

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-07-15T16:14:04.900  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4078864062324524160  
 2Mass ID (if available) : 18481467-2226289

Saturn 2048-07-15T16:14:04 K9.35 G12.95 PgtRgt

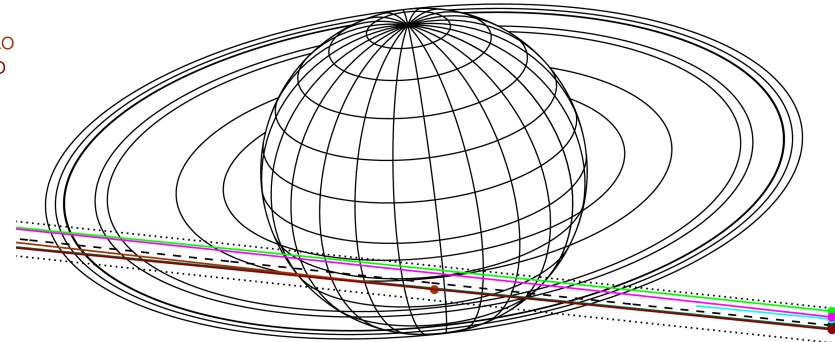
ICRS Star Coord at Epoch: 18h 48m 14.66445s -22:26:29.32703s

RUWE (>1.4 is poor) : 1.04  
 K magnitude : 9.352  
 G magnitude : 12.950  
 RP magnitude : 11.946  
 BP magnitude : 14.002  
 DUPflag : 0  
 Distance (au) : 9.040  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.51  
 Sun-Target sep (deg) : 167.95  
 Sun-Moon sep (deg) : 116.20  
 B (ring opening deg) : 25.42  
 PA of pole (deg) : 6.33

Saturn 2048-07-15T16:14:04 K9.35 G12.95  
 PgtRgt



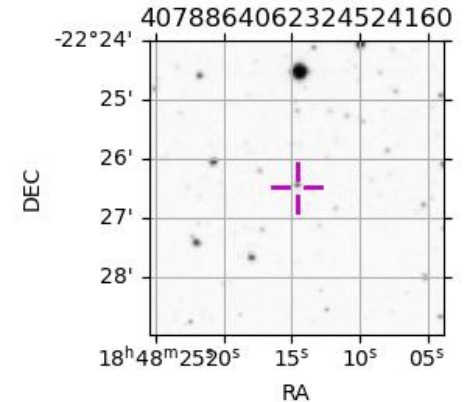
Earth  
 PMO  
 IRTF  
 KAV  
 AAT  
 SAAO  
 MSO



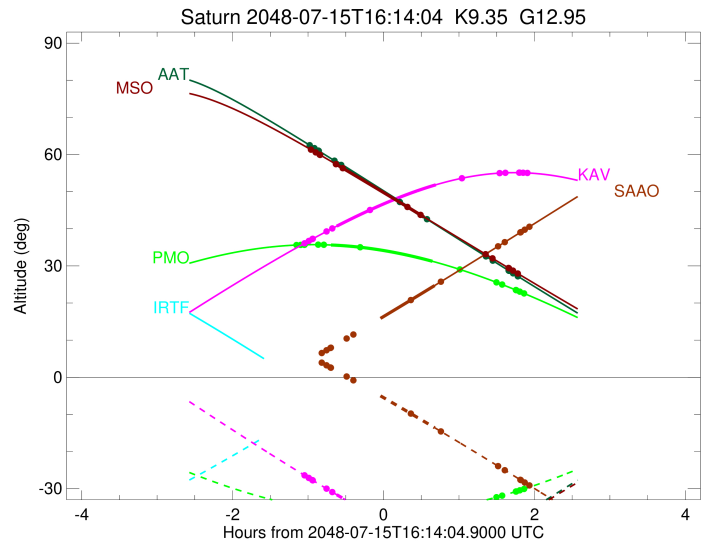
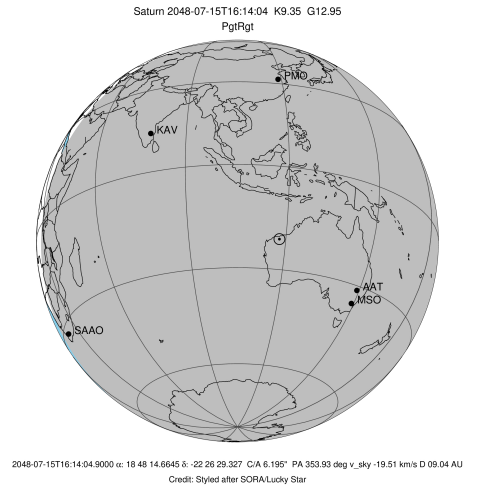
2048-07-15T16:14:04.9000 at: 18 48 14.66445 s: -22 26 29.327 C/A 6.195° PA 353.93 deg v\_sky -19.51 km/s D 09.04 AU  
 Credit: Styled after SORA/Lucky Star

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	+	+	+	JUL 15 15:04 - JUL 15 18:05	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					PnnRnn
KAV	Kavalur Observ	12.6	78.8	+	+	+	JUL 15 15:11 - JUL 15 18:08	PieRie
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European South	-29.3	289.3					PnnRnn
AAT	Siding Spring	-31.3	149.1	+	+	+	JUL 15 15:15 - JUL 15 18:00	PieRie
SAAO	So. Afr. Astro	-32.4	20.8		+	+	JUL 15 16:54 - JUL 15 18:10	PneRne
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JUL 15 15:16 - JUL 15 18:00	PieRie



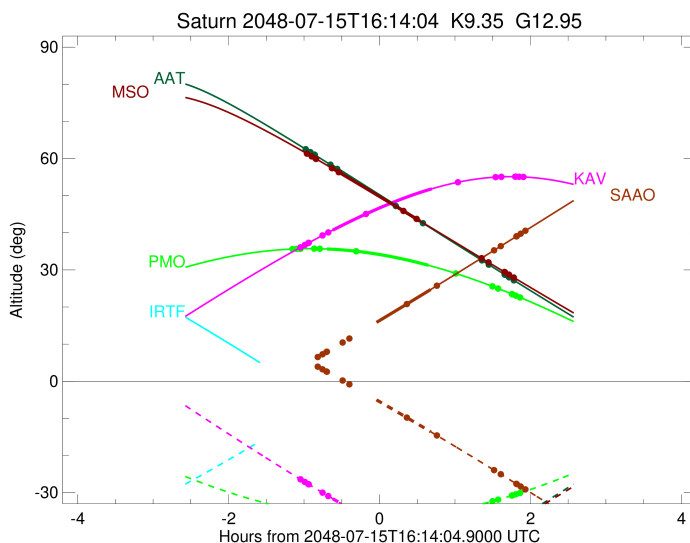
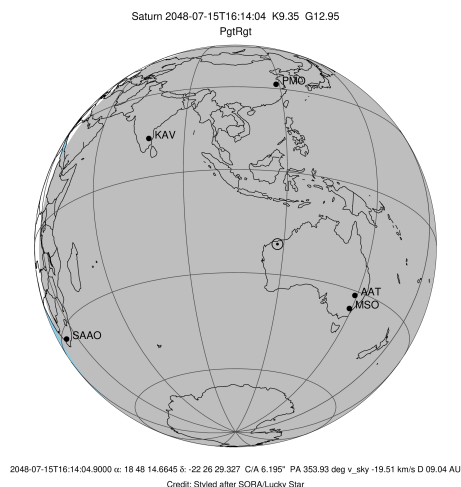
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-07-15T16:12:25.130  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 4078864062324524160  
 2Mass ID (if available) : 18481467-2226289  
 ICRS Star Coord at Epoch: 18h 48m 14.66445s -22:26:29.32703s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 9.352  
 G magnitude : 12.950  
 RP magnitude : 11.946  
 BP magnitude : 14.002  
 DUPflag : 0  
 Distance (au) : 9.040  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.51  
 Sun-Target sep (deg) : 167.95  
 Sun-Moon sep (deg) : 116.52  
 B (ring opening deg) : 25.42  
 PA of pole (deg) : 6.33  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 5.440  
 C/A sky separation (km) : 35665.5  
 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	2048-07-15T15:04:57.567		35.62	-34.49	140461.00	-18.37		
A (OER)	I	2048-07-15T15:08:19.414		35.66	-34.72	136774.40	-18.16		
Encke (OEG)	I	2048-07-15T15:11:07.135		35.69	-34.89	133744.89	-17.97		
Encke (IEG)	I	2048-07-15T15:11:25.044		35.69	-34.91	133423.31	-17.95		
A (IER)	I	2048-07-15T15:22:13.913		35.72	-35.52	122050.38	-17.07		
B (OER)	I	2048-07-15T15:26:39.618		35.70	-35.74	117571.16	-16.64		
B (IER)	I	2048-07-15T15:55:40.996	b	35.02	-36.66	91984.69	-12.22		
Saturn	I	2048-07-15T15:32:22.341		35.63	-35.99	59669.89		-42.88	-48.49
Saturn	E	2048-07-15T16:52:56.751		31.24	-35.84	60087.56		-21.83	-26.13
B (IER)	E	2048-07-15T17:14:51.159		29.04	-34.62	91984.69	12.22		
B (OER)	E	2048-07-15T17:43:58.763		25.56	-32.30	117571.16	16.53		
A (IER)	E	2048-07-15T17:48:26.341		24.98	-31.88	122050.38	16.94		
Encke (IEG)	E	2048-07-15T17:59:20.582		23.50	-30.78	133423.31	17.78		
Encke (OEG)	E	2048-07-15T17:59:38.654		23.46	-30.75	133744.89	17.80		
A (OER)	E	2048-07-15T18:02:27.941		23.07	-30.45	136774.40	17.99		
F ring	E	2048-07-15T18:05:51.759		22.59	-30.08	140461.00	18.19		

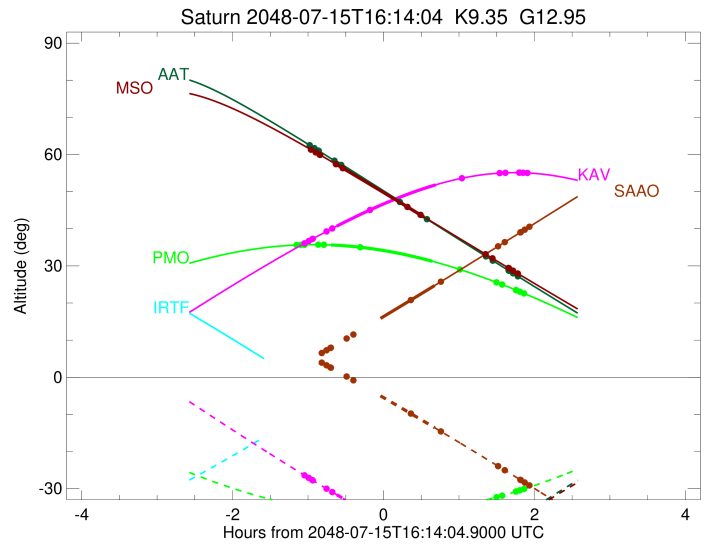
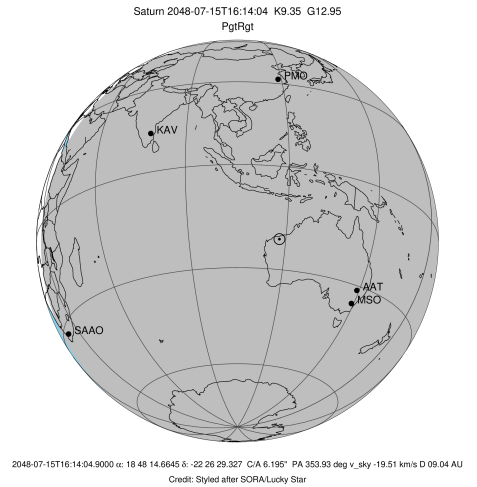
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-07-15T16:16:05.900  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 4078864062324524160  
 2Mass ID (if available) : 18481467-2226289  
 ICRS Star Coord at Epoch: 18h 48m 14.66445s -22:26:29.32703s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 9.352  
 G magnitude : 12.950  
 RP magnitude : 11.946  
 BP magnitude : 14.002  
 DUPflag : 0  
 Distance (au) : 9.040  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.51  
 Sun-Target sep (deg) : 167.95  
 Sun-Moon sep (deg) : 116.94  
 B (ring opening deg) : 25.42  
 PA of pole (deg) : 6.33  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 5.632  
 C/A sky separation (km) : 36922.8  
 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	2048-07-15T15:11:21.682		36.09	-26.43	140461.00	-18.17		
A (OER)	I	2048-07-15T15:14:45.820		36.73	-27.13	136774.40	-17.95		
Encke (OEG)	I	2048-07-15T15:17:35.586		37.25	-27.72	133744.89	-17.74		
Encke (IEG)	I	2048-07-15T15:17:53.722		37.31	-27.78	133423.31	-17.72		
A (IER)	I	2048-07-15T15:28:52.169		39.30	-30.02	122050.38	-16.78		
B (OER)	I	2048-07-15T15:33:22.771		40.09	-30.93	117571.16	-16.31		
B (IER)	I	2048-07-15T16:03:29.324	b	45.09	-36.82	91984.69	-11.42		
Saturn	I	2048-07-15T15:36:55.394		40.71	-31.64	59636.69		-44.38	-49.96
Saturn	E	2048-07-15T16:55:40.740		51.85	-45.94	60070.29		-22.91	-27.36
B (IER)	E	2048-07-15T17:16:28.457		53.62	-49.03	91984.69	11.47		
B (OER)	E	2048-07-15T17:46:30.265		55.00	-52.70	117571.16	16.33		
A (IER)	E	2048-07-15T17:51:00.617		55.07	-53.15	122050.38	16.79		
Encke (IEG)	E	2048-07-15T18:01:58.758		55.11	-54.14	133423.31	17.72		
Encke (OEG)	E	2048-07-15T18:02:16.890		55.11	-54.16	133744.89	17.75		
A (OER)	E	2048-07-15T18:05:06.634		55.09	-54.39	136774.40	17.95		
F ring	E	2048-07-15T18:08:30.768		55.04	-54.64	140461.00	18.17		

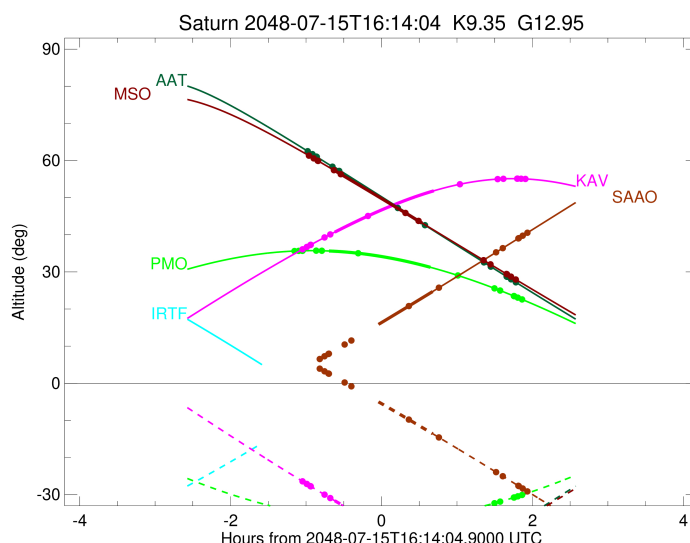
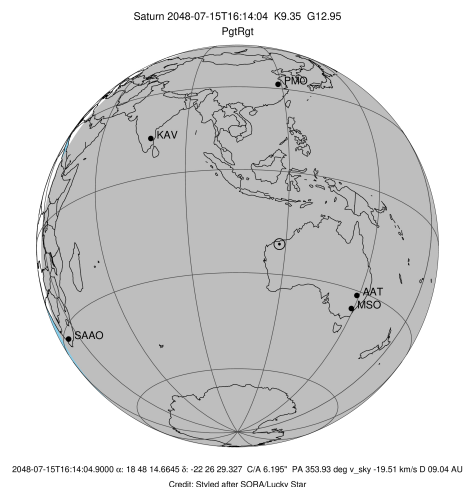
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-07-15T16:10:48.440  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4078864062324524160  
 2Mass ID (if available) : 18481467-2226289  
 ICRS Star Coord at Epoch: 18h 48m 14.66445s -22:26:29.32703s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 9.352  
 G magnitude : 12.950  
 RP magnitude : 11.946  
 BP magnitude : 14.002  
 DUPflag : 0  
 Distance (au) : 9.040  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.51  
 Sun-Target sep (deg) : 167.95  
 Sun-Moon sep (deg) : 116.61  
 B (ring opening deg) : 25.42  
 PA of pole (deg) : 6.33  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 6.490  
 C/A sky separation (km) : 42548.3  
 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

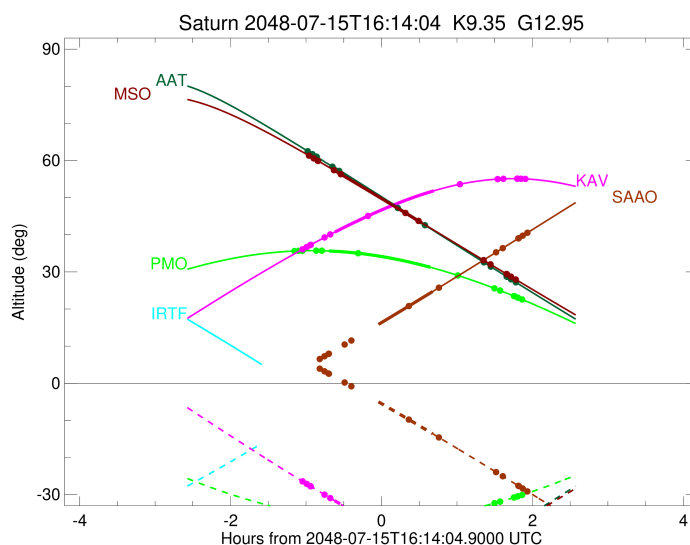
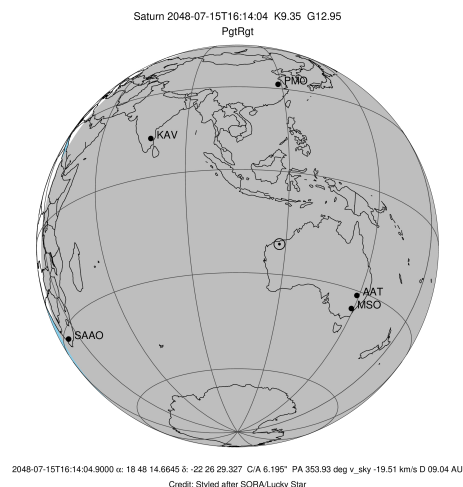
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-07-15T15:15:28.097		62.50	-72.35	140461.00	-16.55		
A (OER)	I	2048-07-15T15:19:13.133		61.71	-71.65	136774.40	-16.21		
Encke (OEG)	I	2048-07-15T15:22:21.738		61.04	-71.05	133744.89	-15.91		
Encke (IEG)	I	2048-07-15T15:22:41.972		60.97	-70.99	133423.31	-15.88		
A (IER)	I	2048-07-15T15:35:10.511		58.32	-68.55	122050.38	-14.45		
B (OER)	I	2048-07-15T15:40:28.380	b	57.20	-67.49	117571.16	-13.72		
B (IER)	I	2048-07-15T16:27:12.335	b	47.18	-57.81	91984.69	-3.28		
Saturn	I	2048-07-15T15:35:48.536		58.19	-68.43	59519.18		-49.72	-55.08
Saturn	E	2048-07-15T16:46:24.312		43.06	-53.74	59948.72		-29.70	-34.87
B (IER)	E	2048-07-15T16:48:45.970		42.56	-53.24	91984.69	3.28		
B (OER)	E	2048-07-15T17:35:39.310		32.54	-43.21	117571.16	13.61		
A (IER)	E	2048-07-15T17:40:59.876		31.41	-42.07	122050.38	14.32		
Encke (IEG)	E	2048-07-15T17:53:36.410		28.74	-39.37	133423.31	15.69		
Encke (OEG)	E	2048-07-15T17:53:56.891		28.67	-39.30	133744.89	15.72		
A (OER)	E	2048-07-15T17:57:07.866		27.99	-38.62	136774.40	16.01		
F ring	E	2048-07-15T18:00:55.898		27.19	-37.81	140461.00	16.32		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-07-15T16:19:09.900  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : SAAO  
 Location : So. Afr. Astro. Obs. (Sutherland)  
 Latitude (deg) : -32.37953  
 E. Longitude (deg) : 20.81070  
 Altitude (km) : 1.768  
 Gaia source ID : 4078864062324524160  
 2Mass ID (if available) : 18481467-2226289  
 ICRS Star Coord at Epoch: 18h 48m 14.66445s -22:26:29.32703s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 9.352  
 G magnitude : 12.950  
 RP magnitude : 11.946  
 BP magnitude : 14.002  
 DUPflag : 0  
 Distance (au) : 9.040  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.51  
 Sun-Target sep (deg) : 167.95  
 Sun-Moon sep (deg) : 116.82  
 B (ring opening deg) : 25.42  
 PA of pole (deg) : 6.33  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 6.542  
 C/A sky separation (km) : 42893.2  
 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	2048-07-15T15:25:02.428		6.54	3.92x	140461.00	-16.43		
A (OER)	I	2048-07-15T15:28:48.936		7.28	3.22x	136774.40	-16.11		
Encke (OEG)	I	2048-07-15T15:31:58.635		7.90	2.62x	133744.89	-15.82		
Encke (IEG)	I	2048-07-15T15:32:18.978		7.97	2.56x	133423.31	-15.79		
A (IER)	I	2048-07-15T15:44:50.423	b	10.46	0.19x	122050.38	-14.42		
B (OER)	I	2048-07-15T15:50:08.774	b	11.52	-0.83x	117571.16	-13.71		
B (IER)	I	2048-07-15T16:35:56.361	b	20.82	-9.80	91984.69	-3.67		
Saturn	I	2048-07-15T15:44:01.183		10.29	0.34x	59498.29		-50.68	-55.99
Saturn	E	2048-07-15T16:54:45.810		24.71	-13.59	59954.52		-29.40	-34.55
B (IER)	E	2048-07-15T16:59:50.483		25.77	-14.62	91984.69	3.68		
B (OER)	E	2048-07-15T17:45:17.648		35.30	-23.96	117571.16	13.86		
A (IER)	E	2048-07-15T17:50:32.578		36.41	-25.05	122050.38	14.57		
Encke (IEG)	E	2048-07-15T18:02:55.485		39.03	-27.63	133423.31	15.98		
Encke (OEG)	E	2048-07-15T18:03:15.587		39.10	-27.70	133744.89	16.01		
A (OER)	E	2048-07-15T18:06:23.008		39.76	-28.35	136774.40	16.31		
F ring	E	2048-07-15T18:10:06.725		40.55	-29.13	140461.00	16.64		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-07-15T16:10:59.950  
 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 : 4078864062324524160  
 2Mass ID (if available) : 18481467-2226289  
 ICRS Star Coord at Epoch: 18h 48m 14.66445s -22:26:29.32703s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 9.352  
 G magnitude : 12.950  
 RP magnitude : 11.946  
 BP magnitude : 14.002  
 DUPflag : 0  
 Distance (au) : 9.040  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.51  
 Sun-Target sep (deg) : 167.95  
 Sun-Moon sep (deg) : 116.63  
 B (ring opening deg) : 25.42  
 PA of pole (deg) : 6.33  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 6.550  
 C/A sky separation (km) : 42941.4  
 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	2048-07-15T15:16:26.923		61.31	-69.94	140461.00	-16.43		
A (OER)	I	2048-07-15T15:20:13.670		60.57	-69.33	136774.40	-16.08		
Encke (OEG)	I	2048-07-15T15:23:23.829		59.95	-68.81	133744.89	-15.77		
Encke (IEG)	I	2048-07-15T15:23:44.237		59.88	-68.75	133423.31	-15.74		
A (IER)	I	2048-07-15T15:36:20.430	b	57.39	-66.59	122050.38	-14.28		
B (OER)	I	2048-07-15T15:41:42.500	b	56.32	-65.63	117571.16	-13.53		
B (IER)	I	2048-07-15T16:33:13.587	b	45.86	-55.80	91984.69	-1.60		
Saturn	I	2048-07-15T15:36:19.736		57.39	-66.59	59509.96		-50.14	-55.48
Saturn	E	2048-07-15T16:46:16.184		43.19	-53.20	59939.82		-30.16	-35.37
B (IER)	E	2048-07-15T16:43:42.545	b	43.71	-53.72	91984.69	1.59		
B (OER)	E	2048-07-15T17:35:22.402		33.13	-43.25	117571.16	13.43		
A (IER)	E	2048-07-15T17:40:47.001		32.03	-42.14	122050.38	14.15		
Encke (IEG)	E	2048-07-15T17:53:30.760		29.44	-39.54	133423.31	15.56		
Encke (OEG)	E	2048-07-15T17:53:51.402		29.37	-39.47	133744.89	15.60		
A (OER)	E	2048-07-15T17:57:03.815		28.72	-38.81	136774.40	15.89		
F ring	E	2048-07-15T18:00:53.417		27.94	-38.03	140461.00	16.22		