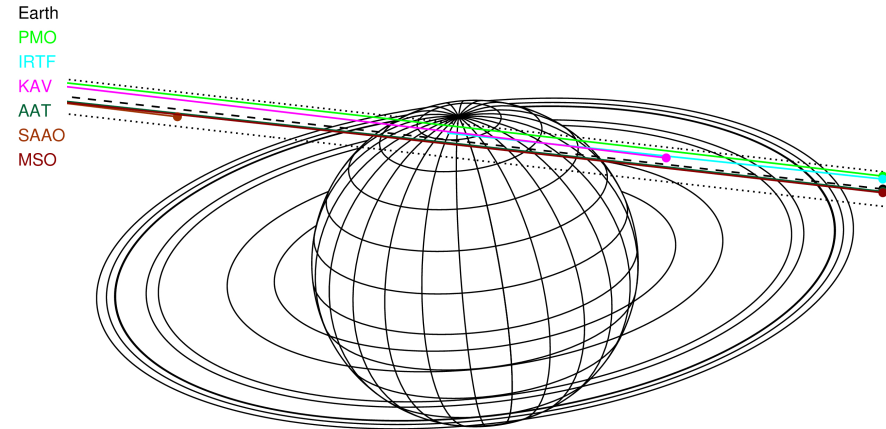


target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2048-06-21T15:15:52.550
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 4075747668408119424
 2Mass ID (if available) : 18554762-2214486

Saturn 2048-06-21T15:15:52 K7.17 G10.91 PgtRgt

ICRS Star Coord at Epoch: 18h 55m 47.61498s -22:14:48.67010s

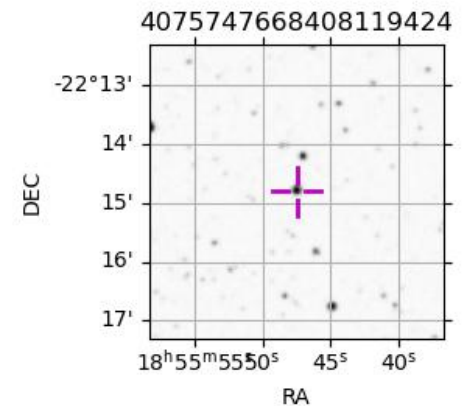
RUWE (>1.4 is poor) : 0.96
 K magnitude : 7.170
 G magnitude : 10.911
 RP magnitude : 9.868
 BP magnitude : 12.029
 DUPflag : 0
 Distance (au) : 9.043
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.43
 Sun-Target sep (deg) : 167.35
 Sun-Moon sep (deg) : 74.69
 B (ring opening deg) : 25.03
 PA of pole (deg) : 6.41
 # a(km) ring



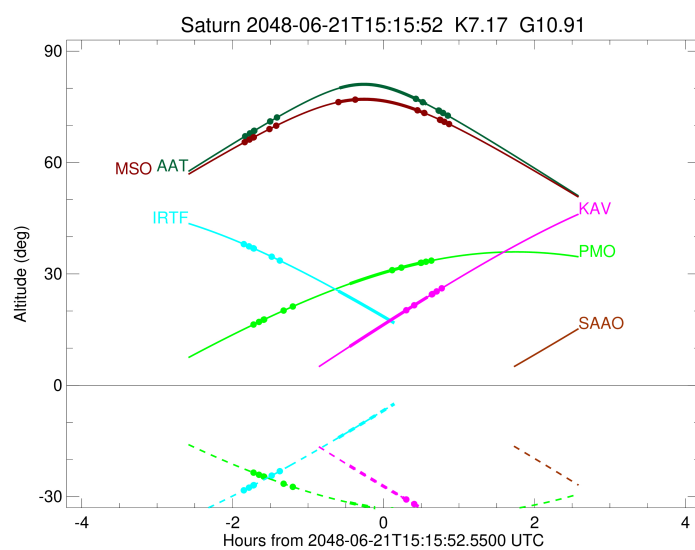
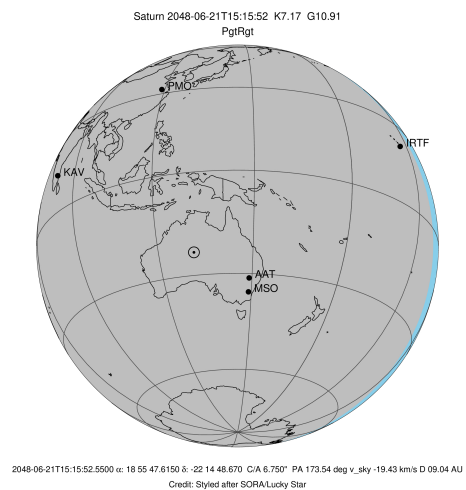
2048-06-21T15:15:52.5500 at: 18 55 47.6150 s -22 14 48.670 C/A 6.750° PA 173.54 deg v_sky -19.43 km/s D 09.04 AU
 Credit: Styled after SORA/Lucky Star

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	+	+	+	JUN 21 13:32 - JUN 21 15:53	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 21 13:24 - JUN 21 14:39	PinRin
KAV	Kavalur Observ	12.6	78.8		+	+	JUN 21 14:48 - JUN 21 16:02	PieRne
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 21 13:25 - JUN 21 16:06	PieRie
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JUN 21 13:25 - JUN 21 16:07	PieRie



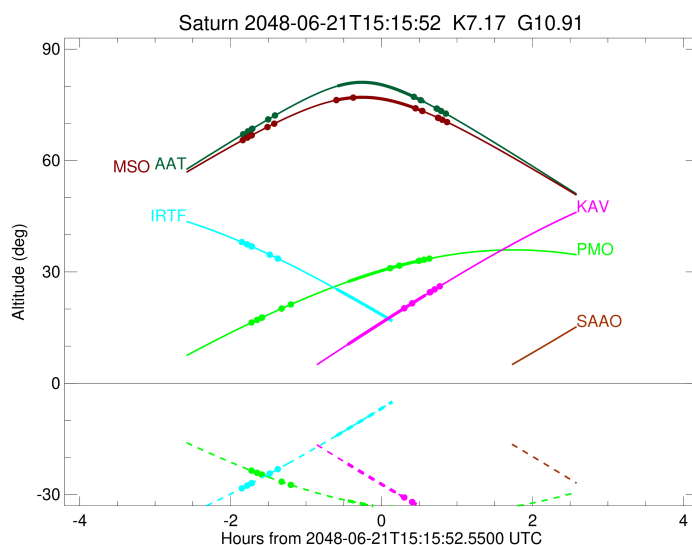
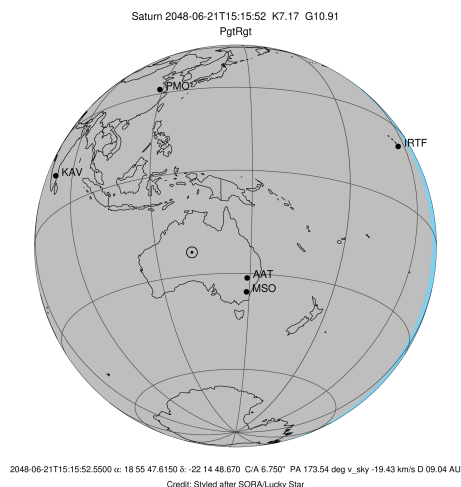
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2048-06-21T15:17:20.800
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 4075747668408119424
 2Mass ID (if available) : 18554762-2214486
 ICRS Star Coord at Epoch: 18h 55m 47.61498s -22:14:48.67010s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 7.170
 G magnitude : 10.911
 RP magnitude : 9.868
 BP magnitude : 12.029
 DUPflag : 0
 Distance (au) : 9.043
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.43
 Sun-Target sep (deg) : 167.35
 Sun-Moon sep (deg) : 75.11
 B (ring opening deg) : 25.03
 PA of pole (deg) : 6.41
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 7.543
 C/A sky separation (km) : 49471.6
 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	2048-06-21T13:32:28.793		16.35	-23.53	140461.00	-14.44		
A (OER)	I	2048-06-21T13:36:48.736		17.05	-24.10	136774.40	-13.92		
Encke (OEG)	I	2048-06-21T13:40:30.062		17.64	-24.58	133744.89	-13.45		
Encke (IEG)	I	2048-06-21T13:40:54.019		17.70	-24.63	133423.31	-13.40		
A (IER)	I	2048-06-21T13:56:21.427		20.10	-26.52	122050.38	-11.02		
B (OER)	I	2048-06-21T14:03:33.423		21.18	-27.34	117571.16	-9.69		
Saturn	I	2048-06-21T14:49:02.079		27.34	-31.65	59792.32		38.09	43.68
Saturn	E	2048-06-21T15:45:00.245		32.93	-34.44	59378.96		57.96	62.68
B (OER)	E	2048-06-21T15:22:50.091	b	31.02	-33.70	117571.16	9.68		
A (IER)	E	2048-06-21T15:30:02.369	b	31.69	-33.99	122050.38	11.02		
Encke (IEG)	E	2048-06-21T15:45:29.936		32.97	-34.45	133423.31	13.40		
Encke (OEG)	E	2048-06-21T15:45:53.884		33.00	-34.46	133744.89	13.46		
A (OER)	E	2048-06-21T15:49:35.078		33.27	-34.53	136774.40	13.93		
F ring	E	2048-06-21T15:53:54.775		33.58	-34.60	140461.00	14.45		

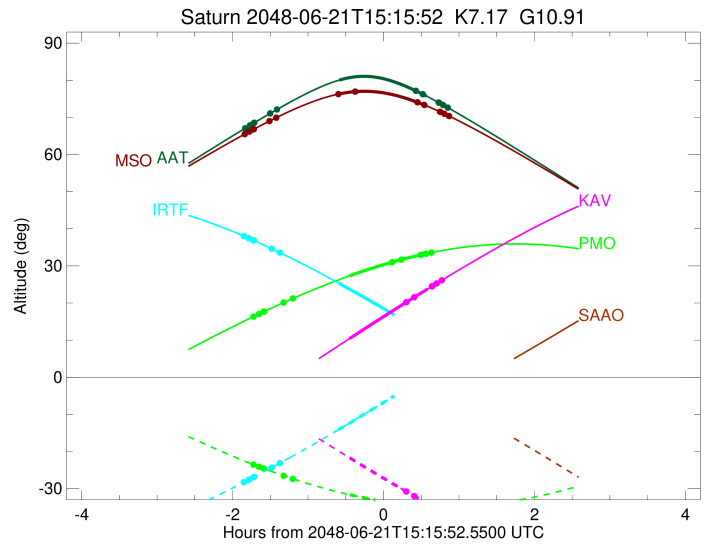
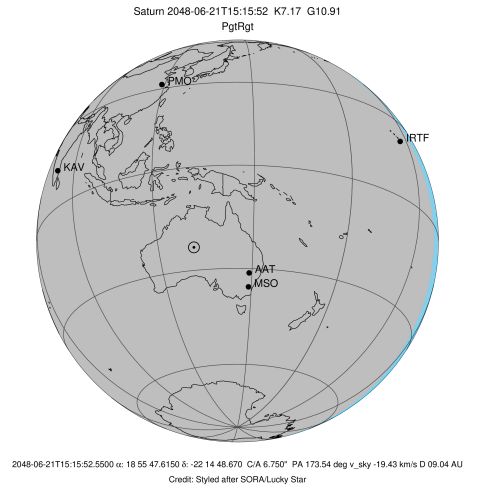
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2048-06-21T15:11:32.730
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : IRTF
 Location : Mauna Kea/IRTF
 Latitude (deg) : 19.82622
 E. Longitude (deg) : 204.52800
 Altitude (km) : 4.168
 Gaia source ID : 4075747668408119424
 2Mass ID (if available) : 18554762-2214486
 ICRS Star Coord at Epoch: 18h 55m 47.61498s -22:14:48.67010s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 7.170
 G magnitude : 10.911
 RP magnitude : 9.868
 BP magnitude : 12.029
 DUPflag : 0
 Distance (au) : 9.043
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.43
 Sun-Target sep (deg) : 167.35
 Sun-Moon sep (deg) : 75.22
 B (ring opening deg) : 25.03
 PA of pole (deg) : 6.41
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 7.141
 C/A sky separation (km) : 46838.0
 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

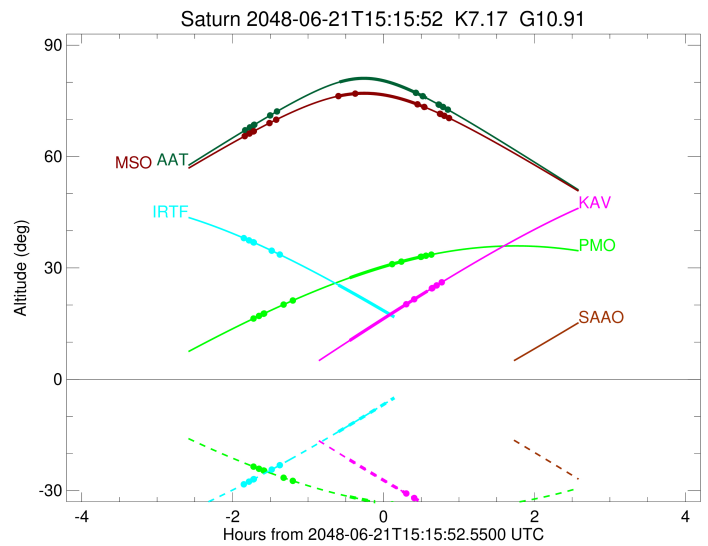
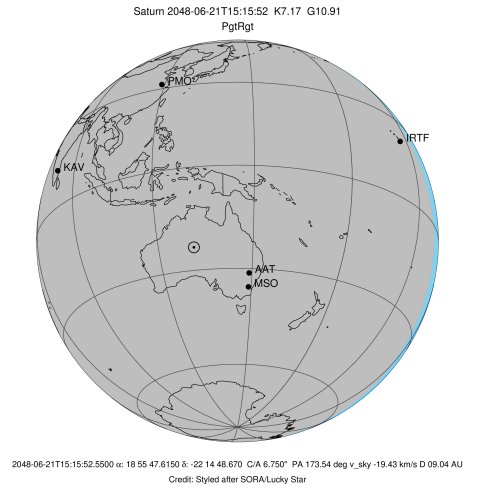
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-06-21T13:24:45.885		38.03	-28.31	140461.00	-15.20		
A (OER)	I	2048-06-21T13:28:52.039		37.43	-27.59	136774.40	-14.75		
Encke (OEG)	I	2048-06-21T13:32:20.269		36.91	-26.98	133744.89	-14.34		
Encke (IEG)	I	2048-06-21T13:32:42.724		36.86	-26.91	133423.31	-14.30		
A (IER)	I	2048-06-21T13:46:54.703		34.65	-24.35	122050.38	-12.31		
B (OER)	I	2048-06-21T13:53:14.588		33.62	-23.18	117571.16	-11.25		
Saturn	I	2048-06-21T14:39:57.488		25.41	-14.14	59858.55		34.88	40.37
Saturn	E	2048-06-21T15:42:38.304		13.09	-1.17x	59441.25		54.77	59.77
B (OER)	E	2048-06-21T15:26:50.494	b	16.30	-4.51x	117571.16	11.14		
A (IER)	E	2048-06-21T15:33:14.408	b	15.01	-3.16x	122050.38	12.18		
Encke (IEG)	E	2048-06-21T15:47:36.335		12.07	-0.11x	133423.31	14.12		
Encke (OEG)	E	2048-06-21T15:47:59.068		11.99	-0.03x	133744.89	14.15		
A (OER)	E	2048-06-21T15:51:29.906		11.26	0.72x	136774.40	14.57		
F ring	E	2048-06-21T15:55:39.231		10.40	1.61x	140461.00	15.00		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2048-06-21T15:20:11.540
 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 : 4075747668408119424
 2Mass ID (if available) : 18554762-2214486
 ICRS Star Coord at Epoch: 18h 55m 47.61498s -22:14:48.67010s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 7.170
 G magnitude : 10.911
 RP magnitude : 9.868
 BP magnitude : 12.029
 DUPflag : 0
 Distance (au) : 9.043
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.43
 Sun-Target sep (deg) : 167.35
 Sun-Moon sep (deg) : 74.75
 B (ring opening deg) : 25.03
 PA of pole (deg) : 6.41
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 7.194
 C/A sky separation (km) : 47184.5
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-06-21T13:31:24.251	-7.00x	-5.05	140461.00	-15.20			
A (OER)	I	2048-06-21T13:35:30.224	-6.06x	-5.95	136774.40	-14.77			
Encke (OEG)	I	2048-06-21T13:38:58.047	-5.27x	-6.71	133744.89	-14.38			
Encke (IEG)	I	2048-06-21T13:39:20.444	-5.19x	-6.80	133423.31	-14.34			
A (IER)	I	2048-06-21T13:53:27.713	-1.98x	-9.88	122050.38	-12.42			
B (OER)	I	2048-06-21T13:59:43.509	-0.56x	-11.24	117571.16	-11.40			
Saturn	I	2048-06-21T14:48:52.006		10.42	-21.69	59864.74		34.57	40.05
Saturn	E	2048-06-21T15:50:48.970		23.76	-33.98	59422.30		55.72	60.65
B (OER)	E	2048-06-21T15:34:02.191	b	20.22	-30.78	117571.16	11.44		
A (IER)	E	2048-06-21T15:40:16.243	b	21.54	-31.98	122050.38	12.49		
Encke (IEG)	E	2048-06-21T15:54:18.048		24.49	-34.63	133423.31	14.45		
Encke (OEG)	E	2048-06-21T15:54:40.269		24.56	-34.70	133744.89	14.49		
A (OER)	E	2048-06-21T15:58:06.388		25.28	-35.34	136774.40	14.90		
F ring	E	2048-06-21T16:02:10.166		26.12	-36.08	140461.00	15.34		

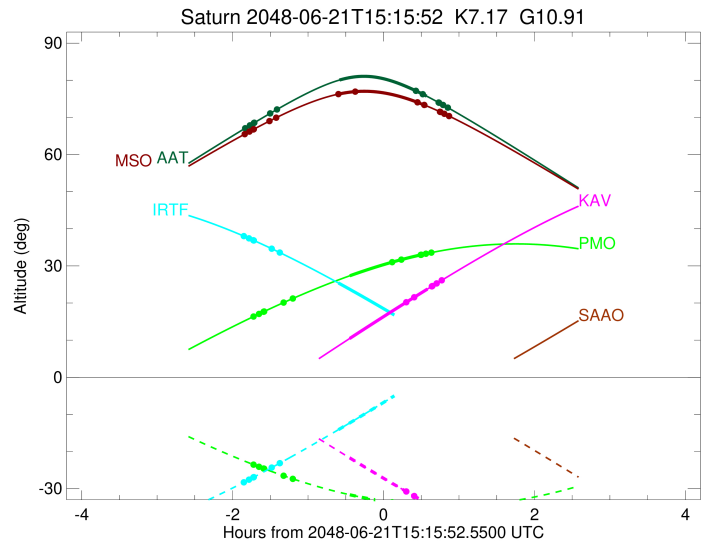
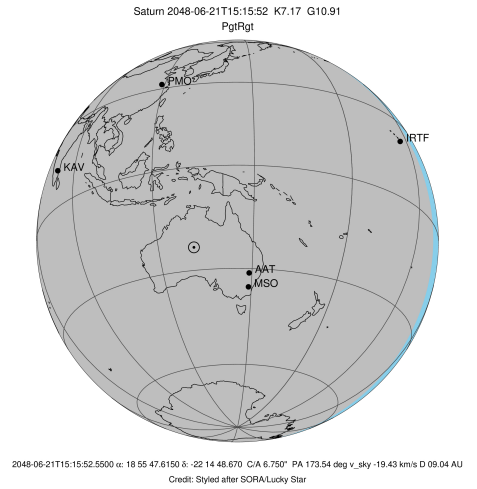
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2048-06-21T15:15:46.160
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : AAT
 Location : Siding Spring (AAT)
 Latitude (deg) : -31.27703
 E. Longitude (deg) : 149.06608
 Altitude (km) : 1.164
 Gaia source ID : 4075747668408119424
 2Mass ID (if available) : 18554762-2214486
 ICRS Star Coord at Epoch: 18h 55m 47.61498s -22:14:48.67010s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 7.170
 G magnitude : 10.911
 RP magnitude : 9.868
 BP magnitude : 12.029
 DUPflag : 0
 Distance (au) : 9.043
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.43
 Sun-Target sep (deg) : 167.35
 Sun-Moon sep (deg) : 75.64
 B (ring opening deg) : 25.03
 PA of pole (deg) : 6.41
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 6.593
 C/A sky separation (km) : 43243.9
 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	2048-06-21T13:25:52.310		67.08	-78.30	140461.00	-16.49		
A (OER)	I	2048-06-21T13:29:38.243		67.85	-78.92	136774.40	-16.14		
Encke (OEG)	I	2048-06-21T13:32:47.751		68.49	-79.41	133744.89	-15.83		
Encke (IEG)	I	2048-06-21T13:33:08.091		68.56	-79.46	133423.31	-15.79		
A (IER)	I	2048-06-21T13:45:42.261		71.07	-81.14	122050.38	-14.30		
B (OER)	I	2048-06-21T13:51:03.947		72.12	-81.67	117571.16	-13.53		
Saturn	I	2048-06-21T14:40:50.485		80.06	-79.05	59954.77		29.97	35.16
Saturn	E	2048-06-21T15:50:10.052		75.73	-65.62	59515.13		51.14	56.42
B (OER)	E	2048-06-21T15:41:40.662	b	77.16	-67.39	117571.16	13.47		
A (IER)	E	2048-06-21T15:47:03.916	b	76.26	-66.27	122050.38	14.23		
Encke (IEG)	E	2048-06-21T15:59:41.547		74.01	-63.62	133423.31	15.72		
Encke (OEG)	E	2048-06-21T16:00:01.977		73.95	-63.54	133744.89	15.76		
A (OER)	E	2048-06-21T16:03:12.320		73.36	-62.87	136774.40	16.07		
F ring	E	2048-06-21T16:06:59.240		72.64	-62.07	140461.00	16.42		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2048-06-21T15:15:49.510
 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 : 4075747668408119424
 2Mass ID (if available) : 18554762-2214486
 ICRS Star Coord at Epoch: 18h 55m 47.61498s -22:14:48.67010s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 7.170
 G magnitude : 10.911
 RP magnitude : 9.868
 BP magnitude : 12.029
 DUPflag : 0
 Distance (au) : 9.043
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.43
 Sun-Target sep (deg) : 167.35
 Sun-Moon sep (deg) : 75.62
 B (ring opening deg) : 25.03
 PA of pole (deg) : 6.41
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 6.527
 C/A sky separation (km) : 42809.8
 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	2048-06-21T13:25:30.988		65.49	-75.37	140461.00	-16.60		
A (OER)	I	2048-06-21T13:29:15.289		66.18	-75.84	136774.40	-16.26		
Encke (OEG)	I	2048-06-21T13:32:23.287		66.75	-76.21	133744.89	-15.96		
Encke (IEG)	I	2048-06-21T13:32:43.457		66.81	-76.25	133423.31	-15.93		
A (IER)	I	2048-06-21T13:45:09.867		69.01	-77.45	122050.38	-14.48		
B (OER)	I	2048-06-21T13:50:27.114		69.91	-77.82	117571.16	-13.74		
B (IER)	I	2048-06-21T14:39:39.013		76.25	-76.19	91984.69	-2.18		
Saturn	I	2048-06-21T14:40:28.696		76.31	-76.09	59964.78		29.43	34.58
Saturn	E	2048-06-21T15:50:38.800		73.03	-64.45	59524.48		50.70	56.00
B (IER)	E	2048-06-21T14:53:33.875	b	76.95	-74.37	91984.69	2.18		
B (OER)	E	2048-06-21T15:42:56.149	b	74.07	-65.92	117571.16	13.68		
A (IER)	E	2048-06-21T15:48:14.898	b	73.36	-64.91	122050.38	14.42		
Encke (IEG)	E	2048-06-21T16:00:44.611		71.53	-62.50	133423.31	15.86		
Encke (OEG)	E	2048-06-21T16:01:04.866		71.47	-62.43	133744.89	15.89		
A (OER)	E	2048-06-21T16:04:13.661		70.98	-61.81	136774.40	16.20		
F ring	E	2048-06-21T16:07:58.902		70.37	-61.08	140461.00	16.53		