

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-17T14:16:07.730  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4069694066624254720  
 2Mass ID (if available) : 18042641-2221153

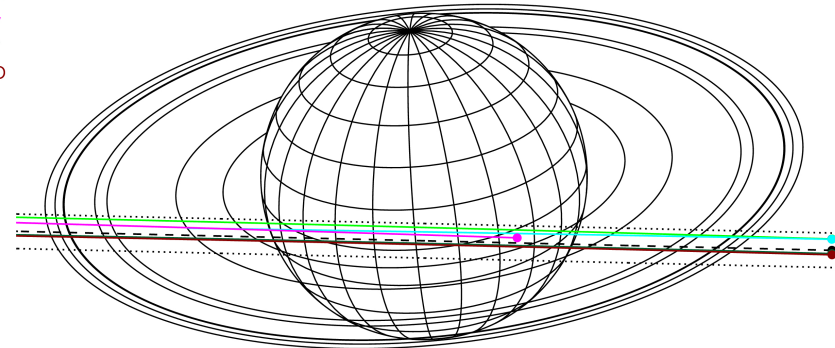
Saturn 2047-06-17T14:16:07 K8.14 G14.42 PgtRgt

ICRS Star Coord at Epoch: 18h 04m 26.39935s -22:21:15.68764s

RUWE (>1.4 is poor) : 1.01  
 K magnitude : 8.138  
 G magnitude : 14.418  
 RP magnitude : 12.995  
 BP magnitude : 17.003  
 DUPflag : 0  
 Distance (au) : 9.034  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.05  
 Sun-Target sep (deg) : 174.55  
 Sun-Moon sep (deg) : 109.51  
 B (ring opening deg) : 26.39  
 PA of pole (deg) : 5.60



Earth  
 PAL  
 PMO  
 IRTF  
 KAV  
 AAT  
 MSO

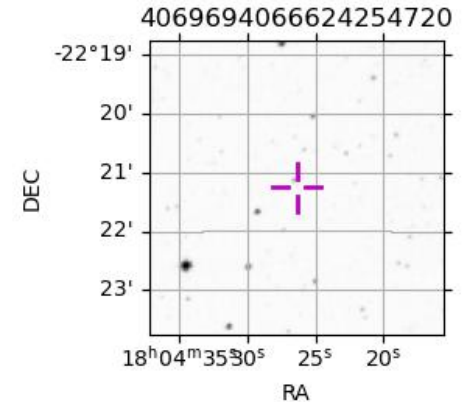


2047-06-17T14:16:07.7300 at: 18 04 26.3993 s: -22 21 15.688 C/A 3.623° PA 358.67 deg v\_sky -20.05 km/s D 09.03 AU  
 Credit: Styled after SORA/Lucky Star

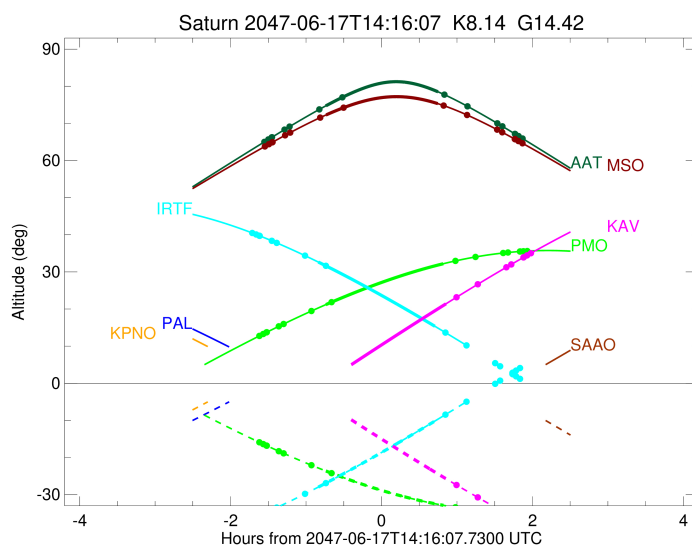
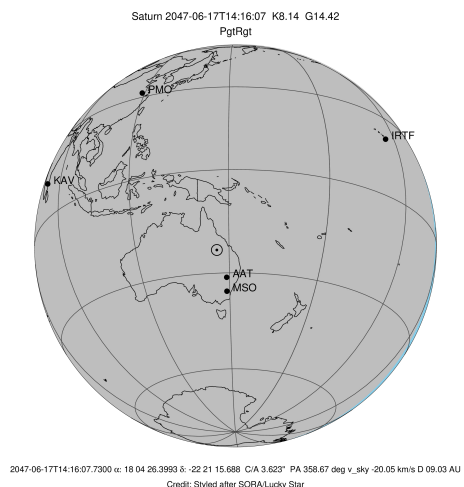
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (20	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8	+	+	+	JUN 17 12:39 - JUN 17 16:12	PieRie
KPNO	Kitt Peak Natl	32.0	248.4					PnnRnn
MCD	McDonald Obs.	30.7	256.0					PnnRnn
TEN	Teide Obs./Ten	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+	+	+	JUN 17 12:33 - JUN 17 15:06	PieRie
KAV	Kavalur Observ	12.6	78.8		+	+	JUN 17 15:07 - JUN 17 16:14	PneRne
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European South	-29.3	289.3					PnnRnn
AAT	Siding Spring	-31.3	149.1	+	+	+	JUN 17 12:43 - JUN 17 16:08	PieRie
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JUN 17 12:43 - JUN 17 16:08	PieRie

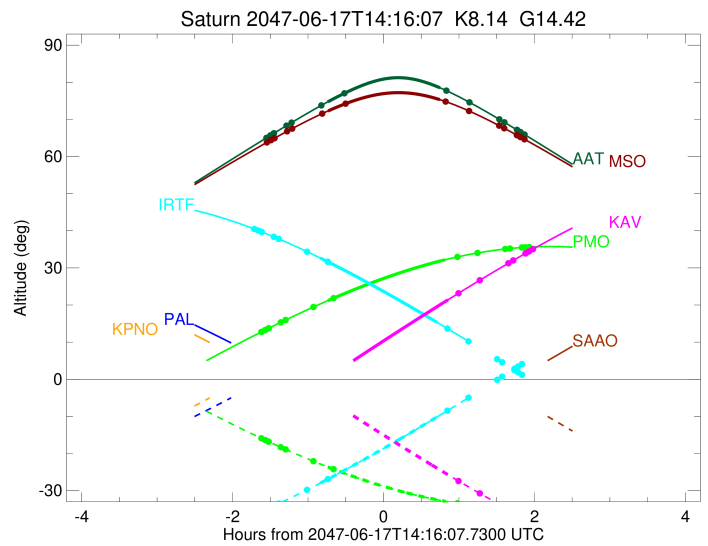
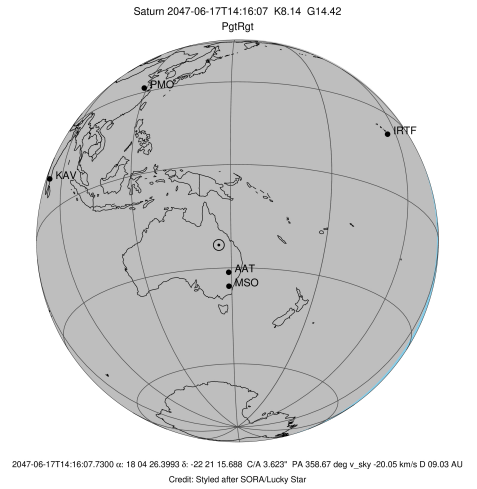


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-17T14:18:29.470  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 4069694066624254720  
 2Mass ID (if available) : 18042641-2221153  
 ICRS Star Coord at Epoch: 18h 04m 26.39935s -22:21:15.68764s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 8.138  
 G magnitude : 14.418  
 RP magnitude : 12.995  
 BP magnitude : 17.003  
 DUPflag : 0  
 Distance (au) : 9.034  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.05  
 Sun-Target sep (deg) : 174.55  
 Sun-Moon sep (deg) : 109.78  
 B (ring opening deg) : 26.39  
 PA of pole (deg) : 5.60  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.870  
 C/A sky separation (km) : 18808.3  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-17T12:39:04.273		12.76	-15.91	140461.00	-20.01		
A (OER)	I	2047-06-17T12:42:08.749		13.28	-16.39	136774.40	-19.96		
Encke (OEG)	I	2047-06-17T12:44:40.687		13.71	-16.79	133744.89	-19.92		
Encke (IEG)	I	2047-06-17T12:44:56.834		13.75	-16.83	133423.31	-19.91		
A (IER)	I	2047-06-17T12:54:30.621		15.34	-18.31	122050.38	-19.72		
B (OER)	I	2047-06-17T12:58:18.302		15.97	-18.88	117571.16	-19.63		
B (IER)	I	2047-06-17T13:20:27.726		19.47	-22.08	91984.69	-18.76		
C (IER)	I	2047-06-17T13:36:29.499	b	21.86	-24.23	74490.58	-17.48		
Saturn	I	2047-06-17T13:31:48.307		21.17	-23.62	60057.75		-22.59	-27.00
Saturn	E	2047-06-17T15:05:13.181		32.20	-32.87	60225.18		-9.96	-12.17
C (IER)	E	2047-06-17T15:14:54.385		32.96	-33.41	74490.58	17.56		
B (IER)	E	2047-06-17T15:30:52.014		34.03	-34.10	91984.69	18.84		
B (OER)	E	2047-06-17T15:52:54.725		35.09	-34.64	117571.16	19.74		
A (IER)	E	2047-06-17T15:56:41.105		35.23	-34.68	122050.38	19.83		
Encke (IEG)	E	2047-06-17T16:06:11.402		35.50	-34.72	133423.31	20.04		
Encke (OEG)	E	2047-06-17T16:06:27.447		35.50	-34.72	133744.89	20.05		
A (OER)	E	2047-06-17T16:08:58.407		35.56	-34.72	136774.40	20.09		
F ring	E	2047-06-17T16:12:01.668		35.62	-34.70	140461.00	20.14		

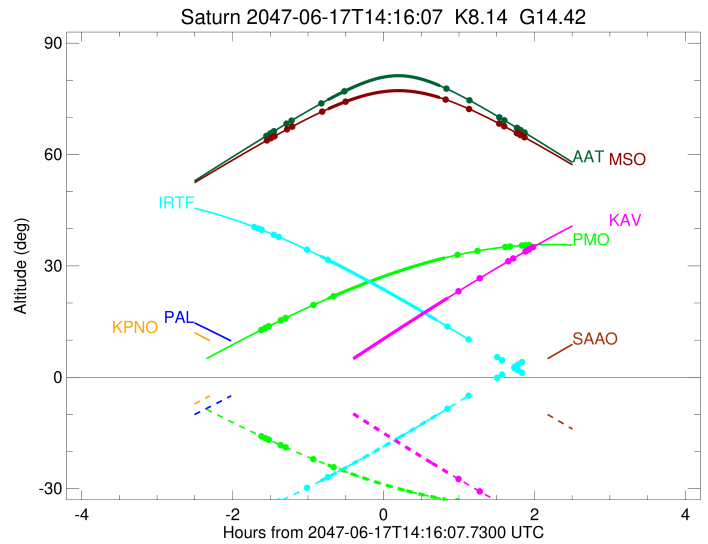
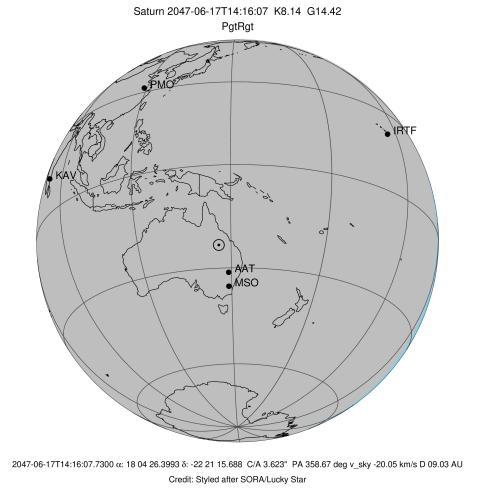
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-17T14:12:01.600  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : IRTF  
 Location : Mauna Kea/IRTF  
 Latitude (deg) : 19.82622  
 E. Longitude (deg) : 204.52800  
 Altitude (km) : 4.168  
 Gaia source ID : 4069694066624254720  
 2Mass ID (if available) : 18042641-2221153  
 ICRS Star Coord at Epoch: 18h 04m 26.39935s -22:21:15.68764s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 8.138  
 G magnitude : 14.418  
 RP magnitude : 12.995  
 BP magnitude : 17.003  
 DUPflag : 0  
 Distance (au) : 9.034  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.05  
 Sun-Target sep (deg) : 174.55  
 Sun-Moon sep (deg) : 110.10  
 B (ring opening deg) : 26.39  
 PA of pole (deg) : 5.60  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.123  
 C/A sky separation (km) : 20460.1  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-17T12:33:24.545		40.48	-36.42	140461.00	-19.91		
A (OER)	I	2047-06-17T12:36:30.056		40.08	-35.97	136774.40	-19.84		
Encke (OEG)	I	2047-06-17T12:39:02.980		39.74	-35.60	133744.89	-19.78		
Encke (IEG)	I	2047-06-17T12:39:19.239		39.70	-35.55	133423.31	-19.77		
A (IER)	I	2047-06-17T12:48:58.009		38.37	-34.09	122050.38	-19.51		
B (OER)	I	2047-06-17T12:52:48.263		37.82	-33.49	117571.17	-19.39		
B (IER)	I	2047-06-17T13:15:22.102		34.37	-29.78	91984.69	-18.28		
C (IER)	I	2047-06-17T13:31:58.618	b	31.63	-26.89	74490.58	-16.67		
Saturn	I	2047-06-17T13:25:48.073		32.66	-27.98	60040.94		-23.54	-28.07
Saturn	E	2047-06-17T14:58:33.220		15.36	-10.18	60206.56		-11.96	-14.58
C (IER)	E	2047-06-17T15:06:57.315		13.65	-8.45	74490.58	16.55		
B (IER)	E	2047-06-17T15:23:42.569		10.20	-4.97x	91984.69	18.09		
B (OER)	E	2047-06-17T15:46:33.451		5.40	-0.13x	117571.16	19.11		
A (IER)	E	2047-06-17T15:50:27.137		4.58x	0.70x	122050.38	19.22		
Encke (IEG)	E	2047-06-17T16:00:15.192		2.49x	2.80x	133423.31	19.45		
Encke (OEG)	E	2047-06-17T16:00:31.725		2.43x	2.86x	133744.89	19.45		
A (OER)	E	2047-06-17T16:03:07.263		1.87x	3.42x	136774.40	19.50		
F ring	E	2047-06-17T16:06:16.031		1.19x	4.10x	140461.00	19.56		

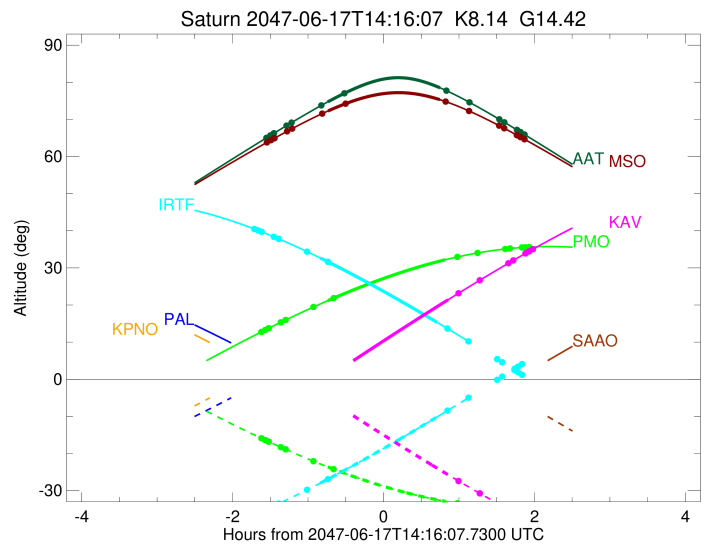
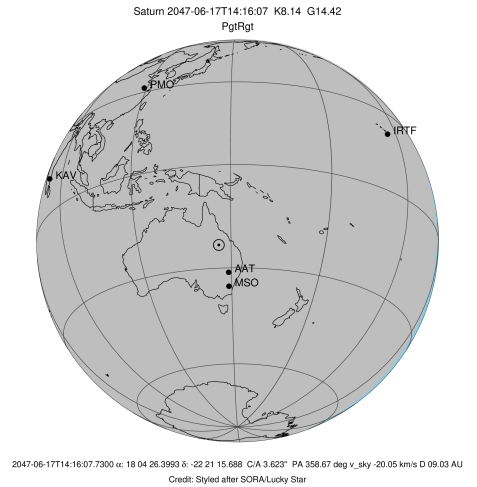
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-17T14:21:08.560  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 4069694066624254720  
 2Mass ID (if available) : 18042641-2221153  
 ICRS Star Coord at Epoch: 18h 04m 26.39935s -22:21:15.68764s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 8.138  
 G magnitude : 14.418  
 RP magnitude : 12.995  
 BP magnitude : 17.003  
 DUPflag : 0  
 Distance (au) : 9.034  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.05  
 Sun-Target sep (deg) : 174.55  
 Sun-Moon sep (deg) : 109.39  
 B (ring opening deg) : 26.39  
 PA of pole (deg) : 5.60  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.290  
 C/A sky separation (km) : 21558.7  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itr93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

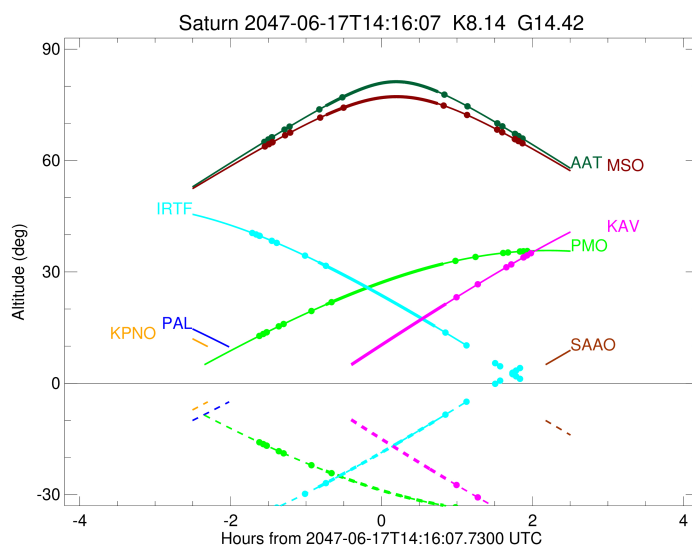
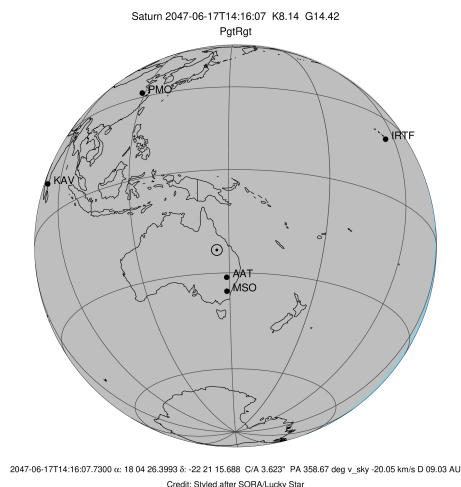
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-17T12:43:37.922		-10.50x	5.36x	140461.00	-19.48		
A (OER)	I	2047-06-17T12:46:47.491		-9.78x	4.65x	136774.40	-19.42		
Encke (OEG)	I	2047-06-17T12:49:23.736		-9.19x	4.06x	133744.89	-19.36		
Encke (IEG)	I	2047-06-17T12:49:40.348		-9.12x	4.00x	133423.31	-19.36		
A (IER)	I	2047-06-17T12:59:31.566		-6.87x	1.79x	122050.38	-19.10		
B (OER)	I	2047-06-17T13:03:26.759		-5.98x	0.92x	117571.16	-18.98		
B (IER)	I	2047-06-17T13:26:31.114		-0.75x	-4.21x	91984.69	-17.84		
C (IER)	I	2047-06-17T13:43:36.427	b	3.09x	-7.97	74490.58	-16.10		
Saturn	I	2047-06-17T13:34:49.331		1.12x	-6.04	60009.14		-25.25	-29.99
Saturn	E	2047-06-17T15:07:25.868		21.41	-25.73	60204.10		-12.21	-14.87
C (IER)	E	2047-06-17T15:15:46.787		23.17	-27.41	74490.58	16.26		
B (IER)	E	2047-06-17T15:32:41.155		26.67	-30.74	91984.69	18.05		
B (OER)	E	2047-06-17T15:55:26.969		31.26	-35.06	117571.17	19.27		
A (IER)	E	2047-06-17T15:59:18.524		32.02	-35.77	122050.38	19.41		
Encke (IEG)	E	2047-06-17T16:08:59.963		33.90	-37.52	133423.31	19.70		
Encke (OEG)	E	2047-06-17T16:09:16.286		33.95	-37.57	133744.89	19.70		
A (OER)	E	2047-06-17T16:11:49.789		34.44	-38.03	136774.40	19.77		
F ring	E	2047-06-17T16:14:55.944		35.03	-38.57	140461.00	19.84		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-17T14:16:22.530  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4069694066624254720  
 2Mass ID (if available) : 18042641-2221153  
 ICRS Star Coord at Epoch: 18h 04m 26.39935s -22:21:15.68764s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 8.138  
 G magnitude : 14.418  
 RP magnitude : 12.995  
 BP magnitude : 17.003  
 DUPflag : 0  
 Distance (au) : 9.034  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.05  
 Sun-Target sep (deg) : 174.55  
 Sun-Moon sep (deg) : 110.33  
 B (ring opening deg) : 26.39  
 PA of pole (deg) : 5.60  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.770  
 C/A sky separation (km) : 24701.2  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-17T12:43:02.732		65.03	-70.33	140461.00	-19.43		
A (OER)	I	2047-06-17T12:46:12.904		65.69	-70.98	136774.40	-19.34		
Encke (OEG)	I	2047-06-17T12:48:49.880		66.23	-71.50	133744.89	-19.26		
Encke (IEG)	I	2047-06-17T12:49:06.583		66.29	-71.56	133423.31	-19.25		
A (IER)	I	2047-06-17T12:59:02.877		68.33	-73.53	122050.38	-18.88		
B (OER)	I	2047-06-17T13:03:01.240		69.13	-74.30	117571.16	-18.70		
B (IER)	I	2047-06-17T13:26:45.145		73.78	-78.58	91984.69	-17.03		
C (IER)	I	2047-06-17T13:45:06.984	b	77.04	-81.14	74490.58	-14.45		
Saturn	I	2047-06-17T13:31:50.346		74.73	-79.39	59960.78		-27.71	-32.71
Saturn	E	2047-06-17T15:01:05.103		78.51	-75.29	60165.61		-15.53	-18.82
C (IER)	E	2047-06-17T15:06:08.991		77.75	-74.32	74490.58	14.47		
B (IER)	E	2047-06-17T15:24:30.529		74.60	-70.68	91984.69	17.02		
B (OER)	E	2047-06-17T15:48:16.399		70.01	-65.78	117571.16	18.66		
A (IER)	E	2047-06-17T15:52:15.230		69.21	-64.95	122050.38	18.84		
Encke (IEG)	E	2047-06-17T16:02:12.832		67.18	-62.85	133423.31	19.20		
Encke (OEG)	E	2047-06-17T16:02:29.574		67.12	-62.79	133744.89	19.21		
A (OER)	E	2047-06-17T16:05:06.926		66.58	-62.24	136774.40	19.29		
F ring	E	2047-06-17T16:08:17.569		65.93	-61.56	140461.00	19.38		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-17T14:16:22.800  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MSO  
 Location : Mt. Stromlo Observatory  
 Latitude (deg) : -35.32000  
 E. Longitude (deg) : 149.00833  
 Altitude (km) : 0.770  
 Gaia source ID : 4069694066624254720  
 2Mass ID (if available) : 18042641-2221153  
 ICRS Star Coord at Epoch: 18h 04m 26.39935s -22:21:15.68764s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 8.138  
 G magnitude : 14.418  
 RP magnitude : 12.995  
 BP magnitude : 17.003  
 DUPflag : 0  
 Distance (au) : 9.034  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.05  
 Sun-Target sep (deg) : 174.55  
 Sun-Moon sep (deg) : 110.31  
 B (ring opening deg) : 26.39  
 PA of pole (deg) : 5.60  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.837  
 C/A sky separation (km) : 25141.3  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-17T12:43:27.097		63.81	-68.78	140461.00	-19.35		
A (OER)	I	2047-06-17T12:46:38.054		64.41	-69.35	136774.40	-19.26		
Encke (OEG)	I	2047-06-17T12:49:15.709		64.90	-69.81	133744.89	-19.17		
Encke (IEG)	I	2047-06-17T12:49:32.486		64.95	-69.86	133423.31	-19.16		
A (IER)	I	2047-06-17T12:59:31.676		66.80	-71.57	122050.38	-18.78		
B (OER)	I	2047-06-17T13:03:31.359		67.52	-72.23	117571.16	-18.59		
B (IER)	I	2047-06-17T13:27:26.319		71.57	-75.71	91984.69	-16.85		
C (IER)	I	2047-06-17T13:46:04.825	b	74.25	-77.56	74490.58	-14.14		
Saturn	I	2047-06-17T13:31:58.558		72.27	-76.24	59952.60		-28.11	-33.15
Saturn	E	2047-06-17T15:00:57.663		75.32	-73.07	60160.30		-15.94	-19.31
C (IER)	E	2047-06-17T15:05:32.715		74.80	-72.34	74490.58	14.17		
B (IER)	E	2047-06-17T15:24:10.696		72.27	-69.16	91984.69	16.84		
B (OER)	E	2047-06-17T15:48:07.448		68.31	-64.71	117571.16	18.56		
A (IER)	E	2047-06-17T15:52:07.571		67.60	-63.94	122050.38	18.74		
Encke (IEG)	E	2047-06-17T16:02:07.994		65.78	-62.00	133423.31	19.12		
Encke (OEG)	E	2047-06-17T16:02:24.807		65.73	-61.95	133744.89	19.13		
A (OER)	E	2047-06-17T16:05:02.818		65.24	-61.43	136774.40	19.21		
F ring	E	2047-06-17T16:08:14.220		64.64	-60.80	140461.00	19.31		