02 −4.008	−3.01	−6.04 −4.010	−3.02	−6.05 −4.010	−3.16	−6.12 −4.010
	50 44.08		51 31.98		52 51.98		54 58.60 53		54 26.51		58 25.06	
	7.4 6.5		8.0		8.5		9.0		8.6		9.0 8.5	
	49 58.8 2.6 6.8 82	−4.02	51 9.6 13.3 16.9 88		52 6.0 9.5 12.0 275		53 17.7 21.3 24.7 37		54 10.9 14.1 16.8 118		57 40.0 42.6 47.4 100	
	50 2.73	55 9 51.89	51 12.93	55 13 19.03	52 9.17	55 16 4.29	53 21.23	55 1 22.81	54 13.93	55 2 45.11	57 43.33	50 51 30.30
	+36.77	− 35	+14.49	− 5	+38.27	− 38	+32.85	− 28	+8.07	− 2	+3.721	− 37
	1.565 40	− 731	1.161 07	− 120	1.582 86	− 21	1.516 54	− 34	0.906 87	− 8	1.570 66	− 29
	9.756 78	+ 13659	9.756 24	+ 13.73	9.755 51	+ 13.79	9.758 41	+ 1351	9.758 05	+ 13.53	9.800 12	+ 8.98
	1.444 87	+ .40	1.039 91	+ .40	1.460 97	+ .40	1.397 55	+ .40	0.784 52	+ .40	1.493 38	+ .25
	15	−39.70	10	−39.80	10	−39.80	25	−39.80	25	−39.80	35	−39.10
	2 52.9 53.6 5	9 21.14	4 33.0 31.9 49	12 48.09	0 53.9 54.8 7	16 17.07	1 23.9 23.4 13	0 52.28	0 12.7 12.1 8	2 15.12	8 14.0 14.5 5	50 55.75
	17 4 53.25 5510	52.90	14 32.45 8 1590	10	10 55.54.35 11 5450	00	26 23.65 56 24.70		25 11 42.40 57 3595	05	36 14.25 46 3410	1390
	55 10 13.89 − 22.76		55 13 34.69 − 15.14		55 17 12.79 − 25.47		55 1 43.49		55 2 54.74 − 9.56		50 51 52.89 − 22.79	
	50 38.09	8 41.06	51 25.98	12 8.0	52 45.96	16 37.0 5	53 52.46 5	0 12.2	54 20.46	1 35.0	58 18.94	50 15.6

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1877 Dec. 9, Dec. 12

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 0 11	23 59 22.4	0 4 6	3 15.4	0 5 10	4 19.0	0 8 26	7 34.3	0 11 47	10 55.1	0 15 33	15 0.0
δ	54° 1′	53 55.1	50° 28′	22.5	50° 46′	40.6	52° 52′	46.2	54° 10′	44	53° 56′	50.2
		9.1		8.6		8.5		7.3		9.5		7.1

Dec. 9

	0 20.9	8.23	4 14.7	4.64	5 18.8	4.55	8 33.8	7.05	11 55.8	9.48	16 1.7	8.21
	24.6		18.1		22.0		36.8		59.8		3.3	
	27.9		21.2		25.9		40.2		3.0		8.6	
	31.6		24.5		28.8		43.8		6.6		12.3	
	36.3		27.8		32.9		47.2		10.0		15.8	
	1402		65		1272		2018		3152		436	
	0 28.04		4 21.30		5 25.44		8 40.36		12 3.04		16 8.72	
	+ 652	+5.33	+ 652	+5.48	+ 652	+5.46	+ 652	+5.38	+ 652	+5.32	+ 6.51	+5.83
	— 1.79		— 1.04		— 1.06		— 1.14		— 1.20		— 1.18	
	0 33.37		4 26.78		5 30.90		8 45.74		12 8.36		16 14.05	
	— 3.23	−6.15	— 3.33	−6.21	— 3.35	−6.22	— 3.40	−6.27	— 3.44	−6.34	— 3.51	−6.40
	0 30.14	−40.10	4 23.45	−40.10	5 27.55	−40.10	8 42.34	−40.08	12 4.92	−40.06	16 10.54	−40.00

α 2°

	0 1.2		4 33.0		5 33.4		8 21.7		11 38.9		16 39.3			
	3.7		36.7		36.4		24.2		42.0		42.4			
	8.0		39.6		39.8		27.3		45.2		46.3			
	12.9		193		196		132		60		70			
10	0 43.0	54 3 0.71	4 36.43	50 30 9.00	5 36.53	50 48 17.59	8 24.46	52 53 37.07	11 42.50	54 12 14.47	15 46.23	53 58 19.95
19	+23.74	− 15	− 15.13	− 6	−1109	− 3	+1596	− 7	+21.04	− 11	+26.39	− 18
0	1.37548	− 120	1.17984	− 80	1.04493	− 1.25	1.20303	− 1.08	1.32305	− 15	1.42144	− 1.10
2	9.76870	+ 12.66	9.80336	+ 8.73	9.80074	+ 9.06	9.78047	+ 11.38	9.76712	+ 12.82	9.76957	+ 12.57
5	1.26678	+ 40	1.10580	+ 25	0.96827	+ 25	1.10610	+ 30	1.21277	+ 40	1.31361	+ 40
	20	−39.70	55	−39.00	35	−39.00	30	−39.50	15	−39.80	25	−39.50
60	4 42.7	2 29.24	2 26.6	29 34.64	11 19.41	47 42.94	4 13.1	53 4.62	0 30.9	11 44.15	4 21.9	57 48.36
	42.4		26.0		19.7	43.14	16.3		31.6		21.1	
	11		6		11		9.4		5		10	
	24 42.55	90	57 26.30	65	39 19.55	90	311 11.30	1505	15 31.25	60	19 21.85	85
	58 58.0		25 22.05		43 28.80		48 33.63		7 17.10		53 26.85	
	54 3 24.24		50 30 40.49		50 48 47.24		52 53 52.09		54 12 35.54		53 58 45.29	
	− 22.32		− 30.71		− 28.36		− 15.65		− 18.18		− 25.50	
	0 23.99	1 49.1	4 17.24	28 54.5	5 21.33	47 3.0	8 36.07	52 24.5	11 58.58	11 4.1	16 4.14	57 8.4

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		+11.23		+7.54		+7.74		+10.31		+12.71		+11.35		
	0 19.0	7.41	4 12.4	3.85	5 16.6	3.72	8 31.3	6.29	11 37.0	8.74	16 43.1	7.34
	22.5		16.8		20.0		34.6		57.4		2.9	
	26.0		17.0		23.1		38.1		1.0		6.8	
	29.5		22.2		26.5		41.4		4.6		8.9	
	35.0		25.4		30.0		44.5		7.8		13.6	
	1300		948		1162		1903		48		326	
	0 26.50		4 18.96		5 23.24		8 38.06		12 0.96		16 6.52	
	+ 865	+7.56	+ 865	+7.69	+ 865	+7.68	+ 865	+7.60	+ 865	+7.55	+ 8.65	+7.57
	— 109		— 96		— 97		— 105		— 110		— 108	
	0 33.56		4 26.65		5 30.92		8 41.66		12 5.51		16 14.09	
	− 3.16	−6.15	− 3.28	−6.21	− 3.29	−6.22	− 3.32	−6.27	− 3.37	−6.34	− 3.45	−6.40
	0 30.40	−40.10	4 23.37	−40.10	5 [36.15] 27.63	−40.10	8 42.34	−40.08	12 5.14	−40.06	16 10.64	−40.00

α 8°

	9 17.0		3 38.8		4 46.6		8 15.2		11 35.0		15 31.1			
	57.0		42.8		48.4		19.0		37.8		34.2			
	1.0		45.0		52.2		21.3		39.8		36.2			
	1720		77		1482		555		226		116			
30	59 57.33	54 3 1.92	3 42.57	50 30 9.78	4 44.40	50 48 18.88	8 18.50	52 53 36.44	11 37.53	54 12 17.36	15 33.83	53 58 19.79
	+28.67	− 21	+36.39	− 36	+33.81	− 31	+19.56	− 10	+23.43	− 14	+32.69	− 28
	1.45743	− 1.22	1.56098	− 62	1.52943	− 1.12	1.29137	− 1.09	1.36977	− 13	1.51441	− 1.14
	9.76870	+ 12.40	9.80366	+ 8.60	9.80094	+ 8.92	9.78047	+ 11.20	9.76712	+ 12.63	9.76957	+ 12.38
	1.34873	+ 40	1.48724	+ 25	1.45271	+ 25	1.19444	+ 30	1.25949	+ 40	1.40658	+ 40
	20	−39.80	55	−39.10	35	−39.20	30	−39.70	15	−40.00	25	−40.00
75	4 48.8	2 29.53	3 11.9	29 34.53	4 59.9	47 43.40	4 17.5	53 3.03	0 36.8	11 46.10	4 27.8	57 47.13
	47.1		9.9		57.8		17.1		35.9		25.4	
	8.9		21.8		1.1		6		4		1.32	
	24 47.95	60	58 10.90	55	39 58.55	50	34 17.30	1695	15 36.35	00	29 26.60	25
	58 0.40		24 39.45		42 49.50		48 31.05		7 12.08		53 21.95	
	54 3 19.19		50 29 56.24		50 48 8.29		52 53 49.84		54 12 32.79		53 58 40.54	
	− 18.48		+ 12.76		+ 9.30		− 12.77		− 16.32		− 20.89	
	0 24.25	1 49.4	4 17.16	28 54.4	5 21.41	47 3.3	8 36.07	52 23.0	11 58.80	11 6.0	16 4.24	57 7.1

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Ref. Dec. 9, Dec. 12. Obs. W.A.R. Rec. J.F.M. 16

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 16 20	15 30.0 31.1 / 15 29.2	0 17 20	16 25.6	0 18 8	17 17.4	0 19 32	18 38.5	0 21 36	20 41.7	0 22 27	21 33.3
δ	53° 37'	448 1.0	53° 7'	1.0 7.3	50° 1'	49 555 8.4	53° 48'	424 9.0	52° 20'	14.1 8.7	52° 41'	352 8.7

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	+1123		+1080		+728		+1205		+1061		+1013	
	16 20.1	7.75	17 27.1	7.32	18 19.3	3.80	19 42.3	8.57	21 44.2	7.13	22 35.5	6.65
	24.3		30.3		22.4		45.8		47.6		38.9	
	27.9		34.0		23.4		49.1		50.5		42.3	
	31.2		37.4		28.8		52.1		54.2		45.8	
	44.4		40.9		32.0		55.7		57.8		49.3	
	1885		1697		1281		466		46		2118	
	16 37.70		17 33.94		18 25.62		19 48.32		21 50.92		22 42.36	
	+ 6.51	+5.34	+ 6.51	+5.37	+ 6.51	+5.49	+ 6.51	+5.33	+ 6.51	+5.40	+ 6.51	+5.38
	- 1.17		- 1.14		- 1.02		- 1.18		- 1.11		- 1.13	
	16 43.04	6.41 4000	17 39.31	6.42 4000	18 31.11	6.40 3998	19 52.65	6.46 3996	21 56.32	6.47 3994	22 47.74	6.49 3992
	-3.53		-3.56		-3.58		-3.60		-3.64		-3.65	
	16 39.51		17 35.75		18 27.53		19 51.05		21 52.68		22 44.09	
	16 33.10											
	8.7		7.8		8.4		8.6		8.8		8.6	
	17 4.5		17 42.9		18 16.8		19 20.7		21 16.3		22 15.0	
	8.3		46.5		18.7		23.2		18.3		21.1	
	11.0		52.7		21.0		27.0		22.4		25.5	
	238	-3.48	346		565		109		580		46	
	17 793	53 38 5645	17 51.25	53 9 2.81	18 1883	50 3 24.11	19 2363	53 50 2558	21 1933	52 21 54.01	22 21.53	52 42 53.06
	-3023	- 23	-17.31	- 8	+ 6.79	- 1	+25.69	- 17	+31.59	- 26	+20.83	- 12
	1.480444	- 1.15	1.238830	- 1.08	0.831876	- 1.15	1.409776	- 60	1.499955	- 20	1.318669	- 1.22
	9.772855	+ 12.28	9.777995	+ 11.66	9.807822	+ 8.24	9.770995	+ 1242	9.785776	+ 1077	9.782307	+ 11.17
	1.375889	+ 40	1.138855	+ 30	0.762097	+ 20	1.303311	+ 40	1.407911	+ 30	1.223599	+ 30
	45	-39.70 15		-39.40 20		-39.10 35		- 39.80 5		-39.50		-39.60
	4 24.6	38 24.50	3 56.3	8 30.43	4 27.0	2 48.81	2 14.2	49 54.350	0 47.6	21 21.64		42 20.11
	23.4		55.3		25.2		14.8		48.9			
	0		116		122		10		4			
	49 24.87 35		18 55.80 56.15		24 26.10 45		37 14.85 50		5 48.20 55			
	33 24.35		3 32.55		58 22.25		45 33.85		17 0.15			
	53 38 42.79		53 9 10.99		50 3 40.69		53 50 52.29		52 22 18.59		52 43 12.19	
	+ 13.42		- 6.45		- 17.96		- 24.86		- 24.43		- 18.42	
	16 33.10	37 44.5	17 29.33	7 50.4	18 21.13	2 8.8	19 14.59	49 14.4	21 46.21	20 41.7	22 37.60	41 40.2

Dec. 12

	+1121		+1075		+706		+1480		+1046		+988	
	16 28.2	7.19	17 24.7	6.73	18 17.0	3.04	19 40.0	7.78	21 41.8	6.44	22 33.0	5.86
	32.0		28.3		20.2		43.3		44.3		36.5	
	35.4		31.7		23.4		46.8		48.8		39.8	
	38.0		35.1		26.6		50.5		52.2		43.5	
	42.3		38.6		29.9		53.1		55.3		46.9	
	1770		84		1171		2348		435		498	
	16 35.40		17 31.68		18 23.42		19 46.96		21 48.70		22 39.96	
	+ 8.65	+7.57	+ 8.65	+7.60	+ 8.65	+7.71	+ 8.65	+7.56	+ 8.65	+7.63	+ 8.65	+7.61
	- 1.08		- 105		- 94		- 109		- 102		- 104	
	16 42.97	6.41 4000	17 39.28	6.42 4000	18 31.13	6.40 3998	19 54.52	6.46 3996	21 56.33	6.47 3994	22 47.57	6.49 3992
	- 3.47		-3.49		-3.52		-3.53		-3.57		-3.59	
	16 39.50		17 35.79		18 27.61		19 42.93 50.99		21 52.76		22 43.98	
	8.7		7.8		8.4		8.6		8.8		8.6	
	17 48.2		17 20.8		17 58.4		19 12.3		21 14.8		22 14.7	
	42.9		23.2		2.0		15.3		15.2		16.7	
	45.3		26.7		5.4		18.2		21.6		19.7	
	74	-4.02	107		70		158		556		211	
	16 52.47	53 38 5621	17 23.57	53 9 4.54	18 2.33	50 3 22.73	19 15.27	53 50 27.49	21 18.53	52 21 54.16	22 17.03	52 42 53.77
	-17.07	- 7	+ 8.11	- 2	+21.09	- 12	+31.66	- 26	+30.17	- 24	+22.93	- 14
	1.232233	- 1.14	0.909021	- 1.01	1.324108	- 1.14	1.500921	- 57	1.479958	- 21	1.360440	- 1.27
	9.772855	+ 12.02	9.777955	+ 11.48	9.807622	+ 8.12	9.770995	+ 12.23	9.785776	+ 1061	9.782307	+ 10.99
	1.127688	+ 40	0.809571	+ 30	1.254302	+ 20	1.394477	+ 40	1.387944	+ 30	1.265302	+ 30
	45	-39.90 15		-39.80 20		-39.20 35		-40.00 5		-39.70		-39.80
	4 35.2	38 23.48	4 18.9	8 31.47	4 38.8	2 46.57	2 22.0	49 55.270	0 46.9	21 20.90		42 19.83
	33.7	50	17.3		35.7		20.9		48.2			
	89		2		1145		29		151			
	49 34.45 10		19 15.10 1775		24 37.25 3690		37 21.45 10		5 47.55 20			
	33 13.90		3 30.25		58 11.10		45 26.90		17 0.80			
	53 38 32.69		53 8 49.04		50 3 29.89		53 50 45.49		52 22 19.59		52 43 9.79	
	+ 23.76		+ 13.77		- 5.78		- 20.11		- 25.58		- 16.93	
	16 33.09	37 43.5	17 29.37	7 51.5	18 21.21	2 6.6	19 44.53	49 15.3	21 46.29	20 41.0	22 37.49	41 39.9

The circles are drawings on this page.

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1877, Dec. 9, Dec. 12.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	0 23 28	22 34.5	0 24 14	23 19.0	0 25 29	24 34.2	0 26 45	25 50.4	0 29 1	28 6.0	0 29 51	28 56.0
δ	54° 55′	48.6 8.8	54° 36′	29.9 9.0	54° 31′	24.9 8.1	52° 10′	4.2 8.7	53° 28′	22.2 5.8	53° 12′	5.9 4.1

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23 35.5	+13.51 10.03	24 20.2	+13.00 10.07	25 37.7	+13.32 9.84	26 54.0	+10.46 6.98	30.4 9.6	+12.18 +11.33 8.70 7.85	29 39.4	+10.73 7.45
23 42.90	+5.28	24 27.18	+5.30	25 44.66	+5.31	27 0.54	+5.40	37.32 16.48	+5.35 +5.35	30 6.08	+5.36
23 48.18		24 32.48		25 49.97		27 6.54		28 42.67 21.83	−6.59 −39.78	30 11.44	
23 44.51	−6.54 −39.90	24 28.80	−6.54 −39.88	25 46.26	−6.56 −39.86	27 2.51	−6.55 −39.84	28 38.91 29 18.06	−6.59 −39.78	30 7.65	−6.61 −37.76
23 19.60	54 56 10.59	24 16.63	54 37 35.34	25 11.63	54 32 40.03	26 33.23	52 11 47.20	25.00 1.43	−39.60 −39.74	29 51.23	53 13 44.77
1.36736 9.75931 1.24927	+13.65 +40 −40.00	1.02325 9.76271 0.90856	+13.30 +40 −39.90	1.51891 9.76342 1.40493	+13.20 +40 −39.90	1.44107 9.78739 1.35106	+10.61 +30 −39.50	1.09061 1.17754 9.77405 9.77456 0.98726 1.07470		1.17173 9.77711 1.01144	
5456 23.59		54 37 24.14		54 33 8.94		52 12 15.14		53 30 20.39	28 45.8	53 14 1.59	
23 37.97	55 0.7	24 22.26	36 25.6	25 39.70	31 30.1	26 55.96	10 34.8	28 32.32 29 11.47	28 6.0	30 1.04	12 32.9

Dec. 12

The circle readings on this page were copied in the wrong space.

23 33.6	+13.32 9.30	24 17.8	+13.25 9.23	25 35.2	+11.78 7.76	26 52.0	+10.21 6.19	29 7.2	+11.28 7.26	29 56.7	+10.68 6.66
23 40.68	+7.52	24 24.90	+7.54	25 42.30	+7.55	26 58.60	+7.63	29 14.06	+7.58	30 3.76	+7.58
23 48.20		24 32.44		25 49.86		27 6.23		29 21.64		30 11.34	
23 44.60	−6.54 −39.90	24 28.83	−6.54 −39.98	25 46.21	−6.56 −39.86	27 2.56	−6.55 −39.84	29 17.93	−6.60 −39.78	30 7.62	−6.61 −37.76
23 24.97	54 56 11.62	24 40.83	54 37 36.37	25 5.77	54 32 40.84	26 23.30	52 11 46.45	28 46.70	53 29 58.41	29 41.40	53 13 43.84
1.19618 9.75931 1.07809	+13.43 +40 −40.20	1.20222 9.76271 1.08753	+13.10 +40 −40.10	1.56265 9.76342 1.44867	+13.00 +40 −40.10	1.54777 9.78739 1.45776	+10.45 +30 −39.70	1.44498 9.77439 1.34197	+11.86 +35 −39.90	1.34947 9.77711 1.24918	
54 56 28.34	55 40.72	54 37 43.44	37 5.50	54 33 5.44	32 8.50	52 12 9.64	11 12.94	53 12 4 9.34	29 25.77	53 13 55.04	
23 38.06	55 0.8	24 22.29	36 25.6	25 39.65	31 28.6	26 56.01	10 33.1	29 11.33	28 46.0	30 1.01	12 30.8

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1877phae.proj.1b17R

Eq. Dec. 9 Dec. 12 Obs. W. A. R. Rec. & J. M.

	h m s		h m s		h m s	
α	0 30 45	29 49.3	0 31 35	30 43.2	0 33 48	32 51.8
δ	53° 4′	52 58.3	50° 41′	35.9	52° 6′	0.9
		8.9		8.2		9.2

Dec. 9 +11.38 +8.86 +9.62

	30 54.9	7.90	31 46.3	4.58	33 56.2	6.14
	48.3		47.0		49.6	
	1.6		43.0		2.9	
	5.1		56.4		6.5	
	8.6		54.6		9.8	
	85		263.5		3150	
	31 1.70		31 53.10		34 3.00	
	+ 6.51	+5.37	+ 6.51	+5.48	+ 6.50	+5.40
	− 1.14		− 1.03		− 1.10	
	31 7.07		31 58.58		34 8.40	
	− 3.80	662	− 3.81	660	− 3.85	665
	31 3.27	39.74	31 54.77	39.72	34 4.55	3966
						39.

44	30 40.9		78 31 33.7		98 33 33.0	
	43.9		37.0		36.7	
	46.3		31.4		39.0	
	113	−3.48	201		187	
	30 43.77	58 6 2.21	31 36.70	50 43 28.02	33 36.23	52 8 32.41
	+ 17.93	− 8	+ 16.40	− 7	+ 26.77	− 19
	1.253558	− 45	1.214484	− 1.10	1.427655	− 1.05
	9.777846	+ 1161	9.801236	+ 8.98	9.781788	+ 1056
	1.15464 n	+ .30	1.13880 n	+ 25	1.33813 n	+ .30
20		−39.60	40	−39.20	15	−39.40
	1 47.9	5 30.51	41 24.1	42 53.40	41 36.2	7 54.15
	48.2		22.5		57.0	
	1		66		132	
	21 48.65 40		44 23.30 65		19 56.60 95	
	1 0.30		38 25.05		2 51.75	
	53 6 18.74		50 43 43.49		52 8 10.19	
	− 16.41		− 16.80		+ 22.61	
	30 56.65	4 50.8	31 48.17	42 13.7	33 57.90	7 19.5

Dec. 12 +11.5 +7.86 +9.22

	30 42.3	7.13	31 44.4	3.84	33 47.0	5.20
	45.9		47.6		47.3	
	49.2		51.0		0.8	
	2.7		54.0		4.1	
	6.3		57.3		7.5	
	296.4		43		37	
	30 59.28		31 50.86		34 0.74	
	+ 8.64	+ 7.59	+ 8.64	+ 7.69	+ 8.64	+ 7.63
	− 1.05		− .95		− 1.01	
	31 6.87		31 58.55		34 8.37	
	− 3.74	662	− 3.75	660	− 3.80	665
	31 3.13	39.74	31 54.80	39.72	34 4.57	3966
						39.

86			73		93	
	30 34.8		31 28.8		34 24.8	
	38.7		31.8		28.3	
	41.5		34.8		32.5	
	116.0	−4.02	54		85.6	
	30 38.67	53 6 2.33	31 31.80	50 43 27.49	34 28.53	52 8 32.80
	+20.61	− 12	+19.06	− 10	− 27.70	− 21
	1.314 08	− 47	1.280 72	− 1.14	1.444 380 n	− 1.27
	9.778 46	+ 1144	9.801 36	+ 8.85	9.781 788	+ 1040
	1.21514 n	+ .30	1.20408	+ .25	1.35437	+ .30
20		−39.80	40	−39.40	15	−39.50
	1 51.2	5 29.66	41 26.6	42 51.93	41 13.8	7 58.50
	50.1		24.1		12.1	
	1 3	30	107		59	
	21 50.65		411 25.35 60		19 12.95 60	
	0 57.70		383 23.01		3 35.40	
	53 6 16.49		50 43 41.79		52 8 54.19	
	− 14.28		− 13.77		− 21.78	
	30 56.51	4 49.9	31 48.20	42 12.2	33 57.92	7 18.8

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1877phae.proj.167R

599 601

1877. Dec. 3, Dec. 9. Obs. W.A.R. Rec. J. K. M.

19

	h m s		h m s		h m s		h m s		h m s		h m s	
α	23 11 52	11 7.6	0 34 56	34 0.2	0 37 30	36 32.7	0 38 32	37 36.1	0 40 42	39 48.7	0 43 57	43 4.9
δ	55° 1′	54 55.1	54° 31′	24.9	53° 1′	52 55.4	54° 36′	30.5	50° 44′	39.2	52° 3′	57.9
		9.2		9.0		8.9		8.8		7.5		9.0

Dec. 3

		+13.06				+10.37		+12.96		+8.78		
	35 10.2	9.97	37 43.1	7.28	38 48.1	9.17	40 57.4	5.69				
	14.0		46.6		51.5		0.7					
	17.5		50.1		54.1		3.9					
	21.2		53.3		58.6		7.2					
	24.8		56.5		2.2		10.4					
	8 77		2499		2755		196					
	35 17.54		37 49.98		38 55.10		41 2.92					
	+ 3.03	+2.01	+ 3.03	+2.06	+ 3.03	+2.00	+ 3.03	+2.13				
	− 1.02		− .97		− 1.03		− .90					
	35 19.55		37 52.04		38 57.10		41 6.05					
	− 4.02	−6.72	− 4.04	−6.73	− 4.09	−6.78	− 4.08	−6.73				
	35 15.53	−39.64	37 48.00	−39.56	38 53.01	−39.54	41 1.97	−39.46				
	9.0		9.0		8.8		8.9					
	34 35.6		37 18.0		38 20.0		40 31.1					
	38.7		21.6		22.7		33.8					
	42.0		24.1		25.6		36.7					
	11 71	−3.09	37		83		116					
	34 39.03	54 32 30.75	37 21.23	53 2 55.15	38 22.77	54 38 16.50	40 33.87	50 46 55.12				
	+ 38.51	− 39	+ 28.75	− 22	+ 32.33	− 27	+ 30.05	− 24				
	1.58557	− 21.45864		− 1.15	1.50961	− 1.06	1.47784	− 19				
	9.76342	+ 1307	9.77896	+ 1144	9.76253	+ 1319	9.80089	+ 896				
	1.47152	+ 40	1.36020	+ 30	1.39474	+ 40	1.40133	+ 25				
	55	−39.20	20	− 39.00	45	−39.20	40	−38.50				
Rm=−.24	0 7.41	32 1.52	4 49.0	2 23.43	11 27.1	37 46.41	0 46.8	46 22.31				
n=−.73	5.8		48.8		24.2		46.5					
	132		178		113		13					
+5′ 18.62″	55 6.60		24 48.90		49 25.65		40 46.65					
	27 41.75		57 59.93		33 22.70		42 1.70					
	54 33 0.37		53 3 18.07		54 38 41.32		50 47 20.32					
	− 29.62		− 22.92		− 24.82		− 25.20					
	35 8.81	31 21.9	37 41.27	1 43.9	38 46.23	37 58.44	40 55.24	45 42.8				
						30.8						

Dec. 9

		+13.18		+10.44		+12.35	+11.53			+8.95		
	35 6.8	9.970	37 40.0	6.96	38 44.8	8.87	10.05	40 54.0	5.47			
	10.4		43.2		48.2			57.2				
	14.1		46.5		51.7			0.3				
	17.5		50.0		55.2			3.7				
	21.0		53.5		58.8			6.9				
	6 98		2332		82 6.01			21				
	35 13.96		37 46.64		51.64	12.02		41 0.42				
	+ 6.50	+5.30	+ 6.50	+5.36	+ 6.50	+6.50	+5.29	+ 6.50	+5.44			
	− 1.20		− 1.14		− 1.21	−1.21		− 1.06				
	35 19.26	−6.72	37 52.00	−6.73	38 56.93	39 17.31	−6.78	41 5.86				
	− 3.89	−39.64	− 3.93	−39.56	− 3.96	−3.96	−39.54	− 3.97	−6.73			
	35 15.37		37 48.07		38 52.97	39 13.35	−6.78	41 1.89	−39.46			
							−39.54					
	9.0		9.0		6.560	54 38 16.54	27.02	8.5 8.9				
	34 31.0		37 13.1		38 16.3	39 21.2	− 27 − 19	40 35.3				
	34.2		17.0		19.6	39.7	−1.10 −.00					
	36.6		18.9		22.3	41.8	+1332 +1332					
	118	−3.48	208		582	11 67	+.40 +.40					
	34 33.93	54 32 31.35	37 16.93	53 2 57.96	19.40	38 39.90	−39.50 −39.46	40 35.30	50 46 55.48			
	+ 40.03	− 42	+ 29.71	− 23	+ 32.24	−26.88	37 45.61 56.77	+ 25.12	− 17			
	1.60239	− 21.47290		− 120	1.50840	1.42543		1.40002	− 20			
	9.76342	+ 13229.77896		+ 1157	9.76253	9.76253		9.80089	+ 9.07			
	1.48841	+ 40	1.37446	+ 30	1.39353	1.31456		1.32351	+ .25			
	55	− 39.50	20	− 39.60	45 50			40	−39.10			
	0 5.6	32 1.25	4 46.1	2 25.32	4 26.49 09			0 50.5	46 21.85			
	3.7		44.2		24.6 59.9			50.0				
	9.3		10.3		49 110 50 0.40			5				
	55 4.65		24 45.15		2.550			40 50.25				
	27 43.70		58 3.20		38 2283 32 47.95			41 58.10				
Rm=−.25	54 33 2.14		53 3 21.64		54 38 41.29 38 6.39			50 47 16.54				
n=−.86	− 30.79		− 23.68		− 24.75 + 20.63			− 21.06				
+5′ 18.44″	35 8.65	31 21.6	37 41.34	1 45.8	38 46.19	37 6.1		40 55.16	45 42.4			
					39 6.47	34 17.2						

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1877phae.proj.1017R

1877 Dec. 3 Dec. 9 Obs. W.A.R. Rec. J.F.M.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 44 53	43 59.0	0 45 51	44 54.1	0 52 42	51 43.0	0 53 59	53 04	0 55 46	54 56.9	0 56 42	55 43.1		
δ	50° 41	36 [illegible]	55° 5	54 59.1	52° 17	11.7	54° 32	25.8	54° 21	15.0	54° 23	17.3		
		95.93		9.0		8.8		8.9		9.0		9.3		

Dec. 3

		+7.98		+13.61		+9.80		+13.02		+11.65		+12.56		
	46 9.6	4.89	46 5.3	10.52	52 54.7	6.81	53 13.8	8.93	56 10.1	8.60	56 16.8	9.47		
	12.7		8.9		58.0		17.4		14.3		0.4			
	16.0		12.1		1.4		20.9		17.8		3.9			
	17.9		16.1		4.8		24.5		21.4		7.4			
	22.5		14.8		8.1		28.2		24.9		11.0			
	800		625		70		1048		891		195			
	45 16.00		46 12.50		53 1.40		54 20.96		56 17.82		57 3.90			
	+ 303	+ 3.13	+ 302	+ 1.98	+ 302	+ 2.08	+ 302	+ 2.08	+ 302	+ 2.01	+ 302	+ 2.01		
	− 90		− 104		− 94		− 102		− 101		− 101			
	45 18.13		46 14.48		53 3.48	6.94	54 22.96		56 19.83		57 5.91			
	− 4.14	6.98	− 4.23	6.91	− 4.30	3904	− 4.36	7.02	− 4.40	7.05	− 4.41	7.06		
	45 13.99	3934	46 10.25	3930	52 59.18		54 18.60	3900	56 15.43	3892	57 1.50	3888		
	9.4		9.0		9.0		8.7		8.9		9.1			
	44 41.2		45 40.8		52 26.7		53 33.2		55 35.5		56 41.1			
	44.4		43.8		29.8		36.7		38.4		47.3			
	46.6		46.8		32.1		40.0		41.2		57.7			
	12.2	−3.09	11.4		8.6		10.9		11.5		13.1			
	44 44.07	50 43 52.12	45 43.80	55 6 31.45	52 29.53	52 19 29.89	53 36.63	54 33 30.04	55 38.37	54 22 37.40	56 54.37	54 24 55.97		
	+ 31.93	− 27	+ 28.70	− 21	+ 31.87	− 27	+ 44.33	− 57	+ 39.45	− 41	+ 9.53	− 3		
	1.50420	− 91	1.45786	− 29	1.50338	− 77	1.64670	− 96	1.59605	− 120	0.97909	− 74		
	9.80136	+ 8.91	9.75733	+ 13.71	9.78609	+ 10.64	9.76324	+ 13.09	9.76519	+ 12.90	9.76484	+ 12.93		
	1.42816	+ 25	1.33781	+ 40	1.41207	+ 30	1.53254	+ 40	1.48384	+ 40	1.86653	+ 40		
40		−38.40	20	−39.10	5	−38.50	50	−38.80	0	−38.70	0	−38.70		
	3 49.1	43 18.61	1 14.9	6 2.87	3 11.4	18 58.20	4 4.9	33 0.17	4 59.9	22 7.30	3 5.1	24 26.74		
	47.0		12.6		11.1		0.8		56.3		2.2			
	161		7.5		5		5.7		162		7.3			
	43 48.05		21 13.75		8 11.25		54 2.85		4 58.10	+1"	3 3.65			
	39 0.30		81 3460		14 3710		28 4550		17 5025		19 44.70			
	50 44 18.92		55 6 53.22		52 19 55.72		54 34 4.12		54 23 88.7		54 25 3.32			
	− 26.80		− 21.77		− 25.83		− 34.08		− 30.47		− 7.35			
	45 7.21	42 39.3	46 3.34	5 23.6	52 52.24	18 19.2	54 11.58	32 21.2	56 8.38	21 28.4	56 54.14	23 47.9		

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		+8.04		+13.81		+10.10		+12.76		+11.86		+12.69		
	45 6.3	4.56	46 1.8	10.33	52 41.2	6.52	54 10.3	8.78	56 7.4	8.38	56 53.3	9.21		
	9.4		5.6		44.6		13.9		10.7		56.1			
	12.4		9.0		47.9		17.5		14.3		57.9			
	15.8		12.7		1.3		21.0		18.0		4.0			
	19.1		16.3		4.8		24.6		21.8		7.6			
	630		454		298		873		722		23			
	45 12.60		46 9.08		52 57.96		54 17.46		56 14.41		57 0.46			
	+ 6.50	+5.44	+ 6.50	+5.27	+ 6.50	+5.39	+ 6.50	+5.29	+ 6.49	+5.29	+ 6.49	+5.29		
	− 106		− 123		− 111		− 120		− 120		− 120			
	45 18.04		46 14.35		53 3.35	6.94	54 22.75	7.02	56 19.73	7.05	57 5.75			
	− 4.04	6.98	− 4.12	6.91	− 4.19	3904	− 4.25	39.00	− 4.28	3892	− 4.30	7.06		
	45 14.00	3934	45 33.25	3930	52 59.16		54 18.60		56 15.45		57 1.45	3888		
			46 10.24											
	9.5		8.5		9.0		8.6		8.8		8.7			
	44 35.9		45 42.7		52 23.5		53 36.3		55 24.7		56 37.8			
	39.4		46.4		26.3		40.1		37.9		40.9			
	41.9		49.0		29.3		43.4		41.4		44.3			
	1172	−3.48	181		195		1198		1140		30			
	44 39.07	50 43 54.10	45 46.03	55 6 32.36	52 26.50	52 19 30.50	53 39.93	54 33 30.09	55 38.00	54 22 38.90	56 41.00	54 24 56.92		
	+ 33.93	− 30	+ 23.05	− 14	+ 31.46	− 26	+ 37.53	− 37	+ 36.44	− 35	+ 19.46	− 9		
	1.52543	− 92	1.36267	− 32	1.49776	− 80	1.57438	− 102	1.56158	− 125	1.28914	− 72		
	9.80136	+ 9.01	9.75732	+ 13.87	9.78609	+ 10.76	9.76324	+ 13.25	9.76519	+ 13.06	9.76484	+ 13.10		
	1.44939	+ 25	1.24260	+ 40	1.40645	+ 30	1.46022	+ 40	1.44937	+ 40	1.17658	+ 40		
40		−39.10	20	−39.80	5	−39.20	50	−39.60	5	−39.50	0	−39.50		
	3 45.3	43 19.56	1 17.5	6 2.89	3 10.7	18 57.78	4 9.5	33 2.27	0 0.0	22 7.78	2 55.5	24 26.63		
	43.8		16.4		10.9		6.2	32 55.7	59.5		54.2			
	9.1		13.9		7.6		15.7		1195		9.7			
	43 44.53		21 16.95		8 10.80		54 7.85		54 59.75		2 54.85			
	39 3.80		1 3140		14 37.55		28 40.50		18 7 48.60		19 53.50			
	50 44 22.24		55 6 49.84		52 19 55.99		54 33 58.14		54 23 7.04		54 25 11.94			
	− 28.14		− 17.48		− 25.49		− 28.85		− 28.14		− 15.02			
	45 7.22	42 40.2	46 3.33	5 23.6	52 52.22	18 18.7	54 11.48	32 10.3	56 8.40	21 28.9	56 54.39	23 47.8		

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1877phae.proj.1697R

599 601

1877 Dec. 3, Dec. 9

21

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 58 16	57 158	1 2 29	1 33.7	1 3 11	2 15.7	1 4 36	3 42.9	1 5 59	4.524	1 7 19	6 18.1
δ	53° 55′	49.8 8.6	51° 3′	58.1 7.3	50° 59′	53.8 9.0	50° 50′	45.1 8.2	50° 21′	46.1 8.7	52° 56′	54.5 9.4

Dec. 3

+12.62 +8.75 +9.00 +9.12 +7.66 +7.65 +7.56 +10.38

58	28.1	9.53	2	47.0	47.5	5.66	5.91	3	28.1	6.03	4	46.5	47.1	4.57	4.56	6	5.4	4.47	7	32.7	7.29
	32.1			50.3	50.7				32.0			57.7	0.1				8.7			36.2	
	35.5			53.6	53.9				35.3			2.5	3.2				11.9			39.8	
	39.2			56.8	57.2				38.6			6.2	6.5				15.3			43.0	
	42.6			0.3	0.6				41.8			9.5	9.8				18.4			46.6	
	1781			2681	2699				1764			3148	3164				597			1983	
58	35.62			53.62	53.98			3	35.28		5	2.96	3.28			6	11.94		7	39.66	
	+3.02	+2.02		+3.02	+3.02	+2.11	+2.11		+3.02	+2.11		+3.02	+3.02	+2.12	+2.12		+3.02	+2.14		+3.02	+2.06
	−.90			−.91	−.91				−.91			−.90	−.90	−7.06			−.88			−.96	
58	37.64		2	55.73	56.09	−7.04		3	37.39		5	5.08	5.40	−3852		6	14.08		7	41.72	
	−4.43	−7.07		−4.44	−4.44	−3862			−4.45	−7.05		−4.47	−4.47		−7.06		−4.47	−7.06		−4.56	−7.17
58	33.21	−3880	2	51.29	51.65	−7.04		3	32.94	−3858	5	0.61	0.93	−3852		6	9.61	−3846	7	37.16	−8838
						−3862															

8.9 8.8.4 51 5 45 39 59.19 8.9 8.8.91 50 52 47.64 47.12 8.5 9.5

58	3.6		2	31.2	− 35	− 10		3	12.8		4	19.7	18.7	− 52	− 53	5	40.2		7	11.5
	7.3			35.4	− 46	− 46			15.9					− 1.13	− 1.13		42.6			15.8
	10.5			37.6	+ 9.31	+ 9.31			19.3					+ 9.06	+ 9.06		45.7			18.8
	214	53		142	+ 25	+ 25			179					+ .25	+ 25		85			161
58	7.13	−57 40.91		34.73	−38.10	−38.10		3	15.97	51 1 45.77		19.70	18.70	−37.90	−37.90	5	42.83	50 23 45.31	7	15.37	52 58 55.7
	+28.49	− 27		+35.82	+19.25	12.95	2.90		+19.31	− 10		+43.96	+44.58	52	14.31	13.78	+29.11	− .23		+24.29	− .15
	1.445469	− 2		1.55413	1.28443				1.28578	− 26		1.643061	1.64914				1.446404	− .96		1.385748	− 1.13
	9.769547	+ 12.45		9.797793	9.797793				9.798556	+ 9.23		9.999976	9.999976				9.804443	+ 855		9.779780	+ 11.36
	1.346886	+ 40		1.47466	1.20496				1.20694	+ 25		1.565621	1.57170				1.39107	+ 20		1.28783	+ .30
30		− 3860	20					25		− 3800	30					0		−37.80	25		− 3820
0	5.9	57 11.32	1	52.1				1	6.2	1 13.80	4	44.0				3	59.0	23 11.98	41	42.9	57 34.66
	2.8			51.4					4.0			41.1					55.1			41.1	
	87			35					102			51					141			40	
30	4.35		21	51.75				26	5.10		34	42.55				3	57.05		29	42.00	
52	44.00		0	56.60				56	43.25		48	5.80				18	51.30		53	6.35	
58	58 26.2		51	6 15.22				51	2 1.87		50	53 24.92				50	24 9.92		52	58 24.97	
	− 2223			− 2983					− 1610			− 36.78					− 2461			− 19.40	
				− 1603	4 34.3							− 3730		51	35.8						
58	26.14	56 32.5	2	44.25	48.4			3	25.89	0 35.2	4	53.55			35.3	6	2.55	22 33.5	7	29.99	56 56.3
		+12.77		44.61	+8.90	+9.12				+9.23		53.87		+7.84	+7.80			+7.57			+10.45

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58	25.1	9.29	2	43.6	43.9	5.42	5.64	3	25.3	5.75	4	43.0	43.5	4.36	4.32	6	2.1	4.09	7	28.4	6.94
	28.5			47.2	47.4				28.7			46.2	46.8				5.2			32.6	
	32.1			50.5	50.7				31.8			49.7	0.3				8.4			36.3	
	35.6			53.6	53.8				35.0			2.7	3.2				11.7			39.8	
	38.2			56.8	57.0				38.5			6.1	6.6				15.0			43.3	
	1608		2	51.7	28				93			29.77	04				424			1814	
58	32.16		2	50.34	50.56			3	31.86		4	59.34	5 0.08			6	8.48		7	36.28	
	+ 6.49	+5.30		+ 6.49	+ 6.49	+5.42	+5.42		+ 6.49	+5.42		+ 6.49	+ 6.49	+5.43	+5.43		+ 6.49	+5.46		+ 6.49	+5.35
	− 1.19			− 1.07	− 1.07				− 1.07			− 1.06	− 1.06				− 1.03			− 1.14	
58	37.46		2	55.76	55.98	−7.04		3	37.28		5	4.97	5.51	−7.06		6	13.94		7	41.63	
	−4.32	−7.07		−4.34	−4.34	−3862			−4.35	−7.05		−4.38	−4.38	−3852			−4.39	−7.06		−4.47	−7.17
58	33.14	−3880	2	51.42	51.64	−7.04		3	32.93	−3858	5	0.59	5.13		−7.06	6	9.55	−3846	7	37.16	−8838
						−3862									−3852						

8.7 8.7.64 51 5 45 56 0.20 8.9 8.7.9.6 50 52 50.16 48.61 8.6 9.8

57	59.5		2	43.7	31.6	− 29	− 7	3	11.4		4	20.3	18.9	− 41	− 45	5	32.6		7	8.5	
	2.2			46.8	34.0	− 48	− 48		15.2					− 1.18	− 1.18		34.7			11.9	
	4.6			49.8	38.1	+ 9.42	+ 9.42		17.8					+ 9.18	+ 9.18		37.8			14.2	
	73	53		213	147	+ 25	+ 25		144					+ 25	+ 25		155			46	
58	2.43	57 40.70		17.10	3490	−38.70	−38.70	3	14.80	51 1 47.61		20.30	18.90	−38.60	−38.60	5	35.17	50 23 43.03	7	11.53	52 58 59.2
	+29.73	− 28		+33.24	+15.66	5 12.28	2.14		+17.06	− 8		+39.24	+41.18	52	14.92	14.33	+33.31	− 30		+24.75	− 16
	1.473119	− 00		1.52166	1.19479				1.23198	− 28		1.595731	1.61469				1.522257	− 98		1.393587	− 6.18
	9.769547	+ 12.60		9.797793	9.797793				9.798556	+ 9.34		9.999976	9.999976				9.804443	+ 8.65		9.779780	+ 11.49
	1.365366	+ 40		1.44219	1.15532				1.15314	+ 25		1.561291	1.53625				1.44960	+ 20		1.29598	+ .30
30		− 34.40	20					25		− 38.70	30					0		−38.50	25		− 38.90
0	2.9	57 10.59	1	53.9				1	5.7	1 14.66	4	45.1				3	54.3	23 8.62	4	42.4	57 33.97
	2.9			53.2					4.2			42.5					56.9			39.8	
									99			76					112			22	
30	2.90		21	53.55				26	4.95		34	43.60				3	55.60		29	41.10	
52	45.45		0	54.80				56	43.40		48	4.55				18	52.75		53	7.25	
53	58 3.89		51	6 13.24				51	2 1.84		50	53 22.99				50	24 11.19		52	58 25.69	
	− 2319			− 2768					− 1423			− 3283					− 2816			− 19.77	
				− 1304								− 3438									
58	26.07	56 31.8	2	44.38	43.3	4 33.7		3	25.88	0 36.1	4	53.53		51	37.4	6	2.49	22 30.2	7	29.99	56 55.6
				44.62	42.5							54.02			35.8						

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1877, Dec. 3, Dec. 9. Obs. W. A. R. Rec. J. F. M.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 11 1	10 1.5	1 12 31	11 3.10	1 18 37	17 35.2	1 19 28	18 26.0	1 20 29	19 27.2	1 21 25	21 23.1
δ	54° 54′	47.6	54° 24′	18.2	52° 45′	39.0	54° 18′	13.1	53° 29′	24.1	53° 39′	33.8
		9.0		9.4		8.8		9.2		9.4		8.7

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	+1290		+12.77		+1096		+12.34		+1180		+1093	
	11 18.3	9.81	12 47.3	9.62	18 41.6	7.87	19 44.0	9.28	20 44.0	8.71	21 41.6	8.84
	22.0		50.8		43.0		47.6		47.8		45.0	
	25.7		54.4		58.3		50.9		51.2		48.3	
	29.3		57.8		1.6		54.6		54.6		51.0	
	32.9		1.5		05.1		58.0		58.2		55.4	
	1282		2718		2916		49		58		423	
	11 25.64		12 54.36		18 58.32		19 50.98		20 51.16		21 48.46	
	+ 3.02	+1.98	+ 3.02	+2.00	+ 3.02	+2.06	+ 3.02	+2.01	+ 3.02	+2.03	+ 3.02	+2.02
	− 1.04		− 1.02		− .96		− 1.01		− .99		− 1.53	
	11 27.62		12 56.36		19 0.38		19 52.99		20 53.19		21 50.48	
	− 4.68	−7.31	− 4.69	−7.31	− 4.71	−7.33	− 4.81	−7.41	− 4.81	−7.39	− 4.83	−7.41
	11 22.94	−38.18	12 51.67	−38.10	18 55.64	−37.76	19 48.18	−37.70	20 48.38	−37.64	21 45.65	−37.60
	11 15.63											
	9.0		9.4		9.0		9.2		9.4		8.8	
	10 43.8		12 26.3		18 28.7		19 22.0		20 20.3		21 17.9	
	46.3		29.4		28.0		25.2		23.3		20.5	
	49.4		33.8		31.9		28.0		26.1		23.9	
	197	−3.09	889		863		152		97		23	
	10 46.7	54 54 58.64	12 29.63	54 25 39.19	18 28.77	52 46 38.82	19 25.07	54 19 52.99	20 23.23	53 31 29.21	21 20.77	53 40 55.14
	+39.04	− 39	+24.73	− 15	+29.55	− 23	+25.91	− 18	+27.93	− 20	+27.69	− 43
	1.59184	− 62	1.39322	− 50	1.47056	− 26	1.41347	− 70	1.44607	− 31	1.44232	− 47
	9.75949	+ 1351	9.76466	+ 1296	9.78163	+ 1115	9.76572	+ 1285	9.77405	+ 1196	9.77250	+ 1216
	1.47393	+ 40	1.28048	+ 40	1.37479	+ 30	1.30179	+ 40	1.34272	+ 35	1.33742	+ 40
	30	−38.30	0	−38.20	40	−37.70	5	−37.90	55	−37.70	45	−37.70
	2 39.3	54 30.15	2 9.9	25 10.61	1 5.1	46 8.99	2 55.1	19 24.37	1 16.3	31 0.22	1 57.0	40 26.31
	37.8		7.5		3.5		52.8		15.2		49.1	
	171		174		89		79		115		1001	
	32 38.55		2 8.70		41 4.45		7 53.95		56 15.75		46 50.05	
	50 9.80		20 39.65		41 43.90		14 54.40		26 32.60		35 38.30	
	54 55 28.42		54 25 58.27		52 47 25.2		54 20 13.02		53 31 51.22		53 41 16.92	
	− 29.78		− 19.08		− 23.70		− 20.03		− 22.01		− 21.75	
	11 15.63	53 52.0	12 44.36	24 31.5	18 48.31	45 31.2	19 40.77	18 46.7	20 40.99	30 22.6	21 38.24	39 48.7
		+13.29		+12.71		+11.04		+13.48		+12.03		+12.12

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	11 15.4	9.81	12 43.8	9.23	18 48.1	8.56	19 40.7	9.00	20 41.2	8.55	21 38.1	8.64
	18.6		47.5		51.5		44.3		44.3		41.6	
	22.2		51.1		54.9		48.0		48.0		45.2	
	25.6		54.4		58.3		51.6		51.6		48.6	
	29.5		57.8		1.8		55.0		54.9		4.9.1	
	1113		50		2746		2394		2399		2255	
	11 22.26		12 51.00		18 54.92		19 47.88		20 47.98		21 45.10	
	+ 6.49	+5.27	+ 6.49	+5.29	+ 6.48	+5.35	+ 6.48	+5.28	+ 6.48	+5.32	+ 6.48	+5.31
	− 1.22		− 1.20		− 1.13		− 1.20		− 1.16		− 1.17	
	11 27.53	−7.31	12 56.29	−7.31	19 0.27	−7.33	19 53.16	−7.41	20 53.30	−7.39	21 50.41	−7.41
	− 4.58	−38.18	− 4.59	−38.10	− 4.65	−37.76	− 4.72	−37.70	− 4.72	−37.64	− 4.74	−37.60
	11 22.95		12 51.70		18 55.62		19 48.44		20 48.58		21 45.67	
	8.8		9.4		9.0		9.1		9.4		8.8	
	11 8.3		12 13.9		18 18.3		19 15.8		20 28.8		21 23.3	
	11.6		16.3		21.0		19.5		31.7		26.0	
	14.1		20.0		24.2		21.9		34.4		29.2	
	40	−3.48	501		35		573		59		185	
	11 11.33	54 55 0.06	12 16.70	54 25 39.53	18 21.17	52 46 39.62	19 19.10	54 19 52.99	20 31.97	53 31 29.92	21 26.17	53 40 56.07
	+10.93	− 3	+34.30	− 31	+33.75	− 29	+28.78	− 22	+16.01	− 17	+18.93	− 9
	1.03862	− 75	1.53529	− 50	1.52827	− 25	1.45909	− 70	1.20439	− 35	1.27715	− 48
	9.75949	+13.67	9.76466	+ 1312	9.78163	+ 1128	9.76572	+ 1300	9.77405	+ 1210	9.77258	+ 1229
	0.92071	+ 40	1.42255	+ 40	1.43250	+ 30	1.34741	+ 40	1.10104	+ 35	1.17225	+ 40
	30	−39.10	0	−39.00	40	−38.50	5	−38.90	55	−38.50	45	−38.50
	2 59.9	54 30.77	2 1.5	25 9.76	1 0.8	46 8.68	2 52.2	19 23.29	1 21.6	30 59.97	1 57.1	40 26.21
	56.9		0.1		57.4		50.9		23.9		52.6	
	168		16		02		31		85		117	
	32 58.40		2 0.80		41 0.10		7 51.55		56 21.25		46 55.85	
	49 49.95		20 47.55		41 48.25		14 56.80		26 24.10		38 52.50	
	54 55 8.39		54 26 5.99		52 47 6.69		54 20 15.24		53 31 42.54		53 41 10.94	
	− 8.33		− 26.46		− 27.07		− 22.25		− 12.62		− 14.87	
	11 15.64	53 52.6	12 44.39	24 31.7	18 48.29	45 30.9	19 41.03	18 45.6	20 41.2	30 22.3	21 38.26	39 48.6

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1877, Dec. 3, Dec. 9

	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	1 22 21	1 23 30	1 24 34	1 25 29	1 26 23	1 27 28	
	21 19.5	22 26.8	23 31.2	24 26.3	25 20.5	26 25.0	
δ	53° 29'	53° 34'	54° 4'	53° 12'	54° 16'	54° 4'	
	23.7 8.1	29.5 9.0	53 59.4 8.6	6.8 9.1	10.6 9.3	53 58.9 8.7	

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				+10.86	+11.88	+12.54	
				25 44.1 7.77	26 39.0 8.79	27 43.4 9.45	
				47.3	42.6	47.0	
				50.9	46.2	50.4	
				54.2	49.8	53.9	
				57.9	53.2	57.6	
				46	2308	23	
				25 50.92	26 46.16	27 50.46	
				+ 302 +2.04	+ 302 +2.01	+ 302 +2.02	
				− 98	− 101	− 100	
				25 52.96	26 48.17	27 52.48	
				− 4.88 −7.45	− 4.94 −7.52	− 4.95 −7.52	
				25 48.08 −37.34	26 43.23 −37.28	27 47.53 −37.22	
				8.9	9.3	8.8	
				25 16.3	26 16.8	27 16.8	
				19.2	19.3	20.1	
				22.2	21.8	23.2	
				577	579	01	
				25 19.23 53 14 15.11	26 19.30 −54 17 58.73	27 20.03 54 6 45.77	
				+3169 − 26	+2486 − 19	+3043 − 24	
				1.50092 − 82	1.42911 − 1.15	1.48330 − 24	
				9.77711 +1164	9.76607 +1282	9.76800 +1262	
				1.40063 +30	1.31778 +40	1.37390 +40	
				10 −37.40 5	−37.50 20	−37.40	
				3 27.9 13 45.18	41 48.7 17 30.02	0 58.6 6 17.82	
				25.5	46.2	56.5	
				13.1	11.9	15.1	
				13 26.70	9 47.45	20 57.55	
				9 21.65	13 0.90	1 50.80	
				53 14 40.27	54 18 19.52	54 7 9.42	
				− 25.16	− 20.79	− 23.65	
				25 40.63 13 8.1	26 35.71 16 52.7	27 40.01 5 40.6	

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	+11.44	+12.21	+12.84 +12.95	+11.08	+12.03	+12.70	
	22 34.8 8.29	23 42.0 8.73	24 46.0 46.5 9.39 9.47	25 40.6 7.60	26 34.8 8.65	27 40.0 9.22	
	38.2	44.3	48.6 50.2	44.0	36.3	43.6	
	41.8	45.8	53.4 53.8	47.6	43.8	47.2	
	45.4	52.2	56.6 57.2	51.0	46.6	50.6	
	48.9	55.7	0.2 0.6	54.4	40.0	54.0	
	2086	2442	2658 2684	2375	2144	2354	
	22 41.72	23 48.84	24 53.16 53.68	25 47.50	26 42.88	27 47.08	
	+ 6.48 +5.32	+ 6.48 +5.31	+ 648 + 648 +5.29 +5.29	+ 6.48 +5.33	+ 6.48 +5.28	+ 6.48 +5.29	
	− 116	− 117	−119 −119	− 115	− 120	− 119	
	22 47.04	23 54.15	24 58.45 48.39 −7.48	25 52.17	26 48.16	27 52.37	
	− 4.75	− 4.77	− 4.81 −4.80	− 4.79	− 4.84	− 4.86	
	22 42.29 −7.42 −37.14	23 49.38 −7.44 −37.16	24 53.64 52.18 −7.48 −37.40	25 48.04 −7.45 −37.34	26 43.32 −7.52 −37.28	27 47.51 −7.52 −37.22	
	8.5	8.7	9.0 9.0 5 46 59.67 14.78 8.7		9.0	8.4	
	22 6.3	23 20.6	24 32.4 33.5 − 8 − 0	25 21.5	26 17.0	27 15.4	
	7.5	24.2	34.7 36.3 − 22 − 22	21.4	20.0	18.8	
	10.9	26.9	39.3 +1277 +1277	31.4	23.2	21.8	
	24.1		+ 40 + 40	844	02	560	
	22 8.03 53 31 9.32	23 23.90 −36 56.27	24 35.57 55.50 −38.50 −38.50	25 28.13 53 14 15.96	26 20.07 54 18 0.89	27 18.67 54 6 47.46	
	+ 33.69 − 30	+ 24.94 − 16	+17.59 −1.82 6 30.56 45.73	+ 19.37 − 9	+ 22.81 − 14	+ 28.41 − 21	
	1.52 7.50 − 38	1.39690 − 20	1.24527 0.26807	1.28713 − 90	1.35813 − 120	1.45347 − 25	
	9.77 422 +12.10	9.77 319 + 12.22	9.76800 9.76800	9.77711 +11.77	9.76 607 +1297	9.76 800 + 1276	
	1.42432 + .35	1.29269 + .35	1.35820 1.01507	1.18684 + 30	1.24680 + 40	1.34407 + 40	
	−38.40	− 38.40		−38.30	−38.40	−38.40	
	55	50	20	10	5	20	
	1 31.9	0 51.1	0 52.0	3 36.0	41 48.9	0 58.1	
	29.9	50.7	52.9	34.9	47.7	56.4	
	18	18	64	109	166	145	
	56 30.90	50 50.90	20 53.45	13 35.45	9 48.30	20 57.25	
	26 17.45	31 57.45	1 54.90	9 12.90	13 0.05	1 51.10	
	53 31 35.89	53 37 15.89	54 7 13.34	53 14 31.34	54 18 18.49	54 7 9.54	
	− 26.57	− 19.62	− 13.67	− 15.28	− 17.65	− 22.08	
			+ 1.41				
	22 34.87 30 1.7	23 41.94 35 49.1	24 46.16 5 53.2	25 40.59 13 4.9	26 35.50 16 53.8	27 39.99 5 41.1	
			46.26 8.3				

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1877 Dec. 3 Dec. 9 Obs. W.A.R. Rec. J.A.M.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 28 21	27 17.6	1 29 14	28 10.9	1 30 21	29 17.6	1 31 19	30 15.2	1 32 17	31 13.0	1 34 2	32 57.3
δ	54° 32'3	53 57.3	54° 5'	53 59.8	53° 23'	18.5	53° 29'	23.9	53° 27'	21.8	52° 51'	46.0
		7.0		8.8		9.0		8.0		9.4		9.2

Dec. 3

		+12.01		+12.46		+11.55		+11.69		+11.16		+10.11
	28 35.8	8.92	29 30.0	9.37	30 25.9	8.46	31 34.0	8.60	32 33.0	8.07	34 16.7	7.02
	37.3		33.5		29.2		37.5		36.4		20.0	
	42.8		37.0		42.8		40.8		39.9		23.4	
	46.2		40.6		46.2		44.5		43.3		26.9	
	48.8		44.1		49.7		48.0		46.8		30.2	
	2140		1852		2138		48		1995		1172	
	28 42.80		29 37.04		30 42.76		31 40.96		32 ~~44.88~~ 39.90		34 23.44	
	+ 3.02	+2.01	+ 3.02	+2.01	+ 3.02	+2.03	+ 3.02	+2.03	+ 3.02	+2.03	+ 3.02	+2.06
	− 1.01		− 1.01		− .99		− .99		− .99		− .96	
	28 44.81		29 39.05		30 44.79		31 ~~43.99~~ 43.99		32 41.93		34 25.50	
	−4.96	−7.53	−4.98	−7.55	−4.96	−7.53	−4.99	−7.55	−5.00	−7.56	−5.00	−7.56
	28 39.85	−37.18	29 34.07	−37.16	39.~~74~~82	−37.02	31 ~~38.98~~ 38.00	−36.96	32 ~~36.93~~ 36.93	−36.88	34 20.~~48~~50	−36.76
	~~28 32.32~~											
	8.0		9.0		8.8 ~~7.8~~		8.5 ~~8.8~~		9.3		9.0	
	28 14.2		29 11.7		30 10.0		31 9.6		32 8.7		33 41.8	
	17.7		14.1		13.8		12.4		11.4		44.5	
	20.1		15.0		16.5		15.4		15.0		47.7	
	5.24	−3.09	145		103		74		51		140	
	28 17.47	54 4 28.56	29 14.83	54 7 5.11	30 13.43	53 25 57.70	31 12.47	53 31 1.90	32 11.70	53 28 59.47	33 44.67	52 53 15.49
	+25.33	− 17	+22.21	− 13	+29.33	− 23	+28.49	− 21	+28.20	− 21	+38.47	− 40
	1.40364	− 79	1.34655	− 41	1.46731	− 43	1.45469	− 41	1.45025	− 91	1.58850	− 104
	9.76852	+ 12.97	9.76800	+ 12.60	9.77507	+ 11.86	9.77422	+ 11.96	9.77456	+ 11.93	9.78063	+ 1127
	1.29476	+ 40	1.23715	+ 40	1.36498	+ 35	1.35151	+ 35	1.34741	+ 35	1.49173	+ 30
	20	−37.40 20		−37.30 0		−37.20 55		−37.20 55		−37.10 30		−36.90
	3 20.0	4 0.08	×0 45.3	~~×0~~ 37.18	1 46.8	25 28.96	1 43.7	30 33.30	3 47.0	28 30.44	4 22.8	52 43.61
	17.4		43.9	6	45.4		41.5		43.5		22.1	
	37.4		92		122		52		105		9	
	23 18.70		×0 4460		1 46.10		56 42.60		58 45.25		34 22.45	
	59 29.65		×2 375		21 2.25		26 5.75		24 3.10		48 25.90	
	54 4 48.27		54 7 22.37		53 26 20.87		53 31 24.37		53 29 21.72		52 53 44.52	
	− 19.71		− 17.26		− 23.17		− 22.47		− 22.25		− 31.03	
	28 32.32	3 22.9	29 26.52	6 0.0	30 32.29	24 51.9	31 30.45	29 56.3	32 29.37	27 53.6	34 12.94	52 6.8

Dec. 9

		+12.17		+12.83		+11.37		+11.54		+11.29		+10.29
	28 32.1	8.64	29 26.9	9.35	30 32.7	8.19	31 30.7	8.39	32 28.7	7.81	34 13.5	6.81
	34.7		30.2		36.1		34.2		33.4		16.6	
	39.6		33.8		39.5		37.8		36.7		20.2	
	43.2		37.3		42.9		41.4		40.3		23.7	
	46.6		40.8		46.6		44.5		43.9		26.9	
	1978		1690		1978		1886		1840		1009	
	28 ~~44.45~~ 39.56		29 33.80		30 8956		31 37.72		32 36.80		34 20.18	
	+ 6.48	+5.29	+ 6.48	+5.29	+ 6.48	+5.32	+ 6.48	+5.32	+ 6.48	+5.32	+ 6.48	+5.35
	− 7.19		− 1.19		− 1.16		− 1.16		− 1.16		− 1.13	
	28 44.85		29 39.09		30 44.88		31 43.04		32 42.12		34 25.53	
	−4.87	−7.53	−4.89	−7.55	−4.88	−7.53	−4.90	−7.55	−4.92	−7.56	−4.93	−7.56
	28 39.98	−37.18	29 34.20	−37.16	30 ~~40.00~~	−37.02	31 38.14	−36.96	32 ~~43.20~~ 37.20	−36.88	34 20.60	−36.76
	7.0 ~~8.4~~		~~8.7~~ 8.8		~~8.7~~ 8.6		~~8.6~~ 8.4		9.2		9.0	
	28 16.2		29 6.0		30 6.6		31 12.6		32 6.9		33 47.9	
	17.6		8.6		10.2		15.6		9.3		50.9	
	22.5		12.0		12.8		18.4		12.7		53.7	
	581		266		00		166		289		25	
	28 19.53	54 4 28.55	29 8.87	54 7 6.00	30 10.00	53 25 57.94	31 15.53	53 31 2.04	32 9.63	53 29 0.50	33 50.83	52 53 14.86
	+26.03	− 10	+24.93	− 16	+29.56	− 23	+22.19	− 13	+27.17	− 20	+29.35	− 23
	1.30168	− 85	1.39672	− 18	1.47670	− 45	1.34616	− 45	1.43406	− 92	1.46761	− 118
	9.76852	+ 12.42	9.76817	+ 12.77	9.77507	+ 12.00	9.77422	+ 12.10	9.77456	+ 12.06	9.78063	+ 1140
	1.19280	+ 40	1.28749	+ 40	1.36837	+ 35	1.24298	+ 35	1.33125	+ 35	1.37084	+ 30
	20	−38.30 20		−38.30 0		−38.10 55		−38.10 55		−38.00 30		−37.80
	3 23.4	3 58.94	0 42.0	6 37.05	46.0	25 28.03	1 48.0	30 32.33	3 45.6	28 30.31	41 29.5	52 43.81
	21.9		40.8		45.0		46.5		44.1		27.5	
	53		28		110		145		97		170	
	23 22.65		20 41.10		1 45.50		56 47.25		58 44.85		34 28.50	
	59 2.570		2 6.95		21 2.85		26 1.10		24 3.50		48 1985	
	54 4 44.14		54 7 25.39		53 26 21.29		53 31 19.54		53 29 21.94		52 53 38.29	
	− 15.59		− 19.39		− 23.35		− 17.50		− 21.44		− 23.49	
	28 32.45	3 21.8	29 26.65	5 59.9	30 32.47	24 51.0	31 30.59	29 53.14	32 29.64	27 53.4	34 13.04	52 7.0

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25

1877, Dec. 3 Dec. 9.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 35 32	34 27.3	1 37 56	36 51.7	1 39 48	38 43.6	1 40 37	39 46.8	1 42 11	41 7.3	1 43 22	42 18.1
δ	52° 15′	8.9 7.0	52° 58′	52.7 8.8	53° 15′	9.9 8.0	53° 32′	26.6 9.5	53° 6′	0.9 8.5	53° 14′	8.9 8.7

Dec. 3

+10.19 +10.81 +11.10 +10.47 +11.26

34 46.3 49.8 53.0 56.4 59.9 7.10 | 38 11.8 15.2 18.5 22.0 25.4 7.72 | 41 7.5 11.3 14.5 18.2 21.6 8.01 | 42 28.0 31.6 35.1 38.4 41.8 7.38 | 43 39.0 42.4 45.8 49.4 52.8 8.17

2654 | 929 | 731 | 1749 | 2295

35 53.08 + 3.02 + 2.06 − .94 35 55.16 | 38 18.58 + 3.02 + 2.05 − .97 38 20.63 | 41 14.62 + 3.02 + 2.03 − .99 41 16.68 | 42 34.98 + 3.02 + 2.05 − .97 42 37.03 | 43 45.90 + 3.02 + 2.04 − .98 43 47.94

− 5.01 35 50.15 −7.55 −36.66 | − 5.08 38 15.55 −7.62 −36.50 | − 5.15 41 11.50 −7.69 −36.28 | − 5.15 42 31.88 −7.68 −36.18 | − 5.18 43 42.76 −7.71 −36.08

70 | 86 | 94 | 84 | 87

34 12.6 16.3 18.4 173 | 37 48.1 51.6 54.4 40 | 40 35.2 38.6 42.6 11.58 | 41 56.4 57.1 1.7 1776 | 43 8.0 11.5 14.4 40

35 15.77 52 16 23.65 | 37 51.33 52 59 52.57 | 40 38.60 53 33 43.55 4505 | 41 5.920 53 8 19.95 | 43 11.33 53 15 52.30

+37.31 1.557163 9.786558 1.481012 | − 37 − 29 + 10.60 + 25 −37.60 25 | +27.25 1.437537 9.779463 1.337433 | − 19 − 70 + 11.40 + 30 −36.70 | +36.02 1.556541 9.773702 1.452842 | − 34 − 94 + 1203 + 35 −36.60 15 | +35.78 1.553642 9.778122 1.454362 | − 34 − 1.03 + 11.54 + 30 −36.50 | +34.57 1.538702 9.776772 1.438072 | − 31 − .43 + 11.70 + 31 −36.40

10 | 10 | 50 | 10

1 13.2 12.9 1 11 13.05 11 35.30 52 16 53.92 − 30.27 15 53.15 | 2 53.5 51.9 54 27 52.70 −.05 54 55.65 53 0 14.27 − 21.75 59 23.59 | 3 6 885 536 101 5505 53 54.86 53.30 33 14.46 14.96 | 41 19.7 17.41 171 19 18.55 3 29.80 53 8 48.92 − 28.47 7 50.83 | 1 47.8 46.7 1.45 11 47.25 11 1.10 53 16 19.72 − 27.42 15 24.07

53 28 54.86 53.30 53 34 [illegible] 11.92 − 28.37

41 3.81 32 38.7 +11.32 42 24.20 7 14.6 +10.67 43 35.65 14 48.0 44 +11.34

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+10.52 +10.79 +11.49 +11.32 +10.67 +11.34

35 43.0 46.5 50.0 53.3 56.7 7.04 | 38 8.3 11.7 15.3 18.7 22.3 7.31 | 39 19.8 23.3 6.8 10.2 13.6 8.21 | 41 4.4 7.9 11.3 14.8 18.2 7.84 | 42 24.8 28.2 31.6 35.2 38.7 7.19 | 43 35.6 39.1 42.7 46.3 49.9 7.96

2495 | 763 | 3837 | 566 | 1585 | 2132

35 49.90 + 6.48 + 5.37 − 1.11 35 55.27 | 38 [illegible] 15.26 + 6.48 + 5.34 − 1.14 38 20.60 | 40 [illegible] 6.74 + 6.48 + 5.33 − 1.15 40 12.07 | 41 11.32 + 6.47 + 5.31 − 1.16 41 16.63 | 42 31.70 + 6.47 + 5.33 − 1.14 42 37.03 | 43 42.64 + 6.47 + 5.32 − 1.15 43 47.96

− 4.93 35 50.34 −7.58 −36.66 | − 5.00 38 15.60 −7.62 −36.50 | − 5.04 40 7.03 −7.66 −36.36 | − 5.08 41 11.55 −7.69 −36.28 | − 5.08 42 31.95 −7.68 −36.18 | − 5.10 43 42.86 −7.71 −36.08

69 | 65 | 77 | 94 | 84 | 87

34 27.1 30.7 34.4 21 | 37 36.0 39.5 42.9 1174 | 39 32.8 35.8 38.8 172 | 40 42.8 46.0 48.8 177 | 42 1.0 5.0 7.0 13.0 | 43 8.6 13.0 18.3 69

35 30.70 52 16 24.61 | 37 39.13 52 59 52.80 | 39 35.73 53 16 56.75 | 40 45.90 53 33 42.37 | 42 4.33 53 8 20.31 | 43 12.30 53 15 54.58

+19.20 1.283330 9.786558 1.192488 | − 10 − 35 + 10.72 + 25 −37.50 25 | +36.13 1.557887 9.779463 1.459933 | − 34 − 70 + 11.53 + 30 −37.60 10 | +31.01 1.491150 9.779660 1.390702 | − 25 − 20 + 11.84 + 30 −37.60 50 | +25.42 1.405188 9.778702 1.301482 | − 17 − 1.02 + 12.16 + 35 −37.50 15 | +27.37 1.439271 9.778122 1.337992 | − 20 − 1.10 + 11.67 + 30 −37.40 | +30.34 1.482022 9.776772 1.381392 | − 24 − 45 + 11.82 + 32 −37.40

10 | 10 | 50 | 10

1 26.9 26.3 12 11 26.0 11 27.78 52 16 40.19 − 15.58 15 54.15 | 2 45.2 45.1 3 27 45.15 55 3.20 53 0 21.64 − 28.84 59 22.51 | 0 45.8 45.1 9 10 45.45 12 2.90 53 17 21.34 − 24.59 16 27.36 | 41 5.7 3.1 88 54 4.40 28 43.95 53 34 23.9 − 20.02 33 12.71 | 41 26.0 23.4 94 19 24.70 3 23.65 53 8 42.09 − 21.78 7 50.10 | 1 48.2 48.1 3 11 48.15 11 0.20 53 16 18.64 − 24.06 15 25.14

35 42.79 15 17.5 | 38 7.96 58 46.0 | 39 59.37 15 51.0 | 41 3.86 32 36.4 | 42 24.27 7 13.9 | 43 35.15 14 49.1

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1877 Dec. 3, Dec. 9 Obs. W. A. R. Rec. of F. No.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 44 7	43 2.9	1 45 88	44 19.4	1 46 36	45 30.8	1 47	46 34.3	1 48 36	47 12.7 / 48.4	1 50 17	49 11.9		
δ	53° 16′	106 / 8.4	53° 17′	11.7 / 8.7	53° 33′	28.4 / 7.0	55° 2′	56.7 / 8.2	51° 53′	48.3 / 9.5	54° 38′	52.3 / 7.6		

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	+1073		+1093		+1456		+1256		+983		+1295			
	44 23.0	7.64	45 40.3	7.84	46 52.4	8.47	47 57.5	9.77	48 33.7	6.74	50 34.9	9.86		
	26.4		44.0		56.0		1.0		37.1		38.6			
	29.8		47.4		59.5		4.8		40.5		42.1			
	33.3		50.7		2.9		8.4		43.9		45.8			
	36.7		54.3		6.4		12.0		47.3		49.2			
	1494		2369		2972		237		2025		2106			
	44 29.88		45 47.38		46 59.44		48 4.74		48 40.50		50 42.12			
	+3.02	+2.04	+3.02	+2.04	+3.02	+2.03	+3.02	+1.98	+3.02	+2.99	+3.02	+1.98		
	−.98		−.98		−.99		−1.04		−.93		−1.04			
	44 31.92		45 49.42	−7.74 / −35.92	47 1.47		48 2.76		48 42.59	−7.70 / −35.68	50 44.10			
	−5.19		−5.21		−5.24		−5.34		−5.19		−5.38			
	44 26.73	−7.72 / −36.02	45 44.19 / 21		46 56.23	−7.77 / −35.82	48 1.38	−7.88 / −35.74	48 37.40		50 38.72	−7.91 / −35.54		
	7.0		8.8		7.4		8.4		9.4		8.3			
	44 3.9		45 18.2		46 24.2		47 32.4		48 42.8		50 8.2			
	8.4		21.3		27.2		35.4		46.0		12.4			
	11.7		24.2		30.3		38.0		48.2		14.8			
	370	−3.09	37		817		158		165		64			
	44 9.00	53 17 58.27	45 21.23	53 18 54.85	46 27.23	53 35 26.36	47 35.27	55 3 33.04	48 45.50	51 55 22.01	50 12.13	54 59 19.70		
	+20.88	−.12	+26.15	−18.	+32.21	−27	+20.47	−22	−5.00	−1	+29.99	−23		
	1.31973	−.118	1.41747	−94	1.50799	−55	1.46938	−101	0.69897	−671	1.44698	−82		
	9.77643	+11.73	9.77626	+11.75	9.77353	+1203	9.75787	+1369	9.79015	+10219	9.75877	+13.60		
	1.21876	+.30	1.31633	+.30	1.40412	+.35	1.34985	+.40	0.61172	+.30	1.35835	+.40		
	5	−36.405		−36.3050		−36.3020		−36.4030		−36.0025		−36.20		
	4 53.5	17 29.51	3 52.5	18 26.39	2 16.3	34 58.53	41 13.2	3 6.41	2 49.8	54 52.75	3 25.8	58 53.36		
	508		50.3		14.2		9.9		48.3		23.1			
	43		28		105		2.31		181		89			
	9 52.15		8 51.40		52 15.25		24 11.55		32 49.05		28 24.45			
	12 56.20		13 56.95		30 33.10		58 36.80		49 59.30		54 23.90			
	53 18 1482		53 19 1557		53 35 51.72		55 3 55.42		51 55 1792		54 59 42.52			
	−1655		−2072		−2536		−2238		+409		−2282			
	44 19.01	16 53.5	45 36.47	17 50.5	46 48.46	34 22.7	47 53.50	2 30.7	48 29.70	54 17.1	50 30.81	58 17.8		

Dec. 9

	+1087		+1103		+1474		+1295		+986		+1305			
	44 19.7	7.39	45 37.2	7.55	46 48.9	8.26	47 54.2	9.47	48 30.6	6.38	50 31.7	9.57		
	23.0		40.7		52.4		57.8		39.8		34.3			
	26.6		44.0		56.0		1.3		37.0		38.9			
	30.0		47.7		59.5		5.0		40.3		42.4			
	33.4		51.0		3.0		8.5		43.7		46.0			
	1327		2206		2798		68		1854		1943			
	44 26.54		45 44.12		46 55.96		48 1.36		48 37.08		50 38.86			
	+6.47	+5.32	+6.47	+5.32	+6.47	+5.31	+6.47	+5.24	+6.47	+5.37	+6.47	+5.24		
	−1.15		−1.15		−1.16		−1.23		−1.10		−1.23			
	44 31.86	−7.72 / −36.02	45 49.44	−7.74 / −35.92	47 1.27	−7.77 / −35.82	48 6.60	−7.88 / −35.74	48 42.45	−7.70 / −35.68	50 44.10	−7.91 / −35.54		
	−5.12		−5.14		−5.17		−5.26		−5.12		−5.30			
	44 26.74		45 44.30		46 56.10		48 1.34		48 37.33		50 38.80			
	8.3		8.6		7.5		8.5		9.1		7.0			
	44 2.6		45 12.0		46 25.3		47 27.3		48 47.8		50 3.8			
	6.9		15.3		28.6		30.4		51.2		7.3			
	9.8		17.8		30.7		33.5		54.0		10.3			
	14.3	−3.48	171		847		132		40		214			
	6 84353	17 59.10	45 13.70	53 18 54.77	46 28.23	53 35 26.96	47 30.50	55 3 33.23	48 51.33	51 55 22.75	50 7.13	54 59 20.89		
	+20.11	−.10	+28.42	−.21	+27.73	−.20	+30.96	−.25	−14.25	−.5	+31.73	−.26		
	1.30341	−.120	1.45362	−.95	1.44295	−.58	1.49080	−1.05	1.15381	−.12	1.50147	−.85		
	9.77643	+11.87	9.77626	+11.89	9.77353	+12.17	9.75787	+13.85	9.79015	+10.33	9.75877	+13.76		
	1.20244	+.30	1.35248	+.30	1.33908	+.35	1.37127	+.40	1.06656	+.30	1.38284	+.40		
	5	−37.305		−37.2050		−37.2020		−37.4020		−36.8025		−37.20		
	4 53.4	17 29.19	3 50.8	18 25.12	2 18.1	34 58.02	41 11.6	3 8.78 / 5.30	2 56.1	54 52.33	3 22.7	58 53.26		
	50.1		48.2		17.9		8.5		55.3		20.8			
	35		990		160		201		114		35			
	9 51.75		8 49.50		52 18.00		24 10.05		32 55.70		28 21.75			
	12 56.60		13 58.85		30 30.35		58 38.30		49 52.65		54 26.60			
	53 18 1504		53 19 1727		53 35 48.77		55 3 56.74		51 55 1809		54 59 4504			
	−1579		−2252		−2183		−2351		+1166		−2415			
	44 19.02	16 53.2	45 36.56	17 49.2	46 48.33	34 22.2	47 53.46	2 29.6	48 29.63	54 16.6	50 30.89	58 17.7		

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1877, Dec. 3, Dec. 9.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 52 0	50 54.8	1 53 25	52 19.0	1 54 5	53 0.3	1 55 13	54 7.5	1 56 7	55 0.6	1 57 26	56 20.3
δ	52° 21′	16.2 9.0	54° 10′	54 9.0	51° 55′	50.0 9.1	54° 30′	25.0 8.9	54° 9′	3.8 8.5	52° 54′	48.8 8.7

Dec. 3

+9.63 +12.76 +10.24 +13.22 +12.48 +12.25 +10.70

	52 17.3	6.54	53 42.0	9.64	54 22.4	7.15	27.7 30.8	9.72	56 22.7	9.16	57 43.6	7.81
	20.6		45.7		25.7		31.3 34.8		26.2		46.9	
	24.0		49.2		29.0		34.2 38.1		29.8		50.4	
	27.5		52.8		32.4		38.7 42.0		33.1		53.7	
	30.6		56.3		34.8		42.0 45.1		36.6		57.2	
	12.00		4.60		45.3		17 49 19.08		14.84		18	
	52 24.00		53 49.20		54 29.06		34.98 38.16		56 29.68		57 50.36	
	+3.02	+2.08	+3.02	+2.01	+3.02	+2.09	+3.02 +3.02	+2.00 +2.00	+3.02	+2.01	+3.02	+2.05
	−.94		−1.01		−.93		−1.02 −1.02	−7.95	−1.01	−7.94	−.97	
	52 26.08		53 51.21		54 31.15		55 36.98 40.94.16	−35.12	56 31.69	−35.06	57 52.41	
	−5.27		−5.38		−5.28		−5.43 −5.43		−5.43		−5.37	−7.88
	52 17.79 20.81	−7.78 −35.40	53 35.59 45.83	−7.91 −35.28	54 25.87	−7.78 −35.22	31.55 34.73	−7.95 −35.12	56 26.26		57 47.04	−34.94

	51 46.0		53 14.5		54 9.7		7.0		56 46.5		57 23.0	
	48.4		17.9		12.3		56.2 9.1		49.8		25.4	
	51.3		21.0		14.3		0.7 13.3		53.3		25.2	
	14.57		5.34		7.8		17.04 29.8 + .40 + .40		14.96		1.66	
	51 48.57	52 23 15.49	53 17.80	54 12 19.31	54 12.60	51 56 52.27	38.80 9.93	−35.50 −35.80	56 49.87	54 10 18.17	57 25.53	52 55 27.43
	+35.43	− .33	+31.40	− .26	+16.46	− 7	21.82 +28.23		−20.14	− .10	+24.83	− .16
	1.54937	− 1.06	1.49693	− .10	1.21643	− .24	1.33885 1.45071		1.30514	− .74	1.39498	− .55
	9.78 516	+ 10.72	9.76 712	+12.72	9.78 983	+1025	9.76378 9.76378		9.76747	+1269	9.78 013	+ 11.31
	1.45757	+ .30	1.38665	+ .40	1.12886	+ .30	1.22523 1.33709		1.19521	+ .40	1.29771	+ .30
	0	−35.80	15	−35.90	30	−35.60	55 55		15	−35.70	30	−35.50
	4 23.5	22 46.23	0 23.7	11 53.08	1 2.1	56 23.82	0 42.3 26.1		3 6.0	9 51.63	2 20.1	55 0.03
	22.1		22.9		0.41		405 24.1		2.9		18.7	
	56		66		25		CN 28 102	C.R.	89		38.8	
	4 22.80		15 23.30		31 1.25		55 41.10 57 25.10		18 4.45		32 19.40	
	18 25.55		7 25.05		51 47.10		27.95 2325		4 43.90		50 38.95	
	52 23 44.17		54 12 43.67		51 57.72		32 25.5 41.87		54 10 25.2		52 55 47.57	
	− 28.68		− 24.36		− 12.45		−21.73 +16.50		+ 15.67		− 19.85	
	52						29 57.5					
	52 13.03	22 10.8	53 37.92	11 17.8	54 18.09	55 48.6	55 23.60 31 2.9		56 18.32	9 16.6	57 39.16	54 25.1
	+9.57			+12.88		+10.37	26.78	+13.03 +13.28		+12.57		+11.05

Dec. 9

	52 14.0	6.39	53 38.1	9.40	54 18.0	6.89	24.2 9.355	9.80	56 17.4	9.03	57 40.0	7.57
	17.4		42.3		22.4		28.1 31.7		22.8		43.5	
	20.7		45.8		26.7		31.7 34.2		26.4		47.0	
	24.0		49.4		28.0		34.7 38.5		30.0		50.4	
	27.7		53.0		32.7		38.6 41.8		33.6		53.8	
	10.38		22.92		12.87		15.72 17.58		3.22		23.47	
	52 20.76		53 45.84		54 25.74		55 31.44 35.05		56 26.44		57 46.94	
	+ 6.47	+5.36	+ 6.47	+5.28	+ 6.47	+5.37	+ 6.47 + 6.47	+5.26 +5.26	+ 6.47	+5.24	+ 6.47	+5.33
	− .11		− 1.19		− 1.10		− 1.21 − 1.21		− 1.19		− 1.14	
	52 26.12		53 51.12		54 31.11		55 36.70 40.42.31	−7.95 −35.12	56 31.72	−7.94 −35.06	57 52.27	−7.88 −34.94
	− 5.21		− 5.32		− 5.22		− 5.36 − 5.36		− 5.36		− 5.32	
	52 20.91	−7.78 −35.40	53 45.80	−7.91 −35.28	54 25.89	−7.78 −35.22	31.34 35.06 34.95	−7.95 −35.12	56 26.36		57 46.95	

	51 53.0		53 7.7		54 11.5		6.0 48.3	− 13 − 1	56 32.1		57 23.9	
	56.4		10.6		14.3		9.1 51.0	− 48 − 30	35.2		27.0	
	59.3		13.9		17.8		12.7 54.5	+13.24+13.25	38.4		30.6	
	1.87		2.2		1.38		278 38	+ 40 + 40	1.57		8.09	
	51 56.23	52 23 16.73	53 10.73	54 12 19.35	54 14.60	56 52.48	927 51.27	−36.50 −36.50	56 35.23	54 10 19.69	57 26.97	52 55 28.86
	+24.53	− .16	+35.11	− .32	+ 11.14	− 3	+22.17 −16.11		− 8.79	− .2	+ 19.97	− .10
	1.38970	− 1.12	1.54543	− .08	1.04689	− 28	1.34577 1.20710		0.94399	− .72	1.30038	− .60
	9.78560	+ 10.85	9.76712	+12.88	9.78983	+1038	9.76378 9.76378		19.76747	+12.85	9.78013	+ 11.45
	1.29790	+ .30	1.43515	+ .40	0.95932	+ .30	1.22305 1.09398		0.83406	+ .40	1.20311	+ .30
	0	−36.70	15	−36.90	30	−36.50	55 55		15	−36.80	30	−36.50
	4 31.41	22 46.42	0 20.9	11 51.88	1 5.9	56 22.87	1 51.9 1.15.0		2 54.7	9 51.92	2 22.1	54 59.93
	29.0		19.5		4.5		50.9 14.9		53.5		21.6	
	011		404		104		8.51 99		82		43	
	4 30.20		15 20.20		31 5.20		56 51.10 1495	-18	17 54.10	-18	32 22.15	-18
	18 18.15		7 28.15		51 43.15		25 56.95 24 33.40		4 54.25		50 26.20	
	52 23 36.59		54 12 46.59		51 57 1.59		31 15.54 31 52.02		54 10 12.87		52 55 44.82	
	− 19.86		− 27.24		− 9.11		−1.07 + 12.40		+ 6.82		− 15.96	
	52 13.13	22 11.02	53 37.69	11 16.6	54 18.11	55 47.6	55 23.89 29 56.1		56 18.42	9 16.9	57 39.07	54 25.0
							27.00 31 2.3					

+5 1844

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1877phae.proj.1617R

1877, Dec. 3, Dec. 9 Ob. W.A.R. Rec. J.F.M.

	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	1 58 8	2 3 8	2 10	2 4 16	3 9.1	2 5 41	4 33.7	2 6 40
δ	53° 58′	54° 22′	16.6 9.0	54° 31′	25.6 8.9	54° 18′	13.2 8.5	55° 0′

	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	5 31.6	2 8 23	2 9 40	8.318	2 10 58	2 12 16	2 13 34	2 14 52
δ	54.8 7.8	54° 17′	53° 42′	36.7 7.5	54° 17′	53° 42′	36.7 7.5	54° 17′

Dec. 3

	58 17.2	3 28.4	4 34.1	5 58.5	6 12.9	8 41.6	9 18.1	
	20.5	32.0	38.3	3.0	0.4	+2.01 45.3	+2.02 1.6	
	24.2	35.5	41.8	6.5	4.0	48.8	5.0	
	27.6	39.0	45.7	10.0	7.6	52.2	8.6	
	31.0	42.7	49.0	13.8	11.4	55.8	12.0	
	1205	1776	2095	3828	203	2437	253	
	58 24.10	3 35.52	4 41.90	6 6.56	7 4.06	8 48.74	10 5.06	
	+ 3.02 +2.01	+ 3.02 +2.00	+ 3.02 +2.00	+ 3.02 +2.01	+ 3.02 +1.98	+ 3.02	+ 3.02	
	− 1.01	− 1.02	− 1.02	− 1.01	− 1.04	− 1.01	− 1.00	
	58 26.11	3 37.52	4 43.90	6 8.57	7 6.04	8 50.75	10 7.08	
	− 5.45	− 5.56	− 5.58	− 5.59	− 5.65	− 5.61	− 5.62	
	58 20.66	3 31.96	4 38.32	6 2.98	7 0.39	8 45.11	10 1.46	
						−8.13 −33.96	−8.10 −33.84	
	4.4	9.2	9.0	8.8	7.6	8.2	7.8	
	58 12.8	3 8.0	4 7.5	5 36.8	6 34.0	8 11.0	9 27.2	
	15.5	11.7	11.2	38.8	36.7	14.5	30.8	
	19.5	14.8	14.4	42.8	38.9	17.3	33.4	
	18.2	39	31	1194	206	128	14	
54 −3.09		−3.09						
18 47.05	58 16.07	53 59 46.46	3 11.30	54 23 36.82	4 11.03	54 32 18.62	5 39.80	54 19 37.73
− .31	+ 8.03	− 2 +24.22	− 15 +30.87	− 25 +26.76	− 19	+27.19	− 19	+34.47
− 1.94	0.904472	− 77 1.384117	− 1.01 1.489954	− .10 1.427749	− 74	1.434441	− 29	1.539895
+ 12.85	9.769222	+ 1250 9.765011	+ 1294 9.763604	+ 13.08 9.765722	+ 12.86	9.758234	+ 13.64	9.769590
+ .40	0.796542	+ .40 1.271782	+ .40 1.375744	+ .40 1.315812	+ .40	1.318244	+ .40	1.425944
− 34.90	25	−3560 0	−3520 55	−3520 5	−3510 25		−3510 25	
18 21.06	3 15.5	59 19.88 4 12.8	23 10.71 0 25.4	31 53.46 3 10.8	19 11.87 1 12.1		1 10.67 3 54.4	4 42.0
	13.0	10.1	23.8	6.3	9.9		52.1	38.5
	8.5	2.9	9.2	1.7	2.0		6.5	0.5
	28 14.25	4 11.415	55 24.60	8 8.55	26 11.00		8 53.25	44 40.25
	54 34.10	18 36.90	27 23.75	14 39.80	56 37.35		13 55.10	38 8.10
	53 59 52.72	54 23 55.52	54 32 42.37	54 19 58.42	55 1 55.97		54 19 13.72	53 43 26.72
	− 6.26	− 18.70	− 23.75	− 20.69	− 20.67		− 26.7	− 29.15
	58 12.69	58 45.1 3 23.90	22 36.3 4 30.24	31 19.1 5 54.89	18 37.6 6 52.24		0 36.6 8 36.08	9 53.36

Dec. 9

	58 13.7	3 25.0	4 31.4 44.6	9.80 8.97 5 56.2	8.90. 6	6 33.6	9.28	8 38.3
	17.2	28.6	34.9 48.2	59.8	37.2	0.7		41.8 +5.28
	20.7	32.2	38.6 51.6	3.3	0.7	4.2		45.5 1.8
	24.3	35.8	42.1 55.3	6.9	4.2	8.0		49.0 4.2
	27.7	39.5	45.7 58.7	10.4	8.0	12.6		52.6 8.7
	1035	1611	19.27 84	166	37			2273 88
	58 20.70	3 32.22	38.54 51.68	6 3.32	7 0.74			8 45.46 10 1.76
	+ 6.47 +5.28	+ 6.46 +5.26	+ 6.46 + 6.46 +5.26 +5.26	+ 6.46 +5.27	+ 6.40 +5.23			+ 6.46 + 6.46
	− 1.19	− 1.20	− 1.20 − 1.20	− 1.19	− 1.23			− 1.19 − 1.18
	58 25.98	3 37.48	4 43.80 56.94	6 8.59	7 5.97			8 50.73 10 7.04
	− 5.39	− 5.50	− 5.52 − 5.52	− 5.53	− 5.60			− 5.58 − 5.56
	58 20.59	3 31.98	4 38.28 51.42	6 3.06	7 0.37			8 45.15 10 1.48
								−8.13 −33.96 −8.10 −33.84
	9.1	8.9	8.6 9.1	8.7	8.2			8.5 7.7
	58 10.2	3 1.7	4 7.3 40.2	5 25.1	6 33.9			8 1.7 9 18.8
	43.0	4.7	6.0	31.9	36.8			1.8 24.3
	46.3	7.1	9.8	34.5	40.1			5.1 26.8
−3.48	87	−3.48 137	191	45	1107			16.8 711
54 18 48.97	58 42.90	53 59 47.82	3 45.7 54 23 40.87	6.37 34.00	−3620 −3620	5 31.50	54 19 39.12	6 36.90 55 1 36.30
− .42	−22.20	− 13 +27.65	− 20 +32.17 +17.68	31 53.42 51.79	+31.82	− 27	+23.84	− 15 +39.86 +38.06
− .95	1.346435	− 90 1.441470	− 102 1.501451 1.24748		1.502702	− 78	1.377731	− 30 1.600547 1.558047
+ 13.02	9.769222	+ 12.66 9.765011	+ 13.11 9.763604 9.76342		9.765722	+ 13.03	9.758234	+ 13.81 9.765908 9.77 2116
+ .40	1.238172	+ .40 1.329312	+ .40 1.397654 1.23350		1.391022	+ .40	1.258144	+ 40 1.489044 1.475233
− 36.01	25	−3670 0	−3630 55 50		−3640 25		−3610 25	
18 21.50	3 37.9	59 19.67 4 6.7	23 12.88 023.1 435.1		3 5.0	19 11.92	1 13.9	1 10.48 3 48.8 4 38.8
	35.0	3.8	21.7 31.2		1.5		11.2	45.6 35.2
	12.9	1.05	18.3 27.8		6.5		5.1	42.4 31.6
	28 36.45	4 5.25	55 22.10 33.15 +82		8 3.25		26 11.55	8 47.20 44 37.40
	54 11.90	18 4.10	24 25.55 28 15.20		14 45.10		56 35.80	14 1.15 38 11.35
	53 59 30.52	54 24 1.72	32 44.57 33 33.82 .64		54 20 3.72		55 1 54.42	54 19 19.77 53 43 29.77
	+ 17.30	− 21.35	− 24.75 − 13.60		− 24.60		− 18.12	− 30.84 − 29.87
	58 12.62	58 44.9 3 23.92	22 38.4 4 30.20 31 19.1		5 54.97	18 37.78	6 52.22	0 36.4 8 37.02 9 53.38
			43.34					17 48.5 41 58.2

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1877, Dec. 12, Dec. 13 Obs. W.A.R. Rec. J.F.M.

	h m s	h m s	h m s	h m s	h m s	h m s	h m s
318 α	0 34 49	33 52.40	0 38 36	37 40.4	0 40 44	39 47.0	0 41 25
	36.7 8	43° 15′	9.7	55° 2′	55.7	53° 5′	52 59.7
	7.5		8.9		9.1		9.1
Dec. 12							
	+ 11.15	+11.81				+11.54	
	8.06	7.79				7.52	
	34 55.6				40 51.2		41 31.8
	59.3				54.8		35.0
	2.7				55.0		38.4
	6.0				1.4		41.6
	9.4				4.9		45.0
	31 30				29 03		19 18
	35 26.0				40 58.06		41 38.36
	+ 8.64	+7.58			+ 8.64	+7.59	+ 8.64
	− 1.06				− 1.05		− 1.00
	35 10.18	−6.69			41 5.65		41 46.00
	− 3.82	−39.64			− 3.93	−6.78	− 3.93
	35 6.36				41 1.72	−39.48	41 42.07
	53	9.0			9.5		7.7
	42 59.57	34 33.9			40 45.3		41 21.0
	− 31	37.6			48.0		23.3
	− 1.13	0.2			50.8		25.5
	+ 12.19	17.7	−4.02		1.4 41		9.8
	+ 40	34 57.23	53 17 34.88		40 48.03	53 7 18.51	41 23.27
	−34.80	+ 5.37	− 1		+ 10.03	− 3	+ 15.09
	42 32.83	0.729974	− 13		1.001 30	− 18	1.178 69
		9.776413	+ 11.65		9.778 29	+ 11.45	9.794 78
		0.062900	+ 30		0.902 19	+ 30	1.096 07
		10	− 39.90		20	−39.80	1
		0 27.8	17 2.77		0 39.9	6 46.23	1 32.9
		28.2			41.4		34.1
	n = −.79	0			8 13		40
	+5′ 16.79″	10 28.00			20 40.65		1 33.50
		12 20.35			2 7.70		21 14.85
	Ron = −.26	53 17 39.14			53 7 4.49		51 26 33.64
		− 4.26			− 7.98		− 12.48
		34 59.67	16 23.1		40 54.94	6 46.24	41 35.32
Dec. 13			+11.32	+12.22		+10.91	
	+ 11.21	34 57.6	7.56	38 44.2	8.46	40 50.3	7.15
	7.73	58.0		47.7		53.9	
		1.6		51.4		57.3	
		5.1		54.8		0.8	
		8.5		58.6		4.2	
		78		67		38 65	
		35 1.56		38 51.34		40 57.30	
		+ 9.31	+8.34	+ 9.30	+8.27	+ 9.30	+8.34
		− 97		− 103		− 96	
		35 9.90	−6.69	38 59.61		41 5.64	−6.78
		−3.80	−39.64	−3.89	−6.79	−3.92	−39.48
		35 6.10		38 55.72	−39.54	41 1.72	
	53	8.8		9.5		9.8	
	43 0.10	34 41.3		38 32.6		40 18.4	
	+ .38	44.7		35.4		23.1	
	− 1.15	47.4		38.4		26.3	
	+ 12.34	134	−3.76	174		88	
	+ .90	34 44.47	53 17 34.58	38 35.80	55 3 28.64	40 22.93	53 7 19.06
	−35.80	+ 17.06	− 8	+ 15.54	− 6	+ 34.37	− 31
	42 32.03	1.232724	− 8	1.191145	− 1.14	1.531618	− 8
		9.776643	+ 11.18	9.758 05	+ 13.02	9.778 29	+ 11.00
		1.131 77	+ 30	1.072 10	+ 40	1.437 07	+ 30
		10	− 39.80	20	− 40.30	20	− 39.90
		0 17.1	40.00	41 26.3	2 56.82	0 18.9	6 46.31
		19.5	17 2.14	25.6		21.1	
		166		119		400	
		10 18.30		211 25.65		20 20.00	
		12 30.05		58 22.40		2 28.35	
	Ron = −.26	53 17 98.12		55 3 40.47		53 7 46.42	
	n = −.72	− 13.54		− 11.81		− 27.36	
	+5′ 16.07″	34 59.41	16 22.5	38 48.93	2 17.3	40 54.94	6 6.8

	h m s	h m s	h m s	h m s	h m s
	40 28.6	0 43 57	43 0.9	0 44 35	43 40.9
	18.5	53° 3′	52 57.9	50° 4′	49 59.2
	7.0		9.0		7.5
	+9.39	+14.92		+18.04	
	5.37	6.90		4.02	
	41	44 6.0		44 44.4	
		9.2		47.5	
		12.7		50.7	
		16.1		54.0	
		19.6		57.3	
		6 36		39	
	41 38.36	44 12.72	+7.59	44 50.78	+7.70
	+ 8.64	+ 8.64		+ 8.64	
	− 1.00	− .94		− .94	
	41 46.00	44 20.31		44 58.48	
	− 3.93	− 3.98	−6.83	− 3.97	−6.77
	41 42.07	44 16.33	−39.36	44 54.51	−39.34
	7.7	9.2		7.0	
	41 21.0	43 38.0		44 53.0	
	23.3	40.2		1.8	
	25.5	42.9		6.1	
	9.8	11		17	
	41 23.27	43 40.37	53 5 33.53	44 55 0.57	50 6 53.62
	+ 15.09	+ 32.35	− 27	− 9.79	− 3
	− .6	− 42	− 55	agg 28	− 34
	1.178 69	1.509 87	+ 11.44	9.80 701	+ 8.21
	− 42	+ 962	+ 30	0.920 39	+ 20
	9.778 46	+ 25	−39.80		−39.20
	1.410 93	−39.50	20		
	25 46.03	2 8.2	5 0.63	1 21.8	6 18.44
		7.5		21.9	
		15.4		17	
		22 7.85		21 21.85	
		0 40.50		1 26.50	
	25 6.6	44 9.50	4 21.3	44 52.74	5 39.6
	+9.02		+10.57		+7.72
	5.26	44	6.76	44 43.7	3.96
		8.7		46.9	
		12.0		50.0	
		15.3		53.4	
		18.8		56.7	
		5 99		07	
	41 37.68	44 11.98		44 50.14	
	+ 9.30	+ 9.30	+ 8.34	+ 9.30	+8.44
	+ .91	− .96		− .86	
	41 46.07	44 20.32		44 58.58	
	−3.92	−3.98	−6.83	−3.97	−6.77
	41 42.15	44 16.34	−39.36	44 54.61	−39.34
	7.5	9.0		7.0	
	41 20.7	43 41.7		44 54.8	
	23.7	45.7		58.4	
	26.1	48.6		2.6	
	10.5	160		1738	
	41 23.50	43 45.33	53 5 3.80	44 57.93	6 5.24
	+ 14.18	+ 26.65	− 19	− 1.91	− 2
	− 8	1.425 70	− 57	0.897 54	− 34
	1.151 68	9.778 46	+ 10.98	9.807 01	+ 7.88
	+ 11.00	+ 9.24	+ 30	0.821 15	+ 20
	9.794 78	1.326 76	−39.90		−39.30
	+ 30	+ 25	20		
	1.069 06	−39.50			
	25 47.01	2 10.6	5 0.66	1 17.8	6 19.90
		12.2		17.8	
		28			
		22 11.40		21 17.80	
		0 36.95		1 30.55	
		53 5 55.02		50 6 48.62	
		− 21.22		+ 6.62	
	25 7.6	44 9.51	4 21.3	44 47.84	5 40.6

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1877phae.proj.1617R

1877 Dec. 12, Dec. 13. Ob. W.A.R. Rec. & F. M.

30

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 46 5	45 7.8	0 47 0	46 2.5	0 48 41	47 43.0	0 49 44	48 46.5	0 50 31	49 33.0	0 52 11	51 18.3 / 57.0 / 51 12.5		
δ	51° 38′	32.1 / 8.8	54° 47′	40.7 / 9.3	54° 10′	3.9 / 8.5	54° 16′	9.9 / 7.2	51° 27′	21.1 / 7.2	54° 4′	53 59.5 / 8.8		
Dec. 12		+9.24		+7.41		+12.49		+12.93		+8.78		+11.72		
	46 11.8	5.02	47 8.3	8.39	48 49.1	8.47	49 51.3	8.91	50 38.2	4.76	52 24.6	7.70		
	13.2		11.8		52.8		55.2		41.4		27.8			
	18.5		15.4		56.3		58.8		44.9		31.6			
	21.9		19.3		59.7		2.5		48.3		35.0			
	25.3		23.0		3.2		5.9		51.5		38.4			
	927		778		2811		2942		2243		1575			
	46 18.54		47 15.56		48 56.22		49 58.84		50 44.86		52 31.50			
	+ 8.64	+7.64	+ 8.64	+7.52	+ 8.64	+7.54	+ 8.64	+7.54	+ 8.64	+7.64	+ 8.64	+7.58		
	− 1.00		− 1.12		− 1.10		− 1.10 / 50 − 6.38 / 49 59.59		− 1.00		− 1.09			
	46 26.18		47 23.08		49 3.76				50 52.50		52 39.05			
	−4.01	6.82 / 39.30	−4.06	6.92 / 39.26	−4.09	6.93 / 39.20	−4.11	6.95 / 39.16	−4.08	6.88 / 39.14	−4.15	6.98 / 39.06		
	46 22.17		47 19.02		48 59.67		50 2.27		50 48.42		52 34.90			
	9.0		9.3		8.8		7.0		6.7		9.0			
	45 48.0		47 21.4		48 19.5		49 25.6		50 22.0		51 47.7			
	47.6		24.8		22.0		29.3		24.8		51.1			
	48.8		28.0		24.5		32.0		27.0		55.3			
	224	−4.02	152		60		869		138		41			
	45 47.47	51 39 57.38	47 25.07	54 48 18.66	48 22.00	54 11 39.84	49 28.07	54 17 43.42	50 24.60	57 28 50.96	51 51.37	54 4 35.42		
	+31.07	− 2.5	− 9.51	− 3	+34.23	− 30	+29.87	− 23	+20.26 / +10.86	− 11	+40.13	− 42		
	1.49234	− 70	0.97818	− 127	1.53428	− 26	1.47524	− 0	1.30664	− 104	1.60347	− 78		
	9.79256	+9.89	9.76075	+13.31	9.76712	+ 1265	9.76607	+12.76	9.79431	+ 9.68	9.76835	+ 1252		
	1.40750	+ 30	0.86153	+ 40	1.42400	+ 40	1.36391	+ 40	1.22355	+ 25	1.49442	+ 40		
	45	−39.52.35		−4010 15		−39.90 10		−3990 55		−39300 20		−39.60		
	2 42.5	39 25.10	4 56.6	47 46.95	1 1.0	11 8.41	0 0.1	17 12.43	4 0.0	28 16.42	3 1.4	4 3.32		
	41.9		54.9		0.5		1.1		58.9		59.6			
	44		115		15		12		1189		10			
	47 42.20 −20		39 55.75		16 0.75		10 0.60		58 59.45		23 0.50			
	135 6.15		42 52.60		6 49.60		12 47.75		23 48.90		59 47.85			
	51 40 24.94		54 48 11.39		54 12 6.39		54 18 6.54		51 29 7.69		54 5 6.64			
	− 25.56		+ 7.27		− 24.55		− 23.12		− 16.73		− 3.22			
	46 15.35	38 45.8	47 12.10	47 7.7	48 52.74	10 29.2	49 57.32	16 33.3	50 41.54	2737.3	52 2.792	3 24.3		
Dec. 13		+8.89		+4.83		+12.16		+12.48		+8.45		+11.28		
	46 11.3	5.13	47 7.0	8.07	48 48.4	8.40	49 51.2	8.72	50 37.6	4.69	52 23.8	7.52		
	14.6		11.2		51.8		54.5		40.9		27.5			
	17.8		14.7		55.4		58.0		44.0		30.8			
	21.0		18.4		58.1		1.6		47.3		34.3			
	24.5		21.8		2.8		5.3		50.8		37.9			
	893		737		2776		2906		2206		1544			
	46 17.86		47 14.74		48 55.52		49 58.12		50 44.12		52 30.88			
	+ 9.30	+8.39	+ 9.30	+8.28	+ 9.30	+8.30	+ 9.30	+8.30	+ 9.30	+8.39	+ 9.30	+8.31		
	− .91		− 1.02		− 1.00		− 1.00		− .91		− .99			
	46 26.25		47 23.02		49 3.82		50 6.42		50 52.51		52 39.19			
	− 4.00	6.82 / 39.30	− 4.05	6.92 / 39.26	− 4.07	6.93 / 39.20	− 4.09	6.95 / 39.16	− 4.08	6.88 / 39.14	− 4.14	6.98 / 39.06		
	46 22.25 / 35		47 18.97		48 59.75		50 2.33		50 48.43		52 35.05			
	8.9		8.8		8.7		7.0		7.3		8.8			
	45 47.5		46 43.5		48 42.6		49 32.5		50 26.1		51 52.0			
	51.0		46.5		45.7		35.6		28.9		55.8			
	53.4		50.6		49.0		38.0		31.6		59.3			
	19	−3.76	1406		173		171		866		171			
	45 30.63	51 40 0.92	46 46.87	54 48 21.56	48 45.77	54 11 40.06	49 35.70	54 17 43.37	50 28.87	51 28 50.88	51 55.70	54 4 35.10		
	+27.23	− 19	+27.87	− 20	+ 9.75	− 3	+22.42	− 13	+15.25	− 6	+35.18	− 32		
	1.43505	− 70	1.44514	− 114	0.98960	− 34	1.35064	− 3	1.18327	− 104	1.54630	− 87		
	9.79256	+ 9.48	9.76075	+ 12.77	9.76712	+ 12.13	9.76607	+ 12.24	9.79431	+ 9.30	9.76835	+ 1201		
	1.35021	+ 30	1.32849	+ 40	0.87872	+ 40	1.23931	+ 40	1.10018	+ 25	1.43725	+ 40		
	45	−3960 35		−4020 15		−4000 10		−4000 55		−3940 20		−3990		
	2 42.8	39 26.45	4 23.9	47 49.43	1 18.0	11 8.46	0 5.5	17 12.09	4 3.0	28 16.24 / 17	3 4.8	4 2.72		
	43.4		23.2		19.6		5.9		2.9		3.1			
	2		11		176		14		59		79			
	47 43.10		39 23.55		16 18.80		10 5.70		59 2.05		23 3.95			
	35 5.25		43 24.80		6 29.55		12 42.65		23 45.40		59 44.40			
	51 40 23.32		54 48 42.87		54 11 47.62		54 18 0.72		51 29 3.47		54 5 2.47			
	− 22.40		− 21.31		− 7.56		− 17.35		− 12.54		− 2.37			
	46 15.43	38 47.2	47 12.05	47 10.2	48 52.82	10 29.3	49 55.38	16 32.9	50 41.55	27 37.13	52 28.07	3 23.7		

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1877phae.proj.1697R

1877, Dec. 12, Dec. 13.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	0 52 42	51 43.0	0 53 35	52 36.5	0 56 28	55 29.1	0 57 9	56 10.4	0 57 36	56 40.6	1 5 44	4 45.9
δ	52° 17′	11.7 8.8	54° 53′	46.6 8.9	54° 18′	12.5 9.1	55° 6′	54 59.9 8.0	50° 13′	8.8 8.8	51° 55′	49.8 9.0

Dec. 12

			+13.58	+12.41		+13.69					+10.27	
	53 32.1		9.56	8.39	56 38.6		57 18.0	9.67			5 54.2	6.25
	45.5				42.0		21.7				57.5	
	49.0				45.4		25.3				1.7	
	52.6				44.0		28.5				3.8	
	56.2				52.8		32.4				7.3	
	2454				2278		2529				35	
	53 49.08				56 45.56		57 25.18				6 0.70	
	+ 8.64	+7.52			+ 8.64	+7.54	+ 8.14	+7.51			+ 8.63	+7.62
	− 1.12				− 1.10		− 1.13				− 1.01	
	53 56.60				56 53.10		57 32.69				6 8.32	
	− 4.19				− 4.24		− 4.26				− 4.36	
	53 52.41	−7.03 −39.62		−7.06 −38.88	56 48.86		57 28.43	−7.09 −38.86			6 3.96	−7.11 −38.46
	8.8				9.0		8.2				9.4	
	53 24.3				56 20.4		57 47.7				5 50.0	
	27.8				23.2		50.5				52.3	
	30.5				26.7		53.3				55.5	
	839				103		15				78	
	53 27.97	54 52 29.78		54 20 22.63	56 23.43		57 50.50	55 7 33.89			5 52.60	51 57 14.23
	+21.11	− 11		− 13	+22.13		−25.32	− 16			+8.10 −51.60	− 2
	1.32449	− 10		− 65	1.34198		1.40346	− 23			0.90849	− 21
	9.76023	+1339		+1299	9.76572		9.75714	+1368			9.78983	+10.20
	1.20712	+ 40		+ 40	1.23330		1.28320	+ 40			0.82092	+ 30
	35	−3990		−39.80	5		20	−3990			30	− 39.11
	0 21.1	51 59.44		19 51.22	2 27.8		0 52.8	7 3.66			0 45.8	56 41.37
	21.4				27.0		52.1				46.8	
	5				8		9				6	
	35 21.25				4 27.40		20 52.45				30 48.30	
	47 27.10				15 20.95		1 55.90				52 20.5	
	54 52 45.89				54 20 39.74		55 7 14.69				51 57 20.89	
	− 16.11				− 17.11		+ 19.20				− 6.62	
	3											2.
	53 45.38	51 20.4		19 12.4	56 41.80		57 21.34	6 24.8			5 56.85	56 7.9

Dec. 13

		+9.39	+13.10	+11.97		+13.40				+7.70		+9.75
	52 48.2	5.63	9.34	8.21	56 37.7	9.64	57 17.4		57 46.3	3.94	5 53.0	5.99
	51.6				41.3		20.9		49.5		56.5	
	55.0				44.7		24.5		52.8		59.7	
	58.3				48.2		28.0		56.0		3.0	
	1.7				51.8		31.8		59.5		6.4	
	2748				2237		1226		141		2986	
	52 54.96				56 44.74		57 24.52		57 52.82		5 59.72	
	+ 9.30	+8.37	+8.28		+ 9.30	+8.30	+ 9.30	+8.27	+ 9.30	+8.44	+ 9.30	+8.38
	− 93				− 100		− 103		− 86		− 92	
	53 3.33				56 53.04		57 32.79		58 12.6		6 8.10	
	− 4.12	−6.94 −39.04	−7.03 −39.02		− 4.22	−7.06 −38.88	− 4.24	−7.09 −38.86	− 4.19	−6.95 −38.84	− 4.35	−7.11 −38.46
	53 59.21		53 52.31		56 48.82		57 28.55		57 57.07		6 3.75	
	9.0		8.4		8.6				8.6		8.9	
	53 11.1		53 36.7		56 26.6		57 11.1		58 8.0		5 29.8	
	14.7		38.6		29.8		14.2		10.0		21.3	
	17.4		42.8		33.0		16.8		13.5		32.9	
	132		1191		895		121		15		880	
	53 14.40	52 19 32.13	53 39.70	54 52 30.74	56 26.83	54 20 22.09	57 14.03	55 7 34.92	58 10.50	50 16 32.16	5 29.33	51 57 16.43
	− 10.44	− 10	+8.56	− 2	+14.91	− 6	+10.49	− 3	− 17.68	− 9	+30.39	− 24
	1.28870	− 99	0.93247	− 13	1.17348	− 65	1.02078	− 10	1.24748	− 47	1.48273	− 10
	9.78625	+ 10.18	9.76023	+12.85	9.76572	+12.28	9.75714	+ 13.13	9.80565	+ 8.06	9.78983	+ 9.79
	1.14755	+ 30	0.81510	+ 40	1.06180	+ 40	0.90052	+ 40	1.17573	+ .20	1.39516	+ 30
	5	−39.50	35	−40.00	5	−39.90	20	−40.00	10	−39.10	30	−39.20
	3 49.5	18 58.26	0 28.9	52 6.08	2 33.5	19 50.40	0 23.1	7 4.56	1 49.4	15 54.00	0 24.2	56 43.22
	50.6		29.4		32.1		24.0		49.1		26.1	
	01		183		56		71		5		10.3	
	8 50.05		35 29.15		4 32.80		20 23.55		11 49.25		30 25.15	
	13 58.30		47 19.20		15 15.55		2 24.80		10 59.10		52 23.20	
	52 19 16.37		54 52 37.27		54 20 33.62		55 7 42.87		50 16 17.17		51 57 41.27	
	+ 15.76		− 6.53		− 11.53		− 7.95		+ 14.99		− 24.84	
	52 52.27	18 19.2	53 45.34	51 21.1	56 41.76	19 11.5	57 21.46	6 25.7	57 50.12	15 18.2	5 56.64	56 4.8

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1877. Dec. 12. Dec. 13. Obs. W.A.R. Rec. of F.M.

602 603 8382 32

	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 6 32	5 32.0	1 7 32	6 33.6	1 8 28	7 28.1	1 9 46	8 46.4	1 11 4	10 5.9	1 12 15	11 16.5
δ	54° 56′	50.2 9.3	51° 43′	37.6 9.0	54° 53′	46.9 8.5	54° 17′	11.2 8.8	51° 16′	10.6 9.2	52° 0′	51 54.1 8.0

Dec. 12

	+1260		+949		+1280		+1199 +1221		+823 +861		+1018	
	6 36.0 39.8 43.3 46.8 50.5	8.58	7 41.5 44.7 48.1 51.4 54.9	5.47	8 38.3 42.0 45.5 49.3 52.9	8.78	9 48.0 52.0 55.5 57.0 2.5	7.97 8.19	11 12.8 16.9 20.0 23.2 26.3	4.21 4.49	12 25.6 28.8 32.3 35.9 39.2	6.16
	2165		2406		2280		2770 3159		992 1099		1617	
	6 43.30 + 8.63 +1751 1.12		7 48.12 + 8.63 +1768 1.00		8 45.60 + 8.63 +1751 1.12		53.40 3.18 + 8.63 + 8.63 +1753 +1753 1.10 1.10		11 1984 2198 + 8.63 + 8.63 +1764 +1764 .99 .99		12 32.34 + 8.63 +1.01	
	6 50.81		7 55.75		8 53.11		10 2.93 10.71		11 2748 29.62		12 37.96	
	− 4.44		− 4.39		− 4.48		4.49 −.49		4.44 −.44		− 4.48	
	6 46.37	−7.13 −38.38	7 51.96		8 48.63	−7.27 −38.32	9 58.44 6.22	−7.26 −38.26	11 23.04 25.82	18 −7.16 −38.18	12 3548	−7.21 −38.12
	9.4		9.0		8.7		9 8.8 54 20 33.30 18 5959		90.2 51 18	5385 4425 9840 1440	8.0	
	6 32.2 34.7 38.4 153	−402	7 27.4 30.1 33.3 08		8 18.8 21.9 25.3 60		22.0 29.2 24.2 32.0 28.6 35.6 158 68	− 25 − 23 − 96 − 75 +1280 +1279 + .40 + .40	11 48.7 52.8 55.9 74	10.6 − 28 − 2 13.3 −125 −122 15.3 +951 +950 9.2 + .25 + .25	12 35.5 38.2 40.7 11 44	
	6 35.10	54 53 23.78	7 30.27	51 45 11.23	8 22.80	54 2689	25.27 3227	−3940 −3940	52.47	13.07 −3890 −3890	12 38.13	52 1 4811
	+ 8.20	− 2	+17.85	− 9	+23.60	− 15	29.87 27.67	1.87 2838	32.63 +8.91	18 −9.56 1.16	− 5.79	− 1
	0.91381	− 1.20	1.25164	− 70	1.37291	− 88	1.47524 1.49010		1.51362 0.94988	354	0.76268	− .39
	9.75985	+ 1342	9.79176	+ 998	9.75967	+1343	9.76590 9.76572		9.79605 9.79605		9.78902	+ 10.28
	0.79826	+ 40	1.16600	+ 30	1.25518	+ 40	1.36374 1.37842		1.43227 0.86853		0.67430	+ 30
	30	−39.60 40		−39.02 30		−3950	5 CR 5 CR		5 5		25	−3900
	4 37.9 36.3 142	52 5276	2 40.9 41.6 2.5	44 37.40 70	3 23.1 21.4 45	53 56.17	3 44.4 2.57.0 121 42.9 56.9 73 1.39	CR	4 50.4 40.5 CR 495 402 999 7		1 29.1 28.4 175	1 10.27
	31 37.10 48 41.25		42 41.25 46 710		33 22.25 49 2610		8 43.65 5.695 14 4.70 14 5.46		9 49.95 10.35 12 58.40 13 8.02		26 28.75 56 19.60	
	54 53 30.04 − 6.26		51 45 25.89 − 14.66		54 54 44.89 − 18.50		5 49 23.89 20 10.19 + 23.11 − 23.90 + 23.11		5 18 17.19 26.79 + 27.66 − 7.39		52 1 38.39 + 4.72	
			7 44.23	43 59.3	8 41.36	53 17.8	9 51.18 58.96	19 50.1 +1142 +1204	11 15.88 18.02	16 57.2 +148 +1485	12 28.24	0 32.2

Dec. 13

	+1327		+911		+1232						+976	
	6 40.7 44.5 48.0 51.6 55.3	9.51	7 40.6 44.0 47.4 50.7 54.0	5.35	8 37.6 41.1 44.8 48.2 52.0	8.56	9 47.4 51.0 54.6 58.5 2.2	7.66 8.28	11 12.3 15.8 19.0 22.3 25.7	14.7 18.0 21.3 24.6 28.1	4.42 4.09 12 24.9 28.2 31.5 34.9 38.2	6.00.
	401		367		237		27 37 3106		951 1066		1577	
	6 48.02 + 9.29 +8.27 − 1.02		7 47.34 + 9.29 +8.38 − .91		8 44.74 + 9.29 +8.27 − 1.02		54 74 232 + 9.29 + 9.29 +8.29 +8.29 − 1.00		+ 9.29 + 9.29 +8.39 +8.39 − .90 − .90		12 31.54 + 9.29 + 8.37 − .92	
	6 56.29		7 55.72		8 53.01		10 3.23 10.41	−7.26 −38.26	11 2741 29.71	−7.16 −38.18	12 39.91	
	− 4.42		− 4.37		− 4.45		4.47 −4.47		− 4.43 −4.43		− 4.46	
	6 51.87	−7.24 −38.42	7 51.35	−7.13 −38.38	8 48.56	−7.27 −38.32	9 58.86 6.14	−7.26 −38.26	11 22.98 25.28	−7.16 −38.18	12 35.45	−7.21 −38.12
	8.8		9.0		8.6		9 20 8.7 54 20 33.43 19 1.85		9.1 90 51 18 53.96	10.37	8.0	
	6 39.8 43.0 47.0 98	−3.76	7 26.0 30.1 32.5 886		8 22.8 26.7 29.3 188		9 38.4 43.2 46.8 94	22.0 − 35 − 4 25.7 − 94 − 62 28.8 +1231 +1230 165 1 40 + 40	11 30.6 34.4 36.7 117	40.8 − 6 − 38 43.5 − 114 − 114 46.6 + 9.13 + 9.12 109 + 25 + 25	12 4 2 7.2 9.5 209	
	6 43.27	54 57 42.20	7 29.53	51 45 13.75	8 26.27	54 27.49	4313	25.50 −3950	3890	4363 −3890 −3900	12 6.97	52 1 43.57
	+ 4.76	− 1	+17.81	− 9	+18.47	− 8	11.81	20 1.59 30.63	14.88 +37.69	18 1.48 73.46	+24.57	− .16
	0.67669	− 8	1.25066	− 68	1.26647	− 88	1.07225		1.17268 1.57623		1.39041	− .26
	9.45895	+12.96	9.79176	+ 9.58	9.75967	+1288	9.76590		9.79605 9.79605		9.78902	+ 9.87
	0.55824	+ 40	1.16502	+ 30	1.14874	+ 40	0.96075		1.09125 1.49488		1.30203	+ 30
	30	−39.70 40		−39.10 30		−3960	5		6		25	−39.00
	0 19.9 21.3 412	57 1999 12.01	2 37.9 38.2 161	44 40.00	3 24.8 24.9 14	53 56.45	3 36.7 24.1 CR 358 23.6 101 24#125 77		4 25.1 24.5 96		1 2.4 3.2 56	1 10.57
	30 20.60 52 2775		42 38.05 40 10.30		33 24.85 49 23.50		3625 23.85 14 1210 15 2450		9 24.80 13 23.55		26 2.80 56 4555	
	54 57 48.82 − 3.62		51 45 28.37 − 14.62		54 54 41.57 − 14.08		5 9 30.17 20 4257 − 9.44 − 14.08 − 23.32 − 9.14		5 18 41.62 + 12.34 − 31.25		52 2 36.2 − 20.56	
	6 44.63	56 33.6	7 44.22	44 1.6	8 41.29	53 18.1	9 51.30 58.88	19 23.3 18 52.4	11 15.82 18.12	17 41.3 16 57.3	12 28.24	0 32.4

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1877 Dec. 12. Dec. 13.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 13 12	12 135	1 19 34	19 32.1	1 21 6	20 3.9	1 21 56	20 53.8	1 23 12	22 8.7	1 36 55	35 52.2
δ	51° 19′	13.4 7.2	54° 30′	25.5 9.0	54° 58′	52.9 9.0	54° 21′	15.7 8.8	53° 29′	23.6 8.8	51° 42′	37.1 9.2

Dec. 12

+9.20 +13.15 +13.14 +13.17 +11.55 +9.22

13 23.2 5.18 | 21 21 9.7 16.3 13.4 20.0 17.4 23.7 21.0 26.8 24.5 30.5 9.13 9.12 | 22 5.2 8.8 12.3 14.8 17.4 9.10 | 23 20.0 23.7 27.0 30.6 33.9 7.53 | 37 4.4 8.8 13.0 15.3 18.8 5.20

26.3 29.8 33.0 36.3

1486 | 866 1174 | 615 | 1352 | 603

13 29.72 + 8.63 + 7.64 − .99 13 37.36 | 1732 2348 + 863 + 863 + 7.50 + 7.50 − 113 − 113 21 2482 30.98 | 22 12.30 + 863 + 7.53 − 1.10 22 19.83 | 23 27.04 + 8.63 + 7.56 − 1.07 23 34.60 | 37 12.06 + 8.62 + 7.62 − 1.00 37 19.68

− 448 13 32.88 | − 472 − 472 21 2000 26.26 | − 472 22 15.11 | − 471 23 29.89

7.8 | 9.0 | 6.9

13 10.7 12.8 14.5 80 | 20 55.1 21 0.9 − 12 − 13 − 68 − 68 +1355 +1355 + 40 + 40 55.10 0.90 | 21 48.0 50.5 53.7 22 | 22 42.8 47.6 52.9 203 | 36 47.4 48.3 52.8 1496

13 12.67 51 21 0.97 | −3910 −3910 | 21 50.73 54 22 43.13 | 22 56.77 53 30 54.07 | 36 49.87 51 44 13.86

+17.05 − 8 1.23172 − 49 9.79558 + 9.52 1.14990 + 25 5 − 38.80

+22.22 +22.58 59 45.62 45.33 1.34674 1.35372 9.75859 9.75859 1.22793 1.23491 25 | +21.57 − 12 1.33385 − .31 9.76519 +1287 1.22164 + 40 5 −39.00 55 | +30.27 − 24 1.48101 − 47 9.77422 +1178 1.37783 + 35 −38.80 | +22.19 − 15 1.34616 − 94 9.79192 + 999 1.26068 + 30 −37.90 40

1 52.2 51.9 1 6 52.05 15 56.30 20 27.75 35 | 2 35.2 34.1 9.3 27 34.65 55 13.70 | 0 7.8 6.9 4 5 7.35 17 41.80 22 13.23 | 1 49.5 48.9 18.4 56 49.21 25 39.15 30 22.80 | 3 35.2 34.9 10.1 43 35.05 39 43.30 43 41.16

51 21 15.09 − 14.12 13 25.69 19 49.3 | 55 0 32.49 − 16.90 − 17.18 21 12.53 59 8.0 7.7 | 54 22 59.77 − 16.66 22 7.66 21 35.7 | 53 31 14.94 − 2.387 − 18.23 23 22.46 29 45.3 | 51 44 32.09 37 7.24 43 41.6

Dec. 13

+8.65 +12.11 +12.67 +12.64 +11.03 +8.88

13 22.3 26.8 29.0 32.3 35.6 4.89 | 19 55.6 59.3 2.6 6.2 9.8 8.35 | 21 8.8 12.6 16.2 19.8 23.5 15.6 18.0 22.7 26.0 29.9 8.9 1890 | 22 4.5 7.9 11.6 15.0 18.6 8.98 | 23 18.0 22.6 26.1 29.6 32.0 7.27 | 37 4.9 8.3 11.3 14.6 18.0 5.12

14 50 13 29.00 + 9.29 + 8.39 − .90 13 37.39 | 3135 20 6270 + 9.29 + 8.27 − 1.02 20 10.97 | 809 1132 16.18 22.64 + 9.29 + 9.29 + 8.26 + 8.26 − 103 − 103 21 2444 30.90 | 576 22 11.52 + 9.29 + 8.29 − 102 22 17.81 | 1803 23 26.06 + 9.29 + 8.31 − .98 23 34.37 | 571 37 11.42 + 9.28 + 8.37 − .91 37 19.79

− 448 13 32.91 | − 4.66 20 6.31 − 7.43 − 37.64 | − 470 − 470 21 19.74 26.20 | − 4.70 22 15.11 | − 4.70 23 29.67 | − 4.88 37 14.91

7.5 | 9.5 | 9.2 8.8 | 8.5 | 8.6 | 9.2

12 30.1 53.9 56.2 102 | 19 33.3 38.0 41.3 1126 | 20 20 48.6 53.5 0 8.59 17.46 − 11 − 12 − 62 − 62 +1300 +1300 + 40 + 40 | 21 56.8 59.8 3.1 1797 | 22 30.8 53.8 56.8 106 | 37 2.8 6.1 8.8 17.8

12 53.40 51 21 1.03 | 19 37.53 54 30 27.93 | 1860 53.50 −3930 −3920 | 21 39.90 54 22 43.95 | 22 53.56 53 30 53.32 | 37 5.93 51 44 12.41

+35.60 1.55 1445 9.79558 1.46963 5 | − 34 − 42 + 9.16 + .25 −38.90 | +25.17 1.24 0088 9.76395 1.28643 55 | − 16 − 60 + 124.79 + 40 −39.20 | +27.58 +29.14 59 48.20 47.10 1.44059 1.46449 9.75859 9.75851 1.32178 1.34508 25 | +1162 1.06521 9.76519 0.95300 5 | − 4 − 5 + 1243 + 40 −39.10 | +32.53 1.51228 9.77422 1.40910 55 | − 28 − 470 + 1143 + .35 −38.90 | +5.49 9.73957 9.79192 0.65409 60 | − 1 − .99 + 9.55 + .30 −38.00

1 35.5 36.3 11.8 6 35.90 16 12.45 51 21 30.52 − 29.49 19 49.0 | 2 18.8 19.5 18.3 57 19.15 25 39.20 54 30 47.27 − 19.34 19 58.88 29 19.4 | 2 26.9 26.8 17 27 26.85 55 21.50 55 0 39.57 − 20.98 − 22.17 21 18.27 18.73 59 16.6 9.5 | 0 12.9 14.1 7.0 5 13.50 17 34.85 54 22 52.92 − 8.97 22 7.66 21 36.3 | 1 47.0 47.9 9 56 47.45 26 0.90 53 31 18.97 − 25.65 23 22.24 29 44.2 | 3 48.5 48.5 43 48.58 +1" 38 59.85 51 44 17.92 − 4.57 57 7.37 43 3.0

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1877 Dec. 12, Dec. 13. Obs W. A. R. Rec. of F. M.

34

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 38 0	36 56.4	1 40 36	39 31.9	1 42 9	41 47	1 43 4	42 0.1	1 44 0	42 55.7	1 45 37	44 31.2		
δ	54° 19′	13.7 9.5	54° 17′	12.5 8.2	54° 34′	28.7 8.4	54° 16′	11.1 7.4	54° 42′	36.7 8.6	52° 20′	14.3 9.4		
Dec. 12		+12.67		+12.45		+13.12		+12.18 +12.52		+12.47		+10.30		
	38 12.4	8.65	40 44.6	8.43	42 18.7	9.10	43 14.5 27.8	8.16 8.50	44 11.6	8.95	45 46.4	6.28		
	15.4		47.2		22.0		18.0 31.1		15.1		49.6			
	17.4		52.7		25.8		21.6 34.8		18.7		53.1			
	23.0		56.2		27.2		25.0 38.5		22.3		56.5			
	26.6		58.8		33.0		28.7 42.0		26.2		0.2			
	973		2635		1287		1078 1742		939		2658			
	38 19.46		40 52.70		42 25.74		21.56 34.84		44 18.78		45 53.16			
	+ 8.62	+7.52	+ 8.62	+7.52	+ 8.62	+7.51	+ 8.62 + 8.62	+7.52 +7.52	+ 8.62	+7.51	+ 8.62	+7.60		
	− 1.10		− 1.10		− 1.11		− 1.10 − 1.10	−7.76	− 1.11		− 1.02			
	38 26.98		41 0.22	−7.73	42 33.25		43 29.08 42.36	−36.10	44 26.29	−7.80	46 0.76			
	− 5.01	−7.67	− 5.06 55.5.16	−36.30	− 5.10	−7.77	− 5.10 − 5.11	−7.77	− 5.14	−36.04	− 5.07	−7.69		
	38 21.97	−36.48	40 [illegible] 2.46		42 28.15	−36.18	43 [illegible] 23.98 3.25	−36.10	44 21.15		45 55.69	−35.90		
	9.3		8.6		8.0		7.0 8.0 54 19 2049 20 2990		7.6		9.1			
	37 26.5		40 19.7		41 36.7		42 [illegible] 43.7	− 13 − 2	44 27.3		45 15.8			
	2.4		23.8		0.7		53.4 43.0	− 91 − 70	27.8		18.6			
	3.0		26.0		2.8		2.3 46.3	+1282+1284	33.2		22.0			
	1799		96		02		1772 90	+ 40 + 40	903		574			
	37 59.97	−4.02 54 20 55.93	40 23.20	54 20 31.34	42 0.07	54 36 48.03	53.07 43.00	−3800 −3800	44 30.10	54 43 48.46	45 19.13	52 21 25.05		
	+14.49	− 9	+29.50	− 2.2	+25.67	− 17	+22.49 − 8.16	+8 50.65 30 0.40	− 11.32	− 3	+34.03	− 31		
	1.289 81	− 49	1.46982	− 57	1.40943	− 26	1.35199 0.91169		1.05385	− 17	1.53186	− 34		
	9.76 554	+1285	9.76 554	+1284	9.76 271	+1313	9.76540 9.76554		9.76 146	+1327	9.77 592	+1065		
	1.17795	+ 40	1.35796	+ 40	1.29474	+ 40	1.24049 0.79983		0.93791	+ 40	1.45038	+ 30		
	6	−3830	5	−3810	50	−3810	5 5		40	−3790	5	−3750		
	1 56.5	20 26.28	2 13.5	20 1.67	0 59.9	36 19.03	3 29.9 2 43.7		4 28.2	43 19.01	1 14.8	20 53.83		
	55.8		12.5		58.9		28.6 43.4		26.5		15.5			
	123		60		188		5 7 11		147		103			
	6 56.15		7 13.00		50 59.40		4 29.25 43.55		44 27.35		6 15.15			
	15 52.20		15 35.35		31 48.95		14 19.10 5.480		38 31.00		16 33.20			
	54 21 10.99		54 20 51.14		54 37 7.74		54 19 38.9 20 23.59		54 43 39.79		52 21 51.99			
	− 15.06		− 22.80		− 19.71		−17.40 + 6.31		+ 8.67		− 26.94			
			43				43 16.22	18 14.6	44 [illegible] 13					
	38 14.22	19 49.8	40 47.37	19 25.4	42 20.38	35 42.8	43 29.[illegible]	19 24.3		42 43.0	45 48.00	20 17.9		
Dec. 13	9.0	+12.40	8.0	+12.07	7.6	+12.48	7.0 8.1	+11.64 +12.00	8.8	+12.94	9.3	+9.97		
	38 11.3	8.34	40 44.8	8.31	42 17.7	8.72	43 13.6 27.2	7.88 8.34	44 20.7	9.18	45 45.7	6.21		
	15.0		48.4		21.3		17.3 30.6		24.3		48.9			
	18.6		51.9		24.8		20.7 34.2		27.8		52.4			
	22.1		55.4		28.4		24.3 37.8		31.3		55.8			
	25.6		58.0		32.0		27.9 41.4		34.9		59.1			
	726		95		1242		1038 1712		1390		2619			
	38 18.52		40 51.90		42 24.84		20.76 34.24		44 27.80		45 52.38			
	+ 9.28	+8.28	+ 9.28	+8.28	+ 9.28	+8.27	+ 9.28 + 9.28	+8.28 +8.28	+ 9.28	+8.27	+ 9.28	+8.30		
	− 1.00		− 1.00		− 1.01		− 1.00 − 1.00	−7.76	− 1.01		− 0.93			
	38 26.80		41 0.18	−7.73	42 33.11		43 29.04 42.52	−36.10	44 36.07		46 0.73			
	− 4.99	−7.69	− 5.04	−36.30	− 5.08	−7.77	− 5.09 − 5.09	−7.77	− 5.12	−7.81	− 5.05	−7.69		
	38 21.81	−36.40	40 55.14		42 [illegible] 28.03	−36.18	43 [illegible] 23.95 37.43	−36.10	44 30.95	−36.04	45 55.68	−35.90		
	9.0		8.0		7.6		7.0 8.1 54 19 2120 20 0.54		8.8		9.3			
	37 57.1		40 37.6		41 45.4		42 54.5 38.3	− 14 3 1	44 13.8		45 28.7			
	53.6		40.4		48.4		57.7 38.0	− 91 − 70	16.8		33.9			
	56.6		43.6		52.8		1.0 41.9	+1229+1231	20.0		36.5			
	113	−3.76	16		1476 54		17 32 1162	+ 40 + 40	507		1001			
	37 53.77	54 20 57.29	40 40.53	54 20 32.48	41 49.20	36 48.95	57.13 38.73	−3810 −3810	44 16.90	54 42 27.77	45 33.37	52 21 26.92		
	+24.75	− 16	+11.37	− 3	+35.64	− 32	+23.03 − 4.49	18 50.98 20.68	+10.90	− 3	+19.01	− 10		
	1.39 3.58	− 47	1.05576	− 62	1.55194	− 21	1.36229 0.65225		1.03443	− 13	1.27898	− 36		
	9.76 554	+1233	9.76 554	+1232	9.76 271	+1261	9.76590 9.76584		9.76 182	+1270	9.77 592	+1013		
	1.28172	+ 40	0.94390	+ 40	1.43725	+ 40	1.25079 0.54039		0.92185	+ 40	1.17750	+ 30		
	5	−3830	5	−3820	50	−3820	5 5		45	−3810	5	−3760		
	1 50.1	20 27.33	2 25.4	20 2.59	0 49.1	36 19.47	3 28.1 2 39.4		0 30.4	41 58.85	1 23.7	20 55.53		
	49.9		24.9		51.1		26.7 39.3		30.2		25.2			
	1000		10.3		1002		14.8 7		6		8.9			
	6 50.00		7 25.15		50 50.10		8 27.40 39.35 +10		45 30.30		6 24.45			
	15 58.35		15 23.20		31 58.25		14 20.95 15.9.60		37 18.05		16 23.90			
	54 21 16.92		54 20 41.27		54 37 16.32		54 19 39.02 20 27.07		54 42 38.12		52 21 41.97			
	− 19.13		− 8.79		− 2.37		− 1.82 + 3.47		− 8.35		− 15.05			
							16							
	38 14.12	19 50.8	40 47.41	19 26.3	42 20.26	35 43.3	43 21.19 29.64	18 14.9 19 54.6			45 47.99	20 19.6		

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1877 Dec. 12, Dec. 13.

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	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 49 2	47 56.7	1 54 9	53 3.5	1 55 48	54 41.7	1 55 49	54 41.7	1 57 37	56 31.6	1 58 9	57 3.1
δ	52° 5	52 59.9	52° 28	22.6	52° 20	15.5	52° 20	15.0	52° 6	1.2	53° 9	53 36.4

Dec. 12 — 06 52.0

+10.10 +7.91 +10.48 +9.38 +11.50

	54 24.9	6.08		55 37.0	5.89		55 48.0	6.46		57 48.7	5.36		58 19.2	7.48		
	28.4			3.7			20			52.0			22.6			
	31.7			3.8						55.4			26.2			
	35.1			3.6	7.0		90			58.7			28.5			
	38.9						12.5			2.2			33.6			
	90			205			342			2770			1305			
	54 31.80			56 [5.12]	3.70		56 [6.84]	5.62		57 55.40			58 26.10			
	+ 862	+7.60		+ 862	+7.60		+ 862	+7.60		+ 862	+7.61		+ 862	+7.57		
	− 102			− 102			− 102			− 101			− 105			
	54 39.40			56 [12.72]	11.30		56 [14.14]	13.22		58 3.01			58 33.67			
	−5.21			−5.23			−5.23			−5.25			−5.32			
	54 [34.19] 34.19			56 [7.49] 6.07			56 [8.21] 7	7.99		57 57.76			58 28.35			
		−7.81 −35.22			−7.82 −35.08			−7.82 −35.08			−7.83 −34.92					

8.8 8.5 8.7 8.9 8.3

	54 1.0			55 38.0			56 23.8			57 33.4			58 50.7			
	4.5			40.6			28.1			37.2			53.3			
	7.3			43.5			31.4			40.3			55.2			
	12.8			21			8.33			1109			122			
	54 4.27	52 29 34.01		55 40.70	52 19 [24.15] 28.30		56 27.77	52 21 [55.04] 56.03		57 36.97	52 8 4.04		58 54.07	53 12 43.20		
	+2753	− 20		[+2300 24.19]	− 16		[−2215 20.93]	− 12		+1843	− 9		−2757	− 21		
	1.43981	− 83		[1.35 1.43]	− 86		[1.32 48.37]	− 39		1.26553	− 125		1.44669	− 21		
	9.78445	+ 1083		9.78609	+ 1063		9.78576	+ 1069		9.78805	+ 1042		9.77728	+ 1162		
	1.34686	+ 30		1.29644	+ 30		1.22913	+ 30		1.17618	+ 30		1.34657	+ 30		
	55	−37.40		7042	−36.90		5	−36.90		15	−36.80		15	−36.90		
	3 10.7	29 3.09		3 20.3	18 [56.12] 57.29		1 28.0	21 [24.60] 23.59		11 46.5	7 32.60		0 45.7	12 13.78		
	11.1			20.1			30.1			47.7			46.6			
	18			4			581			162			12.3			
	58 10.90			8 20.20			6 29.05			19 48.10			15 46.15			
	24 37.45			14 28.15			16 19.30			3 0.25			7 2.20			
	52 29 56.24			52 19 46.94			52 21 38.09			52 8 19.04			53 12 20.99			
	− 22.23			− [19.30] 18.64			+ [16.95] 17.94			− 15.80			+ 22.21			
	54 26.38	28 27.9		55 56.25	18 22.2		56 0.17	20 50.5		57 49.93	6 57.7					

Dec. 13 — +9.62 +9.68 +9.26 +10.21 +8.90 +11.35

49 0.6	5.86		54 24.1	5.92		55 56.0	5.50		55 57.9	6.45		57 41.8	5.14		58 18.3	7.57		
3.8			27.7			59.5			1.4			51.3			21.7			
7.2			30.9			3.0			4.7			54.6			25.6			
10.5			34.4			6.3			8.0			58.0			28.8			
14.1			37.8			9.7			11.3			1.3			32.4			
362			1549			8155			233			2730			1268			
49 7.24			54 30.98			56 [3.10] 2.90			56 [4.66]			57 54.60			58 25.36			
+ 9.28	+8.36		+ 9.28	+8.38		+ 9.28	+8.35		+ 9.28	+8.35		+ 9.28	+8.36		+ 9.28	+8.32		
− 92			− 0.93			− 93			− 93			− 92			− 96			
49 15.60			54 39.33			56 11.25			56 10.01			58 2.96			58 33.68			
[−5.09] −5.09	−7.77 −35.64		−5.20	−7.81 −35.22		−5.22	−7.82 −35.08		−5.22	−7.82 −35.08		[−5.24] −5.24	−7.83 −34.92		−5.30			
49 10.51			54 34.13			56 6.03			56 4.79			[57 57.72] 57.72			58 28.38			

8.9 8.6 8.6 8.9 8.7 8.3

48 47.4			54 2.8			[55 18.8] 19.8			55 41.3			57 25.8			58 26.0			
49.6			6.2			23.0			44.8			28.7			28.4			
51.3			8.4			26.0			48.0			31.0			33.3			
148.3			17.4			89			141			855			877			
48 49.43	52 1 6.43		54 5.80	52 29 34.29		55 22.97	52 19 29.11		55 44.70	52 21 56.61		57 28.50	52 8 3.93		58 29.23	53 12 43.34		
+17.81	− 9		+25.18	− 17		+39.93	− 42		+19.96	− 11		+26.10	− 18		− 3.87	− 1		
1.25066	− 47		1.40106	− 83		1.60130	− 811		1.20016	− 23		1.41664	− 122		0.58777	− 10		
9.78918	+ 9.88		9.78445	+ 1038		9.78609	+ 1019		9.78576	+ 10.25		9.78805	+ 1000		9.77728	+ 1114		
1.16244	+ 30		1.30811	+ 30		1.50999	+ 30		1.40852	+ 30		1.33729	+ 30		0.48759	+ 30		
25	−37.80		55	−37.10		5	−37.00		5	−37.00		15	−36.90		15	−37.00		
1 44.7	0 34.89		3 11.2	29 3.11		3 4.8	18 57.61		0 53.1	21 26.06		11 40.8	7 32.18		0 25.9	12 13.91		
46.2			12.4			5.1			54.2			40.7			26.4			
109			36			99			7.3			15			3			
26 45.45			58 11.80			8 4.95			5 53.65			19 40.75			15 26.15			
56 2.90			24 36.55			14 43.40			16 54.70			3 7.60			7 22.20			
52 1 20.97			52 29 34.62			52 20 1.97			52 22 12.77			52 8 25.67			53 12 40.27			
− 14.54			− 20.33			− 33.26			− [12.84] 16.16			− 21.74			+ 3.07			
49 2.79	59 59.2		54 26.32	28 27.9		55 58.21	18 22.5		55 59.97	20 51.0		57 49.89	6 57.2					

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1877phae.proj.1017R

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	2 3 51	2 44.6	2 5 12	4 35.5	2 15 29	14 17.5	2 16 17	15 9.5	2 17 37	16 28.5	2 18 25	17 16.5
δ	53° 40′	354 9.5	53° 19′	13.6 8.9	53° 38′	32.7 8.2	54° 41′	35.8 7.0	53° 44′	38.6 8.2	54° 26′	21.0 9.0
Dec. 12		+12.48		+14.30		+11.11		+13.32		+11.47 +11.36		+13.27
	4 3.4	8.16	5 25.0	7.28	15 36.8	7.09	16 30.9	9.30	17 49.9	7.45 7.34	18 39.3	9.25
	1.8		28.8		40.4		34.5		52.3		42.6	
	10.5		32.2		44.0		37.4		54.7		46.3	
	13.8		35.6		47.8		41.4		57.2		48.9	
	17.7		38.9		51.0		45.0		3.9		53.4	
	5223		1605		2196		1897		2846 2846		2315	
	4 10.46		5 32.10		15 43.92		16 37.64		56.92 56.92		18 46.30	
	+ 862	+7.54	+ 862	+7.56	+ 861	+7.53	+ 861	+7.50	+ 861 + 861	+7.53+7.53	+ 861	+7.51
	− 108		− 106		− 108		− 111		− 108 − 108	−8.21 −33.08	− 110	
	4 18.00		5 39.66		15 51.45		16 45.44		18 4.45 4.45		18 53.81	
	− 5441	−8.02 −34.38	− 5441	−8.01 −34.26	− 562	−8.17 −33.28	− 570	−8.26 −33.20	− 566 − 566	−8.21 −33.08	− 573	−8.27 −32.98
	4 12.56		5 34.22		15 45.83		16 39.74		58.79 58.79		18 48.08	
	9.5		8.7		8.5		7.5		9.1 8.7	53 44 7.10 10.6	8.9	
	3 38.2		5 0.5		15 17.7		16 7.6		17 32.2 17 24.5	− 16 − 27	18 30.4	
	42.1		3.3		14.7		10.7			− 96 − 96	34.0	
	45.3		5.6		23.3		14.3			+12.19 +12.19	38.0	
	6.4		9.4		6.07		2.6			+ 40 + 40	12.4	
	3 42.20	53 42 10.65 −4.02	5 3.13	53 20 41.06	15 20.23	53 38 17.01	16 10.87	54 42 9.65	3220 2450	−3560 −3560	18 34.13	54 27 42.56
	+28.26	− 21	+28.97	− 22	+23.69	− 15	+27.67	− 19	+2472 +3242	43 3895 3280	+12.17	− 4
	1.45114	− 16	1.46105	− 55	1.37457	− 117	1.43249	− 16	13305 1.51081		1.08529	− 8
	9.77 2313	+ 12.15	9.77592	+ 11.77	9.77 3072	+ 1208	9.76 182	+ 18.27	9.77199		9.76 431	+1299
	1.34610	+ 40	1.36047	+ 30	1.27019	+ 35	1.31691	+ 46	1.28764 1.40540		0.97220	+ 46
	45	−36.65		−36.40	45	−35.70	45	−35.80	40		0	−35.60
	0 34.1	41 42.21	2 3.9	20 11.94	4 32.5	37 48.40	0 36.8	41 43.15	8 41.5		0 15.2	27 16.21
	34.5		2.41		30.5		36.7		39.8		15.2	
	6		6.3		30		15		8.13			
	45 34.30		7 3.15		49 31.50		45 36.75		43 40.65		0 15.20	
	37 14.05		15 45.20		33 16.85		37 11.60		39 7.70		22 33.15	
	53 42 32.54		53 21 3.99		53 38 35.64		54 42 30.39		53 44 26.49		54 27 57.94	
	− 22.19		− 22.93		− 18.63		− 20.74		− 19.39		− 9.38	
									− 25.43	43 5.7		
	4 4.54	41 7.8 +11.50	5 26.21	19 37.7 +10.89	15 37.66	37 15.1 +10.64	16 31.48	41 11.0 +12.87	17 50.58 50.58	42 59.7 +10.92 +10.79	18 39.81	26 43.28 +12.76
Dec. 13												
	4 2.4	8.04	5 24.3	7.13	15 36.3	6.88	16 29.9	9.11	17 48.1 17 42.6	7.16 7.03	18 38.6	9.00
	6.0		27.8		39.7		33.5		46.0 46.0		42.0	
	9.6		31.3		43.2		37.0		49.7 49.7		45.7	
	13.0		34.8		46.6		40.7		3.1 3.1		49.1	
	16.5		38.2		50.2		44.4				52.7	
	475		65		2160		1855		2805 2805		2281	
	4 9.30		5 31.30		15 43.20		16 37.10		56.10 56.10		18 4.62	
	+ 9.28	+8.30	+ 9.28	+8.31	+ 9.27	+8.29	+ 9.27	+8.26	+ 9.27 + 9.27	+8.29+8.29	+ 9.27	+8.26
	− 98		− 97		− 98		− 101		− 98 − 98	−8.21 −33.08	− 101	
	4 17.80	−8.02 −34.38	5 39.61	−8.01 −34.26	15 54.49	−8.17 −33.28	16 45.36	−8.26 −33.20	18 4.39 4.39		18 53.88	
	− 543		− 543		− 561		− 569		− 565 − 565		− 571	
	4 12.37		5 34.188		15 45.88		16 39.67		58.74 58.74	−8.21 −33.08	18 48.127	−8.27 −32.98
	9.3		8.7		8.4		7.6		9.0 8.9	53 44 9.80 3.68	8.9	
	3 51.5		5 12.0		15 19.6		16 17.7		17 27.2 17 19.4	− 22 − 35	18 32.5	
	53.6		15.8		22.7		21.2			− 94 − 94	35.8	
	56.7		18.3		25.2		23.9			+1168 +1168	38.1	
	118	−3.76	161		75		28			+ 40 + 40	174	
	3 53.93	53 42 10.90	5 15.37	53 20 40.86	15 22.50	53 38 17.54	16 20.93	54 42 10.58	2720 1940	−3570 −3570	18 33.80	54 27 43.35
	+15.57	− 17	+15.93	− 17	+20.70	− 11	+16.17	− 17	+28.90 +36.70	43 4126 3501	+ 9.82	− 3
	1.19229	− 18	1.20222	− 57	1.31597	− 117	1.20871	− 18	1.46090 1.56467		0.99211	− 8
	9.77 2313	+11.65	9.77592	+12.13	9.77 3072	+11.57	9.76 182	+12.72	9.77199		9.76 431	+1247
	1.08722	+ 40	1.10074	+ 30	1.21159	+ 35	1.09313	+ 40	1.35549 1.45926		0.87902	+ 40
	45	−36.70	5	−36.50	45	−36.90	45	−35.90	40		0	−35.70
	0 42.8	41 42.24	2 12.4	20 11.49	4 33.1	37 47.52	0 43.5	41 43.79	3 34.0		0 15.1	27 16.65
	43.6		13.5		32.1		43.4		33.9		15.9	
	64		59		52		9		7.9		10	
	45 43.20 +10		7 12.95		49 32.60		45 43.45		43 33.95		0 15.0 −50	
	37 5.15		15 35.40		33 15.45		37 4.90		39 14.40		22 32.85	
	53 42 23.12 22		53 20 53.97		53 38 33.82		54 42 22.97		53 44 32.47		54 27 50.92	
	− 12.23		− 12.61		− 16.28		− 12.39		− 22.67		− 7.57	
			26						− 28.79	42		
	4 4.35	41 7.9	5 22.17	19 37.2	15 37.71	37 14.2	16 31.41	41 10.6	17 50.53	43 33.6	18 39.90	26 43.7
									50.53	23.6		

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1877, Dec. 12, Dec. 13.

	h m s			h m s			h m s			h m s			h m s			h m s		
α	2 19 29	18 39.9		2 20 26	19 16.6		2 21 41	20 32.5		2 23 17	22 8.2		2 23 57	22 48.5		2 25 22	24 13.0	
δ	54° 24′	19.3	8.2	53° 18′	13.1	8.5	53° 27′	22.4	9.4	53° 41′	36.5	9.0	54° 6′	53 54.8	7.5	52° 16′	12.0	7.0

Dec. 12

+12.54 +10.99 +11.15 +11.09 +10.89 +12.01 +10.73

20 2.1 8.52 | 20 36.0 36.0 6.97 | 21 57.6 7.13 | 23 31.6 31.6 7.07 6.87 | 24 11.3 7.99 | 25 33.8 6.71
5.8 | 39.6 39.6 | 58.3 | 34.0 34.0 | 14.6 | 37.2
9.3 | 42.9 42.8 | 1.7 | 36.3 36.3 | 18.3 | 40.4
12.8 | 46.5 46.5 | 4.8 | 41.7 41.7 | 21.6 | 44.0
16.5 | 48.7 48.8 | 8.6 | 45.6 45.6 | 25.2 | 47.3
465 | 2149 2149 | 80 | 1922 1922 | 910 | 2027
20 9.30 | 4298 4298 | 22 1.60 | 38.44 38.44 | 24 18.20 | 25 40.84
+8.61 +7.51 | +8.61 +8.61 +7.85 | +8.61 +7.55 | +8.67 +8.61 +7.53 +7.53 | +8.61 +7.52 | +8.61 +7.58
−1.10 | −1.06 −1.06 | −1.06 | −1.08 −1.08 | −1.09 | −1.02
20 16.81 | 20 50.53 50.53 | 22 9.15 | 23 45.97 45.97 −8.28 | 24 25.72 | 25 48.13
−5.75 −8.29 | −5.69 −5.69 −8.21 | −5.72 −8.24 | −5.76 −5.76 −32.50 | −5.79 −8.31 | −5.70 −8.20
20 11.06 −32.86 | 20 44.84 44.84 −32.78 | 22 3.43 −32.66 | 23 40.21 40.21 −32.50 | 24 19.93 −32.44 | 25 42.43 −32.28

7.8 | 6.5 9.5 | 9.3 | 9.2 | 7.6 | 7.9
19 31.0 | 20 33.2 33.2 | 21 41.0 | 22 53 42.3 37.4 7.6.4 | 24 35.0 | 25 11.4
39.4 | 35.0 35.0 | 43.3 | 6.3 46.0 −22 −42 | 38.2 | 14.1
37.7 | 38.1 38.1 | 46.4 | 8.6 49.6 −127 −127 | 41.3 | 17.3
131 | 163 163 | 107 | 12.3 1.0 +1218 +1218 | 1151 | 136
19 34.37 54 25 44.70 | 35.43 35.43 53 18 42.56 | 21 43.57 53 28 53.91 | 27.2 17.56 40 +40 | 24 38.37 −54 0 23.91 | 14.53 52 17 44.85
+34.93 − 8.2 +7.55 +7.55 − 2 | +18.03 − 8.4 29.37 +39.91 42 11.34 19.41 | −20.17 − 10 +26.01 − 18
1.54320 − 49 0.87795 0.87795 − 1.12 | 1.25600 − 1.04 1.67760 1.60108 | 1.30471 − 78 1.41514 − .80
9.76466 +12.95 9.77626 9.77626 +11.83 | 9.77456 +11.92 9.77216 9.77216 | 9.76922 +12.49 9.78642 + 10.61
1.43046 + 40 0.77681 0.77681 + 30 | 1.15316 + 35 1.36266 1.49584 | 1.19653 + 40 1.32416 + 30
0 −35.40 5 −35.30 | 55 −35.20 40 | 25 −35.10 10 − 34.70
1 53.6 25 17.82 | 41 19.0 18 14.23 | 3 59.8 28 25.84 | 41 57.1 | 2 59.7 59 56.80 | 0 1.5 17 16.86
53.4 | 18.2 | 58.2 | 55.8 | 58.2 | 2.9
10 | 17.2 | 18.0 | 12.9 | 17.9 | 4.4
1 53.85 50 | 9 18.60 | 58 59.00 | 44 56.115 | 27 58.95 | 10 2.20 −1″
20 52.85 | 13 29.75 | 23 49.35 | 37 51.90 | 54 49.40 | 12 48.15
54 26 11.64 | 53 18 48.54 | 53 29 8.14 | 53 43 10.69 | 54 0 8.19 | 52 18 59.94
− 2.94 | − 5.98 | − 14.23 | −2.85 | + 15.72 | − 21.07
5.98 | −3.32

20 2.77 2445.0 | 20 36.63 17 41.4 | 21 55.19 27 53.2 | 23 31.93 41 38.8 | 24 11.62 59 24.4 | 25 34.23 1644.6

Dec. 13

+12.18 +10.22

20 1.5 8.6 8.42 | 25 33.0 6.46
4.9 8.4 | 86.3
39.7
43.1
46.3
1984

20 8.50 | 25 39.68
+9.27 +8.26 | +9.27 +8.34
−1.01 | −.93
20 16.76 | 25 48.02
−5.74 | −5.69
20 17.02 11.02 −8.29 −32.86 | 25 42.33 −8.20 −32.28

9.0 | 8.5
18 43.2 | 25 55.5
46.9 | 58.4
49.8 | 2.0
199 | 1759
19 46.63 54 25 46.65 | 25 58.63 52 17 43.94
+21.87 − 13 | −18.95 − 10
1.33985 − .52 | 1.27761 − 16
9.76486 + 12.43 | 9.78642 + 10.18
1.22729 + .40 | 1.18663 − 34.30
0 − 35.60 | 10 17 15.60
2 30 25 19.47 | 0 36.6
2.8 | 39.1
58 | 15.4
2 2.90 | 10 37.85
20 45.45 | 12 10.50
54 25 6.352 | 52 17 28.57
− 16.887 | + 15.37
3

20 2.73 2446.6 | 25 34.78 1643.3

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1877. Dec. 12, Dec. 13. Obs. W.A.R. Rec. J.F.M.

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	h m s		h m s		h m s		h m s		h m s	
α	2 26 36	25 26.8	2 31 15	30 58.8	2 31 29	30 19.3	2 32 33	31 23.9	2 33 59	32 49.1
δ	53° 47′	41.7 / 8.5	52° 14′	9.7 / 9.0	52° 15′	10.2 / 7.5	52° 8′	3.4 / 8.5	52° 59′	54.2 / 6.0

Dec. 12

	+12.37		+9.96		+10.51		+9.57		+10.78	
	26 40.0	8.35	31 26.3	5.94	31 40.8	6.49	32 46.1	5.55	34 11.7	6.76
	53.4		29.9		43.3		49.5		15.0	
	57.0		33.3		46.7		52.8		18.3	
	1.3		36.8		50.0		56.2		21.8	
	3.9		40.5		53.6		59.7		25.4	
	2846		1648		2336		2643		9222	
	26 56.92		31 23.36		31 46.72		32 52.86		34 18.44	
	+ 8.61	+7.53	+ 8.61	+7.59	+ 8.61	+7.57	+ 8.61	+7.60	+ 8.61	+7.56
	− 1.08		− 1.02		− 1.02		− 1.01		− 1.05	
	27 4.45	−8.33 / 32.16	31 40.95	−8.26 / 31.66	31 54.31	−8.27 / 31.64	33 0.46	−8.27 / 31.57	34 26.00	−8.36 / 31.36
	− 5.82		− 5.79		− 5.80		− 5.81		− 5.88	
	27 58.63		31 35.16		31 48.51		32 54.66		34 20.12	
	8.2		9.0		7.3		8.3		6.0	
	26 45.3		31 6.3		31 47.0		32 24.0		33 38.2	
	47.8		8.5		57.5		27.2		40.7	
	51.1		12.3		1.2		30.0		43.0	
	1442	−4.02	271		1727		812		21	
	26 48.07	53 47 0.66	31 9.03	52 14 54.29	31 57.57	52 16 49.39	32 27.07	52 8 52.80	33 40.70	53 0 28.43
	+ 8.85	− 2	+ 24.33	− 16	− 10.85	− 3	+ 25.79	− 18	+ 37.74	− 37
	0.946694	− 26	1.386141	− 75	1.035443	− 36	1.411415	− 101	1.576680	− 55
	9.771471	+12.25	9.786911	+ 10.57	9.786588	+ 10.60	9.787888	+ 10.46	9.779920	+ 11.40
	0.841011	+ 40	1.295652	+ 30	0.944612	+ 30	1.321932	+ 30	1.478702	+ 30
	40	−34.80	10	−34.20	10	−34.20	15	−34.10	25	−34.10
	1 0.0	46 34.20	2 53.1	14 26.03	1 25.8	16 21.68	3 53.8	8 24.25	2 9.1	0 1.09
	59.1		53.1		27.3		52.9		8.1	
	1191				131		67		172	
	48° 59.55		12 53.10		11 26.53		18 53.35		27 8.60	
	41 48.80		9 55.25		11 21.80		3 55.60		55 39.75	
	53 47 7.59		52 15 14.09		52 16 40.59		52 9 13.79	31 15.8 / 3.7	53 0 58.54	
	− 6.93		− 19.75		+ 8.80		− 20.99		− 30.11	
	26 50.30	46 2.0	31 26.90	13 54.4	31 40.24	15 50.0	32 46.38	31 23.9 / 3.4	34 11.76	59 29.7
		+11.81		+9.31		+10.05	7 52.7	+9.18 +9.45		+10.46

Dec. 13

	26 49.2	8.05	31 25.6	5.55	31 38.2	6.29	32 35.3 32 48.7	5.42 5.69	34 10.8	6.70
	52.6		28.9		42.6		38.7 48.0		14.3	
	56.1		32.5		46.0		42.0 52.0		17.6	
	59.6		35.8		49.4		45.7 55.8		21.1	
	3.2		39.5		52.8		48.8 59.0		24.5	
	2807		1623		2300		2105 2617		8 83	
	26 56.14		31 32.46		31 46.00		42.10 52.34		34 7.66	
	+ 9.27	+8.29	+ 9.27	+8.34	+ 9.27	+8.34	+9.27 +9.27	+8.35 +8.35	+ 9.27	+8.31
	− 98		− 93		− 93		− 92 − 92	−8.27 / 31.52	96	
	27 4.43	−8.33 / 32.16	31 40.80	−8.26 / 31.66	31 54.34	−8.27 / 31.64	32 50.45 50.69		34 25.97	−8.36 / 31.36
	− 5.80		− 5.78		− 5.79		− 5.80 − 5.80		− 5.87	
	27 58.63		31 35.02		31 48.55		32 44.65 44.89		34 20.10	
	8.6		9.0		8.0		8.6 8.2 52 10 41.44	8 52.00	6.5	
	26 33.7		30 50.0		31 19.3		33 4.6 33 26.4	− 17 − 14	33 32.3	
	37.1		54.0		22.3		8.0 28.2	−101 − 73	55.0	
	40.0		56.9		24.5		10.1 32.0	+1006 +1032	58.0	
	11 08	−3.76	109		61		227 876	+ 30 + 30	153	
	26 56.93	53 47 0.17	30 53.63	52 14 55.49	31 22.03	16 49.21	757 2920	−3420 −3420	33 55.10	53 0 27.07
	+ 19.21	− 9	+ 38.83	− 46	+ 23.97	− 15	−25.47 +23.14	10.12.66 −549	+ 22.56	− .14
	1.283553	− 23	1.589917	− 72	1.379967	− 26	1.406031.364361	23.	1.353384	− 62
	9.771471	+11.73	9.786911	+ 10.93	9.786588	+ 10.69	9.787872 9.787872		9.779301	+ 10.92
	1.177602	+ 40	1.498682	+ 30	1.288852	+ 30	1.316351.274682		1.255241	+ 30
	40	−35.00	10	−34.30	10	−34.30	15 15		25	−34.20
	0 50.9	46 33.22	2 38.9	14 26.74	0 57.1	16 21.21	3 56.1 45.0		2 20.8	59 59.57
	51.5		39.9		58.4		55.1 46.4		21.9	
	2.1		188		155		112 17 114		27	
	40 51.20		12 39.40		10 57.75		18 55.60 45.70		27 21.35	
	41 57.15		10 8.95		11 30.60		3 52.75 2.65		55 27.00	
	53 47 15.22		52 15 24.02		52 17 8.67		52 9 10.82 10 20.72		53 0 45.07	
	− 15.05		− 31.53		− 19.45		+ 20.72 − 18.82		− 18.80	
							− 18.82 + 20.72	9 41.1		
	26 50.30	46 1.1	31 26.76	13 55.1	31 40.28	15 49.6	32 36.38	32 46.6	34 11.74	59 28.2

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	23 43 35	112 46.8	23 44 45	43 56.5	23 46 37	45 47.2	23 52 43	51 52.3	23 54 35	53 44.3	23 56 59	58 8.1		
δ	51° 24	185 8.7	51° 22	16.9 8.4	53° 34	28.3 9.0	52° 51	45.8 7.3	52° 27	21.3 8.2	52° 27	21.6 7.0		

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		+9.78		+8.70		+11.30 +11.36		+9.83		+9.75		+9.82		
	33.1	5.08	47.9	4.60	38.0	7.20 7.26	44.5	5.73	36.8	5.65	1.0	5.72		
	36.6		51.3		42.6		47.8		40.3		4.3			
	38.9		54.5		45.8		51.1		43.8		7.7			
	43.0		57.8		49.5		54.7		47.0		11.0			
	46.5		1.2		53.0		58.8		50.5		14.4			
	1991		27.28		12.51	23.00	65		21.84		38.4			
I ν.	43 39.82		44 54.56		25.02	46.00	52 51.30		54 43.68		59 7.68			
	+ 10.75	+9.85	+ 10.75	+9.85	+ 10.75	+ 10.75 +9.77 +9.77	+ 10.75	+9.80	+ 10.75	+9.82	+ 10.75	+9.82		
	− .79		− .79		− .86	− .86 −5.93	− .83		− .82		− .82			
	− .11		− .11		− .12	− .12 −40.04	− .12		− .11		− .11			
	43 49.67		45 4.41	−5.92	46 34.74	55.77 −5.94	53 1.10	−6.03	54 53.50	−6.06	59 17.50	−6.13		
	− 2.84	−5.91	− 2.86	−40.02	− 2.83	− 2.83 −40.04	− 2.96	−40.08	− 3.00	−40.10	− 3.08	−40.10		
	43 46.83	−40.00	45 1.55		46 31.96	52.94	52 58.14		54 50.50		59 14.42			
	8.8		8.5		7.8 8.9	53 35 42.79 19.81	7.7		7.8		7.6			
	43 20.4		47 28.4		46 47.03	− 8 − 7	52 26.0		54 20.2		58 42.3			
	23.9		31.8		3.9 7.4	3.3 − 59 − 54	29.3		24.0		46.0			
	26.3		34.4		10.0 6.8	+1162 +1162	33.0		26.3		48.4			
	106	−4.10	87	51	21.3 10.5	+ 35 + 35	883		103		16.7			
2 ν	43 23.53	51 26 34.63	44 31.90	25 3.65	7.10 3.50	−3940 −3940	52 29.43	52 53 17.24	54 23.50	52 29 30.60	58 45.57	52 29 48.10		
	+16.29	− 7	+22.66	− 14	17.92 −17.50	35 10.59 38 49.67	+21.87	− 13	+20.18	− 11	+22.41	− .13		
	1.21192	− 35	1.35526	− 731	25334 1.24304		1.33985	− 1.21	1.30492	− 89	1.34459	− 81		
	9.79463	+ 9.35	9.79494	+9.32	9.77236 9.77356		9.78063	+ 10.87	9.78445	+ 10.45	9.78445	+ 10.46		
	1.12915	+ 25	1.27280	+ 25	1.14930 1.13900		1.24308	+ 30	1.21197	+ 30	1.24164	+ 30		
	0	7−38.80		−38.80	50 50		30	−39.40	55	−39.40	55	−39.50		
Kn=−.27	1 17.9	26 0.91	2 43.9	24 29.45	2 10.4 2 1.5		41 32.41	52 43.57	3 20.1	28 56.85	3 1.8	29 14.32		
n=−.63	20.6		46.0		10.5 1.1		32.8		20.8		1.8			
C=−.07	385		99		9 6		12		9					
+5 18.99	1 19.25	3	2 44.95		52 10.45 1.30		31 32.60		58 20.45		58 1.80			
	21 29.10		20 3.40		30 37.90 30 47.05		48 15.75		24 29.90		24 46.55			
	51 26 48.09		51 25 22.39		55 55.89 36 6.04		52 53 39.74		52 29 46.89		52 30 5.54			
	− 13.46		− 8.74		− 14.10 + 13.77		− 14.80		− 16.29		− 17.54			
		209							44					
	43 40.92	25 55.0	44 55.63	23 49.4	46 26.03	34 30.6	52 52.11	52 3.5	54 44.53	28 16.8	59 8.29	28 34.2		
		+9.22		+8.81	47.00	35 7.6 +11.41 +11.46		+9.81		+9.84		+9.87		

Dec. 16

	32.3	5.27	47.1	4.86	38.0	7.46 7.51	43.6	5.86	36.2	5.89	0.3	5.92		
	33.8		50.4		41.7		47.0		39.5		3.7			
	38.1		53.6		45.2		50.6		42.8		6.8			
	42.5		57.0		48.6		54.0		46.2		10.4			
	44.8		0.4		52.1		57.5		49.8		13.8			
	456		2685		12.20 22.46		27		2145		351			
	43 39.12		47 58.70		24.20 45.12		52 50.54		54 48.90		59 7.02			
	+ 11.63	+10.55	+ 11.63	+10.55	+ 11.63 + 11.63	+10.46 +10.46	+ 11.63	+10.49	+ 11.63	+10.52	+ 11.63	+10.52		
	− .97		− .97		− 1.05 − 1.05	−5.93	− 1.02		− 1.00		− 1.00			
	− .11		− .11		− .12 − .12	−40.04	− .12		− .11		− .11			
	43 49.67	−5.91	45 4.25	−5.92	46 34.86	55.58 −5.94	53 1.03	−6.03	54 53.42	−6.06	59 17.54	−6.13		
	− 2.81	−40.00	− 2.83	−40.02	− 2.80	− 2.81 −40.04	− 2.94	−40.08	− 2.98	−40.10	− 3.06	−40.10		
	43 46.86		45 1.42		46 32.06	52.77	52 58.09		54 50.44		59 14.48			
	54 .16					36								
	8.9		8.8		7.9.0	53 35 43.71 20.89	7.3		8.0		7.2			
	43 12.3		44 33.2		46 47 2.8 0.0	− 8 − 8	52 14.8		54 17.4		58 36.2			
	15.2		36.6		6.2 4.0	− 59 − 54	17.9		20.0		38.4			
	19.2		39.0		8.7 6.9	+1173 +1173	20.6		24.0		40.5			
	167	−3.95	188	51	178 10.9	+ 35 + 35	533		14		1141			
	43 15.5	51 26 35.84	44 36.27	25 5.03	5.93 3.63	−3940 −3940	52 17.77	52 53 18.43	54 20.47	52 29 29.34	58 38.03	52 29 46.90		
	+ 23.55	− 14	+ 17.13	− 8	18.47 −18.51	35 11.77 49.08	+ 32.77	− 28	+ 22.13	− 15	+ 28.99	− 22		
	1.37199	− 32	1.24130	− 761	1.26447 1.26741		1.51548	− 1.19	1.35083	− 89	1.46225	− 78		
	9.79463	+ 9.43	9.79494	+9.40	9.77336 9.77306		9.78063	+ 10.98	9.78445	+ 10.56	9.78445	+ 10.57		
	1.28922	+ 25	1.15884	+ 25	1.16243 1.16337		1.41871	+ 30	1.25788	+ 30	1.36930	+ 30		
	0	−3880	0	−38.90	50 50		30	−39.41	55	−39.40	55	−39.60		
	1 9.8	26 2.31	2 45.8	24 28.99 30.99	2 7.9 2 0.0		4 20.09 24.77	52 44.89	3 16.2	28 55.83	2 55.9	29 13.22		
	14.5		50.2		10.5 2.3		56		21.8		58.4			
	243		960		184 23				400		148			
	1 12.15		2 48.00		52 9.20 52 1.15		34 22.80		58 20.00		57 57.15			
	21 36.20		20 0.35		30 39.15 30 47.20		48 25.55		24 28.35		24 51.20			
Kn=−.27	51 26 58.30		51 25 19.45		53 58.25 36 6.30		52 53 44.63		52 29 47.45		52 30 10.30			
n=−.77	− 19.46		− 14.42		− 14.54 + 14.57		− 26.22		− 18.11		− 23.40			
C=−.07														
+5 19.10	43 40.95	25 22.3	44 55.50	23 51.0	46 26.13	34 31.7	52 52.06	52 4.8	54 44.38	28 15.7	59 8.35	28 33.1		
					46.83	35 9.0								

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1877, Dec. 15, Dec. 16. Obs. W.A.R. Rec. J.K.M.

604 605

40

	h m s		h m s		h m s		h m s		h m s		h m s	
α	0 0 33	23 59 42.50	2 48 1 56.0		0 3 35 2 43.7		0 5 7 4 14.9		0 6 7 5 16.9		0 7 0 6 8.1	
δ	54° 3'	53 57.2 9.0	51° 18' 12.1 9.0		51° 32' 26.7 7.1		53° 14' 7.6 9.0		50° 46' 41.0 8.0		53° 45' 39.4 8.2	
Dec. 15		+7.58		+8.68		+8.91		+10.80				+11.93
	0 36.2	7.48 5	2 50.8	4.58	3 38.6	4.81	5 11.0	6.70			7 4.3	7.82
	39.8		54.1		42.0		14.4				7.8	
	43.3		57.3		45.2		17.8				11.3	
	46.7		0.6		48.5		21.3				14.8	
	50.2		3.9		51.9		24.8				18.4	
	2162		2867		2262		8493				5661	
.1	0 43.24		2 57.31		3 45.24		5 17.86				7 11.80	
	+ 10.74	+9.754	+ 10.74	+9.84	+ 10.74	+9.84	+ 10.74	+9.78			+ 10.74	+9.78
	− .87		− .79		− .79		− .84				− .86	
	− .12		− .11		− .11		− .12				− .12	
	0 52.99		3 7.18		3 55.08		5 27.64				7 21.08	
	− 3.09	6.16	− 3.18	6.19	− 3.19	6.20	− 3.20	6.23			− 3.22	6.26
	0 49.90	40.10	3 4.00	40.10	3 51.89	40.10	5 24.44	40.10			7 17.86	40.08
	9.0		9.0		7.8		9.0				8.6	
	0 8.8		2 44.0		3 31.3		4 43.9				6 42.8	
	11.8		46.7		34.0		47.7				46.0	
	15.4		50.1		36.9		50.8				48.6	
	60	−4.10	1408		122		1416				174	
2	0 12.50	54 5 7.09	2 46.93	51 20 7.96	3 34.07	51 34 49.69	4 47.20	53 15 50.12			6 45.80	53 47 22.39
	+ 31.24	− 25	+ 10.41	− 3	+ 11.17	− 3	+ 30.66	− 25			+ 25.52	− 17
	1.49 4471	− 70	1.01 7445	− 76	1.04 8057	− 84	1.48 6577	− 51			1.40 6888	− 11
	9.76 8135	+12139.79 5573		+ 9.22	9.79 3356	+ 9.48	9.77 6777	+ 11.26			9.77 1475	+ 11.80
	1.38 566	+ 40	0.93 578	+ 25	0.96 400	+ 30	1.38 594	+ 30			1.30 095	+ 40
	20	−39.905		−39.91	50	−39.90	10	−39.80			40	−39.90
	2 36.0	4 34.672	50.4	39.40	3 8.4	39.30	1 52.4	15 17.02			0 25.0	46 50.31
	35.9		57.1	19 33.14	8.5	34 15.20	53.4				24.9	
	11.0		15		9		58				9.9	
3	22 35.95		7 50.75		53 8.115		11 52.90				40 24.95	
	0 12.40		14 57.60		29 39.90		10 55.45				42 23.40	
	54 5 31.39		51 20 16.59		51 34 58.89		53 16 14.44				53 47 42.39	
	− 24.30		− 8.63		− 9.40		− 24.32				− 20.00	
	0 43.74	3 54.6	2 57.81	18 53.0	3 45.69	33 35.1	5 18.21	14 36.9			7 11.60	46 10.2
Dec. 16		+11.55		+8.76		+8.81		+11.00		+7.74		+12.09
	0 35.3	7.60	2 50.4	4.81	3 37.9	4.86	5 10.3	7.05	6 11.7	3.79	7 3.7	8.141
	38.8		53.6		41.4		13.8		15.0		7.3	
	42.2		56.7		44.7		17.0		18.2		10.8	
	45.8		59.8		48.0		20.5		21.5		14.0	
	49.4		3 3		51.2		24.0		24.9		17.9	
	2115		2838		2232		8556		9131		5371	
	0 42.30		2 56.76		3 44.64		5 17.12		6 18.26		7 10.74	
	+ 11.62	+10.44	+ 11.62	+10.55	+ 11.62	+10.54	+ 11.62	+10.47	+ 11.62	+10.56	+ 11.62	+10.45
	− 1.06		− .96		− .97		− 1.03		− .95		− 1.05	
	− .12		− .11		− .48		− .12		− .11		− .12	
	0 52.74	6.16	3 7.31	6.19	3 55.58	6.20	5 27.59	6.23	6 28.82	6.23	7 21.79	6.26
	− 3.06	40.10	− 3.15	40.10	− 3.16	40.10	− 3.17	40.10	− 3.22	40.10	− 3.19	40.08
	0 49.68		3 4.16		3 52.02		5 24.42		6 25.60		7 18.00	
	8.8		9.0		7.5		9.1		7.5		8.5	
	0 1.5		2 44.7		4 0.6		4 48.4		5 48.0		7 0.5	
	5.3		47.1		4.4		51.3		53.0		4.9	
	8.2		49.6		7.0		55.2		58.1		7.8	
	15 0	−3.95	214		120		49		67		13 2	
	0 5.02	54 5 7.93	2 47.13	51 20 7.02	4 4.01	51 34 50.31	4 51.43	53 15 50.28	5 52.23	50 48 37.89	7 4.40	53 47 23.18
	+ 37.30	− 37	+ 9.63	− 3	− 19.36	− 10	+ 25.49	− 17	+ 26.03	− 18	+ 6.34	− 1
	1.57 1741	− 68	0.98 363	− 78	1.28 6988	− 97	1.40 6342	− 51	1.41 5447	− 1.11	0.80 209	− 19
	9.76 8135	+12.25	9.79 573	+ 9.32	9.79 3356	+ 9.38	9.77 6777	+ 11.38	9.80 058	+ 8.38	9.77 1447	+ 11.94
	1.46 266	+ 35	0.90 196	+ 25	1.20 293	+ 30	1.30 574	+ 30	1.33 865	+ 25	0.69 616	+ 35
	20	−39.905		−39.30	50	−39.40	10	−39.80	35	−39.30	40	−40.00
	2 29.6	4 35.63	2 51.1	19 32.53	3 31.5	34 15.77	1 54.8	15 17.53	4 7.4	48 1.88	0 37.1	46 57.32
	31.4		53.8		34.7		59.1		9.1		41.5	
	610		49		62		139		165		786	
	22 30.50		7 52.48		53 33.10		11 56.65		39 8.25		40 39.36	
	0 17.85		14 55.90		29 15.25		10 51.40		43 4010		42 9.05	
	54 5 34.95		51 20 15.00		51 34 34.35		53 16 10.50		50 48 59.20		53 47 28.15	
	− 29.02		− 7.98		+ 15.96		− 20.22		− 21.81		− 4.97	
	0 43.52	3 55.5	2 57.97	18 52.4	3 45.82	33 35.7	5 18.19	14 37.4	6 19.37	47 21.8	7 11.74	46 11.2

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	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	0 8 15	0 17 25	0 22 5	0 25 6	0 26 5	0 27 15		
δ	53° 22′	52° 32′	52° 37′	52° 8′	54° 12′	54° 15′		

Dec. 15

	8	18.9		6.40	17	27.9		5.45	22	10.0		5.70	24	44.6		5.51	26	8.3		7.18	27	19.9		8.03
		22.6				31.3				13.5				47.9				11.8				23.4		
		25.8				34.5				16.7				51.3				15.4				26.9		
		29.3				38.2				20.3				54.6				18.8				30.5		
		32.9				41.5				23.6				58.0				22.5				33.9		
		12.95				17.34				8.41				6.41				7.68				13.46		
	8	25.90			17	34.68			22	16.82			24	51.28			26	15.36			27	26.92		
	+	10.74	+9.77		+	10.74	+9.81		+	10.74	+9.81		+	10.74	+9.82		+	10.74	+9.74		+	10.74	+9.74	
	−	.85			−	.82			−	.82			−	.81			−	.88			−	.83		
	−	.12			−	.11			−	.11			−	.11			−	.12			−	.12		
	8	35.67	+6.13		17	44.49			22	26.63			25	1.10			26	25.10			27	36.66		
	−	3.25		6.28	−	3.42		6.41	−	3.52		6.48	−	3.56		6.57	−	3.58		6.57	−	3.61		6.59
	8	32.42		40.08	17	41.07		4000	22	23.11		3992	24	57.54		39.86	26	21.52		3984	27	33.05		3982
	7.0				8.3				9.0				6.8				7.0				9.1			
	7	50.0			17	10.8			21	48.0			24	36.8			25	38.7			26	44.3		
		53.8				13.9				2.7				40.0				41.8				48.8		
		56.0				16.7				5.8				43.0				44.6				1.4		
		98				115				75				1149				51				1755		
	7	53.27	53 24 1439		17	13.83	52 33 3503		21	2.50	52 89 382		24	39.97	52 10 12.19		25	41.70	54 13 3555		26	38.50	54 16 2343	
		+32.63	− 28			+20.85	− 12			+14.32	− 5			+11.31	− 3			+33.66	− 29			+28.42	− 21	
		1.51362	− 92			1.31911	− 1.16	1.15594		− 1.05	1.05346			− 76				1.52711	− 1.11			1.45362	− 38	
		9.77541	+ 11.40			9.78379	+ 10.53	9.78296		+ 10.61	9.78772			+ 10.10				9.76677	+ 1228			9.76642	+ 1202	
		1.41163	+ 30			1.22550	+ 30	1.06150		+ 30	0.96378			+ 30				1.41648	+ 40			1.34264	+ 40	
	0		−39.90		60		−39.80		45		−39.90		15		−39.80		10		−4020		10		−4020	
	3	26.4	23 40.89		4	14.9	33 0.68		3	51.4	38 29.63		2	45.1	9 37.90		4	6.3	13 2.53		1	21.7	15 51.26	
		24.6				16.1				52.6				46.8				5.1				22.1		
		14.3				110				40				119				11 4				38		
	3	27.15			54	15.50			48	52.00			17	45.95			14	5.70			11	21.90		
	19	2120			28	3285			33	5635			5	2.40			8	4265			11	26.45		
	53	24 4019			52	33 5184			52	39 1534			52	10 21.39			54	14 1.64			54	16 4544		
		− 2580				− 1681				− 1152				− 9.20				− 2609				− 2201		
	8	26.14	23 0.8		17	34.66	32 20.7		22	16.63	37 49.7		24	51.02	8 58.0		26	14.95	12 22.7		27	26.46	15 11.4	
			+10645				+9.70				+982				+9.41				+1150				+1231	

Dec. 16

	8	18.1		6.70	17	27.1		5.75	22	7.3		5.87	24	43.7		5.76	26	7.4		7.55	27	18.0		8.36
		21.8				30.5				12.9				47.2				11.0				22.4		
		25.0				34.0				16.3				50.6				14.5				26.4		
		28.6				37.5				19.7				53.7				18.0				29.8		
		32.2				40.9				23.0				57.3				21.6				33.4		
		12.57				17.00				8.12				5.25				7.25				13.10		
	8	25.14			17	37.00			22	16.24			24	50.50			26	14.50			27	26.20		
	+	11.62	+10.46		+	11.62	+10.51		+	11.62	+10.57		+	11.62	+10.52		+	11.62	+10.43		+	11.62	+10.43	
	−	1.04			−	1.00			−	1.00			−	.99			−	1.07			−	1.07		
	−	.12			−	.11			−	.11			−	.11			−	.12			−	.12		
	8	35.60		6.28	17	23.49		6.41	22	26.84		6.48	25	1.02		6.52	26	24.43		6.57	27	36.63		6.59
	−	3.22		4008	−	44.51		4000	−	3.49		3992	−	3.54		3986	−	3.56		3984	−	3.58		3982
	8	32.38			17	41.11			22	23.26			24	57.48			26	21.37			27	33.05		
					−	3.40																		
	7.4				8.8				9.1				5.0				6.0				9.0			
	7	50.2			17	11.6			21	43.5			24	26.6			25	46.2			26	58.7		
		52.4				14.8				47.2				29.8				48.0				2.7		
		56.8				18.2				50.5				32.4				51.3				6.3		
		94				146				1412				888				1465				77		
	7	53.13	53 24 1449		17	14.87	52 33 3543		21	47.07	52 89 398		24	29.60	52 10 11.80		25	48.83	54 13 3585		27	2.57	54 16 2275	
		+32.01	− 27			+19.13	− 9			+29.17	− 22			+20.90	− 12			+25.67	− 17			+23.63	− 15	
		1.50526	− 92			1.28171	− 1.16	1.46494		− 1.00	1.32015			− 70				1.40943	− 113			1.37346	− 38	
		9.77541	+ 11.54			9.78379	+ 10.65	9.78296		+ 10.74	9.78772			+ 10.23				9.76677	+ 12.45			9.76642	+ 1249	
		1.40330	+ 30			1.18810	+ 30	1.37050		+ 30	1.23047			+ 30				1.29880	+ 35			1.26248	+ 35	
	0		−39.90		50		−39.90		05		−40.00		15		−39.90		10		−4030		10		−4030	
	8	26.2	23 41.29		4	15.0	33 1.28		3	38.5	38 29.85		2	37.1	9 37.66		4	10.5	13 3.10		1	25.0	15 5081	
		29.1				18.2				41.5				40.2				12.9				27.8		
		15.3				13.2				800				7.73				3.4				728		
	3	27.65			54	16.60			48	40.00			17	31.65			14	11.70			11	26.40		
	19	3070			28	31.75			34	8.35			5	9.70			8	36.65			11	21.55		
	53	24 3980			52	33 5885			52	39 2745			52	10 28.80			54	13 5875			54	16 4105		
		− 2531				− 1542				− 2347				− 1709				− 1990				− 1830		
	8	26.10	23 1.2		17	34.70	32 21.3		22	16.78	37 49.9		24	50.96	8 57.8		26	14.80	12 23.3		27	26.46	15 11.0	

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42

3251.8

α	h m s			h m s			h m s			h m s			h m s			h m s			h m s						
	0 28 40	27	448	0 29 40	28	450	0 30 22	29	26.8	0 30 59	30	7.5	0 33 56	33	0.1	0 34 39	33	43.8						
δ	55° 1′		54.7	54° 16′		9.9	54° 32′		26.0	50° 45′		39.7	52° 5′		58.6	53° 21′		15.0						
			7.6			6.8			7.7			9.0			7.0			9.0						
Dec. 15		+13.12			+12.39			+11.91			+8.54			+8.92			+11.57								
	28 42.7	9.02		29 42.4	8.29		30 25.5	7.81		31 6.4	4.44		33 51.8	4.82		34 44.8	7.47								
	46.4			46.0			28.6			9.5			55.2			48.3									
	50.0			49.4			32.3			12.9			58.7			51.7									
	53.5			52.9			35.8			16.2			1.8			55.0									
	57.3			56.5			39.4			19.4			5.5			58.5									
	2499			472			1616			644			2930			83									
	28 49.98			29 49.44			30 32.32			31 12.88			33 58.60			34 51.66									
	+ 10.74	+9.72		+ 10.74	+9.74		+ 10.74	+9.74		+ 10.74	+9.86		+ 10.74	+9.82		+ 10.74	+9.78								
	− .40			− .88			− .88			− .77			− .81			− .84									
	− .12			− .12			− .12			− .11			− .11			− .12									
	28 59.70	663		29 59.18	663		30 42.06	664		31 22.74	659		34 8.42	665		35 1.44	669								
	− 3.63	3980		− 3.65	3976		− 3.66	3976		− 3.68	3974		− 3.73	3966		− 3.74	3964								
	28 56.07			29 55.53			30 38.40			31 19.06			34 4.69			35 57.70									
	8.0			7.3			7.7			8.9			9.2			9.0									
	28 11.1			29 17.8			30 19.7			31 30.0			33 16.9			34 30.0									
	13.5			20.8			23.4			34.0			20.0			33.5									
	18.0			23.4			25.8			36.3			22.8			36.7									
	146	−4.10		21			89			103			597			102									
	28 14.87	55 2 17.11		29 20.70	54 17 21.09		30 22.47	54 33 26.70		31 33.43	50 47 28.57		33 19.90	52 8 34.70		34 33.40	53 22 49.45								
	+ 35.11	− 31		+ 28.74	− 22		+ 9.35	− 3		− 20.55	− 12		+ 38.70	− 39		+ 18.26	− 8								
	1.54 5443	− 10		1.45 8449	− 10		0.97 081	− 124		1.31 2814	− 24		1.55 7741	− 108		1.26 1506	− 3								
	9.75 8223	+ 1314		9.76 6259	+ 12.32		9.76 342	+ 1263		9.80 089	+ 865		9.78 788	+ 1009		9.77 558	+ 11.38								
	1.42 626	+ 40		1.34 734	+ 40		0.85 683	+ 55		1.23 630	+ 25		1.49 819	+ 30		1.15 968	+ 30								
	25	− 40 40 10			− 40 30 50			− 40 30 40			− 39 60 15			− 39 80 5			− 40 10								
	0 23.0	1 45.73		0 23.6	16 49.08		4 34.1	32 55 21		0 56.3	46 53 41		4 1.5	7 59.82		0 3.1	22 16.82								
	24.1			24.4			32.8	54		55.7			0.8			3.8									
	25 7.1			8.0			6.9			12.0			2.3			9									
	25 23.53			10 24.00			54 33.45			40 56.80			19 1.15	10		5 3.45									
	57 24.80			12 24.35			28 14.90			41 52.35			3 47.20			17 44.90									
	55 2 43.77			54 17 43.34			54 33 33.89			50 47 11.34			52 9 6.19			53 23 3.89									
	− 26.68			− 22.25			− 7.19			+ 17.23			− 31.49			− 14.44									
	28 49.44	1 5.9		29 48.90	16 9.3		30 31.76	32 14.4		31 12.47	46 13.7		33 58.04	7 20.2		34 51.01	21 37.2								
Dec. 16		+13.35			+12.58			+12.09			+9.92			+9.28			+11.76									
	28 42.0	9.40		29 41.8	8.63		30 24.5	8.14		31 14.1	3.97		33 51.0	5.33		34 44.2	7.81								
	45.7			45.1			28.2			17.6			54.3			47.4									
	49.3			48.7			31.6			21.0			57.6			50.8									
	52.8			52.2			35.2			24.0			1.0			54.3									
	56.5			55.8			38.7			27.4			4.4			57.7									
	463			436			1582			41			2883			44									
	28 49.26			29 48.72			30 31.64			31 20.82			33 57.66			34 50.88									
	+ 1162	+10.40		+ 1162	+10.43		+ 1162	+10.42		+ 1162	+10.56		+ 1162	+10.52		+ 1162	+10.47								
	− .10			− 1.07			− 1.08			− .95			− .99			− 2.03									
	− .12			− .12			− .12			− .11			− .11			− .12									
	28 59.66	663		29 59.15	663		30 42.06	664		31 31.38			34 8.18	665		35 1.35	669								
	− 3.61	3980		− 3.63	3976		− 3.64	3976		− 3.66			− 3.71	3966		− 3.72	3964								
	28 56.05			29 55.52			30 38.42			31 27.72			34 4.47			35 57.63									
	6.0			6.7			7.3			9.3			8.8			8.9									
	28 14.0			29 22.7			30 18.8			31 40.5			33 37.4			34 34.2									
	18.0			26.3			21.8			44.4			40.4			37.0									
	21.3			28.8			27.8			46.7			42.9			41.6									
	533	−3.95		178			84			116			07			1148									
	28 17.77	55 2 16.72		29 23.93	54 17 20.31		30 22.80	54 33 26.10		31 43.57	50 49 46.06		33 40.23	52 8 33.77		34 38.27	53 22 50.27								
	+ 31.49	− 25		+ 22.79	− 14		+ 8.84	− 2		− 23.05	− 14		+ 17.43	− 8		+ 12.61	− 5								
	1.49 814	− 10		1.35 744	− 13		0.94 6445	− 124		1.36 2647	− 100		1.24 1430	− 116		1.10 072	− 3								
	9.75 823	+ 1331		9.76 625	+ 12.50		9.76 342	+ 1280		9.80 043	+ 881		9.78 788	+ 1022		9.77 558	+ 11.54								
	1.37 900	+ 40		1.24 659	+ 35		0.83 247	+ 55		1.28 570	+ 25		1.15 178	+ 30		0.99 890	+ 30								
	25	− 40 50 10			− 40 30 50			− 40 35 40			− 39 60 15			− 39 90 5			− 40 20								
	0 25.3	1 45.62		0 27.9	16 48.64		4 33.9	32 53.86		3 38.9	49 10.43		4 17.9	7 59.20		0 6.1	22 17.86								
	28.3			31.1			35.2	54		42.5			21.1			8.3									
	136			540			91			812			390			144									
	25 26.80			10 29.50			54 34.55			38 40.70			19 16.50			5 7.20									
	57 21.55			12 18.85			28 13.80			44 7.65			3 28.85			17 41.15									
	55 2 40.65			54 17 37.95			54 33 32.90			50 49 26.75			52 8 47.93			53 23 0.25									
	− 23.93			− 17.64			− 6.80			+ 19.31			− 14.18			− 4.98									
	28 49.42	1 5.8		29 48.89	16 8.9		30 31.78	32 14.1					33 57.82	7 19.5		34 50.94	21 38.2								

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	h m s		h m s		h m s		h m s		h m s		h m s	
α	0 40 51	39 54.1	0 44 30	43 35.6	0 46 12	45 11.2	0 48 41	47 42.7	0 49 3	48 4.7	0 52 11	51 12.5
δ	51° 39′	33.4	50° 12′	49 51.8	51° 44′	53.8	53° 25′	19.4	55° 7′	20	54° 4′	53 59.5
		8.8		9.2		9.3		8.5		8.2		8.8

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		+9.10		+7.40		+9.52		+11.35		+12.69		+12.16
	40 33.3	5.00	44 31.8	3.80	46 27.6	5.42	48 45.1	7.25	49 8.6	8.58	52 17.1	8.06
	38.7		35.0		31.0		48.4		12.2		20.3	
	2.0		38.2		34.3		52.0		15.7		24.0	
	5.3		41.4		37.7		55.5		19.3		27.4	
	8.7		44.7		41.1		59.0		23.2		31.0	
	100		411		1717		2600		790		1198	
	41 2.00		44 38.27		46 34.34		48 52.00		49 15.80		52 23.98	
	+ 10.74	+9.83	+ 10.74	+9.88	+ 10.74	+9.83	+ 10.74	+9.78	+ 10.74	+9.72	+ 10.74	+9.75
	− .80		− .75		− .80		− .84		− .90		− .87	
	− .11		− .11		− .11		− .12		− .12		− .12	
	41 11.83	−6.75	44 48.10		46 44.17	−6.83	49 1.78	−6.91	49 25.52	−6.96	52 33.71	
	−3.86	−39.46	+3.92		−3.96	−39.28	−4.01	−39.20	−4.04	−39.18	−4.09	−6.98
	41 7.97		44 44.18		46 40.21		48 57.77		49 21.48		52 29.62	−39.06
	8.8		9.4		9.6		8.7		8.4		8.8	
	40 18.5		44 3.2		46 10.4		48 21.8		48 25.7		52 45.6	
	22.3		6.0		13.0		24.6		28.4		49.0	
	25.1		8.2		15.0		27.5		32.0		51.9	
	59		174		84		139		861		1465	
	40 21.97	51 41 10.82	44 58.1	50 10 39.11	46 12.80	51 46 30.12	48 24.68	53 26 56.77	49 28.70	55 9 40.21	52 48.83	54 7 25.77
	+40.03	− 42	+32.42	− .29	+ 21.54	− 13	+ 27.37	− 20	− 12.90	− 5	− 24.87	− 16
	1.60239	− 38	1.51081	− .54	1.33325	− 35	1.48724	− 22	1.11059	− 97	1.39568	− 27
	9.79240	+ 9.60	9.80641	+ 8.03	9.79144	+ 9.70	9.77490	+ 11.47	9.75678	+ 13.31	9.76885	+ 12.89
	1.51739	+ .30	1.43982	+ .20	1.24729	+ .30	1.33477	+ .30	0.98997	+ .40	1.28628	+ .40
		−39.70		−39.40		−39.70		−40.00		−40.40		−40.10
	45		45		46		46		45		48	
	1 22.7	40 36.12	2 05	10 3.01	1 18.6	45 55.84	0 48.41	26 24.02	3 37.1	9 8.40	1 1.5	6 53.13
	24.5		09		205		49.5		36.4	39	1.5	
	72		11		391		179		138			
	46 23.60		17 0.70		41 19.55		0 48.95		18 36.90		21 1.50	
	36 24.75		5 47.65		41 28.80		21 59.40		4 11.45		1 46.85	
	51 41 43.74		50 11 6.64		51 46 47.79		53 27 18.37		55 9 30.41		54 7 58.4	
	− 32.92		− 27.53		− 17.67		− 21.62		+ 9.77		+ 19.33	
	41 1.22	39 56.7			46 33.38	45 16.6	48 50.86	25 44.8	49 14.52	8 29.2	52 22.64	6 14.1
		+9.43			E.L.	+9.54		+11.55		+12.50		+12.11

Dec. 16

	40 54.7	5.48			46 ~~28.2~~	5.59	48 44.5	7.60	48 ~~7.7~~	8.85	52 15.8	8.16
	57.9				33.4 ~~26.8~~		47.8		11.3		19.9	
	1.3				33.9 30.6		51.2		14.9		23.0	
	4.4				33.9 33.9		54.9		18.7		26.6	
	7.8				33.8 ~~37.1~~		58.4		22.5		30.2	
	61				33.3 ~~39.9~~		69		251		1155	
	41 1.22				46 ~~30.32~~	33.66 +.01	48 51.38		49 15.02	10.	52 23.10	10.
	+ 1162	10.53			+ 1162	+10.53	+ 1162	+10.47	+ 1162	+8.40	+ 1162	+8.44
	− .98				− .98		− 1.03		− 1.10		− 1.06	
	− .11				− .11		− .12		− .12		− .12	
	41 11.75	−6.75			46 ~~40.85~~	44.19	49 1.85	−6.91	49 25.42	−6.96	~~5 11.54~~	
	−3.84	−39.46			−3.93		−3.99	−39.20	−4.02	−39.18	52 33.54	−6.98
	41 7.91				46 ~~36.92~~	40.26 −6.83	49 ~~56.86~~		49 21.40		−4.07	−39.06
						−39.28	48 57.86				52 29.47	
	8.7				9.6		8.6		8.0		8.8	
	40 34.0				45 55.3		48 25.8		49 31.3		52 53.7	
	36.7				37.7		30.3		34.3		56.7	
	40.0				0.0		32.8		37.4		0.0	
	1107				1730		889		130		1704	
	40 36.40	51 41 10.05			45 57.67	51 46 30.07 ~~39.42~~	48 29.43	53 26 56.77	49 34.33	55 9 40.73	52 56.80	54 7 25.10
	+ 24.32	− 16				− 28	+ 21.75	− 13	− 19.31	− 9	− 33.70	− 29
	1.38596	− 43			+3599 ~~+32.65~~	− 30	1.33746	− 24	1.28578	− 150	1.52763	− 30
	9.79240	+ 9.72			~~5.18~~	+ 9.82	9.77490	+ 11.62	9.75678	+ 13.49	9.76800	+ 12.35
	1.30096	+ .30			~~1.55~~ 9.79144	+ .30	1.23496	+ .30	1.16516	+ .40	1.41823	+ .35
		−39.80			~~+43.92~~	− 39.80		− 40.10		− 40.40		− 40.20
	45				40 1.470 22		45		45		48	
	1 35.9	40 35.73			1 6.3	45 ~~57.98~~	0 51.5	26 24.27	3 40.0	9 9.18	20 71	6 53.06
	38.9				94	55.86	55.5		42.7		1 160	
	1.18				15.		70		2.4		1.41	
	46 37.40				41 4.85		0 53.50		18 41.35		21 6.55	
	36 10.95				41 40.50		21 54.85		4 7.00		1 39.80	
	51 41 30.05				51 46 59.60		53 27 13.95		55 9 24.10		54 6 ~~38.90~~	
	− 2.00				− ~~2.44~~		− 17.18		+ 14.63		+ 26.20	
					−29.53							
	41 1.16	39 56.3			46 33.43	45 16.6	48 50.95	25 45.1	49 14.44	8 30.0	52 22.49	6 14.0

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1877phae.proj.1617R

624 605

1877, Dec. 15, Dec. 16. Obs. W.A.R. Rec. by J.M.

44

	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	0 52 17	51 183 0	53 34	52 353	1 2 10	1 9.8	1 3 18
	2 18.0	1 9 11	8 11.5	1 11 6	10 6.4		
δ	54° 2′	53 57 0	54° 51′	44.8	54° 3′	53 58.2	54° 29′
	22.6	53° 5′	.0.1	53° 5′	0.5		
	88	8.5	7.0	4.8	8.3	9.0	
	8						

Dec. 15

	+11.38		+12.95		+11.77	+12.06	
	52 22.3	7.26	53 39.4	[illegible]	2 16.0	7.67	3 24.1
	25.8		43.0		19.6		28.4
	27.6		46.8		23.2		31.9
	32.9		50.3		26.5		35.6
	36.3		54.0		30.2		38.0
	470		336		1155		98
	52 24.40		53 46.72		2 23.10		3 21.96
	+ 10.74	+9.75	+ 10.74	+9.73	+ 10.73	+9.74	+ 10.73
	− .87		− .89		− .87		− .88
	− .12		− .12		− .12		− .12
	52 39.15	−6.98	53 56.45	−7.03	2 32.84	−7.14	3 41.69
	− 4.09	−3906	− 4.12	−3902	− 4.28	−3864	− 4.31
	52 35.06		53 52.33		2 28.56		3 37.38

	8.7		8.7 E.K.		8.0		6.0
	47 10.0		53 16.1		1 58.0		2 36.7
	53.0		18.2		0.3		39.4
	56.2		21.0		3.9		2.4
	92	−4.10	571		22		1782
	51 53.07	54 4 3483	53 1903	54 51 52.02	2 0.73	54 5 2434	2 59.40
	+36.33	− 35	+ 27.69	− 20	+22.37	− 13	+32.56
	1.56027	− 84	1.44232	− 24	1.34967	− 65	1.51268
	9.76835	+ 1215	9.75985	+1299	9.76835	+ 1215	9.76395
	1.45122	+ 40	1.32477	+ 40	1.24062	+ 40	1.39923
	20	−40010	35	−40020	20	−39.90	55

	3 4.9	4 1.99	0 52.2	51 2067	2 25.3	4 52.11	2 26.1
	3.6		52.2		25.9		28.1
	8.5				12		
	23 4.25		35 54.20		22 25.60		57 28.10
	59 44.10		46 54.15		0 22.75		25 20.25
	54 5 30.9		54 52 13.14		54 5 41.74		54 30 39.24
	− 28.26		− 21.12		− 17.40		− 2.50

	52 28.08	3 22.8	53 45.30		2 21.42	4 13.5	3 30.21
		+11.58		+13.39		+11.93	
	52 21.6	7.63	53 38.8	9.44	2 15.4	7.98	3 24.1
	25.0		42.4		18.8		27.8
	28.7		45.8		22.7		31.3
	32.0		49.5		26.0		34.8
	35.8		53.2		29.6		38.3
	432		2297		1125		1563
	52 28.64	78	53 45.94		2 22.50		3 31.26
	+ 11.62	+8.44	+ 11.62	+10.41	+ 11.62	+10.44	+ 11.62
	− 1.06		− 1.09		− 1.06		− 1.08
	− .12		− .12		− .12		− .12
	52 39.08	−6.98	53 56.35	−7.03	2 32.94	−7.14	3 41.68
	− 4.07	−3906	− 4.10	−3902	− 4.26	−3864	− 4.29
	52 35.01		53 52.25		2 28.68		3 37.39

	8.7		8.6		7.0		5.0
	51 55.8		53 27.0		2 8.4		2 58.3
	58.9		29.0		11.6		1.9
	2.0		31.6		14.2		5.0
	1777	−3.95	876		42		62
	51 56.23	54 4 3534	53 29.20	54 52 31.38	2 11.40	54 5 2382	3 2.07
	+29.41	− 22	+16.74	− 7	+11.10	− 3	+29.19
	1.46850	− 86	1.22376	− 3.11	1.04532	− 70	1.46523
	9.76835	+1231	9.75985	+1311	9.76835	+1231	9.76395
	1.35945	+ 35	1.10621	+ 40	0.93627	+ 35	1.35178
	20	−40020	35	−4a3020		−40000	55

	3 8.0	4 2.80	0 21.7	52 052	2 34.0	4 51.80	2 29.8
	10.4		24.9		36.8		31.9
	18.4		66		100		64.4
	23 9.20		35 23.30		22 35.00		57 30.85
	59 39.15		47 25.05		0 13.35		25 17.50
	54 4 58.25		54 52 44.15		54 5 32.45		54 20 36.60
	− 22.88		− 12.77		− 8.63		− 22.48

	52 28.03	3 23.7	53 45.22	51 21.5	2 21.54	4 13.2	3 30.22

	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	2 18.0	1 9 11	8 11.5	1 11 6	10 6.4		
δ	22.6	53° 5′	.0.1	53° 5′	0.5		
	4.8		8.3		9.0		

	+12.06		+11.35		+10.01		
	7.96	9 18.5	7.23	11 14.8	5.91		
		22.0		18.0			
		25.4		21.8			
		28.8		25.0			
		32.2		28.6			
		1269		82			
	+9.73	9 25.38	+9.77	11 21.64	+9.77		
		+ 10.73		+ 10.73			
		− .84		− .84			
		− .12		− .12			
	−7.17	9 35.15	−7.21	11 31.41	−7.23		
	−3858	− 4.39	−3828	− 4.43	−3818		
		9 30.76		11 26.98			

	8.1			9.0			
	9 11.8			10 50.6			
	14.0			53.8			
	16.1			56.2			
	119			106			
	9 13.97	53 7 4096		10 53.53	53 8 982		
	− 28	+ 11.41	− 3	+ 28.11	− 21		
	− 65	1.05729	− 8	1.44886	− 124		
	+ 12.59	9.77812	+ 11.14	9.77812	+ 11.16		
	+ 40	0.95801	+ 30	1.34958	+ 30		
	−4000	20	−3960	15	−39.50		

	29 42.13	0 16.7	7 8.59	4 35.4	7 36.23		
		17.0		34.9			
		14.6		10.3			
		20 17.30		19 35.15			
		2 31.05		3 13.20			
		53 7 50.04		53 8 32.19			
		− 9.08		− 22.37			

	29 3.6	9 23.56	6 30.3	11 19.75	6 58.0		
	+12.38		+11.45		+10.14		
	8.35	9 17.7	7.50	11 14.0	6.22		
		21.1		17.6			
		24.8		21.0			
		28.2		24.4			
		31.8		27.8			
		238		48			
	+10.42	9 24.76	+10.48	11 20.96	+10.48		
		+ 11.62		+ 11.62			
		− 1.02		− 1.02			
		− .12		− .12			
	−7.17	9 35.24	−7.21	11 31.44	−7.23		
	−3858	− 4.37	−3828	− 4.41	−3818		
		9 30.87		11 27.03			

	9.0			9.0			
	9 26.0			10 50.6			
	28.6			54.7			
	33.0			57.2			
	886			125			
	9 29.53	53 7 3880		10 54.17	53 8 813		
	− 4.77	− 1		+26.79	− 19		
	0.67852	− 13		1.42797	− 124		
	+ 1129	9.77812		9.77812	+ 11.30		
	+ 30	1.32869			+ 30		
	−3960	15			−39.60		

	29 42.47	0 30.7	7 6.70	4 37.1	7 34.75		
		34.2		38.9			
		4.9		16.0			
		20 32.45		19 38.00			
		2 15.90		3 10.35			
		53 7 35.00		53 8 29.45			
		+ 3.80		− 21.32			

	29 3.9	9 23.66	6 28.4	11 19.80	6 56.6		

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	h m s		h m s		h m s		h m s		h m s		h m s	h m s
α	1 12 25	11 26.7	1 13 16	12 15.5	1 14 4	13 2.8	1 15 18	14 16.3	1 17 11	16 9.1	1 18 40 17 37.2	1 30 41 29 37.5
δ	51° 28′	22.1 7.0	53° 2′	52 56.2 9.5	52° 19′	13.4 8.8	52° 46′	42.6 8.5	52° 32′	26.5 8.7	52° 28′ 22.5 7.4	52° 37′ 32.2 8.7

Dec. 15

+9.75 5.65

Dec. 15
30 49.4
53.1
56.3
59.4
2.7
28.09
30 56.18
+9.99 + 10.73
− 83
− .11
31 5.97
− 4.66
77
31 1.20
−7.50
−37.00
30 28.6
31.6
35.8
6.0
52 39 1.09 30 32.00
− 15 +24.18
− 103 1.38346
+ 10.63 9.78296
+ .30 1.28902
−38.70 45
38 28.04 3 46.2
49.4
13.6
48 46.80
34 1.55
52 39 20.54
19.45
37 51.0 30 53.70

Dec. 16

+8.87 / 4.92	+10.30 / 6.35	+9.96 / 6.01	+10.52 / 6.57	+9.76 / 5.81	+9.94 / 5.99
12 32.5, 34.9, 38.3, 42.5, 45.9, 461	13 22.9, 26.2, 29.8, 33.2, 36.3, 484	14 8.8, 12.5, 15.7, 19.3, 22.6, 789	15 23.8, 27.1, 30.6, 34.0, 37.6, 32	17 16.9, 20.3, 23.8, 27.1, 30.4, 1185	18 45.0, 48.3, 51.8, 55.2, 58.4, 87
12 39.22 + 11.62 +10.54 − 97 − .11	13 29.68 .48 + 11.62 +10.58 − 1.02 − .12	14 15.78 + 11.62 +10.51 − .99 − .11	15 30.64 + 11.61 +10.47 − 1.02 − .12	17 23.70 + 11.61 +10.50 − 1.00 − .11	18 51.74 + 11.61 +10.50 − 1.00 − .11
12 11.76 − 4.39 −7.19 12 45.37 −38.12	13 40.16 − 4.45 −7.26 13 35.71 −38.06	14 26.29 − 4.44 −7.25 14 21.85 −38.02	15 41.11 − 4.48 −7.28 15 36.63 −37.96	17 34.20 − 4.51 −7.30 17 29.69 −37.84	19 2.24 − 4.53 −7.32 18 57.71 −37.74
8.0 12 11.4, 15.2, 17.0, 136	9.6 13 35.3, 38.0, 42.2, 1155	8.9 14 31.0, 34.0, 36.8, 118	8.5 15 14.1, 17.2, 20.0, 513	8.5 16 52.5, 55.3, 57.9, 157	7.5 18 19.3, 23.6, 25.7, 86
12 14.53 51 29 38.67	13 38.50 53 3 43.08	14 22.93 52 20 45.87	15 17.10 52 50 21.60	16 55.23 52 33 53.75	18 22.87 52 29 56.44
+24.69 − 16; 1.39252 − 84; 9.79399 + 9.57; 1.30911 + .30; −39.20	− 8.82 − 2; 0.94547 − 122; 9.77879 +11.24; 0.84686 + .30; −39.50	−18.15 − 9; 1.25888 − 70; 9.77592 + 10.45; 1.15740 + .30; −39.80	+13.54 − 5; 1.13162 − .70; 9.78113 + 10.97; 1.03535 + .30; −39.80	+28.47 − 21; 1.45439 − 103; 9.78379 + 10.70; 1.36078 + 30; −39.80	+28.87 − 22; 1.46045 − .76; 9.78445 + 10.62; 1.36750 + 30; −39.50
55 3 6.9, 9.9, 168; 30 4.39; 58 8.40; 24 39.95; 51 30 59.05; 29 20.38	20 21 29.9, 32.9, 628; 3 9.93; 24 31.40; 58 16.95; 53 3 36.05; + 7.03	5 2 34.0, 37.9, 119; 20 12.48; 7 35.25; 15 12.40; 52 20 31.50; + 14.37	35 2 33.4, 36.6, 100; 49 48.77; 37 35.00; 45 13.35; 52 50 32.95; − 10.85	50 3 49.2, 52.3, 1015; 33 20.26; 53 50.75; 28 57.60; 52 34 16.70; − 22.95	53 2 45.8, 49.6, 154; 29 23.23; 57 47.70; 25 0.65; 52 30 19.75; − 23.31
12 38.18 28 26.3	13 28.45 2 31.9	14 14.60 19 34.5	15 29.35 49 10.8	17 22.39 32 42.4	18 50.39 28 45.4

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	h m s		h m s		h m s		h m s		h m s		h m s	
	1 20 38	19 36.5	1 21 49	20 47.0	1 24 4	23 1.1	1 24 54	23 51.3	1 25 56	24 53.2	1 27 17	26 13.2
δ	53° 20′	152 8.5	53° 57′	51.7 8.5	53° 21′	16.4 7.4	52° 34′	28.5 8.8	52° 41′	35.8 8.1	52° 26′	20.4 8.9
Dec. 16	m	+11.67		+11.51		+10.55		+10.42		+9.79		+9.42
	20 44.0	7.72	21 55.7	7.56	24 10.5	6.60	24 58.3	6.47	26 1.8	5.84	27 22.5	5.47
	47.8		59.1		14.2		2.7		5.0		25.8	
	51.0		2.8		17.5		6.3		8.2		29.3	
	54.6		6.0		21.0		9.7		11.9		32.7	
	58.0		9.7		24.6		13.3		15.3		36.2	
	54		133		878		313		422		465	
	20 51.08		22 2.66		24 17.56		25 6.26		26 8.44		27 29.30	
	+ 1161	+10.46	+ 1161	+10.43	+ 1161	+10.46	+ 1161	+10.49	+ 1161	+10.49	+ 1161	+10.50
	− 1.03		− 1.06		− 1.03		− 1.01		− 1.01		− 1.03	
	− .12		− .12		− .12		− .11		− .11		− .11	
	21 1.54	−7.39	22 13.09	−7.43	24 28.02	−7.43	25 14.75	−7.41	26 18.93	−7.43	27 39.80	−7.44
	− 4.59	−37.64	− 4.63	−37.56	− 4.66	−37.42	− 4.65	−37.38	− 4.67	−37.30	− 4.69	−37.22
	20 56.95		22 8.46		24 23.36		25 12.10		26 14.26		27 35.11	
	9.2		8.8		8.0		9.0		8.0		8.0	
	20 32.4		21 40.8		23 43.9		24 43.7		25 40.1		26 57.6	
	40.0		44.4		47.6		46.9		44.7		2.7	
	43.4		46.9		50.5		48.8		48.1		5.7	
	08	−3.95	121		1420		204		129		80	
	20 40.27	53 22 22.24	21 44.03	53 59 9.22	23 47.33	53 23 35.80	24 46.80	52 35 53.88	25 44.30	52 43 16.76	27 2.67	52 28 1.58
	+ 10.81	− 3	+ 18.63	− 9	+ 30.23	− 24	+ 19.46	− 10	+ 24.14	− 15	+ 26.63	− 19
	1.03383	− 16	1.27021	− 160	1.48044	− 1.11	1.28914	− 51	1.38274	− 122	1.42537	− 127
	9.77575	+ 1156	9.76939	+ 1225	9.77541	+ 1160	9.78346	+ 1073	9.78230	+ 1086	9.78478	+ 1058
	0.93218	+ 30	1.16220	+ 35	1.37845	+ 30	1.19520	+ 30	1.28764	+ 30	1.33275	+ 30
Kπ = −.27	5	−39.30 25		−39.40 0		−39.20 50		−39.00 40		−39.00 55		−38.90
π = −.77	0 34.7	21 50.66	3 42.9	58 37.38	4 6.4	23 3.20	56.3	35 19.35	4 29.8	42 43.60	4 42.9	27 28.15
C = −.07	38.6		44.5		9.1		59.5	21.	32.8		45.8	
	133		74		155		158		26		87	
+5′ 19.″10	5 36.65		28 43.70		4 7.75		57.90		44 31.30		59 44.35	
	17 11.70		54 4.65		18 40.60		30 30.45		38 17.05		23 4.00	
	53 22 30.80		53 59 23.75		53 23 57.70		52 36 9.55		52 43 36.15		52 28 23.10	
	− 8.56		− 14.53		− 23.90		− 15.67		− 19.39		− 21.52	
	20 49.56	21 13.0	22 1.03	57 59.8	24 15.93	22 25.8	25 4.69	34 44.0	26 6.63	42 6.3	27 27.67	26 50.9
Dec. 17		+4.34		+11.11		+10.29		+10.22		+9.55		+9.15
Add +023 to (21+m) Dec 17. It has been added to bring the constants and to final R.A.	20 43.2	7.60	21 54.7	7.37	24 10.0	6.65	24 58.2	6.48	26 0.7	5.81	27 21.6	5.41
	46.8		58.2		13.4		1.4		4.3		25.0	
	50.2		1.6		16.8		5.3		7.6		28.4	
	53.7		5.3		20.2		8.7		11.1		31.8	
	57.1		8.4		23.7		12.1		14.4		35.2	
	10		85		841		262		381		420	
+023	20 30.20		22 1.70		24 16.82		25 5.24		26 7.62		27 28.40	
	+ 1245	+11.22	+ 1245	+11.19	+ 1245	+11.22	+ 1245	+11.26	+ 1245	+11.25	+ 1245	+11.26
	− 1.06		− 1.09		− 1.07		− 1.04		− 1.04		− 1.03	
	− .17		− .17		− .17		− .16		− .16		− .16	
	20 12.41	−7.39	22 12.88	−7.43	24 28.03	−7.43	25 18.88	−7.41	26 18.87	−7.43	27 39.66	−7.44
	− 4.57	−37.64	− 4.61	−37.56	− 4.64	−37.42	− 4.63	−37.38	− 4.65	−37.30	− 4.67	−37.22
	20 56.83	5	22 8.26	8	24 23.38	40	25 11.84	7	26 14.22	2	27 34.99	
	8.9		8.8		7.8		8.9		8.5		8.8	
	20 23.2		21 26.0		23 43.7		24 51.9		25 46.0		26 55.0	
	26.2		29.3		47.2		55.1		43.9		58.3	
	29.3		32.7		50.5		58.0		46.2		1.2	
	187	−3.74	880		1414		150		101	16.63	745	
	20 26.23	53 22 24.74	21 29.33	53 59 11.47	23 47.13	53 23 37.28	24 55.00	52 35 54.86	25 48.37	52 43 24.75	26 58.17	52 28 1.99
	+ 23.97	− 15	+ 32.37	− 27	+ 29.69	− 23	+ 10.24	− 3	+ 24.25	− 15	+ 30.23	− 24
	1.37967	− 11	1.57014	− 94	1.47261	− 111	1.01030	− 54	1.38471	− 122	1.48044	− 127
	9.77575	+ 1130	9.76939	+ 1197	9.77541	+ 1133	9.78346	+ 1049	9.78230	+ 1062	9.78478	+ 1036
	1.27802	+ 30	1.40213	+ 35	1.37062	+ 30	0.91636	+ 30	1.28961	+ 30	1.38782	+ 30
	5	−39.40 25		−39.50 0		−39.30 50		−39.10 40		−39.10 55		−39.00
	0 20.8	21 52.74	3 29.0	58 39.34	4 4.1	23 4.53	2 2.1	35 22.24	4 26.8	42 48.34	4 38.5	28.40
	24.6		30.4		7.2		4.5		29.8		41.5	
	454		594		113		66		166		800	
	5 22.70		28 29.70		4 5.65		52 3.30		44 28.30		59 40.00	
Kπ = −.27	17 25.65		54 18.65		18 42.70		30 45.05		38 20.05		23 8.35	
π = −.79	53 22 43.71		53 59 36.71		53 24 0.76		52 36 3.11		52 43 38.14		52 28 26.41	
C = −.10	− 18.97		− 25.24		− 23.48		− 8.25		− 17.36		− 24.42	
+5′ 18.″06	20 49.46	21 15.3	22 0.85	58 1.8	24 15.97	22 27.1	25 4.46	34 44.9	26 6.79	42 7.0	27 27.55	26 51.2

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1877phae.proj.1617R

1877. Dec. 16, Dec. 17

	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 29 16	28 15.8	1 30 41	29 37.5	1 31 46	30 42.5	1 32 27	31 18.2	1 34 19	33 16.0	1 35 13	34 10.3
δ	54° 32′	26.8	52° 37′	32.2	52° 15′	10.2	54° 31′	25.9	51° 45′	39.5	51° 43′	37.8
		9.4		8.7		9.0		8.9		9.1		7.2

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	+11.18	8.23	+9.87	5.92	+10.35	6.40	+11.88	7.93	+9.72	5.72	+8.37	4.42
	29 26.7		30 48.6		31 52.2		32 30.1		34 26.3		35 21.4	
	30.9		52.2		55.2		33.7		29.7		24.1	
	34.0		55.5		58.4		37.3		33.0		28.2	
	37.6		58.8		2.0		40.8		36.2		31.2	
	41.0		2.2		5.5		44.4		38.7		34.5	
	1702		2773		4433		1863		1649		400	
	29 34.04		30 55.46		31 58.86		32 32.26		34 32.98		35 28.00	
	+ 1161	+10.41	+ 1161	+10.49	+ 11.61	+10.51	+ 11.61	+10.41	+ 11.61	+10.52	+ 11.61	+10.52
	− 108		− 101		− .99		− 1.08		− .98		− .98	
	− 12		− 11		− .11		− 12		− .11		− .11	
	29 4445	−7.57	31 5.95	−7.50	32 9.17	−7.49	32 47.67	−7.62	34 43.50	−7.50	35 38.52	−7.52
	− 4.79	−37.08	− 4.75	−37.00	− 4.76	−36.94	− 4.85	−36.88	− 4.79	−36.74	− 4.80	−36.68
	29 39.66		31 ~~1.20~~ 1.20		32 4.41		32 42.82		34 38.71		35 33.72	
	8.7		8.5		9.0 8.7		8.8		9.0		9.2	
	29 18.7		30 23.0		31 28.4		32 20.0		34 7.0		35 10.6	
	22.1		27.0		31.7		22.5		10.6		13.5	
	25.7		29.5		35.1		25.8		13.8		16.2	
	65		195		52		83		14		103	
	29 22.17	54 34 3.77	30 26.50	52 39 1.35	31 31.73	52 17 12.20	32 22.77	54 32 5.55	34 10.47	51 46 32.43	35 13.43	51 45 31.09
	+ 11.87	− 4	+ 28.96	− 22	+ 26.93	− 19	+ 14.49	− 5	+ 22.51	− 13	+ 14.57	− 6
	1.09 4445	− 1.05	1.46 180	− 107	1.43 0224	− 16	1.16 104	− 1.32	1.35 238	− 35	1.16 346	− 65
	9.76 324	+ 1287	9.78 296	+ 10.79	9.78 658	+ 10.40	9.76 342	+ 1285	9.79 144	+ 9.85	9.79 160	+ 8.78
	0.96 029	+ 40	1.36 736	+ 30	1.33 942	+ 30	1.04 709	+ 40	1.26 672	+ 30	1.07 766	+ 30
	50	−39.20	45	−38.80	10	−38.70	50	−39.10	40	−38.50	40	−38.40
	3 53.5	33 32.80	3 41.0	38 28.47	0 31.6	16 39.90	4 56.4	32 28.38	1 15.0	45 39.65	2 22.9	44 37.11
	55.6		44.6		35.2		57.1		18.1		25.9	
	91		56		68		135		131		88	
	53 54.55		48 42.80		10 33.40		54 56.75		41 16.55		42 24.40	
	28 53.80		34 5.55		12 14.95		27 51.60		41 31.80		40 23.95	
	54 34 12.90	32 55.7	52 39 24.65		52 17 34.05	16 3.0	54 33 10.70		51 46 50.90		51 45 43.05	
	− 9.13	28 22.4	− 23.30		− 21.85	30 25.4	− 11.15		− 18.47		− 11.96	
		26.7				11.0						
	29 32.09		30 53.70	37 51.5	31 56.92	30 42.5	32 35.20	31 51.5	34 31.21	45 22.9	35 26.20	44 20.4
		+11.67		+9.71		10.2 +10.15 +10.12		+12.80		+9.28		+8.13

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		7.93		5.97		6.41 6.38		9.06		5.54		4.39
	29 32.6		30 47.6		31 33.8 31.2		32 27.2		34 25.4		35 20.5	
	36.2		51.1		87.0 54.4		33.1		28.7		23.4	
	39.7		54.5		40.4 51.1		36.4		32.0		27.1	
	43.5		58.0		43.8 1.3		40.8		35.6		30.1	
	46.8		14		47.2 4.6		43.2		38.8		33.8	
	488		2726		22 2891		1821		1605		1357	
	29 39.76		30 54.52		40.44 57.88		32 36.42		34 22.10		35 27.14	11.30
	+ 12.45	3 +11.17	+ 12.46	4 +11.27	+ 12.45	4 +11.28 +11.28	+ 12.45	1 +11.18	+ 12.45	4 +11.30	+ 12.45	4 +11.47
	− 1.11		− 104		− 102 − 102		− 1.11		− 1.00		− 1.00	
	− 17		− 16		− 16 − 16		− 17		− 16		− 16	
	29 50.93	−7.58	31 5.77	−7.50	31 51.71 32 9.15	−7.49	32 47.59	−7.62	34 43.39	−7.50	35 38.43	−7.52
	− 4.77	−37.08	− 4.73	−37.00	− 4.74 − 4.74	−36.94	− 4.83	−36.88	− 4.77	−36.74	− 4.79	−36.68
	29 46.14	6	31 1.03	6	31 46.968 ~~973~~ 4.148	2	32 42.75	7	34 38.62	3	35 33.63	6
	9.5		8.8 8.5		9.0 8.7	17	52 17 13.60	57.14	9.0 9.1		9.0	
	29 22		30 28.1		31 22.81 26.7	− 17 − 22	32 50.5		34 30.6		35 0.0	
	5.1		31.4		5.3 29.1	− 14 − 14	54.2		34.1		3.2	
	8.1		34.5		8.0 32.0	+1016+1018	58.0		36.6		6.3	
	15 4		40		16.5 878	+ 30 + 30	127		113		8.5	
	29 5.13	54 33 58.04	30 31.33	52 39 3.20	31 5.50 29.27	−3850 −3850	32 54.23	54 32 59.56	33 53.77	51 46 33.91	35 28.35	51 45 32.41
	+ 34.63	− 31	+ 23.19	− 14	+25.06+28.61	16 41.21 17 24.72	− 1781	− 8	+ 38.33	− 39	+ 24.31	− 16
	1.53 945	− 100	1.36 530	− 100	1.39 598 1.45 652		1.25 066	− .08	1.58 354	− 27	1.38 578	− 57
	9.76 324	+ 1258	9.78 296	+ 1055	9.78 658 9.78 658		9.76 342	+ 1256	9.79 144	+ 964	9.79 160	+ 8.58
	1.42 529	+ 40	1.27 086	+ 30	1.30 816 1.36 570		1.13 668	+ 40	1.49 758	+ 30	1.29 998	+ 30
	50	−39.30	45	−38.90	10 10		55	−39.20	40	−38.60	40	−38.60
	3 40.4	33 26.67	3 42.41	38 30.27	0 27.8 27.8		0 18.8	32 29.42	0 59.4	46 0.85	2 11.6	44 58.50
	43.1		46.7		31.4 31.4		22.3		2.7		15.9	
	35		91		592 592		411		1221		75	
	53 41.75		48 44.55		14 29.60 29.66		55 20.55		41 1.05		42 13.75	
	29 6.60		34 3.80		12 8.75 8.78		27 27.80		41 47.30		40 34.60	
	54 34 24.66		52 39 21.86		52 ~~7 3681~~ 3681		54 32 ~~49.86~~ 49.86		51 47 ~~8.36~~ 8.36		51 45 ~~52.66~~ 52.66	
	− 26.62		− 18.66		~~= 2033 − 2021~~		+ 13.70		− 31.45		− 19.95	
					~~29.21 + 2033~~							
	29 38.58	32 49.6	30 53.56	37 53.3	31 29.49	16 4.3	32 35.15	31 52.5	34 31.13	45 24.1	35 26.14	44 21.8
					31 56.93	16 47.8						

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
	1 36 32	35 29.3	1 40 39	39 34.9	1 42 16	41 11.8	1 43 17	42 12.7	1 44 10	43 4.9	1 48 20	47 15.9		
8	51° 10′	45 54° 31′		26.1 54° 18′		13.0 54° 18′		13.2 52° 22′		16.5 51° 42′		36.7		
		9.0		9.3		9.0		8.8		8.8		8.6		

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	36 37.4	5.06	40 54.5	7.84	42 24.0	8.12	43 11.6	7.84	44 12.8	44 17.8	3.59	5.55	48 28.0	
	42.8		58.0		27.8		14.9		16.7	21.2			31.4	
	46.0		1.9		31.3		18.6		20.0	24.6			34.6	
	49.3		5.4		34.6		22.0		23.0	28.0			38.0	
	52.9		8.8		38.3		25.6		26.3	31.3			41.4	
	2304		86		60		927		988	229			1734	
	36 46.08		41 1.72		42 31.20		43 18.54		19.76	24.58			48 34.68	
	+ 11.61	+10.54	+ 11.61	+10.41	+ 11.61	+10.42	+ 11.61	+10.42	+ 11.61	+ 11.61	+10.50	+10.50	+ 11.61	+10.52
	− .96		− 1.08		− 1.07		− 1.07		− 1.00	− 1.00			− .98	
	− .11		− .12		− .12		− .12		− .11	− .11			− .11	
	36 56.62	−7.51	41 12.13		42 41.62	−7.76	43 28.96	−7.77	44 30.26	35.08	−7.67		48 45.20	−7.69
	− 4.80	−36.60	− 5.00		− 5.02	−36.16	− 5.04	−36.08	− 4.99	− 4.98	−36.02		− 5.03	−35.70
	36 51.82		41 7.13		42 36.60		43 23.92		44 25.27	30.10			48 40.17	
	9.1		9.3 40.87		9.1		7.8		9.0 6.8	52 24 8.49	28 18.19	8.2		
	36 14.1		41 16.0		42 54.7		43 34.0		44 38.8	44 17.9	− 2 − 15		48 18.2	
	17.0		20.0		58.0		37.2		43.8		−1.27 −1.16		16.0	
	20.8		23.8		1.5		40.1		47.0		+10.53 +10.51		18.2	
	5.19	−3.95	5.98		17.3.9		111.3		1308		+ .30 + .30		174	
	36 17.30	51 11 42.23	41 19.93	54 28 39.58	42 57.97	54 20 46.64	43 37.10	54 19 20.86	43.60	17.90	−38.10	−38.10	48 15.80	51 44 12.09
	+ 28.78	− 22	− 18.21	− 8	− 26.77	− 19	− 18.56	− 9	− 23.84	+ 6.68	35.98	45.64	+ 18.88	− 10
	1.45909	− 27	1.26031	− 1.27	1.42765	− 73	1.26858	− 108	1.37731	0.82478			1.27600	− 100
	9.79699	+ 9.25	9.76413	+ 12.79	9.76554	+ 1264	9.76590	+ 126	9.78543	9.78543			9.79192	+ 9.81
	1.37868	+ .25	1.14704	+ .35	1.31579	+ .35	1.15708	+ .35	1.28534	0.73281			1.19052	+ .30
	15	−38.30	55	−38.60	5	−38.50	5	−38.50	0 H	0			40	−37.80
	0 59.5	11 8.99	4 40.8	28 8.82	2 39.9	20 16.26	4 0.0	18 50.20	41 41.9	4 16.9			3 38.0	43 39.35
	3.1		43.0		43.1		1.9		45.8	19.6			41.7	
	12.6		38		8.30		19		77	165			797	
	16 1.30		59 41.90		7 41.50		9 0.95		4 43.85	16.25			43 39.85	
	6 47.05		23 6.45		15 6.85		13 44.40		18 4.50	18 30.10			39 8.50	
	51 12 6.15		54 28 25.55		54 20 25.75		54 19 6.50		52 23 23.60	23 49.20			51 44 27.60	
	− 23.92		+ 14.03	39 34.9	+ 20.69		+ 14.36						− 15.51	
				26.1				42 12.7						
	36 44.31	10 32.4		39 45.1	42 28.84	19 40.1	43 16.15	13.2	44 17.60	22.43			48 32.48	43 3.6
Dec. 17	m s													
	36 38.6	5.03	40 44.5	40 57.5	42 2.33	8.17	43 24.1	8.27	44 12.0	44 17.0	5.52	5.61		
	41.1		50.1	1.0	26.8		27.6		15.7	20.4				
	45.2		53.7	4.1	30.5		31.2		19.7	23.7				
	48.5		57.1	7.6	34.0		34.6		22.2	27.2				
	51.8		1.2	11.3	37.6		38.0		25.6	30.4				
	226.0		26.92 41 2.15		22		1555		940	11.87				
	36 45.20		53.84 41 4.30		42 30.44		43 31.10		18.80	23.74				
	+ 12.45	+11.32	+ 12.48	+ 12.45 +11.18 +11.18	+ 12.48	+11.39	+ 12.48	+11.20	+ 12.48	+ 12.48	+11.27	+11.27		
	− .98		− 1.11	− 1.11	− 1.10		− 1.10		− 1.03	− 1.03				
	− .16		− .17	− .17	− .17		− .17		− .16	− .16				
	36 56.51	−7.51	41 5.01	15.47	42 41.62	−7.76	43 42.28	−7.77	44 30.06	35.00	−7.67			
	− 4.79	−36.60	− 4.99	− 4.98	− 5.01	−36.16	− 5.02	−36.08	− 4.97	− 4.97	−36.02			
	36 51.72		41 0.01	10.49	42 36.60		43 37.25		44 25.05	30.02				
	9.0		90 8.7	54 33 46.3	9.0		7.4		8.7 6.4	52 24 10.39	23 20.22			
	36 8.7		41 22.3	40 41.8	42 46.3		43 15.3		44 3.3	44 0.3	− 12 − 10			
	12.9		26.7	44.8	30.6		18.7		8.3	3.1	−1.22 −1.13			
	15.1		29.9	48.3	34.4		20.9		12.7	6.1	+10.30 +10.28			
	67	− 3.74	189	135	03		549		11.43	95	+ .30 + .30			
	36 12.23	51 11 44.56	26.30	44.50	42 50.10	54 20 48.21	43 18.30	54 20 32.31	28.10	3.17	−38.20	−38.20		
	+ 32.97	− 29	− 32.46	+ 19.80	− 19.66	− 10	+ 12.80	− 5	+ 19.30	+ 20.57	37.71	47.63		
	1.51812	− 24	1.51135	1.20667	1.29358	− 70	1.10721	− 66	1.28556	1.31302				
	9.79699	+ 9.05	9.76342	9.76342	9.76554	+ 12.36	9.76572	+ 12.36	9.78543	9.78543				
	1.43771	+ .25	1.39737	1.18269	1.18172	+ .35	0.99553	+ .35	1.19359	1.22126				
	15	−38.40	55	55	5	−38.60	5	−38.60	0	0				
	0 52.41	11 11.19	0 87.5	25.0 C.R.	2 31.7	20 17.78	2 22.6	20 1.98	4 25.4	9.9			17.5	
	56.5	C.R.	41.4	26.5	35.1		25.8		30.7	13.5			20.8	
	89	24 789	55	135	68		84		591	234				
	15 54.45		55 39.45	26.75	33.40		7 24.20		4 29.55	11.60				
	6 53.90		27 8.90	21.60	15 14.95		15 24.15		18 18.80	36.65				
	51 12 11.96		54 32.26	39.66	54 20 33.01		54 20 42.21		52 23 36.86	59.71				
	− 27.40		−24.97	15.23	+ 15.20		− 9.90		+15.62	16.64				
			−15.23	+24.97					−16.64	+16.62				
	36 44.22	10 34.8	40 52.29	31 58.4	42 28.86	19 41.6	43 29.51	19 25.90	44 17.43	23 1.7				
			41 2.75	5.6					22.37	41.6				

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 49 2	47 56.7	1 53 25	52 18.6	2 1 32	0 24.6	2 2 42	1 35.5	2 4 30	3 23.0	2 5 7	2 5 47		
δ	52° 5′	59.9	53° 23′	18.4	53° 15′	10.0	54° 20′	14.6	54° 31′	26.4	54° 15′	54 43		
		9.5		9.0		6.0		9.0		9.3				

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	+12.57	+12.47		+11.01		+11.21		+12.51		+13.04				
	8.62	8.52	53 39.7	7.06	1 41.2	7.26	2 51.5	8.56	4 26.3	9.09	5 16.4			
			43.4		44.8		55.0		29.8		+10.42 19.9	+10.40		
			47.0		48.4		58.8		33.3		23.4			
			50.3		51.7		2.1		36.7		27.0	635 7.1		
			53.8		55.0		3.8		40.2		30.6	3.8 10.9		
			2342		411		2932		1668		1173	13		
			53 46.84 -		1 48.22 -		2 58.64 -		4 33.26		5 23.46 -	6 3.65		
			+ 11.61	+10.45	+ 11.61	+10.46	+ 11.61	+10.42	+ 11.61	+10.41	+ 11.61	+ 11.61		
			- 104		- 103		- 107		- 108	-8.08	- 107	- 109		
			- .12		- .12		- .12		- .12	-34.32	- 12	- .12		
			53 57.29	-7.86	1 58.68	-7.96	3 9.06	-8.05	4 43.67		5 33.88	6 14.05		
			- 5.19	-35.28	- 5.32	-34.58	- 5.40	-34.48	- 5.43		- 544	- 547		
			53 52.10		1 53.36		3 3.66		4 38.24		5 28.44	6 8.58		
											-8.08	-8.12		
											8.8 -34.36	7.0 -34.20		
	9.3		8.9		6.5		8.9		8.9					
			54 11.4		1 26.7		2 32.0		4 16.8		5 48.4	6 18.0		
			16.0		30.0		37.5		19.8		51.2	21.8		
			20.0		31.5		37.8		23.0		54.8	25.2		
			474		882		143		597		44	50		
	54 17 45.98	54 44 52.87	54 15.80	53 25 45.98	1 29.40	53 16 6.92	2 34.77	54 21 27.66	4 19.90	54 32 21.92	5 31.47	6 21.67		
	- 20	- 8	-2896	- 22	+18.82	- 9	+23.87	- 15	+13.36	- 5	-28.01	-18.32		
	- 19.	- 94	1.46180	- 78	1.27462	- 49	1.37785	- 35	1.12581	- 16	1.44731	1.26293		
	+ 1261	+ 1309	9.77507	+ 1166	9.77677	+ 1149	9.76537	+ 1266	9.76360	+ 1285	9.76607	9.76129		
	+ .35	+ .40	1.35947	+ 30	1.17394	+ 30	1.26582	+ 35	1.01201	+ 40	1.33548	1.14682		
	- 37.20	- 37.20	0	- 37.80	10	- 37.20	5	- 37.40	55	- 37.30	10	40		
	17 12.40	44 24.19		25 15.24		15 36.98		20 58.82		31 58.71				
			2 41.9		1 44.1		1 19.9		0 34.1		0 4.40	3 25.6		
			46.8		47.1		22.8		36.4		45.3	26.6		
			87		112		427		105		63	12		
			2 44.35		11 45.60		6 21.35		55 35.25		10 43.15	13 28.60		
			20 4.80		11 2.75		16 27.00		27 10.10		12 5.20	39 19.75		
			53 25 23.10		53 16 21.85		54 21 46.10		54 32 32.20		54 17 24.30	54 44 38.85		
			+ 22.88		- 14.93		- 18.44		- 18.28		+ 27.48	+ 41.02		
		47 46.1												
		+9.44	53 44.24	24 40.0	1 45.40	15 2.4	2 55.61	20 24.3	4 30.16	31 19.4	5 20.36	6 0.46		
Dec. 17				+10.83		+10.95		+12.27	+11.15	+12.18	16 43.1	43 50.0		
	48 57.5	5.70	53 39.0	7.09	1 40.1	7.25	2 —	8.53	7.41	8.44	5 15.5	6 55.6		
	1.9		424		43.8		57.1	57.9			+11.19 11.1	+11.18 57.2		
			46.0		47.2		2.1	58.2			22.7	2.7		
	7.8		49.3		50.7		5.6	58.7			26.4	6.4		
	11.0		52.4		54.1		10				30.6	1.8		
	182		2294		2359		2 57.77				1133	3137		
	49 4.55		53 46.88		1 47.18		2 57.84				5 22.66	6 2.74		
	+ 12.48	4 +11.29	+ 12.48	4 +11.22	+ 12.48	4 +11.24	+ 12.48	4 +11.19			+ 12.48	+ 12.48		
	- 1.01		- 107		- 106		- 1.10				- 110	- 112		
	- .16		- .17		- .17		- .17				- .17	- .17		
	49 15.84	-7.72	53 57.10	-7.86	1 58.41	-7.96	3 6.94	-8.05			5 33.84	6 13.91		
	- 5.03	-35.64	- 5.17	-35.28	- 5.31	-34.58	- 5.39	-34.48			- 542	- 545		
	49 10.74		53 51.93	3	1 53.07	11	3				5 28.45	3 6 8.44		
	1.61						3.55				-8.08	-8.12		
											8.6 -34.26	7.0 -34.20		
			8.9		6.0		9.4							
	49 25.2		53 41		1 19.0		2 36.6				4 51.4	6 1.3		
	27.9		72		22.8		40.2	17.64			54.1	20.5		
	30.4		107		36.2		43.6				57.1	24.0		
	8.35		220		80		04				129	18		
	49 27.83	52 1 6.26	53 7.33	53 25 48.25	1 22.67	53 16 10.02	2 40.13	54 21 30.00	54 17 48.26	54 44 52.88	4 54.30	6 20.60		
	- 23.28	- 14	+ 38.55	- 39	+ 24.51	- 16	+ 18.20	- 8	- 21	- 8	+28.36	-17.86		
	1.36698	- 62	1.58602	- 49	1.38934	- 43	1.26402	- 38	- 132	- 94	1.45271	1.25188		
	9.78918	+ 990	9.77507	+ 11.41	9.77677	+ 11.24	9.76537	+ 12.38	+1233	+1280	9.76607	9.76129		
	1.27876	+ 30	1.48369	+ 30	1.28871	+ 30	1.14804	+ 35	+ 35	+ 40	1.34138	1.13577		
25		-37.90 0		-37.90 10		-37.40 5		-37.50	-37.30	-37.30	5	40		
	2 17.5	0 34.06	1 45.8	25 17.44	1 35.0	16 39.83	1 20.5	21 1.03	17 18.37	44 24.024	4 55.3	3 25.9		
	20.8		49.6		38.9	15	24.2				57.1	28.5		
	383		154		139		47				124	144		
	27 19.15		1 47.70		11 36.95		6 22.35				9 56.26	43 27.20		
	55 29.20		21 0.65		11 11.40		16 26.50				12 52.15	39 21.15		
	52 0 47.26		53 26 18.71		53 16 29.46		54 21 44.06				54 18 10.21	54 44 39.21		
	+ 19.80		- 30.46		- 19.44		- 140.6				- 21.95	+ 136.7		
	.09			24 42.2										
	49 3.77	59 58.4	53 44.07	25 9.5	1 45.15	15 5.2	2 55.50	20 26.6			5 20.35	6 0.38		
											16 44.1	43 49.8		

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	2 6 56	5 48.3	2 8 33	7 23.9	2 10 25	9 22.5	2 11 59	10 50.6	2 13 47	12 39.0	2 14 58	13 57.4		
δ	54° 15′	102 / 8.3	52° 47′	42.5 / 9.2	49° 55′	50.3 / 9.2	54° 44′	39.0 / 8.5	54° 30′	24.9 / 9.2	54° 47′	41.8 / 6.4		
Dec. 16		+12.75		+10.13		+7.44		+12.95		+12.73		+12.31		
	7 5.0	8.80	8 40.2	6.18	10 36.8	2.82	12 5.0	9.00	13 57.5	8.78	15 7.3	8.36		
	8.3		43.4		40.0		12.8		1.1		10.7			
	12.0		46.8		43.3		16.1		4.7		14.3			
	15.4		50.4		46.3		19.8		8.2		17.9			
	19.1		53.6		49.9		23.2		11.6		21.5			
	598		2344		2163		809		231		717			
	7 11.96		8 46.88		10 43.26		12 16.18		14 4.62		15 14.34			
	+ 11.61	+10.42	+ 11.61	+10.47	+ 11.61	+10.48	+ 11.61	+10.40	+ 11.61	+10.41	+ 11.61	+10.40		
	− 1.07		− 1.02		− .92		− 1.09		− 1.08		− 1.09			
	− .12		− .12		− .11		− .12		− .12		− .12			
	7 22.38	8.10 / 34.10	8 57.35 / 51.93	8.02 / 33.94	10 53.84	7.86 / 33.76	12 26.58	8.21 / 33.62	14 15.03	8.21 / 33.44	15 24.74	8.25 / 33.32		
	− 5.47		− 5.42		− 5.32		− 5.59		− 5.60		− 5.64			
	7 16.91		8 51.93		10 48.52		12 20.99		14 9.43		15 19.80			
	7.8		9.0		6.8		8.7		9.2		5.5			
	6 57.2		8 22.6		10 12.7		11 52.2		13 38.7		14 48.2			
	2.6		25.4		15.3		58.4		41.7		57.8			
	5.4		29.3		19.0		1.1		44.2		54.0			
	72	−3.95	173		170		1717		46		40			
	7 2.40	54 17 20.85	8 25.77	52 48 58.73	10 15.67	49 57 9.41	11 57.23	54 46 7.20	13 41.53	54 31 25.93	14 5.33	54 48 38.92		
	+ 9.56	− 3	+ 21.11	− 12	+ 27.59	− 21	+ 18.95	− 9	+ 23.00	− 14	+ 23.01	− 14		
	0.980460	− 16	1.324469	− 105	1.440755	− 16	1.277617	− 49	1.363422	− 98	1.361922	− 1.13		
	9.766256	+ 1259	9.781360	+ 11.00	9.808522	+ 794	9.761117	+ 1313	9.763787	+ 1285	9.760577	+ 1318		
	0.869310	+ 38	1.228399	+ 30	1.371877	+ 20	1.161329	+ 40	1.249807	+ 40	1.245097	+ 40		
	10	−37.10 35		−36.40 30		−36.10 40		−36.80 55		−36.60 35		−36.60		
	0 37.9	16 52.55	3 50.2	48 27.94 28.21	0 33.4	56 37.13	1 44.5	45 39.40	1 22.5	30 58.11	4 10.1	48 10.68		
	40.5		53.4		35.3		47.0		25.0		11.8			
	784		36		90		115		795		19			
	10 39.20		38 57.80		30 34.52		41 45.75		56 23.75		39 10.95			
	12 9.15		43 56.55		52 13.85		41 2.60		26 24.60		43 37.40			
	54 17 28.25		52 49 15.65		49 57 32.95		54 46 21.70		54 31 43.70		54 48 56.50			
	− 7.40		− 16.92		− 23.54		− 14.50		− 17.77		− 17.58			
Dec. 17	7 8.81	16 18.4	8 43.91	47 54.3	10 40.66	56 3.4	12 12.78	45 5.8	14 1.22	30 24.7	15 10.85	47 37.4		
		+12.38		+7.67		+7.52		+12.58		+12.53		+11.97		
	6 −	8.64	8 39.2	5.93	10 26.0	3.78	12 8.0	8.84	13 56.1	8.79	15 6.2	8.23		
			42.6		39.2		11.6		0.3		9.8			
	48.9	48.9	46.0		42.3		15.3		3.6		13.4			
	52.6	49.1	49.4		45.7		18.8		7.2		17.0			
	56.0	48.9	52.7		48.8		22.3		10.7		20.7			
	29		2301		2120		760		185		671			
	6 48.97		8 46.02		10 42.40		12 15.20		14 3.70		15 13.42			
	+ 12.484	+11.20	+ 12.484	+11.25	+ 12.484	+11.36	+ 12.484	+11.18	+ 12.484	+11.19	+ 12.484	+11.17		
	− 1.10		− 1.05		− .94		− 1.12		− 1.11		− 1.12			
	− .17		− .16		− .16		− .17		− .17		− .17			
	7 0.16		8 57.27	8.02 / 33.94	10 53.76	7.86 / 33.76	12 26.37	8.21 / 33.62	14 14.88	8.21 / 33.44	15 24.59	8.25 / 33.32		
	− 5.465		− 5.41		− 5.30		− 5.58		− 5.59		− 5.63			
	7 6 54.67		8 51.84 6		10 48.46 6		12 20.79 9		14 9.27 36		15 18.94 6			
	6.3		6.9		9.0		6.8		9.2		6.9			
	7 11.2		8 0.4		10 47		11 41.5		13 47.2		14 41.0			
	14.5		3.3		7.4		44.4		47.1		44.8			
	18.1		1.7		113		48.1		53.5		47.3			
	138	−3.74	114		234		140		06		131			
	7 4.60	54 17 55.39	8 3.80	52 49 0.02	10 7.80	49 57 8.83	11 44.67	54 46 8.70	13 50.20	54 31 25.62	14 44.37	54 48 41.91		
	− 2.563	− 17	+ 42.22	− 46	+ 34.60	− 32	+ 30.53	− 24	+ 13.50	− 5	+ 29.05	− 22		
	1.408752	− 14	1.625520	− 94	1.539088	− 14	1.484736	− 43	1.130335	− 40	1.463155	− 111		
	9.766077	+ 1234	9.781300	+ 10.77	9.808528	+ 778	9.761117	+ 1285	9.763787	+ 1258	9.760577	+ 1290		
	1.297742	+ .35	1.529422	+ 30	1.470200	+ 20	1.368446	+ .40	1.016711	+ .40	1.346322	+ .40		
	10	−37.20 35		−36.80 30		−36.20 40		−36.90 55		−36.70 35		−36.70		
	0 29.6	17 26.83	3 31.1	44 29.15	0 26.4	56 36.41	1 33.2	45 40.64	1 29.2	30 57.71	4 2.8	48 13.44		
	32.1		34.0		29.7		35.5		31.6		3.8			
	61.7		67.1		161		68.7		60.8		6.6			
	12 30.88		38 32.55		30 26.05		41 24.35		56 30.40		39 3.30	−1″		
	12 17.50		44 15.80		52 20.30		41 14.00		26 17.95		43 45.05			
	54 17 35.56		52 49 33.86		49 57 38.36		54 46 32.06		54 31 36.01		54 49 41.11			
	+ 19.83		− 33.84		− 29.53		− 23.36		− 10.39		− 22.20			
			8 43.84	47 55.2	10 40.60	56 2.6	12 12.58	45 7.0	14 1.09	30 24.3	15 10.71	47 40.1		

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	2 17 40	46 31.1	2 19 20	−18 11.5	2 19 24	−18 15.5	2 21 9	20 0.4	2 21 59	20 5.4	2 23 17	22 8.2		
δ	53° 34′	29.3	53° 49′	43.9	53° 50′	45.1	53° 17′	12.1	53° 23′	18.1	53° 41′	36.5		
		8.5		8.8		9.0		8.0		9.4		9.0		

Dec. 16

	+11.21		+11.57		+12.04		+10.46		+10.95		+12.13			
	17 44.0	7.26	19 30.5	7.62	19 34.8	8.12	21 18.6	6.51	22 10.0	7.00	23 28.5	8.18		
	47.7		34.0		38.5		22.2		13.4		32.0			
	51.1		37.4		41.5		25.8		16.8		35.6			
	54.6		40.8		45.0		29.3		20.1		39.2			
	58.0		44.3		48.7		32.7		24.2		43.0			
	54		1870		91		1286		846		1783			
	17 51.08		19 3440		19 41.92		21 25.72		22 16.92		23 35.66			
	+ 11.61	+10.44	+ 11.61	+10.44	+ 11.61	+10.44	+ 11.61	+10.46	+ 11.61	+10.46	+ 11.61	+10.44		
	− 105		− 105		− 105		− 103		− 103		− 105			
	− .12		− .12		− .12		− .12		− .12		− .12			
	18 1.52	−8.20	19 4784	−8.24	19 52.46	−8.24	21 36.18	−8.22	22 27.38	−8.24	23 46.10	−8.28		
	− 5.61	−3.308	− 565	−3.290	− 566	−3.290	− 566	−3.272	− 568	−3.264	− 5.72	−3.250		
	17 55.91		19 42.19		19 46.80		21 30.52		22 21.70		23 40.38			
	8.6		8.6		8.6		8.0		9.6		9.4 9.0			
	17 55.0		19 9.7		19 23.5		20 49.0		21 53.1		23 11.1			
	57.1		13.2		28.0		53.0		55.9					
	0.1		16.5		31.3		55.8		58.3					
	1722		94		828		78		173					
	17 57.40	53 34 36.33	19 13.13	53 50 6.56	19 27.60	53 51 31.38	20 52.60	53 18 32.61	21 55.77	53 24 31.03	23 11.10	53 42 38.73		
	− 632	− 1	+24.27	− 15	+14.22	− 5	+33.12	− 28	+21.15	− 12	+24.56	− 16		
	0.800 72	− 97	1.385 07	− 73	1.152 90	− 381	1.520 09	− 1.11	1.325 31	− 89	1.390 23	− 5		
	9.773 53	+ 11.84	9.770 945	+ 12.10	9.770 78	+ 1215	9.776 26	+ 11.55	9.775 24	+ 11.66	9.772 16	+ 11.99		
	0.696 85	+ 35	1.278 62	+ 35	1.046 28	+ 35	1.418 95	+ 30	1.223 15	+ 30	1.284 99	+ 35		
	50	−36.20 95		−36.10 35		−36.20 5		−35.80	0	−35.80 45		−35.70		
	8 35.0	34 7.39	2 40.9	49 38.08	1 23.8	51 3.30	41 6.9	18 4.42	23 18.6	24 2.23	0 8.4	42 11.21		
	37.2		42.9		26.1		6.3		20.8		10.5			
	122		38		99		12		894		189			
	53 36.10		37 4190		36 24.95		9 6.60 +90		3 19.70		45 9.45			
	29 1225		45 645		46 2340		13 41.75		19 28.65		37 38.90			
	53 34 31.35		53 50 25.55		53 51 42.50		53 19 0.85		53 24 47.45		53 42 58.00			
	+ 4.98		− 18.99		− 11.12		− 2624		− 1672		− 19.27			
	17 47.71	33 34.3	19 33.95	49 5.2	19 38.26	50 30.4	21 22.30	17 31.7	22 13.46	23 29.6	23 32.10	4138.7		
		+10.73		+11.26		+11.69		+10.23		+10.72		+10.44		

Dec. 17

		6.99		7.52		7.95		6.49		6.98		6.73		
	17 43.1		19 29.4		19 33.7		21 17.1		22 7.2		23			
	46.6		33.1		37.2		21.8		12.4					
	50.1		364		40.7		24.8		16.0					
	53.6		399		44.3		28.3		19.5					
	57.0		46.5		47.8		31.7		23.0					
	04		1823		37		1242		803					
	17 50.08		19 36.46		19 40.74		21 24.84		22 16.06		23 34.80			
	+ 12.47	+11.21	+ 12.48	+11.21	+ 12.47	+11.22	+ 12.47	+11.23	+ 12.48	+11.23	+ 12.47	+11.21		
	− 108		− 108		− 108		− 106		− 106		− 108			
	− .17		− .17		− .17		− .17		− .17		− .17			
	18 1.30	−8.20	19 47.68	−8.24	19 51.06 29.52	−8.24	21 36.08	−8.22	22 27.30	−8.24	23 46.02	−8.28		
	− 560	−3.308	− 565	−3.290	− 565	−3.290	− 566	−3.272	− 568	−3.264	− 5.72	−3.250		
	17 55.67 9		19 42.00 2		19 46.28 31		21 30.39 41		22 21.59 41		23 40 27 9			
	8.4		9.0		8.9		8.4		9.4		9.3			
	17 7.1		18 55.5		19 54.8		20 46.4		21 55.0		23 2.1			
	10.2		2.1		58.3		49.0							
	12.6		6.0		2.0		52.9							
	29.9		76		1751		1495							
	17 .997	53 34 37.98	19 2.53	53 50 8.71	19 58.37	53 51 32.80	20 49.83	53 18 35.77	21 55.00	53 24 31.21	23 2.10	53 42 40.75		
	+40.11	− 42	+33.93	− 30	−17.63	− 8	+35.01	− 32	+21.06	− 12	+32.70	− 28		
	1.603 25	− 78	1.530 58	− 68	1.246 25	− 49	1.544 19	− 1.08	1.323 46	− 89	1.514 55	− 135		
	9.773 53	+ 11.58	9.770 95	+ 11.89	9.770 78	+ 11.91	9.776 26	+ 11.33	9.775 24	+ 11.43	9.772 16	+ 11.75		
	1.499 38	+ 35	1.424 13	+ 35	1.139 63	+ 35	1.443 05	+ 30	1.221 30	+ 30	1.409 31	+ 35		
	50	−36.30 35		−36.20 35		−36.20 5		−35.90	0	−35.90 40		−35.80		
	2 55.8	34 8.67	2 30.1	49 4.003	1 45.8	51 4.55	4 2.4	18 6.36	23 17.5	24 2.29	4 5 59.1	42 12.65 11.68		
	57.9		32.2		49.0		3.4		19.6		0.9			
	137		23		148		58		171		1260			
	52 56.85		37 31.15		36 47.40		9 2.90		3 18.55		45 0000			
	29 5150		45 1720		46 0.95		13 45.45		19 2980		37 4835			
	53 35 9.56		53 50 35.26		53 51 1.01		53 19 3.51		53 24 47.86		53 43 6.41			
	− 3158		− 2655		+ 13.79		− 2774		− 1665		− 2566			
	47													
	17 58.49	33 35.6	19 33.78	49 7.1	19 38.07	50 31.6	21 22.19	17 33.6	22 13.37	23 29.6	23 32.01	4139.2		

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	h m s		h m s		h m s		h m s		h m s		h m s	
1	2 25 26	24 17.4	2 31 53	30 43.7	2 33 8	32 2.9	2 33 39	32 34.0	2 37 14	36 4.6	2 38 59	37 49.4
8	52° 51′	465 8.8	53° 9′	42 9.3	51° 36′	31.6 8.7	51° 20′	160 9.0	52° 49′	44.7 9.5	52° 25′	20.4 9.4
Dec. 16		+10.99		+11.02		+8.67		+9.71		+10.77		+10.48
	25 36.4	7.04	32 3.6	7.07	33 11.2	4.72	33 52.8	5.76	37 26.4	6.82	39 10.0	6.53
	38.7		7.4		14.4		56.0		30.2		13.4	
	43.3		11.0		17.6		58.4		33.5		17.0	
	46.6		14.5		20.8		2.8		36.7		20.5	
	50.3		17.8		24.5		6.0		40.3		23.6	
	21 63		544		885		2970		1671		845	
	25 43.26		32 10.88		33 17.70		33 59.40		37 33.42		39 16.90	
	+ 11.61	+10.47	+ 11.60	+10.46	+ 11.60	+10.52	+ 11.60	+10.53	+ 11.60	+10.46	+ 11.60	+10.49
	− 102		− 102		− 97		− 96		− 102		− 100	
	− 12		− 12		− 11		− 11		− 12		− 11	
	25 53.73	8.24	32 21.34	8.34	33 28.22		34 9.93	8.23	37 11.88	8.38	39 27.39	8.37
	− 5.40	32.28	− 3.82	31.58	− 5.44		− 5.74	31.40	− 5.88	31.00	− 5.88	30.82
	25 48.03		32 15.52		33 22.78		34 4.19		37 38.00		39 21.51	
	9.0		9.0		9.5		9.2		9.5		9.5	
	25 10.1		31 53.8		32 48.2		33 50.6		37 12.7		38 57.4	
	13.0		56.4		52.2		53.7		15.0		59.8	
	15.8		0.6		55.4		55.5		17.4		3.9	
	89		1708		68		98		151		1811	
	25 12.97	52 52 12.90	31 56.50	53 10 33.41	32 57.27	51 33 36.44	33 53.27	51 23 0.68	37 15.03	52 50 55.87	39 0.37	52 26 32.39
	+ 30.29	− 24	+ 13.95	− 5	+25.43	− 17	+ 6.13	− 1	+ 18.39	− 8	+ 16.53	− 7
	1.48130	− .14	1.14457	− 65	1.40535	− 113	0.78746	− 0	1.26458	− 51	1.21827	− 38
	9.78080	+1107	9.77761	+1142	9.79351	+ 967	9.79526	+ 947	9.78097	+1106	9.78494	+1063
	1.38470	+ 30	1.04478	+ 30	1.32146	+ 30	0.70532	+ 25	1.16815	+ 30	1.12581	+ 30
	35	−35.40	5	−34.90	50	−34.60	5	−34.50	35	−34.60	0	−34.90
	0 28.8	51 44.54	2 21.4	10 5.58	4 9.0	33 6.56	0 0.3	22 31.94	1 55.2	50 28.29	1 20.2	26 4.72
	31.8		24.5		11.1		3.1		58.5		23.2	
	606		59		201		34		13.4		34	
	35 30.30		17 22.95		54 10.05		5 1.70		36 56.86		1 21.90	
	47 18.05		5 25.40		28 38.30		17 46.65		45 57.50		21 26.65	
	52 52 37.15		53 10 44.50		51 33 57.90		51 23 57.85		52 51 10.60		52 26 45.75	
	− 24.25		− 11.09		− 20.96		− 5.07		− 14.73		− 13.36	
	25 39.79	51 12.3	32 7.18	9 34.0			33 55.96	22 0.5	37 29.62	49 57.3	39 13.14	25 33.9
Dec. 17	m s	+10.62				+8.20						
	25 −	6.88	32.2		33 21.7	4.46						
	−				24.3							
	−				28.1							
	−				31.6							
	49.37	42.55			34.9							
		97			41.1							
	25 42.55				33 28.22							
	+ 12.47	4+1.20			+ 12.47	4+1.31						
	− 1.05	3			− .96							
	− .16				− .16							
	25 53.78	−8.24			33 39.54							
	−5.70	−32.28			−5.75							
	25 48.08				33 33.76	8.24						
	11				8	−31.46						
	8.7m s				8.4							
	24 58.0				32 46.7							
	1.3				49.5							
	4.0				52.0							
	33	−3.74			1484							
	25 1.10	52 52 14.23			32 49.47	51 37 54.06						
	+ 41.45	− 45			+ 38.75	− 40						
	1.61752	− 8			1.58827	− 1.27						
	9.78080	+1085			9.79258	+9.57						
	1.52092	+ 30			1.50375	+ 30						
	35	−35.50			45	−34.70						
	0 14.0	51 45.61			4 39.0	37 23.82						
	21.0				41.9							
	38.0				46.9							
	35 19.00				49 40.45							
	47 29.35				33 7.90							
	52 52 47.41				51 38 25.96							
	− 33.18				− 31.90							
	25 39.87	51 13.3			32 25.54	36 52.4						

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1877phae.proj.1617R

665 606

1877, Dec. 16, Dec. 17.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	2 42 20	41 7.62	2 43 2	41 50.3	2 45 33	44 22.4	2 48 9	47 2.4	2 49 31	48 19.5	2 50 27	49 14.8								
δ	54° 25′	209 8.8	52° 44′	394 9.5	54° 1′	53 57.1 8.7	50° 20′	162 8.9	53° 46′	421 8.6	53° 49′	451 8.5								
Dec. 16		+1293		+1077		+1234		+1518		+1086		+1177								
	42 32.6	6.98	43 10.7	6.82	45 47.4	8.39	48 21.8	4.23	49 [illegible]3.5	6.91	50 38.9	7.82								
	36.3		14.0		50.9		24.9		47.2		42.4									
	38.8		17.4		54.9		28.3		50.5		46.0									
	43.4		20.9		58.6		31.5		54.2		49.5									
	47.0		24.4		1.9		35.0		57.7		53.0									
	19 91		8 74		27 37		4 16		31		22 98									
	42 29.82 -		43 17.48 -		45 54.74 -		48 28.32 -		49 50.62 -		50 45.96 -									
	+ 11.60	+10.40	+ 11.60	+10.47	+ 11.60	+10.42	+ 11.60	+10.57	+ 11.60	+10.43	+ 11.60	+10.43								
	− 1.08		− 1.02		− 1.06		− .92		− 1.05		− 1.05									
	− .12		− .11		− .12		− .11		− .12		− .12									
	42 50.22		43 27.95		46 5.16		48 38.89		50 01.05		50 56.39									
	− 6.08	−8.58	− 5.98	−8.44	− 6.11	−8.58	− 5.90	−8.31	− 6.15	−8.61	− 6.10	−8.62								
	42 44.14	−30.44	43 21.97	−30.36	45 59.05	−30.06	48 32.99	−29.76	49 54.90	−29.60	50 50.23	−29.50								
	8.7		9.2		9.0		8.8		9.0		8.8									
	42 10.5		43 30.7		45 19.7		47 46.6		49 14.3		50 22.8									
	13.7		33.9		22.2		48.8		18.5		26.3									
	16.4		36.0		26.0		52.4		20.4		29.3									
	10 6		10 6		7 9		14 89		5 32		18 4									
	42 13.53	54 27 30.99	43 33.53	52 46 40.97	45 23.63	54 2 23.34	47 49.63	50 22 30.18	49 17.73	53 47 54.84	50 26.13	53 50 32.47								
	+26.29	− 17	−16.05	− 7	+32.11	− 27	+36.69	− 40	+32.89	− 28	+19.83	− 10								
	1.41979	− 8	1.20548 m	− 46	1.50664	− 8	1.58760	− 3	1.51706	− 1.30	1.29732	− 62								
	9.76431	+ 1283	9.78163	+ 11.00	9.76887	+ 12.34	9.80458	+ 8.41	9.77130	+ 1.209	9.77078	+ 1214								
	1.30670 m	+ 35	1.10971	+ 30	1.39811 m	+ 35	1.51478 m	+ .20	1.41096 m	+ 35	1.19070 m	+ 35								
	0	−342.40		−33.90	25	−33.80	5	−33.10	35	−33.10	35	−33.40								
	0 11.6	27 5.77	1 37.9	46 13.89	0 17.8	1 57.93	0 3.7	22 1.31	4 46.1	47 28.35	2 17.2	50 7.91								
	17.8		40.8		20.4		5.4		47.6		19.7									
	12 4		78 7		38 2		9 1		13 7		16 9									
	0 16.20		41 39.35		25 19.10		5 4.55		39 46.55		37 15.45									
	22 32.15		41 9.00		57 29.25		17 43.80		43 1.50		45 29.90									
	54 27 51.25		52 46 28.10		54 2 48.35		50 23 29.0		53 48 20.60		53 50 49.00									
	− 2026		+ 1287		− 2501		− 3272		− 2576		− 1581									
Dec. 17	42 35.56	26 35.3	43 13.53	45 43.5	45 50.47	1 27.9	48 24.68	21 31.6	49 46.29	46 58.8	50 41.61	49 38.4								

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1877phae.proj.16:7R

1877 Dec. 17, Dec. 18. Obs. W. A. R. Rec. J. F. M.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	23 25 46	24 594	23 26 49	26 21	23 28 41	27 550	23 29 33	28 464	23 31 27	30 39.5	23 32 2	31 138
δ	53° 29′	22.8 8.7	52° 24′	180 7.2	51° 18′	13.2 8.9	53° 32′	26.0 8.8	54° 14′	8.9 8.9	54° 22′	16.9 9.1
Dec. 17	m s	+10.87 +11.43	m s	+8.72		+5.92		+10.56		+12.16		+11.60
Add +023	25 41.4	25 45.2	7.13	7.69	26 —	5.98	28 41.8	5.18	29 34.1	6.82	31 26.4	8.42
t(D)+my	48.1	49.0					41.5		38.0		29.3	
Dec 17 Sid hus	51.7	52.4					48.3		41.6		33.3	
Incr addl	55.0	55.7			57.9	54.5	51.9		45.1		37.0	
to sum of	58.3	59.2			1.4	54.6	55.2		48.5		40.7	
Sid. Time	75 26 15						429		76		1675	
Incr.	51.50	52.30			26 54.55		28 48.58		29 41.52		31 33.50	
+023	+ 12.48	+ 12.48	+11.20	+1120	+ 12.48	2+11.25	+ 12.48	2+11.29	+ 12.48	2+11.21	+ 12.48	2+11.18
Sid to	— 1.07	— 1.07	561		— 1.03		— .99		— 1.07		— 1.10	
Time	— .17	— .17	3966		— .16		— .16		— .17		— .17	
R.A.	26 2.66	3.46	561		27 5.76		28 59.83		29 52.68		31 44.63	
	— 2.40	— 2.40	3966		— 2.46		— 2.52		— 2.46		— 2.47	
	26 0.28	1.06			27 3.32	4	28 57.38	5	29 50.22	7	31 42.16	
	30	10	31	3.74							20	
	90.7	m s	m s	53 30 56.20	53.44	8.8		9.0		9.0		9.1
		26 1.43	25 40.3	— 18 — 2		27 8.8		28 30.0		29 19.5		31 16.1
		17.9	43.6	— 68 — 30		13.3		33.0		22.1		20.0
		20.2	47.4	+ 1138 + 1140		16.5		35.8		25.3		22.9
		5.36	11.7	+ .35 + .35		8.6		38.8		6.9		5.90
	26	1787	1990	— 3840 — 3840		27 12.87	— 52 25 37.27	28 22.93	51 21 29.65	29 22.30	53 33 41.52	31 19.67
		— 26.37	+ 840	3° 2493 31 2293		— 18.32		+ 15.65	— 7	+ 19.22	— 9	+ 13.83
		1.42111 n	0.92428			1.26293	— 73	1.19451	— 38	1.28375	— 1.13	1.14082
		9.77422	9.77405			9.78510	+ 10.24	9.79542	+ 9.12	9.77370	+ 1143	9.76625
		1.3 1783	0.82093 n			1.17063	+ 30	1.11253 n	+ 25	1.18005 n	+ 35	1.02967 n
Rm=-.27		55	55		0		−3820	5	−38.10	50	−3860	10
n=-.79		2 28.9	4.7		2 41.5	25 5.05	1 22.0	20 56.73	4 8.6	83 9.74	1 11.4	16 12.27
c=-.10		10 33.1	7.6		46.4		25.6		10.9		14.5	
		620	123		79		76		195		59	
+5	18.06	3098	56.17		2 43.95		6 23.80		54 9.75		11 12.95	
		25 1735	26 4220		20 4.40		16 24.55		28 38.60		11 33.40	
		53 30	35.41	32 0.26	52 25 22.46		51 21 42.61		53 33 56.66		54 16 53.46	
		+ 2079	— 662		+ 14.81		— 12.96		— 15.14		— 10.71	
		25 54.69	55.49	30.43.3	26 57.69	24 25.4	28 51.66	2017.0	29 44.60	32 29.0	31 36.51	15 32.5
Dec. 18							m s	+9.64		+11.46		+13.06
							28 41.2	5.82	29 33.7	7.64	31 25.0	9.24
							44.1		47.1		27.0	
							47.3		40.7		32.7	
							50.4		44.4		36.5	
							53.0		48.0		40.0	
							2390		39		1632	
							28 47.80		29 40.78		31 32.64	
							+ 13.39	+12.19	+ 13.39	+12.10	+ 13.39	+12.07
							— 1.04		— 1.12		— 1.15	
							— .16		— .17		— .17	
							28 59.99	569	29 55.46	567	31 44.71	569
							— 2.52	3974	— 2.43	3976	— 2.45	3980
							26 57.49		29 50.45		31 42.26	
							90 m s		6.8		6.8	
							28 30.2		29 27.0		31 34.4	
							33.7		31.9		38.3	
							37.0		34.8		40.5	
							109	−352	37		1132	
							28 33.63	51 21 29.97	29 31.23	53 33 42.73	31 37.73	54 16 40.19
								+14.17	— 5	+9.55	— 3	— 5.09
							1.15137	— 38	0.98000	— 116	0.70672 n	— 40
							9.79542	+ 9.82	9.77270	+1230	9.76625	+1312
							1.06939	+ 25	0.87630	+ 35	0.59557	+ 35
							5	−3810	50	−3860	10	−3890
							1 23.8	20 57.69	4 15.7	33 12.57 11.93	1 30.1	16 10.53
							26.5		17.5		31.1	
							103		132		12	
							6 25.15		54 16.60		11 30.60	
							16 23.20		28 31.75		11 17.75	
Rm=-.27												
n=-.83							51 21 41.70		53 33 58.25		54 16 36.25	
c=-.10							— 11.73		— 7.52		+ 3.94	
+5	18.50						28 51.80	20 18.0	29 44.78	32 32.0	31 36.67	15 30.7

	h m s	
α	32 1.9	31 13.8
δ	54° 22′	16.9 9.1
		+11.60
	32 1.9	7.86
	5.4	
	8.9	
	12.5	
	16.2	
	449	
	32 8.98	
	+ 12.48	2+11.16
	— 1.11	
	— .17	
	32 20.10	
	— 2.48	
	32 17.64	6
	8.8	
	32 17.9	
	21.2	
	25.0	
	41	
54 16 42.75	32 21.37	54 24 30.63
— 5	— 12.89	— 4
— 32	1.09307 n	— 1.03
+ 12.18	9.76501	+ 12.32
+ 35	0.98068	+ 85
−3890	0	−3840
16 12.27	3 43.9	23 59.59
	46.8	
	49.7	
	52.6	
	55.5	
	58.4	
	1.3	
	4.2	
	7.1	
	403	
	32 8.06	
	+ 13.39	+12.06
	— 1.16	
	— .17	
	32 20.12	
	— 2.46	
	32 17.66	
	8.7	
	32 329	
	36.0	
	39.2	
	181	
54 16 40.19	32 36.03	54 24 29.89
— 1	— 27.97	— 20
— 40	1.44669 n	— 1.08
+ 1312	9.76501	+ 1326
+ 35	1.33430	+ 35
−3890	0	−3890
16 10.53	3 58.6	23 58.70
	0.1	
	1.7	
	1187	
11 30.60	3 59.35	
11 17.75	18 49.02	
54 16 36.25	54 24 9.57	
+ 3.94	+ 21.59	
15 30.7	32 11.97	23 18.9

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1877. Dec. 17, Dec. 18.

55

	h m s		h m s		h m s		h m s		h m s		h m s	
α	23 42 3	41 14.3	23 43 39	42 50.2	23 44 27	43 37.8	23 46 37	45 47.2	23 52 46	51 56.4	23 53 33	53 43.0
δ	52° 34′	28.3	50° 6′	0.7	53° 23′	17.1	53° 34′	28.3	53° 10′	3.9	51° 54′	48.4
		8.6		9.5		9.0		9.0		8.6		9.0

45 268
28.3

Dec. 17

+10.14 +10.61 +11.08+11.29 +10.93

42 3.1 6.40 Eb. f. 44 — 6.87 7.34 7.55 52 48.2 7.19 Ochsen

64 46 46 46 46 27.5
9.7 20.0 41.0
13.1 34.4 34.4 23.6 44.5
16.8 37.9 34.4 27.0 48.0
41.4 34.5 30.6 51.6
55.1
59.6
2.0

491 1178 2226 2755

42 9.82 44 34.43 23.56 44.52 52 55.10
+ 12.41 2+11.23 + 12.41 2+11.22 + 12.41 2+11.20 +11.20 + 12.41 2+11.21
− 1.03 − 1.06 − 1.07 − 1.07 − 1.06
− .16 − .17 − .17 − .17 − .17

42 27.04 −5.87 44 45.68 −5.90 46 34.73 55.69 −5.93 −5.94 53 6.28
− 2.73 − 2.75 − 2.77 − 2.78 − 2.91 −6.03
42 18.38 −3.998 44 42.93 −4.002 46 31.96 52.91 −4.004 −4.004 53 3.38 −4.008

8.9 41 9.6 8.8 8.0 9.0
57.4 44 50.0 46 50.4 53 36 1059 35 5203 9.0
2.3 14.2 57.6 53.7 − 18 − 3 22 29.8
35 17.1 06 57.2 − 87 − 51 33.8
5 85 11.3 1732 113 +1148+1148 36.0
482 2.17 52 35 5332 + .35 + .35 96
44 53.77 53 25 2.15 5773 53.77 −3940 −3940 52 33.20 53 11 45.01

+.799 − 1.83 − 19.84 − 9 +25.83 − 9.25 35 3553 36 2618 + 21.90 − 13
0.90255 1.41609 − 52.07 − 2 1.28646 − 89 1.41212 0.96644 − 57 1.34044 − 30
9.78346 9.78346 − 57 9.77524 +11.29 9.77336 9.77336 + 10.43 9.77744 + 11.06
0.80861 + 10.43 1.18430 + .30 1.36808 0.86210 + .30 1.24048 + .30
50 + .30 − 39.00 15 − 39.20 0 50 50 158 − 39.50

2 4.5 35 20.72 11 43.4 3 17.9 24 29.82 2.19 52.8 12 2.6 11 12.70
8.8 44.6 21.2 4.3 55.3 5.4
133 8.0 391 62 81 80
+5 18.06 52 6.65 19 44.40 3 19.53 52.310 51 54.05 16 4.00
30 41.70 3 4.35 19 28.80 30 45.25 30 54.30 6 44.35
52 35 59.76 50 8 22.41 53 24 46.86 53 36.33 36 12.36 53 12 2.41
+ 6.44 + 15.29 − 17.40

42 12.47 34 40.7 44 36.80 23 49.8 46 26.06 34 40.1 52 57.37 10 32.6
47.00 +11.95 +11.95

Dec. 18

+10.93 +11.41 +11.72 +9.71

42 2.6 7.11 44 26.6 7.59 46 36.8 8.13 8.13 52 4.5 7.90 53 44.5 5.89
30.1 12.1 40.3 30.7 47.5
83.6 22.4 44.0 33.4 54.0
87.3 26.4 47.2 54.3
40.4 29.8 50.5 57.5
48.0 1685 1138 188 2711 48
42 9.00 44 33.70 22.76 43.74 52 54.22 53 50.96
+ 13.39 +12.15 + 13.39 +12.11 + 13.39 + 13.39 +12.10 +12.10 + 13.39 +12.11 + 13.39 +12.17
− 1.08 − 1.11 − 1.12 − 1.12 − 1.01 − 1.06
− .16 − .17 − .17 − .17 − .17 − .16

42 21.15 −5.87 44 45.81 −5.90 46 34.86 55.86 −5.93 −5.94 53 6.33 −6.03 54 3.13
− 2.70 − 2.72 − 4.002 − 2.75 − 2.76 − 4.004 − 2.89 − 4.008 − 2.93
42 18.45 −3.998 44 43.09 46 32.11 53.10 53 3.44 54 0.20

8.5 8.0 9.0 53 36 1132 35 5133 9.0 9.1
41 57.4 43 55.2 47.3 − 5 − 18 52 23.7 53 44.1
0.0 38.1 37.2 10.5 − 70 − 57 24.3 49.0
2.4 0.5 28.7 12.7 +1235+1235 28.6 48.0
03 17.38 201 05 + .35 + .35 18.6 152
42 0.10 52 35 54.93 43 57.93 53 28 59.08 3670 1087 −3940 −3940 52 26.20 53 11 43.44 53 45.07 57 58 47.04
+ 8.90 − 2 + 35.77 − 34 13.94 − 2.41 35 40.05 35 20.06 + 28.02 − 21 + 5.89 − 1
0.94939 − 57 1.55352 − 731 1.44426 1.42177 1.44747 − 27 0.77012 − 113
9.78346 + 11.22 9.77524 + 12.18 9.77336 9.77336 9.77744 + 11.90 9.78950 + 10.55
0.85545 + .30 1.45136 + .30 1.04022 1.31773 1.34751 + .30 0.68222 + .30
50 − 39.00 0 − 39.20 50 50 15 − 39.50 25 − 39.30

2 3.5 35 23.04 2 37.9 26 27.47 2 35.2 52 0 59.8 11 12.84 11.84 4 13.9 58 13.63
6.0 41.1 24 37.4 7.8 2.5 16.1
95 79.0 126 130 1223 100
52 4.75 4 39.50 52.36.30 52 6.50 16 1.15 29 15.00
30 43.60 8.85 30 1205 39 41.85 6 47.20 53 33.35
52 36 2.10 53 25 27.35 53 35.36 55 36 0.35 53 12 5.70 51 54 51.85
− 7.17 − 28.27 − 22.26 − 4.81

42 12.58 34 43.6 44 37.19 23 47.4 46 26.18 35 0.0 52 57.41 10 31.8
47.16 34 40.0

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1877 Dec. 17 Dec. 18. Obs. W. A. R. Rec. J. F. M.

	608	609						2 12.8 13.3				
	h m s		h m s		h m s		h m s		h m s		h m s	
α	23 56 54	56 3.8	0 0 22	23 59 30.9	0 1 35	0 44.1	0 3 11	2 19.6	0 3 53	3 1.5	0 5 27	4 35.2
δ	54° 20′	15.6 8.5	51° 17′	11.2 9.0	50° 16′	11.1 9.1	51° 19′	14.0 8.8	51° 36′	30.9 7.9	54° 23′	17.6 8.3
Dec. 17	m s	+11.18		+8.35		+6.96		+8.77 +9.14		+8.52		+12.08 5
	56 56.6 / 0.3 / 3.6 / 7.1 / 10.7	7.44	0 23.1 / 26.6 / 29.9 / 33.2 / 36.5	4.61	1 36.8 / 40.0 / 43.4 / 46.7 / 49.9	3.22	3 55.3 12.2 / 8.6 15.4 / 12.0 18.5 / 15.2 21.9 / 18.3 25.6	5.03 5.40	3 54.7 / 57.9 / 1.4 / 4.7 / 7.9	4.78	5 28.9 / 32.5 / 36.0 / 39.6 / 43.3	8.31
	18.2		149.3		216.8		59.6 93.6		6.6		180.4	
	57 3.64 / + 12.42 / − 1.10 / − .17	2 +11.17	0 29.86 / + 12.42 / − .99 / − .16	2 +11.30	1 43.36 / + 12.42 / − .95 / − .16	2 +11.33	11.92 18.72 / + 12.42 12.42 / − .99 − .99 / − .16 − .16	2 +11.29 +11.29 / −6.19 / −40.10	4 1.32 / + 12.42 / − 1.00 / − .16	2 +11.28	5 36.08 / + 12.42 / − 1.11 / − .17	+11.17
	57 14.78 / − 2.96 / 57 11.88	5 −6.10 / −40.10	0 41.07 / −3.03 / 0 38.04	7 −6.15 / −40.05	1 54.66 / −3.13 / 1 51.54	6 −6.17 / −40.10	4 23.18 29.98 / − 3.15 −3.16 / 4 20.04 26.83	5 −6.19 / −40.10	4 12.57 / − 3.15 / 4 9.43	5 −6.20 / −40.10	5 47.22 / −3.13 / 5 44.09	−6.24 / −40.10
	8.3 m s		9.0		9.1		8.0 8.7	51 21 13.51 3.94	8.2		8.3	
	36 30.2 / 33.0 / 35.8 / 9.0	−3.74	0 8.7 / 12.3 / 15.0 / 6.0		1 11.1 / 13.6 / 16.3 / 11.0		24.05 3 7.7 / 42.5 / 46.4 46.4 / 9.4	− 22 − 3 / − 40 − 24 / + 9.14 + 9.16 / + .25 + .25	3 42.3 / 45.1 / 47.7 / 15.1		5 9.6 / 12.3 / 15.5 / 14	
	56 33.00	54 23 28.5	0 12.00	51 19 25.21	1 13.67	50 18 42.82	43.13 7.70	−39.40 −39.40 / 20 39.14 29.94	3 45.03	51 38 34.16	5 12.47	54 25 51.55
	+30.64 / 1.48620 / 9.76519 / 1.37408	− 24 / −1.24 / +12.31 / + .35 / −39.90 5	+ 17.86 / 1.25188 / 9.79589 / 1.17037	− 9 / − 92 / + 9.11 / + 25 / −39.30 5	+ 29.69 / 1.47261 / 9.80519 / 1.40040	− 24 / − 108 / + 8.08 / + .20 / −39.10 5	+ 28.79 + 11.02 / 1.45924 1.04218 / 9.79558 9.79542 / 1.37742 0.96020 / 5 5		+ 16.29 / 1.21192 / 9.79272 / 1.12724 / 45	− 7 / − 116 / + 9.45 / + .30 / −39.40	+ 23.61 / 1.37310 / 9.76466 / 1.26036 / 0	− 15 / − 51 / +12.36 / + .35 / −40.10
	4 38.9 / 40.9 / 79.8 / 15 4 39.90 / 18 8.45	22 30.39	3 25.8 / 26.8 / 12.6 / 8 26.30 / 14 22.05	18 50.62	3 57.7 / 59.2 / 16.9 / 8 58.45 / 13 49.90	18 7.64 6.94	1 27.4 0 51.6 / 30.7 55.1 / 58.1 6.7 / 6 29.05 5 53.35 / 16 19.30 16 55.00		4 17.7 / 20.0 / 37.7 / 49 18.85 / 33 29.50	37 59.54	1 55.2 / 58.1 / 13.3 / 1 56.65 / 20 51.70	25 19.76
	54 23 26.51 / − 23.66		51 19 40.11 / − 14.80		50 19 7.96 / − 25.14		51 21 37.36 22 13.06 / − 23.85 − 9.12		51 38 47.56 / − 13.40		54 26 9.76 / − 18.21	
	57 5.75	21 50.3	0 31.92	18 10.6	1 45.39	17 26.8	3 13.87 / 20.66	19 59.0 / 20 49.8	4 3.25	37 19.4	5 37.88	24 39.7
Dec. 18	m s	+12.22		+9.04						+9.07		+12.95
	56 55.8 / 59.7 / 3.1 / 6.3 / 10.0	8.40	0 22.5 / 25.7 / 29.0 / 32.3 / 35.6	5.22					3 53.8 / 57.4 / 0.8 / 4.0 / 7.1	5.25	5 28.3 / 31.8 / 35.6 / 38.7 / 42.3	9.13
	34.9		45.1						3.1		176.8	
	57 2.98 / + 13.39 / − 1.15 / − .17	+12.07	0 29.02 / + 13.39 / − 1.04 / − .16	+12.19					4 0.62 / + 13.39 / − 1.05 / − .16	+12.18	5 35.36 / + 13.39 / − 1.16 / − .17	+12.06
	57 15.05 / − 2.94 / 57 12.11	−6.10 / −40.10	0 41.21 / −3.07 / 0 38.14	−6.15 / −40.05					4 12.80 / −3.12 / 4 9.68	−6.20 / −40.10	5 47.42 / −3.10 / 5 44.32	−6.24 / −40.10
	8.5 m s		8.8						8.0		8.8	
	56 45.4 / 49.2 / 53.3 / 147.9	−3.82	0 16.7 / 18.9 / 21.0 / 56.6						4 15.7 / 18.4 / 21.1 / 56.1		5 8.1 / 11.0 / 14.1 / 32	
	56 49.30	54 23 0.63	0 18.87	51 19 24.99					4 18.70	51 38 31.42	5 11.07	54 25 48.52
	+ 13.68 / 1.13609 / 9.76519 / 1.02388 / 0	− 5 / − 1.32 / +13.24 / + 35 / −39.90 5	+ 10.15 / 1.00647 / 9.79589 / 0.92496	− 3 / − 97 / + 9.79 / + 25 / −39.30					−18.08 / 1.25720 / 9.79272 / 1.17252 / 45	− 9 / − 1.30 / + 10.16 / + .30 / −39.40 0	+ 24.29 / 1.38543 / 9.76466 / 1.27269	− 15 / − 54 / + 13.29 / + 35 / −40.10
	4 55.2 / 56.1 / 11.3 / 4 55.65 / 17 52.70	22 29.13	3 32.8 / 34.1 / 6.9 / 8 33.45 / 14 14.90	18 50.91					4 49.9 / 50.7 / 10.6 / 49 50.30 / 32 58.05	37 57.28	1 58.5 / 0.6 / 119.1 / 21 59.55 / 20 48.80	25 17.59
	54 23 11.20 / − 10.57		51 19 33.40 / − 8.41						51 38 16.55 / + 14.88		54 26 7.30 / − 18.74	
	57 6.01	21 49.0	0 31.99	18 10.9					4 3.48	37 17.2	5 38.08	24 37.5

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606 607

1877, Dec. 17, Dec. 18.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 8 11	7 19.2	0 16 3	15 10.8	0 17 26	16 32.0	0 21 51	20 57.4	0 23 14	22 20.2	0 23 59	23 4.3
δ	55° 0′	54 53 9.0	54° 21′	14.7 9.0	54° 53′	47.2 8.4	54° 46′	40.2 8.8	54° 8′	2.3 9.0	55° 0′	54 54.3 6.8

Dec. 17

	+13.05		+12.57		+12.18		+12.97		+14.53		+13.14	
	8 16.1	9.31	16 6.9	8.78	17 27.8	8.44	21 33.6	9.33 9.15	23 16.8	7.79	24 1.3	9.40
	19.6		10.5		31.5		37.1		20.2		4.8	
	23.2		14.1		35.0		0.6		23.9		8.3	
	26.7		17.4		38.6		4.2		27.6		12.0	
	30.4		21.1		42.1		7.7		31.1		15.5	
	1160		700		1750		32		1196		419	
	8 23.20		16 14.00		17 35.80		22 0.64		23 23.92		24 8.28	
	+ 12.42	+11.19	+ 12.42	+11.17	+ 12.42	+11.14	+ 12.41	+11.17	+ 12.48	+11.16	+ 12.41	+11.15
	− 1.13		− 1.10		− 1.13		− 1.12		− 1.12		− 1.13	
	− .17		− .17		− .17		− .17		− .17		− .17	
	8 34.32	−6.29	16 25.15	−6.41	17 46.12	−6.44	22 11.77	−6.51	23 35.05	−6.52	24 19.50	−6.55
	− 3.17	−4.008	− 3.34	−4.000	− 3.36	−3.998	− 3.45	−3.992	− 3.48	−3.990	− 3.49	−3.988
	8 31.15		16 21.81		17 42.76		22 8.32		23 31.57		24 16.01	
	9.2 9.2		9.3		8.6		9.1		9.0		9.0	
	8 26		15 58.6		17 4.0		21 31.7		22 53.4		23 51.7	
	34		1.3		7.0		35.4		57.0		53.0	
	8.5		1.0		9.6		7.7		0.2		57.8	
	165		49		206		150		706		145	
	8 5.50	55 1 49.01	16 1.63	54 22 32.96	17 6.87	54 54 26.96	21 25.07	54 47 44.11	22 56.87	54 10 2.61	23 54.83	55 2 44.6
	+ 17.70	− 8	+ 12.37	− 4	+ 28.13	− 20	+3106 25.64	− 25.47	+ 27.05	− 19	+ 13.55	− 5
	1.24797	− 27	1.09237	− 11	1.44917	− 89	1.49220	− 3	1.43217	− 73	1.13194	− 22
	9.75823	+1300	9.76514	+ 1232	9.75967	+12.87	9.76075	+1277	9.76744	+12.10	9.75823	+ 13.01
	1.12880	+ 40	0.98016	+ 35	1.33144	+ 40	+2922 27	+ 40	1.32224	+ .35	1.01277	+ 40
	25	−4020	5	−4030	30	−4040	40 1.37 5552	−4040	15	−4030	25	−4050
	1 2.8	1 18.12	0 21.6	22 1.44	3 16.2	53 55.00	0 4.2	47 4.94 5.74	2 40.8	30.10	0 50.1	1 33.36
	5.1		26.2		19.8		7.2		44.8		53.2	
	7.9		7.8		160		114		2 56		33	
	26 3.95		5 23.90		33 18.02		40 5.70		17 42.50		25 57.65	
	56 44.90		17 24.45		49 30.35		42 42.65		5 5.55		56 56.70	
	55 2 24.6		54 22 42.51		54 54 48.41		54 48 0.71		54 10 23.61		55 2 14.76	
	− 13.45		− 9.55		− 21.45		− 19.66 23.74		− 21.00		− 10.30	
	8 24.88	0 38.0	16 15.42	21 21.4	17 36.34	53 15.0	22 1.85	46 25.8	23 25.08	8 50.2	24 9.49	0 53.5

Dec. 18

	+14.02		+13.43		+13.09		+13.94					
	8 14.9	10.20	16 5.9	9.61	17 27.0	9.24	21 32.9	10.17 10.14				
	19.0		7.7		30.5		36.1					
	23.1		12.0		33.4		39.8					
	25.0		16.8		37.4		3.6					
	29.3		20.4		41.3		7.0					
	1118		658		1701		2994					
	8 22.36		16 13.16		17 34.02		21 54.88					
	+ 13.39	+12.03	+ 13.39	+12.07	+ 13.39	+12.03	+ 13.39	+12.04				
	− 1.19		− 1.15		− 1.19		− 1.18					
	− .17		− .17		− .17		− .17					
	8 34.39	−6.29	16 25.23	−6.41	17 46.05	−6.44	22 11.92	−6.51				
	− 3.15	−4.008	− 3.31	−4.000	− 3.33	−3.998	− 3.42	−3.992				
	8 31.24		16 21.92		17 42.72		22 8.50					
	8.9		9.0		8.7		9.0					
	8 26		15 58.3		16 58.6		21 31.2					
	9.6		1.0		33		40.1					
	114		2.9		1.7		44.1					
	288		22		76		4410 31					
	8 9.60	55 1 49.90	16 0.73	54 22 33.65	17 2.53	54 54 26.54	21 4.03	54 47 34.99				
	+ 12.76	− 5	+ 12.43	− 4	+ 31.49	− 25	+1578 18.85	− 76				
	1.10585	− 30	1.09447	− 11	1.49817	− 89	1.52 89.1	− 8				
	9.75823	+ 13.97	9.76514	+ 13.39	9.75964	+ 13.83	9.76075	+ 13.71				
	0.98668	+ 40	0.98226	+ 35	1.38044	+ 40	1.08 1462	+ 40				
	25	−4020	5	−4030	30	−4040	40	−4050				
	1. 6.6	1 19.90	0 22.3	22 2.96	3 15.6	53 65.41	0 16.4	47 4.57 6.88				
	7.9		24.9		17.0		18.7					
	145		42		126		15.1					
	26 7.25		5 23.60		33 16.30		40 17.55					
	56 41.10		17 24.75		49 32.05		42 30.80					
	55 1 57.60		54 22 43.25		54 54 50.55		54 47 99.30					
	− 9.70		− 9.60		− 24.01		− 44.1 13.06					
	8 24.95	0 39.8	16 15.31	21 23.0	17 36.28	53 15.4	22 1.99	46 27.0				

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1877. Dec. 17. Dec. 18. Obs. W.A.R. Rec. & J.M.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
✕	0 25 8	24 133	0 26 7	25 16.3	0 26 56	26 1.3	0 28 57	28 1.9	0 29 53	28 584	0 30 ~~44~~	29 39.1
8	53° 1′	1.0 7.4	50° 58′	524 8.8	52° 24′	18.1 8.7	54° 9′	3.2 7.5	54° 32′	25.7 7.8	51° 17′	11.1 8.6

Dec. 17

m s	+10.07		+8.04		+9.98 +10.11		+11.33 +11.58		+12.85		+8.23	
25 11.1	6.33	26 12.6	4.30	26 34.0 27 0.1	6.24	6.37	7.59	7.84	21 55.0	9.11	30 37.2	4.49
14.5		16.0		57.4 33					58.2		40.6	
18.0		19.3		0.7 67					1.8		43.8	
21.5		22.5		37 100					5.4		47.2	
24.9		25.8		7.7 136					8.8		50.7	
900		963		35 337					92		2195	
25 18.00		26 19.26		0.70 6.74					30 1.84		30 48.90	
+ 12.43	3+11.23	+ 12.43	3+11.32	+ 12.43	3+12.57	3+11.27+11.74	12.48	3+12.43	3+11.19+11.19		+ 12.43	3+11.30
− 1.05		− 0.98		− 1.05	− 1.02		− 1.09	− 1.09			− .99	
− .17		− .16		+ .16	− .16		− .17	− .17			− .16	
25 29.20		26 31.54		27 11.94	17.98		29 18.48	20.86	30 12.99		30 55.17	
− 3.52		− 3.56		− 3.56	− 3.56		− 3.59	− 3.59	− 3.61		− 3.63	
25 25.68		26 27.98		27 8.39	14.42		14.92	16.78	30 9.38		30 51.54	
71		27.02		41	14.45		14.92	30	41			
77m s		8.9		90 8.7			52 27 17 29 25 59 15		7792		8.2	
24 48.4		25 45.0		21.4 26 45.3			54 10 46 9 28 78		72		30 36.8	
51.8		47.4		25.5 57.4			− 27 − 16		29 51.6		39.6	
57.3		50.3		28.8 57.6			− 86 − 70		54.3		42.7	
45		14.28		27 1.57 11.45			+ 1211 + 1209		57.3		11.91	
24 51.50	53 8 43.13	25 47.60	50 59 58.24	35.23 28 48.17			+ 35 + 35		13.2			
							− 1040 − 1040					
							25.77 37.27		29 54.40	54 32 56.74	30 39.70	51 18 51.38
+ 26.50	− 18	+ 31.66	− 27	24.53 + 18.57			18.45 + 32.43		+ 7.44	− 2	+ 4.20	− 1
1.42325	− 108	1.50051	− 73	1.38970 1.26881			1.26600 1.51095		0.87157	− 3	0.623225	− 1.13
9.77795	+1103	9.79887	+ 8.99	9.78474 9.78494			9.76747 9.76747		9.76342	+ 12.50	9.79589	+ 9.12
1.32380	+ 30	1.42198	+ 25	1.29724 1.17635			1.15607 1.40102		0.75759	+ 40	0.541174	+ 25
15	− 4010	25	− 4000	0 0			15 15		55	− 4040	5	− 39.60
4 1.9	8 9.36	2 40.0	39.70	50.1 7.0			3 10.5 32.8		0 2.1	32 25.45	41 9.1	18 1627
2.5		43.5	59 2284	54.4 10.9			14.1 35.2		5.8		12.0	
44		35		45 179			49 80		79		211	
19 2.20		24 41.75		1 52.25 1.95			18 12.45 31.00		55 3.95		9 10.55	+1
3 46.15		55 6.60		20.56 10 3.40			4 35.90 51.35		27 44.40		13 37.80	
53 9 42.1		51 0 24.66		52 26 14.16 5.46			54 55.96 10 32.41		54 33 24.6		51 18 55.86	
− 21.08		− 26.42		+ 1983 − 1501			+ 14.32 − 25.18		− 5.72		− 3.48	
25 19.17	7 29.5	26 20.50	5843.0	27 1.86	26 3.7		29 6.31	7 34.1	30 2.77	3145.7	30 44.98	1736.5
				7.90	24 45.7			8 16.4				+5.81

Dec. 18

	4.99
38 36.2	
37.3	
42.6	
46.3	
42.8	
2142	
30 42.84	
+ 13.48	+12.20
− 1.04	
− .16	−6.59
30 55.04	−39.76
− 3.61	
30 51.43	
8.2 8 s	
30 37.8	
57.0	
59.3	
186	
30 56.20	− 382
− 13.36	51 18 51.74
1.125814	− 5
9.79589	− 1.19
1.04430	+ 9.80
5	+ .25
	−39.80
41 25.8	18 1696
26.5	
123	
9 26.15	
13 2220	
51 18 40.70	
+ 11.07	
3044.64	1737.2

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1877, Dec. 17, Dec. 18.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 30 44	29 49.0	0 34 2	33 6.2	0 34 52	33 55.2	0 40 45	39 51.5	0 46 10	45 14.9	0 52 11	51 12.5		
δ	51° 17′	11.3	52° 19′	13.5	53° 35′	30.4	50° 5′	0.2	53° 55′	49.8	54° 4′	53 59.5		
		9.1		8.7		9.3		9.5		8.9		8.8		

Dec. 17

	m s	+8.15		+9.69		+10.57		+7.64		+11.22		+12.01		
	30 50.4	4.41	34 3.9	5.95	34 55.1	6.83	40 37.4	3.90	46 28.8	7.48	52 15.3	8.27		
	53.4		7.3		58.6		41.4		32.5		18.8			
	56.4		10.7		2.0		44.6		35.9		22.4			
	0.0		14.0		5.5		47.7		39.4		25.7			
	3.1		17.5		9.1		51.0		43.1		29.4			
	28 35		5 24		31 03		22 26		17 97		11 18			
	30 56.70		34 10.68		35 2.06		40 44.52		46 35.94		52 22.36			
	+ 12.48	3 +11.30	+ 12.43	+11.27	+ 12.43	+11.22	+ 12.43	+11.35	+ 12.43	+11.19	+ 12.43	+11.19		
	− .99		− 1.02		− 1.07		− .94		− 1.09		− 1.09			
	− .16		− .16		− .17		− .16		− .17		− .17			
	31 7.97		34 21.93		35 13.25		40 55.85		46 47.11		52 33.53			
	− 3.63		− 3.69		− 3.71		− 3.81		− 3.83		− 4.05			
	31 4.34	7 −6.59	34 18.24	6 −6.66	35 9.54	7 −6.70	40 52.04	6 −6.71	46 43.28	−6.89	52 29.48	−6.98		
		−39.74		−39.96		−39.64		−39.46		−39.30		−39.06		
	9.1 m s		8.0		9.4		9.4		9.0		8.9			
	31 11.4		33 3.40		34 4.60		40 13.7		46 10.1		52 4.1			
	13.6		3.74		4.85		16.1		13.4		4.21			
	16.2		4.12		5.17		18.9		16.2		4.88			
	15.5		11.76		14.62		19.3		10.7		15.7			
	31 15.17	51 19 11.17	33 31.20	52 20 49.29	34 46.78	53 38 12.48	40 16.43	50 6 47.47	46 13.57	54 40 24.1	52 45.23	54 4 26.29		
	− 18.17	− 9	+ 33.48	− 30	+ 13.33	− 5	+ 28.09	− 21	+ 22.37	− 13	− 22.87	− 14		
	1.26447 m	− 1.13	1.52479	− 49	1.12483	− 127	1.44855	− 24	1.34967	− 84	1.35927 m	− 27		
	9.79589	+ 9.12	9.78592	+ 10.18	9.77302	+ 1154	9.80701	+ 489	9.77069	+ 1849	9.76880	+ 1204		
	1.18496	+ .25	1.43331 m	+ .30	1.02045 m	+ 33	1.37816 m	+ 20	1.24236 m	+ 35	1.24987	+ 35		
		−39.90		−40.00		−40.20		−39.50		−40.30		−40.20		
	5		5		45		20		30		20			
	21 9.1	18 4.58	1 47.9	20 15.24	41 42.5	37 39.11	0 53.5	6 11.87	3 7.5	54 7.42	0 56.4	6 54.36		
	12.0	35.	52.1		44.4		56.6		9.9		59.4			
	2.11		1000		69		101		1.74		1.58			
	9 10.55		6 50.00		49 43.45		20 55.05		33 8.70		20 54.90			
	13 37.80		15 58.35		33 4.90		1 53.30		49 39.65		1 50.48			
	51 18 53.86		52 21 16.41		53 38 22.96		50 7 11.36		53 54 57.71		54 7 8.51			
	+ 15.31		− 27.12		− 10.48		− 23.89		− 17.47		+ 17.78			
	30 57.78	17 55.8	34 11.60	19 35.6	35 2.87	36 59.5	40 45.35	5 32.4	46 36.31	53 28.1	52 22.52	6 15.3		
		+5.54						+8.29		+12.00		+12.98		

Dec. 18

	30 48.5	5.05	Cloudy.		Cloudy.		40 37.1	4.47	46 28.1	8.18	52 15.0	9.76		
	53.3						40.3		31.7		19.2	29		
	58.0						43.4		35.1		21.6			
	59.0						46.1		38.8		24.8			
	2.2						50.1		42.3		28.7			
	28 00						21 79		17 63		83			
	30 56.50						40 43.58		46 35.26		52 21.66			
	+ 13.40	+12.20					+ 13.40	+12.25	+ 13.40	+12.09	+ 13.40	+12.09		
	− .104						− .199		− .114		− .114			
	− .16						− .16		− .17		− .17			
	31 8.20	−6.59					40 55.83	−6.71	46 47.35	−6.89	52 33.74	−6.98		
	− 3.61	−39.74					− 3.79	−39.46	− 3.91	−39.30	− 4.03	−39.06		
	31 4.59						40 52.04		46 43.44		52 29.72			
	9.0		8.0				9.3		9.0		8.9			
	31 6.8						40 31.3		46 20		52 90			
	9.9						33.0		3.2		5.4			
	12.7						34.7		8.0		6.3			
	29.4						1.40		1.52		16.91			
	31 9.80	51 19 8.79					40 34.67	50 6 44.22	46 5.07	53 54 39.02	54 7 24.51			
	− 13.80	− 5					+ 8.91	− 2	+ 30.19	− 2.3	− 4.66	− 4.99		
	1.13986 m	− 1.13					0.99488	− 35	1.47986	− 84	1.49205	− 14		
	9.79589	+ 9.80					9.80701	+ 8.46	9.77069	+ 1272	9.76880	+ 1254		
	1.05837	+ .25					0.87949 m	+ .20	1.37255 m	+ .35	1.29303 m	+ .35		
	5	−39.80	5		45		20	−39.60	30	−40.30	20	−40.30		
	41 8.9	18 34.04	1 59.0		4 38.0		1 14.0	6 9.09	3 3.6	54 6.90	0 31.5	6 43.85		
	10.1		0.8		38.9		16.1		4.9		32.9	6 53.80		
	1.90		11.8		9		1.01		8.5		4.4			
	9 9.50		6 59.90		49 38.45		21 15.05		33 4.25		20 32.20			
	13 38.85						1 33.30		49 44.10		2 16.15			
	51 18 57.35						50 6 51.80		53 55 2.60		54 7 34.65			
	+ 11.44						− 7.58		− 23.58		− 19.46			
											− 9.84			
	30 58.80	17 54.3					40 45.33	5 29.6	46 36.55	53 27.6	52 24.74	6 14.7		

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1877 Dec. 17, Dec. 18. Obs. W.A.R. Rec. J.F.M.

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	h m s	h m s	h m s		h m s		h m s		h m s		h m s	
α	0 52 17	0 52 42	0 56 41	55 42.0	0 57 36	56 40.6	1 2 24	1° 25.6	1 5 21	4 20.8	1 7 32	6 34.2
δ	54° 2	52 17	53° 45	40.4	50° 13	88	51° 12	6.5	53° 43	37.9	52° 29	23.2
				8.5		8.8		9.0		8.2		9.0
Dec. 17	m s	+11.37		+10.46		+7.86		+8.15		+11.22		+7.92
	52 20.8	7.63	56 45.6	7.02	57 43.3	4.12	2 28.8	4.41	5 26.0	7.48	7 35.7	6.18
	24.2		49.0		46.6		32.0		29.5		39.1	
	27.8		52.4		49.8		35.2		33.0		42.5	
	31.3		56.0		53.0		38.4		36.5		46.1	
	34.7		59.5		56.2		41.7		40.0		49.4	
	1388		26.25		2489		1761		1650		2128	
	52 27.76		56 52.50		57 46.78		2 35.22		5 33.00		7 42.56	
	+ 12.43	+11.20	+ 12.43	+11.20	+ 12.40	+11.34	+ 12.40	+11.30	+ 12.40	+11.21	+ 12.43	+11.26
	- 1.09		- 1.08		- .95		- .99		- 1.08		- 1.03	
	- .17		- .17		- .16		- .16		- .17		- .16	
	52 38.93		57 3.68	-7.04	58 1.11	-6.95	2 46.57	-7.04	5 44.47	-7.17	7 53.81	
	- 4.05	-6.96	- 4.13	-38.88	- 4.10	-38.84	- 4.20	-38.62	- 4.29	-38.48	- 4.31	-7.16
	52 34.88	-39.06	56 59.55	7	57 57.00	2	2 42.37	2	5 39.69	7	7 49.50	-38.38
	91								12		31	
	89 m s		87		84		91		86		90	
	52 1.0		56 26.4		57 33.0		2 12.7		4 58.7		7 11.0	
	4.2		29.6		35.4		15.2		3.0		14.0	
	8.3		32.8		37.7		18.5		6.2		17.6	
	12.5		8.81		186		164		7.9		12.6	
	52 4.50	54 4 3.56	56 29.37	53 48 26.29	57 38.20	50 16 34.80	2 15.47	51 14 2.36	5 2.63	53 45 33.05	7 14.20	52 30 41.12
	+23.26	- 14	+23.13	- 14	+ 13.58	- 5	+19.75	- .11	+30.37	- 24	+28.36	- 21
	1.36661	- .86	1.36418	- 1.19	1.13290	- 35	1.29547	- 1.03	1.48244	- 59	1.45271	- 54
	9.76835	+1202	9.77130	+11.74	9.80550	+ 886	9.79668	+ 9.04	9.77164	+ 11.70	9.78428	+ 10.37
	1.25756	+ .35	1.25808	+ .35	1.06100	+ .20	1.21485	+ .25	1.37668	+ .35	1.35959	+ .37
	20	-40.20	35	-40.10	10	-39.40	10	-39.50	40	-40.00	55	- 39.60
	3 11.1	4 3.09	4 20.2	47 53.21	1 19.1	15 59.52	3 46.4	18 27.27	2 8.0	45 0.53	2 0.9	30 7.70
	14.2		23.8		21.1		46.9		11.1		3.9	
	53		40		402		153		191		48	
	23 12.65		39 22.00		11 20.10		13 47.65		42 9.55		57 2.40	
	59 3.570		43 26.35		11 28.25		9 0.70		40 38.80		25 45.95	
	54 4 53.76		53 48 14.41		50 16 46.31		54 14 18.76		53 45 56.86		52 31 4.01	
	- 18.10		- 18.12		- 11.51		- 16.40		- 23.81		- 22.89	
	52 27.93	3 24.0	56 52.53	47 14.3	57 50.07	15 20.7	2 35.28	12 48.6	5 32.75	44 22.0	7 42.35	29 29.3
				+11.42		+8.37		+8.58		+12.19		+10.20
Dec. 18												
+12.30	52 17.8	52 44.0	56 45.0	7.60	57 42.7	4.55	2 28.0	4.76	5 ~~27.7~~	8.37	6.38	
8.48	+12.09	+12.17	+12.10									
8.38	23.5	47.8	48.2		45.4		31.2		29.1			
	27.0	51.3	52.0		49.1		34.5		32.5			
	30.2	54.4	55.5		52.7		37.8		35.8			
	34.1	57.8	58.8		55.7		41.3		39.4			
	1346	53	95		463		1728		16.28	47		
	52 26.92	52 51.06	56 51.90		57 49.26		2 34.56		5 32.56			
	+ 13.40	+ 13.40	+ 13.40		+ 13.40	+12.24	+ 13.40	+12.20	+ 13.40	+12.10		
	- 1.14	- 1.07	- 1.13		- 1.08		- 1.04		- 1.13			
	- .17	- .16	- .17		- .16		- .16		- .17			
	52 39.01	53 3.23	57 4.00	-7.04	58 1.50	-6.95	2 46.76	-7.04	5 44.66	57		
	- 4.03	- 4.02	- 4.11	-38.88	- 4.08	-38.84	- 4.18	-38.62	- 4.27	-7.17		
	52 34.98	52 59.21	56 59.89		57 57.42		2 42.58		5 40.39	-38.48		
	-6.96	-6.94										
	-39.06	-39.04										
	89 51 53.2	90			90		82		80			
	52 ~~2.0~~	52 3.61	56 11.2		57 29.7		1 54.0		5 12.7			
	35.6	57.2	13.8		32.9		57.2		22.7			
	0.3	28	17.5		36.0		57.2		26.1			
-3.82	16.91											
54 4 ~~4.21~~	57 ~~00.37~~	52 59.53	56 14.10	53 48 22.64	57 32.63	50 16 31.16	1 56.80	51 13 59.57	5 22.83	53 45 31.24	52 19 30.52	
- ~~3.58~~	+26.55	+ 8.47	+37.80	- 38	+16.63	- 8	+37.76	- 39	+ 9.64	- 3	- 2	
- .86	1.25334	0.92785	1.57749	- 113	1.22089	- 38	1.57203	- 97	0.98841408	- 68	- 1.00	
+12.89	9.76835	9.78625	9.77130	+ 1258	9.80550	+ 863	9.79668	+ 969	9.77164	+ 1255	+ 1092	
+ .35	+1.44029	0.83673	1.47139	+ .35	1.14899	+ .20	1.49631	+ .25	0.87832	+ .35	+ .33	
- 40.30	20	5	35	- 4020	10	-39.50	10	-39.60	40	- 40.10	- 40.00	
4 ~~11.59~~	3 10.7	3 42.5	4 14.3	47 50.04	1 21.7	15 56.21	3 34.9	13 24.75	2 27.8	44 59.44	18 56.90	
358	10.4	43.9	14.9		22.1		34.9		28.3	57		
	21.4	64	12		32		98		161			
	23 10.70	8 43.20	39 14.06		11 21.60		13 54.90	+1	42 28.05			
	59 3.765	14 5.15	43 33.75		11 26.75		9 13.45		40 20.30			
	54 4 56.15	52 19 23.65	53 48 52.25		50 16 45.25		51 14 31.93		53 45 38.80			
	-2.068											
	-13.54	+ 6.87	- 29.61		- 14.09		- 31.36		- 7.63			
									56			
	52 28.00	52 52.27	56 52.85	47 11.2	57 50.47	15 37.4	2 35.54	12 44.1	5 33.13	44 21.0		
	3 24.5	18 17.8										

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1877. Dec. 17

	h m s	h m s	h m s	h m s	h m s
α	1 8 25.7	254 + ~~18~~ ~~16~~	1 14 4.13	2.8	1 15 18.14	16.3	1 17 11.16	9.1	1 18 40.17	37.2
δ	57° 36′	30.2 ~~28~~ ~~2~~ 8.0	52° 19′	134 8.8	52° 46′	426 8.5	52° 32′	26.5 8.7	52° 28′	22.5 7.4

Dec. 17

	+11.69		+9.87		+10.23		+9.46		+9.69	
8	31.9	7.95	14 1.8	6.13	15 23.0	6.49	17 16.0	5.72	18 44.1	5.95
	35.3		11.5		26.4		12.6		47.4	
	37.0		13.0		27.8		23.0		51.0	
	42.7		18.3		33.3		26.3		54.3	
	46.2		21.8		36.6		29.7		57.8	
	1951		744		1491		1146		49	
8	39.02 -		14 14.88 -		15 29.82 -		17 22.92 -		18 50.98 -	
	+ 12.48 3 +11.17		+ 12.48 3 +11.27		+ 12.49 3 +11.26		+ 12.48 3 +11.26		+ 12.48 3 +11.26	
	- 1.21		- .02		- .04		- .03		- .03	
	- .17		- .16		- .16		- .16		- .16	
8	50.18		14 26.14	-7.25	15 41.06	-7.28	17 34.17	-7.30	19 2.23	-7.32
	- 4.36		- 4.42		- 9.46		- 4.46		- 4.51	
8	45.81 3	-7.25	14 21.72 3	-38.02	15 36.59 62	-37.96	17 29.71 67	-37.84	18 57.61 57.71 3	-37.74
		-38.32								
	8.2		9.0		8.7		8.5		8.2	
	8 15.1		13 33.4		15 4.0		16 48.0		18 17.9	
	19.0		39.0		7.6		51.3		17.8	
	21.2		2.0		10.5		53.4		21.1	
	56.0		1764		221		47		588	
8	18.67 54 38 13.44		13 58.80 52 20 48.18		15 7.37 52 50 22.77		16 51.57 52 33 54.49		18 19.60 52 29 58.98	
	+ 20.35 - 10		+ 16.08 - 7		+ 22.45 - 13		+ 31.35 - 26		+ 31.38 - 26	
	1.30856 - 1.24		1.20629 - 54		1.35122 - 65		1,49624 - 103		1.49665 - 73	
	9.76253 + 12.63		9.78592 + 10.21		9.78113 + 10.41		9.98379 + 10.45		9.98445 + 10.38	
	1.19369 + .40		1.11481 + .30		1.25495 + .30		1.40263 + .30		1.40370 + .30	
35	- 4.00		- 39.40	35	- 39.50	50	- 39.40	55	- 39.30	
4	36.8 37 41.39		2 3.9 20 14.91		2 23.9 49 49.76		3 44.4 33 20.81		2 39.9 29 25.63	
	37.9		6.5		27.4		48.9		44.3	
	147		104		113		133		42	
49	37.35		7 5.20		37 25.65		53 46.65		57 42.10	
33	11.00		15 48.15		45 22.70		29 1.70		25 6.25	
8	38.58 37 3.1		52 21 1.21		52 50 40.76		52 34 19.76		52 30 24.31	
			- 13.03		- 17.99		- 25.27		- 25.33	
			14 14.48 1936.9		15 29.34 4911.8		17 22.39 3243.0		18 50.41 2847.9	

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1877 Dec. 20, Dec. 25. Ob. W.A.R. Rec. f. F. 16.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 7 35	6 433	0 16 4	15 10.7	0 16 23	15 35.0	0 22 21	21 27.2	0 23 48	22 54.4	0 24 41	23 47.5		
δ	52° 9′	3.2 7.4	53° 35′	28.8 8.1	53° 37′	31.1 8.5	55° 2′	54 56.3 9.0	54° 35′	28.9 8.7	53° 16′	9.7 8.1		
Dec. 20	m s	+9.98	5.1 12.0 +11.95			+10.90		+12.67		+12.85		+11.63		
	1 32.1	6.41	16 8.6	12.1 8.38	16 21.4	7.33	22 21.0	9.10	23 46.2	9.28	24 41.0	8.06		
	36.6		12.1	12.1	25.2		24.6		49.7		44.5			
	39.1		14.3	10.8	28.5		28.1		53.4		48.0			
	43.0		17.4	10.5	32.1		31.6		57.0		51.7			
	46.4				35.6		35.4		0.5		55.9			
	1986				1431		1407		2668		2401			
	7 39.72 -		16 7.5 10.65		16 28.62		22 28.14 -		23 53.36 -		24 48.02 -			
	+ 15.31	+14.15	+ 15.31	+14.09	+ 15.31	+14.09	+ 15.31	+14.02	+ 15.31	+14.04	+ 15.31	+14.10		
	- 1.16		- 1.22		- 1.22		- 1.29		- 1.27		- 1.21			
	7 53.87		16 25.56 24.74		16 42.71		22 42.16		24 7.40		25 2.12			
	- 3.14		- 3.27		- 3.28		- 3.38		- 3.41		- 3.44			
	7 50.73	-6.26 -4008	16 25.30 21.47	-6.40 -4000	16 39.43	-6.41 -4000	22 38.78	-6.52 -3992	24 3.99	-6.54 -39.88	24 58.68	-6.53 -3988		
	8.3 m s		7.0		8.5		8.9		6.8		7.8			
	7 532		15 36.8		16 42.2		21 51.0		23 22.0		24 54.4			
	58.1		52.2		57.6		53.0		26.0		58.1			
	1.6		2.9		17.6		57.2		28.8		0.4			
	1729	-3.57	1784	67	54		133		168		1729			
	7 57.63	52 11 8.70	15 59.63	53 37 2.01	16 51.80	53 38 57.31	21 54.43	55 4 8.99	23 25.60	54 36 33.87	24 57.63	53 17 27.61		
	- 17.91	- 9	+ 11.87 02	- 4	- 23.18	- 14	+ 33.71	- 29	+ 27.76	- 20	- 6.61	- 3		
	1.253102	- 62	1.074785	- 25	1.365112	- 123	1.524776	- 98	1.443442	- 34	0.982272	- 22		
	9.78756	+1039	9.77319	+ 11.94	9.77285	+ 11.97	9.75787	+ 1354	9.76271	+ 1304	9.77660	+ 11.58		
	1.16326	+ 30	0.98024	+ 30	1.26056	+ 30	1.40823	+ 40	1.32873	+ 35	0.88192	+ 30		
R_m=-.28	15	-3974	50 13797	-4020	45	-4020	20	-4060	50	-40.50	10	-40.20		
	2 9.7	10 35.41	0 52.1	36 30.14 .85	4 25.1	38 24.44	3 29.9	3 37.49	1 9.4	36 26.5	0 43.2	16 55.47		
n=-.90	14.1		57.3		28.8		33.0		12.3		48.9			
	238		94		139		629		217		121			
+5′ 17.69	17 11.90		50 54.70		49 26.95		23 31.45		51 10.85		10 46.05			
	3 36.45		31 53.65		33 21.40		59 16.90		31 34.50		12 2.30			
	52 10 54.14		53 37 11.34		53 38 37.09		55 4 34.59		54 36 55.19		53 17 19.99			
	+ 14.56		- 9.33		+ 18.22		- 25.60		- 21.32		+ 7.62			
			867											
	7 44.47	9 55.3	16 15.07	35 50.8	16 33.02	37 44.4	22 32.26	2 57.6	23 57.45	35 22.8	24 52.15	16 15.6		

R_m=-.28
n=-.70
c=-.08
+5′ 19.03

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1877. Dec. 20, Dec. 25.

25 56.3

α	h m s 0 26 56	26 1.3	h m s 0 38 36	37 40.4	h m s 0 45 55	44 57.6	h m s 0 46 41	45 43.1	h m s 0 50 12	49 13.8	h m s 0 52 35	51 35.9
δ	52° 24′	18.1 8.7	55° 2′	55.7 9.4	54° 56′	50.2 8.3	55° 4′	54 57.6 7.9	54° 45′	39.4 9.0	52° 23′	17.8 8.5
Dec. 20		~~+10.18 +10.27~~		~~+12.46~~		~~+12.36~~		~~+13.17~~		~~+13.34~~		~~+10.05~~
	26 57.0 26 57.0 54.5 0.5 57.7 3.7 1.1 7.0 1.3 7.0 4.6 10.5	6.61 6.70	38 38.2 41.7 45.5 49.0 52.4	8.89	45 56.5 0.2 3.5 7.1 10.9	8.79	46 41.9 45.4 49.0 52.7 56.3	9.60	50 11.9 15.4 19.0 22.5 26.3	9.77	52 34.6 37.9 41.3 44.6 48.0	6.48
	289.1 18.7 26 57.82 27 3.74 + 15.31 + 15.31 − 1.17 − 1.17 27 11.96 17.88 − 3.49 − 3.49 27 8.47 14.39	+14.14 +14.14 −6.55 −39.82 −6.55 −39.82	226.8 38 45.36 + 15.31 − 1.29 38 59.38 − 3.71 38 55.67	+14.02 −6.79 −39.54	18.2 46 3.64 + 15.30 − 1.28 46 17.66 − 3.86 46 13.80	+14.02 −6.91 −39.30	45.3 46 49.06 + 15.30 − 1.29 47 3.07 − 3.88 46 59.19	+14.01 −6.92 −39.28	95.1 50 19.02 + 15.30 − 1.28 50 33.04 − 3.94 50 29.10	+14.02 −6.97 −39.14	6.4 52 41.28 + 15.30 − 1.17 52 55.41 − 3.97 52 ~~52.44~~ 51.44	+14.18 −6.94 −39.06
	21 8.6 52 27 26.3 26 25.0 31.4 29.0 35.0 32.2 4.7 8.62 31.57 28.73	25 27 16.28 56.87 − 31 − 32 − 48 − 36 + 10.67 + 10.65 + 30 + 30 − 40.10 − 40.10	9.6 38 10.5 13.2 15.3 9.0 38 13.00	 55 3 28.41	8.0 45 33.0 37.0 37.3 19.3 45 36.43	 54 58 8.08	8.2 46 38.0 40.6 44.1 2.7 46 40.90	 55 5 16.35	8.5 49 52.9 53.4 57.3 17.6 49 55.87	 54 47 18.09	8.5 52 1.7 5.8 8.7 16.2 52 5.40	 −3.57 52 25 35.13
	−33.75 +35.01 1.52827 1.55642 9.78510 9.78510 1.43597 1.46412 n	26 42.79 25 23.47	+32.36 1.51001 9.75805 1.39066 n 20	− 27 − 1.18 + 13.51 + .40 − 40.60	+27.21 1.43473 9.75895 1.31628 n 25	− 19 − 1.29 + 13.44 + .40 − 40.50	+8.16 0.91169 9.75769 0.79198 n 20	− 2 − 76 + 13.55 + .40 − 40.60	+23.15 1.36455 9.76093 1.24808 n 40	− 14 − 14 + 13.22 + .40 − 40.60	+35.88 1.55485 9.78510 1.46255 n 0	− 34 − 56 + 10.65 + .30 − 40.10
	0 0 1 37.5 1 14.2 42.6 19.9 80.1 14.1 1 40.05 1 17.05 21 8.30 21 31.30 52 26 25.99 26 48.99 stet + ~~27.29~~ − 29.12 stet ~~29.12 + 27.29~~	1st C.R. 2nd C.R.	4 12.0 14.1 6.1 24 13.05 58 35.30 55 3 52.99 − 24.58 38 48.88	2 56.70 2 17.2	4 36.1 38.4 14.5 29 37.25 53 11.10 54 58 28.79 − 20.71 46 6.89	57 36.27 56 57.0	2 41.9 45.1 7.0 22 43.50 0 4.85 55 5 22.54 − 6.19 46 52.27	4 45.35 4 6.1	0 28.2 32.3 0.5 40 30.25 42 18.10 54 47 35.79 − 17.70 50 22.13	46 47.26 46 8.1	1 59.9 3.9 12.38 2 1.90 20 26.45 52 26 4.14 − 29.01 52 44.50	25 1.51 24 22.4
Dec. 25	27 1.92 7.74 (8)	26 3.0 24 43.6	~~26 3.0~~ ~~24 43.6~~	~~24 43.6~~								~~+10.24~~
											52 30.1 33.9 37.2 40.3 43.3 18.50 52 37.00 + 19.65 − .91 − .13 52 55.61 − 3.86 52 51.75	6.62 +18.61 ~~−6.94~~ −39.06
											9.0 52 14.5 17.4 21.0 51.9 52 17.30 + 19.70 1.29447 9.78510 1.20217 n 0 2 16.0 16.8 8 2 16.40 20 31.95 52 25 58.98 − 15.93 52 44.81	 −3.62 52 25 35.05 − 11 − 64 + 10.69 + .36 − 40.30 25 1.39 24 21.3

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1877. Dec. 20. Dec. 25. Obs. W. A. R. Rec. J. F. M.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	0 55 57	54 59.2	0 56 56	55 54.0	1 4 59	3 52.4 25.9 3 59.2	1 7 8	6 7.4	1 8 49	7 48.8	1 17 35	16 33.0
δ	51° 26'	21.0 8.9	51° 47'	41.1 8.6	52° 30'	24.8 9.0	52° 10'	3.9 8.6	54° 4'	53 58.8 8.9	54° 17'	12.3 8.4

Dec. 20

m s	+8.50		+9.08		+9.66		+10.02		+12.37		+11.94
55 58.6	4.93	56 53.7	5.51	4 54.4	6.09	7 8.2	6.45	8 52.0	8.80	17 37.6	8.37
2.0		56.8		58.1		11.7		55.4		41.1	
5.3		0.1		1.5		15.0		59.0		44.7	
8.7		3.4		4.8		18.5		2.5		48.5	
11.9		6.6		8.2		21.8		6.0		51.7	
26.5		06		70		75.2		27.49		223.6	
56 5.30		57 0.12		5 1.40		7 15.04		8 58.98		17 44.72	
+ 15.30	+14.17	+ 15.30	+14.16	+ 15.30	+14.13	+ 15.30	+14.14	+ 15.30	+14.06	+ 15.30	+14.05
− 1.13		− 1.14		− 1.17		− 1.16		− 1.24		− 1.25	
56 19.47		57 14.28		5 15.53		7 29.18		9 13.04		17 58.77	
− 4.02	−6.96	− 4.04	−6.98	− 4.20	−7.12	− 4.24	−7.14	− 4.30	−7.24	− 4.48	−7.38
56 15.45	−38.92	57 10.24	−38.88	5 11.33	−38.50	7 24.94	−38.38	9 8.74	−38.30	17 54.29	−37.82

8.8 m s		8.6		9.2		9.0		9.0		9.0	
55 36.0		56 41.1		4 36.4		6 38.4		8 40.2		17 19.3	
39.0		45.0		40.3		41.0		44.0		24.2	
41.0		48.0		42.3		43.7		47.0		25.7	
116.0	−3.57	14.1		119.0		31		11.2		9.2	
55 38.67	51 28 31.85	56 44.70	51 48 46.20	4 39.67	52 33 13.22	6 41.03	52 11 20.89	8 43.73	54 6 33.24	17 23.07	54 19 26.94
+26.63	− 19	+15.42	− 6	+21.73	− 13	+34.01	− 31	+ 15.25	− 6	+ 21.65	− 12
1.42537	− 1.18	1.18808	− 1.15	1.33706	− 1.29	1.53161	− 36	1.18327	− 36	1.33546	− 95
9.79431	+ 9.62	9.79111	+ 9.99	9.78395	+ 10.78	9.78756	+ 10.39	9.76800	+ 12.49	9.76590	+ 12.71
1.34228n	+ .25	1.10179n	+ .30	1.24361n	+ .30	1.44177n	+ .30	1.07387n	+ .30	1.22396n	+ .30
55	−39.80	35	−39.90	50	−39.90	15	−39.80	20	−40.10	5	−39.90
4 10.6	27 56.98	4 5.5	48 11.81	4 33.4	32 39.41	1 15.0	10 47.54	1 16.9	6 7.94	3 20.8	18 55.41
13.8		8.9		36.9		20.0		23.0		23.9	
44		14.4		106		35.0		41.9		47	
59 12.20		39 7.20		54 35.30		16 17.50		21 20.95		8 22.35	
23 36.15		43 41.15		28 13.05		6 30.85		1 27.40		14 26.00	
51 28 53.84		51 48 58.84		52 33 30.74		52 11 48.54		54 6 45.09		54 19 43.69	
− 21.99		− 12.64		− 17.52		− 27.65		− 11.85		− 16.75	
56 8.49	27 18.1	57 3.26	47 32.9	5 4.21	32 0.9	7 17.80	10 9.2	9 1.50	5 23.6	17 46.91	18 17.6

Dec. 25

m s	+8.58		+9.11		+9.72		+10.11		+12.24		+12.07
55 54.0	4.96	56 49.0	5.49	4 50.1	6.10	7 3.8	6.49	8 47.6	8.62	17 33.3	8.40
56.4		52.1		53.4		7.1		50.8		36.5	
0.8		55.7		57.1		10.6		54.4		39.9	
4.0		57.3		0.4		13.8		57.9		43.7	
7.5		2.6		3.7		17.2		1.8		47.2	
27		278.7		284.7		52.5		272.5		200.6	
56 0.54		56 55.74		4 56.94		7 10.50		8 54.50		17 40.12	
+ 19.65	+18.64	+ 19.65	+18.63	+ 19.64	+18.60	+ 19.64	+18.61	+ 19.64	+18.53	+ 19.64	+18.53
− .88		− .89		− .91		− .90		− .97		− .97	
− .13		− .13		− .13		− .13		− .14		− .14	
56 18.64		57 14.37		5 15.54		7 29.11		9 13.03		17 58.65	
− 3.92	−6.96	− 3.94	−6.98	− 4.10	−7.12	− 4.14	−7.14	− 4.19	−7.24	− 4.37	−7.38
56 15.26	−38.92	57 10.43	−38.88	5 11.44	−38.50	7 24.97	−38.38	9 8.84	−38.30	17 54.28	−37.82

8.6 m s		8.5		9.0		8.7		9.0		9.0	
55 33.5		56 36.1		4 34.1		6 39.0		8 18.8		17 18.2	
36.3		39.9		36.8		41.6		21.9		22.0	
39.2		43.6		40.1		44.6		24.2		26.6	
19.0	−3.62	119.6		111.0		5.2		4.9		68	
55 36.33	51 28 33.29	56 39.87	51 48 47.57	4 37.00	52 33 12.45	6 41.73	52 11 22.29	8 21.63	54 6 35.33	17 22.27	54 19 28.12
+24.21	− 15	+15.87	− 7	+19.94	− 10	+28.77	− 22	+ 32.87	− 28	+ 17.85	− 8
1.38399	− 1.18	1.20058	− 1.15	1.29973	− 1.29	1.45894	− 39	1.51680	− 31	1.25164	− 95
9.79431	+ 9.66	9.79111	+ 10.03	9.78395	+ 10.81	9.78756	+ 10.42	9.76800	+ 12.53	9.76590	+ 12.75
1.30090n	+ .25	1.11429n	+ .30	1.20628n	+ .30	1.36910n	+ .30	1.40740n	+ .30	1.14014n	+ .30
55	−40.00	35	−40.10	50	−40.20	15	−40.00	20	−40.40	5	−40.30
4 13.8	27 58.25	4 6.6	48 12.96	4 38.5	32 38.35	1 20.5	10 48.78	1 6.1	6 3.55	3 25.8	18 56.22
14.4		7.0		39.2		22.9		6.9		25.1	
8.2		13.6		17.7		34		10		9	
59 14.10		39 6.80		54 38.85		16 21.70		21 6.58		8 25.45	
23 34.25		43 41.55		28 9.50		6 26.65		1 41.85		14 22.90	
51 28 53.28		51 49 0.58		52 33 28.53		52 11 45.68		54 7 0.88		54 19 41.93	
− 19.99		− 13.01		− 16.08		− 23.39		− 25.55		− 13.81	
56 8.30	27 19.3	57 3.45	47 34.1	5 4.32	31 59.8	7 17.83	10 10.4	9 1.60	5 25.2	17 46.90	18 18.4

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1877, Dec. 20, Dec. 25.

not in place

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 18 40	17 37.2	1 19 34	19 32.1	1 20 44	19° 45.7	1 21 55	20 53.3	1 23 30	22 26.8	1 24 23	23 20.6
δ	52° 28′	22.5 7.4	54° 30′	25.5 9.0	51° 1′	50 55.5 8.6	53° 7′	22 8.7	53° 34′	29.5 9.0	53° 49′	43.9 8.4

Dec. 20

	m s											
	+9.94		+12.54		+7.95		+10.74		+4.80		+12.00	
	18 41.1	6.37	19 49.8	8.97	20 49.5	4.38	22 0.0	7.17	22 32.9	8.23	24 27.3	8.43
	44.6		53.4		52.7		3.5		36.4		38.6	
	48.0		57.0		56.1		7.0		34.1		34.0	
	51.5		0.1		59.3		10.3		43.3		37.6	
	55.0		4.0		2.7		13.9		46.7		41.0	
	24.02		28.46		28.03		34.9		19.42		17.05	
	18 48.04		19 56.92		20 56.06		22 6.98		23 30.84		24 34.10	
	+ 15.30	+14.13	+ 15.30	+14.04	+ 15.30	+14.18	+ 15.30	+14.10	+ 15.30	+14.08	+ 15.30	+14.07
	− 1.17		− 1.26		− 1.22		− 1.20		− 1.22		− 1.23	
	19 2.17		20 10.96		21 10.24		22 21.08		23 53.62		24 48.17	
	− 4.45	−7.32	− 4.52	−7.43	− 4.47	−7.29	− 4.54	−7.39	− 4.57	−7.44	− 4.60	−7.46
	18 57.72	−37.74	20 6.44	−37.64	21 5.77	−37.64	22 16.54	−37.56	23 49.05	−37.46	24 43.57	−37.40
	8.3 m s		9.5		8.6		9.0		9.2		9.0	
	18 10.1		19 38.9		20 33.7		21 40.3		23 7.1		24 11.2	
	12.7		42.3		35.7		42.9		10.6		14.2	
	15.1		46.0		37.9		46.0		13.5		17.0	
	18.2		49.7		40.4		49.2		16.5		19.4	
	18 12.73	32 29 55.73	19 42.40	54 30 27.26	20 34.70	51 3 20.3	21 43.07	53 9 41.63	23 10.50	53 36 57.76	24 14.13	53 51 27.87
	+ 35.31	− 33	+ 14.52	− 5	+ 21.36	− 12	+ 23.91	− 15	+ 29.34	− 22	+ 19.97	− 10
	1.54790	− 76	1.16197	− 67	1.32960	− 134	1.37858	− 87	1.46746	− 22	1.30038	− 39
	9.78445	+ 10.73	9.76395	+ 12.91	9.79840	+ 9.16	9.77778	+ 11.46	9.77319	+ 11.94	9.77061	+ 12.19
	1.45495 m	+ .30	1.04852 m	+ .35	1.25060 m	+ .25	1.27896 m	+ .30	1.36325 m	+ .30	1.19359 m	+ .30
		−39.50		−39.90		−39.20		−39.60		−39.60		−39.60
	55	55		55	20	15		50		55		
	2 39.4	29 22.60	2 25.8	29 56.33	4 45.0	2 27.21	3 4.2	9 9.20	0 43.0	36 26.39	1 21.1	50 56.70
	44.2		29.4		47.4		6.6		47.4		24.0	
	8.36		152		12.4		108		104		51	
	57 41.80		57 27.60		24 46.20		18 5.40		50 45.20		36 22.53	
	25 6.55		25 20.75		58 2.15		4 42.95		32 3.15		46 2.580	
	52 30 24.21		54 30 38.49		51 3 19.84		53 10 0.64		53 37 20.84		53 51 43.49	
	− 28.51		− 11.18		− 17.81		− 19.01		− 23.08		− 15.62	
	18 50.40	28 44.9	19 59.01	29 18.7	20 52.48	1 49.6	22 9.15	8 31.6	23 41.91	35 48.9	24 36.11	50 19.3

Dec. 25

	m s											
	+10.11		+12.53		+9.38		+10.84		+11.98		+12.09	
	18 30.6	6.49	19 45.0	8.91	20 44.8	5.76	21 55.4	7.22	23 28.6	8.36	24 22.5	8.47
	40.1		48.9		48.1		57.0		31.4		26.1	
	48.4		52.0		51.4		2.4		35.4		29.7	
	47.0		56.0		55.1		5.7		38.1		33.1	
	50.4		59.6		58.2		9.3		42.3		36.5	
	21.75		26.15		29.9		31.18		17.69		14.79	
	18 43.50		19 52.30		20 51.58		22 2.36		23 35.38		24 29.58	
	+ 19.64	+18.6	+ 19.64	+18.52	+ 19.64	+18.64	+ 19.64	+18.58	+ 19.64	+18.56	+ 19.64	+18.54
	− .91		− .98		− .87		− .93		− .95		− .96	
	− .13		− .14		− .13		− .13		− .13		− .14	
	19 2.10	−7.32	20 10.82	−7.43	21 10.22	−7.29	22 20.94	−7.39	23 53.94	−7.44	24 48.12	−7.46
	− 4.35	−37.74	− 4.42	−37.64	− 4.37	−37.64	− 4.44	−37.56	− 4.47	−37.46	− 4.50	−37.40
	18 57.75		20 6.40		21 5.85		22 16.50		23 49.47		24 43.62	
	8.0 m s		9.5		8.7		8.9		8.9		8.8	
	18 14.3		19 28.4		20 54.2		21 43.5		23 16.6		24 10.3	
	18.0		31.1		57.0		45.7		20.1		14.6	
	20.3		33.7		59.6		47.9		23.6		17.3	
	22.6		36.2		20 2.3		50.2		27.3		20.0	
	18 17.53	32 29 57.56	19 31.07	54 30 27.63	20 5.27	51 3 16.2	21 42.40	53 9 42.66	23 20.10	53 36 58.16	24 14.07	53 51 29.95
	+ 25.97	− 18	+ 21.23	− 11	− 5.67	− 1	+ 19.96	− 10	+ 15.28	− 6	+ 15.57	− 6
	1.48447	− 78	1.32695	− 67	0.75511 m	− 6	1.30016	− 87	1.18412	− 25	1.19061	− 39
	9.78445	+ 16.77	9.76395	+ 12.96	9.79840	+ 9.20	9.77778	+ 11.51	9.77319	+ 11.99	9.77061	+ 12.24
	1.32152 m	+ .30	1.21350 m	+ .35	0.67611	+ .25	1.20054	+ .30	1.07991 m	+ .30	1.08382 m	+ .31
		−39.90		−110.30		−39.50		−39.90		−40.00		−40.00
	55	55		25	15			50		35		
	2 48.0	29 24.15	2 23.0	29 56.24	0 9.2	2 27.88	3 8.7	9 9.98	0 56.9	36 26.52	1 25.3	50 58.42
	49.7		23.8		11.8		9.0		57.5		25.3	
	1.47		8		210		194		144		506	
	57 48.85		57 23.40		25 10.50		18 8.85		50 57.20		36 25.30	
	24 59.50		25 24.95		57 37.85		11 39.50		31 51.15		486 23.05	
	52 30 18.53		54 30 43.98		51 2 56.88		53 9 58.53		53 37 10.18		53 51 42.08	
	− 20.97		− 16.35		+ 4.74		− 15.87		− 12.02		− 12.13	
	18 50.43	28 46.4	19 58.97 59.0	29 18.6	20 58.56	1 50.2	22 9.11	8 32.4	23 42.03	35 49.1	24 36.16	50 21.0

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	h m s	h m s	h m s	h m s	h m s	h m s
α	1 25 1	1 32 6	1 34 0	1 35 51	1 36 43	1 41 4
δ	53° 1′	53° 13′	53° 28′	53° 17′	54° 11′	53° 14′

Dec. 20

m s	25 41	32 83	34 79	35 35.1	36 47.1	41 84
	1.5	11.8	10.4 1.0	58.8	50.8	11.8
	11.3	15.1	14.0 14.7	2.5	54.2	15.1
	14.7	18.6	17.6 18.4	5.8	57.7	18.4
	17.9	22.1	21.4 — 21.4	9.5	1.4	22.1
	5555	759	709 742	3117	2709	761
	25 11.10	32 15.18	34 11.84 64	36 2.34	36 54.78	41 15.22
	+ 15.29 +14.09	+ 15.29 +14.08	+ 15.29 + 15.29 +14.07 +14.07	+ 15.29 +14.04	+ 15.29 +14.04	+ 15.29 +14.08
	− 1.20	− 1.21	− 1.22 − 1.22	− 1.25	− 1.25	− 1.21
	25 25.19	32 29.26	34 24.75 28.84 71	36 16.38	37 8.22	41 24.30
	− 4.59 −7.43	− 4.73 −7.55	− 4.77 − 4.77 −7.59	− 4.83 −7.66	− 4.84 −7.67	− 4.90 −7.68
	25 20.60 −37.36	32 24.53 −36.90	34 19.98 23.94 −36.78	36 11.55 −36.64	37 3.38 −36.58	41 24.40 −36.26
m s		6.4	9.2 9.3 53 29 5285 5009 30 66 4451	8.5	8.8	9.0
	25 27.2	31 38.8	33 37.7 33 38.3 − 28 − 4	35 24.1	36 27.1	40 54.0
	8.0	42.1	40.4 22 − 78 − 62	27.0	33.5	57.0
	24.6	45.5	45.0 5.6 +11.81 +11.83	29.6	37.0	59.3
	18 −3.57	82	31 71 + .30 + .30	207	96	203
	25 30.60 53 2 4838	31 42.73 53 15 689	33 41.03 34 23.7 −3920 −3920	35 26.90 54 19 0.43	36 33.20 54 13 35.78	40 56.77 53 16 9.31
	+ 19.50 − 9	+ 3.245 − 27	13.21 13.21 36	+ 35.44 − 33	+ 20.98 − 11	+ 18.45 − 8
	1.290039 − 17	1.57121 − 73	1.09584 1.09584 28.13	1.54949 − 101	1.32181 − 62	1.26600 − 48
	9.77896 + 11.32	9.77694 + 11.49	9.77439 9.77422	9.76590 + 12.71	9.76677 + 12.60	9.77677 + 11.57
	1.19159 + .30	1.41075 + .30	1.41744 1.41744	1.43799 + .30	1.21118 + .30	1.16537 + .30
	25 −39.40	10 −39.20	55 1.36701 1.36701	5 −39.30	10 −39.20	10 −38.60
	0 31.0	2 31.6	2 48.0 2 4.4	3 37.1	4 12.6	1 39.3
	35.4	35.2	51.6 14.0	39.3	15.4	42.9
	64	68	996 57 231	164	80	822
	25 33.30	12 33.40	57 4980 57 11.70	8 38.20	14 14.00	11 41.10 +1
	57 1515	10 1495	24.585 36.45	14 10.15	8 3435	11 725
	53 2 32.84	53 15 32.64	53 30 16.24 59.34	54 19 27.84	54 13 52.04	53 16 24.94
	+ 15.54	− 25.75	− 2615 983 444	− 27.41	− 16.26	− 14.63
	25 13.17 1 39.34	32 16.98 13 58.1	34 12.39 29 36.6	36 3.89 17 52.6	36 55.71 12 28.6	41 16.72 15 2.0
			2339 68			
			16.35 +11.26 +11.38	+11.79	+12.19	+11.27

Dec. 25

m s	24 59.4	32 37	33 58.7 34 3.1	35 50.9	36 42.6	41 2.6
	2.7	7.1	2.7 6.4	54.3	46.3	7.2
	6.6	10.6	6.1 10.4	57.8	49.8	10.6
	9.7	14.1	9.7 14.0	1.4	53.2	14.0
	13.2	17.6	13.3 17.1	5.1	56.8	17.3
	318	531	305 510	2895	487	527
	25 6.36	32 10.62	34 6.10 10.20	35 57.90	36 49.74	41 10.34
	+ 19.64 +18.58	+ 19.64 +18.58	+ 19.63 + 19.63 +18.55 +18.55	+ 19.63 +18.52	+ 19.63 +18.52	+ 19.63 +18.56
	− .93	− .94	− .95 − .95 −7.59	− .97	− .97	− .94
	− 13	− .13	− .13 − .13 −36.78	− .14	− .14	− .13
	25 24.44	32 29.19	34 24.65 28.75	36 16.42 −7.66	37 8.26 −7.67	41 29.10 −7.68
	− 4.49 −7.43	− 4.63 −7.55	− 4.67 − 4.67 −7.59	− 4.73 −36.64	− 4.74 −36.58	− 4.80 −36.26
	25 20.45 −37.36	32 24.56 −36.90	34 19.98 24.08 −36.78	36 11.69	37 3.52	41 24.30
m s		7.0	9.1 9.1 53 29 5439 30 4643	8.9	8.8	9.0
	25 18.9	31 46.0	33 48.8 34 32.1 − 6 − 7	35 26.7	36 22.0	40 38.9
	21.8	49.3	51.1 26.5 − 84 − 73	30.0	25.3	41.7
	25.0	51.4	53.0 29.5 +1186 +1188	32.2	28.0	44.6
	657 −3.62	467	27 19.1 + .30 + .30	88.9	153	52
	25 21.90 53 2 4867	31 48.90 53 15 840	33 50.90 26.37 −3960 −3960	35 29.63 54 18 59.61	36 25.10 54 13 3842	40 41.73 53 16 1358
	−15.54 − 6	+ 21.72 − 13	+15.20 −16.17 22 43 30 14.59	+ 28.27 − 21	+ 24.64 − 16	+ 28.81 − 22
	1.191455 − 14	1.336866 − 76	1.18184 1.20871	1.45133 − 106	1.39164 − 62	1.45954 − 42
	9.77896 + 11.37	9.77694 +1159	9.77439 9.77422	9.76590 + 12.76	9.76677 + 1267	9.77677 + 11.63
	1.09301 + .30	1.23640 + .30	1.07883 1.10553	1.33983 + .30	1.27101 + .30	1.35891 + .30
	25 −39.80	10 −39.60	55 55	5 −39.70	10 −3961	10 −39.30
	0 30.5	2 41.3	2 1.1 2 33.9	3 45.7	4 10.7	1 30.7
	31.7	42.2	0.9 33.5	46.1	9.9	31.2
	2.2	3.5	2.0 57 14	118	2.66	19
	25 31.10	12 41.75	56.100 33.84	8 45.90	14 10.30	11 30.95
	57 1725	10 6.60	24.735 25.1465	14 2.45	8 38.05	11 1740
	53 2 36.28	53 15 2563	53 30 6.38 30 3363	54 19 21.98	54 13 5708	53 16 3643
	+ 1239	− 1423	− 1199 + 12.75	− 21.87	− 1866	− 2285
	25 13.02 1 39.34	32 22.01 13 58.3	34 12.39 28 45.6	36 4.03 17 51.4	36 55.85 12 30.8	41 16.62 15 5.7
			16.48 29 37.8			

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	h m s			h m s			h m s			h m s			h m s			h m s				
α	1 42 32	41 27.6		1 42 35	41 31.4		1 43 34	42 30.3		1 48 20	47 15.9		1 53 53	52 47.2		1 55 46	54 37.7			
δ	53° 34′	28.8		53° 35′	29.6		54° 31′	25.7		51° 42′	36.7		55° 0′	54 55.3		52° 17′	12.5			
		9.1			9.4			5.7			8.6			8.8			8.9			
Dec. 20	m s	+11.45			+11.83			+13.44			+5.93			+13.54		m s m s	+9.52	+10.62		
	42 36.0	7.88		42 46.5	8.26		43 39.0	9.57		48 24.5	5.36		53 58.8	9.97		55 03.5 55 14.8	5.95	7.05		
	38.8			44.0			42.6			27.7			2.4			53.5 54.8				
	43.1			47.4			46.3			31.1			6.0			57.1 58.5				
	46.5			50.6			41.7			34.6			9.6			04 15				
	49.8			54.4			55.5			37.8			13.4			3.7 9.0				
	215.2			236.9			231.1			155.4			30.2			285.0 291.2				
	42 43.04			42 47.38			43 46.22			48 31.08			54 6.04			57 00.- 58.21				
	+ 15.29	+ 14.07		+ 15.29	+14.07		+ 15.29	+14.03		+ 15.29	+14.15		+ 15.29	+14.00		+ 15.29 + 15.29	+14.13	+14.13		
	— 1.22			— 1.22			— 1.26			— 1.14			— 1.29			— 1.16 — 1.16	-7.83			
	42 57.11			43 03.45			44 0.25			48 45.23			54 20.04			56 11.13 12.27	-3508			
	— 4.93			— 4.93	-7.72		— 4.98	-7.79		— 4.97	-7.69		— 5.21	-7.97		— 5.11 — 5.11				
	42 52.18	-7.72		42 56.52	-36.16		43 55.27	-36.08		48 40.26	-35.70		54 14.83	-35.24		56 6.02 7.16	-7.82			
		-36.16															-35.08			
	89 m s			95			60			85			86			88.8 52 19 28.55	27.57			
	42 8.3			42 22.0			43 19.2			47 54.8			53 36.6			33 12.7 35 43.4 — 44 — 4				
	11.1			31.1			23.6			17.0			37.4			160 44.1 — 87 — 14				
	13.4			34.2			24.0			1.0			42.6			200 47.0 +10.53 +10.58				
	28			43			88			17.8			11.6			487 187 + .30 + .30				
	42 10.93	53 35 49.77		42 31.43	53 36 40.99		43 22.93	54 32 43.48		47 57.93	51 44 11.46		53 39.53	55 2 11.64		1623 4623 -3750 -2760				
	+ 32.11	— 27		+ 15.95	— 7		+23.29	— 14		+33.15	— 29		+26.51	— 18		+40.77 +12.01	18 56.60	5.66		
	1.50664	— 50		1.20276	— 34		1.36714	— 3		1.52048	— 98		1.42341	— 17		1.61634 1.07954				
	9.77336	+ 11.92		9.77319	+ 11.94		9.76342	+ 12.96		9.79192	+ 9.90		9.75823	+13.49		9.78609 9.78576				
	1.40260	+ .30		1.09855	+ .30		1.25319	+ .35		1.43500	+ .30		1.30424	+ .40		1.51903 0.98770				
	50	-38.80		50	-38.80		55	-38.90		40	-38.20		25	-38.50		5 5				
	1 48.9	35 18.85		1 10.2	36 10.45		0 2.4	32 14.15		3 25.9	43 38.62		0 32.9	1 43.11		3 35 0 37.5				
	53.1			14.8			6.9			28.8			35.6			54 30.5				
	1020			50			93			147			85			89 5 576				
	51 51.00			51 12.50			55 4.65			43 27.35			25 34.25			4.45 28.80	18 21.5			
	30 57.35			31 35.85			27 43.70			39 21.00			57 14.10			14 43.90 7 19.55	21 21.6			
	53 36 15.04			53 36 53.54			54 33 1.39			51 44 38.69			55 2 31.79			52 20 1.59 22 37.24				
	— 25.27			— 12.55			— 17.91			— 27.23			— 20.15			— 33.04 — 9.78				
																	54 39.7			
	42 44.36	3442.7		42 48.80	35 34.3		43 47.48	31 38.1		48 32.57	43 2.9		54 6.86	1 7.9		55 58.20	12.5			
Dec. 25	m s	+11.58			+11.41			+13.22			+8.96			+13.66		59.44	+9.67	+11.77		
	42 31.4	7.96		42 35.8	8.09		43 34.3	9.60		48 19.8	5.34		53 54.2	10.04		55 26.4 55 45.0	5.89	6.09		
	35.1			39.4			38.1			23.3			57.8			30.3 44.0				
	38.5			42.7			41.6			26.6			1.3			33.6 52.3				
	41.9			45.9			45.0			29.9			5.1			36.8 55.7				
	45.3			49.7			48.4			33.9			8.6			40.3 59.0				
	19.22			21.35			7.9			13.25			70			16.76 26.18				
	42 38.44			42 42.70			43 41.58			48 26.50			54 1.40			32.52 32.36				
	+ 19.63	+18.55		+ 19.63	+18.85		+ 19.63	+18.57		+ 19.63	+18.62		+ 19.63	+18.49		+ 19.63 + 19.63	+18.60	+18.60		
	— .95			— .95			— .98			— .89			— 1.00			— .90 — .90	-7.82			
	— .13			— .13			— .14			— .13			— .14			— .13 — .13	-3508			
	42 56.99	-7.72		43 1.25	-7.72		44 0.09	-7.79		48 45.11	-7.69		54 19.89	-7.97		55 52.12 56 10.96				
	— 4.84	-36.16		— 4.84	-36.16		— 4.89	-36.08		— 4.88	-35.70		— 5.11	-35.24		— 5.02 — 5.03	-7.82			
	42 52.15			43 56.41			43 55.20			48 40.23			54 14.78			55 47.10 56 5.93	-3508			
	88 m s			94			62			87			90			19				
	42 9.6			43 0.8			43 44.7			48 42.3			53 37.9			44.85 52.18 11.14	29.93			
	12.8			3.1			48.0			45.7			41.0			57 56 6.1 — 5 — 10				
	16.3			6.1			51.0			49.0			44.1			17.7 12.1 — 1.32 — 10.9				
	8.9			10.3			54.3			16.0			30			22.6 14.4 + 10.58 + 10.60				
	42 12.97	53 35 49.79		43 3.43	53 36 41.84		43 47.90	54 32 44.44		48 45.33	51 44 13.40		53 41.00	55 2 12.08		58.6 28.+ .30 + .30				
	+25.47	— 17		-20.73	— 11		— 6.32	— 1		-18.83	— 10		+20.40	— 10		19.53 10.93 -3840 -3840				
	1.40603	— 53		1.31660	— 48		0.80072	— 14		1.27485	— 118		1.30963	— 20		1.39 -18.57 38.63 45.62				
	9.77336	+ 11.98		9.77319	+ 12.00		9.76342	+ 13.02		9.79192	+ 9.94		9.75823	+13.69		1.14582 1.26681				
	1.30199	+ .30		1.21239	+ .30		0.68674	+ .35		1.18937	+ .30		1.19046	+ .40		9.78625 9.78625				
	50	-39.30		50	-39.30		55	-39.40		40	-38.60		25	-39.10		1.05467 1.17766				
	1 57.0	35 18.45		1 40.3	36 10.63		0 27.4	32 14.64		4 9.4	43 40.14		0 39.3	1 43.02		5 5				
	55.1			41.4			28.2			9.5			40.3			44.9 3 52.1				
	151			17			156			9			7.96			44.9 52.9				
	51 57.55			51 41.85			55 27.80			44 9.45			25 39.80			10				
	30 50.80			31 42.50			27 20.55			38 38.90			57 18.55			8 9 44.90 52.05				
	53 36 9.83			53 36 26.53			54 32 39.58			51 43 57.93			55 2 27.58			13 3.45 55.85				
	— 20.04			+ 16.31			+ 4.86			+ 15.47			— 15.50			57 18 22.48 14.88				
										32.54						— 11.34 + 15.05				
	42 44.43	3442.3		42 48.69	35 35.5		43 47.41	31 38.6		48 32.14	43 4.4		54 6.81	1 7.8		— —	17 3.6			
																55 58.11	18 22.5			

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 58 9	57 31	2 1 0	1 59 54.1	2 2 8	1 04	2 4 30	3 23.0	2 5 1	3 53.0	2 6 25	5 15.7		
δ	53° 41′	364 8.0	52° 8′	30 9.0	52° 36′	31.5 8.5	54° 31′	26.4 9.3	52° 27′	222 6.7	52° 22′	17.4 9.4		

Dec. 20

m s	+10.93		+9.94		+9.80		+13.07	+11.96		+9.74		+9.92		
58 15.3	7.36	1 4.6	6.17	2 11.0	6.23	4 22.4	9.50	8.39	5 —	6.17	6 28.5	6.35		
19.0		7.1		14.2		25.4			—		31.8			
23.6		11.2		17.6		29.6			10.9	10.9	35.5			
25.9		14.4		21.1		33.1			14.3	10.9	38.9			
29.5		18.0		24.5		36.6			17.6	10.8	42.5			
11.23		561		884		1476	2144				1767			
58 22.46		1 11.22		2 17.68		2952	4288		5 10.87		6 35.34			
+ 15.29	+14.07	+ 15.29	+14.04	+ 15.29	+14.11	+ 15.29	+ 15.29	+14.03 +14.03	+ 15.29	+14.12	+ 15.29	+14.12		
— 1.22		— 1.15		— 1.18	-7.92	— 1.26	— 1.26	-8.08	— 1.17		— 1.17			
58 36.53		1 25.36		2 31.79	-34.52	4 43.55	56.91	-34.32	5 24.49	-7.95	6 49.46			
— 5.22	-7.94	— 5.20	-7.88	— 5.24		— 5.37	— 5.38	-8.08	— 5.29	-34.28	— 5.30	-7.97		
58 31.31	-34.48	1 20.16	-34.64	2 26.55		4 38.18	51.53	-34.32	5 19.70		6 44.16	-34.14		

8.0 m s		8.9		8.2		8.2 9.2	54 32 21.04 33 19.76		6.0	52 29 18.56	9.5	52 24 29.57		
57 43.6		0 56.1		1 51.3		7 8.0	4 45.0 — 8 — 1		5 28.7	— .12	6 17.7	— .57		
48.1		57.0		52.0		11.0	48.0 — 14 — 34		32.2	— 1.15	21.0	— .95		
53.5		57.9		52.6		14.0	51.1 +12.94 +12.96		35.5	+ 10.71	24.2	+ 10.62		
1432		1776		139		30	1451 + .35 + .35		64	+ .30	29	+ .30		
57 47.73	53 43 39.05	0 59.20	52 9 42.76	1 54.63	52 38 25.79	1100	4837 — 37.80 -37.80		5 32.13	— 21.26	6 20.97	— 37.50		
+34.73	— 31	+12.02	— 4	+23.05	— 14	+1852	— 549	31 52.74 50.35		28 47.33	+14.37	23 58.62		
1.54070	— 112	1.07990	— 90	1.36267	— 123	1.26764	073957		1.32756		1.15746			
9.77199	+ 1206	9.78772	+ 1038	9.78513	+ 1087	9.78360	9.76342		9.78461		9.78527			
1.43529	+ 30	0.99022	+ 30	1.26840	+ 30	1.15384	062359		1.23477		1.06533			
40	— 3800	15	— 3760	45	— 3770	55 50			55		0			
3 58.3	43 8.51	3 11.9	9 11.33	4 19.8	37 54.42	029.1 4 49.6			4 3.2		3 22.9			
0.2	41	15.1		23.6		323 51.4			6.1		26.8			
1185		70		434		6 14 1010			93		97			
43 59.75		18 13.50		49 21.70		55 37.05 50 50			59 4.65		3 24.85			
38 48.60		4 34.85		33 26.65		27 1768 5785			23 43.70		19 23.50			
53.41 6.29		52 9 52.54		52 38 44.34		543 23.27 31.54			52 29 1.39		52 24 41.19			
— 27.24		— 9.78		— 18.55		— 1425 + 422			+ 17.17		— 18.62			
58 23.37	42 33.5	1 12.28	8 36.7	2 18.63	37 19.9	4 30.18	31 ~~44.7~~	18.4						
Dec. 25 m s	+11.04		+9.81	6.2	+9.45	43.45	32 16.0	+13.08 +11.96	5 11.75	28 13.0	6 36.19	23 24.5		
58 11.0	7.42	1 0.1	6.19	2 7.6	6.13	4 18.1	4 31.2	9.38 8.34				+10.21		
14.5		3.7		13.1		21.3	35.0				6 24.0	6.39		
17.8		6.9		16.6		25.3	38.2				27.5			
21.4		10.1		20.0		28.8	41.9				30.8			
24.9		13.7				32.3	45.4				34.2			
896		345		155		1258	1917				87.5			
58 17.92		1 6.90		2 13.10		25.16	38.34				40			
+ 19.63	+18.55	+ 19.63	+18.62	+ 19.63	+18.58	+ 19.63	+ 19.63	+18.51 +18.51			6 30.80			
— .95		— .89		— .92		— .98	— .98	-8.08			+ 19.63	+18.57		
— .13		— .13		— .13		— .14	— .14	-34.32			— .91			
58 36.47	-7.94.6	1 25.51	-7.88	2 31.68	-7.92	4 43.67	56.85	-8.08			— .13			
— 5.13	-34.80	— 5.12	-34.64	— 5.16	-34.52	— 5.28	— 5.29	-34.32			6 49.39	-7.97		
58 31.34		1 20.39		2 26.52		4 38.39	51.56				— 5.13	-34.14		
											6 44.16			

8.3 m s		9.0		8.2		6.7 9.1					9.2			
57 42.4		0 54.1		2 30.3		3 51.0	4 48.3				6 15.1			
46.7		56.7		34.0		57.0	57.1				18.2			
49.1		59.7		38.3		56.8	34.1				21.3			
18.2	-3.62	19.5		12.6		11.8	33.54				5.46			
57 46.07	53 43 40.99	0 56.50	52 9 46.12	2 34.20	52 38 27.46	53.93	51.17	32 22.20 33 21.75			6 16.20	52 24 33.94		
+ 31.85	— 27	+ 10.40	— 3	— 21.10	— 12	+3123	-12.83	— 25 — 5			+ 12.60	— 5		
1.50311	— 112	1.01703	— 90	1.32 4282	— 137	1.49457	1.10823	— 11 — 137			1.00037	— 95		
9.77199	+ 1213	9.78772	+ 1044	9.78 313	+ 1094	9.76360	9.76342	+1301 +1303			9.78527	+ 18.71		
1.39770	+ 30	0.92735	+ 30	1.23001	+ 30	1.38077	0.99425	+ 35 + 35			1.00824	+ 30		
40	— 3860	15	— 3810	45	— 3810	55 50		— 8830 — 28.30			0	— 3780		
4 1.9	43 9.81	3 12.1	9 14.21	4 56.7	37 55.49	0 20.9	4 55.0	31 53.28 32 51.79			3 22.9	24 2.53		
0.9		13.5		57.1		21.4	56.0 ~~56~~				23.6			
28		56		138		2.3	~~120~~				65			
44 1.40		18 12.60		49 56.90		55 21.15	54 55.50				3 23.25			
38 46.95		4 35.55		32 51.45		27 2720	27 ~~460~~ 55.55				19 25.10			
53 44 5.78		52 9 54.58		52 38 10.48		543 46.23	33 ~~78~~ 11.88				52 24 44.13			
— 24.99		— 8.46		+ 16.98		— 2403 + 987					— 10.19			
58 23.40	42 34.9	1 12.51	8 39.6	2 18.60	37 21.0	4 30.31	31 19.0				6 36.19	23 28.4		
						— 43.48	32 17.5							

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1877phae.proj:1617R

1877, Dec. 20, Dec. 25.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	2 9 6	7 59.3	2 12 7	10 59.3	2 12 10	11 2.3	2 13 2	11 54.0	2 15 20	14 12.0	2 15 53	14 49.5		
δ	53° 59′	53.6 8.4	54° 49′	44.4 7.0	54° 50′	41.5 9.0	53° 40′	34.7 8.6	53° 38′	33.1 9.0	51° 45′	40.4 9.3		

Dec. 20

m s		+4.59		+12.97		+13.30		+11.75		+14.64 +14.05		+9.63		
9 13.6	8.02	12 13.8	9.40	12 17.3	9.73	13 —	8.18	15 22.5	15 30.8	7.87 7.48	16 2.3	6.06		
16.8		17.3		20.8		—		27.0	33.1		5.1			
20.4		20.8		24.3		—		30.6	37.3		9.1			
23.1		24.3		28.0		15.9	12.4	33.7	41.1		13.4			
27.2		28.0		31.1		19.0	12.0	37.1	44.0		15.8			
19		42		216				1519	1871		455			
9 20.38		12 20.84		12 24.30		13 12.20		20.38	37.42		16 9.10			
+ 15.28	+14.04	+ 15.28	+14.00	+ 15.28	+14.00	+ 15.28	+14.06	+ 15.28	+ 15.28	+14.06 +14.06	+ 15.28	+14.14		
— 1.24		— 1.28		— 1.28		— 1.22		— 1.22	— 1.22	-8.17	— 1.14			
9 34.42		12 34.84		12 38.30		13 26.26		15 44.44	57.48	-33.30	16 23.24			
— 5.44	-8.11	— 5.53	-8.22	— 5.53	-8.22	— 5.48	-8.14	— 5.52	— 5.52	-8.17	— 5.44	-8.04		
9 28.98	-33.88	12 29.31	-33.60	12 32.77	-33.60	13 20.78	-33.52	15 38.92	45.96	-33.30	16 17.80	-33.24		
90 m s		90		91		88		88 80	53 38	16 79 41.83	9.5			
8 35.7		11 47.3		12 37.6		13 27.3		15.2	14 55.1	— 41 — 4	16 33.7			
39.1		41.5		43.3		29.1		17.1	57.7	— 120 — 118	36.2			
42.3		53.1		49.5		34.0		20.6	0.1	+1195+1197	39.2			
1171		1499		84		912	53	537	1732	+ 30 + 30	191			
8 39.03	54 0 20.26	11 49.97	54 50 57.97	12 42.80	54 52 6.06	13 30.40	41 30.08	1790	57.73	-3690 -3690	16 36.37	51 46 59.96		
+41.35	— 45	+30.87	— 25	−18.50	— 8	— 18.20	— 8	+1248	+39.69	37496 38 12.51	27.27	— 20		
1.616418	— 62	1.489954	— 48	1.267172	— 34	1.26007	— 30	1.09621	1.59885		1.413569	— 342		
9.769222	+ 12.36	9.760211	+ 13.30	9.760083	+ 13.32	9.77250	+1203	9.77285	9.77285		9.791446	+ 9.95		
1.508830	+ 30	1.372352	+ 40	1.149802	+ 40	1.15517	+ 30	0.99166	1.49413		1.349732	+ 30		
25	−37.40	35	−37.30	35	−37.30	45	−37.00	45	45		40	−36.50		
2 12.0	59 50.88	1 43.4	50 30.07	1 12.5	51 38.49	1 48.8	41 1.26	4 17.1	4 13.0		1 26.9	46 29.52		
15.1		45.6		15.7		51.7		19.0	15.8		30.0			
71		90		82		1005		161	88		569			
27 13.55		36 44.56		36 14.10		46 50.25		2 58.49	18.05 14.40	1st ER	41 28.45			
55 3480		46 385		46 3425		35 58.10		33 3030	3395		41 1990			
54 0 52.49		54 51 21.54		54 51 51.94		53 41 15.77		53 38 97.99	57.64		51 46 34.59			
— 32.23		— 23.57		+ 14.12		+ 14.29		— 981 = 3120		2d 13	+ 22.37			
								20 — 3120	— 981	37 8.7				
9 20.87	59 17.0	12 21.09	49 56.5	12 24.55	51 4.9	13 12.64	40 27.7	15 30.75	37.79	39.61 +10.75 +11.7	16 9.76	45 56.3		
Dec. 25.	+11.84		+12.96		+13.51		+11.96					+9.82		
9 8.7	8.22	12 9.0	9.34	12 12.8	9.89	13 0.5	8.34	15 18.5	25.9	7.13 7.50	15 57.8	6.20		
12.1		12.9		16.2		4.0		22.3	29.6		1.1			
15.6		16.2		19.8		7.4		25.9	32.8		4.5			
19.1		19.8		23.2		11.0		29.6	36.3		8.3			
22.6		23.2		26.7		14.5		32.8	39.8		11.5			
781		811		987		374		1291	1644		232			
9 15.62		12 16.22		12 19.74		13 7.48		2582	32.88		16 4.64			
+ 19.63	+18.53	+ 19.62	+18.48	+ 19.62	+18.48	+ 19.62	+18.54	+ 19.62	+ 19.62	+18.54 +18.54	+ 19.62	+18.6X		
— .96		— .100		— .100		— .95		— .95	— .95	-8.17	— .89			
— .14		— .14		— .14		— .13		— .13	— .13	-33.30	— .13			
9 34.15	-8.11	12 34.70	-8.22	12 38.22	-8.22	13 26.02	-8.14	15 44.36	57.42	-8.17	16 23.24	-8.04		
— 5.35	-33.88	— 5.45	-33.60	— 5.45	-33.60	— 5.41	-33.52	— 5.44	— 5.44	-33.30	— 5.36	-33.24		
9 28.80		12 29.25		12 32.77		13 20.61		15 38.92	45.98		16 17.88			
6.7		6.0		9.1		8.8		9.0 86	53 38	17 46 43.50	9.5			
8 41.3		11 37.2		12 0.0		12 57.0		15 11.3	14 52.0	— 37 — 4	16 22.3			
44.1		40.0		3.1		53.2		13.7	53.0	— 120 — 118	24.3			
48.1		41.7		6.0		56.5		15.7	58.4	+1202 +1204	25.6			
135		1189		91		107	53	10.7	15.4	+30 +30	12.2			
8 44.50	54 0 22.47	11 39.63	54 50 58.54	12 3.03	54 52 9.13	12 53.57	41 32.61	13.57	55.13	-3750 -3750	16 24.07	51 47 03.7		
+31.12	— 25	+36.59	— 34	+16.71	— 7	+13.91	— 5	+1225	+37.75	37 47.09 38 13.50	-19.43	— 10		
1.493044	— 641	1.563336	— 48	1.222988	— 22	1.143333	— 39	1.088141	1.576922		1.285247	— 39		
9.769222	+ 12.43	9.760211	+ 13.38	9.760003	+ 13.40	9.772502	+1210	9.772852	9.772852		9.791446	+1201		
1.384861	+ 30	1.446172	+ 40	1.105612	+ 40	1.038432	+ 30	0.958592	1.472372		1.202512	+ 30		
25	−37.94	35	−37.90	35	−37.90	45	−37.70	45	45		40	−37.10		
2 20.1	59 52.78	1 40.9	50 29.98	0 45.0	51 41.12	1 23.8	41 3.25	4 20.2	4 13.4		1 22.8	46 29.47		
21.2		44.9		46.0		23.9		20.3	15.1		23.1			
13		18		110		17		5	85		59			
27 20.65		36 40.90		35 115.50		46 23.85	2d CR.	49 24.25	11.25	1st ER	41 22.95			
55 2770		46 745		41 285		36 2450		33 2810	3410		41 2590			
54 0 46.73		54 51 24.48		54 52 2.88		53 41 43.53		53 38 47.13	53.13		51 46 44.93			
— 24.26		— 27.94		— 12.75		— 10.92		— 962	— 296	1st	+ 15.94			
								2d — 2967	— 962					
9 20.69	59 18.9	12 21.03	49 56.4	12 24.55	51 7.5	13 12.47	40 29.7	15 30.75	37.81	37 13.8 40.2	16 9.84	45 56.2		

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1877phae.proj.tif7R

1877, Dec. 20, Dec. 25 Obs. W.A.R. Rec. J. F. Mc.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	2 17 56	16 51.8	2 19 20	18 16.2	2 20 26	19 16.6	2 21 41	20 32.5	2 23 31	22 22.0	2 23 57	22 48.5
δ	51° 29′	24.4 9.0	51° 6′	2.0 9.0	53° 18′	13.1 8.5	53° 27′	22.4 9.4	53° 45′	39.7 9.0	54° 0′	53 54.8 7.5

Dec. 20

m s	+5.95			+10.64		+10.85		+11.75		+11.78		
18 5.6	5.38	not seen		7.07		7.28		8.18		8.21		
8.7												
12.3												
15.3												
18.5												
604												
18 12.08				1817		2744		2306		587		
+ 15.28	+14.15			20 36.34		21 54.88		23 46.12		24 11.74		
− 1.13				+ 15.28	+14.07	+ 15.28	+14.07	+ 15.28	+14.06	+ 15.28	+14.04	
18 26.23				− 1.21		− 1.21		− 1.22		− 1.24		
− 5.45				20 50.41		22 8.95		24 0.18		24 25.78		
18 20.78	8.05 33.04			− 5.59	−8.21 −32.78	− 5.62	−8.24 −32.66	− 5.68	−8.29 −32.48	− 5.70	−8.31 −32.44	
				20 44.82		22 3.33		23 54.50		24 20.08		
89 m s				8.6		9.5		6.8		7.4		
17 32.2				20 11.1		21 27.6		23 11.8		24 26.8		
34.5				14.1		31.1		16.0		29.1		
37.8				17.0		33.4		19.1		32.0		
145	−3.57			122		21		170		8.79		
17 34.83	51 30 29.40			20 14.07	53 18 43.20	21 30.70	53 28 53.26	15.67	53 46 14.62	24 29.10	54 0 23.78	
+ 37.25	− 37			+ 22.27	− 13	+ 24.18	− 15	+ 30.45	− 24	− 17.56	− 8	
1.57113	− 59			1.34772	−115	1.38346	− 109	1.48359	− 42	1.24452	− 81	
9.79399	+ 9.66			9.77626	+1162	9.77456	+11.79	9.77164	+12.11	9.76922	+ 1237	
1.48772	+ .25			1.24658	+ 30	1.28062	+ 30	1.37783	+ 30	1.13634	+ 30	
55	−36.30			5	−36.40	55	−36.40	40	−36.30	25	−36.30	
2 4.6	29 58.48	2 3.8		4 4.5	18 13.87	3 52.5	28 24.14	1 26.3	45 48.50	2 57.8	59 55.69	
7.2		2.2		5.9		54.9		28.8		57.1		
11.8		1.0		10.4		7.4		15.1		11.9		
57 5.90				9 5.20		58 53.70		41 27.53		27 55.95		
25 42.45				13 43.15		23 54.65		41 20.80		54 52.40		
51 31 0.14				53 19 0.84		53 29 12.34		53 46 38.49		54 0 10.09		
− 30.74				− 17.64		− 19.08		− 23.87		+ 13.69		
18 12.73	29 25.4			20 36.61	17 41.1	21 55.09	27 51.5	23 46.21	45 14.02	24 11.77	59 23.2	

Dec. 25

m s	+9.22		+8.97	+10.50		+10.85		+11.73		+11.79		
18 0.8	5.60	19 21.0	5.35	7.18		7.23		8.11		8.37		
4.2		27.6		28.3		46.9		37.8		34		
7.3		30.7		32.0		50.4		41.4		4.1		
11.1		34.1		35.5		53.7		45.1		10.7		
143		37.4		38.9		57.3		48.7		14.1		
377		15.38		1600		17		2076		353		
18 4.54		19 30.76		20 32.00		21 50.34		23 41.52		24 7.06		
+ 19.62	+18.61	+ 19.62	+18.62	+ 19.62	+18.55	+ 19.62	+18.53	+ 19.62	+18.53	+ 19.62	+18.57	
− .88		− .87		− .94		− .94		− .95		− .97		
− .13		− .13		− .13		− .13		− .14		− .14		
18 26.05	−8.05 −33.04	19 49.38	−8.03 −32.88	20 [illegible]	−8.21 −32.78	22 8.89	−8.24 −32.66	24 0.05	−8.29 −32.48	24 25.67	−8.31 −32.44	
− 5.38		− 5.39		− 5.52		− 5.55		− 5.60		− 5.62		
18 20.77		19 43.99		20 [illegible]		22 3.34		23 54.45		24 19.95		
91 m s		8.8		8993		46		6.9		6.7		
17 42.0		19 10.6		20 17.8		21 15.3		23 10		23 57.0		
46.1		13.6				19.6		3.8		0.4		
50.1		15.1				21.1		6.7		8.0		
13.52	−3.62	9.3				560		145		04		
17 46.07	51 30 31.81	19 13.10	51 10 50.20	20 17.50	53 18 47.28	21 18.67	53 28 56.94	23 3.83	53 46 17.06	24 0.13	54 0 26.33	
+ 21.47	− 12	+ 17.66	− 9	+14.20	− 5	+ 31.67	− 26	+ 37.69	− 37	+ 6.93	− 2	
1.33183	− 64	1.24699	− 56	1.15229	−1.15	1.50065	− 1.06	1.57623	− 39	0.84073	− .73	
9.79399	+ 9.73	9.79715	+ 9.37	9.77626	+ 11.70	9.77456	+ 11.87	9.77164	+ 12.19	9.76922	+ 1244	
1.24842	+ .25	1.16674	+ .26	1.05115	+ 30	1.39781	+ .30	1.46047	+ .30	0.73255	+ .30	
55	−36.90	15	−36.70	5	−37.00	55	−37.00	40	−36.90	25	−37.00	
2 17.9	30 0.51	2 2.8	10 18.85	4 9.2	18 17.46	3 45.2	28 27.17	1 21.1	45 48.27	2 35.8	59 57.70	
17.8		2.2		8.5		45.7		21.8		35.5		
17		1.0		17.7		9		9		13		
57 17.85		17 2.50		9 8.85		58 45.45		41 21.45		27 35.65		
25 30.50		5 45.85		13 39.50		24 2.90		41 26.90		55 12.70		
51 30 49.53		51 11 4.68		53 18 58.53		53 29 21.93		53 46 45.98		54 0 31.73		
− 17.72		− 14.68		− 11.25		− 24.99		− 28.87		− 5.40		
18 12.72	29 27.5	19 35.96	9 46.0	20 36.82	17 44.7	21 55.10	27 54.5	23 46.16	45 15.8	24 11.64	59 25.3	

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1877, Dec. 20, Dec. 25.

no 2 on place 2nd 4

	h m s		h m s		h m s		h m s		h m s		h m s	
α	2 25 9	24 4.4	2 25 41	24 36.3	2 33 39	32 34.0	2 37 21	36 11.5	2 38 59	37 49.4	2 42 20	41 7.6
δ	52° 4′	51 57.8	51° 24′	19.9	51° 20′	16.0	52° 38′	33.4	52° 25′	26.4	54° 25′	20.9
		8.5		9.3		9.0		8.0		9.4		8.8

Dec. 20

	m s											
		+10.02		+9.19 +9.33		+5.35		+7.71		+10.48		+12.83
	25 20.1	6.45	25 37.0 25 56.9	5.62 3.76	33 49.1	4.78	37 27.1	6.34	38 6.1	6.91	42 29.1	9.26
	24.0		54.2 0.2		52.4		30.6		10.0		32.4	
	27.3		57.4 3.5		54.7		34.0		12.3		36.0	
	30.4		0.7 7.0		54.1		37.1		16.5		28.7	
	34.0		4.1 10.0		59.3		40.3		19.8		43.9	
	1369		2874 176		2786		1691		657		1804	
	25 27.38		57.48 3.52		33 55.72		37 32.82		39 13.14		42 36.08	
	+ 15.28	+14.13	+ 15.28 + 15.28	+14.15 +14.15	+ 15.28	+14.15	+ 15.28	+14.10	+ 15.28	+14.11	+ 15.28	+14.02
	− 1.15		− 1.13 − 1.13	−8.14	− 1.13		− 1.18		− 1.17		− 1.26	
	25 41.51		26 11.63 17.67	−32.24	34 9.87		37 47.92		39 27.25		42 50.10	
	− 5.61	−8.18	− 5.58 − 5.58	−8.14	− 5.70	−8.23	− 5.82	−8.37	− 5.84	−8.37	− 6.04	−8.58
	25 35.90	−32.30	26 4.195 12.09	−32.24	34 4.17	−31.40	37 42.10	−31.00	39 21.41	−30.82	42 44.06	−30.44
			6.05									

	m s											
89	25 11.2		87.95 51 26 17.17 27 10.71 9.0				8.6		9.5		8.9	
	14.8		26 10.9 26 24.4 − 7 − 15		33 35.4		36 53.5		38 47.0		42 0.3	
	17.0		13.9 27.1 − 56 − 36		38.0		3.0		49.7		8	
	130		16.4 30.4 + 957 + 959		41.0		7.4		51.4		6.7	
			112 823 + 25 + 25		1144		6.9		1484		10.2	
	25 14.33	52 5 59.06	1373 27.50 3570 3570		33 38.13	51 23 1.83	37 2870	52 39 1.46	38 49.47	52 26 32.61	42 3.40	54 27 31.40
	+ 13.05	− 5	− 16.25 − 23.98	25 47.09 26 40.77	+ 17.59	− 8	+ 30.12	− 24	+ 23.67	− 15	+ 32.68	− 28
	1.11561	− 53	1.21085 1.37985		1.24527	− 134	1.47885	− 104	1.37420	− 341	1.51428	− 6
	9.78837	+ 10.30	9.79478 9.79463		9.79216	+ 9.52	9.78296	+ 10.89	9.78494	+ 1067	9.76431	+ 12.87
	1.02658	+ .30	1.12823 1.29708		1.16313	+ .25	1.38441	+ .30	1.28174	+ .30	1.40119	+ .30
		− 3580				− 3510		− 3570		− 3480		− 3480
	20		0 0		0	45						
	1 54.7	5 29.71	2 0.9 1 13.1		4 48.1	22 31.51	3 39.0	38 32.80	1 12.1	26 4.720	8.0	27 6.84
	58.0		37 17.2		51.0		41.7		16.5		10.9	586
	127		46 10.3		99.1		80.7		86		18.9	
	21 56.35		2 2.30 1 15.15		4 49.55	+10	48 40.35		1 14.30		0 9.45	
	0 52.60		20 46.05 21 33.20		17 58.80		34 8.00		21 34.05		22 38.90	
	52 6 9.69		51 26.37 4 26 50.87		51 23 16.99		52 39 25.67		52 26 51.74		54 27 55.59	
	− 10.63		+ 13.43 + 19.82		− 14.56		− 24.23		− 19.13		− 25.19	
				148								
	25 27.72	4 57.4	25 57.91	25 32.0	33 55.94	22 0.2	37 33.73	35 1.8	39 13.04	25 33.9	42 35.48	26 35.4
			26 3.95	26 8.5						+10.46		+12.93
				+9.39 +9.46								

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	m s											
		+9.88		5.77 5.89	Cloudy		Cloudy					
	25 16.0	6.26	25 46.5 25 52.1						39 1.4	6.78	42 24.5	9.80
	17.1		49.7 53.5						5.0		28.0	
	22.4		53.1 58.4						8.3		31.5	
	26.0		56.6 2.1						11.8		35.3	
	29.4		59.9 5.6						15.2		38.6	
	1132		26.54 29.32						417		79	
	25 22.64	60	53.08 58.64						39 8.34		42 31.58	
	+ 19.62	+18.80	+ 19.62 + 19.62	+18.61 +18.61					+ 19.62	+18.58	+ 19.62	+18.50
	− .89		− .88 − .88	−8.14					− .91		− .98	
	− .13		− .13 − .13	−32.24					− .13		− .14	
	25 41.24	−8.18	26 11.69 17.25	−8.14					39 26.92	−8.37	42 50.08	−8.58
	− 5.54	−32.30	− 5.51 − 5.61	−32.24					− 5.78	−30.82	− 5.98	−30.44
	25 35.70		26 6.18 17.64						39 21.14		42 44.10	
			11.54									

	m s											
88	24 44.4		88.92 51 26 17.85 27 13.66						9.3		8.8	
	46.7		25 42.5 26 13.8 − 1 − 10						38 28.1		41 33.7	
	50.1		48.2 17.9 − 48 − 34						30.9		37.0	
	1412		50.1 21.3 + 963 + 965						32.2		0.3	
			1408 530 + 25 + 25						12		1710	
	24 47.07	52 6 1.15	46.93 17.67 − 26.30 − 26.30						38 30.40	52 26 34.32	41 57.00	54 27 32.68
	+ 35.57	− 33	+ 6.15 − 19.03	25 47.31 26 43.20					+ 37.94	− 38	+ 34.58	− 31
	1.55108	− 450	1.78888 1.27944						1.57910	− 28	1.53882	− 8
	9.78837	+ 10.36	9.79478 9.79463						9.78494	+ 10.76	9.76431	+ 12.96
	1.46205	+ .30	0.70626 1.19667						1.48664	+ .30	1.42573	+ .30
		− 3650								− 3540		− 3550
	20		0 0		0		45		0			
	1 37.1	5 30.91	43.8 8.2		4 46.0		3 35.8		1 2.5	26 5.70	0 8.1	27 6.48
	37.4		45.1 10.7		47.3		36.6		2.3		8.0	
	5		89, 189		133		124		8		1	
	21 37.25		144.45 945		4 46.65		48 36.20		1 2.40		0 8.05	
	1 11.10		21 390 3890		18 1.70		34 12.15		21 45.95		22 40.30	
	52 6 30.13		51 26 22.93 57.73		51 23 24.73		52 39 31.13		52 27 47.78		54 27 39.33	
	− 28.98		− 5.08 + 15.73						− 30.66		− 26.65	
				15.1								
	25 27.52	4 58.6	25 58.04	25 39.78					39 12.77	25 34.9	42 35.52	26 36.0
			26 3.80	26 11.0								

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	h m s		h m s		h m s		h m s		h m s		h m s	
α	2 43 2	41 52.3	2 45 33	44 22.4	2 48 33	47 21.5	2 49 31	48 19.5	2 50 27	49 14.8	2 55 52	54 40.6
δ	52° 44′	39.4 9.5	54° 1′	53 57.1 8.7	53° 53′	49.1 8.5	53° 46′	42.1 8.6	53° 49′	45.1 8.5	52° 8′	34 7.9

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	m s		m s		m s		m s		m s		m s	
	43 7.1	7.40	45 43.9	8.84	48 45.1	8.26	49 40.0	7.35	50 35.4	8.20	55 54.4	5.93
	10.4		47.4		49.0		43.4		38.7		2.8	
	13.7		51.0		52.3		47.1		42.1		0.1	
	17.3		54.2		55.8		50.6		45.7		7.8	
	20.4		57.9		59.4		54.1		49.2		13.0	
	69.1		44		2616		2253		2111		311	
	43 13.82		45 50.88		48 52.32		49 47.06		50 42.22		56 6.22	
	+ 15.28	+14.09	+ 15.28	+14.04	+ 15.28	+14.04	+ 15.28	+14.05	+ 15.28	+14.05	+ 15.27	+14.12
	1.19		− 1.24		− 1.24		− 1.23		− 1.23		− 1.15	
	43 27.91		46 49.8		49 6.36		50 1.11		50 56.27		56 20.34	
	−5.93		− 6.07		− 6.09		− 6.11		− 6.12		− 6.09	
	43 21.98		45 58.65		49 0.27		49 55.00		50 50.15		56 14.25	

	m s		m s		m s		m s		m s		m s	
	43 5.4		45 19.7		48 15.8		49 24.7		50 25.0		55 40.0	
	8.6		22.0		18.7		23.5		27.3		43.5	
	11.5		26.1		20.6		25.6		29.6		47.4	
	25.5		88		55.1		98		219		89	
	43 8.50	52 46 42.02	45 22.93	54 2 24.2	48 18.37	53 56 15.8	49 23.27	53 47 53.31	50 27.30	53 50 32.67	55 42.97	52 9 11.42
	+ 5.32	− 1	+ 27.95	− 20	+ 33.95	− 30	+ 23.79	− 15	+ 14.92	− 6	+ 23.25	− 14
	0.725 91	− 36	1.444 638	− 8	1.530 844	− 45	1.376 39	− 1.371	1.173 74	− 67	1.366 42	− 1.01
	9.781 63	+ 1104	9.76 887	+ 1239	9.76 991	+ 1228	9.771 36	+ 1214	9.771 078	+ 12.20	9.78 788	+ 10.35
	0.630 14	+ 30	1.337 85	+ 30	1.423 35	+ 30	1.270 29	+ 30	1.067 15	+ 30	1.276 90	+ 30
	40	−34.50	35	−34.45	30	−34.10	35	−34.10	35	−34.07	15	−33.20
	1 18.1	46 14.92	0 18.2	1 59.08	1 36.8	55 35.74	4 52.0	47 26.56	2 20.3	50 6.87	3 34.6	8 44.15
	21.4		21.1		39.1		54.2		23.1		36.8	
	39.5		39.3		15.9		62		34		114	
	41 19.75		25 19.65		31 37.95		39 53.10	+1″	37 21.70		18 35.74	
	41 28.60		57 28.70		51 10.40		42 55.25		45 26.65		4 12.65	
	52 46 46.27		54 2 46.39		53 56 28.09		53 48 12.94		53 50 44.34		52 9 30.39	
	− 427		− 21.77		− 26.51		− 18.63		− 11.67		− 18.92	
	43 13.54	45 44.6	45 50.27	1 59.0	48 51.66	55 6.0	49 46.39	46 57.0	50 41.53	49 37.4	56 5.72	8 15.3

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	m s		m s		m s		m s		m s			
	43 34.0	6.95	45 29.3	8.69	48 16.7	8.66	49 35.5	7.36	50 30.6	8.14		
	37.8		42.9		20.5		38.7		34.2			
	40.8		46.5		23.8		42.5		37.8			
	44.0		50.1		27.2		45.9		41.2			
	47.5		53.6		30.6		49.6		44.8			
	236		232.4		1188		2122		1886			
	43 40.72		45 46.48		48 23.76		49 42.44	−01	50 37.72			
	+ 19.62	+18.56	+ 19.62	+18.52	+ 19.62	+18.52	+ 19.61	+18.51	+ 19.61	+18.51		
	− .93		− .96		− .96		− .96		− .96			
	− .13		− .14		− .14		− .14		− .14			
	43 59.28		46 5.00	8.58	48 42.28		50 0.95	−861	50 56.23	−862		
	− 5.88		− 6.01	3006	− 6.04		− 6.05	−2960	− 6.07	−2950		
	43 53.40		45 58.99		48 37.24		49 54.89		50 50.16			

	m s		m s		m s		m s		m s			
	43 14.6		45 3.4		47 59.3		49 13.0		50 5.7			
	19.3		6.1		23		16.3		9.3			
	22.4		11.0		4.0		19.6		12.3			
	56.3	−3.62	20.5		56		189		27.3			
	43 15.77	52 45 21.96	45 6.83	54 2 25.40	48 1.87	53 52 6.06	49 16.30	53 47 54.86	50 4.10	53 50 33.34		
	+ 21.95	− 13	+ 39.65	− 41	+ 21.89	− 13	+ 26.14	− 18	+ 28.62	− 21		
	1.344 43	− 67	1.598 24	− 6	1.340 24	− 20	1.417 31	− 1.37	1.456 67	− 62		
	9.781 97	+ 11.07	9.76 887	+ 12.48	9.770 61	+ 1231	9.771 30	+ 12.23	9.770 78	+ 1229		
	1.246 00	+ 30	1.489 71	+ 30	1.233 45	+ 30	1.311 21	+ 30	1.350 05	+ 30		
	40	−35.10	25	−35.20	35	−34.80	35	−34.80	35	−34.70		
	2 26.7	44 53.81	0 10.7	1 58.89	0 43.8	51 39.92	4 52.9	47 27.42	2 11.8	50 6.78		
	26.9		11.5		44.6		51.2		11.5			
	16		22		84		41		13			
	42 26.80		25 11.10		35 44.20		39 52.05		34 11.65			
	40 20.55		57 37.25		47 4.15		42 56.30		45 36.70			
	52 45 39.58		54 2 56.28		53 52 23.18		53 48 15.33		53 50 55.73			
	− 1762		− 30.88		− 17.12		− 20.47		− 22.39			
			45 50.41	128.8			49 46.28	46 57.8	50 41.54	49 37.3		

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	2 56 51	55 390	2 58 6	56 54.0	2 58 8	56 55.9	3 0 31	2 59 19.1	3 2 22	1 8.6	3 3 27	2 14.1		
δ	52° 34′	29.3 / 8.5	53° 59′	55.3 / 8.5	53° 58′	54.4 / 9.3	53° 41′	37.5 / 8.4	53° 12′	8.4 / 9.3	54° 16′	12.5 / 9.0		

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	m s													
	+10.78	6.61	+11.75	8.18	+11.62	8.05	+10.78	7.21	+10.51	6.94	+11.36	7.79		
	56 59.8		58 13.5		58 17.3		0 38.8		2 29.7		3 25.9			
	3.2		16.8		21.0		42.3		33.2		37.6			
	6.5		20.5		24.4		45.7		36.8		43.2			
	9.7		24.1		27.9		49.0		40.5		46.6			
	13.2		27.5		31.4		53.8		43.7		50.2			
	324		24		12.23		22.86		18.39		21.53			
	57 6.48		58 20.48		58 24.46		0 45.72		2 36.78		3 43.06			
	+ 15.27	+14.09	+ 15.27	+14.03	+ 15.27	+14.03	+ 15.27	+14.04	+ 15.27	+14.06	+ 15.27	+14.02		
	− 1.18		− 1.24		− 1.24		− 1.23		− 1.21		− 1.25			
	57 20.57		58 34.51		58 38.49		0 59.76		2 50.84		3 57.08			
	− 6.14		− 6.26		− 6.26		− 6.28		− 6.28		− 6.37			
	57 14.43	−8.58 / −28.72	58 28.25	−8.73 / −28.56	58 32.23	−8.73 / −28.56	0 53.48	−8.73 / −28.26	2 44.57	−8.70 / −28.04	3 50.71	−8.82 / −27.90		
	8.7 m s		8.6		9.2		8.4		9.3		8.6			
	56 43.2		58 45.7		57 48.5		0 10.0		2 2.3		3 8.5			
	44.4		48.2		51.3		12.4		4.0		11.4			
	49.2		51.0		54.1		15.0		7.1		14.3			
	188		1449		39		74		13 3		48			
	56 46.27	52 34 4925	58 48.30	54 0 53.17	57 51.30	54 0 0.69	0 12.47	53 43 2.30	2 44.3	53 13 55.31	3 11.60	54 17 43.84		
	+ 20.21	− 10	− 27.82	− 20	+ 33.16	− 28	+ 33.25	− 28	+ 32.35	− 27	+ 31.46	− 26		
	1.30557	− .84	1.44436	− .73	1.52061	− .76	1.52179	− 1.29	1.50987	− 1.64	1.49776	− 1.37		
	9.78362	+ 1082	9.76904	+ 12.38	9.76922	+ 12.36	9.77216	+ 12.05	9.77711	+ 11.52	9.78607	+ 12.69		
	1.21179	+ 30	1.33600	+ 30	1.41243	+ 30	1.41655	+ 30	1.40958	+ 30	1.38643	+ 30		
	60	−33.20 25		−33.20 25		−33.20 40		−32.90 10		−32.70 5		−32.70		
	2 59.4	34 22.66	2 33.2	0 28.15	2 38.1	59 35.54	4 36.2	42 36.61	3 43.8	13 29.55	4 57.1	17 18.93		
	1.6		35.9		40.9		39.1		46.3		58.3			
	10		91		79.0		153		101		157			
	53 0.50		27 34.55		27 39.50		44 37.65		13 45.05		9 57.85			
	29 47.85		55 13.80		55 8.85		38 10.70		9 3.30		12 50.50			
	52 35 55.4		54 0 31.99		54 0 26.54		53 43 28.39		53 14 20.99		54 18 8.19			
	− 16.29		+ 21.68		− 25.85		− 26.09		− 25.68		− 24.35			
	57 5.85	33 53.9	58 19.52	59 59.6	58 23.50	59 7.0	0 44.75	42 8.4	2 35.87	13 1.5	3 41.89	16 51.0		
				+11.33		+11.92		+10.76		+10.69		+12.96		

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			58 8.4	7.74 / 85	58 12.8	8.30 / 16	0 34.0	7.14	2 25.7	7.07	3 31.5	9.34		
			12.3		16.3		37.6		29.1		35.1			
			15.8		20.0		41.1		32.1		38.6			
			19.1		23.6		44.8		35.7		42.1			
			23.0		27.0		48.1		39.3		45.5			
			791		497		56		119		428			
			58 15.82		58 19.94		0 41.12		2 32.38		3 38.36			
			+ 19.61	+16.50	+ 19.61	+16.50	+ 19.61	+16.32	+ 19.61	+16.54	+ 19.61	+16.50		
			− .97		− .97		− .96		− .94		− .97			
			− .14		− .14		− .13		− .13		− .14			
			58 34.32	−8.73 / −28.56	58 38.44	−8.73 / −28.56	0 59.64	−8.73 / −28.26	2 50.92	−8.70 / −28.04	3 57.06	−8.82 / −27.90		
			− 6.21		− 6.28		− 6.22		− 6.22		− 6.32			
			58 28.11		58 32.23		0 53.42		2 44.70		3 50.74			
			8.8 m s		9.3		8.7		9.5		9.4			
			58 37.5		58 41.7		59 58.3		2 6.6		3 15.8			
			0.0		45.0		2.6		10.1		18.6			
			2.9		87.6		37		12.8		21.5			
			04		143		60		294		559			
			59 0.13	54 0 54.25 / 24.75	58 34.77	54 0 1.79 / 31.29	0 2.00	53 43 3.18	2 9.80	53 13 55.61	3 18.63	54 17 48.31		
			*44.31	− 51	− 14.83	− 6	+ 39.12	− 40	+ 22.58	− 14	+ 19.93	− 10		
			1.64650	− .7842	1.17114	− .9278	1.59240	− 1.29	1.35372	− 109	1.29951	− 3		
			9.76904	+ 12.46	9.76922	+ 12.46	9.77216	+ 12.15	9.77711	+ 11.62	9.76607	+ 12.79		
			1.53814	+ .30	1.06296	+ .30	1.48716	+ .30	1.25343	+ .30	1.18818	+ .30		
			25	−33.90 25		−33.90 40		−33.60 10		−33.40 10		−33.50		
			2 47.1	59 58.56 / 0 28.20	2 44.1	0 5.69 / 59 36.05	4 33.9	42 36.72	3 53.8	13 29.28	0 9.7	17 19.15		
			48.2		48.2		33.1		53.9		76			
			153		153		10		17		13			
			27 47.65		27 47.65		44 33.50		13 53.85		10 7.65	+1"		
			55 0.70		55 0.70		38 14.85		8 54.50		12 40.70			
			54 0 19.73	53 59 50.23	54 0 17.73	53 43 33.88		53 14 13.53		54 17 57.73				
			+ 34.52	+ 11.56	+ 34.52	− 30.70		− 17.92		− 15.42				
			58 19.38	59 59.6	58 23.50	59 7.5	0 44.69	42 8.5	2 36.00	13 1.2	3 41.92	17 24.2		

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	h m s		h m s		h m s		h m s		h m s	
α	3 6 58	5 45.2	3 10 20	9 7.2	3 11 6	9 53.6	3 12 23	11 10.1	3 13 14	11 59.0
δ	52° 59	54.6 9.5	52° 12	7.7 8.7	52° 48	44.1 8.9	52° 15	10.7 7.5	54° 3	2 58.7 8.3

Dec. 20

	m s									
	7 7.1	7.17	10 27.6	5.89	11 15.0	6.64	12 31.3	6.97	13 24.1	7.77
	10.6		30.6		18.4		34.7		27.9	
	13.9		34.3		21.7		37.8		31.4	
	17.1		37.5		25.1		41.4		34.9	
	20.4		40.8		28.5		45.0		38.4	
	6.44		17.08		10.87 10.77		19.02		6.7	
	7. 13.88		10 34.16		11 21.64		12 38.04		13 31.34	
	+ 15.27	+14.07	+ 15.27	+14.91	+ 15.27	+14.08	+ 15.27	+14.11	+ 15.27	+14.03
	− 1.20		− 1.16		− 1.19		− 1.16		− 1.24	
	7 27.95		10 48.27		11 35.82		12 52.15		13 45.37	
	7 − 6.32		− 6.30	8.69 27.04	− 6.34	8.76 26.92	− 6.34	8.72 26.74	− 6.50	
	7 21.63		10 41.97		11 29.48		12 45.81		13 38.87	

9.5	m s		8.5		8.9		7.8		8.5	
	7 2.5		7 58.0		10 38.3		12 7.5		12 57.2	
	5.2		1.0		0.2		10.0		2.8	
	8.5		3.6		3.4		4.4		5.2	
	16.2	−3.57	2.6		1.9		30.74		7.2	
	7 5.40	53 0 6.07	10 0.87	52 14 8.95	11 0.63	52 49 4.72	12 10.13	52 17 3.86	13 2.40	54 3 3.82
	+ 8.48	− 2	+ 33.29	− 30	+ 21.11	− 12	2.92 2.701	− 21	+ 28.94	− 22
	0.92840	− 81	1.52231	− 98	1.32449	− 104	1.44546	− 6	1.46150	− 118
	9.77946	+ 11.27	9.78707	+ 1044	9.78130	+ 11.07	9.78642	+ 10.51	9.76852	+ 1244
	0.83046	+ .30	1.43198	+ .30	1.22839	+ .30	1.35478	+ .30	1.35262	+ .30
25		−32.20	10	−31.70	35	−31.40	10 1.37574	−31.50	00	−31.60
	2 52.0	59 41.04	3 29.0	13 43.14	3 42.8	48 37.66	0 10.2	17 7.33 6.21	4 11.0	3 7.99
	54.4		31.1		46.0		12.9		12.4	
	6.4		6.01		8.8		31		3.4	
	27 53.20		13 30.05		38 41.48		10 11.53		24 11.70	
	54 55.15		9 18.30		44 3.95		12 3.680		58 36.65	
	53 0 12.84		52 14 35.99		52 49 21.64		52 17 54.49		54 3 54.34	
	− 6.77		− 27.04		− 16.92		− 22.63 23.75		− 22.52	
			10 33.28	13 16.1	11 20.72	48 12.7	12 37.09	16 39.5		

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	m s									
	7 2.1	7.14	10 22.9	5.93	11 10.2	6.70	12 26.6	6.92	13 20.0	7.84
	5.9		26.1		13.7		30.0		23.4	
	9.6		29.5		17.4		33.2		26.8	
	12.8		32.6		20.7		37.0		30.4	
	16.1		36.6		24.4		40.5		33.8	
	4.65		14.77		8.61		16.74		13.44	
	7 9.30		10 20.54		11 17.22		12 32.48		13 26.88	
	+ 19.61	+18.55	+ 19.61	+18.58	+ 19.61	+18.55	+ 19.61	+18.58	+ 19.61	+18.51
	− .93		− .90		− .93		− .90		− .96	
	− .13		− .13		− .13		− .13		− .14	
	7 27.85		10 48.12	8.69 27.04	11 35.77	8.76 29.62	12 52.06	8.72 26.74	13 45.39	
	7 − 6.28		− 6.26		− 6.30		− 6.30		− 6.47	
	7 21.57		10 41.86		11 29.47		12 45.76		13 38.92	

9.6	m s		9.3		9.3		8.5		8.6	
	6 40.1		9 53.6		10 55.0		11 58.1		12 57.3	
	42.6		53.1		57.5		3.0		0.3	
	45.6		56.2		17.5		17.86		4.0	
	8.3	−3.62	0.0		17.50		28.83		16	
	6 42.77	53 0 8.31	9 22.99 36.22	52 14 9.37	10 58.33	52 49 6.84	11 6.95	52 17 2.60	13 8.53	54 3 3.427
	+ 26.53	− 18	+ 33.32	− 30	+ 18.89	− 9	32.13 + 33.95	− 31	+ 26.35	− 18
	1.42374	− 73	1.52270	− 98	1.27623	− 106	1.53851	− 6	1.42078	− 1.18
	9.77946	+ 11.27	9.78707	+ 1053	9.78130	+ 11.17	9.78642	+ 1061	9.76852	+ 1255
	1.32580	+ .30	1.43237	+ .30	1.18013	+ .30	1.43986	+ .30	1.31190	+ .30
25		−32.90	10	−32.40	35	−32.50	10 1.41997	−32.20	20	−32.40
	2 37.3	59 42.55	3 31.5	13 42.90	3 44.9	48 41.04	0 11.5	17 2.32 3.55	4 12.8	3 9.74
	38.5		30.4		45.9		13.0		12.4	
	1.58		1.9		1.08		4.5		1.2	
	27 37.90		13 30.95		38 45.40		10 12.25		24 12.60	
	55 10.45		9 17.40		44 2.95		12 3.610		58 35.75	
	53 0 29.48		52 14 36.43		52 49 21.98		52 17 55.13		54 3 54.78	
	− 21.17		− 27.06		− 15.14		− 22.53 26.30		− 20.51	
			10 32.97	13 15.9	11 20.71	48 14.1	12 32.60	16 36.8		

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	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	0 16 19	15 25.1	0 17 27	16 33.3	0 23 14	22 20.0	0 23 57	23 3.7
δ	55° 5′	54 59.5	53° 40′	34.2	54° 8′	2.3	54° 57′	51.1
		8.5		9.0		9.0		9.0

	h m s	h m s	h m s	h m s
α	0 24 41	23 47.5	0 25 8	24 13.3
δ	53° 16′	9.7	53° 7′	1.0
		8.1		7.4

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							+11.84				+7.38 +12.36				+11.50				+10.30	
	23	8.3				8.44		23	50.6	23	51.6	8.98	8.96	24	35.5	8.10		25	—	6.90
		11.7							54.1		55.1				39.2				—	
		15.4							58.0		59.1				42.8				—	
		19.3							1.3		2.2				45.9				13.1	9.7
		22.8							5.2		6.2				49.3				16.3	9.5
		7.75							28.92		29.42				21.27					
	23	15.50							57.84		58.84			24	42.54			25	9.60	
		+ 2.051	+19.49			+	2.051	+	2.051	+19.45	+19.45			+	2.051	+19.52			+ 2.051	+19.53
		— .88				—	.92	—	.92	-6.55				—	.86				— .85	
		— .14				—	.14	—	.14	-39.88				—	.13				— .23	
	23	34.99	-6.52	24	17.29		18.29		-6.55				25	2.06	-6.53		25	29.13		-6.54
		— 3.26	-39.90		— 3.26		-3.26		-39.88					— 3.30	-39.88			— 3.31		-39.86
	23	31.73		24	14.03		15.03						24	58.76			25	24.82		
																		25		
	9.0					9.2	9.0		54	58	52.02	53	7.8			7.2				
	23	21.5				24	18.6	24	21.4		— 11 — 13			24	54.9			25	22.0	
		21.0									— 1.26 — 1.26				59.2				25.9	
		28.5									+1335 +13.35								28.4	
		18.0									+ .40 + .40				14.1				16.3	
	23	26.00		54	-3.40						-40.70 -40.70			24	57.05	53 17 26.52		25	25.43	58 8 42.07
		-10.50			10 0.22		18.60		21.40		-20.76 -22.56		58	20.30	-14.51				-15.83	
	1.02119				— 3								14		1.16167				— 5	— 7
	9.76747				— 90		1.31723		1.35384						9.77660				— .25	— .29
	0.91126				+ 12.47		9.75877								1.06087				+ 11.50	1.14948 + 11.36
					+ .30		1.49860		1.23471										+ .30	+ .30
	15				-40.50		25												-40.30	-40.30
Rn = -.28																				
n = -.64	3	13.9			9.28.16		4	29.9						0	50.8		16	54.32	4 37.1	8 8.67
C = -.08		15.5						31.2							52.7				37.5	
		94						6.11							35				6	
+5′ 18.42	18	14.70					29	30.55						10	51.75			19	37.20	
	4	3.365					53	17.80						11	56.60			3	11.05	
	54 9	52.07					54 58	36.22						53 17	15.02			53 8	29.47	
		+ 8.15						+ 15.80							+ 11.50				+ 12.60	
								+ 17.17			57 40.4									
	23	25.21			8 48.3		24	7.48			41.8			24	52.23	16 14.4		25	19.28	7 28.8

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			+13.73			+11.86			+11.65		8.48	+12.52 +12.54				+11.63					
	16	20.8	10.60	17	20.0	8.73	23	7.9	8.52	23	49.5	23	9.39 9.41	24	34.6	8.50				
		24.2			23.4			11.0			53.4				38.2					
		28.2			26.8			14.5			57.0	57.8			41.8					
		31.9			30.2			17.9			1.0	1.6			45.1					
		35.3			34.2			21.7			4.4	5.2			48.7					
		4.04			3.46			7.30			2.853	2.886			84					
	16	28.08		17	26.92		23	14.60	20		57.06	57.72	93		41.68					
	+	2.133	+20.21	+	2.133	+20.26	+	2.133	+14.25	+	2.133	+ 2.133	+20.21 +20.21	+	2.133	+20.28				
	—	1.12		—	1.07		—	1.08		—	1.12	— 1.12		—	1.05					
	16	48.29		17	47.18		23	34.85		24	17.27	17.93	18.14	25	1.96					
	—	3.08	-6.42	—	3.13	-6.42	—	3.21	31.6	—	3.24	— 3.24	-6.55	—	3.28	-6.53				
	16	45.281	-40.00	17	44.05	-39.98	23	57.59	-6.52	24	14.03	14.69	-39.88	24	58.68	-39.88				
								31.61	-39.90			14.70								
	8.7			8.8			9.2				9.39.7	54 58 51.35	53.59 7.5							
	16	33.2		17	36.7		22	33.9		23	37.6	23 41.2	— 9 — 7	24	25.0					
		38.0			39.5			37.5					— 1.12 — 1.12		28.0					
		40.9			45.0			40.2					+1.333 +1.333		31.3					
		11.21	-3.13		12			11.16					+ .40 + .40		8.43					
	16	37.37	55 7 43.00	17	40.40	53 42 51.4	22	37.20	54 10 40.7		37.60	41.20	-40.60 -40.60	24	28.10	53 17 29.14				
	—	9.29	— 2	—	13.48	— 5	+	37.40	— 37	+	1946	+16.59	58 20.14	24	13.58	— 5				
	0.96802		— 14	1.12969		— 34	1.57287	—	731.28914	1.21581					1.13290	— 11				
	9.75714		+ 1349	9.77233		+ 1195	9.76747	+	1245	9.75877					9.77660	+ 11.49				
	0.84776		+ 45	1.02462		+ 30	1.46294	+	30	1.17051					1.03210	+ .30				
	20		-40.46	45		-39.86	15		-40.50	25						-40.30				
			40.46			40.20								10						
	0	29.2	7 13.20	1	9.9	41 33.67	2	32.4	9.3209	21	0.0			0	24.8	16 5734				
		32.0			13.1			34.5			0.8				28.5					
		612			230			69			8				133					
	20	30.60		46	11.50 +50		17	33.45		29	0.40			10	26.65					
Rn = -.28	2	1775		36	36.35		5	1490		53	4795			12	2170					
n = -.78	55 7	35.96		53 41	54.56		54 10	33.11		54 59	6.16			53 17	39.91					
	+	7.04		+	10.58		—	29.04		—	1481			—	10.77					
											1257									
+5′ .16.21	16	38.79	6 33.2	17	37.63	40 53.7	23	25.09	8 52.2	24	7.48	8.36	57 40.3 42.4	24	52.15	16 17.5				

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1877, Dec. 26, Dec. 27. Obs. W.A.R. Rec. & F.M.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	0 26 56	26 1.3	0 28 57	28 1.9	0 38 36	37 40.4	0 41 13	40 19.3	0 45 55	44 57.6	0 46 41	45 43.1
δ	52° 24′	18.1 8.7	54° 9′	3.2 7.5	55° 2′	55.7 9.4	55° 5′	0.7 8.0	54° 56′	50.2 8.3	55° 4′	54 57.6 7.9

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	+10.34		+12.11			+12.37		+12.11		+13.06		
	26 51.6	6.97	28 51.7	8.71			41 11.9	8.97	45 51.0	8.71	46 36.3	9.66
	55.0		55.0				15.6		54.5		39.8	
	58.2		58.7				18.2		58.2		43.6	
	1.5		2.2				22.9		1.9		47.0	
	4.7		5.6				26.5		5.5		50.7	
	2910		29.32				961		2911		2174	
	26 58.20		28 58.64				41 19.22		45 38.22		46 43.48	
	+ 20.51	+19.55	+ 20.51	19.49			+ 20.51	+19.45	+ 20.51	+19.46	+ 20.51	+19.45
	− .83		− .88				− .92		− .91		− .92	
	− .13		− .14				− .14		− .14		− .14	
	27 17.75	−6.55	29 18.13	−6.61			41 38.67	−6.83	46 17.68	−6.91	47 2.93	−6.92
	− 3.35	−39.82	− 3.37	−39.78			− 3.62	−39.46	− 3.72	−39.30	− 3.73	−39.28
	27 14.40		29 14.76				41 35.05		46 13.96		46 59.20	
	9.0		7.8				8.0		8.0		8.0	
	26 26.0		28 40.3				40 42.0		45 17.3		46 22.6	
	28.7		44.5				46.3		19.9		25.3	
	32.0		47.5				49.3		21.7		28.7	
	8.7	−3.40	12.3				176		589		166	
	26 28.90	52 25 57.53	28 44.10	54 10 45.69			40 45.87	55 8 12.19	45 19.63	54 58 8.54	46 25.53	55 5 17.14
	+29.30	− 23	+14.54	− 5			+33.35	− 29	+38.59	− 38	+17.95	− 8
	1.46684	− 28	1.16256	− 62			1.52310	− 1.26	1.55644	− 126	1.25406	− 73
	9.78510	+10.58	9.76730	+1248			9.75714	+ 1352	9.75895	+ 1325	9.75769	+ 1347
	1.37457	+ 30	1.05246	+ 30			1.40284	+ 40	1.46802	+ 40	1.13435	+ 40
	0	−4010	15	−4060			15	−40.90	25	−40.90	20	−4090
	1 44.6	25 24.40	2 9.6	10 13.80			41 28.8	7 40.26	41 29.1	57 36.35	2 36.1	4 45.90
	46.5		10.0				29.8		28.6		35.9	
	111		196				186		177		120	
	1 45.55		17 9.80				19 29.30		29 28.85		22 36.00	
	21 2.80		5 38.53				3 19.05		53 19.50		0 12.35	
	52 26 21.22		54 10 56.97				55 8 37.47		54 58 37.92		55 5 30.77	
	− 23.69	25 56.3	− 11.28				− 25.28		− 29.38		− 13.63	
	27 7.85	26 1.3	29 8.15	9 34.0			41 28.22	7 0.8	46 7.05	56 57.0	46 52.28	4 6.6
	24 44.6	+10.30 +10.29		+11.99		+12.49		+12.25		+11.97		+13.05

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	26 26	7.14 7.16	28 50.8	8.86	38 32.0	9.36	41 11.3	9.12	45 50.5	8.84	46 35.4	9.92
	44.5 50.6		54.4		35.4		15.0		53.1		39.2	
	48.2 54.0		57.8		39.0		18.5		57.5		42.4	
	51.4 —		1.4		42.5		22.0		1.2		46.0	
	54.8 0.8		5.2		46.5		25.5		4.7		49.8	
	58.3 4.2		28 97		1954		927		28 78		21.28	
	72 2296		28 57.74		38 39.08		41 18.54		45 57.66		46 42.56	
	5144 5740		+ 21.33	+20.25	+ 2132	+20.20	+ 21.32	+20.20	+ 21.32	+20.21	+ 21.32	+20.20
	+ 2133+21.33	+20.32 +20.32	− 108		− 1.12		− 112		− 111		− 112	
	− 101 − 101		29 18.19		38 57.28		41 38.74	−6.83	46 17.77	−6.91	47 2.76	
	27 1476 1472		− 3.35	−6.61	− 3.51	−6.79	− 3.60	−39.46	− 3.69	−39.30	− 3.70	−6.92
	− 3.33 − 3.33	−6.55	29 14.84	−39.78	38 55.74	−39.54	41 35.14		46 14.08		46 59.06	−39.28
	27 8.43 1439	−39.82					35.					
	9.0 8.6	−6.55	8.0		9.4		7.8		8.4		8.1	
	27 26	−39.82										
	7.0 23.9		28 22.8		38 15.5		40 34.5		43 8.0		46 28.0	
	12.2 26.2		28.5		17.9		38.8		13.0		31.0	
	14.5 28.7		31.5		20.6		41.2		15.6		33.3	
	57 188	−3.13	8.29		540		1145		66		2.3	
	11.90 262	26 0.20 26 0.65	28 27.63	54 10 9.54	38 18.00	55 3 29.95	40 38.17	55 8 12.05	45 12.20	54 58 8.86	46 30.77	55 5 18.01
	+2046+31.13	− 25 − .11	+ 30.31	− 24	+ 21.08	− 11	+ 40.37	− 42	+ 45.36	− 53	+ 11.79	− 4
	1.31091 1.49318	− 31 − 48	1.48156	− 53	1.32387	− 1.20	1.60606	− 1.23	1.65667	− 1.23	1.04151	− 76
	9.78494 9.78494	+1056+1056	9.76730	+1246	9.75805	+ 1340	9.75714	+ 13.58	9.75895	+ 1333	9.75769	+ 1345
	1.21845 1.40072	+ 30 + 30	1.37149	+ 30	1.20452	+ 40	1.48580	+ 40	1.53822	+ 40	0.98180	+ 40
	0 0	−4010−4010	15	−4060	20	−40.80	15	−40.90	25	−40.90	20	−4090
	1390 38.0	25 27.27 26 4.71	1 54.9	10 14.80	41 19.3	2 58.51	41 23.1	7 40.27	41 22.1	57 36.82	2 37.4	4 47.03
	43.41 47.21		58.1		21.9		24.4		24.2		41.5	
	824 101		130		412		78		63		792	
	41.20 45.05	+40	16 52.50		24 2060		19 23.90		29 23.15		22 39.60	
	21 7.15 21 13.30		5 5185		58 2475		3 2445		53 2520		0 8.75	
	52 26 25.31	27 1.51	54 11 10.06		55 3 45.96		55 8 42.66		54 58 43.41		55 5 26.96	
	− 8.14		− 23.52		− 16.01		− 30.61		− 34.53		− 8.25	
	+ 25.16	+ 16.54										
	27 1.88	24 47.4	29 8.23	9 35.0	38 46.95	2 19.0	41 28.31	7 0.8	46 7.17	56 57.5	46 52.14	4 7.8
	7.84	11 46.2										

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1877, Dec. 26, Dec. 27.

	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	0 48 45	0 50 12	0 52 35	0 56 45	0 57 12	0 58 56	
δ	52° 11	54° 45	54° 36	53° 30	53° 59	53° 55	

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48	39.8 50.3	5.55 5.91	52	30.2	8.18	56 38.0	7.10	58 51.1	7.64
	43.3 53.6			33.8		42.5		54.4	
	46.7 56.6			37.3		45.9		58.0	
	50.0 59.8			41.0		49.4		1.4	
	53.4 3.0			44.6		53.0		4.8	
	2333 2833			1869		2298		2897	
48	46.66 56.66	1370 1660	52	37.38		56 45.96		58 57.24	
	+ 2051 + 2051	2051 + 2051		+ 2051	+ 19.47	+ 2051	+ 19.582	+ 2051	+ 19.49
	− .83 − .83	− .91 − .91		− .90		− .86		− .88	
	− .13 − .13	− .14 − .14		− .141		− .13		− .141	
49	6.21 16.21	50 3.80 3.80	52	56.85		57 5.48		59 17.43	
	− 3.77 − 3.77	− 3.80 − 3.80		− 3.85		− 3.93		− 3.98	
49	2.441 12.44	50 25.36 3226	52	53.00		57 1.55		59 13.45	
	2d# 13	2d# 47							
	8.8 9.2 52 12 5558	13 2206 8892 54 46	6.9					8.8	
48	27.1 13.5	48 57.7 45.7	51	48.9		56 3.0		58 22.0	
	30.2 16.3	1.7 48.4		51.7		6.5		26.8	
	32.8 19.5	4.4 51.5		55.8		9.4		28.7	
	01 193	40 1486		64		189		175	
48	30.03 16.43	50 1.33 48.53	51	52.13	54 38 869	56 6.30	53 33 1632	58 25.83	53 58 13.22
	+ 1663 + 4023	+ 2873		+ 2525	− 52	+ 3966	− 41	+ 32.11	− 27
	1.22089 1.60455	1.46135		1.65562	− 1.23	1.59835	− 1.20	1.50664	− 126
	9.78723 9.78922	9.76111 9.76093		9.76253	+ 1298	9.77387	+ 1181	9.76957	+ 1227
	1.13072 1.51438	1.34488 1.33177		1.54075	+ 35	1.44482	+ 30	1.39881	+ 30
	C.R. 10 10 C.R. 1st #	C.R. 40 40 C.R. 1st #	46		− 4080	50	− 40.50	25	− 4060
	2d# 4 37.9 33.05	2d# 37.1 38.9	4	23.1	37 36.07	4 18.9	32 42.92	4 28.2	57 40.26
	39.1 33.19	39.4 40.8		23.6		19.5		28.8	
	170 24	5 797		7		184		10	
	4 38.50 14 31.20	41 37.25 40 38.85	49	23.35		54 19.20		29 28.50	
	8 985 1715	41 1110 42 8.50	50	22.39		28 2915		53 1785	
	52 13 2827 3557	54 46 2982 47 292	25.29	54 38 4342		53 33 47.57		53 58 3827	
48	55.56 − 135 − 3269	47 415		− 3473		− 31.25		− 2505	
12	8.6 − 3269 − 1351	47 469							
		8.4 5.6							
		21.47 2.46 46 7.4	5	52 46.00	36 57.0	56 54.52	32 4.0	59 6.37	57 1.5

Dec. 27

48	39.2 5.85	6.94 50 8.2	9.68	10.06	52 28.5	8.60	56 38.3	7.40	57 6.0	9.22	58 50.0	7.92
	33.3 42.5	5.5 12.0			33.1		41.7		9.7		53.6	
	36.8 42.5	9.2 12.0			36.7		45.2		13.0		57.1	
	40.0 45.8	12.9 —			40.2		48.7		16.6		0.8	
	43.4 49.0	16.6 17.0			43.8		52.0		20.0		4.0	
	46.7 52.6	19.9 22.8			18.34		2259		653		2855	
48	02 2292	641 6.21			52 36.68		56 45.18		57 13.06		58 5710	
	4.04 45.84	12.82 15.52			+ 2132	+ 20.22	+ 21.32	20.27	+ 2132	+ 20.24	+ 2132	+ 20.24
	+ 2132 + 2132	2132 + 2132	+ 2021	+ 20.21	− 110		− 1.05		− 108		− 108	
	− 101 − 101	− 111 − 111	6.97		52 56.90		57 5.45		57 33.30		59 1734	
49	0.35 6.15	50 33.03 35.73	39.14		− 3.83		− 3.91		− 3.92		− 3.95	
	− 3.74 − 3.75	− 3.77 − 3.78	6.97		52 53.07		57 1.54		57 29.38		59 13.39	
48	56.61 49 2.40	50 29.26 31.95	39.14									
		2d# 15 1st #										
	9.0 9.3 52 12	2288 5248 8.8 9.4	54 46	881	6.3		7.0		9.1		9.2	
	48 47	50 48			51 58.5		56 4.8		57 22.8		58 23.0	
	20.3 55.5	24.0 41.8			1.8		7.3		27.4		26.2	
	23.0 2.0	27.8 44.6			4.0		10.4		31.0		29.3	
	26.3 5.6	32.0 47.2			43		225		812		185	
48	96 71	8.48 136			52 1.43		56 7.50		57 27.07		58 26.17	
	23.20 48 2.37	28.27 44.53										
	+ 16.84 + 43.41	45 48.53 18.12	15.45	+ 30.99	45 37.67	48.54	+ 35.25	54 38 840	− 32	+ 3768	53 33 1667	− 37	57 27.07	54 2 2692	− 5	+ 30.93	58 26.17	53 58 1398
	1.22634 1.63819	1.18893 1.29122					1.54716		− 1.26	1.57611		− 1.20	1.14644		− 22	1.49038		− 25
	9.78723 9.78674	9.76111 9.76093					9.76253		+ 1296	9.77387		+ 11.80	9.76887		+ 1232	9.76957		− 126
	1.13617 1.54753	1.07264 1.37475					1.43229		+ 35	1.47258		+ 30	1.03791		+ 30	1.38255		+ 30
	C.R. 10 10 C.R. 1st #	C.R. 40 40 C.R. 1st #			46				− 40.80	50		− 40.50	25		− 4060	25		− 4060
	2d# 41 72 58.9	2d# 132.9 38.1			4	29.8	37 36.20	4 18.4	32 43.57	0 48.9	1 55.54	4 272	57 41.30
	9.6 8.19	35.2 30.1				32.4		22.0		52.2		29.4	
	168 1408	81 40 1182			49	622		404		1011		169	
	14.840 12 59.54	41.3405 59.10			54	31.10		20.20		25 5053		29 28.45	
	8 36.95 10 4795	41 7430 14925			33	1725		28 2815		56 5780		53 1990	
	52 13 58.16 16 6.16	54 46 3251 47 146			54 38 3546		53 33 4636		54 2 1601		53 58 3871	
	− 1368 − 3528	+ 1182 − 2370			− 2706		− 2969		+ 1091		− 2413	
	− 3525 − 1368	− 2370 + 1182										
	48 49.73 12 9.4	50 22.29 44 58.6			52 46.07	36 57.1	56 54.51	32 4.7	57 22.32	116.7	59 6.31	57 2.5
	5652 388	2484 9.4										

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	h m s	h m s	h m s	h m s	h m s	h m s
α	1 2 25	1 5 10	1 7 32	1 8 54	1 11 33	1 12 39
	1 264	4 9.5	6 31.2	7 58.4	10 35.9	11 40.1
δ	51° 21′	52° 53′	52° 29′	52° 13′	50° 7′	51° 10′
	15.7	47.6	23.2	7.8	2.3	4.1
	7.5	8.1	9.0	9.4	9.2	6.8

Dec. 26

+5.74 +10.41 +10.02 +9.46 +7.50 +9.03

2 21.0	4.84	5 5.7	7.01	7 27.4	6.62	8 55.6	6.36	11 33.4	4.10	12 36.7	5.63
24.2		9.2		30.8		58.3		36.5		40.0	
28.0		12.5		34.2		2.4		38.6		43.3	
31.0		16.0		37.5		5.7		42.8		46.5	
34.5		18.5		40.8		9.3		46.0		49.8	
1387		629		1707		123		1983		2163	
2 27.74		5 12.58		7 34.14		9 2.46		11 39.66		12 43.26	
+ 20.51	+19.58	+ 20.51	+19.54	+ 20.51	+19.55	+ 20.51	+19.53	+ 20.51	+19.63	+ 20.52	+19.59
− .80		− .84		− .83		− .83		− .76		− .88	
− .13		− .13		− .13		− .13		− .12		− .13	
2 47.32	−7.05	5 32.12	−7.14.6	7 53.69	−7.16	9 22.01	−7.17	11 59.29	−7.13	13 2.85	−7.18
− 4.02	−3862	− 4.08	−3846	− 4.12	−3838	− 4.15	−3830	− 4.14	−3816	− 4.20	−3810
2 43.30		5 28.04		7 49.57		9 17.86		11 55.12		12 58.65	

60	80	89	95	93	72	
1 55.5	4 34.2	6 49.6	8 26.5	11 32.0	12 9.8	
58.4	37.9	53.2	30.3	35.1	13.4	
0.7	40.2	55.5	33.3	37.8	15.6	
1746	1123	83	01	149	88	
1. 58.20	4 37.43	6 52.77	8 30.03	11 34.97	12 12.93	
	52 55 8.34	52 30 40.88	52 15 19.39	50 9 57.79	51 11 47.87	
+29.54	+ 35.15	+ 41.37	+ 32.43	+ 4.69	+ 30.33	
− 23	− 32	− 45	− 28	− 1	− 25	
− 1.26	− 70	− 53	− 670	− 87	− 25	
1.476441	1.545938	1.616609	1.510395	1.506117	1.481879	
9.79526	9.78030	9.78428	9.78691	9.80656	9.79699	
+ 948	+ 11.13	+ 1070	+ 1041	+ 818	+ 928	
1.38827	1.44883	1.52357	1.42046	0.60033	1.40146	
+ 25	+ 30	+ 30	+ 30	+ 20	+ 25	
0 −4000	30 −40.30	55 −4010	10 −4010	15 −39.60	15 −3980	

4 30.6	22 36.61	2 28.7	54 35.02	1 51.6	30 7.40	2 20.3	14 45.65	3 4.9	9 22.29	0 53.3	11 13.20
30.5		32.0	34.92	53.4		21.8		5.1		55.1	
11		607		50		21		100		84	
4 30.55		32 30.45		56 52.50		12 21.05		18 5.00		15 54.20	
18 1780		50 18.00		25 5585		10 2730		4 43.35		6 541.5	
51 23 36.22		52 55 36.32		52 31 1427		52 15 4572		50 10 1.77		51 12 12.57	
− 2445		− 2811		− 3339		− 2633		− 398		− 2520	
2 36.25	21 58.0	5 20.90	53 56.6	7 42.41	29 29.0	9 10.69	14 7.4	11 47.99	8 44.1	12 51.47	10 35.1
	+5.07		+10.24		+10.19		+9.79		+7.42		+9.06

Dec. 27

2 20.4	4.94	5 5.0	7.11	7 26.5	7.06	8 57.8	6.66	11 32.0	4.29	12 35.8	5.93
23.6		8.3		29.7		58.0		35.7		39.4	
26.5		11.8		33.3		1.5		38.7		42.4	
30.3		15.0		36.6		5.0		41.8		45.8	
33.7		18.6		40.0		8.4		45.3		49.0	
1349		587		1661		77		435		2124	
2 26.98		5 11.74		7 33.22		9 1.54		11 38.70		12 42.48	
+ 21.32	+20.34	+ 21.32	+20.29	+ 21.32	+20.30	+ 21.32	+20.31	+ 21.32	+20.39	+ 21.32	+20.34
− .98		− 1.03		− 1.02		− 1.01		− .93		− .98	
2 47.32		5 32.03		7 53.52		9 21.85		11 59.09		13 2.82	
− 4.00	−7.05	− 4.06	−7.14	− 4.10	−7.16	− 4.13	−7.17	− 4.16	−7.13	− 4.18	−7.18
2 43.32	−3862	5 27.97	−3848	7 49.42	−3838	9 17.72	−3830	11 54.93	−3816	12 58.64	−3810

83	83	89	92	94	74	
1 43.5	4 24.2	6 58.8	8 28.7	11 46.5	12 13.7	
46.9	27.3	2.9	31.6	50.0	16.6	
48.8	31.0	5.5	34.0	53.8	19.8	
192	830	82	43	03	201	
1 46.40	4 27.67	7 2.73	8 31.43	11 50.10	12 16.70	
	51 23 13.28	52 30 41.95	52 15 20.61	50 9 58.14	51 11 46.94	
+40.58	+ 44.07	+ 30.49	+ 30.11	− 1.40	+ 25.78	
− 44	− 51	− 56	− 24	− 3	− 18	
− 1.20	− 67	1.484416	1.478771	1.056902	1.411128	
1.608316	1.644144	9.78428	9.78691	9.80656	9.79699	
9.79526	9.78030	+ 1069	+ 1040	− 8.14	+ 927	
+ 946	+ 11.12	+ 30	+ 30	+ .20	+ 25	
+ .25	+ .30	1.391104	1.388221	0.98606	1.330871	
1.526171	1.547041	− 40.20	− 40.20	− 39.60	− 39.50	
0	30 −40.30	55	10	15	15	

4 18.0	22 38.22	2 19.41	54 36.68	1 58.0	30 8.81	2 19.9	14 47.07	3 17.0	9 22.83	0 56.5	11 13.07
21.4		23.5		2.0		23.1		19.2		59.9	
394		429		1200		430		162		164	
4 19.70		32 21.45		56 80.00		12 21.50		18 18.10		15 58.20	
18 2865		50 2690		25 4835		10 2685		4 3025		6 5015	
51 23 46.86		52 55 15.11		52 31 6.56		52 15 45.06		50 9 48.46		51 12 8.36	
− 33.58		− 35.24		− 24.61		− 24.45		+ 9.68		− 21.42	
2 36.27	21 59.6	5 20.83	53 58.2	7 42.26	29 30.4	9 10.55	14 8.8	11 47.80	8 44.7	12 51.46	10 35.0

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524

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 14 52	13 43.1	1 15 23	14 24.7	1 16 37	15 36.1	1 21 56	20 53.6	1 24 2	23 1.1	1 26 6	25 5.3		
δ	51° 6	1.0 7.7	52° 4	51 58.7 7.9	51° 36	30.7 9.0	52° 41	36.0 8.5	51° 59	43.3 7.8	52° 0	51 55.2 8.9		
Dec. 26		+8.21		+10.04		+8.67	Chg	Chg				+8.84		
	14 40.0	4.81	15 22.9	6.64	16 34.0	5.27					26 5.3	5.44		
	43.1		26.3		37.2						8.6			
	46.4		29.5		40.5						11.7			
	49.8		32.8		43.9						15.3			
	53.2		36.1		47.5						18.5			
	3.25		4.84		2031						594			
	14 46.50	19	15 29.48		16 40.62						26 11.88			
	+ 2052	+30.60	+ 2052	+19.57	+ 2052	+19.58					+ 2052	+19.57		
	− 79		− .82		− .81						− .82			
	− .13		− .13		− .13						− .13			
	15 6.10		15 49.05		17 0.20						26 31.45			
	− 4.24	−7.21	− 4.27	−7.25	− 4.28	−7.25					− 4.47	−7.40		
	15 1.86	−37.98	15 44.78	−37.94	16 55.92	−37.90					26 26.98	−37.30		
	8.0		8.5		9.0						9.1			
	14 31.6		15 21.0		16 18.0						25 33.8			
	35.0		23.8		22.0						37.2			
	37.3		25.7		24.9						40.0			
	139		21.1		49						1110			
	14 3463	51 8 3240	15 2442	52 6 10.59	16 2163	51 38 16.94					25 3700	52 2 49.32		
	+11.87	− 4	+5.26	− 1	+18.99	− 10					+34.88	− .32		
	1.074415	− 1.230.42099	1.788 34	− 50	1.27852	− 129					1.54258	− 1.34		
	9.79 746	+ 923 9.78834		+1025	9.79288	+976					9.78886	+10.20		
	0.99451	+ 25 0.63196		+ 30	1.19400	+ 30					1.95404	+ .36		
	15	−39.70 20		−39.90	45	−39.80	40		25		20	−39.60		
	4 24.5	7 57.51	1 50.3	5 37.33	11 34.5	37 42.41	41 21.41		3 6.8		4 48.5	2 15.16		
	24.5		51.5		33.9		22.9		6.9		49.5			
	1		18		84		43		17		180			
	49 24.50		21 5090+1"		49 34.20		414 22.15		28 6.85		24 49.00			
	3 23.85		0 57.45		33 14.15						57 57.35			
	51 8 4227		52 6 1587		51 38 3257						52 3 1777			
	− 981		− 4.28		− 1563						− 2856			
	1454.65	719.5	15 37.53	459.4	1648.67	37 4.5					26 19.58	1 37.9		
		+7.95		+9.98		+8.60		+9.87		+9.53		+8.84		
Dec. 27	14 38.3	4.82	15 21.5	6.85	16 33.5	5.47	21 53.4	6.74	23 46.3	6.40	26 4.2	5.71		
	42.5		25.2		36.4		56.8		49.8		7.6			
	45.8		25.7		40.0		0.4		53.3		10.8			
	49.2		32.1		43.4		3.5		56.4		14.3			
	52.4		35.4		46.5		6.8		59.8		17.6			
	2292		1434		1998		10		2157		546			
	14 45.84		15 28.68		16 39.96		22 0.20		23 53.14		26 10.92			
	+ 2132	+20.35	+ 2132	20.32	+ 21.32	20.24	+ 21.31	20.29	+ 21.31	+24.31	+ 21.31	+20.31		
	− 97		− 100		− 98		− 102		− 150		− 150			
	15 6.19		15 49.00		17 0.30		22 20.49		24 13.45		26 31.23			
	− 4.22	−7.21	− 4.25	−7.25	− 4.26	−7.25	− 4.37	−7.37	− 4.40	−7.37	− 4.115	−7.40		
	15 1.97	−37.98	15 44.75	−37.94	16 55.04 56.	−37.90	22 16.12	−37.56	24 9.05	−37.42	26 26.78	−37.30		
	8.0		8.6		8.8		8.7		9.0		9.3			
	14 6.3		15 8.0		16 11.4		21 30.7		23 45.5		25 33.0			
	8.8		11.5		13.3		33.8		48.3		36.5			
	11.2		14.4		16.5		38.7		50.9		40.0			
	263		39		117		132		1447		1095			
	14 8.7	51 8 3222	15 11.30	52 6 1080	16 13.90	51 38 1811	21 34.40	52 43 3594	23 48.23	51 59 48.20	25 36.50	52 2 4944		
	+37.07	− 37	+17.38	− 8	+26.06	− 18	+25.80	− .18	+ 491	− 1	+ 3442	− 81		
	1.56902	− 1.15	1.24005	− 48	1.41597	− 1.26	1.41162	− 1.18	0.69108	− 90	1.53681	− 1.34		
	9.79746	+ 922	9.78837	+1024	9.79288	+ 9.74	9.78213	+ 10.93	9.78934	+1014	9.78886	+10.19		
	1.48908	+ 25	1.15102	+ 30	1.33145	+ 30	1.31635	+ 30	0.60302	+ 30	1.44827	+ 30		
	15	− 39.80 20		−40.00	45	−39.80	40	−39.90	25	−39.70	20	−39.40		
	4 2.1	7 57.24	1 39.7	5 37.65	4 25.7	37 43.78	4 8.0	43 27.8	3 12.8	59 14.90	4 47.1	2 15.47		
	4.9		43.5		28.3		11.8		15.9		51.0			
	40		832		140		198		87		981			
	19 3.50		21 41.60		49 27.00		414 9.90		28 14.35		24 49.05			
	3 4485		1 6.75		33 2135		38 38.98		54 3408		57 5930			
	51 9 3.06		52 6 2496		51 38 39.58		52 43 5661		51 59 5221		52 3 1751			
	− 3084		− 1416		− 2145		− 2072		− 401		− 2897			
	1454.76	719.3	15 37.50	459.7	1648.79	37 5	22 8.75	42 25.2	24 1.68	58 37.5 39 11.5	26 19.38	1 38.7		

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α	h m s 1 26 47	25 46.1	h m s 1 27 36	26 35.7	h m s 1 29 25	28 12.5 19.4 ~~28 22.4~~	h m s 1 30 33	29 32.5	h m s 1 31 11	30 8.2	h m s 1 32 16	31 13.9
δ	51° 30'	24.6 8.8	51° 31'	25.2 7.7	54° 23'	24.7 8.6	51° 47'	41.7 8.5	51° 38'	33.0 9.2	51° 13'	7.6 .86

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26 46.9 50.1 53.5 56.5 0.0 2670	+961 6.21	27 35.2 38.7 41.9 45.2 48.7 2097	+975 6.35	29 12.8 16.4 19.6 23.5 26.7 990	+1287 9.47	30 32.7 35.9 39.3 42.7 46.3 469	+900 5.60	31 9.0 12.5 15.8 18.8 22.0 781	+931 5.91	32 15.0 18.2 21.8 25.0 28.3 1083	+866 5.26
26 53.40 + 20.52 − .81 − .13	+19.58	27 41.92 + 20.52 − .81 − .13	+19.58	29 19.80 + 20.52 − .90 − .14	+19.48	30 39.38 + 20.52 − .81 − .13	+19.58	31 15.62 + 20.52 − .81 − .13	+19.58	32 21.66 + 20.52 − .80 − .13	+19.59
27 28.98 − 4.47 27 8.51	−7.39 −37.26	28 1.52 − 4.48 27 57.04	−7.40 −37.18	29 39.28 − 4.58 29 34.70	−7.57 −37.08	30 58.96 − 4.54 30 54.42	−7.46 −37.00	31 35.20 − 4.55 31 30.65	−7.46 −36.96	32 41.25 − 4.56 32 36.69	−7.45 −36.88
8.9 26 38.0 40.0 43.9 1.9	−3.40	7.7 27 16.0 18.4 20.8 55.2		7.9 29 1.1 3.5 6.0 10.6		8.5 30 7.3 10.9 14.0 22		9.1 31 3.9 6.5 9.3 19.7		8.2 31 56.8 0.3 2.6 1797	
26 40.63 +12.77 1.10619 9.79383 1.02262 55	51 31 55.34 − 5 − 28 + 964 + 30 −39.50	27 18.40 +23.54 1.37181 9.79367 1.28808 55	51 32 34.76 − 15 − 6 + 966 + 30 −39.40	29 2.53 +16.27 1.21139 9.76448 1.09847 0	54 27 23.8 − 7 − 22 + 1287 + 35 −40.00	30 10.73 +28.65 1.45712 9.79111 1.37083 35	51 49 0.23 − 32 − 1.04 + 996 + 30 −39.40	31 6.57 +9.05 0.95665 9.79256 0.87181 45	51 40 18.03 − 2 − 76 + 9.79 + 30 −39.40	31 59.90 +21.76 1.33466 9.79652 1.25678 10	51 14 57.26 − 13 − 81 + 9.35 + 25 −39.20
1 1.1 0.7 18 56 0.90 26 47.45 51 32 58.7 − 10.53	31 22.05	0 11.8 13.4 52 55 12.60 27 35.75 51 32 54.17 − 19.41	32 1.71	0 51.5 52.2 37 0 51.85 21 56.50 54 27 14.92 − 12.54	26 31.85	3 43.0 43.1 1 38 43.05 44 5.30 51 49 23.72 − 23.49	48 26.43	2 40.7 41.9 26 47 41.30 35 4.05 51 40 25.47 − 7.44	39 44.54	2 50.8 52.1 29 12 51.45 9 56.90 51 15 15.32 − 18.06	14 23.32
27 1.12	30 44.8	27 49.64	31 24.5	29 27.13	25 54.8	30 46.96	47 49.4	31 23.19	39 7.6	32 29.24	13 46.4

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9.0 26 45.9 49.3 52.8 56.0 59.3 133	+960 6.47	7.0 27 34.6 37.8 41.3 44.5 47.8 60	+975 6.62	7.5 29 12.0 15.4 19.0 22.6 26.0 950	+1286 9.73	8.9 30 32.0 35.3 38.7 42.0 45.3 433	+888 5.75	9.4 31 8.0 11.2 14.8 18.0 21.5 735	+925 6.12	32 14.2 17.4 20.5 23.8 27.5 34	+872 5.59
26 52.66 + 21.31 − .98	+20.33	27 41.20 + 21.31 − .98	+20.33	29 19.00 + 21.31 − 1.09	+20.22	30 38.66 + 21.31 − .99	+20.32	31 14.70 + 21.31 − .98	+20.33	32 20.68 + 21.31 − .97	+20.34
27 12.99 − 4.45 27 8.54	−7.39 −37.26	28 1.53 − 4.46 27 57.07	−7.40 −37.18	29 39.22 − 4.56 29 34.66	−7.57 −37.08	30 58.98 − 4.52 30 54.46	−7.46 −37.00	31 35.03 − 4.53 31 30.50	−7.46 −36.96	32 41.02 − 4.54 32 36.48	−7.45 −36.88
26 32.7 35.4 38.9 170	−3.13	27 16.3 18.6 21.2 56.1		28 59.0 2.9 6.0 7.9		29 57.2 1.6 4.4 5.2		31 19.2 22.5 26.2 79		32 2.2 6.3 9.2 17.7	
26 35.67 +16.99 1.23019 9.79383 1.14662 55	51 31 55.84 − 8 − 25 + 9.63 + 30 −39.50	27 18.70 +22.50 1.35218 9.79367 1.26845 55	51 32 34.76 − 14 − 6 + 9.65 + 30 −39.50	29 2.63 +16.37 1.21405 9.76448 1.10113 0	54 27 27.9 − 7 − 22 + 12.80 + 35 −40.10	30 1.73 +36.93 1.56738 9.79111 1.48109 35	51 49 0.63 − 36 − 1.01 + 9.95 + 30 −39.80	31 22.63 − 7.93 0.89927 9.79256 0.81443 45	51 40 16.88 − 2 − 81 + [illegible] + 30 −39.40	32 5.90 +14.78 1.16967 9.79652 1.08879 10	51 14 58.79 − 6 − 81 + 9.34 + 25 −39.30
0 55.4 58.0 134 55 56.70 26 51.65 51 32 9.86 − 14.02	31 22.81	0 11.5 15.0 65 55 13.25 27 35.10 51 32 53.31 − 18.55	32 1.88	0 49.5 53.0 10.25 0 51.25 21 57.30 54 27 15.80 − 12.62	26 32.42	3 34.1 37.2 113 38 35.65 44 12.70 51 49 30.91 − 30.28	48 26.88	2 54.5 57.9 124 47 56.20 34 52.15 51 40 10.36 + 6.52	39 43.60	2 54.1 56.9 11.0 12 55.50 9 52.85 51 15 11.06 − 12.27	14 25.08
27 1.15	30 45.6	27 49.67	31 24.7	29 27.09	25 55.2	30 47.00	47 49.9	31 23.04	39 6.6	32 29.03	13 48.2

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	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	1 35 39	1 41 21	1 42 46	1 43 40	1 49 42	1 53 48		
δ	54° 14′	53° 16′	51° 18′	52° 52′	53° 5′	53° 52′		

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	35 48.6	41 2.7	42 43.8	43 36.4 37.4	49 —	53 45.8		
	53.4	6.0	46.7	38.7 40.8	—	49.2		
	56.8	9.6	50.3	43.3 44.4	—	52.6		
	C.5	13.0	53.5	46.6 47.8	72.0 8.6	56.1		
	4.0	16.5	56.9	50.0 51.2	15.4 8.6	59.7		
	28.43	478	14	2160 2216		2635		
	35 56.86	41 9.36	42 50.28	43 20 44.32	49 8.60	53 52.70		
	+ 2052 +19.49	+ 2052 +19.53	+ 2052 +19.59	+ 20.52 + 20.52 +19.55 +19.55	+ 2052 +19.54	+ 2052 +19.50		
	— 89	— .86	— .80	— .84 — .84 -7.69	— 85	— .88		
	— .14	— .15	— .13	— .13 — .13 -36.06	— .13	— .14		
	36 16.35	41 29.09	43 9.87	44 27.5 3.87	49 28.14	54 12.20		
	— 4.71 -7.66	— 4.78 -7.68	— 4.75 -7.59	— 4.82 — 4.82 -7.68	— 4.92 -7.78	— 5.03 -7.89		
	36 11.64 -36.62	41 24.31 -36.24	43 5.12 -36.12	43 57.93 59.05 -36.06	49 23.22 -3564	54 7.17 -35.26		
90	36 7.7	87 40 36.4	88 42 12.1	3090 52 53	49 20.8	57 53 28.5		
	11.0	39.5	14.7	44 4.3 43 15.8 — 15 — 17	23.6	31.0		
	14.0	42.1	17.2	7.6 18.8 — 1.32 — 1.32	27.1	34.0		
	27	118.8	140	10.6 21.8 +11.11 +11.11	123	36		
	36 10.90 54 18 57.93	40 39.60 53 16 12.51	42 14.67 51 20 7.42	225 56.5 + .30 + .30	49 24.10 53 6 49.86	53 31.17 53 54 1.20		
	−14.04 — 5 +29.96	— 24 +35.61	— 34 -24.30 +25.49	750 883 -39.20 -39.24	— 15.50 — 6	+21.53 — 12		
	1.14 73.72 — 1.20 1.47654	— 42 1.55157	— 70 1.38561 1.40635		1.19033 — 42	1.33304 — 1.04		
	9.76590 +12.67 9.77677	+ 11.54 9.79573	+ 944 9.78047 9.78063		9.77829 + 1137	9.77026 +12.23		
	1.03587 + .30 1.37591	+ .30 1.46990	+ 251 1.28868 1.30962		1.09122 + .30	1.22590 + .30		
	5 −39.90 10	−39.40 5	−38.90 30	30 CR 1.44 20	−39.00 30	−38.90		
	4 18.9 18 26.45 1 30.0	15 40.89 2 29.2	19 33.77 4 38.6	4 30.9 1 29.0	6 18.65 3 48.5	53.30.25		
	19.1 31.0	30.5	CR 39.5	32.2 29.5	49.0			
	180 10	59.7	2.11 181	31 5	175			
	9. 19.00 +.70 11 30.50	4 29.85	34 39.05 .34 31.55	31 29.25	33 48.75			
	13 29.35 11 17.85	15 18.50	48 9.30 48 16.80	1 19.10	48 59.60			
	54 18 47.77 53 16 36.21	51 20 36.92	52 53 27.72 52 53 35.22	53 6 37.52	53 54 18.02			
	+ 10.86 — 23.76	— 29.50	+ 19.44	+ 12.34	— 16.84			
			— 20.40					
	36 3.98 17 49.8	41 16.63 15 4.6	42 57.53 18 57.6	43 50.24 52 45.9	49 15.44 5 43.0	53 59.28 52 55.0		
	+1.77	+11.29	+8.54	57.36 51 58.6	+11.19	+11.36		

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	35 48.6	41 2.2	42 42.8		48 0.8	53 45.0		
	52.7	5.8	46.2		4.3	48.4		
	56.2	8.9	49.5		7.7	51.9		
	0.0	12.4	52.8		11.3	55.3		
	3.2	15.8	56.0		14.5	59.1		
	28.07	451	474		387	97		
	35 56.14	41 9.02	42 49.28		49 7.44	53 59.34		
	+ 21.31 +20.23	+ 21.31 +20.26	+ 21.31 +20.34		+ 21.31 +20.27	+ 21.31 +20.24		
	— 1.08	— 105	— 97		— 1.04	— 1.07		
	36 16.37	41 29.28	43 9.82		49 28.01	54 31.48		
	— 4.69 -7.66	4.76 -7.68	— 4.73 -7.59		— 4.90 -7.78	— 5.02 -7.89		
	36 11.68 -36.62	41 24.53.52 -36.24	43 5.09 -36.12		49 22.99 -3564	54 7.16 -35.26		
					23.11			
88	36 58.0	89 41 1.6	90 42 4.7		94 48 35.0	55 53 29.1		
	1.4	4.4	7.7		38.0	31.7		
	5.9	8.2	10.3		41.6	34.0		
	53	14 2	227		1146	48		
	36 1.77 54 18 57.67	41 4.73 53 16 11.96	42 7.57 51 20 7.23		48 38.20 53 6 50.60	53 31.60 53 54 1.82		
	− 5.63 — 1 + 4.29	— 1 + 41.91	— 47		+ 29.54 — 23	+ 2.034 — 10		
	0.75051 — 1.18 0.63246	— .53 1.62232	— 67		1.47041 — 25	1.30835 — 1.06		
	9.76590 + 12.66 9.77677	+ 11.53 9.79573	+ 9.43		9.77829 + 1137	9.77026 + 12.22		
	0.63901 + .30 0.53183	+ .30 1.54065	+ .25		1.37130 + .30	1.20124 + .30		
	5 −39.90 10	−39.40 5	−38.90 30		20 −39.10 30	−39.00		
	4 11.0 18 26.41 1 49.6	15 40.72 2 24.1	19 33.74 4 30.9		0 50.9 6 19.56 3 47.3	53 31.05		
	14.6 52.8	25.1	32.2		51.0	50.4		
	65 1024	92	31		49	977		
	9 13.25 11 51.20	7 24.60	34 31.53		20 52.45	33 45.85		
	13 3.510 10 57.15	15 23.75	48 16.80		1 55.90	48 59.50		
	54.18 53.31 53 16 15.36	51 20 41.96	52 53 35.01		53 7 14.11	53 54 17.91		
	+ 4.36 — 3.40	— 34.73			— 2.351	— 1.589		
						27		
	36 4.02 17 49.8	41 16.54 15 4.5	42 57.50 18 57.6		49 15.33 5 43.9	53 59.39 52 55.3		

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	2 1 14	0 7.4	2 6 38	5 28.2	2 9 12	8 41	2 18 49	17 40.3	2 22 32	21 23.3	2 23 53	22 42.7
δ	54° 53′	47.9 8.5	52° 59′	53.7 8.6	53° 53′	47.6 8.4	53° 2′	52 57.2 9.0	54° 43′	38.2 8.4	54° 46′	41.5 8.0

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	+1.266		+1.077		+1.118		+10.26		+12.56		+13.14	
1 14.7	9.26	6 34.6	7.37	9 12.5	7.78	18 48.7	6.86	22 35.0	9.16	55.3	9.74	
18.2		38.0		15.7		53.1		38.7		59.0		
22.0		41.5		19.4		56.6		42.3		2.3		
25.8		44.7		22.8		0.0		45.8		6.2		
29.4		48.5		26.4		3.3		48.5		8.9		
1101		73		467		2830		2114		1271		
1 22.02		6 41.46		9 19.34		18 56.60		22 42.28		24 2.54		
+ 20.52	+19.47	+ 20.52	+19.54	+ 20.52	+19.50	+ 20.53	+19.55	+ 20.53	+19.49	+ 20.53	+19.48	
− .91		− .85		− .88		− .85		− .90		− .91		
− .14		− .13		− .14		− .13		− .14		− .14		
1 41.49	−8.07	7 1.00	−8.01	9 38.84	−8.11	19 16.15	−8.17	23 1.77	−8.35	24 22.02	−8.37	
− 5.22	−34.60	− 5.24	−34.12	− 5.32	−33.88	− 5.46	−32.94	− 5.62	−32.58	− 5.65	−32.44	
1 36.27		6 55.76		9 33.18		19 10.69		22 56.15		24 16.37		
		96		52								
8.8		8.4		8.7		8.9		8.5		8.5		
0 50.0		6 9.4		8 40.0		18 13.8		22 11.7		23 20.4		
53.0		13.8		44.0		17.8		14.5		24.4		
56.7		16.0		46.3		21.0		17.0		27.0		
97	−3.40	93		103		526		132		118		
0 53.23	54 54 40.48	6 13.10	53 0 38.39	8 43.43	53 54 4.71	18 17.53	53 4 4.64	22 14.40	54 44 49.38	23 23.93	54 46 22.04	
+ 28.79	− 22	+ 28.36	− 21	+ 35.91	− 34	+ 39.07	− 40	+ 27.88	− 20	+ 38.61	− 38	
1.45 92.4	− 87	1.45 52.1	− 59	1.55 52.2	− 1.01	1.59 18.4	− 98	1.44 52.9	− 81	1.58 62.0	− 8	
9.75 94.9	+1335	9.77 93.0	+1127	9.77 02.6	+1223	9.77 87.9	+1134	9.76 12.9	+1317	9.76 89.3	+1320	
1.34 13.3	+ 40	1.35 46.1	+ 30	1.44 80.8	+ 30	1.49 32.3	+ 30	1.32 91.8	+ 40	1.47 02.3	+ 40	
30	−38.70	25	−38.00	30	−38.00	20	−37.20	40	−37.40	40	−37.20	
3 41.2	54 11.04	2 5.3	0 7.76	3 31.1	53 34.49	3 30.9	3 33.30	2 56.0	44 21.14	0 15.1	45 54.58	
44.5		6.2		33.9		31.1	34.	56.1		16.3	6	
7		115		80		2.0		1		4		
33 4.35		27 5.75		33 34.04		23 31.00		42 56.05		40 15.20		
49 44.00		55 42.60		49 14.35		57 17.35		39 52.30		42 33.15		
54 55 2.42		53 1 1.02		53 54 32.77		53 4 35.77		54 45 10.72		54 47 57.57		
− 21.94		− 22.63		− 28.06		− 31.13		− 21.34		− 29.53		
1 28.20	53 36.4	6 47.75	59 33.6	9 25.41	53 0.6	19 2.52	3 1.4	22 47.80	43 48.6	24 8.00	46 22.1	
	+1.265		+10.80		+11.18		+10.38		+12.57		+13.25	

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1 14.0	9.52	6 33.8	7.67	9 11.3	8.05	18 48.1	7.25	22 34.4	9.44	23 54.7	10.12	
17.4		37.3		14.8		52.4		37.7		58.2		
21.0		40.7		18.5		55.8		41.5		1.7		
24.5		44.0		22.0		59.4		44.8		5.4		
28.3		47.5		25.5		2.8		48.6		9.0		
1052		33		422		2795		71		90		
1 21.04		6 40.66		9 18.44		18 55.90		22 41.42		24 1.80		
+ 21.31	+20.20	+ 21.31	+20.27	+ 21.31	+20.23	+ 21.30	+20.26	+ 21.30	+20.20	+ 21.30	+20.19	
− 1.11		− 1.04		− 1.08		− 1.04		− 1.10		− 1.11		
1 41.24	−8.07	7 0.93	−8.01	9 38.67	−8.11	19 16.16	−8.17	23 1.62	−8.35	24 21.99	−8.37	
− 5.20	−34.60	− 5.22	−34.12	− 5.30	−33.88	− 5.45	−32.94	− 5.61	−32.58	− 5.63	−32.44	
1 36.04		6 55.71		9 33.37		19 10.71		22 56.01		24 16.36		
8.9		8.5		8.5		9.2		8.0		8.3		
0 48.2		6 12.0		8 38.4		18 21.8		22 11.5		23 26.9		
51.7		15.5		42.0		25.0		15.5		30.0		
55.3		18.0		44.5		28.2		17.8		33.3		
59	−3.13	155		49		160	3.50	149		02		
0 51.73	54 54 41.12	6 15.17	53 0 39.11	8 41.63	53 54 56.0	18 25.33	53 4 7.60	22 14.97	54 44 49.87	23 30.07	54 47 21.94	
+ 29.31	− 22	+ 25.49	− 17	+ 36.81	− 36	+ 30.57	− 24	+ 26.45	− 18	+31 + 38.13	− 26	
1.46 70.2	− 87	1.40 63.4	− 59	1.56 59.7	− 98	1.48 53.0	− 101	1.42 24.3	− 81	1.50 14.2	− 87	
9.75 94.9	+1334	9.77 93.0	+1126	9.77 02.6	+1222	9.77 87.9	+1133	9.76 12.9	+1316	9.76 09.3	+1319	
1.34 91.1	+ 40	1.30 82.7	+ 30	1.45 88.3	+ 30	1.38 66.9	+ 30	1.30 63.2	+ 40	1.38 50.0	+ 40	
30	−38.80	25	−38.10	30	−38.10	20	−37.30	40	−37.40	40	−37.30	
3 2.3	54 11.84	2 6.1	0 8.74	3 30.9	53 35.55	3 37.0	3 34.55	2 55.3	44 21.91	0 19.2	46 54.76	
3.9		8.0		33.5		40.4	33.45	57.6		21.5		
62		141		41		774		129		407		
33 3.10		27 7.05		33 32.20		23 38.70		42 56.45		110 20.35		
4825		55 41.30		49 16.15		59 9.65		39 51.90		42 28.00		
54 55 34.6		53 0 59.51		53 54 34.36		53 4 27.86		54 45 10.11		54 47 46.21		
− 22.34		− 20.34		− 28.46		− 2026		− 20.24		− 24.27		
						24.36						
1 27.97	53 37.2	6 47.70	59 34.6	9 25.26	53 1.7	19 2.54	3 0.5	22 47.66	43 49.3	24 7.99	46 22.3	

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1877phae.proj.1667R

1877, Dec 26, Dec. 27

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	2 32 10	31 0.5	2 37 14	36 4.6	2 38 37	37 27.0	3 1 48	0 36.5	3 8 28	7 14.6	3 10 7	8 54.1
δ	53° 21	17.0 9.0	52° 49	44.7 9.5	53° 39	34.6 9.4	54° 54	50.0 9.4	53° 24	20.5 8.5	53° 39	35.5 7.5

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+10.40 +10.74 +11.50 +11.47 +11.36 +11.77

	32 11.0	7.00	37 17.6	7.34	38 38.0 41.1	8.10	8.07		8 31.4	7.96	10 12.2	8.37
	14.3		21.1		43.0 45.0				34.6		15.7	
	17.9		24.3		42.0 48.5				38.0		19.4	
	21.4		27.5		50.8 51.9				41.4		22.8	
	24.9		31.1		53.3 55.0				45.5		26.3	
	895		1216		28.31 415				409		465	
	32 17.90		37 24.32		46.62 48.30				8 38.18		10 19.30	
	+ 20.53	+19.54	+ 20.53	+19.56	+ 20.53	+19.53	+19.53		+ 20.53	+19.54	+ 20.53	+19.54
	− .86		− .84		− .87				− .86		− .86	
	− .13		− .13		− .13				− .13		− .13	
	32 37.44	−8.36	37 43.88	−8.38	39 6.15 7.83	−8.47	−8.47		8 57.72	−8.79	10 38.84	−8.83
	− 5.72	−31.56	− 5.77	−31.00	− 5.84 − 5.84	−30.86	−30.86		− 6.32	−27.26	− 6.36	−27.06
	32 31.72		37 38.11		39 0.31 1.99				8 51.40		10 32.48	

9.1 9.5 9.6 8.7 8.2

	31 40.4		36 55.5		38 11.1				7 52.2		9 34.5			
	44.0		58.5		13.7				54.5		37.3			
	47.4		2.3		16.3				57.8		39.4			
	118		1763		111				145		212			
	31 43.93	53 22 52.45	36 58.77	52 50 56.16	38 13.70	53 40 48.41	47.09		7 54.83	53 26 45.63	9 37.07	53 42 9.86
	+ 33.97	− .30	+ 25.95	− 17	+32.92	+34.80	− .28	−.31	+ 43.35	− 49	+ 42.73	− .46
	1.53 1.10	− 1.34	1.40 7.39	− 50	1.51 7.46	1.53 9.08	− .53	−.53	1.63 6.99	− 2.21	1.62 5.62	− 11
	9.77 5.58	+ 11.69	9.78 0.97	+11.11	9.77 2.50	9.77 2.50	+12.01	+12.01	9.77 4.90	+11.77	9.77 2.33	+ 12.04
	1.42 9.28	+ .35	1.31 0.96	+ .30	1.41 2.56	1.43 4.18	+ .30	+.30	1.53 4.49	+ .30	1.52 0.65	+ .30
	0	− 36.30	35	−35.50	45	− 35.80	− 35.50		0	−33.00	45	−32.80
	4 47.1	22 23.15	1 49.2	50 27.70	1 52.1	40 20.71	40 19.36		0 45.9	26 20.59	0 23.2	41 45.43
	47.8		51.1		52.9				47.9		24.3	
	9		1003		10				138		75	
	4 47.45		36 50.15		46 52.50				0 46.90		45 23.75	
	18 0.90		45 58.20		35 55.85				22 1.45		37 24.60	
	53 23 19.32		52 51 16.62		53 41 14.27				53 27 19.87		53 42 43.02	
	− 26.87		− 26.46		− 25.86				− 34.24		− 33.16	
					− 27.18							
	32 23.36	21 51.6	37 29.73	49 56.7	38 53.52	39 48.5			8 42.61	25 53.3	10 23.65	41 18.4
		+10.45		+10.73		+11.45	+13.03			+11.57		+11.88

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	32 10.4	7.32	37 16.8	7.60	38 40.4	8.32	1 53.4	9.90	8 30.7	8.44	10 11.6	8.75
	13.8		20.0		44.0		56.8		34.2		15.0	
	17.2		23.0		47.4		0.4		37.5		18.4	
	20.9		27.0		50.8		4.0		41.0		22.1	
	24.0		30.0		55.2		8.0		44.3		25.6	
	863		1168		378		26		377		426	
	32 17.26		37 23.36		38 47.56		2 0.52		8 37.54		10 18.52	
	+ 21.30	+20.25	+ 21.30	+20.27	+ 21.30	+20.24	+ 21.29	+20.19	+ 21.29	+20.24	+ 21.29	+20.24
	− 1.05		− 1.03		− 1.06		− 1.10		− 1.05		− 1.05	
	32 37.57		37 43.63		39 7.80		2 21.81		8 57.78	−8.79	10 38.76	
	− 5.70	−8.36	− 5.75	−8.38	− 5.83	−8.47	− 6.32	−8.86	− 6.30	−27.26	− 6.35	−8.83
	32 31.81	−31.56	37 37.88	−31.00	39 1.97	−30.86	2 15.49	−28.10	8 51.48		10 32.41	−27.06
							14.39					

8.9 9.5 9.5 9.4 8.9 8.0

	31 45.5		36 54.5		38 10.8		1 34.8		8 2.8		9 38.8			
	48.9		57.8		12.5		38.4		6.3		42.5			
	51.8		1.2		14.6		42.0		9.9		46.3			
	1462		1735		79		1152		190		86			
	31 48.73	53 22 52.74	36 57.83	52 50 57.46	38 12.63	53 40 47.08	1 38.40	54 55 33.11	8 6.33	53 26 47.31	9 42.87	53 42 10.82
	+ 28.53	− .21	+ 25.53	− 17	+ 34.93	− 32	+ 22.12	− 12	+ 31.21	− 25	+ 35.65	− 33
	1.45 5.30	− 1.37	1.40 7.05	− 50	1.54 3.20	− 53	1.34 4.79	− 64	1.49 4.29	− 25	1.55 2.06	− 14
	9.77 5.58	+ 11.68	9.78 0.97	+ 11.10	9.77 2.50	+12.00	9.75 9.31	+ 13.39	9.77 4.90	+11.77	9.77 2.33	+ 12.05
	1.35 3.48	+ .35	1.31 0.62	+ .30	1.43 8.30	+ .30	1.22 6.70	+ .40	1.39 1.79	+ .30	1.44 6.99	+ .30
	0	− 36.40	35	−35.90	45	−35.90	30	−34.00		−33.10	45	−33.00
	4 50.0	22 23.66	1 47.1	50 29.16	1 51.0	40 19.50	2 15.1	55 9.01	0 53.0	26 22.65	0 26.5	41 46.57
	52.5		50.2		53.1		18.1		56.2		29.0	
	25		973		41		132		92		155	
	4 51.25		36 48.65		46 52.05		32 16.60		0 54.60		45 27.75	
	17 5.10		45 59.70		35 56.30		50 31.75		21 53.75		37 20.60	
	58 23 15.31		52 51 17.91		53 41 14.51		54 55 49.96		53 27 11.96		53 42 38.81	
	− 22.57		− 20.45		− 27.43		− 16.85		− 24.65		− 27.99	
	32 23.45	21 52.1	37 29.50	49 58.2	38 53.50	39 48.6	2 5.53	54 40.9	8 42.69	25 55.4	10 23.58	41 19.5

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	3 11 55	10 46.7	3 12 31	11 18.6	3 15 14	14 0.0	3 16 18	15 3.6	3 18 25	17 10.6	3 20 14	18 59.4
δ	52° 2′	51 58.5	52° 11′	6.4	53° 38′	33.8	52° 18′	14.5	52° 53′	49.0	55° 1′	54 57.2
		8.8		7.5		8.7		8.0		8.8		4.8
Dec. 26		+7.38		+10.14		+10.70		+9.67		+10.32		+13.35
	12 2.9	5.98	12 34.9	6.74	15 18.3	7.30	16 20.5	6.24	18 28.7	6.92	20 18.0	9.95
	6.3		38.2		22.8		24.0		31.8		21.4	
	9.8		41.7		26.2		27.4		35.3		25.2	
	13.2		44.8		29.4		30.8		38.8		28.7	
	16.8		48.2		33.1		34.0		42.0		32.3	
	491		79		808		1367		1766		1256	
	12 9.82		12 41.88		15 26.16		16 27.34		18 35.32		20 25.12	
	+ 2053	+19.58	+ 2053	+19.57	+ 2053	+19.53	+ 2053	+19.57	+ 2053	+19.56	+ 2053	+19.47
	− .82		− .83		− .87		− .83		− .84		− .92	
	− .13		− .13		− .13		− .13		− .13		− .14	
	12 29.40	8.70	13 1.15	8.71	15 48.69	8.86	16 46.91	8.76	18 54.88	8.84	20 44.59	
	− 6.27	2682	− 6.29	2674	− 6.44	2638	− 6.35	2624	− 6.42	2596	− 6.64	9.08
	12 23.13		12 54.86		15 39.25		16 40.56		18 47.46		20 37.95	2572
	8.7		7.0		8.8		7.6		8.7		5.6	
	11 42.7		12 36.0		14 38.0		15 37.2		17 56.4		19 45.4	
	45.3		38.6		42.4		54.0		57.5		48.0	
	48.5		41.3		45.8		56.9		2.5		51.7	
	16.5	−3.40	1159		73		121		1784		1451	
	11 45.50	52 4 2.24	12 38.63	52 11 6.07	14 42.43	53 38 36.35	15 54.03	52 19 19.22	17 59.47	52 54 39.20	19 48.37	55 1 49.74
	+24.32	− 16	+2.95	− 0	+43.73	− 49	+33.31	− 30	+35.85	− 34	+36.75	− 34
	1.385096	− 104	0.469822	− 56	1.640778	− 1.09	1.522257	− 92	1.554449	− 84	1.565266	− 22
	9.788169	+ 10.28	9.787556	+ 1040	9.772185	+ 11.98	9.786215	+ 1056	9.780316	+ 1120	9.758223	+ 13.51
	1.297252	+ 30	0.379978	+ 30	1.536223	+ 30	1.431422	+ 30	1.455739	+ 30	1.446094	+ 40
	20	−32.40	15	−32.30	45	−32.30	5	−32.00	30	−31.50	25	−32.00
	3 43.6	3 35.82	1 58.0	10 40.51	3 57.0	38 11.35	3 20.2	18 53.46	2 57.8	54 14.32	0 49.1	1 27.69
	45.8		58.6		55.1		20.9		58.0		49.1	
	94		6		121		11		158			
	23 44.70		16 58.30		48 56.05		8 20.55		32 57.90	+1″	25 49.10	
	59 3.65		5 50.05		33 52.30		14 27.80		49 56.45		56 57.25	
	52 4 22.07		52 11 8.97		53 39 10.72		52 19 46.22		52 55 8.87		55 2 17.67	
	− 19.83		− 2.40		− 34.37		− 27.00		− 28.67		− 27.93	
	12 14.43	3 9.0	12 46.15	10 13.8	15 30.37	37 45.0	16 31.80	18 27.2	18 39.62	53 48.4	20 28.87	1 2.0
Dec. 27		+9.22		+10.07		+10.87		+8.76		+10.40		+13.42
	12 2.4	6.09	12 33.8	6.94	15 18.4	7.74	16 18.6	6.57	18 28.0	7.27	20 17.0	10.29
	5.5		37.3		21.8		23.3		31.3		20.8	
	8.8		40.7		25.3		26.5		34.8		24.4	
	12.3		44.0		28.4		30.0		38.0		28.2	
	15.8		47.6		32.5		33.3		41.5		31.7	
	448		35		1267		1327		1736		1221	
	12 8.96		12 40.70		15 25.34		16 26.54		18 34.72		20 24.42	
	+ 21.29	+20.29	+ 21.29	+20.28	+ 21.29	+20.23	+ 21.29	+20.28	+ 21.29	+20.26	+ 21.29	+20.17
	− 1.00		− 1.01		− 1.06		− 1.01		− 1.03		− 1.12	
	12 29.25	8.70	13 0.98	8.71	15 45.57	8.86	16 46.82	8.76	18 54.98	8.84	20 44.59	
	− 6.26	2682	− 6.28	2674	− 6.42	2638	− 6.34	2624	− 6.41	2596	− 6.63	9.08
	12 22.99		12 54.70		15 39.15		16 40.48		18 48.57		20 37.96	2572
	8.8		7.0		6.7		7.7		9.0		6.0	
	11 28.9		12 49.7		14 50.4		15 55.2		17 57.9		18 47.0	
	31.5		52.2		53.7		58.7		0.6		52.9	
	34.0		54.9		55.9		1.0		4.2		55.7	
	44	−3.13	73		100		1749		27		56	
	11 31.47	52 4 3.70	12 52.43	52 11 8.05	14 53.33	53 38 37.85	15 58.30	52 19 19.17	18 0.90	52 54 42.47	19 51.81	55 1 51.77
	+37.49	− 37	−11.73	− 4	+32.01	− 2	+28.24	− 21	+33.82	− 30	+32.55	− 27
	1.573922	− 98	1.069302	− 59	1.505229	− 1.15	1.450886	− 95	1.529179	− 81	1.512555	− 22
	9.788169	+ 10.29	9.787556	+ 1040	9.772185	+ 11.99	9.786215	+ 1056	9.780310	+ 11.21	9.758223	+ 13.51
	1.485221	+ 30	0.979746	+ 30	1.400744	+ 30	1.359711	+ 30	1.432074	+ 30	1.393388	+ 40
	20	−32.50	15	−32.50	45	−32.40	5	−32.10	40	−32.00	25	−32.10
	3 31.1	3 37.29	2 6.7	10 42.49	4 2.9	38 13.19	3 23.5	18 53.64	2 56.9	54 17.40	0 48.8	1 29.96
	33.5		9.41		4.2		25.5		57.2		51.3	
	46		161		71		90		141		1601	
	23 32.80		17 8.05		49 3.63		8 24.50		32 57.05		25 50.05	
	59 16.05		5 40.30		33 44.80		14 23.85		49 51.30		56 58.30	
	52 4 34.26		52 10 58.51		53 39 3.01		52 19 42.06		52 55 9.51		55 2 16.51	
	− 30.56		+ 9.54		− 25.16		− 22.89		− 27.04		− 24.74	
	12 14.29	3 10.5	12 45.99	10 15.8	15 30.27	37 46.8	16 31.72	18 27.4	18 39.73	53 51.8	20 28.88	1 4.2

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	h m s		h m s		h m s		h m s		h m s	
α	3 21 5	19 49.6	3 22 51	21 35.6	3 28 52	27 37.2	3 31 19	30 3.8	3 33 35	32 19.5
δ	53° 13′	9.3 8.9	54° 45′	41.0 8.7	53° 27′	23.1 8.3	53° 35′	31.1 9.0	53° 41′	38.5 9.0

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		+10.94		+12.82		+10.52		+11.59		+10.45
	21 8.8	7.54	22 55.4	9.42	28 56.5	7.12	31 23.2	8.19	33 40.4	7.25
	12.3		58.8		0.1		26.8		43.7	
	15.9		2.5		3.7		30.0		47.6	
	19.3		6.2		6.9		33.7		51.0	
	22.7		9.6		10.7		37.4		54.3	
	790		1.25		179		11		370	
	21 15.80		23 2.50		29 3.58		31 30.22		33 47.40	
	+ 20.54	+19.54	+ 20.53	+19.48	4 20.54	+19.55	+ 20.54	+19.54	+ 20.54	+19.54
	− .86		− .91		− .86		− .87		− .87	
	− .13		− .14		− .13		− .13		− .13	
	21 35.34	8.90	23 21.98	9.08	29 23.13	9.00	31 49.76	9.04	34 4.94	
	−6.50	25.60	−6.66	25.36	−6.64	24.54	−6.68	24.20	−6.72	
	21 28.84		23 15.32		29 16.49		31 43.08		34 0.22	
	90		87		85		89		90	
	20 53.5		22 16.3		28 24.4		30 56.0		33 4.0	
	57.8		20.1		27.9		58.5		8.0	
	1.7		23.8		31.4		1.9		11.0	
	1730		10		837		1764		230	
	20 57.67	53 14 53.28	22 20.33	54 46 14.16	28 27.90	53 28 10.90	30 58.80	53 36 21.04	33 7.67	53 42 52.74
	+ 18.13	− 8	+ 42.17	− 45	+ 35.68	− 33	+ 31.42	− 26	+ 39.73	− 41
	1.258 40	− 84	1.62 500	− 36	1,552.42	− 1.26	1.49 721	− 39	1.59 612	− 1.32
	9.77 694	+ 11.56	9.76 111	+ 13.23	9.77 473	+ 11.81	9.77 336	+ 11.94	9.77 216	+ 12.08
	1.157 94	+ 30	1.50 871	+ 40	1.449 75	+ 30	1.393 17	+ 38	1.493 88	+ 30
	10	− 31.60 40		− 31.60 55		− 30.80 50		− 30.50 40		− 30.20
	2 59.2	14 29.22	1 20.1	45 51.98	4 26.0	27 47.22	1 20.5	35 58.73	41 42.8	42 29.79
	59.0		20.6		27.4		21.5		42.9	
	2		7		154		20		17	
	12 59.10		41 20.35		59 27.70		51 21.00		44 42.85	
	9 49.25		41 28.80		23 20.65		31 27.35		38 6.50	
	53 15 7.67		54 46 46.42		53 28 39.07		53 36 48.77		53 48 23.92	
	− 14.39		− 32.26		− 28.17		− 24.73		− 31.18	
	21 19.94	14 3.6	23 6.24	45 26.6	29 7.49	27 22.7	31 34.04	35 34.5		

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		+10.94		+13.00		+10.46		+11.64		+10.71
	21 8.4	7.64	22 54.7	9.87	28 55.8	7.32	31 22.5	8.51	33 38.7	7.58
	11.6		58.3		59.5		26.2		43.2	
	15.0		1.8		3.0		29.6		46.4	
	18.4		5.5		6.2		33.0		49.8	
	21.8		9.2		9.6		36.4		53.7	
	753		96		3142		477		328	
	21 15.06		23 1.92		29 2.84		31 29.54		33 46.56	
	+ 21.29	+20.24	+ 21.29	+20.18	+ 21.29	+20.24	+ 21.29	+20.23	+ 21.29	+20.23
	− 1.05		− 1.11		− 1.05		− 1.06		− 1.06	
	21 35.30		23 22.10		29 23.08		31 49.77		34 6.79	
	−6.49	8.90	−6.65	9.08	−6.63	9.00	−6.67	9.04	−6.71	
	21 28.81	25.60	23 15.45	25.36	29 16.45	24.54	31 43.10	24.20	34 0.08	
	90		89		86		90		90	
	20 53.2		22 30.2		28 19.9		30 55.0		33 6.4	
	55.3		34.4		21.8		59.2		10.0	
	58.2		36.2		25.5		1.4		12.4	
	167		108		73		1756		288	
	20 55.57	53 14 55.40	22 33.60	54 46 15.49	28 22.13	53 28 11.56	30 58.53	53 36 22.61	33 9.60	53 42 53.75
	+ 19.46	− 9	+ 28.32	− 21	+ 40.41	− 43	+ 31.01	− 25	+ 36.96	− 36
	1.28 681	− 81	1.45 209	42	1.606 49	− 1.23	1.49 150	− 36	1.56 773	− 1.32
	9.77 694	+ 11.54	9.76 111	+ 13.23	9.77 473	+ 11.81	9.77 336	+ 11.95	9.77 216	+ 12.09
	1.189 35	+ 30	1.33 580	+ 40	1.503 82	+ 30	1.387 46	+ 30	1.462 49	+ 30
	10	− 31.70 40		− 31.80 55		− 30.90 50		− 30.60 40		− 30.40
	2 54.8	14 31.54	1 28.7	45 53.56	4 21.9	27 47.98	1 19.0	36 8.52	41 43.11	42 30.93
	56.6		30.1		24.3		20.1		44.2	
	114		588		62		391		76	
	12 55.70		41 29.40		59 23.10		51 19.55		44 43.80	
	9 52.65		41 18.95		23 25.25		31 28.80		38 4.55	
	53 15 1.086		54 46 37.16		53 28 43.46		53 36 47.01		53 43 22.76	
	− 15.46		− 21.67		− 31.90		− 24.40		− 29.01	
	21 19.91	14 5.9	23 6.37	45 28.2	29 7.45	27 23.14	31 34.06	35 36.3		

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1877phae.proj.1017R

643

The following comes before this

1877, Dec. 31, 1878, Jan. 1. Obs. W. A. R. Rec. J. F. 16.

86

644

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 16 19	15 25.1	0 16 30	15 36.0	0 17 27	16 33.3	0 22 26	21 34.8	22 40 35.6	0 23 48	23 19.0 29.9	22 544	0 24 43	23 48.8
δ	55° 5′	54 59.5 8.5	55° 6′	54 59.6 8.0	53° 40′	34.2 9.0	54° 40′	34.1 8.0	54° 42′	28.9 8.7	53° 49′	43.3 5.2		
Dec. 31		143.61		+13.69		+14.85		+12.84 +13.25			+12.13			+11.57
Add +053° to (α II + m) Dec 31. 21-hrs have been added to sum of the constants and to found R.A. +053	16 7.8 11.4 15.2 18.0 22.2 746 16 14.92 + 24.38 7 + 23.23 − 1.19 16 38.08 − 2.97 16 35.13	10.06 −6.42 −40.00	16 17.6 21.3 — 28.9 32.1 999 16 24.98 + 24.38 7 + 23.23 − 1.19 16 48.14 − 2.98 16 45.16	10.14 −6.42 −40.00	17 16.8 20.2 23.7 27.2 30.8 1187 17 23.74 + 24.38 7 + 23.29 − 1.13 17 46.96 − 3.04 17 43.92	8.30 −6.42 −39.98	22 14 5 22 48.3 18.3 52.3 21.7 55.7 25.3 58.9 28.9 2.9 1087 21.74 55.62 + 24.38 7 + 23.26 + 23.26 − 1.17 − 1.17 −6.52 −39.92 22 44.92 23 18.80 − 3.11 − 3.12 −6.53 −39.92 22 41.83 15.78	9.29 9.70	24 1.8 4.7 8.5 11.8 15.6 422 24 8.44 + 24.38 7 + 23.25 − 1.17 24 31.62 − 3.14 24 28.56	9.88 5	24 32.6 36.0 39.3 42.9 46.4 1972 24 39.57 + 24.38 7 + 23.28 − 1.17 25 2.65 − 3.01 24 59.22 71	8.32 −6.54 −39.88
	9.2 15 55.2		8.5 16 36.0 40.3 43.7 00		8.6 17 34.6 38.5 42.5 1156		8.4 9.0 22 35.6 38.0 42.1 1167	5.4 4.1 2.4 6.5 0.3 7.8 11.0 14.3 17.8 131	42 8.8 23 42.8 47.1 50.0 139		5.7 24 35.3 38.2 41.8 1153			
	15 55.20 + 19.72 1.29491 9.75733 1.17484 20	55 7 8.95 − 3.55 − 10 + 20 + 13.51 + .40 − 40.40 20	16 40.00 − 15.02 1.17667 9.75714 1.05641	55 7 41.40 − 6 − 17 + 13.52 + .40 − 40.40 20	17 38.53 − .1479 1.16997 9.77223 1.06490	53 42 34.2 − 6 − 36 +11.99 + .30 − 40.16 45	38.90 −17.16 −18.75 1.23452 9.76187 1.11894 45	14.37 −40.40 −40.50 −40.55 −39.63 1.27300 9.76167 1.15724 45	23 46.63 18 + 21.81 1.33866 9.76271 1.22397 50	54 37 36.41 − 12 − 8 + 12.98 + .35 − 40.50 35	24 38.43 + 1.01 0.02432 9.77078 .98977 0	53 51 6.87 − 0 − 56 + 12.13 + .30 − 40.30		
Rm = −.28 n = −.83 ′ ″ +5 16.96	0 111.7 42.1 68 20 43.40 2 49.5	6 38.61	0 38.4 36.2 146 20 37.30 2 11.05	7 11.14	1 15.9 15.1 10 46 15.50 36 32.85	41 31.62	1 51.9 53.1 80 46 54.00 45 31.30 35 54.35 39 17.05	31.9 38.4 6	0 15.41 14.9 163 50 15.15 32 33.20	37 4.49	2 0.3 59.0 1193 376 59.65 445 48.70	50 34.89		
	55 7 23.91 − 14.96		55 7 30.01 + 11.39		53 41 51.81 + 11.61		54 1 33 14 2 36.01 +13.15 + 14.36	22 4.0	54 37 52.16 − 16.75	22 544 289	53 51 7.66 − 0.79			
	16 28.76	5 58.6	16 38.81	6 31.1	17 37.57	40 51.6	22 35.36 23 9.23	40 15 54.56 41 39.6	24 22.01	36 24.6	24 53.17	49 55.0		
Jan. 1	E.L.	+13.73		+13.73		+12.08		+13.36		+12.94		+12.08		
	16 6.7 10.5 14.3 17.9 21.1 205 16 14.10 + 25.27 + 24.25 − 1.02 16 38.85 + .26 16 38.61	10.23 −9.63 −100.00	16 16.6 20.2 23.9 27.7 30.5 183 16 23.66 + 25.27 + 24.25 − 1.02 16 47.91 + 6.26 16 48.17	10.23 −9.63 −100.00	17 28.0 31.6 35.0 38.2 41.9 247 17 34.94 + 25.27 + 24.30 − .97 17 59.24 + 0.21 17 59.45	8.58 −9.64 −59.97	22 47.7 51.1 54.5 58.3 2.0 2736 22 54.72 + 25.27 + 24.27 − 1.00 23 18.99 + 0.17 23 19.16	9.86 −9.79 −59.88	23 36.0 39.5 43.0 46.6 50.0 151 23 43.02 + 25.27 + 24.27 − 1.03 24 7.29 + 0.15 24 7.45	9.44 −9.81 −59.82	24 31.5 35.1 38.4 42.0 45.5 425 24 38.80 + 25.27 + 24.30 − .94 25 2.80 + 0.13 25 2.93	8.58 −9.81 −59.82		
	90 15 59.4 1.2 3.6 42 16 1.40	−3.50 55 7 10.69	92 16 40.4 42.4 46.8 96 16 43.20	55 7 44.81	90 17 22.0 26.1 29.1 172 17 25.73	53 37 15.64	91 22 30.4 34.4 37.0 118 22 33.93	54 42 52.66	82 24 0.2 3.7 6.7 106 24 3.53	54 36 34.40	58 24 43.8 46.9 49.4 201 24 46.70	53 51 3.57		
Rm = −.22 n = −.71 ′ ″ +5 19.67	0 48.8 46.5 153 20 47.65 2 0.70 55 7 28.37 − 9.68	7 0.52	0 39.3 36.9 162 20 38.10 2 10.25 55 7 29.92 + 14.89	7 34.41	0 45.6 44.6 102 50 45.10 32 3.25 53 37 22.92 − .28	37 4.12	0 0.8 58.9 1197 45 59.85 38 49.00 54 43 8.67 − 16.01	42 42.02	1 52.1 48.8 989 49.45 30 58.90 54 36 18.57 + 15.83	36 23.2 34	2 16.1 5.7 218 37 10.90 145 37.45 53 50 57.12 + 6.45	50 57.5		
	16 28.98	6 0.5	16 39.54	6 34.6			22 9.37	41 42.1	22 57.64	35 23.5	24 53.12	49 51.9		

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1877, Dec. 31, Jan. 1

	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	0 25 8	0 26 7	0 29 8	0 29 55	0 38 36	0 46 27		
δ	53° 7′	50° 57′	51° 4′	54° 43′	55° 2′	54° 22′		

Dec. 31

	6.79	4.76	5.27	9.10	8.98	8.03		
	25 8.9 5.5	26 0.6	29 0.1	29 45.6	38 28.8	46 18.7		
	12.3 5.5	3.7	3.3	48.0	32.0	23.2		
		6.9	6.8	52.7	35.7	26.7		
		10.2	10.0	56.1	38.5	30.1		
		13.5	13.4	58.8	42.8	33.7		
		349	336	2632	1788	1384		
	25 5.50	26 6.98	29 6.72	29 52.64	38 35.76	46 26.68		
	+ 24.38 7+23.32	+ 24.35 7+23.40	+ 24.38 7+23.39	+ 24.38 7+23.25	+ 24.38 8+23.24	+ 24.38 8+23.26		
	− .110	− 103	− 103	− 117	− 119	− 116		
	25 28.775	26 30.30	29 30.05	30 1583	38 58.93	46 49.89		
	−3.19 6.54	−3.24 6.52	−3.30 6.57	−3.26 6.64	−3.43 6.79	−3.60 6.90		
	25 25.58 63 39.86	26 27.06 14 39.84	29 26.76 81 39.78	30 12.58 63 39.76	38 55.52 7 39.54	46 46.30 6 39.28		
	8.0	9.0	9.1	8.5	9.6	8.4		
	25 14.0	26 17.0	28 33.6	29 47.0	38 9.4	45 47.0		
	18.0	20.8	36.6	48.4	11.9	51.7		
	20.3	24.0	38.9	51.7	13.8	54.3		
	523	18	191	1481	51	30		
	25 17.43 53 8 41.00	26 20.60 50 59 56.38	28 26.37 51 6 25.38	29 49.37 54 44 58.16	38 11.70 55 3 28.08	45 51.00 54 23 18.75		
	− 11.93 − 4	− 13.62 − 5	+ 30.35 − 25	+ 3.27 − 1	+ 24.06 − 15	+ 35.68 − 33		
	1.07664 − 1.20	1.13418 − 95	1.18216 − 36	0.51155 − 87	1.38130 − 1.20	1.55242 − 1.20		
	9.77795 + 11.37	9.79887 + 9.06	9.79793 + 9.18	9.76129 + 1313	9.75805 + 1348	9.76519 + 1276		
	0.97719 + .30	1.05565 + .25	1.40269 + .25	0.39844 + .40	1.26195 + .40	1.44021 + .35		
	15 −4020	25 −39.7020	−39.7040	−4060 20	−4050 0	−4080		
	4 37.2 8 7.59	3 22.6 59 21.44	1 17.1 5 50.95	3 8.2 44 26.66	4 22.8 2 56.26	4 21.9 22 45.98		
	344	22.0	16.2	5.1	19.1	20.1		
	116	6	133	133	419	20		
	19 35.80	28 22.30	21 16.65	43 6.65	24 2095	4 21.00		
	3 1255	54 26.05	1 31.70	39 41.70	58 2740	18 27.35		
	53 8 31.51	50 59 45.01	51 6 50.66	54 45 0.66	55 3 46.36	54 23 46.31		
	+ 9.49	+ 11.37	− 25.28	− 2.50	− 1828	− 2.756		
					78			
	25 19.09 7 27.7	26 20.62 58 41.6	29 20.24 5 11.2	30 5.99 43 46.9	38 48.8 2 16.7	46 39.46 22 6.7		
	+10.81	+8.64	+9.06	+12.93	+12.85	+12.00		
Jan. 1	7.31	5.17	5.56	9.43	9.35	8.50		
	25 —	25 59.4	28 58.0	29 44.7	38 27.9	46 18.4		
	—	2.7	2.4	48.0	31.5	22.0		
	4.5 4.5	5.9	6.8	51.8	34.8	25.6		
	8.0 4.6	9.3	8.9	55.2	38.5	29.2		
	11.4 4.6	12.6	12.2	58.8	41.9	32.8		
		299	285	85	1747	1280		
	25 4.57	26 5.98	29 5.70	29 51.70	38 34.94	46 25.60		
	+ 2527 3 +24.31	+ 2527 +24.39	+ 2527 +24.39	+ 2527 +24.27	+ 2528 +24.26	+ 2528 +25.29		
	− 94	− 88	− 88	− 100	− 102	− 99		
	25 28.90	26 30.37	29 30.09	30 1597	38 59.20	46 49.84		
	+ 0.11 −9.81	+ 0.04 −9.79	+ 0.01 −9.85	+ 0.09 −9.96	− 0.02 −10.18	− 0.12 −10.35		
	25 29.01 −59.79	26 ~~32.09~~ 30.41 −59.76	29 ~~27.80~~ 30 16 −59.67	30 16.06 −59.64	38 59.18 −59.31	46 49.77 −58.92		
	8.0	9.1	9.1	8.8	9.6	8.0		
	25 17.0	26 18.0	28 38.7	29 44.1	38 2.0	45 45.8		
	20.6	21.1	41.0	46.8	4.2	50.0		
	22.9	23.7	43.5	50.0	6.9	52.4		
	05	28	32	1409	131	1482		
	25 20.17 56 8 42.69	26 20.93 50 59 57.56	28 41.07 51 6 ~~26.36~~ 2886	29 46.97 54 44 57.08	38 4.37 55 3 28.48	45 49.40 54 23 20.72		
	− 1560 − 7	− 14.95 − 6	+ 24.63 − 16	+ 4.73 − 1	+ 30.57 − 24	+ 36.20 − 34		
	1.19312 − .83 +29	1.17461 − .61 +25	1.39116 − .23 +36	0.67486 − .56 +87	1.48536 − .77 +20	1.55871 − .77 +29		
	9.77795 + 1145	9.79884 + 9.12	9.79793 + 9.23	9.76129 + 1319	9.75805 + 13.54	9.76519 + 1281		
	1.09585 + .26	1.09829 + .22	1.31417 + .22	0.56093 + .31	1.36813 + .32	1.44868 + .30		
	15 −20.20	25 −19.90	20 −19.80	40 −20.80	20 −20.10	0 −21.10		
	4 39.5 8 29.80	3 24.6 59 43.02	1 ~~15.5~~ 23.5 6 ~~14.2~~ 12.12	3 8.1 44 46.41	4 17.9 3 16.34	4 20.5 23 8.12		
	36.1	21.4	18.3	5.1	14.5	17.9		
	156	60	421	132	124	38.4		
	4 37.80	28 23.60	21 ~~21.05~~ 15.55	43 6.60	24 16.20	4 19.20		
	3 10.55	54 25.35	1 ~~9.98~~ 2.30	39 41.75	58 32.15	18 29.15		
	53 8 30.22	50 59 45.02	51 6 ~~44.7~~ 46.97	54 45 1.42	55 3 51.82	54 23 48.82		
	+ 1247	+ 12.54	− 20.61	− 3.64	− 23.34	− 28.10		
	58		5	43				
	25 19.20 7 30.0	26 20.62 59 43.3	29 20.25 6 12.4	30 6.10 44 46.8	38 49.00 2 17.4	46 39.42 22 9.2		

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613 614

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	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 0 44.0	59 43.7	1 2 56	1 57.6	1 3 56	2 57.4	1 8 25	7 25.4	1 9 57	8 48.7	1 12 44	11 44.1
δ	53° 32′	27.3 / 6.8	51° 27′	21.4 / 7.0	52° 2′	51 56.7 / 8.7	54° 36′	30.2 / 8.0	51° 40′	37.3 / 8.5	52° 18′	12.1 / 4.0

Dec. 31

	+11.17		+8.51		+9.36		+11.86		+9.91		+12.07	
	0 35.3	7.62	2 48.4	4.96	3 48.5	5.81	8 19.4	8.31.	8 40.6	6.36	12 37.6	8.47
	38.6		51.7		51.8		23.2		44.0		41.4	
	42.2		55.0		55.1		26.6		47.3		44.8	
	45.5		58.3		58.5		30.4		50.6		48.4	
	49.1		1.8		1.8		34.0		53.8		52.0	
	2107		2752		2758		1336		2363		2242	
	0 42.14		2 55.04		3 55.16		8 26.72		9 47.26		12 44.84	
	+ 24.38	+23.31	+ 24.38	+23.38	+ 24.38	+23.37	+ 24.38	+23.27	+ 24.38	+23.38	+ 24.38	+23.28
	− 1.12		− 1.05		− 1.06		− 1.17		− 1.05		− 1.15	
	1 5.41		3 18.38		4 18.49		8 49.94		10 10.60		13 8.09	
	− 3.89		−3.92		− 3.94		−3.95.		− 4.05		− 4.14.	
	1 1.52		3 14.46		4 14.55		8 46.04		10 6.59		13 3.988	
		−7.10 / −38.70		−7.06 / −38.60		−7.09 / −38.54		−7.25 / −38.32		−7.16 / −38.26		−7.31 / −38.10
	44		75		90		78		87		68	
	0 6.8		2 16.0		3 28.8		7 50.0		9 27.0		12 23.5	
	10.5		18.5		32.3		54.4		30.2		27.8	
	12.8		22.2		35.1		56.9		32.9		29.7	
	01	−3.55	577		62		113		01		210	
	10.02	53 34 58.28	2 19.23	51 29 0.59	3 32.07	52 4 0.04	7 53.77	54 38 13.82	9 30.03	51 42 14.90	12 2.00	54 19 37.57
	+32.11	− 27	+35.81	− 35	+23.09	− 14	+32.95	− 28	+17.23	− 8	+17.84	− 8
	1.506.64	− 76	1.554.00	− 1.01	1.363.42	− 1.06	1.517.86	− 1.26	1.236.29	− 17	1.251.39	− 92
	9.77 353	+ 11.90	9.79 431	+ 9.62	9.78 869	+ 10.26	9.76 253	+ 1305	9.792.24	+ 986	9.765.72	+ 12.72
	1.40277	+ 30	1.47091	+ 25	1.27441	+ 30	1.40298	+ 35	1.15113	+ 30	1.13971	+ 30
	50	−4060	55	−4010	20	−4020	45	−4080	45	−4010	5	−4060
	2 14.9	34 25.30	3 39.1	28 25.45	3 49.1	3 25.65	4 30.0	37 41.33	0 38.4	41 42.16	3 17.1	19 5.44
	42.6		35.2		47.8		26.4		38.1	41.	14.8	
	75		143		169		564		5		119	
	52 43.75		58 37.15		23 48.45		49 28.24		45 38.25		8 15.95	
	30 4.60		24 11.20		58 54.90		33 20.15		37 10.10		14 32.40	
	53 35 23.56		51 29 30.16		52 4 18.86		54 38 39.11		51 42 29.06		54 19 57.36	
	− 25.28		− 29.57		− 18.82		− 25.29		− 14.16		− 13.79	
								7 48.8 / 58.8				
	0 54.46	33 46.6	3 7.44	27 46.8	4 7.50	2 47.1	8 38.79	37 3.0	9 59.43	41 2.9	12 56.67	18 27.3
		+11.21				+9.76		+12.41		+9.61		+12.37
Jan. 1	0 34.2	7.71			3 47.8	6.26	8 41.6	8.91	10 10.8	6.11	12 36.7	8.87
	37.7				50.9		45.0		14.3	9.195	40.3	
	41.3				54.0		48.5		17.4		43.9	
	44.9				57.6		52.0		2[illegible]	37.4	47.4	
	48.2				0.8		55.8		24.3		51.2	
	2063				2711		429		378		195	
	0 41.26				3 54.22		8 48.88		10 17.56	47	12 43.90	
	+ 25.28	+24.32			+ 25.28	+24.37	+ 25.28	+24.28	+ 25.28	+24.38	+ 25.28	+24.29
	− .96				− .91		− 100		− .90		− .99	
	1 5.58	−10.64 / −58.05			3 18.59	−10.64 / −57.81	9 12.86	−10.86 / −57.48	10 41.84	85 / −10.75 / −57.39	13 8.19	−10.96 / −57.15
	− 0.32				− 0.34		− 0.40		− 0.45		− 0.46	
	1 5.26				4 18.22		9 12.46		10 41.40		13 7.73	
	67				63		90		89		70	
	58 52.0				3 30.4		8 17.7		10 7.8		12 19.4	
	54.3				34.3		22.0		10.0		23.2	
	57.5				36.8		24.0		13.0		25.7	
	138	−3.50			115		37		08		83	
	59 54.60	53 34 59.60			3 33.83	52 4 0.41	8 21.23	54 6 34.35	10 10.27	51 44 57.93	12 22.77	54 19 38.75
	+ 46.66	− 4.56			+ 20.39	− 11	+ 27.35	− 19	+ 7.28	− 2	+ 21.13	− 11
	1.668.941	− 70.45			1.309.42	− 1.061	1.413.696	− 2340.86	9.792.76	− 56.7	1.324.90	− 58.90
	9.77 353	+ 11.94			9.78 869	+ 10.30	9.76 800	+ 1253	9.791.46	+ 9.95	9.765.42	+ 12.76
	1.56725	+ 28			1.22289	+ 25	1.32.974	+ 29	0.77727	+ 24	1.21540	+ 30
	50	−21.20			20	−21.00	20	−2160	40	−20.905	5	−2160
	2 32.8	34 46.11			3 52.1	3 45.67	1 13.41	6 21.66	3 5.4	44 43.80	3 13.9	19 26.02
	30.2				49.7		11.2		2.9	14	11.8	
	30				10 18		46		8 3		57	
	52 31.50				23 50.90		21 12.30		43 4.15		8 12.85	
	30 16.85				58 57.95		1 3.605		37 44.20		14 35.50	
	53 35 36.52				52 4 17.12		54 6 55.72		51 45 3.87		54 19 55.17	
	− 36.92				− 16.71		− 21.37		− 6.97		− 16.42	
	0 54.62	33 48.1			4 7.58	2 47.9	9 1.60	5 24.2	10 30.65	43 45.8	12 56.77	18 28.9

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	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 14 4	13 2.8	1 15 16	14 15.4	1 16 39	15 37.9	1 17 14	16 12.5	1 21 14	20 16.9	1 22 10	21 8.4
δ	52° 19	13.4 8.8	54° 56	50.8 8.9	54° 26	20.7 8.8	53° 16	11.4 8.7	53° 42	36.8 8.1	53° 36	30.9 8.6

Dec. 31

	+10.23		+12.23		+11.53		+10.59		+11.06		+10.52	
	13 55.8	6.68	15 10.6	8.68	16 33.6	7.98	17 7.4	7.04	21 12.7	7.51	22 4.7	7.24
	58.3		14.0		37.1		10.9		16.0		8.0	
	2.5		17.5		40.5		14.3		19.5		11.3	
	5.8		21.2		44.3		17.9		23.0		14.7	
	9.3		24.8		47.8		21.4		26.5		18.2	
	12.9		881		33		719		977		66	
	14 258		15 17.62		16 40.66		17 14.38		21 19.57		22 11.32	
	+ 24.76	38+23.36	+ 24.76	38+23.25	+ 24.76	38+23.27	+ 24.76	38+23.32	+ 24.76	38+23.29	+ 24.76	38+23.31
	− 107		− 119		− 116		− 111		− 114		− 113	
	14 25.91		15 40.83		17 3.90		17 37.67		21 42.80		22 34.68	
	−4.14		−4.20		− 422		− 4.81		− 4.30		− 432	
	14 21.77/80	−7.25 −38.02	15 36.63/71	−7.38 −37.96	16 59.68/71	−7.38 −37.88	17 33.48/53	−7.33 −37.84	21 38.48/53	−7.41 −37.60	22 30.25/31	−7.42 −37.54
	9.0		8.8		9.0		9.0		8.0		9.0	
	13 45.0		14 43.1		16 1.1		17 5.4		20 46.2		21 41.8	
	48.6		46.8		5.5		7.8		50.9		44.8	
	51.3		50.5		8.4		10.0		54.2		47.0	
	1449		1404		1500		232		13		136	
	13 48.30	52 20 47.69	14 46.80	54 57 55.85	16 5.00	54 27 55.03	17 7.73	53 18 27.34	20 50.43	53 43 47.97	21 41.53	53 38 18.44
	+ 54.28	− 5	+ 30.82	− 25	+ 3566	− 33	+ 6.65	− 2	+ 29.11	− 22	+ 26.79	− 19
	1.154473	− 59	1.488883	− 1.34	1.555218	− 1.32	0.822282	− 1.29	1.464404	− 1.09	1.427627	− 1.26
	9.785192	+ 10.57	9.775895	+ 13.42	9.764310	+ 12.88	9.776435	+ 11.60	9.771994	+ 12.07	9.773027	+ 11.97
	1.063252	+ .33	1.370382	+ .40	1.439092	+ .30	0.721852	+ .30	1.358632	+ .30	1.323592	+ .30
	5	− 402035		− 40.70 55		− 4060 5		− 4030 40		− 4040 45		− 4030
	2 9.1	20 14.07	4 49.9	57 23.83	4 46.3	27 22.41	4 36.3	17 54.08	3 58.1	43 15.08	4 19.5	37 45.41
	7.2		46.1		43.3		39.1		51.9		26.1	
	163		160		96		94		130		156	
	7 8.05		29 48.00		59 44.80		9 34.70		43 56.50		49 27.80	
	15 40.30		53 0.35		23 3.55		13 13.65		38 51.85		33 20.55	
	52 20 59.26		54 58 19.31		54 28 22.51		53 18 32.61		53 44 10.81		53 38 39.51	
	− 11.57		− 23.46		− 27.48		− .527		− 22.84		− 21.07	
	14 14.55	19 36.0 +10.29	15 29.29	56 45.9 +12.65	16 52.33	26 44.5 +12.05	17 26.16	17 16.2 +10.98	21 31.12	42 37.5 +11.58	22 22.89	37 7.9 +11.44
Jan. 1	13 54.8	6.77	15 9.6	9.15	16 32.6	8.55	17 6.2	7.48	21 11.8	8.08	22 3.5	7.91
	58.5		13.1		36.2		10.2		15.2		7.0	
	1.6		16.8		39.7		13.4		18.6		10.3	
	5.0		20.4		43.3		16.9		22.0		13.9	
	8.4		23.9		46.8		20.4		25.6		17.2	
	83		838		487		671		932		519	
	14 1.66		15 16.76		16 39.74		17 13.42		21 18.64		22 10.38	
	+ 2528	+ 24.36	+ 2528	+ 24.26	+ 2528	+ 24.29	+ 2528	+ 24.33	+ 2528	+ 24.31	+ 2529	+ 24.32
	− 92		− 102		− 99		− 95		− 97		− 91	
	14 26.02		15 41.12		17 4.03		17 37.85		21 42.95		22 34.70	
	−0.119	−10.87 −5703	−0.148	−11.07 −5694	−0.150	−11.07 −5682	−0.153	−11.00 −5676	−0.158	−11.12 −5640	−0.158	−11.13 −5631
	9.0		8.7		8.8		8.8		8.5		9.0	
	13 27.6		14 40.4		16 2.3		17 24.4		21 52.2		21 51.5	
	32.6		43.7		5.6		28.3		5.8		55.8	
	35.3		47.2		7.8		30.9		8.4		58.6	
	55		113		157		836		16 4		159	
	13 31.83	55 20 48.38	14 43.77	54 57 55.53	16 5.23	54 27 56.24	17 27.87	53 18 27.23	21 54.7	53 43 48.24	21 55.30	53 38 19.45
	+ 29.83	− 24	+ 32.99	− 28	+ 3451	− 31	− 1445	− 5	+ 13.17	− 5	+ 15.08	− 6
	1.474652	− 3455	1.518385	− 86.34	1.537994	− 86.34	1.159872	− 88.57	1.119564	− 76.18	1.178402	− 83.29
	9.185922	+ 10.60	9.758915	+ 13.47	9.764313	+ 12.92	9.776435	+ 11.64	9.711919	+ 12.11	9.773027	+ 12.02
	1.385352	+ .25	1.402112	+ .32	1.427032	+ .30	1.061082	+ .27	1.016362	+ .28	1.076202	+ .28
	5	− 21.10 25		− 21.80 55		− 21.70 5		− 21.40 40		− 21.40 45		− 21.60
	1 55.9	20 34.05	4 49.0	57 42.88	4 46.5	27 43.09	4 53.8	18 13.31	4 10.7	43 34.92	4 38.9	38 5.76
	54.8		45.5		43.6		50.8		8.1		34.4	
	104		145		101		46		188		133	
	6 55.35		29 47.25		59 45.05		9 52.30		44 9.40		49 36.65	
	15 53.02		53 1.10		23 3.30		12 56.05		38 38.95		33 1170	
	52 21 1.67		54 58 20.77		54 28 22.97		53 18 15.72		53 43 58.12		53 38 31.37	
	− 24.29		− 25.24		− 26.73		+ 11.51		− 10.38		− 11.92	
	14 14.66	19 37.0	15 29.47	56 45.9	16 52.46	26 46.3	17 26.22	17 16.2	21 31.25	42 38.5	22 22.99	37 9.4

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	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 24 38.4	23 31.2	1 25 30	24 26.6	1 26 40	25 39.2	1 27 23	26 19.3	1 28 55	27 51.5	1 30 45	29 41.5
δ	54° 4′	59.4	55° 0′	54 55.0	51° 56′	50.4	52° 42′	36.1	52° 27′	21.9	52° 35′	30.0
		8.6		9.0		9.0		6.6		9.1		8.7

Dec. 31

+1265 +1274 +13.64 +9.13 +10.00 +9.87 +10.83

	9.10 9.19		10.09		5.58		6.45		6.32		7.28
	24 27.7 24 28.3	25 24.0		26 34.5		27 15.6		28 47.8		30 39.3	
	31.2 31.7	27.7		37.7		18.3		51.1		42.6	
	34.8 35.3	31.3		41.3		22.0		54.5		46.0	
	38.2 38.6	34.8		44.5		25.6		58.0		49.3	
	41.8 42.4	38.7		48.0		28.8		1.4		52.9	
	1737 1763	1565		2060		1110		2728		2301	
24	34.74 35.26	25 39.12		26 41.20		27 22.20		28 54.56		30 46.02	
	+24.38 +24.38	31.30	+23.24	+24.38	+23.37	+24.38	+23.34	+24.38	+23.35	+24.38	+23.34
	−1.15 −1.15	+24.38		−1.06		−1.10		−1.08		−1.09	
	−7.48	−119		4.55		4.551		29 17.89		31 9.34	
24	58.00 58.52	25 54.52		27		27					
	−4.37 −4.87	−4.41		−4.37		−4.40		−4.42		−4.46	
	−37.40	−7.54		−7.41		−7.45		−7.46		−7.50	
24	53.60 54.18	25 50.98	−37.34	27 0.15	−37.26	27 41.08	−37.22	29 13.44	−37.18	31 4.85	−36.98
	5365			20		14		9		4.90	
	−3.55										
	89 6.6 54 7 3.08 19.08 8.7			8.3		8.5		8.0		8.0	
	24 11.7 24 36.7	25 8.9		26 15.3		27 8.6		28 26.5		30 12.0	
	15.7	12.0		17.8		11.7		31.0		16.6	
	19.4	15.8		20.0		15.0		33.0		19.0	
	168	67		531		53		05		176	
24	1560 2670	25 12.23	55 2 15.82	26 17.70	51 58 27.61	27 11.77	52 43 26.78	28 30.17	52 29 11.67	30 15.87	52 37 16.48
	+19.14 −1.44 6 31.78 4.87	+19.07	−9	+23.50	−14	+10.43	−3	+24.39	−16	+30.15	−24
	1.28194 0.15836	1.28035	−17	1.37107	−1.20	1.01828	−1.26	1.38703	−101	1.47929	−11
	9.76800 9.76800	9.75823	+13.50	9.78967	+10.17	9.78230	+10.99	9.78461	+10.74	9.78329	+1088
	1.72540 04896	1.16118	+.40	1.28334	+.30	1.92318	+.30	1.29424	+.30	1.38518	+.30
	20 20	25	−40.50	25	−39.90	40	−40.00	55	−39.90	57	−39.90
	0 50.9 0 50.9	0 38.1	1 45.41	4 21.8	57 53.29	4 33.41	42 53.23	3 37.0	28 38.09	0 27.2	36 43.86
	47.8 47.8	35.9		19.2		30.9	37.9	34.9		25.9	
	30 9.87 9.87	1.40		4.10		43	1.60	1.19		1.31	
	20 20	25 37.00		29 20.50		44 32.15		58 35.95		50 26.55	
	49.35 49.35	57 11.35		53 27.85		38 16.20		24 12.40		32 21.80	
	1 59.02 59.00										
54	7 19.96 19.96	55 2 30.31		51 58 46.81		52 43 35.76		52 29 31.36		52 37 40.76	
	−19.88 +1.12	−14.49		−19.20		−8.38		−19.69		−24.28	
	24 46.17 5 54.4						42 16.0				
	24 46.69 6 10.5	25 42.59	1 8.1	26 52.79	57 16.03	27 33.69	41 55.0	29 6.03	28 0.9	30 57.40	36 6.9
	+1261 +1268		+13.68		+9.44		+10.38		+10.18		+10.95
Jan. 1											
	9.11 9.18	10.18		5.94		6.88		6.68		7.45
	24 26.4 24 26.8	25 32.9		26 33.3		27 14.4		28 46.8		30 38.3	
	30.1 30.6	26.6		37.1		17.9		50.0		41.8	
	33.6 34.0	30.2		40.0		21.3		53.4		45.1	
	37.0 37.4	33.6		43.5		24.5		56.8		48.6	
	40.5 40.9	37.3		46.9		28.1		0.6		52.0	
	1676 1698	06		2008		1062		2677		2258	
24	33.52 33.96	25 30.12		26 40.16		27 21.24		28 53.84		30 45.16	
	+25.29 +25.29	+25.29	+24.27	+25.29	+24.38	+25.29	+24.35	+25.29	+24.37	+25.29	+24.36
	−.98 −.98	−1.02		−.91		−.94		−.92		−.93	
	−11.22	−5610		−4.54		−4.559		−17.41		−9.52	
24	57.83 58.27	25 54.39		27		27		29		31	
	−0.61 −0.61	−0.61	−11.31	−0.65	−11.11	−0.65	−11.18	−0.67	−11.20	−0.69	−11.24
	−11.22	−5610	−56.01		−55.89		−55.83		−55.77		−55.47
24	57.22 57.66	25 53.78		27 3.89		27 44.94		29 17.24		31 8.83	
	−350										
	90 8.9 54 7 3.63 19.95 8.7			8.9		8.8		8.0		8.3	
	24 11.3 24 35.6	25 14.5		26 6.5		26 58.9		28 23.6		30 22.0	
	16.4 38.8	16.5		10.0		3.6		27.2		25.6	
	19.9	20.0		13.5		6.6		30.7		29.1	
	+1254 +1254	510		60		101		815		167	
	176 144 + 29 + 29										
24	1587 3720 −21.70 −21.70	25 17.00	55 2 17.15	26 10.00	51 58 27.25	26 38.87	52 43 25.89	28 27.17	52 29 11.07	30 25.54	52 37 17.32
	+17.65 +3.24 6 51.04 7.43	+13.12	−5	+30.16	−24	+17.84	−8	+26.37	−18	+19.50	−10
	1.24674 0.57055	1.11793	−13.20	1.47943	−77.20	1.25212	−81.26	1.42111	−65.01	1.29203	−11.17
	9.76800 9.76800	9.75823	+13.54	9.78967	+10.20	9.78230	+11.01	9.78461	+10.76	9.78329	+10.90
	1.13952 04033	1.00094	+.32	1.39388	+.25	1.15920	+.26	1.33050	+.25	1.20010	+.26
	20	25	−21.90	25	−21.20	40	−21.40	55	−21.40	57	−21.40
	0 51.9	0 42.0	2 5.43	4 16.9	58 11.99	4 28.6	43 11.37	3 35.5	28 56.35	0 35.8	37 3.38
	19.3	39.4		15.1		26.8		33.6		33.9	
	16.12	8.17		12.0		15.4		9.1		9.7	
	20 50.60	25 40.65		29 16.00		44 27.70		58 34.55	+1	50 34.85	
	1 57.75	57 7.50		53 32.35		38 20.65		24 13.80		32 13.50	
54	7 17.42	55 2 27.17		51 58 52.02		52 43 40.32		52 29 32.47		52 37 33.17	
	−13.79	−10.02		−24.77		−14.43		−21.46		−15.85	
	+2.53										
	24 46.00 5 54.9	25 42.47	1 9.74	26 52.78	57 16.1	27 33.76	42 15.5	29 6.04	28 0.6	30 57.59	36 7.9
	46.44 6 11.3										

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1877, Dec. 31, Jan. 1

	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 31 29	30 25.4	1 32 3	30 58.6	1 38 9	37 4.6	1 42 9	41 4.7	1 42 54	41 51.5	1 44 6	43 0.9
δ	52° 16′	11.0 8.2	53° 48′	42.9 7.8	54° 7′	20.0 9.4	54° 34′	28.7 8.4	51° 34′	29.1 8.9	52° 22′	16.9 8.5

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Jan. 1

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613 614

1877 Dec. 31 1878 Jan. 1 Obs. W.A.R. Rec. J.F.M.

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	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 53 48	52 41.6	1 56 34	55 32.3 37.4	2 1 32	0 24.9	2 5 1	3 53.0	2 6 22	5 14.5	2 8 15	7 12.6
δ	53° 52′	47.4 5.0	50° 42′	37.0 9.3	54° 41′	36.0 9.0	52° 27′	22.2 6.7	54° 30′	24.6 6.9	50° 56′	51.2 7.5
Dec. 31		+11.20		+8.00		+12.06		+9.84		+12.64		+4.56
	53 42.0	7.65	56 33.6	4.45	1 28.5	8.51	4 54.7	6.29	6 18.4	9.09	8 14.4	4.01
	45.3		36.9		33.3		55.2		21.9		17.8	
	48.8		40.0		36.8		1.4		25.7		21.1	
	52.3		43.3		40.5		4.8		29.0		24.3	
	55.8		46.6		44.0		8.4		32.7		27.6	
	443		04		1842		76		277		52	
	53 48.86		56 40.08		1 36.84		5 1.52	+01	6 25.54		8 21.04	
	+ 24.00	38+23.29	+ 24.43	38+23.42	+ 24.44	38+23.25	+ 24.44	38+23.36	+ 24.44	38+23.27	+ 24.44	38+23.41
	− 1.14		− 1.01		− 1.18		− 1.08		− 1.16		− 1.02	
	54 12.15	.89	57 3.50		2 0.10		5 24.88	7	6 48.82		8 44.46	
	− 4.94	7.26 .35	− 4.88	−7.74 −35.00	− 5.11	−8.06 −34.58	− 6.11	−7.95 −34.28	− 5.21	−8.11 −34.14	− 5.10	5 −7.90 −33.96
	54 7.21		56 58.62		2 [illegible] 1 54.98		5 19.77		6 [illegible] 43.60		8 39.36	
	53 59.32											
	11.5		9.0		9.0		7.0		7.2		8.1	
	53 6.3		56 1.8		1 3.6		4 26.6		5 49.8		7 34.5	
	8.7		6.0		7.0		30.0		54.1		37.4	
	11.4		9.0		10.5		32.5		56.4		39.0	
	264	−3.55	16.8		211		891		1603		209	
	53 8.80	53 54 3.51	56 56.0	50 43 42.57	1 7.03	54 43 1.53	4 29.70	52 29 19.96	5 53.43	54 31 11.34	7 36.97	50 57 54.95
	+ 40.06	− 42	+ 34.48	− 32	+ 29.81	− 28	+ 31.82	− 27	+ 32.11	− 27	+ 44.04	− 32
	1.60241	− 98	1.53754	− 81	1.47436	− 1.32	1.50270	− 95	1.50664	− 42	1.64414	− 1.29
	9.77026	+1230	9.80136	+ 8.86	9.76164	+1321	9.78461	+10.76	9.76378	+12.98	9.79918	+ 9.12
	1.49557	+ .30	1.46153	+ .25	1.35860	+ 40	1.40991	+ 30	1.39302	+ 35	1.56592	+ .25
30		−39.30 40		−38.40 40		−39.00 55		−38.50 55		−39.30 55		25 −37.90
	3 34.2	53 31.86	2 57.7	43 8.62	4 45.1	42 31.04	3 23.1	28 47.75	1 32.9	30 41.13	4 37.9	57 21.04
	30.8		53.9		40.8		20.2		29.6		33.2	
	50		116		59		33		625		111	
	33 32.50		42 55.80		444 42.95		58 21.65		56 31.25		29 35.53	
	49 1585		39 5 5255		38 540		24 2670		26 1710		53 1280	
	53 54 34.81		50 44 11.51		54 43 24.36		52 29 45.66		54 31 36.06		50 58 31.76	
	− 31.30		− 28.94		− 22.83		− 25.70		− 24.72		− 36.81	
	53 59.32	52 56.6	56 50.86	43 33.6	1 46.92	41 56.5	5 11.82	28 13.5	6 35.49	30 7.0	8 31.45	56 47.1
Jan. 1		+11.37		+6.40		+12.39		+10.28		+12.78		+8.19
	53 40.8	7.87	56 32.6	4.90	1 28.5	8.89	4 53.7	6.78	6 17.8	9.25	8 13.7	4.69
	44.5		35.8		32.3		57.0		21.0		16.6	
	48.0		39.1		35.8		0.4		24.5		20.0	
	51.4		42.5		39.2		3.6		28.2		23.3	
	54.9		46.6		43.0		7.1		31.8		26.5	
	397		456		288		18		230		1001	
	53 47.94		56 39.12		1 35.76		5 0.86		6 24.60		8 20.02	
	+ 25.29	+24.32	+ 25.29	+24.42	+ 25.29	+24.28	+ 25.29	+24.37	+ 25.29	+24.30	+ 25.29	+24.42
	− .97		− .87		− 1.01		− .92		− .99		− .87	
	54 12.26	−11.84	57 3.54	−11.61	2 0.04	−12.09	5 24.73	−11.93	6 48.96	−12.17	8 44.46	
	− 0.97	−52.89	− 0.99	−52.50	− 1.07	−51.87	− 1.10	−51.42	− 1.19	−51.21	− 1.11	−11.85
	54 11.29		57 2.55		1 58.97		5 23.63		6 47.77		8 43.30	−60.94
	6.0		8.9		8.8		6.8		7.0		6.0	
	52 56.1		56 10.1		0 57.8		4 34.8		5 50.8		7 43.0	
	57.4		14.2		2.3		40.5		53.3		45.8	
	3.4		17.0		4.4		42.2		55.9		47.6	
	1789	−3.50	113		46		1175		95		164	
	52 59.63	53 54 1.83	56 13.77	50 44 43.84	1 1.53	54 43 2.12	4 39.17	52 29 20.63	5 53.17	54 31 12.15	7 45.47	50 57 54.07
	+ 48.31	− 61	+ 25.35	− 17	+ 34.23	− 30	+ 21.46	− 12	+ 31.43	− 2.56	+ 34.55	− 32
	1.68404	− 78	1.40398	− 54.4	1.53441	− 85.22	1.33224	− 63.98	1.49734	− 27.42	1.53845	− 85.32
	9.77026	+1232	9.80120	+ 8.90	9.76164	+1323	9.78461	+10.78	9.76378	+13.51	9.79918	+ 9.14
	1.57908	+ .29	1.32996	+ .21	1.42083	+ .31	1.24163	+ .25	1.38590	+ .31	1.46241	+ .22
30		−21.70 40		−21.00 40		−21.90 55		−21.50 55		−21.80 55		25 −21.00
	3 29.0	53 48.80	3 4.5	44 27.4	4 41.7	42 48.5 49.11	3 31.3	29 5.91	1 32.9	30 59.63	4 47.1	57 37.76
	26.6		1.1		37.4		26.6		30.2		42.8	
	16.5		56		791		599		31		99	
	33 28.25		43 2.80		444 39.55		58 29.95		56 31.55		29 44.95	
	49 20.10		39 48.55		38 8.80		24 18.40		26 1680		53 3.40	
	53 54 39.77		50 45 52.2		54 43 28.47		52 29 38.07		54 31 36.47		50 58 23.07	
	− 37.94		− 21.38		− 26.35		− 17.44		− 24.32		− 29.00	
	53 59.45	52 55.1	56 50.94	43 35.2	1 46.88	41 57.2	5 11.70	28 14.5	6 35.60	30 8.4	8 31.45	56 46.8

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1877. Dec. 31, Jan. 1

α	2 10 45 9 41.6 (22.5)	2 10 46 9 41.6	2 12 24 11 16.1		2 21 47	20 38.2
δ	49 55 50.8 8.1 9.2	49 55 50.8 8.1	53 56 50.8 6.5		54 59	54.0 6.5

Dec. 31 Ex 9 430 501

12 20.9	+12.35 8.80	21 45.0	+13.35 9.80
24.3		48.6	
27.9		52.0	
31.6		55.8	
34.8		59.5	
395		2609	
12 27.90		21 52.18	+.01
+ 24.75	38 +23.28	+ 24.76	38 +23.24
− 1.15		− 1.19	
12 51.20		22 15.45	
− 5.30	−8.15	− 5.55	−8.36
12 45.88	−33.68	22 9.82	−32.66

8.5 9.2 6.0 7.0

12 30.6		21 8.0	
34.1		11.7	
37.4		15.8	
121		55	
12 34.03	53 57 63.9	21 11.83	55 0 35.74
− 6.13	− 1	+ 40.35	− 42
0.78746	− 31	1.60584	− 56
9.76974	+12.37	9.75478	+13.93
0.67980	+ 30	1.48322	+ 40
	−38.30	685	−38.00
	56 36.89		

30 0 43.2	30 1 26.5	30 1 7.5	25 2 3.2
41.0	23.9	3.9	58.9
42	104	114	1223
30 42.10	31 25.20	31 5.70	27 1.15
52 6.25	51 23.15	51 42.65	55 47.20
49 57 25.21	49 56 42.11	53 57 1.61	55 21 6.16
		+ 4.78	− 30.42
		12 37.73 56 3.3	22 1.52 59 34.6

Jan. 1 Ex

10 22.7	+7.93 4.43	10 41.6 10 42.9	+7.94 +8.06 4.44 4.56	12 20.0 +12.50 9.00
25.9		44.9 46.0		23.7
29.2		48.0 49.8		27.2
32.5		51.3 52.6		30.6
35.6		54.5 55.7		34.0
1459		403 465		355
10 29.18		48.06 49.30		12 27.10
+ 25.29	+24.45	+ 25.29 +25.29	+24.43 +24.45	+ 25.30 +24.32
− 84		− 84 − 84	−11.80 −50.61	− .98
10 4.73		11 12.51 13.75		12 51.42
− 1.14	−11.79	−1.14 −1.14	−11.80	−1.20 −12.23
10 52.49	−50.61	11 11.37 12.61	−50.61	12 50.22 −50.37

29# 57 121# 53.85 22.60

8.6		8.0 9.2	49 56 51.05 48.40 6.0	
9 57.9		10 33.8 11 0.7	−25 6	12 22.1
2.2		36.2 3.6		26.0
6.0		385 2.8	+8.04 +8.04	28.4
81	49	106 121	+ 19 + 19	165
10 2.70	57 10.06	10 36.20 11 4.03	−20.70 −20.70	12 25.50 53 57 8.56
+ 26.48	− 19	+ 11.86 −14.73		+ 1.60 − 6
1.42292	− .11	1.07408 1.16820		1.20412 − .18
9.88852	+ 8.04	9.80852 9.80852		9.76974 +12.39
1.35122	+ .19	1.00738 1.10150		1.09864 + .29
30	− 20.70	30 30		30 − 21.60
0 36.3	56 53.79	28.1 0 36.3		0 59.5 56 55.96
34.2	CR 29#	25.5 34.2	CR 121#	56.9
105		136 105		164
30 35.25		31 26.80 30 35.25		30 58.20
52 13.10		51 21.55 52 13.10		51 50.15
49 57 32.77		49 56 41.22 57 32.77		53 57 9.82
− 22.71		−10.17 +12.63		− 1.26
10 40.70 56 3.2		+12.63 −10.17 10 59.8 11 0.81 56 15.8	57 55 47.0	12 38.00 56 5.6

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	h m s		h m s		h m s		h m s		h m s		h m s	
	2 23 52	22 43.6	2 33 4	31 59.1	2 38 45	37 35.0	2 45 43	44 31.8	2 57 12	55 59.8	2 58 36	57 24.9
8	53° 24′	19.4 / 9.0	53° 33′	28.5 / 9.4	53° 20′	16.3 / 8.0	53° 54′	49.7 / 8.8	54° 13′	8.7 / 8.8	53° 54′	49.6 / 9.4
Dec. 31		+11.48		+7.95		+11.52 +11.57		+12.03		+12.74		+11.84
	23 49.0	7.93	33 4.7	4.40	38 30.0 38 30.5	7.97 8.02	45 43.9	8.48	57 11.1	8.69	58 39.~~6~~	8.26
	52.7		8.1		33.6 34.0		47.2		14.7		38.9	42.4
	56.0		11.2		37.0 37.4		51.0		18.3		42.5	42.5
	59.8		14.7		40.5 40.9		54.5		21.8		46.~~0~~	42.5
	3.2		18.0		44.0 44.4		57.8		25.4		49.5	
	23 07		33 5.67		37 51 37 2.72		45 44		57 4.13		58 1.30	42.47
	23 56.14		33 11.34		37 02 38 34.44		45 50.88		57 18.26		58 42.~~80~~	
	+ 24.46 38+23.31		+ 24.~~67~~ 38+23.43		+ 24.~~07~~ 38+24.72 38+23.32+23.32		+ 24.~~98~~ 38+23.30		+ 24.~~78~~ 38+23.28		+ 24.~~48~~ 38+23.29	
	1.12		1.00		1.11 1.11		1.14		1.15		1.14	
	24 19.48		33 34.81		38 27.~~30~~ 38 0.38 ~~1.80~~		46 14.22		57 44.60		59 5.~~44~~76	
	- 5.47		- 5.30		- 5.74 - 5.74		- 5.90		- 6.13		- 6.12	
	24 13.~~93~~ 8		33 29.21		38 54.~~55~~ 54.~~97~~		46 8.28		57 35.~~36~~ 41		58 59.~~77~~ 64	
	35		37		53 25 58.51 26 8.13		9.1		9.2		9.4	
	28 21.3		32 40.2		38 18.8 38 31.0		45 20.2		56 57.3		58 12.4	
	24.9		42.6		21.4 34.4		23.8		1.7		15.6	
	28.0		45.8		25.1 37.7		26.4		4.6		19.1	
	142		86.50		53 131		105		36		171	
	23 24.73 53 26 22.39		32 42.87		34 50.59 21.77	34.37	45 23.50 53 56 9.38		57 1.20 54 15 19.64		58 16.70 53 55 24.75	
	+ 31.41	− 26	+ 28.47	− 21	+ 15.25 + 3.6	25 30.18 3985	+ 27.38	− 19	+ 17.06	− 7	+ 26.50	− 19
	1.49707	− 36	1.45439	− 81	N18327 048714		1.43743	− 45	1.23198	− 73	1.42 ~~2625~~ 479	− 67
	9.77507	+ 11.80	9.80 274	+ 8.72	9.77567 9.77507		9.76991	+12.37	9.76660	+12.44	9.77 009	+12.37
	1.39474	+ .30	1.37973	+ .25	1.08074 0.38481		1.32994	+ 30	1.12118	+ 30	1.32 ~~244~~ 0 85	+ 30
Rds=-28	0	−37.40	50	−36.10	0		30	−35.90	10	−34.96	30	− 31.40
n=-.83	1 21.11	25 52.92	2 54.1	34 18.89	1 57.7		1 38.0	55 41.96	2 36.8	14 53.43	2 22.9	54 58.~~41~~
	18.8		57.41		55.8		35.1		32.1		20.2	
	402		55		135		131		89		31	
+5′ 18.96	1 20.10		52 52.75		1 56.75		31 36.55		12 34.45		32 21.53	
	21 28.25		29 55.60		20 51.60		51 11.80		10 13.90		30 26.86	
	53.26 47.21		50.35 14.56		53 26 10.56		53 56 30.76		54 15 32.86		53 55 45.76	
	− 2482		− 2497		− 1205		− 2138		− 1322		− ~~2701~~	
	77				− 243 24 59.3					55 38.4	− 2091	
	24 5.67	25 20.5	33 21.11	33 47.4	38 46.16	25 9.0	45 59.70	55 11.9	57 26.67	14 24.8	58 50.~~91~~	54 29.9
Jan. 29				+8.42	46.~~58~~ 47.38	+11.65 +11.83		+12.41		+12.69		
			32 32.4	9.24	37 ~~57.5~~ 37 57.8	12.47 12.65	45 11.6	13.23	56 18.6	13.51		
			35.3		1.1 1.4		14.8		22.0			
			38.7		4.6 4.9		18.4		25.5			
			42.0		7.9 8.1		21.7		29.0			
			45.5		11.6 11.8		25.5		32.7			
			43.9		227 240		420		12.78			
			32 38.78		4.54 4.80		45 18.40		56 23.56			
			+ 5.18	+ 5.30	+ 5.~~6~~18 + 5.~~6~~.18	+ 53.20 + 53.20	+ 5.~~6~~.18	+ 5.~~6~~.18	+ 5.~~6~~.19	+ 5.~~5~~.18		
			− .88		− .98 − .98		− 1.00		− 1.01			
			33 34.08		38 ~~59~~.74 39 0.00	− 12.66 − 46.26	46 13.58		57 20.74			
			− 0.83	− 12.24	− 0.87 − 0.87		− 0.97	− 12.86	− 1.13	− 13.10		
			33 33.25	− 47.19	38 58.67 ~~59.53~~ 59.13	− 12.66 − 46.26	46 12.61	− 45.06	57 19.61	− 42.99		
			9.5		8.2 8.9		8.8		9.0			
			32 7.7		37 21.0 37 31.0		44 44.0		55 57.0			
			11.6		23.8 33.8		46.7		0.8			
			14.4		26.8 36.8		49.8		4.0			
			37.50	+ 0.82	116 116.53 26		205		13			
			32 11.28	34 47.47	238.7 33.57	25 55.55 3.25	44 46.83	53 56 38.7	56 0.43	54 15 4.52		
			+ 27.55	− 20.40	+ 30.93 − 43 − 25		+ 31.57	− 26	+ 25.13	− 16		
			1.42 1612	− .5~~48~~4	1.~~6~~0927 1.49038	− .~~31~~48 − .3148	1.49923	− .3148	1.40019	− .5048		
			9.80 274	+ 8.98	9.77507 9.77507	+ 12.15 + 12.15	9.76991	+ 12.73	9.76660	+ 13.09		
			1.36764	+ .18	1.50912 1.39073	+ .24 + .24	1.39396	+ .25	1.29157	+ .26		
			50	− 21.20	0	− 22.10 − 22.30		− 22.30	10	− 22.40		
Rds=-~~28~~.18			2 56.8	34 35.51	1 38.9 25 45.92 25 53.80		1 38.6	55 54.80	2 43.1	14 55.63		
n=-~~.83~~.74			1.7		45.5		1.42		48.8			
+5 21.69			11.85		8.44		8.28		11.9			
			52 59.25		1 42.20		31 41.40		12 45.95			
			29 49.10		21 6.15		51 6.95		10 2.40			
			50 35 10.79		53 26 27.84		53 56 28.64		54 15 24.09			
			− 23.32		− 32.29		− 24.77		− 19.57			
					− 24.59							
			33 21.01	33 48.3	38 46.21 46.47	24 59.7 25 7.5	45 59.75	55 9.6	57 6.51	14 12.6		

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613 621

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	h m s		h m s		h m s		h m s		h m s		h m s	
α	3 2 39	1 25.9	3 11 58	10 49.8	3 14 6	12 57.7	3 16 12	15 3.2	3 17 58	16 49.4	3 23 5	21 50.2
δ	54° 2'	53 57.7	51° 6'	2.9	51° 41'	37.6	51° 34'	30.2	51° 43'	39.2	53° 49'	45.1
		9.5		8.3		8.7		9.3		8.8		8.4

Dec. 31

	+11.46		+8.27		+10.18		+9.13		+9.23		+11.51	
2	36.0	7.91	12 0.3	4.72	14 8.3	6.63	16 15.8	5.78	18 1.8	5.68	23 4.8	8.26
	38.8		3.5		11.7		19.0		5.1		8.8	
	43.4		6.7		14.7		22.1		8.1		12.0	
	46.8		10.1		18.0		25.8		11.8		15.8	
	50.6		13.4		21.4		28.8		15.3		18.7	
	167		340		741		1116		421		98	
2	43.34		12 6.80		14 14.82		16 22.32		18 8.42		23 11.96	
+	24.51	38+23.28	+ 24.51	38+23.41	+ 24.51	38+23.38	+ 24.51	38+23.38	+ 24.51	38+23.38	+ 24.51	38+23.30
−	1.15		− 1.03		− 1.05		− 1.05		− 1.05		− 1.14	
3	6.68		12 30.27		14 38.27		16 45.78		18 31.88		23 35.33	
	− 6.21		− 6.14		− 6.21		− 6.24		− 6.28		− 6.52	
	26.32	8.78	12 24.07	7 8.61	14 31.94	9 8.68	16 39.41	6 8.69	18 25.47	8.73	23 29.00	8.98
3	0.36	26.80		26.80		26.54		26.24	52	26.00	8	25.34
	41										74	

26			8.5		6.8		9.4		6.8		8.5	
2	13.9		11 26.2		14 4.3		15 42.6		17 34.5		22 51.8	
	17.0		28.6		7.1		45.8		38.0		53.1	
	19.9		32.0		10.0		48.0		40.7		57.6	
	208		878		214		164		1132		145	
2	16.93	54 3 30.7	11 20.27	51 8 15.38	14 7.13	51 42 46.99	15 45.47	51 35 27.69	17 37.73	51 44 49.21	22 54.83	53 50 24.55
	+26.41	− 18	+ 37.53	− 38	+7.69	− 2	+36.85	− 36	+30.69	− 26	+ 17.13	− 7
	1.421744	− 120	1.574138	− 92	0.885903	− 6	1.566441	− 62	1.487700	− 81	1.233776	− 70
	9.768550	+ 12.54	9.791762	+ 9.32	9.792108	+ 9.96	9.793335	+ 9.81	9.791176	+ 1.00	9.770795	+ 12.28
	1.312891	+ 30	1.494960	+ 25	0.800061	+ 30	1.482391	+ 30	1.401361	+ 30	1.127311	+ 30
		−34.30		−32.80		−32.70		−32.50		−32.40		−32.20
20		15		45		50		40		35		
4	17.9	3 4.32	4 22.9	7 47.30	4 49.49	42 20.92	2 16.2	35 0.77	2 54.9	44 22.49	2 31.1	50 0.61
	14.2		18.5		13.79		7.3		50.9		27.6	
	12.1		41.4		28.0		18.5		58		58.7	
24	16.05		19 20.70		45 14.00		52 9.25		42 52.90		37 29.35	
58	32.30		3 27.65		37 34.35		30 39.10		39 55.45		45 19.02	
54 3	51.26		51 8 46.61		51 42 53.31		51 35 58.06		51 45 14.91		53 50 37.96	
	− 20.55		− 31.23		− 6.32		− 30.37		− 25.20		− 13.41	
	2 51.63	2 36.3	12 15.46	7 20.5	14 23.31	41 54.4	16 30.57	34 34.5	18 16.79	43 56.5	23 19.76	49 35.3

Jan. 29

	+12.12				+9.34		+9.69					
2	4.5	1294			13 35.9	10.16	15 43.3	10.51				
	7.4				39.2		46.5					
	10.1				42.5		50.0					
	14.0				45.8		53.0					
	18.2				49.1		56.8					
	548				21.25		496					
2	10.96				13 42.50		15 44.92					
+	56.19	+53.18			+56.20	+33.28	+ 56.20	+53.24				
−	1.01				− .92		− .92					
3	6.14				14 37.78	1303	16 45.20					
	− 1.20	−13.18			− 1.33	37.81	− 1.36	−13.04				
3	4.94	−42.00			14 36.45		16 43.84	−39.36				
							184					

26					8.5		9.0					
1	32.5				13 11.7		15 21.0					
	40.4				14.0		24.0					
	44.3				17.8		27.7					
	22				135		127					
1	40.73	54 3 27.20			13 14.50	51 42 46.52	15 24.23	51 35 22.61				
	+30.23	− 23			+28.00	− 21	+25.69	− 18				
	1.480444	−777.20			1.447416	− 90.40	1.409776	− 43.67				
	9.768522	+ 12.87			9.792208	+ 10.24	9.792335	+ 10.09				
	1.373774	+ .25			1.364022	+ .21	1.327891	+ .21				
20		−2230.45			40	−21.54.50		−21.40				
41	16.9	3 17.84	8	1.49	4 57.9	42 35.18	2 23.2	35 11.72				
	21.5			13.1	2.9		29.1					
	384				1208		123					
24	19.20				45 0.40		52 26.15					
58	29.15				37 4.95		30 22.20					
54 3	50.84				51 43 9.44		51 35 48.89					
	− 23.14				− 23.12		− 21.28					
	2 51.76	2 35.8			14 23.42	41 55.4	16 30.80	34 32.4				

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	3 23 58.3	22 44.6	3 27 33	26 17.8	3 32 17	31 4.8 7.4	3 33 31	32 20.9	3 34 6	32 49.7	3 36 20	35 4.1		
δ	51° 27′	232 9.5	54° 7′	3.5 9.0	54° 11′	49 9.3	51° 15′	120 8.3	53° 7′	4.0 9.0	53° 30′	27.1 8.0		
Dec. 31		+8.87		+11.51		216 +12.70		+9.31		+11.62		+11.58		
	23 57.4	5.32	27 34.6	7.96	32 26.6	9.15	33 34.8	5.76	34 5.0	8.07	36 20.8	8.03		
	0.6		37.8		25.1		38.2		8.7		24.7			
	3.8		41.7		28.5		41.6		14.3		27.8			
	8.0		45.0		32.0		44.8		16.0		31.4			
	10.7		48.4		35.8		48.0		19.0		34.8			
	4 205		76		420		74		630		392			
	28 410		27 41.52		32 28.60		33 41.48		34 12.60		36 22.84			
	+ 24.5	38+23.38	+ 24.5	38+23.28	+ 24.5	38+23.28	+ 24.5	38+23.40	+ 24.5	38+23.38	+ 24.5	38+23.31		
	− 1.05		− 1.15		− 1.15		− 1.04		− 1.10		− 1.12			
	24 27.56		28 4.89		32 51.97		34 4.96		34 36.02		36 51.25			
	− 6.35	−8.75	− 6.63	−9.00	− 6.70	−9.11	− 6.48	−8.82	− 6.63	−9.01	− 6.70	−9.08		
	24 21.05 13	−25.22	27 58.12 7	−24.72	32 45.18	−24.06	33 58.34 40	−23.88	34 29.25 30	−23.82	36 44.40 5	−22.50		
	9.5		8.6		9.3		8.7		9.3		8.4			
	23 38.7		27 6.8		32 27.6		33 16.5		34 33.0		35 52.6			
	40.2		11.0		33.5		20.4		37.6		56.2			
	42.7		13.5		36.3		22.9		41.0		58.7			
	16	−3.55	014		94	27	598		1116		175			
	23 40.53	51 29 23.99	27 10.47	54 8 33.59	32 33.13	54 12 8.43	33 19.93	51 16 40.48	34 37.20	53 8 22.18	35 55.83	53 31 19.42		
	+23.57	− 15	+31.05	− 25	− 4.73	− 1	+21.55	− .13	−24.60	− 16	+32.01	− 27		
	1.37236	− 95	1.49206	− 1.18	0.62 4567	− 28	1.33345	− 31	1.39094	− 3	1.50529	− 39		
	9.79431	+ 9.72	9.76765	+ 1264	9.96712	+ 1269	9.79621	+ 9.50	9.77812	+ 1151	9.77422	+11.94		
	1.28927	+ 25	1.38231	+ 30	0.56458	+ 30	1.25226	+ 25	1.29166	+ 30	1.40211	+ 30		
	55	−32.76	15	−32.50	15	−31.20	10	−30.60	20	−30.80	55	−30.70		
	3 25.5	31.60	4 12.0	31.70	1 4.2	11 46.38	1 11.4	16 15.64	0 5.9	7 59.45	1 23.2	30 56.15		
	22.2	28 57.71	7.2	8 9.85	0.9	22	6.5		3.5		20.1			
	77		192		51		179		94		33			
	58 23.85		19 9.60		16 2.55		11 8.95		20 4.70		58 21.65	+1"		
	24 24.50		3 38.75		6 45.80		11 39.40		2 43.65		26 26.40			
	51 29 43.46		54 8 57.71		54 12 47.6		51 16 58.36		53 8 26.1		53 31 45.66			
	− 19.47		− 24.12		+ 3.67 51		− 17.88		+ 19.57		− 25.24			
	12					22						382		
	24 18.38	28 32.5	27 49.11	7 45.1	32 36.07	11 17.2	33 49.58	15 51.8	34 20.29	7 35.6	36 35.37	30 32.6		
Jan. 29														

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1877. Dec. 31, Jan. 29.

	h m s		h m s		h m s		h m s	
α	3 37 41	36 25.1	3 39 0	37 43.7	3 41 32	40 15.8	3 45 29	44 18.4
δ	53° 33′	29.9 / 9.4	53° 26′	22.7 / 9.0	53° 9′	6.4 / 8.7	51° 6′	3.2 / 9.0

Dec. 31

	+12.08		+11.74		+11.02		+9.48	
	37 42.0	8.53	39 1.5	8.19	41 32.2	7.41	45 33.5	3.93
	49.4 45.8		4.9		35.7		36.8	
	49.2 49.2		8.2		38.0		40.0	
	49.3 52.8		11.6		42.5		43.2	
	49.5 56.4		15.3		45.8		46.6	
	4.63		4.15		19.52		01	
	37 49.26	49.35	39 8.30		41 39.04		45 40.02	
	+ 24.53	38+23.31	+ 24.53	38+23.32	+ 24.53	38+23.32	+ 24.53	38+23.40
	− 1.12		− 1.12		− 1.11		− 1.03	
	38 12.66		39 31.71		42 2.46		46 3.52	
	− 6.73		− 6.73		− 6.75		− 6.63	
	38 5.79 93	−9.09	39 24.89	−9.09	41 55.60 56	−9.08	45 56.74 79	−8.91
	84	−23.32		−23.12	55.61	−22.76		−22.18
	9.2		8.6		8.5		8.9	
	37 17.8		38 43.0		41 5.0		45 18.6	
	19.5		46.2		8.8		22.7	
	22.4		48.8		11.6		25.8	
	592	431.62	180		255		81	
	37 19.73	53 37 29.19	38 46.00	53 26 44.80	41 8.50	53 10 33.29	45 22.70	51 7 48.25
	+ 23.53 62	− 22	+ 22.30	− 13	+ 30.57	− 24	+ 17.32	− 8
	1.47 026	− 6	1.34 830	− 31	1.48 487	− 62	1.23 855	− 3
	9.77 302	+ 1206	9.77 490	+ 11.88	9.77 761	+ 1158	9.79 762	+ 9.34
	1.36 588	+ 30	1.24 580	+ 30	1.38 508	+ 30	1.15 877	+ 25
	50 14.6	− 3050	0	− 3030	15	− 3000	20	− 29.20
	83 4.6	37 7.21	7.4	26 21.89	2 11.6	10 10.76	0 6.5	7 24.98
	10.2	34 9.65	4.0		7.9		2.8	
	4.8		11.11		19.5		9.3	
	583 4.9	12.40	1 5.70		17 9.75		20 4.15	
	29.32 3.45	35.85	21 41.65		5 38.60		2 43.70	
	53 37 4.21	54.91	53 27 1.61		53 10 57.56		51 8 2.66	
	− 23.28	9	− 14.61		− 24.27		− 14.41	
	37 56.84	33 46.3	39 15.80	25 58.8	41 46.53	9 48.0	45 47.88	7 2.8

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1877. Dec. 29 1878. Jan. 29. Ob. W.A.R. Rec. & F.M. 98.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	4 31 29	30 10.0	4 33 10	31 51.4	4 35 14	33 55.2	4 35 56	34 37.1	4 37 43	36 24.4	4 39 14	37 55.0		
δ	54° 25′	22.5 / 8.0	53° 49′	47.0 / 9.0	53° 24′	22.0 / 9.0	55° 2′	54 59.9 / 9.2	54° 35′	32.7 / 8.8	54° 58′	56.0 / 8.9		
Dec. 29		+19.46		+14.49		+11.01		+13.87		+12.68		+12.29		
	31 33.0	8.48	33 15.3	7.31	35 18.1	7.83	36 3.0	9.69	37 49.2	8.50	39 20.1	8.71		
	36.4		18.6		21.7	6.	6.5		52.9		23.6			
	40.0		22.0		25.0		10.2		56.4		27.5			
	43.6		25.5		28.7		14.2		59.9		30.7			
	47.0		28.3		32.0		17.7		3.5		34.5			
	00		107		255		516		2819		364			
	31 40.00		33 22.14		35 25.10		36 10.32		37 56.38		39 27.28			
	+ 23.16	+22.13	+ 23.16	+22.15	+ 23.16	+22.16	+ 23.16	+22.10	+ 23.16	+22.12	+ 23.16	+22.10		
	− 1.03		− 1.01		− 1.00		− 1.06		− 1.04		− 1.06			
	32 2.13		33 44.29		35 47.26		36 32.42		38 18.50		39 49.38			
	− 7.54	−9.61	− 7.48	−9.54	− 7.46	−9.50	− 7.67	−9.72	− 7.65	−9.67	− 7.69	−9.73		
	31 55.59	−15.08	33 36.81	−14.80	35 39.80	−14.46	36 24.75	−14.32	38 10.85	−14.06	39 41.69	−13.80		
	54													
	8.6		9.0		8.8		9.2		8.8		9.0			
	31 15.5		32 43.0		34 46.6		35 55.0		37 27.2		38 51.9			
	20.2		47.3		50.0		57.4		30.7		55.2			
	22.6		50.9		54.3		59.9		33.6		58.3			
	5.83		2.12		0.09		2.23		0.12		1.54			
	31 19.43	54 25 5663	32 47.07	53 50 0.40	34 50.30	53 24 5470	35 57.43	55 2 4241	37 30.40	54 35 4039	38 55.13	54 57 5577		
	+20.57	− 11	+35.67	− 32	+34.80	− 32	+12.89	− 5	+25.98	− 17	+32.15	− 27		
	1.313 23	− 53	1.54 4924	− 73	1.54 158	− 76	1.11 025	− 6	1.41 4664	− 59	1.50 718	− 134		
	9.76 466	+1295	9.77 095	+1224	9.77 524	+ 11.79	9.75 805	+ 1358	9.76 289	+1309	9.75 895	+ 1350		
	1.200 49	+ 35	1.43 842	+ 30	1.43 942	+ 36	0.990 90	+ 40	1.300 13	+ 35	1.38 873	+ 40		
	0	−2300	35	−2270	0	−2240	25	−2252	50	−2210	25	− 2200		
n = −.74	1 52.6	25 42.11	2 37.1	49 45.01	2 42.9	24 39.13	0 12.8	2 29.60	2 5.2	35 26.79	4 45.8	57 41.88		
	55.0		39.8		45.3		15.4		6.7		46.3			
	76		169		82		82		119		121			
+5′ 17.″95	1 53.80		37 38.45		2 44.10		25 14.10		52 5.95		29 46.05			
	20 54.55		45 9.90		20 4.25		57 34.25		30 4.40		53 2.30			
	54 26 12.50		53 50 27.85		53 25 22.20		55 2 52.20		54 36 0.35		54 58 20.25			
	− 15.87		− 27.45		− 27.50		− 9.79		− 19.96		− 24.48			
	31 44.98	25 27.0	33 27.27	49 30.2	35 30.30	24 24.7	36 15.03	2 15.3	38 1.18	35 12.7	39 32.96	57 28.1		
		+13.09		+12.16		+11.67		+14.23		+13.13		+13.16		
Jan. 29	30 59.6	13.91	32 41.8	12.98	34 44.8	12.49	35 28.9	15.05	37 16.0	13.95	38 46.8	13.98		
	3.1		45.3		48.2		33.2		19.6		50.4			
	6.6		48.7		51.8		36.8		23.0		54.0			
	10.1		52.3		55.3		40.4		26.8		57.6			
	13.8		55.8		58.8		44.0		30.3		1.5			
	3.32		440		90		3 44.3		1157		2704			
	31 56.64		32 48.80		34 51.80		35 38.86		37 23.14		38 54.08			
	+ 5623	+55.21	+ 5623	+55.23	+ 56.24	+55.25	+ 5624	+55.18	+ 5624	+55.21	+ 5624	+55.18		
	− 1.02		− 1.00		− 99		− 1.06		− 1.03		− 1.06			
	32 1.85	−1441	33 44.03	−14.32	35 47.05	−14.26	36 32.00	−14.57	38 18.35	−14.50	39 49.28	−14.59		
	− 2.37	−22.62	− 2.37	−22.20	− 2.38	−21.69	− 2.45	−21.48	− 2.45	−21.06	− 2.49	−20.70		
	31 59.48		33 41.66		35 44.67		36 29.59		38 15.90		39 46.77			
	8.4		9.0		8.8		9.2		8.8		8.8			
	30 36.0		32 16.6		34 16.8		35 23.7		36 47.0		38 23.1			
	38.7		19.3		21.0		27.2		57.1		26.5			
	41.3		21.5		25.0		30.9		54.9		30.8			
	11.60	+0.82	5.74		28		8.18		30		8.04			
	30 38.67	54 25 5531	32 19.13	53 49 5990	34 20.93	53 24 5442	35 27.27	55 2 41.72	36 51.00	54 35 3938	38 26.80	54 57 5612		
	+27.94	− 20	+26.77	− 23	+ 30.87	− 25	+ 6.50	− 3	+ 32.14	− 27	+27.28	− 19		
	1.44 4664	− 3453	1.47 2332	− 5078	1.48 954	− 5079	0.98 182	− 058	1.50 7052	− 3856	1.43 584	− 881.37		
	9.76 466	+ 1847	9.77 095	+ 1264	9.77 524	+ 12.18	9.75 805	+ 1403	9.76 289	+ 13.52	9.75 895	+ 13.95		
	1.336 13	+ 26	1.36 805	+ 25	1.38 956	+ 24	0.864 65	+ 28	1.394 72	+ 26	1.31 957	+ 28		
	0	−1990	35	−1960	0	−1940	25	−1980	50	−1960	25	−1960		
η = −.784	1 50.2	25 49.32	2 44.1	49 53.28	2 49.0	24 47.51	0 18.3	2 36.97	2 3.8	35 33.73	4 57.2	57 50.50		
	55.9		49.5		53.2		23.7		7.9		54.9			
	61		136		1022		420		117		61			
+5″ 21.69	1 53.05		37 46.80		2 51.10		25 21.00		52 5.85		29 53.05			
	20 55.30		45 1.55		19 57.25		57 27.35		30 42.50		52 55.30			
	54 26 14.99		53 50 23.24		53 25 18.94		55 2 49.04		54 36 4.19		54 58 14.99			
	− 21.68		− 23.34		− 24.52		− 7.32		− 24.81		− 20.87			
	31 45.07	25 26.7	33 27.34	49 31.1	35 30.41	24 25.8	36 15.02	2 15.5	38 1.40	35 12.7	39 32.18	57 29.8		

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1877phae.proj.1607R

1877, Dec. 29, Jan. 29

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	4 40 16	38 57.2	4 41 8	39 49.0	4 55 9	53 49.2	4 56 25	55 5.1	4 57 36	56 16.2	5 3 41	2 20.0
δ	54° 23′	21.1 9.0	54° 47′	44.6 9.0	53° 12′	14.1 9.2	53° 21′	18.6 8.7	53° 3′	0.7 8.0	54° 38′	36.0 8.5

53 46.8 7.7

Dec. 29

		+12.45			+12.98			+11.58			+11.03			+10.08			+12.99			
	40 22.0	7.97		41 14.5	8.80		55 14.0	7.40		56 28.3	6.85		57 39.5	5.90		4 46.7	8.81			
	25.7			18.4			17.6			32.6			42.8			50.3				
	29.0			21.6			20.8			35.9			46.5			53.9				
	32.6			25.5			24.4			31.2			49.9			57.6				
	36.2			29.2			27.8			42.8			53.5			1.0				
	455			92			46			1798			322 3.32			2645				
	40 29.10			41 21.84			55 20.92			56 35.96			57 46.64			3 53.90			
	+ 23.16	+22.13		+ 23.16	+22.11		+ 23.16	+22.17		+ 23.16	+22.17		44			+ 23.16	+22.12			
	− 103			− 105			− .99			− .99			+ 23.16	+22.18		− 1.04				
	40 51.23			41 43.95			55 43.04			56 58.13			− .98			4 16.02				
	− 7.63	−9.66		− 7.69	−9.71		− 7.84	−14.37		− 7.66	−14.40		58 8.62			− 7.89	−9.80			
	40 43.60	−13.62		41 36.26	−13.70		55 35.20	−16.71		56 50.47	−16.41		− 7.65			4 8.13	−9.70			
													58 0.97							
	8.8			8.3			9.2			8.5			8.4			8.2				
	39 59.5			41 36.8			54 49.3			56 2.5			57 10.0			3 24.2				
	1.9			40.3			52.7			6.1			14.3			28.8				
	6.2			42.5			56.0			9.0			17.8			31.9				
	76			1196			80			176			121			849				
	40 2.53	54 24 36.65		41 39.87	54 46 9.64		54 52.67	53 12 26.11		56 5.87	53 20 6.32		57 14.03	53 2 50.66		3 28.30	54 36 40.29			
	+ 26.57	− 19		−18.03	− 8		+28.25	− .21		+30.09	− 24		+32.41	− 27		+25.60	− 17			
	1.42439	− 90		1.25600	− 62		1.45102	− 7		1.47842	− 73		1.51068	− 1.34		1.40824	− 31			
	9.76484	+12.89		9.76111	+1.328		9.77744	+11.56		9.77609	+11.70		9.77896	+11.39		9.76271	+13.12			
	1.31183	+ .35		1.13971	+ .40		1.35106	+ .30		1.37711	+ .30		1.41224	+ .30		1.29355	+ .35			
	0	−21.70	40		−21.60	15		−19.30	5		−19.10	20		−18.90	50		−17.80			
	3 8.1	24 22.92	2 9.1		45 56.84	0 17.9		12 14.21	2 35.2		19 5.407	4 48.9		2 37.66	1 5.8		36 31.30			
	10.2		11.8			17.6			37.1			50.7			6.9					
	18.3		20.9			15			12.3			9.94			12.7					
	3 9.15		42 10.45			15 7.75			7 36.15			241 49.80			51 6.35					
	19 39.20		40 37.90			7 30.60			15 12.20			57 58.55			31 42.50					
	54 24 57.15		54 45 55.85			53 12 48.55			53 20 30.15			53 3 16.50			54 36 59.95				
	− 20.50		+ 13.79			− 22.44			− 23.83			− 25.84			− 19.66				
							53 49.2 10.1													
	40 33.94	24 9.3	41 26.55	45 43.1		55 21.08	12 25.5									3 58.33	36 21.6			
Jan. 29		+12.88		+13.64		11 57.5	+11.98				+11.61			+10.92			+13.19			
	39 48.7	13.70	40 41.6	14.46		54 40.6	12.80		55 55.8	12.43		57 6.3	11.74		3 13.5	14.01				
	52.2		44.8			44.0			59.3			8.7			17.0					
	55.8		48.7			47.6			3.0			13.0			20.5					
	59.5		52.3			50.9			6.2			16.6			24.2					
	3.0		55.9			54.4			9.5			20.0			27.9					
	279.2		433			2375			138			656			31					
	39 55.84		40 48.66			54 47.50			56 2.76			57 13.12			3 20.62					
	+56.24	+55.22	+ 56.24	+55.20		+ 56.25	+25.27		+ 56.25	+25.27		+ 56.25	+25.28		+ 56.25	+55.22				
	− 102		− 104			− .98			− .98			− .97			− 103					
	40 51.06		41 43.86	−14.57		55 42.77	− .37		56 58.03			58 8.40			4 15.84					
	− 2.48	−14.40	− 2.50	−20.55		− 2.60	−14.67		− 2.62	−14.40		− 2.62	−14.35		− 2.76	−14.70				
	40 48.58	−20.43	41 41.36			55 40.17	−16.71		56 55.41	−16.41		58 5.78	−16.11		4 13.08	−14.55				
	9.0		8.6			9.3			8.6			8.5			8.3					
	39 31.7		40 38.7			54 24.5			55 30.5			56 42.0			2 36.0					
	35.0		42.9			27.3			33.2			45.3			38.4					
	39.0		46.0			29.5			36.6			47.8			42.7					
	157		86			213			103			151			1171					
	39 35.23	54 24 36.46	40 42.57	54 46 10.19		54 27.10	53 12 25.00		55 33.43	53 20 3.45		56 45.03	53 2 50.43		2 39.03	54 36 48.44				
	+20.61	− 11	+5.74	− 1		+20.40	− 11		+29.33	− 23		+28.09	− 21		+41.59	− 44				
	1.31408	−5.982	0.76268	−.3458		1.30963	−.098		1.46731	− 4.976		1.44855	−.88.35		1.61896	−18.28				
	9.76484	+ 13.32	9.76111	+13.72		9.77744	+11.95		9.77609	+ 1209		9.77896	+11.78		9.76271	+13.55				
	1.20370	+ .26	0.64857	+ .27		1.21185	+ .23		1.36818	+ .24		1.35229	+ .23		1.50648	+ .26				
	0	−19.40	40	−19.50	15		−18.30	5		−18.20	20		−18.10	50		−18.10				
	3 15.4	24 30.76	1 53.1	46 5.15		0 26.4	12 19.50		2 40.4			19 5.768	4 54.8		2 44.07	0 57.9		36 14.35		
	19.8		57.4			31.1			46.1				59.4			1.1				
	152		168			575			65				142			1190				
	3 17.60		41 55.40			15 28.75			7 43.25				241 57.10			50 59.50				
	19 30.75		40 52.95			7 19.60			15 5.10				57 51.28			31 48.85				
	54 24 52.44		54 46 14.64			53 12 41.29			53 20 24.79				53 3 12.94			54 37 10.54				
	− 15.98		− 4.45			− 16.29			− 23.34				− 22.51			− 32.10				
	40 34.10	24 10.3	41 26.79	45 44.6		55 25.80	12 2.8		56 41.01	19 41.3		57 51.43	2 28.0		3 58.38	36 19.8				

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1877phae.proj.16i7R

612 621 100

1877 Dec. 29. 1878 Jan. 29. Obs. W. A. R. Rec. J. F. M.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	5 4 29	3 8.4	5 9 30	8 9.1	5 12 20	10 59.3	5 13 19	11 57.8	5 17 12	15 51.1	5 17 51	16 29.7
δ	53° 4′	1.6 6.5	53° 51′	48.6 9.0	53° 25′	22.9 9.0	53° 14′	12.1 9.0	53° 40′	38.3 8.7	54° 0′	53 58.9 9.3

Dec. 29

	4 31.2 34.5 38.0 41.2 45.0	+10.61 6.43	9 32.6 36.2 39.6 43.2 46.7	+11.37 7.19	12 27.8 31.1 34.9 38.3 41.7	+11.05 6.87	13 22.0 25.6 29.0 32.5 35.8	+11.10 6.92	17 17.0 20.7 24.2 27.6 31.1	+10.81 6.63	17 [55.5] 58.1 2.5 5.9 9.4	+11.72 7.54
	399		483		1738		449		1206		1235	
	4 39.8 + 23.16 − .98	+22.18	9 39.66 + 23.16 − 1.01	+22.185	12 34.76 + 23.15 − 1.00	+22.115	13 28.98 + 23.15 − .99	+22.16	17 24.12 + 23.15 − 1.01	+22.15	18 [2.50] + 23.15 − 1.02	+22.13
	5 0.16	−9.60 −9.58	10 1.81	−9.71 −8.72	12 56.91	−9.67 −8.24	13 51.14	−9.65 −8.08	17 46.27	−9.72 −7.40	18 [24.88] 55	
	4 [53.46] 52.		9 53.98		12 49.10		13 43.35		17 [38.40] 38.		18 16.40 62	−9.76 −7.28
58	4 18.6 23.3 28.5 704	−4.18	9.0 10 0.8 4.8 9.0 147		9.0 11 58.5 2.4 5.0 69		8.9 12 58.7 3.0 7.3 100		8.7 16 43.1 47.1 50.2 1404		9.0 17 48.3 52.0 56.4 67	
	4 23.47 + 14.91 1.16167 9.77879 1.06306	53 4 5.04 − 5 − 106 +1142 + 30 −17.80 35	10 4.90 − 25.24 1.40209 9.77095 1.29564	53 49 52.00 − 16 − 1.01 + 12.24 + 30 −17.100	12 2.30 + 32.46 1.51135 9.77524 1.40919	53 24 51.59 − 27 − .98 + 11.80 + 30 −16.60	13 2.33 + 25.65 1.40909 9.77677 1.30846	53 15 30.15 − 17 − 64 + 11.61 + 30 −16.40	16 46.80 + 37.32 1.57194 9.77285 1.46739	53 38 29.66 − 37 − 1.15 + 12.03 + 30 −15.80	17 52.23 + 10.27 [1.01] 9.76926 [0.0339] −15.80	53 59 29.74 − 3 − .98 + 12.43 + 30 −15.70
20	3 49.0 50.4 8 994 23 49.70 58 38.65	3 53.67	3 33.41 34.7 81 38 34.05 44 14.30	49 42.09	2 47.8 50.3 981 2 49.05 19 59.30	24 41.86	2 [11.4] 17.2 116 12 15.80 10 3255	15 20.67	4 [7.7] 6.9 146 49 7.30 33 41.05	38 20.49	3 28.1 29.0 171 28 28.55 54 1980	59 21.58 65
	53 4 1660 − 1156		53 49 3225 + 19.75		53 25 1725 − 2566		53 15 5050 − 2035		53 38 59.00 − 2934		53 59 [37.75] − [2.01] 7.94	
	4 42.86	3 44.1 +11.27	9 44.27	49 33.4 +12.23	12 39.43	24 33.6 +11.56	13 33.70	15 12.6 +11.74	17 28.68	38 13.1 +11.69	18 6.86	59 14.4 +12.46
Jan. 29	3 57.8 1.2 4.5 8.0 11.5 230	12.09	8 [59.0] 2.7 6.3 9.9 13.3 312	13.05	11 [59.5] 57.9 1.4 4.8 8.4 70	12.38	12 48.7 52.4 56.8 59.3 2.4 2786	12.56	16 43.6 47.3 51.2 54.4 57.9 44	12.51	17 22.0 25.4 28.7 32.2 35.7 440	13.26
	4 4.60 + 56.25 − .97	+55.248	9 6.24 + 56.25 − 1.00	+55.25	12 1.40 + 56.26 − .99	+55.27	12 [58.72] + 56.26 − .98	+855.248	16 50.88 + 56.26 − .99	+55.27	17 28.80 + 56.26 − 1.01	+55.25
	4 59.88 −2.70	−14.40 −14.37	10 1.49 −2.78	−9.77 −14.57 −13.08	12 56.67 −2.79	−14.50 −12.86	13 51.00 −2.79	−14.47 −12.12	17 46.75 −2.85	−14.58 −11.10	18 24.05 − 2.88	−14.65 −10.92
	4 57.18		9 58.71		12 [53.88]		13 48.21		17 43.30		18 21.17	
7.0	3 43.5 46.3 49.2 190	+ 0.82	9.1 8 [39.6] 43.4 46.7 97		9.1 11 20.9 23.7 26.9 115		8.8 12 44.2 46.7 49.3 202		6.8 16 17.4 22.0 25.2 46		9.1 17 22.7 24.8 27.8 153	
	3 46.33 + 18.27 − 1.26174 9.77879 1.16531	53 4 4.21 − 8 − .68 [1.06] + 11.80 + 23 −17.70 35	8 [43.3] + 23.01 1.36192 9.77095 1.25765	53 49 50.94 − 14 − [.54] + 12.66 + 25 −17.600	11 [23.8]3 + 3.757 1.57484 9.77524 1.47486	53 24 49.35 − 37 − [.50] + 12.19 + 24 −17.30 10	12 [46.7]3 + 8.99 − 2 − [.47] + 12.60 + 23 −17.20 45	53 15 29.07	16 [21.3]3 +29.35 − 2.2 1.46461 9.77285 1.36524	53 38 29.45 − [3.77] + 12.44 + 24 −17.00 25	17 [25.1]0 + 3.70 − [.65] 0.56820 9.76922 0.46220	53 59 29.59 − 1 − [.70] + 12.85 + 25 −17.10
	3 48.5 53.9 1024 23 51.20 58 57.15	3 58.60	2 58.9 3.1 1220 38 1.00 44 47.35	49 46.39	2 48.6 53.1 1017 2 50.85 19 5.50	24 44.43	2 30.7 36.9 76 12 33.80 10 1455	15 24.43	4 14.9 19.9 148 49 17.40 33 30.95	38 24.96	3 35.0 40.1 751 28 37.55 54 1080	59 28.75
	53 4 18.84 − 1463		53 50 9.04 − 18.10		53 25 19.19 − 2.984		53 15 36.24 − 7.17		53 38 52.64 − 23.19		53 59 32.49 − 2.90	
	4 42.78	3 44.2	9 44.14	49 33.3	12 39.38	24 32.1	13 33.74	15 12.3	17 28.72	38 13.9	18 6.52	59 14.8

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101

1877 Dec. 29 Jan. 29.

	h	m	s			h	m	s		
α	5	18	59	17	37.9	5	20	5	18	43.8
δ	54°	3′			1.5	54°	37′			35.8
					7.5					9.5

Dec. 29

				+11.27						+13.11	
	19	4.2		7.09		20	12.0			8.93	
		7.8					15.9				
		11.0					19.6				
		14.7					22.5				
		18.4					26.5				
		61					965				
	19	11.22				20	19.30				
	+	23.15		+22.13		+	23.15			+22.11	
	−	7.02				−	1.04				
	19	33.35				20	41.41				
	−	7.95				−	8.02				
	19	25.40		−9.77		20	33.39			−9.85	
				−7.08						−6.90	
7.0					9.6						
	18	89.7				19	47.8				
		43.6					52.1				
		46.3					55.2				
		96					52				
	18	43.20	54	2 59.83		19	51.73	54	37	10.38	
		+28.02		− 20			+27.57		−	20	
	1.44	7447		− 1.32		1.44	0444		−	17	
	9.76	8710		+12.49		9.76	2721		+	13.13	
	1.33	877		+ .30		1.32	575		+	.35	
20				−15.60		50				−15.40	
	41	44.2		2 51.32		0	34.6		37	3.91	
		45.1					34.9				
		93					15				
	24	44.65				50	34.75				
	58	3.70					32 1360				
	54	3 2.65				54	37 31.55				
	−	2.82				−	2.17				
	19	15.63		2 44.2		20	23.54		36	57.0	
				+12.19						+13.63	
Jan. 29	18	31.0		13.01		19	39.1			14.45	
		34.4					42.6				
		37.9					46.0				
		41.4					49.2				
		45.0					53.1				
		397					2300				
	18	37.92				19	46.00				
	+	56.26		+55.25		+	56.26			+55.23	
	−	1.01				−	1.03				
	19	33.19				20	41.23				
	−	2.90				−	2.94				
	19	30.29		−14.66		20	38.29			−14.78	
				−10.62						−10.35	
6.0					9.5						
	18	15.0				19	30.5				
		18.0					33.7				
		20.0					36.2				
		530					104				
	18	17.67	54	2 59.78		19	33.47	54	37	8.12	
		+20.27		− 0.11			+12.53		−	4	
	1.30	6855		−88.34		1.09	795		−	16.25	
	9.76	870		+12.92		9.76	271		+	13.56	
	1.20	033		+ .25		0.98	544		+	.27	
2.0				−17.00		50				−17.10	
	41	52.9		2 55.79		0	50.1		37	5.47	
		55.9					54.4				
		88					45				
	24	54.40				50	152.25				
	57	53.95				31	56.10				
	54	3 1.564				54	37 1.779				
	−	1.586				−	967				
	19	15.63		2 45.2		20	23.51		36	55.1	

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1878 Jan 5, Jan 7. Obs. U.S.A. R. Rec. of F. No.

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	0 3 11	2 19.6	0 4 55	4 3.4	0 6 7	5 16.9	0 7 35	6 43.3	0 16 23	15 30.0	0 22 21	21 27.2
δ	51° 19′	17.0	55° 15′	9.3	50° 46′	41.0	52° 9′	32	53° 37′	31.1	55° 2′	54 56.3
		8.8		7.4		8.0		7.4		8.5		9.0
Jan. 5		+4.56		+4.06		+8.32		+10.19		+11.60 +11.74		+13.26 +13.10
	2 48.2	6.16	4 39.1	10.66	5 53.6	4.92	7 18.5	7.09	15 42.4 7.3	8.20 8.34	22 6.8 22.5	9.85 9.70
	51.4		42.8		56.8		22.3		45.8 10.9		10.0 26.0	
	54.6		46.7		59.8		25.6		49.1 14.2		13.8 29.6	
	57.8		50.3		3.5		29.0		52.8 18.0		17.5 33.3	
	1.0		54.0		6.6		32.4		56.3 21.6		21.1 37.0	
	2731		2329		05		1278		464 720		692 484	
	2 5462		4 4658		6 0.10		7 25.56		4928 1440		1384 2968	
	+ 2906	+28.20	+ 2906	+28.06	+ 2906	+28.21	+ 2906	+28.17	+ 2906 + 2906	+28.12 +28.17	2907 + 2907	+28.05 +28.06
	− .86		100		− .85		− .89		− .94 − .94	−9.60	− .99 − .99	−9.78
	3 22.82		5 14.64		6 28.31		7 53.73		16 1440 4452	−1 0.00	22 41.92 54.71	−59.86
	+ 0.40	−9.29	+ 0.52	−9.34	+ 0.35	−9.35	+ 0.38	−9.39	+ 0.38 + 0.32	−9.60	+ 0.30 + 0.21	
	3 23.22	−1 0.15	5 15.16	−1 0.15	6 28.66	−1 0.15	7 54.11	−1 0.12 16	17.72 42.84	−1 0.00	22 42.22 58.05	
	8.4		8.3		8.5		7.8		7.7 8.1		8.3 8.4 55	4 10.35 42.5
	2 42.9		4 15.4		5 26.8		7 12.0		15 9.5 15 58.0		21 37.8 21 57.4	− 28 − 21
	46.0		18.3		29.5		16.0		14.0 1.4		41.3 1.8	− 1348 − 1285
	48.6		21.5		32.4		19.3		17.6 5.9		43.7 4.4	+ 1385 + 1285
	175	−3.40	552		887		173		411 3353 38		28 37	+ .31 + .31
	2 45.83 51 21 11.40		4 1840 55 17 7.23		5 29.57 50 48 34.96		7 15.77 52 11 9.12		15 13.70 16 1.77 39 25.01 55.89		21 4093 22 1.23	−2040 −2040
	+ 8.79	− 2	+28.18	− 20	+30.58	− 25	+ 9.79	− 3	+3558 +12.43 − 33 − 5		+32.91 +28.45	3 5980 2 6355
	0.943992	− .3250	1.446994	− .1177	1.484738	− .7415	0.999078	− .3250	1.55721 1.10140	5849 7244	1.51733 1.14204	
	9.795558	+ 9.68	9.755551	+ 1.4005	9.800658	+ 9.11	9.987856	+ 10.60	9.77285 9.77285	+1224 +1224	9.75787 9.75805	
	0.864351	+ 22	1.330231	+ .32	1.410091	+ 20	0.903121	+ .24	1.44884 0.99903	+ .27 + .27	1.39958 1.38691	
	5	−1860	10	−19.60	35	−1860	15	−1900	45 45	−1970 −1970	20 20	
Rs = −18	1 48.4	20 58.96	0 38.7	16 58.79	4 7.8	48 21.28	1 49.9	10 57.21	3 14.7 4 2.9	39 13.51 4453	3 33.0 4 43.8	
Rs = −28	46.2		35.1		8.9		47.9		11.12 57.4		28.1 36.3	
n = −69	1146		138		16.7		178		58 1203		611 801	
	6 47.30		10 36.90		39 5.35		16 48.90		48 12.90 8.15		24 4005	
+5 17.67	16 1.05		12 11.45		43 43.00		5 59.45		3435 45 33 48.20		5055 38 8.30	
	51 21 18.72		55 17 29.12		50 49 0.67		52 11 17.12		53 3953.12 39 587		59 1378 55 4354.7 3 25.11	
	− 732		− 2139		−25.71		− 800		28.11 − 998		− 2512 − 21.72	
		− 5.59										
Jan. 7	3 13.93	19 58.8	5 5.82	15 58.6	6 19.31	47 21.1	7 44.72	9 57.1	16 8.12	38 13.5	22 32.44	2 59.9
									33.24	27 44.5		53.7

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1877phae_proj.1617R

1878, Jan. 5, Jan. 7.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	0 23 59	23 4.3	1 16 41	15 37.9	1 17 25	16 23.2	1 21 57	20 54.1	1 24 38	28 56.1	1 27 19	26 16.2
δ	55° 0′	54 54.3	52° 31′	25.7	52° 45′	39.4	52° 50′	45.2	54° 46′	41.0	52° 23′	17.5
		6.8		8.5		8.8		8.8		9.2		9.0

Jan. 5.

+13.70 +16.40 +16.46 +11.42 +11.56 +13.14 +10.26

23 43.8 10.30 16 28.4 29.2 7.00 7.06 17 14.2 8.02 21 46.0 8.16 24 47.7 9.78 22 8.0 6.86
47.7 31.7 32.8 2 1 17.5 48.6 51.2 11.8
51.1 36.0 36.1 20.8 53.0 54.6 14.8
54.5 38.4 39.5 24.0 56.2 58.4 18.5
58.2 41.7 42.7 27.6 59.8 2.0 22.0
53 252 303 41 146 239 752
23 51.06 35.04 36.06 17 20.82 21 52.92 24 54.78 27 15.04
+ 2907 +24.08 + 2909 + 2909 +28.19 +28.19 + 2909 +24.18 + 2909 +24.11 + 2909 +28.19
− .99 − .90 − .90 − .91 − .91 − .98 − .90
24 19.14 17 323 425 17 49.00 22 21.10 25 22.89 27 43.23
+ 0.27 − 0.42 − 0.42 −10.94 − 0.43 −10.97 − 0.49 −1108 − 0.51 −1128 − 0.56 −1116
24 19.41 −9.82 17 2.81 3.83 −5.682 17 48.57 −5.676 22 20.61 −5.634 25 22.38 −5.604 27 42.67 −5.583
−5.982 −10.94
−5.682

7.0 8.9 9.0 8.8 9.0 8.9 8.9

23 13.3 16 41.2 13.6 17 7.6 21 37.6 24 50.6 26 30.7
17.6 44.9 16.9 10.9 40.4 53.7 34.6
20.0 48.2 20.0 14.4 43.8 56.6 38.0
50.9 143 515 52 33 329 18 109 188
23 16.97 55 2 4.38 16 44.77 17 17.33 37.00 1086 17 10.97 − 3.40 21 40.60 52 52 28.81 24 53.63 54 48 47.94 26 34.43 52 24 59.36
+ 3.406 − 30 − 9.73 + 18.89 − 9 − 3 + 985 − 8 + 12.32 − 4 + 1.15 − 0 + 40.61 − .44
1.53263 − 11 0.98511 12.623 −.85 −.83 0.99344 −.1422 1.09061 −.59 0.06070 −.77 1.60863 −.47
9.75823 +1380 9.78399 9.78356 +1109 +1107 9.78163 + 1134 9.78080 + 1144 9.76057 + 1365 9.78527 + 10.93
1.41564 n + .310 0.89668 1.18476 + .25 + .25 0.89985 n + .25 0.99619 n + .25 9.94605 n + .30 1.51868 n + .24
−2040 −21.30 −21340 −21.40 35 −21.40 35 0 −2140
25 50 50
0 37.8 1 54.28 41 42.3 4 39.5 33 22.70 33 56.20 0 50.9 46 55.15 0 28.8 52 15.57 4 20.0 37.5 48 35.82 2 35.7 24 49.82
33.4 37.4 34.3 48.2 25.8 14.4 26.2 31.6
112 797 138 991 146 3.44 73
25 35.60 2D C.R. 54 39.85 54 36.90 1st C.R. 40 48.55 35 27.30 39 17.20 2 33.65
57 12.75 26 8.50 28 11.48 41 58.80 47 21.05 43 31.15 20 14.10
55 2 30.42 33 26.17 33 29.12 52 47 16.47 52 52 38.72 54 48 48.82 52 25 32.37
− 2604 + .788 − 15.31 − 7.94 − 9.91 − 0.88 − 33.01
− 15.31 + 7.88 32 25.9
24 9.59 0 54.5 16 51.87 31 59.8 17 37.60 45 58.4 22 9.53 51 18.2 25 11.10 47 39.8 27 31.51 23 49.0
52.89 +10.84 +10.95 +11.85 +12.11 +13.84 +11.10

Jan. 7

16 16 17 11.5 6.26 21 43.3 6.52 24 45.1 8.25 27 5.6 5.51
25.7 26.5 5.25 5.33 14.5 46.7 48.7 9.5
28.8 29.9 18.0 50.4 52.0 12.3
32.0 33.3 21.7 53.4 56.0 15.7
35.6 36.9 24.8 57.2 59.7 19.1
39.0 40.0 111 1666 405 10 115 6.22
16 32.22 33.32 17 18.10 21 50.20 24 52.30 27 12.44
+ 31.74 +31.74 +30.89 +30.89 + 31.74 +30.88 + 31.74 +30.88 + 31.75 +30.83 + 31.75 +30.90
− .85 − .85 − .86 − .92 − .85
17 3.11 4.21 −10.94 17 48.98 −10.97 22 21.08 −11.08 25 23.13 −11.28 27 43.34 −11.16
− 0.38 − 0.38 − 0.39 − 0.114 − 0.46 − 0.57
17 2.73 3.83 −10.94 17 48.59 −5.676 22 20.64 −5.634 25 22.67 −5.604 27 42.83 −5.583
−5.682

add 80 to d′

− 5.59
85 87 52 33 36.92 33 11.36 9.1 9.0 9.1 9.4
16 16 17 28.2 21 33.0 24 42.6 26 50.8
47.3 1.3 − 22 − 8 33.9 38.0 46.0 53.7
50.3 4.5 −.83 −.29 −.86 −.34 37.5 41.1 47.0 56.2
53.6 6.9 +11.64 + 11.61 1006 221 176 99
12 127 + 2.5 + 2.5 −5.59 1108
16 50.40 42.3 − 2.120 − 2.120 17 33.53 52 47 5.23 21 37.37 52 52 29.37 24 45.87 54 48 48.28 26 53.30 52 24 57.13
+29.09 −18.18 + 20.88 33 20.77 33 55.49 − 15.43 − 6 + 12.83 − 5 + 6.43 − 1 + 19.14 − 10
1.25959 1.46374 2.177 56.29 − .238 1.10823 − .09 0.80821 − .32 1.28194 − .52
9.78379 9.78395 1.18837 9.78080 + 1189 9.76057 + 12.00 9.76057 + 14.32 9.78527 + 11.48
1.16816 1.37247 n 9.78183 + .25 1.01381 n + .25 0.69356 n + .30 1.19199 n + .24
1.09478 − 21.40 35 − 21.57 35 − 2100 0 − 21.40
50 50 40
4 36.9 4 50.6 1 15.1 46 5.89 0 32.8 52 13.39 4 20.9 48 34.53 2 57.9 24 44.24
296 434 277 5.59 26.2 14.19 11.0 3.533 53.1 42.04
665 940 11.28 590 319 130
2nd C.R. 1st C.R. 28 15.10 28 1.35 41 16.40 35 29.50 39 15.95 16.00 2 56.60
34.7 3325 4704 4 36.75 47 18.85 43 32.40 19 51.85
52 33 35.94 33 22.19 52 46 5.77 5.84 52 52 39.69 54 48 53.22 52 25 12.69
+ 14.73 − 23.58 + 14.73 + 12.44 − 10.32 − 4.94 − 15.56
16 51.79 32 25.0 17 37.62 45 59.2 22 9.56 51 18.8 25 11.39 43 39.3 27 31.67 23 46.2
52.89 31 59.5

Rs = −18 −28
n = −65
+5 −5.59
21.69

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1877phae.proj.tif

1878, Jan. 5, Jan. 7. Obs. W. A. R. Rec. J. F. M. 104.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 29 21	28 17.2	1 30 46	29 44.20	1 31 15	30 11.7	1 32 5	31 1.3	1 34 13	33 9.2	1 43 41	42 44.1
δ	52° 24′	18.9 9.4	52° 42′	37.2 8.8	52° 18′	13.1 9.2	54° 11′	6.4 8.2	54° 3′	53 57.6 9.5	50° 33′	28.6 8.9

Jan. 5

+10.76 +10.79 +10.42 +10.29 +12.48 +12.33 +8.47

29 8.0 12.4 15.7 19.4 23.3 — 7.36 — 794 — 29 15.88 + 29.09 + 28.19 — .90 — 29 44.07 — .059 — 11.20 — 29 43.48 — 5562

30 34.0 37.4 40.7 44.3 47.8 — 7.39 — 42 — 30 40.84 + 29.09 + 28.18 — .91 — 31 9.02 — .060 — 11.25 — 31 8.42 — 5547

31 3.2 6.5 10.2 13.5 17.0 — 7.02 6.89 — 504 10.08 + 29.09 + 29.09 + 26.20 + 28.20 — .89 — .89 — 31 38.28 38.88 — .061 — .061 — 11.23 — 55.44 — 31 37.67 38.27 — 11.23 — 55.44

31 54.0 57.6 1.0 4.5 8.0 — 9.08 — 51 — 32 1.02 + 29.09 + 26.13 — .96 — 32 32.89 — .060 — 11.40 — 55.35 — 32 31.67 28.55

34 2.8 6.3 9.9 13.3 17.0 — 8.93 — 493 — 34 9.86 + 29.09 + 28.14 — .95 — 34 38.00 — .063 — .035 — 11.43 — 55.14 — 34 37.37

43 34.4 37.5 40.7 44.0 47.4 — 3.07 — 40 — 43 40.80 + 29.09 + 28.25 — .84 — 44 9.05 — .077 — 11.35 — 54.09 — 44 8.28

9.4

28 48.6 52.4 55.3 6.3 — 3.40 — 561 — 28 52.10 52 26 15.50 + 23.78 — 1.5 — 1.376221 — .2742 — 9.785510 + 1094 — 1.286092 + 24 — 21.40 — 26 1.46

9.5

30 15.6 18.7 21.8 — 561 — 30 18.70 52 44 22.45 + 22.11 — 13 — 1.345218 — .6195 — 9.782132 + 11.28 — 1.252092 + .25 — 21.50 — 44 8.343

9.2 9.5

31 27.9 31 38.3 — 52 — 27.90 39.30 — 20 11.98 20.18 — 17.82 — 28.62 — 1.25091 — 1.4569 — 9.78609 — 1.16178 1.36754 + .24 + .24 — 21.40 — 21.40 — 3 — 19 5.60 20 6.67

7.0

31 48.7 51.7 54.7 48 — 13 — 31 51.60 54 13 54.38 — 9 — 22 + 9.42 — .3 — .574 — 15 + 12.96 + .29 — 21.90 — 13 41.56

9.6

33 36.6 40.7 44.0 13 — 33 40.3 54 4 48.46 — 29.43 — 1.468779 — 1.76835 + 12.79 + .28 — 21.90 — 4 38.49

8.7

43 2.0 5.0 8.3 15.8 — 43 5.10 50 35 49.42 + 35.70 — 1.552627 — .3250 — 9.80 2.579 — 1.48004 — 21.10 — 35 33.39

0 1 33.1 29.3 62.4 — 1 31.20 — 21 17.15 — 52 26 34.82 — 19.32 — 29 32.28 — 25 5.8

3 27.9 23.5 11.4 — 43 25.70 — 39 22.65 — 52 44 40.32 — 17.87 — 30 5.17 — 43 12.9 +11.24

40 3 10.7 6.4 17.1 — 8 8.55 +60 — 14 39.80 — 52 19 5.47 + 14.51 + 23.31 — 19 2.2 — 31 26.44 — 27.04 — 10.2 +10.4 +10.94

41 7.5 1.1 8.6 — 14 4.30 — 8 44.05 — 54 14 1.72 — 7.34 — 32 17.15 — 12 46.2 +13.13

2 57.0 52.1 9.1 — 22 54.53 — 59 53.80 — 54 5 11.47 — 23.01 — 34 25.94 — 3 40.4 +12.94

1 47.4 43.4 10.8 — 57 45.40 +1′ — 31 2.95 — 50 36 20.62 — 30.20 — 43 56.93 — 34 39.3 +5.97

Jan. 7

30 30.9 34.8 38.0 41.2 45.0 — 5.68 — 399 — 30 5.98 + 31.75 + 30.89 — .86 — 31 8.87 — .055 — 11.25 — 55.47 — 31 8.32

31 0.5 3.6 7.4 10.9 14.6 — 5.38 — 370 7.40 — 31.75 + 31.75 + 30.94 + 30.91 — .84 — 31 38.31 38.99 — .056 — .056 — 11.23 — 55.44 — 31 37.75 38.43 — 11.23 — 55.44

31 51.1 54.7 58.2 1.8 5.5 — 7.54 — 413 — 31 58.26 + 31.75 + 30.84 — .91 — 32 29.10 — .056 — 11.40 — 55.35 — 32 28.64

34 0.1 3.8 6.8 10.6 18.7 — 7.35 — 349 — 34 6.98 + 31.75 + 30.85 — .90 — 34 37.83 — .058 — 11.43 — 55.14 — 34 36.25 39.

43 31.6 34.7 38.3 41.0 44.5 — 3.38 — 401 — 43 38.02 + 31.75 + 30.96 — .79 — 44 8.98 — .073 — 11.35 — 54.09 — 44 8.25

8.9

30 7.2 10.2 14.3 17.1 — 52 — 5.59 — 44 20.52 — 30 10.57 + 27.11 — 1.437391 — 9.78293 — 1.34482 — 40

9.0 9.2

31 12.3 16.9 19.3 — 185 — 16.17 — 26.07 — 20 10.68 18.19 — 20 — 8.77 — 17.99 — 1.25503 — 9.78609 — 1.16570 — 21.40 — 5

7.2

31 47.3 49.9 53.0 0.2 — 31 50.07 — 54 13 54.96 — 2 + 8.49 — .574 — 15 + 13.60 + .29 — 21.90 — 10

9.5

33 33.4 37.4 40.2 111.0 — 33 37.00 — 54 4 51.65 — 29.98 — 1.476835 — 9.76835 + 13.41 + .28 — 21.90 — 28

8.6

43 3.0 5.6 8.3 16.9 — 43 5.63 — 50 35 50.49 — 23 + 32.39 — 1.510411 — 9.80259 — 1.43778 — 20 — 21.20 — 28 — .3250 + 9.37 — 35 32.67

3 29.5 23.6 13.1 — 43 26.55 — 39 21.80 — 52 44 42.64 — 22.12 — 30 5.07

4.1 2.2 11.3 — 8 5.65 — 14 42.70 — 52 20 3.54 + 7.14 + 14.65 — 19 0.1 — 31 26.52 — 27.20 — 4.5

12.6 3.1 15.7 — 14 7.85 — 8 40.50 — 54 14 1.34 — 6.38 — 32 17.14

2 58.0 50.2 8.2 — 22 54.10 — 59 54.25 — 54 5 15.09 — 23.44 — 34 25.82

1 54.1 46.5 10.06 — 51 54.36 — 50 58.05 — 50 36 18.89 — 27.40 — 43 56.90

4 37.10 37.90 — 3 42.8

35 32.67 33.47 — 34 39.4

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1877phae.proj.1687R

1878, Jan. 5, Jan. 7.

See page 118 for remainder of work for these stars.

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1877phae.proj.1617R

1877. Jan. 16, Jan 19. Obs. W. A. R. Rec. J. F. M. 106

	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 13 11	12 100	1 15 52	14 52.5	1 16 48	15 46.6	1 16 59.6	15 54.2	1 20 58	19 57.9	1 21 48	20 45.7
δ	54° 41'	35.6 8.9	53° 34'	29.0 8.9	54° 18'	12.7 9.0	54° 14'	8.9 8.0	51° 35'	29.3 8.5	54° 11'	5.8 8.4

Jan. 16

Add +0.012 to (UT+m) Jan 16. 21 has been added to sum of the constants and to final R.A. +012

	12 46.6	+12.97 7.26	15 29.4	+12.71 6.50	16 22.8	+12.95 7.24	16 31.1	+13.15 7.44	20 34.0	+10.14 4.47	21 24.0	+12.59 6.83
	50.4		32.9		26.0		34.5		37.2		27.6	
	53.8		36.3		30.0		38.0		40.7		30.9	
	57.7		39.8		33.6		41.5		43.9		34.7	
	1.3		43.4		36.9		45.3		47.4		38.0	
	198		318		1493		404		32		52	
	12 53.96		15 36.36		16 29.86		16 38.08		20 40.64		21 31.04	
	+ 41.60	3+40.77	+ 41.68	3+40.81	+ 41.68	3+40.79	+ 41.60	3+40.79	+ 41.68	3+40.88	+ 41.68	3+40.79
	.87		.83		.85		.85		.77		.83	
	13 34.69		16 17.13		17 10.61		17 18.83		21 21.47		22 1.79	
	.07		.13		.13		.13		.24		.20	
	13 34.62	-11.00 -57.12	16 17.00	-10.99 -56.88	17 10.48	-11.06 -56.79	17 18.70	-11.06 -56.79	21 21.23	-10.97 -56.43	22 1.59	-11.17 -56.34
	8.9		9.0		9.0		8.0		8.7		8.3	
	12 17.7		14 57.1		16 8.0		16 55.9		20 18.0		21 1.7	
	20.7		59.8		12.2		59.5		21.0		4.3	
	24.6		2.8		17.8		2.9		23.8		8.3	
	30	-5.71	17.7		8.0		1783		23		14.3	
	12 28.054	43 5.50	14 59.90	53 36 30.70	16 12.67	54 19 32.72	16 59.43	54 16 44.54	20 20.77	51 36 44.94	21 4.77	54 13 22.57
	+32.96	.28	+36.46	.35	+17.19	.7	.21.35	.12	+19.84	.11	+26.27	.18
	1.51799	.83+.29	1.56182	.2234	1.23528	.6125	1.32940	.3178	1.29820	.2231	1.41946	.79+.23
	9.76164	+13.80	9.77319	+12.52	9.76572	+13.35	9.76625	+13.30	9.79304	+10.27	9.76695	+13.23
	1.40441	+.28	1.45979	+.26	1.12578	+.28	1.22043	+.28	1.21602	+.22	1.31119	+.25
	40	-21.40	50	-21.30	5	-21.50	10	-21.50	50	-20.90	10	-21.60
Rx=-.18 -.29	4 40.0	42 50.86	1 10.6	36 15.70	3 24.9	19 18.96	1 41.4	16 30.48	1 8.1	36 28.51	1 26.9	13 7.74
N=-.61	36.9		8.0		20.6		40.4		6.8		24.8	
	769		186		55		18		149		117	
	44 38.45		51 9.30		8 22.75		11 40.90		51 7.45		14 25.85	
+5 20.48	38 9.90		31 39.05		14 25.60		11 7.45		31 40.90		8 22.50	
	54 43 30.38		53 36 59.53		54 19 46.08		54 16 27.93		51 37 1.38		54 13 42.98	
	.25.38		.28.83		.13.36		+16.61		.16.44		.20.47	
	18 23.66	41 53.7 +13.07	16 6.04	35 19.0 +11.43	16 59.46	18 21.7 +12.14	17 7.68	15 33.7 +13.46	21 10.31	35 32.1 +9.52	22 0.46	12 11.4 +11.81

Jan. 19

Add +0.013 to (UT+m) Jan 19. 21 has been added to sum of the constants and to final R.A. +013

	12 43.0	13.67	15 25.4	12.03	16 18.8	13.77	16 27.1	13.06	20 29.9	10.12	21 20.0	12.41
	46.3		28.8		22.3		30.6		33.2		23.4	
	52.0		32.3		25.8		34.1		36.4		26.8	
	53.4		35.8		29.4		37.8		39.7		30.4	
	57.0		38.4		32.9		41.1		43.2		34.0	
	24.97		117		292		207		32.6		346	
	12 49.94		15 32.34		16 25.84		16 34.14		20 36.52		21 26.92	
	+ 45.68	4+44.85	+ 45.68	4+44.89	+ 45.68	4+44.87	+ 45.68	4+44.88	+ 45.68	4+44.84	+ 45.68	5+44.87
	.80		.76		.78		.78		.71		.78	
	13 34.80	-11.00 -57.12	16 17.24	-10.99 -56.88	17 10.72	-11.06 -56.79	17 19.02	-11.06 -56.79	21 21.47	-10.97 -56.43	22 1.80	-11.17 -56.34
	+.001		-.005		-.005		-.005		-.016		-.012	
	13 34.781		16 17.178		17 10.665		17 18.995		21 21.436		22 1.468	
	9.0		8.9		9.1		8.4		8.9		8.8	
	13 10.7		14 48.9		16 3.0		16 44.6		20 9.6		21 2.7	
	13.5		53.6		6.4		47.5		12.3		5.8	
	16.0		56.4		9.7		50.7		15.0		8.9	
	102	+.060	99		19.1		1428		69		17.4	
	13 13.40	54 42 51.36	14 53.30	53 36 22.43	16 6.37	54 19 27.12	16 47.60	54 16 36.62	20 12.30	51 36 38.56	21 5.80	54 13 14.89
	-23.46	.14	+39.01	.40	+19.47	.9	-13.46	.5	+24.22	.16	+21.12	.11
	1.37033	.09+.74	1.59151	.2234	1.28937	.6125	1.42905	.3178	1.38417	.2234	1.32469	.83+.29
	9.76164	+13.02	9.77319	+11.80	9.76572	+12.59	9.76625	+12.54	9.79304	+9.68	9.76695	+12.48
	1.25675	+.28	1.48948	+.25	1.17987	+.28	1.02008	+.28	1.30199	+.22	1.21642	+.27
	45	-21.20	50	-21.00	5	-21.20	10	-21.20	50	-20.70	10	-21.20
Rx=-.18 -.28	0 22.1	42 49.83	1 8.4	36 13.46	3 19.5	19 18.69	1 35.7	16 28.48	1 2.6	36 27.98	4 30.5	13 5.90
N=-.56	35.2		20.9		31.9		47.9		16.1		42.7	
	573		293		514		836		187		732	
	45 26.65		51 14.65		8 25.70		11 41.80		51 9.35		14 36.60	
+5 19.60	37 19.70		31 33.70		14 22.65		11 6.65		31 39.00		8 11.45	
	54 42 39.30		53 36 53.30		54 19 42.25		54 16 26.15		51 36 58.60		54 13 31.35	
	+.1806		-.3087		-.1513		+.1047		.2024		-.1646	
	13 23.80	41 52.7	16 6.19	35 16.6	16 59.60	18 21.9	17 7.91	15 31.7	21 10.33	35 31.6	22 0.51	12 9.6

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617 618

1878, Jan. 16, Jan. 19.

	h m s		h m s		h m s		h m s		h m s		h m s	
α	1 22 21	21 19.5	1 25 0	23 57.0	1 48 19	47 12.7	1 58 9	57 3.1	2 0 18	1 59 13.2	2 0 54	1 59 47.3
δ	53° 29′	23.7 8.1	52° 22′	16.9 8.4	52° 41′	35.4 7.5	53° 41′	36.4 8.0	53° 1′	52 56.5 9.0	52° 38′	33.0 7.7

Jan. 16

		+1733		+10.66		+11.40		+11.90		+10.94		+11.44
	21 58.5	6.62	24 35.5	4.95	47 53.2	5.69	57 48.3	6.19	59 56.2	5.23	0 31.5	5.43
	2.0		39.2		56.9		51.7		59.6		34.9	
	5.2		42.5		0.1		55.1		3.0		38.2	
	8.8		46.0		3.6		58.8		6.4		41.8	
	12.4		49.3		6.9		2.2		9.9		45.2	
	26.9		1.25		0.7		2.61		1.51		4.16	
	22 5.38		24 42.50		48 0.14		57 55.22		0 3.02		0 38.32	
	+ 4.16	3+H0.82	+ 41.66	3+H0.85	+ 4.16	4+H0.84	+ 4.16	4+H0.82	+ 4.16	4+H0.84	+ 4.16	4+H0.85
	— .82		— .79		— .81		— .84		— .81		— .80	
	22 46.16		25 23.81		48 40.94		58 36.00		0 43.83		1 19.14	
	— 0.22		— 0.26		— 0.56		— 0.67		— 0.71		— 0.72	
	22 45.97 8	−11.13	25 23.05 7 23.15	−11.11	48 40.4x 2	−11.62	58 35.33 7	−11.91	0 43.14 5	−11.89	1 18.42 5	−11.87
		−56.31		−56.04		−53.55		−52.32		−52.05		−51.96
	7.1		8.0		7.2		8.4		8.6		7.2	
	21 48.7		24 13.5		47 20.2		57 17.5		59 19.2		0 25.3	
	52.8		16.3		22.3		20.4		21.3		27.5	
	55.7		18.7		25.2		22.9		24.4		31.9	
	58.2		18.5		7.7		0.8		4.9		8.47	
	21 52.73	53 31 14.90	24 16.17	52 24 33.53 3.48	47 22.57	52 42 37.35	57 20.27	53 43 42.92	59 21.63	53 3 15.52	0 28.23	52 40 0.37
	+12.65	— 5	+26.39	— 18	+37.57	— 37	+34.93	— 32	+41.39	— 45	+10.09	— 3
	1.10209	— 3.178	1.42655 144	— 58.90	1.57484	— 0	1.54345	— 32.42	1.61690	— 77.20	1.00385	— 54.54
	9.77422	+ 1243	9.78527	+ 11.18	9.78230	+ 1153	9.77199	+ 1268	9.77896	+ 11.91	9.78280	+ 11.47
	1.00109	+ .26	1.33056 140	+ 24	1.48192	+ .24	1.44022	+ .26	1.52064	+ 25	0.91147	+ 24
	55	— 21.400		— 21.20 45		— 21.80 40		— 22.10 20		— 22.00 45		— 21.90
	1 44.7	31 0.12	3 12.9	24 17.28 3	0 1.2	42 21.24	3 57.9	43 27.01	4 21.41	2 58.75	3 1.1	39 43.90
	43.1		12.9		1.1		56.8		15.9		59.5	
	7.8				3		16.7		40.3		06	
	56 43.90		3 12.90 +1"		45 1.15		43 58.35		24 20.15		48 0.30	
	26 4.45		19 35.45		37 47.20		38 50.00		58 28.20		34 48.05	
	53 31 24.93		52 24 55.93		52 43 7.68		53 44 10.98		53 3 48.68		52 40 8.53	
	— 10.33		— 21.48 5		— 30.33		— 27.56		— 33.16		— 8.16	
	22 34.85	30 3.8	25 12.04	23 21.2	48 28.80	41 27.7	58 23.46	42 34.7	0 31.26	2 6.7	1 6.58	38 57.9
		+11.50		+10.31		+9.83		+11.72		+10.31		+10.44

Jan. 19

	21 54.5	12.10	24 57.8	9.1	47 49.4	10.43	57 44.2	7.2	59 52.0	9.1	0 27.5	11.67
	57.9		1.0		52.7		47.6		55.3		30.7	
	1.3		4.4		56.2		51.0		58.8		34.2	
	4.8		7.8		59.5		54.6		2.3		37.5	
	8.4		11.0		2.9		58.0		5.8		40.9	
	1.9		2.21		3.07		54		4.42		2.08	
	22 1.38		25 4.42		47 5.64		57 51.08		59 58.84		0 34.16 +01	
	+ 4.566	5+H4.91	+ 4.566	5+H4.93	+ 4.567	5+H4.92	+ 4.567	5+H4.89	+ 4.567	6+H4.93	+ 4.567	6+H4.93
	— .75		— .743		— .74		— .77		— .74		— .74	
	22 46.29		25 49.35		48 41.07		58 35.98		0 43.77		1 19.09	
	— 0.44		— 0.19		— 0.48		— 0.60		— 0.64		— 0.63	
	22 46.85	−11.13	25 49.15 7		48 40.59 8	−11.62	58 35.36 7	−11.91	0 43.12 3	−11.89	1 18.43 5	−11.87
	46.45	−56.31				−53.55		−52.32		−52.05		−51.96
	8.2		9.0		7.5		8.2		8.8		7.3	
	22 14.0		24 32.5		47 16.4		57 9.6		59 18.7		0 21.0	
	17.6		34.7		19.2		12.5		21.7		24.6	
	20.3		39.0		22.0		15.0		24.0		27.8	
	5.19		16.2		5.76		7.1		4.4		1.34	
	22 17.20	53 31 7.92	24 35.40	52 21 42.93	47 19.20	52 42 31.63	57 12.37	53 43 38.03	59 21.47	53 3 10.21	0 24.47	52 39 55.87
	-15.92	— 7	+29.02	— 22	+36.94	— 36	+38.71	— 39	+37.37	— 37	+9.69	— 5
	1.20194	— 40.52	1.46270	— 18.28	1.56750	— 92.140	1.58782	— 72.42	1.57252	— 79.73	0.98632	— 56.84
	9.77422	+ 11.72	9.78576	+ 10.48	9.78230	+ 1087	9.77199	+ 11.97	9.77896	+ 1123	9.78280	+ 1082
	1.10094	+ .25	1.37824	+ 23	1.47458	+ 24	1.48459	+ .26	1.48626	+ 24	0.89390	+ 24
	55	— 21.20 5		— 21.00 40		— 21.60 40		— 22.00 20		— 21.90 45		— 21.80
	2 6.1	30 58.82	0 52.9	21 32.84	4 59.9	42 20.46	3 53.7	43 27.75	4 24.1	2 59.22	2 57.0	39 44.34
	19.2		7.9		13.1		5.1		33.1		12.2	
	25.3		2.8		1.30		11.88		5.42		1.01	
	57 12.65		6 14.0		45 6.54		43 59.40		24 27.10		47 5.05	
	25 35.70		16 46.98		37 41.85		38 48.95		58 21.25		34 43.30	
	53 30 55.30		52 22 6.55		52 43 1.45		53 44 8.35		53 3 40.85		52 40 2.90	
	+ 12.62		— 23.62		— 29.82		— 30.52		— 36.64		— 7.83	
	22 35.02	30 2.5			48 28.94	41 26.9	58 23.46	42 35.4	0 31.24	2 7.2	1 6.58	38 52.4

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617 618 168

1878, Jan. 16, Jan. 19 Obs. W. A. R. Rec. J. F. M.

on Dm place

	h m s		h m s		h m s		h m s	
α	2 6 10	5 3.1	2 12 22	14 218	2 12 53	11 436	2 19 20	18 16.2
δ	53° 56	51.1 8.5	53° 3	52 58.7 9.1	53° 52	468 9.2	50° 22	17.5 8.5

Jan. 16

	+12.19		+11.39		+12.19		+8.28	
5 48.1	6.48	11 54.3	5.68	12 30.6	6.48	19 3.9	2.57	
52.4		57.8		34.0		6.8		
56.0		1.3		37.5		10.1		
59.5		4.5		41.1		13.5		
3.0		8.0		44.6		16.8		
2798		59		378		12		
5 55.96		12 1.18		12 37.56		19 10.24		
+ 1.68	4+40.81	+ 41.62	4+40.85	+ 1.62	4+40.81	+ 41.63	4+40.91	
- .84		- .81		- .84		- .74		
6 3674		12 4199		13 1834		19 51.13		
- 0.78		- 0.86	-12.13	- 0.87	-12.23	- 0.96	-11.99	
6 35.98	-12.10 -51.24	12 41.33	-50.40	13 17.49	-50.28	19 50.18	-49.32	

7.5 9.6 8.8 8.4

5 29.0		11 20.0		12 51.1		18 33.9		
32.3		22.7		54.3		36.5		
35.8		26.0		58.0		40.0		
41	-5.41	87		134		1104		
6 32.37	53 57 5288	11 22.90	53 5 1793	12 54.47	53 53 2981	18 36.80	50 24 4238	
+23.56	- 15	+38.28	- 39	-16.91	- 7	+33.44	- 30	
1.37273	-.90+.40	1.58294	-.41+.64	1.22814	-.88+.27	1.52424	-.54+.84	
9.76957	+12.97	9.77862	+11.94	9.77043	+12.87	9.80428	+ 8.93	
1.26708	+ .27	1.48637	+ .25	1.12335	+ .27	1.45333	+ .19	
25	-2220	10	-22030		-2226	0	-21.30	
4 59.1	57 37.16	2 21.44	5 1.61	4 54.3	53 1409	3 0.0	24 23.65	
55.8		19.1		50.3		56.1		
149		405		46		1161		
29 57.45		22 20.25		34 52.30		2 58.05		
52 5090		0 2810		47 5605		19 50.30		
53 58 1358		53 5 4858		53 53 1653		50 25 1078		
- 1850		- 3065		+ 1328		- 2840		

6 23.89	56 45.9	12 29.04	4 11.2	13 5.27	52 23.8	19 38.20	23 34.3	
Jan. 19	+11.23		+10.97		+11.55		+7.74	
6.5 45.0	11.83	11 50.4	11.57	12 26.7	12.15	18 59.6	8.34	
48.4		53.8		30.0		2.8		
51.8		57.0		33.3		5.9		
55.4		0.6		36.9		9.3		
58.9		4.0		40.4		12.5		
96		358		173		301		
5 51.92		11 57.16		12 33.46		19 6.02		
+ 4.56	6+44.90	+ 4.56	6+44.93	+ 4.56	6+44.90	+ 4.56	6+44.00	
- .74		- .74		- .71		- .68		
6 36.82	-12.10 -51.24	12 42.09	-12.13 -50.40	13 18.36	-12.23 -50.28	19 51.01	-11.99 -49.32	
- 0.71		- 0.79		- 0.79		- 0.89		
6 36.11		12 41.30		13 17.57		19 50.12		

7.2 9.4 8.8 8.3

5 10.3		11 50.7		12 20.5		18 28.9		
13.3		54.0		24.8		32.8		
16.0		57.3		28.9		35.5		
96	+.060	120		142		82		
5 13.20	53 57 4649	11 54.00	53 5 12.57	12 24.73	53 53 2369	18 32.73	50 24 3583	
+38.72	- 29	+3.16	- 7	+8.73	- 2	+33.29	- 30	
1.58794	-.86+.34	0.49969	-.52+.81	0.94101	-.83+.24	1.52231	-.57+.87	
9.76957	+ 12.21	9.77862	+11.26	9.77043	+ 12.13	9.80428	+ 8.42	
1.48229	+ .27	0.40309	+ .24	0.83622	+ .27	1.45137	+ .18	
25	-2220	10	-22030		-2226	0	-21.30	
4 45.2	57 36.12	2 46.6	5 2.14	4 30.9	53 13.64	2 57.9	24 22.87	
57.0		59.1		43.9		9.8		
1622		1057		748		1277		
29 57.20		22 52.85		34 37.40		3 3.85		
52 5725		89 5550		48 1095		19 44.50		
53 58 1685		53 5 1510		53 53 3058		50 25 410		
- 3036		- 253		- 186		- 2827		

6 24.01	56 44.9	12 29.17	4 11.7	13 5.34	52 23.4	19 38.14	23 33.5	

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1877phae.proj.1607R

619 623

1878, Jan. 22, Jan. 28, Obs. W.A.R. Rec. & F.M.

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	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	1 21 24	20 22.3	1 28 57	27 58.5	1 30 51	29 46.8	1 31 56	30 53.3	3 1. 48	0 36.5	3 2 21	1 7.9
δ	53° 33′	28 3 50° 36′ 8.5		31 0 52° 20′ 8.8		14.7 54° 25′ 8.8		202 54° 54′ 8.2		50.0 9.4	54° 8′	4.2 9.5

Jan. 22

		+11.29		+7.76		+10.63		+12.42		+12.64		+11.62
		11.95		8.44		10.69		13.08		13.28		12.28
		0.0										
	21 3.5	0.1										
	7.0											
	21 0.05		28 29.1		30 19.3		31 25.9		1 25.4		1 56.2	
	+ 48.54	+47.78	32.4		22.4		29.5		28.8		59.7	
	− .76		35.7		25.9		33.0		32.4		3.0	
	21 47.83		38.0		29.3		36.6		36.0		6.7	
			42.0		32.7		40.2		39.6		10.3	
			282		296		152		122		159	
	− .005		28 35.64		30 25.92		31 33.04		1 32.44		2 3.18	
	21 47.78		+ 48.54	+47.86	+ 48.54	+47.82	+ 48.54	+47.76	+ 48.53	+47.74	+ 48.53	+47.76
			− .68		− .72		− .78		− .79		− .77	
			29 23.50		31 13.74		32 20.80		2 20.18		2 50.94	
			− 0.20		− 0.12		− 0.29		− 1.38		− 1.38	
		−11.12	29 23.30	−11.07	31 13.55	−11.23	32 20.64	−11.41	2 18.80	−13.29	2 49.56	−13.19
		−56.40		−55.77		−55.47		−55.38		−42.15		−42.06
			4.6		8.3		8.2		9.0		9.2	
	21 10.0		28 21.7		29 47.5		30 57.9		0 54.2		2 29.6	
	13.4		24.5		50.9		1.5		56.4		32.4	
	16.0		27.3		53.4		4.5		0.8		35.8	
	94		135		18		39		1714		72	
	21 12.13	+ 0.66	28 24.50	50 38 25.13	29 50.60	52 21 53.05	31 1.30	54 27 17.64	0 57.13	54 55 29.40	2 32.40	54 9 45.37
	− 13.08	− 5	+ 11.14	− 3	+ 3.32	− 33	+ 31.74	− 26	+ 35.31	− 32	− 29.22	− 22
	1.11661	− .4976	1.04689	− .8372	1.54802	− .1422	1.50161	− .0777	1.54790	− .4052	1.46568	− .6876
	9.77336	+ 11.58	9.80228	+ 8.46	9.78576	+ 1027	9.76448	+ 12.48	9.75921	+ 13.05	9.76747	+ 12.26
	1.01475	+ .25	0.97395	+ .18	1.45856	+ .23	1.39087	+ .27	1.43199	+ .29	1.35793	+ .26
	50	−21.00	45	−20.80	5	−21.00	0	−21.80	30	−22.40	15	−22.20
Rs = −.18 −.27	2 33.1	35 28.94	41 27.3	38 13.14	0 39.1	21 42.74	0 18.9	27 9.12	2 5.0	55 20.28	3 35.9	9 35.47
n = −.56	46.9		40.9		41.6		33.9		19.41		53.2	
	826		682		937		528		244		921	
	52 41.00		49 34.10		5 46.65		0 26.40		32 12.20		18 46.05	
+5 20.29	30 7.35		33 1425		17 1.50		22 21.95		50 36.15		4 2.30	
	53 35 27.64		50 38 34.54		52 22 21.79		54 27 42.24		54 55 56.41		54 9 22.59	
	+ 10.35		− 9.42		− 28.74		− 24.60		− 27.04		+ 22.80	
	21 36.66	34 32.5	29 12.23	37 17.4	31 2.32	20 47.3	32 9.23	26 13.7	2 5.51	54 38.1	2 36.37	8 53.4
										+13.86		+12.79
Jan 28										13.37		12.43

Add +.007 to (ΔT + ns) Jan 28 It has been added to sums of the constants, and to final R.A.

									1 18.3			50.3		
									22.7			53.8		
									26.5			57.0		
									29.9			0.6		
									33.7			4.0		
									3.21			3.57		
									1 26.42			1 57.14		
								+.007	+ 54.95	+53.81		+ 54.95	+53.84	
									− 1.15			− 1.12		
									2 20.22			2 50.97		
									− 1.22			− 1.23		
									2 19.00	1 −13.29		2 49.74	5 −13.19	
										−42.15				−42.06
									9.4			9.4		
									0 46.9			2 16.7		
									51.0			20.1		
									54.5			23.5		
									24	+ 0.31		03		
									0 50.80	54 55 30.86		2 20.10	54 9 44.30	
									+.3562	− 32		− 22.96	− 14	
									1.55169	− .4052		1.36092	− .4744	
									9.78931	+ 1358		9.76741	+ 12.67	
									1.43578	+ .38		1.25322	+ .24	
									30	− 22.50		15	− 22.30	
Rs = −.18 −.28									2 6.5	55 21.73		3 37.9	9 34.43	
n = −.8182									15.0			47.1		
									215			850		
+5 20.54									32 12.75			18 42.50		
									50 3.760			4 8.85		
									54 55 58.14			54 9 26.39		
									− 27.28			+ 17.91		
									2 5.72	54 39.6		2 36.56	8 52.4	

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1877phae.proj.1107R

1878, Jan. 22, Jan. 28 Obs. W. A. R. Rec. J. F. M.

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	h m s		h m s		h m s		h m s		h m s		h m s	
α	3 13 22	12 8.2	3 14 15	12 54.5 4.4	3 15 38	14 24.3	3 37 0	37 43.7	3 40 54	39 38.5	3 41 32	40 15.8
δ	54° 46	42.0 7.0	54° 7	27.9 7.3	54° 13	9.3 8.4	53° 26	22.7 9.0	54° 57	54.2 8.0	53° 9	6.4 8.7

Jan. 22

+4.99 +4.82 +11.29 +12.31 +10.97

	12 59.3	12.65	13 43.7	12.48			38 36.7	11.95	40 31.8	12.97	41 7.6	11.63
	2.8		47.0				40.0		35.2		10.9	
	6.3		50.6				43.6		38.8		14.4	
	10.0		54.2				47.0		42.5		17.7	
	13.6		57.7				50.7		46.2		21.3	
	3.20		3.32				1.80		4.45		7.19	
	13 6.40		13 50.64				38 43.60		40 38.90		41 14.38	
	+48.53	+47.73	+ 48.53	+47.76			+ 48.53	+47.77	+ 48.53	+47.73	+ 48.53	+47.78
	− .80		− .77				− .76		− .80		− .75	
	13 54.13	−13.46 −39.93	14 38.40	−13.38 −39.78			39 31.37	−13.64 −34.68	41 26.63	−13.92 −34.29	42 2.16	−13.63 −34.14
	− 1.53		− 1.53				− 1.82		− 1.90		− 1.87	
	13 52.60		14 36.87				39 29.53		41 24.73		42 00.29	

7.0	12 28.9		9.0 13 43.0				9.0 38 7.4		8.2 39 54.4		8.7 41 0.8	
	32.7		45.3				10.8		58.2		3.7	
	36.2		49.0				13.3		1.2		5.4	
	75	+0.66	173				15		738		8.4	
	12 32.50	54 47 38.09	13 45.77	54 9 23.49			38 10.50	53 26 41.47	39 57.93	54 58 42.46	41 4.50	53 10 29.45
	+33.90	− .30	+4.87	− 1			+33.10	− .28	+40.97	− 43	+9.88	− 3
	1.530020	−.92 +1.13	0.687753	−.6704			1.519183	− .1828	1.612247	−.70189	0.994476	−.4540
	9.760750	+12.93	9.767650	+12.23			9.774900	+ 11.50	9.755877	+ 13.15	9.977761	+ 11.21
	1.415132	+ .28	0.579960	+ .27			1.419512	+ .25	1.496021	+ .29	0.897715	+ .24
	35	−22.10	15	−22.00			0	−21.20	25	−21.50	15	−21.50
	4 57.9	47 28.64	3 33.9	9 13.97			0 53.9	26 32.22	3 48.5	58 33.93	2 24.8	10 20.78
	11.1		48.8				7.9		1.2		37.8	
	9.0		8.27				18		109.7		6.26	
	40 4.50		18 41.35				1 0.40		28 54.85		17 31.30	
	42 43.85		4 7.00				90		53 33.50		5 17.05	
	54 48 4.14		54 9 27.29				21 47.45		54 59 13.79		53 10 32.34	
	−26.05		− 3.80				53 27 7.74		− 31.33		− 7.89	
							− 26.27					
	13 39.14	46 48.7 +13.42	14 23.49	8 34.2 +12.24		+12.44 12.75	39 15.89	25 57.5 +11.63	41 10.81	57 59.6 +12.93	41 46.66	9 45.7 +11.10 11.41

Jan. 28

	12 53.2	13.73	13 37.5	12.55	15 8.8		38 30.5	11.94	40 25.5	13.24	41 1.1	
	56.8		41.7		12.3		34.0		29.0		4.7	
	0.6		44.8		15.8		37.4		32.6		8.0	
	4.0		48.0		19.3		40.9		36.4		11.4	
	7.6		51.9		23.1		44.4		39.8		15.0	
	2.2		2.36		7.93		3.72		1.33		4.02	
	13 0.44		13 44.72		15 31.06		38 34.44		40 32.66		41 8.04	
	+ 54.95	+53.81	+ 54.95	+53.83	16.86		+ 54.94	+53.86	+ 54.94	+53.79	+ 54.94	+53.885
	− 1.15		− 1.12		+ 54.95	+53.83	− 1.09		− 1.16		− 1.09	
	13 54.24	−13.46 −39.93	14 38.55	−13.38 −39.78	16 9.68		39 31.29	−13.64 −34.68	41 26.44	−13.92 −34.29	42 1.89	
	− 1.38		− 1.39		− 1.41	−13.42 −39.51	− 1.70		− 1.76		− 1.73	−13.63 −34.14
	13 52.86		14 37.16		16 8.27		39 29.59		41 24.68		42 0.16	

7.	12 27.5		8.5 13 35.1		8.7 14 43.4		9.0 37 56.6		8.3 39 56.7		8.9 41 34.0	
	31.9		37.9		46.7		1.4		1.3		32.4	
	34.0		41.6		50.3		4.8		3.9		41.0	
	34	+0.31	1146		1404		2.8		1.9		1124	
	12 31.13	54 47 38.37	13 38.20	54 9 24.15	14 46.80	54 15 36.72	38 0.93	53 26 42.01	40 0.63	54 58 43.74	41 8.47	53 10 31.20
	+29.31	− .22	+6.52	− 1	+29.06	− .22	+36.51	− .35	+32.03	− .26	−29.43	− .23
	1.446702	−.0225	0.814425	−.6704	1.463306	−.4062	1.562411	−.1828	1.505567	−.7212	1.468796	−.5484
	9.760750	+13.38	9.767650	+12.66	9.766420	+12.80	9.774900	+11.92	9.755877	+13.63	9.977761	+11.63
	1.352552	+ .28	0.706684	+ .26	1.354500	+ .26	1.462091	+ .24	1.389111	+ .28	1.371718	+ .24
	40	−22.30	15	−22.20	16	−22.20	1	−21.50	25	−21.90	15	−21.40
	0 4.0	47 29.80	3 35.41	9 14.50	2 11.9	15 27.27	0 53.9	26 32.45	3 57.3	58 35.08	2 57.3	10 21.21
	12.0		43.9		14.2		1.9		40		5.1	
	16.0		7.93		19.1		11.58		13		2.4	
	40 8.00		18 39.65		12 9.55		0 57.90		29 0.65		18 1.20	
	42 40.35		4 8.70		10 38.80		21 50.45		53 47.70		4 47.15	
	54 48 0.89		54 9 29.24		54 15 59.34		53 27 10.99		54 59 8.24		53 10 4.69	
	− 7.25		− 5.09		− 22.62		− 28.98		− 24.50		+ 23.51	
	13 39.41	46 49.9	14 23.78	8 34.7	15 54.86	14 47.8	39 15.96	25 57.8	41 10.77	58 0.8	41 46.53	9 47.1

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619 620

1878, Jan. 22, Jan. 28

	h m s		h m s		h m s		h m s		h m s		h m s		h m s	
α	3 45 29	44 18.4	3 48 42	47 25.2	3 49 58	48 47.3	3 50 41	49 24.4	3 52 22	51 4.9	4 7 11	4 11 11	5 5 53.1	9.57.4
δ	51° 6′	3.2 53° 32′		39.3 51° 17′		14.0 52° 35′		31.4 53° 22′		19.5 53° 2′		52 59.4 50 4 13		
		9.0		8.8		9.3		8.5		8.9		8.0		2.8

Jan. 22

	45 8.9	8.72	48 4.4	12.03	49 1.4	9.44	10.87	11.10	11.27	11.71	6 46.6		10 50.1	
	12.0		7.7		10.6		20.7				+47.79 50.0	+47.86	53.8	
	15.4		11.2		13.8		24.0				53.6		57.0	
	18.7		14.5		17.3		27.4				56.9		0.2	
	22.0		18.0		20.4		30.7				0.5		3.5	
	770		558		195		489 198		252 316		76		352	
	45 15.40		48 11.16		49 13.90		1978 2296		504 632		6 53.52		57.04	
	+ 48.53	+47.84	+ 48.53	+47.77	+ 48.53	+47.83	+ 48.53 + 48.53	+47.80 +47.80	+ 48.53 + 48.53	+47.77 +47.77	+ 48.53		+ 48.53	
	− .69		− .76		− .70		− .73 − .73		− .76 − .76		− .74		− .67	
	46 3.24		48 58.93		50 1.73		51 7.58 11.76		52 52.81 57.09		7 41.31		18 44.90	
	− 1.87		− 1.95		− 1.91		− 1.96 − 1.96	−13.65	− 2.00 − 2.00		− 2.17		− 2.15	
	46 1.37	−1336	48 56.98		49 59.82		51 5.62 9.80	−32.13	52 56.81		7 39.14		42.75	
		−33.27								−1380				
										−31.74	−13.92		−1349	
											−28.38		−27.42	
	90		92		94		90 8.2 52 35 4.53 35 57.92		87 93					
	44 38.0		47 54.6		48 57.5		49 57.3 50 10.3		51 18.5		6 35.2		10 25.2	
	40.4		56.4		0.6		59.7 13.9		23.7		37.6		27.7	
	42.5		58.8		3.9		3.6 17.6		28.5		41.9		30.4	
	09		198		20		06 118		72		114 7		83.3	
	44 40.30	51 7 49.43	47 56.60	53 35 18.62	49 0.67	51 19 29.12	020 1393		2435.55 6.49		6 38.73		10 27.77	
	+ 35.10	− 33	+ 4.56	− 6	+ 13.23	− 5	19.58 + 10.03		15.97 +43.25		+15.24		+29.27	
	1.54 531	− 86.34	1.16 316	− 47.73	1.12 156	− 63.98	1.23181 1.00130		1.20150 1.63599	− 63.95	1.54141		1.46642	
	9.79762	+ 9.05	9.77353	+ 11.65	9.79573	+ 9.25	9.78362 9.78346		9.77824 9.77524	+ 11.48 + 11.48	9.77879		9.80731	
	1.46771	+ .20	1.06147	+ .25	1.04207	+ .21	1.20021 0.90954		1.10332 1.53601	+ .25 + .25	1.08798		1.39851	
	15	−2050	58	−20.90 5		−2020	80 80		0 0	−2070 −2070			20	
	4 43.2	7 37.65	2 31.9	35 9.75	3 21.9	19 18.36	2 41.1 55.1		3 21.3 13.9		4 18.2		2 37.2	
	56.5		45.1		35.1		53.4 10.1		30.5 26.9	24 26.12	31.9		57.6	
	997		770		570		965 52		596 408		561		878	
	19 49.85		52 38.50		8 28.50		52.4825 52 2.60		3 2780 3 20.40		24 25.05		22 43.90	
	2 58.50		30 9.85		14 17.85		30 0.10 30 4.75		19 20.55 19 27.15		58 23.30		0 44.5	
	51 8 18.79		53 35 30.14		51 19 40.14		52 35 30.39 36.04		532 40.84 24 48.24		53 3 10.59		50 5 24.74	
	− 29.36		− 11.52		− 11.02		− 15.86 − 8.12		−12.69 −34.35		− 12.25		− 25.03	
							50 51.97		−34.35 −12.69					
	45 48.01	7 4.4					56.15	35 16.3	52 37.01	23 54.4	7 25.22		11 29.26	
		+8.79				+8.80		+10.60		+11.33	2 54.0		4 21.1	

Jan. 28

	45 2.8	8.20			47 31.9	9.11	50 11.1	10.91	51 52.0	11.64	53 3 31.34		50 4 59.71	
	6.0				55.3		14.4		55.5		− 6		− 23	
	9.4				58.5		17.8		57.0		− 79 −93		− 49 −46	
	12.7				41.7		21.5		2.4		+ 11.10		+ 1.95	
	16.1				45.0		25.0		6.3	58.80	+ 24		+ .17	
	470				424		398		452 462	82	− 2010		−1920	
	45 9.80				49 38.48		50 17.96		51 4.34 58.82		3 22.39		4 48.57	
	40								54					
	+ 54.94	+53.95			+ 54.94	+53.94	+ 54.94	+53.89	+ 54.94	+53.86				
	− 1.00				− 1.01		− 1.06		− 1.09					
	46 3.34				50 32.41		51 11.84		52 47.69					
	− 1.74				− 1.79		− 1.83		− 1.87					
	46 1.60	1 −1336			50 36.62	3 −13.44	51 10.01	2 −13.65	52 51.03	−1380				
		−33.27				−32.28		−32.13	50.81	−31.74				
	90				91		78		80					
	44 27.3				49 10.7		50 42.4		51 26.3					
	29.6				13.6		44.6		30.8					
	33.4				15.9		48.2		33.7					
	03				102		152		03					
	44 30.10	51 7 48.32			49 13.40	51 18 18.49	50 45.07	52 35 59.04	51 30.10	53 24 35.00				
	+ 39.30	− 42			+ 25.08	− 17	− 27.11	− 19	+ 28.04	− 22				
	1.59 4139	− 86.34			1.39933	− 84.26	1.43313	− 45.70	1.48232	− 58.96				
	9.79 7612	+ 9.38			9.79 605	+ 9.58	9.78 346	+ 18.01	9.77 524	+ 11.89				
	1.51679	+ .19			1.32016	+ .20	1.34134	+ .23	1.36152	+ .24				
	15	−20.70			5	−2060	50	− 21.00	0 1.35941	− 21.10				
	41 43.5	7 36.22			41 24.8	18 7.00	2 27.1	35 48.95	3 6.7	24 25.34				
	51.9				34.2		36.5		15.1					
	954				590		636		218					
	19 47.70				9 29.50		52 31.80		3 10.90					
	3 0.65				13 18.85		30 16.56		19 37.45					
	51 8 21.19				51 18 39.39		52 35 37.09		53 24 57.99					
	− 32.87				− 20.90		+ 21.95		− 22.88					
		2.9												
	4548.25	7 3.0			50 17.19	17 34.7	50 56.36	35 16.8	52 37.01	23 53.9				

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1877phae.proj.1107R

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622 623

9 55.5 53

	h m s	h m s	h m s	h m s	h m s	h m s
α	2 55 52 54 40.6	2 56 51 55 39.0	3 11 58 10 49.8	2 12 43 11 34.5	3 14 19 13 11.0	3 15 0 13 51.5
δ	52° 8' 34 7.9	52° 34' 29.3 8.5	51° 6' 2.9 8.3	50° 38' 34.2 8.8	50° 12' 8.4 8.6	50° 2' 49 58.3 9.0

Jan. 30 +7025 +1096 Chf. +801

55 16.4 11.24 56 ~~16.6~~ 11.95 14 28.4 9.00
20.0 ~~16.2~~ 31.6
23.4 23.4 34.5
26.4 26.5 37.6
30.0 30.1 40.8

1162 168 1729
55 23.24 56 23.76 27 14 34.58
+ 5763 +5865 + 5763 +56.62 + 57.63 +587.1
− 98 − 101 − .92
56 19.89 57 19.88 89 15 31.29
− 1.08 − 1.10 −1.32
56 18.81 57 18.88 15 29.97
79

−1288 −12.82
−4306 −3960

7.8 9.1 9.0 9.3

54 52.2 56 0.1 14 33.1
55.1 3.7 35.2
56.5 7.3 36.7
58 11.3 150
+0.99 4755
54 55.27 52 9 9.88 56 3.77 52 34 43.38 14 35.00 50 4 15.41
+ 27.97 − 21 + 19.56 − 10 − 1.42 − 0
1.44669 − .65 .01 1.29 80.3 − .56 .88 0.15229 − .09 .09
9.78788 + 10.89 9.78 362 79 + 1139 9.80746 + 855
1.33935 + 22 1.30043 + 23 0.08453 + .16
− 21.50 1.19860 − 21.90 − 21.00
15 50 45 10 20

Rn=−.18 −.25 n=−.77 3 34.6 8 58.44 59.42 32 3 4.2 10.1 10.1 143 34 33.43 37.60 3 10.1 159 260 3 56.2 0.9 1171 3 53.8 58.8 126 4 3.41
18 3775 53 7.15 48 13.00 13 58.55 23 56.30
+5 22.15 4 10.60 29 4.20 34 35.35 58 52.05
52 9 32.75 52 35 3.35 50 39 57.50 50 4 14.20
− 22.87 − 14.97 + 1.21
15.88

57 5.91 33 54.5

Feb. 2 +10.20 E.K. +943 +8.97 +819 +794 +795

55 12.2 11.27 10 28.2 22.4 10.50 9.99 12 7.0 9.76 13 43.2 9.04 14 24.0 9.02
15.5 31.5 26.0 10.3 46.7 26.8
18.9 34.8 28.8 13.8 48.7 30.2
22.5 38.1 32.2 16.9 52.9 33.5
25.7 41.4 35.7 20.2 56.5 36.6

448 240 451 18.2 490 11
55 18.96 34.80 29.02 12 13.64 13 49.80 14 30.22
+ 61.64 +1 0.67 + 61.65 +61.65 +1 0.71 +1 0.71 + 61.65 +1 0.72 + 61.65 +1 0.74 + 61.65 +1 0.75
− .94 − .94 − .93 − .91 − .90
56 19.63 11 35.51 29.38 −12.91 13 14.36 14 50.54 15 30.97
− 1.01 − 1.20 − 1.21 − 1.23 − 1.24
56 18.62 11 34.31 28.53 −12.91 13 13.15 −1287 14 49.31 −12.83 15 29.73 −1282
−4020 −4005 −3975 −3960

7.7 7.5 8.8 8.7 9.1

57 53.1 10 33.0 11 8.7 11 54.7 13 26.2 14 22.6
58.7 36.4 13.1 57.4 29.7 26.0
60.5 40.3 16.6 59.8 31.6 28.5
190 197 84 219 875 171
+1.07
34 56.33 52 9 9.72 36.57 12.50 50 39 53.8 11 57.30 50 39 53.8 13 29.17 50 13 48.74 14 28.70 50 4 15.61
+ 22.63 − 14 − 1.7 + 16.22 − 0 − 7 + 16.34 − 7 + 20.63 − 12 + 452 − 1
1.35468 − 67104 0.24795 1.21005 −4779 −85.7 1.21325 −5454 1.31450 −.7212 0.65514 −.68 106
9.78788 + 10.80 9.79762 +9.71 +9.65 9.80 1.91 + 912 9.80595 + 8.64 9.80746 + 8.48
1.26734 + .21 0.16990 1.13245 +.19 +.19 1.14000 + .18 1.24523 + 1 0.58738 + .16
− 21.70 −21.40 −21.40 − 21.20 − 21.10 − 21.10
15 15 45 10 20

Rn=−.18 −.25 n=−.787 3 37.1 8 59.29 45.6 82.7 18 41.35 4 7.00 52 9 28.23 − 18.51 2 31.0 40.1 39.0 46.9 100 A 70 35.00 43.50 35.48 5 13.35 3.45 51 10 39.58 26.08 − 13.57 +1.48 11 21.40 9.45.0 12 15.62 20.9 2 39.1 5.1 42 48 2.10 34 46.25 50 40 7.48 − 13.80 39 42.24 41 0.2 5.1 53 14 2.65 +60 8 45.70 50 14 6.93 − 17.54 13 36.48 3 47.0 53.2 100.2 23 50.10 58 58.25 50 4 19.48 − 38.7 12 56.9 3 23.9

15 16.91

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1877phae.proj.1607R

1878, Jan. 30, Feb. 2

622 623

	h m s		h m s		h m s		h m s		h m s		h m s	
α	3 16 41	15 32.7	3 16 46	15 37.0	3 17 42	16 33.7	3 18 43	17 38.5	3 20 36	19 21.4	3 22 56	21 47.0
δ	50° 57′	53.6 7.6	50° 54′	50.8 9.0	50° 3′	49 59.5 8.9	50° 29′	25.8 8.1	52° 58′	54.9 8.8	50° 59′	55.7 9.0
Jan. 30		+8.76		+9.35		+8.16		+8.77		+11.63		+9.12
	16 8.6	9.75	16 13.5	10.34	17 11.6	9.15	18 16.0	9.76	20 1.2	12.62	22 25.9	10.11
	13.2		16.3		14.9		18.8		4.4		29.0	
	16.0		19.6		17.8		22.2		8.0		32.3	
	19.4		22.7		21.3		25.6		11.6		35.3	
	22.5		26.0		24.5		28.8		15.1		38.9	
	807		481		402		114		403		114	
	16 16.14		16 19.62		17 18.04		18 22.28		20 8.06		22 32.28	
	+ 57.63	+56.68	+ 57.63	+56.68	+ 57.63	+56.71	+ 57.63	+56.70	+ 57.63	+56.61	+ 57.63	+56.68
	− .95		− .95		− .92		− .93		− 1.02		− .95	
	17 12.82		17 16.30		18 14.75		19 18.98		21 4.67		23 28.96	
	− 1.34		− 1.34		− 1.35		− 1.36		− 1.41	26	− 1.42	−1.306
	17 11.48	−12.97 −39.27	17 14.96	−12.96 −39.27	18 13.40	−12.86 −39.06	19 17.62	−12.93 −38.85	21 8.12	−13.30 −38.49	23 27.54	−38.01
	6.7		9.4		8.7		7.5		8.5		9.2	
	15 35.3		16 1.2		17 1.5		17 57.8		19 43.3		21 57.5	
	38.0		5.7		5.3		0.8		46.6		59.5	
	40.4		9.0		7.8		4.8		50.0		3.2	
	1137		15 9		14 6		35		1399		02	
	15 37.90	50 59 9.61	16 5.30	50 56 7.52	17 4.87	50 5 6.94	18 1.17	50 30 56.71	19 46.63	53 0 48.62	22 0.07	51 0 26.33
	+38.24	− 40	+14.32	− 5	+13.17	− 5	+ 21.11	− 12	+21.43	− 12	+32.21	− 27
	1,582.52	− 6.38	1.15594	− 32.50	1.11959	− 52.84	1.32449	− 34.53	1.33102	− 38.59	1.50799	− .41 64
	9.79903	+ 9.60	9.79950	+ 9.53	9.80731	+ .857	9.80336	+ 9.05	9.77930	+ 11.90	9.79887	+ 9.61
	1.50633 n	+ .19	1.08022 n	+ .19	1.05168 n	+ .16	1.25263 n	+ .18	1.23510 n	+ .23	1.43164 n	+ .19
	25	− 21.30	30	− 21.30	20	− 21.00	55	− 21.10	25	− 21.50	25	− 21.20
	3 25.8	58 58.06	1 48.0	55 56.56	2 49.7	4 55.09	1 53.4	30 45.37	2 2.3	0 39.44	2 14.2	0 15.24
	31.8		53.9		54.9		58.1		7.1		20.1	
	576		1019		1046		118		94		343	
	26 26.80		31 54.95		22 52.30		56 55.90		27 4.70		27 17.15	
	54 1955		50 57.40		59 56.05		25 52.95		55 43.65		55 31.20	
	50 59 41.70		50 56 19.55		50 5 18.20		50 31 14.60		53 1 5.80		51 0 53.35	21 29.3
	− 32.09		− 12.03		− 11.26		− 17.89		− 17.18		− 27.02	21 47.0
												65.9
Feb. 2	16 58.51	58 18.8	17 2.00	55 17.3	18 0.54	4 16.0	19 4.69	30 6.5	20 49.96	0 1.0	23 14.48	59 37.2 +9.09 +9.15
		+8.97		+8.91		+8.10		+8.74		+11.30		
	16 5.4	10.04	16 9.0	9.98	17 7.0	9.17	18 11.6	9.81	19 57.1	12.37	23 5.2	22 21.7 10.16 10.22
	8.8		12.3		10.5		14.8		0.6		8.2	24.1
	12.1		15.6		13.9		17.9		3.9		11.5	28.4
	15.4		18.0		17.3		21.4		7.4		14.7	31.6
	18.8		22.0		20.4		24.4		11.2		17.3	34.8
	605		779		691		401		202		69	414
	16 12.10		16 15.58		17 13.82		18 18.02		20 4.04		11.38	28.28
	+ 6.165	+1 0.71	+ 6.165	+1 0.71	+ 6.165	+1 0.73	+ 6.165	+1 0.73	+ 6.165	+1 0.64	+ 6.165	+1 0.71 +1 0.71
	− .94		− .94		− .982		− .92		− 1.01		− .94	− .94 −1.306
	17 12.81		17 16.29		18 14.57		19 18.75		21 4.68		23 12.09	28.99 −38.01
	− 1.27	−12.97	− 1.26	−12.96	− 1.27	−12.86	− 1.29	−12.93	− 1.33	−13.36	− 1.35	− 1.34 −1306
	17 11.54	−39.27	17 15.03	−39.27	18 13.28	−39.06	19 17.46	−38.85	21 3.35	−38.49	23 10.74	27.65 −38.01
	7.8		9.3		9.1		7.5		8.5		8.8 9.0	51 0 17.40 27.8
	15 55.3		15 31.3		17 6.3		18 3.2		19 21.2		23 43.7	22 3.0 17 13
	57.5		34.0		9.8		5.8		25.1		46.3	6.3 .45 .43
	59.3		36.2		14.3		9.2		30.0		48.4	9.7 +952 +952
	221		115		304		18 2		763		184	187 +.19 +.19
	15 57.37	50 59 11.68	15 33.83	50 56 11.41	17 10.13	50 5 6.47	18 6.07	50 30 55.95	19 25.43	53 0 49.07	46.13	6.23 −2.20 −2.20
	+14.73	− 6	+41.75	− 47	+ 3.69	− 1	+ 11.95	− 4	+38.61	− 39	+25.25	+22.05 0 6.36 16.50
	1.16820	− .68	1.62066	− .25	0.56703	− .54	1.07737	− .38	1.58670	− .32	1.40226	1.34317
	9.79903	+ 9.52	9.79950	+ 9.44	9.80731	+ 8.49	9.80336	+ 8.98	9.77930	+ 11.79	9.79887	9.79887
	1.07201 n	+ .19	1.54494 n	+ .19	0.49912 n	+ .16	1.00055 n	+ .18	1.49078 n	+ .22	1.32591 n	1.26706 n
	25	− 21.30	30	− 21.30	20	− 21.00	55	− 21.10	25	− 21.80	25	25
	3 42.7	59 0.42	1 19.6	56 5.09	2 54.2	4 54.64	2 6.3	30 44.76	1 45.9	0 39.64	2 27.6	2 20.1
	49.1		26.6		2.7		6.7		53.2		34.4	27.1
	118		462		119		70		991		620	27 72
	28 45.90 +.20		31 23.10		22 59.95		57 3.50		26 49.55		31.00	2360
	54 245		51 2525		59 4840		2.5 4485		55 5880		55 1735	55 2475
	50 59 23.68		50 56 46.48		50 5 9.63		50 31 6.08		53 1 20.03		50 0 38.58	0 45.98
	− 11.80		− 35.07		− 3.16		− 10.13		− 30.96		−21.18	−18.50
	16 58.57	58 21.2	17 2.07	55 20.8	18 0.42	4 15.6	19 4.53	30 5.8	20 50.05	0 1.2	22 57.69	59 25.4
											23 14.60	38.5

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35 235

	h m s		h m s		h m s		h m s		h m s		h m s	
α	3 24 13	23 3.8	3 27 33	26 17.8	3 37 35	36 24.2	3 39 9	37 58.8	3 40 46	39 35.4	3 41 22	40 5.6
δ	51° 52'	48.4 8.3	54° 7'	3.5 9.0	51° 18'	14.9 6.5	51° 34'	30.7 8.2	52° 0'	51 57.3 9.5	54° 18'	15.3 8.0

Jan. 30

+10.60 11.59 | +12.49 13.48 | +9.40 10.39 | +9.86 10.85 | +10.65 11.64 | +12.87 13.86

23 44.1 47.6 50.7 54.0 57.6 — 40
23 30.80 + 57.63 +56.64 — .99 — 24 47.44 — 1.44 — 24 46.18 — 13.20 37.77

27 0.5 4.0 7.8 11.4 14.8 — 385
27 7.70 + 57.63 +56.57 — 1.06 — 28 4.27 — 1.52 — 28 2.75

37 4.0 7.3 10.6 13.8 17.5 — 32
37 10.64 + 57.63 +56.67 — .96 — 38 7.31 — 1.60 — 38 5.71 — 13.29 34.98

38 39.7 43.0 46.3 49.6 53.0 — 2316
38 46.32 + 57.63 +56.67 — .97 — 39 42.98 — 1.62 — 39 41.36 — 13.35 34.62

40 4.9 8.2 11.9 15.6 18.5 / 40 17.0 20.4 23.7 27.0 30.8 — 591 189
11.82 23.78 + 57.63 + 57.63 +56.65 +56.65 — .98 .98 — 41 8.47 20.43 — 1.65 1.66 — 41 6.82 18.77 — 13.44 34.26

40 49.8 53.3 56.8 0.5 3.9 — 343
40 56.86 + 57.63 +56.56 — 1.07 — 41 53.42 — 1.70 — 41 51.72 — 13.81 34.14

8.3 | 8.6 | 6.4 | 8.1 | 2d * Stel. | 7.7

23 19.3 22.3 26.6 — 082 — 23 22.73 +0.99 51 52 40.81
+28.07 — 21 — .02 — 1.44824 9.79047 1.36349 + 1061 + .22 — 21.40 — 35 — 52 31.00
0 4.1 9.1 132 — 35 6.60 — 47 41.75 — 51 53 8.90 — 2309

26 36.1 39.0 43.3 — 284 — 26 39.47 54 8 30.51
+28.23 — 20 — .77 — 1.45071 9.76765 1.34314 + 1321 + .25 — 2200 — 15 — 8 27.99
4 15.7 20.2 359 — 19 17.95 — 3 30.40 — 54 8 52.55 — 2204

36 38.5 41.7 45.3 — 55 — 36 41.83 51 19 42.61
+28.81 — 22 — .56 — 1.45954 9.79573 1.38005 + 9.98 + .20 — 21.00 — 5 — 19 32.00
3 1.6 6.2 78 — 8 390 — 14 44.45 — 51 20 6.60 — 2399

38 22.4 25.0 28.3 — 157 — 38 25.23 51 35 3.73
+21.09 — 12 — .50 — 1.32408 9.79335 1.24221 + 10.27 + .21 — 21.10 — 50 — 34 53.48
2 46.2 52.4 986 — 52 49.30 — 29 59.05 — 51 35 21.20 — 1747

39 54.6 57.2 57.2 — 210 — 39 57.00 — 26.78 — 1.42781 9.78502 1.34181 — Stel
δ 2d * — 52 1 51.88 — .19 — .16 + 10.78 + .22 — 21.10 — 1 42.42
25 0 54.2 59.1 133 — 25 56.65 — 56 51.70 — 52 2 13.85 — 21.97

41 19.8 23.5 25.9 — 92 — 41 23.07 54 20 0.77
+26.21 — 18 — .63 — 1.41847 9.76572 1.30897 + 13.42 + .26 — 21.70 — 5 — 19 52.93
3 27.7 32.5 602 — 8 30.10 — 14 18.25 — 54 19 40.40 + 20.37

24 32.80 51 53.2 | 37 52.42 18 57.0 | 39 28.01 34 18.9 | 40 53.38 41 5.33 1 8.2 | 41 37.91 19 18.8

Feb. 2

+10.50 11.57 | +12.24 13.31 | +9.26 10.33 | +9.68 10.75 | +10.58 11.65 | +13.08 14.07

23 39.8 43.4 46.6 50.0 53.5 — 333
23 46.66 + 61.66 +1 0.67 — 99 — 24 47.33 — 1.37 — 24 45.96 — 13.20 37.77

26 56.2 59.9 3.3 7.0 10.5 — 169
27 3.38 + 61.66 +1 0.61 — 105 — 28 3.99 — 1.44 — 28 2.55

36 59.9 3.2 6.3 9.8 12.9 — 322
37 6.44 + 61.66 +1 0.71 — .95 — 38 7.15 — 1.52 — 38 5.63 — 13.29 34.98

38 35.5 38.7 42.0 45.3 48.9 — 104
38 42.08 + 61.66 +1 0.70 — 96 — 39 42.78 — 1.55 — 39 41.23 — 13.35 34.62

40 1.1 4.3 7.8 11.1 14.5 — 388
40 7.76 + 61.66 +1 0.69 — 97 — 41 8.45 — 1.58 — 41 6.88 — 13.44 34.26

40 46.2 49.3 52.9 56.0 59.8 — 142
40 52.84 + 61.66 +1 0.60 — 1.06 — 41 53.44 — 1.63 — 41 51.81 — 13.81 34.14

8.2 | 9.0 | 6.8 | 8.6 | 9.5 | 7.5

23 14.3 18.4 21.0 — 537 — 23 17.90 +1.07 51 52 43.37
+28.76 — 22 — 0 — 1.45879 9.79847 1.37404 + 1051 + .21 — 21.50 — 30 — 52 33.44
4 59.8 5.3 51 — 35 2.55 — 47 45.80 — 51 53 7.03 — 2360

26 24.6 27.5 30.8 — 829 — 26 27.63 54 8 31.36
+35.75 — 34 — .76 — 1.55328 9.76765 1.44571 + 1309 + .25 — 27.10 — 15 — 8 22.57
4 7.3 13.1 204 — 19 10.20 — 3 38.15 — 54 8 59.38 — 2802

36 30.8 33.5 36.8 — 111 — 36 33.70 51 19 43.07
+32.74 — 28 — .54 — 1.51508 9.79573 1.43559 + 988 + .20 — 21.10 — 5 — 19 32.30
2 56.4 2.1 1185 — 7 59.25 — 14 49.10 — 51 20 10.33 — 2726

38 10.5 14.5 17.0 — 120 — 38 14.00 51 35 4.32
+28.08 — 21 — .49 — 1.44840 9.79335 1.36653 + 1018 + .20 — 21.10 — 50 — 34 53.97
2 37.9 46.1 840 — 52 42.00 — 30 6.35 — 51 35 27.58 — 2326

39 30.6 34.2 36.4 — 112 — 39 33.73 52 2 37.94
+ 34.03 — 31 — .02 — 1.53186 9.78886 1.44550 + 1070 + 21 — 21.20 — 25 — 2 28.39
0 0.7 6.8 75 — 25 3.75 — 57 44.60 — 52 3 5.83 — 2789

40 48.6 51.7 55.0 — 53 — 40 51.77 54 20 0.25
+ 1.67 — 0 — .56 — 0.02938 9.76572 9.91988 + 13.30 + .26 — 21.90 — 5 — 19 52.42
3 5.2 11.8 170 — 8 8.50 — 14 39.85 — 54 20 1.08 — 083

24 32.76 51 55.7 | 37 52.34 18 57.3 | 39 27.88 34 19.3 | 40 53.43 1 54.1 | 41 38.00 19 18.3

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	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	3 38 44	4 0 16	4 0 48	4 2 43	4 4 4	4 12 39	
δ	53 1	52 40	52 48	54 5	52 48	51 17	

Jan. 30

	3 58 59.2	372 85	3 59 30.3	458 83	1 26.3	23 7.5	457 90
	+11.33		+11.32		+11.76		+11.29
	1232		12.31		1375		12.28
	59 42.9	0 15.2	2 12.9		3 31.6		12 9.3
	46.4	19.0	16.8		35.3		12.5
	49.9	22.5	20.2		38.6		15.8
	53.5	25.7	23.2		42.0		19.2
	56.9	28.2	26.8		45.7		22.9
	496	116	00		432		290
	59 49.92	0 22.32	2 2000		3 3864		12 15.80
	+ 4 57.63 +56.61	+ 57.63 +56.61	+ 5 7.63 +56.57		+ 57.63 +56.61		+ 57.14 +56.68
	− 102	− 102	− 106		− 102		− 96
	0 46.53	1 18.93	3 16.57		4 35.25		13 12.48
	−1.91	−1.92	−1.98		−1.96		−203
	0 44.62 −13.78 −29.97	1 17.01 −13.81 −2985	3 14.59 −14.05 −2.940		4 33.29 −13.84 −2.910		13 10.45 −13.69 −2709
	8.7	8.6	7.7		9.2		8.8
	59 26.7	0 9.4	1 42.0		3 23.8		11 46.0
	28.7	11.6	45.2		25.6		48.5
	31.9	14.4	48.2		27.6		51.4
	273	54	15 4		16 5		259
	59 29.10	0 11.80	1 45.13	54 5 4645	3 25.50	52 49 41.07	11 48.63 51 18 5107
	+26.82	+ 1052	+34.87	− 32	+13.14	− 5	+27.17 − 19
	1.31848	1.02202	1.52245	−.3455	1.11860	−.5992	1.43109 −.68 166
	9.78263	9.78113	9.76817	+ 1317	9.78113	+ 11.70	9.79589 + 9.98
	1.22589 n	0.92793 n	1.43540 n	+ 25	1.02451 n	+ 23	1.35476 n + 22
	45 −2080	35 −2080	20 −21.10	35	−20.70	5	− 1990
	1 37.0 41 4.90	3 9.1 49 41.041	54.4 5 39.10	3 15.5	49 32.65	3 47.8	18 47.49
	43.6	15.9	58.9	22.2		53.8	
	806	250	136	377		1016	
	46 40.90	38 12.50	21 56.80	38 18.65		8 50.80	
	36 8.05	44 3585	0 5155	44 2950		13 5755	
	52 41 30.20	52 49 58.00	54 6 13.70	52 49 51.65		51 19 19.70	
	− 1682	− 847	− 2725	− 10.58		− 22.63	
	0 30.84 40 34.9	1 37.20 49 11.2	3 0.54	5 9.7	4 19.45	49 3.8	12 56.76 18 20.4
	Obj.	Obj.		+12.84		+11.46	+9.08
Feb. 2			2 11.2	13.91	4 8.8	12.23	12 4.8 10.15
			14.5		12.0		8.2
			18.2		15.7		11.4
			21.3		19.7		14.8
			24.9		23.3		18.1
			401		293		75
			2 18.02		4 15.90		12 11.50
			+ 61.67 +1 0.62		+ 61.67 +1 0.66		+ 61.68 +1 1.73
			− 105		− 101		− 95
			3 18.64		5 16.56		13 12.23
			−1.90		−1.89		−1.96 −13.69
			3 16.74		5 14.67		13 10.27 −27.09
	6.8	8.8	8.3	6.2	7.0	8.3	
				2 32.2	3 49.8	11 32.3	
				35.7	54.6	35.2	
				39.3	58.8	38.6	
				174	132	161	
				2 35.80 54 6 15.33	3 54.10 52 49 51.32	11 35.37 51 18 57.33	
				−17.78 − 8	+21.50 − 12	+36.13 − 35	
				1.24993 n −.3852	1.33244 −.5484	1.55787 −.67104	
				9.76817 + 1306	9.78113 + 1160	9.79589 + 9.84	
				1.14288 + .25	1.23835 n + .22	1.47854 n + .21	
				20 −21.20	35 −2080	5 −2010	
	45	35		2 5.2 6 8.04	2 57.8 49 42.75	3 38.9	18 47.38
	1 27.9	3 29.9		11.1	4.1	45.4	
	34.9	36.3		163	1.9	843	
	628	662		22 8.15	38 0.95	8 42.15	
	46 31.40	38 33.10		0 4020	44 4740	14 6.20	
				54 6 1.43	52 50 8.63	51 17 27.43	
				+ 13.90	− 17.31	− 30.10	
						12 56.58	18 20.3

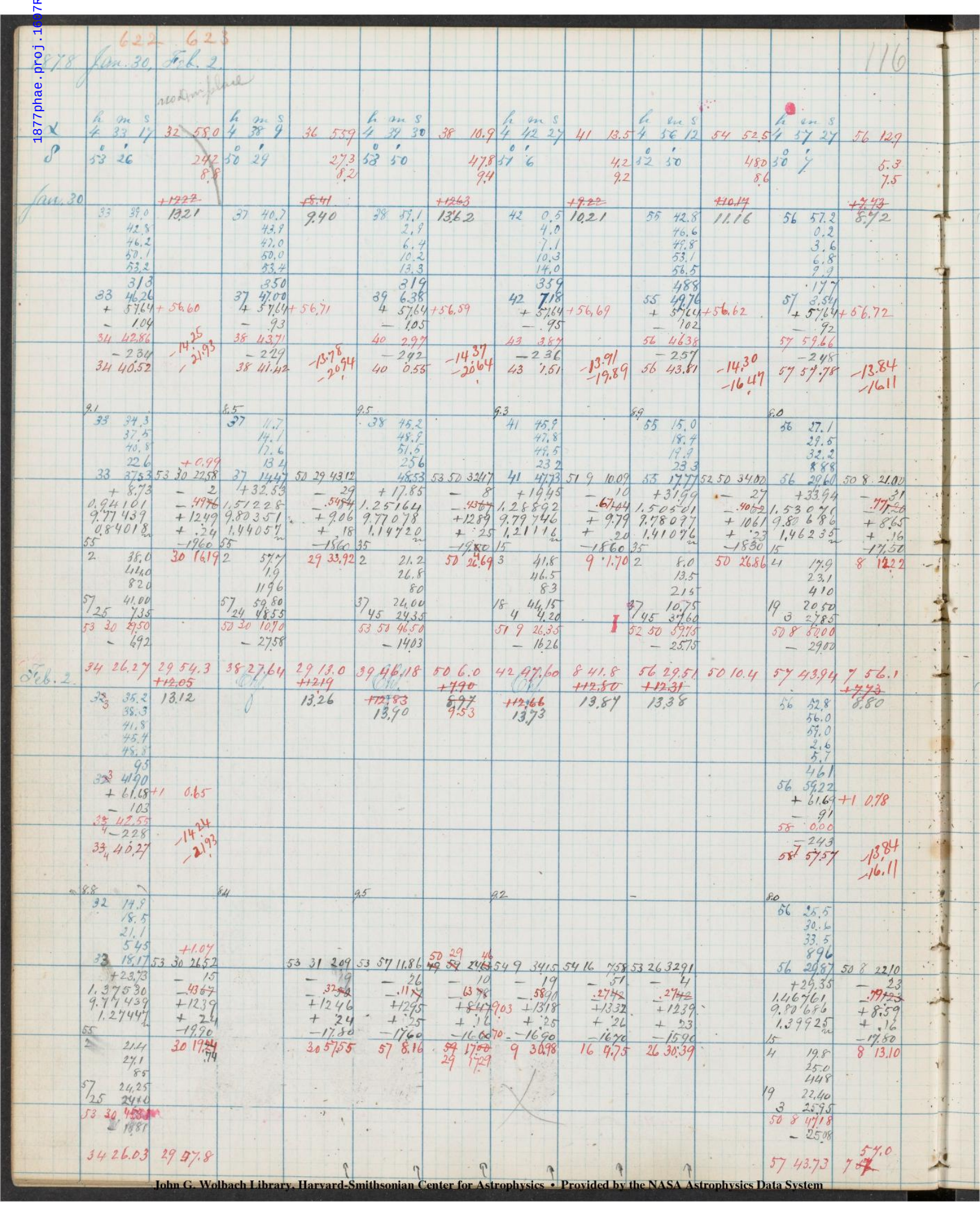
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	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
α	5 6 25	5 4.0	5 6 37	5 35.9	5 11 37	10 22.0	5 12 29	5 17 21	5 18 20	5 28 38	5 31 23	5 40 53
δ	0 ′	18.1 8.3	0 ′	25.2 Var.	0 ′	20.0 7.8	0 ′	0 ′	0 ′	0 ′	0 ′	0 ′
	53 20		53 27		51 21		53 31	53 37	50 29	54 9	54 16	53 24

Jan. 30

	5 52.7	12.69	6 26.0	13.40	11 9.9	10.91	11 59.6	13.17	28 10.0	13.81		
	56.3		29.7		13.1		2.7		13.7			
	59.6		33.1		16.4		6.4		17.2			
	3.0		36.8		19.5		9.7		20.6			
	6.7		40.0		22.9		13.3		24.0			
	483		156		318		317		355			
	5 59.66	+56.61	6 33.12	+56.61	11 16.36	+56.68	12 6.34	+56.60	28 17.10	+56.58		
	+5764		+5764		+5764		+5764		+5764			
	−1083		−103		−96		−104		−106			
	6 56.27		7 29.73		12 13.04		13 2.94		29 13.68			
	−2.71		−2.72		−268		−278		−2.98			
	6 53.56	−1446 −13.86	7 27.01	−1448 −13.71	12 10.36	−14.12 −12.51	13 0.16	−1452 −13.30	29 10.70	−1471 −8.13		

8.1 8.7 8.2 9.0 8.8

	5 26.4		6 37.3		10 44.7		11 53.7		27 49.3			
	30.5		41.3		48.0		56.8		53.0			
	33.0		43.8		50.9		59.8		56.6			
	899		25		236		203		89			
	5 29.47	53 19 27.22	6 40.83	53 26 51.57	10 47.87	51 22 6.34	11 56.77	53 30 0.41	27 52.97	54 9 33.07		
	+29.69	−23	−771	−2	+28.49	−21	+9.57	−3	+24.13	−15		
	1.47261	−5992	0.88465	−2546	1.45469	−1350	0.98091	−5484	1.38256	−5993		
	9.77609	+12.29	9.77490	+1245	9.79542	+1026	9.77439	+1251	9.76747	+1330		
	1.37348	+.23	0.78673	+.23	1.37489	+.20	0.88008	+.24	1.27481	+.26		
	5	−17.80	0	−17.80	5	−17.00	55	−17.50	15	−16.60		
	3 17.1	19 22.11	1 22.9	26 47.17	0 37.5	22 0.25	2 59.5	29 56.38	3 16.2	9 30.28		
	22.2		27.2		43.4		4.9		21.0			
	393		101		809		44		372			
	8 19.65		1 2505		5 40.45		58 2.20		18 18.60			
	14 58.70		21 23.30		17 4.90		24 46.15		41 29.45			
	53 19 30.85		53 26 43.45		51 22 30.05		53 30 8.30		54 9 51.90			
	− 23.63		+ 6.12		− 23.71		− 7.59		− 18.83			
				5 31.0			11 21.6					39 11.9
	6 39.10	19 8.2	7 12.53	5 38.9	11 56.24	21 47.7	30.9		28 55.99	9 22.2		26.5
		+1168	26 33.5	+11841		+955	12 45.64	29 44.1				

Feb. 2

	5 48.7	12.75	6 17.0	6 22.1	11 5.9	10.92	12 10.0	16 48.2	17 49.1	28 6.4	30 52.2	39 58.0
	52.0		21.0	25.8	9.0		+1 0.67 13.3	+1 0.65 51.6	+1 0.78 53.4	+1 0.66 9.64	+1 0.64 55.5	+1 0.68 1.4
	55.3		24.5	29.3	12.8		16.8	55.2	56.5	12.8	57.0	4.7
	58.9		28.0	32.5	16.0		20.4	58.6	57.5	16.5	2.8	8.0
	2.4		31.4	35.9	19.3		23.9	1.9	2.2	20.0	6.3	11.6
	273		1219	456	630		344	255	322	634	458	237
	5 55.46		24.38	29.12	11 12.60		12 16.88	16 55.10	17 56.44	28 13.08	30 59.16	40 4.74
	+61.70 +1 0.66		+61.70	+61.70 +1 0.68	+1 8.68 +61.70	+1 0.75	+61.70	+61.70	+61.70	+61.71	+61.71	+61.71
	−102		−102	−102	−95		−103	−105	−92	−105	−106	−103
	6 56.14	76 25.06	29.80	−1448 −13.71	12 13.35		13 17.55	17 5.75	18 57.22	29 13.70	31 59.51	41 5.42
	−2.65	−266	−266	−263		−14.12	−2.73	−2.80	−2646	−295	−298	−2.98
	6 53.49	−1446 −1386 7 22.40	27.14	−1448 −13.71	12 10.72	−12.51	13 14.82	17 52.95	18 54.58	29 10.80	31 56.83	41 2.44
							−14.53 −12.24	−14.63 −11.04	−14.00 −10.80	−1471 −8.13	−14.74 −7.41	−14.59 −4.95

7.5 8.7 7.8 7.8 9.1 9.4 9.0 8.6 9.0 8.4

	5 27.1		4.7		10 38.7		11 45.8	16 20.0	17 34.2	27 43.5	30 11.9	39 49.7
	31.8		10.7		42.7		50.5	25.0	37.1	45.7	14.7	52.9
	36.0		14.5		46.2		53.2	26.3	38.9	48.4	17.7	56.2
	49		299		76		1495	113	212	176	143	88
	5 31.63	53 19 28.41	997	53 26 52.00	10 42.53	51 22 7.26	11 49.83	16 23.77	17 37.07	27 45.87	30 14.77	39 52.93
	+23.83	−15	−40.85	−44	+30.07	−24	+27.05	+31.33	+19.57	+27.21	+44.39	+11.81
	1.37712	−6195	1.61119	−3256	1.47813	−1144	1.43217	1.49596	1.28713	1.43473	1.64729	1.47225
	9.77609	+12.21	9.77490	+1237	9.79542	+1026	9.77422	9.76974	9.82522	9.76417	9.76642	9.77490
	1.27799	+.23	1.51087	+.23	1.29833	+.20	1.33117	1.39048	1.22613	1.32698	1.53849	0.97193
	5	−1810	0	−1810	5	−17.30	55	30	445 5	15	10	0
	3 19.5	19 23.06	1 46.9	26 46.81	0 34.1	22 0.88	1 43.2	0 30.2	3 24.9	3 11.3	1 24.9	1 24.9
	24.9		53.1		40.5		48.9	36.1	31.8	17.1	30.0	29.7
	444		1000		746		121	63	567	84	549	146
	8 22.20		1 50.00		5 37.30		56 46.05	30 33.15	5 28 28.35	8 14.20	11 27.45	1 27.30
	14 26.15		20 58.35		17 11.05		26 2.30	52 15.20	254 20.00	4 34.15	11 20.50	21 21.05
	53 19 47.38		53 26 19.58		51 22 32.25		53 31 23.53	53 57 34.43	50 29 4.23	54 9 55.58	54 16 42.13	53 26 42.25
	− 18.97		+ 32.42		− 25.02		− 21.49	− 24.57	− 16.60	− 21.23	− 34.55	− 9.37
												42.88
	6 39.03	19 9.2	7 7.92	26 33. 21.1	11 56.60	21 48.4	13 8.29	17 35.32	18 40.56	28 56.09	31 42.09	40 50.63
			12.66				35 45.3	56 57.1	20 6.5	9 22.8	155.3	26 25.4

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	1	2	3	4	5	6
α (h m s)	2 1 27 · 0 20.1	2 6 4 · 4 57.2 (struck)	2 12 22 · 11 21.8	2 12 49 · 11 37.5	2 17 17 · 16 13.4	2 19 20 · 18 16.2
δ	53° 44′ · 38.7, 8.5	53° 29′ · 21.7, 9.2	52° 3′ (obs 52°) · 58.7, 2 9.1	52° 7′ · 2.5, 8.8	49° 58′ · 53.5, 9.0	50° 22′ · 17.5, 8.5
	+12.11 (struck) 8.71	+11.79 (struck) 8.39	+10.66 (struck) 7.26	+9.79 (struck) 6.39	+7.96 (struck) 4.56	+8.17 (struck) 4.77
R.A. (m s)	1 25.10	5 55.58	12 22.90	12 44.36	17 16.90	19 23.04
	+ 29.10	+ 29.10	+ 29.11	+ 29.11	+ 29.11	+ 29.11
	− .95	− .93	− .88	− .88	− .82	− .83
	1 53.85	6 23.75	12 51.13	13 12.59	17 45.19	19 51.32
	− 0.98	− 1.03	− 1.11	− 1.11	− 1.15	− 1.18
	1 52.87	6 22.72	12 50.02	13 11.48	17 44.04	19 50.14
	+28.15 −11.99 −51.87	+28.17 −12.05 −51.27	+28.23	+28.23 −12.04 −50.31	+28.29 −11.91 −49.65	+28.28 −11.99 −49.32
δ (−3.40)	53 45 21.24	53 30 57.51	52 8 14.49	52 9 2.51	50 0 42.55	50 24 19.55
	− 7	− 36	− 17	− 29	− 12	− 20
	− .54 (.84 struck)	− .31 (.48 struck)	− .04 (.46 struck)	− .81 (1.76 struck)	− .38 (.59 struck)	− .56 (.87 struck)
	+ 12.45	+ 12.19	+ 10.63	+ 10.65	+ 8.28	+ 8.74
	+ .27	+ .27	+ .24	+ .24	+ .18	+ .19
	− 21.80	− 21.80	− 21.40	− 21.40	− 20.90	− 21.00
	45 8.15	30 44.10	8 0.35	8 47.50	0 26.21	24 23.32
	1 40.88 · 44 16.3	6 10.67 · 29 52.8		12 59.44 · 9 57.2	17 32.13 · 59 36.6	19 38.15 · 23 34.7

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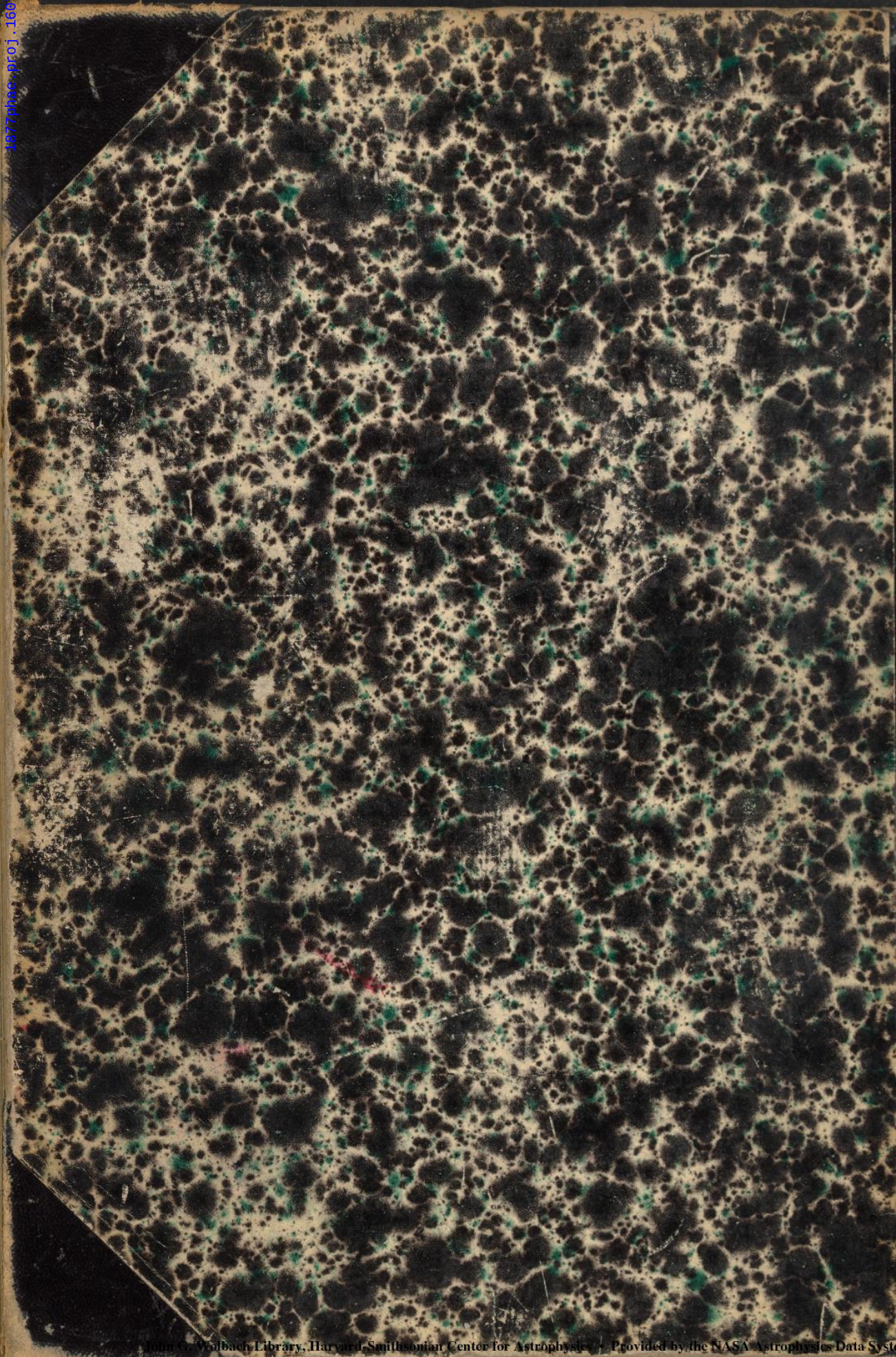
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