

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-01T15:43:18.750  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4069538687564667136  
 2Mass ID (if available) : 17595793-2222344

Saturn 2047-07-01T15:43:18 K8.30 G12.89 PgtRgt

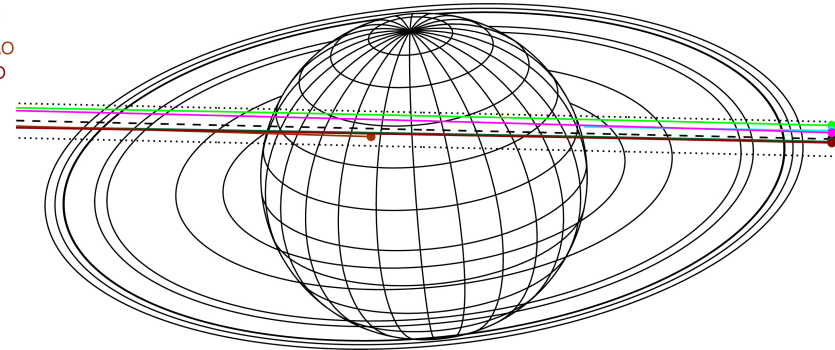
ICRS Star Coord at Epoch: 17h 59m 57.93586s -22:22:34.41557s

RUWE (>1.4 is poor) : 0.84  
 K magnitude : 8.300  
 G magnitude : 12.894  
 RP magnitude : 11.705  
 BP magnitude : 14.434  
 DUPflag : 0  
 Distance (au) : 9.041  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.80  
 Sun-Target sep (deg) : 170.83  
 Sun-Moon sep (deg) : 68.89  
 B (ring opening deg) : 26.51  
 PA of pole (deg) : 5.51

Saturn 2047-07-01T15:43:18 K8.30 G12.89  
 PgtRgt



Earth  
 PMO  
 IRTF  
 KAV  
 AAT  
 SAAO  
 MSO

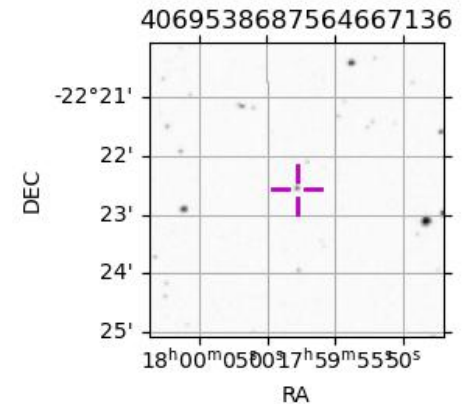


2047-07-01T15:43:18.7500 at: 17 59 57.9359 S: -22 22 34.416 C/A 2.628° PA 178.71 deg v\_sky -19.80 km/s D 09.04 AU  
 Credit: Styled after SORA/Lucky Star

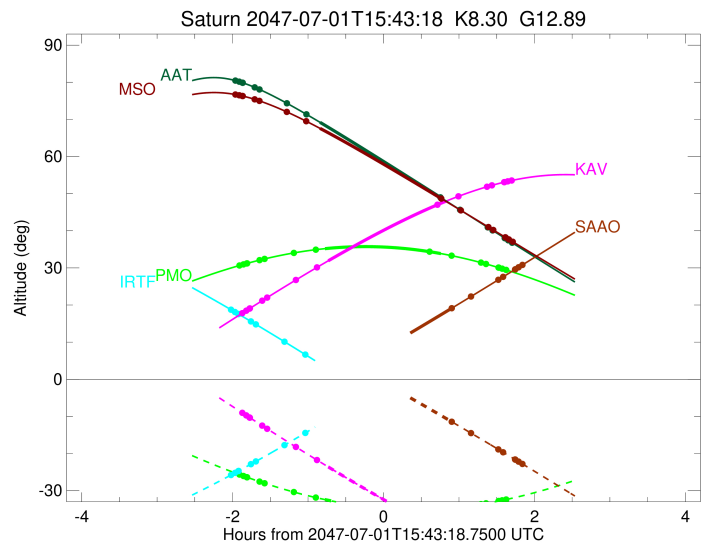
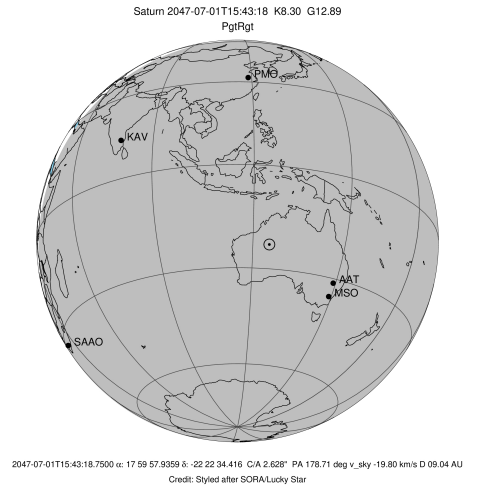
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

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	OEncode
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 01 13:48 - JUL 01 17:20	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	+	+	+	JUL 01 13:42 - JUL 01 14:41	PnnRin
KAV	Kavalur Observ	12.6	78.8	+	+	+	JUL 01 13:51 - JUL 01 17:25	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 01 13:45 - JUL 01 17:25	PieRie
SAAO	So. Afr. Astro	-32.4	20.8		+	+	JUL 01 16:36 - JUL 01 17:33	PneRne
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JUL 01 13:45 - JUL 01 17:26	PieRie



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-01T15:42:55.990  
 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 : 4069538687564667136  
 2Mass ID (if available) : 17595793-2222344  
 ICRS Star Coord at Epoch: 17h 59m 57.93586s -22:22:34.41557s  
 RUWE (>1.4 is poor) : 0.84  
 K magnitude : 8.300  
 G magnitude : 12.894  
 RP magnitude : 11.705  
 BP magnitude : 14.434  
 DUPflag : 0  
 Distance (au) : 9.041  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.80  
 Sun-Target sep (deg) : 170.83  
 Sun-Moon sep (deg) : 69.48  
 B (ring opening deg) : 26.51  
 PA of pole (deg) : 5.51  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.415  
 C/A sky separation (km) : 22395.0  
 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

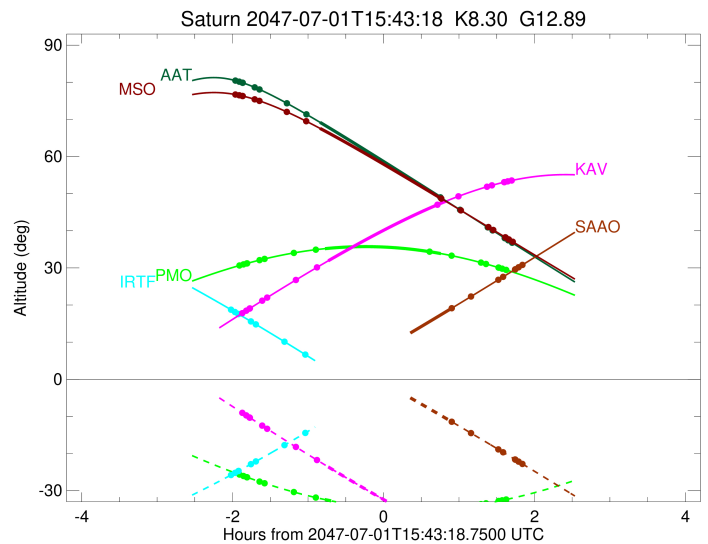
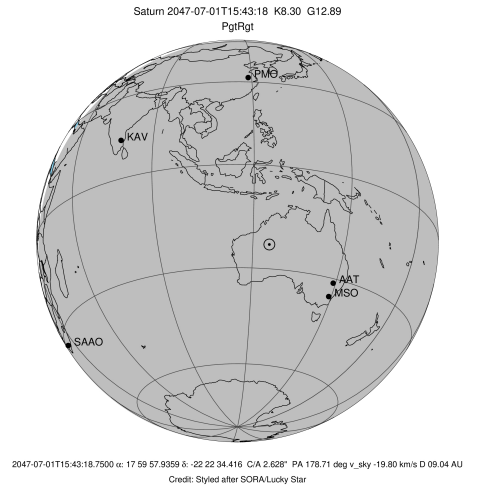


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-01T13:48:48.639		30.65	-25.67	140461.00	-19.43		
A (OER)	I	2047-07-01T13:51:58.751		30.95	-26.06	136774.40	-19.36		
Encke (OEG)	I	2047-07-01T13:54:35.530		31.19	-26.38	133744.89	-19.29		
Encke (IEG)	I	2047-07-01T13:54:52.203		31.22	-26.41	133423.31	-19.28		
A (IER)	I	2047-07-01T14:04:46.245		32.09	-27.57	122050.38	-18.99		
B (OER)	I	2047-07-01T14:08:42.939		32.41	-28.01	117571.16	-18.85		
B (IER)	I	2047-07-01T14:32:02.104		34.04	-30.38	91984.69	-17.56		
C (IER)	I	2047-07-01T14:49:29.438		34.91	-31.87	74490.58	-15.64		
Saturn	I	2047-07-01T14:56:48.223		35.18	-32.41	60189.65		13.46	16.38
Saturn	E	2047-07-01T16:28:54.951		33.86	-34.82	60004.07		25.36	30.11
C (IER)	E	2047-07-01T16:19:55.163	b	34.37	-34.97	74490.58	15.59		
B (IER)	E	2047-07-01T16:37:25.837		33.30	-34.61	91984.69	17.51		
B (OER)	E	2047-07-01T17:00:49.563		31.43	-33.64	117571.16	18.79		
A (IER)	E	2047-07-01T17:04:47.111		31.06	-33.42	122050.38	18.92		
Encke (IEG)	E	2047-07-01T17:14:43.426		30.09	-32.81	133423.31	19.21		
Encke (OEG)	E	2047-07-01T17:15:00.165		30.06	-32.79	133744.89	19.21		
A (OER)	E	2047-07-01T17:17:37.578		29.79	-32.61	136774.40	19.28		
F ring	E	2047-07-01T17:20:48.476		29.46	-32.39	140461.00	19.35		

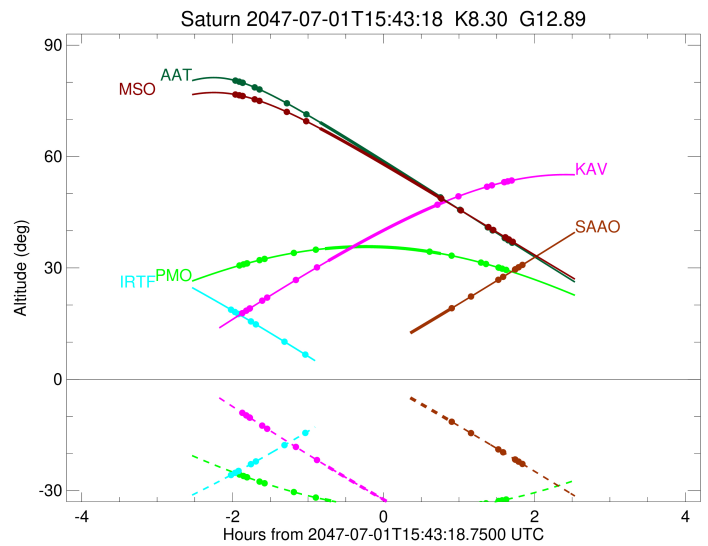
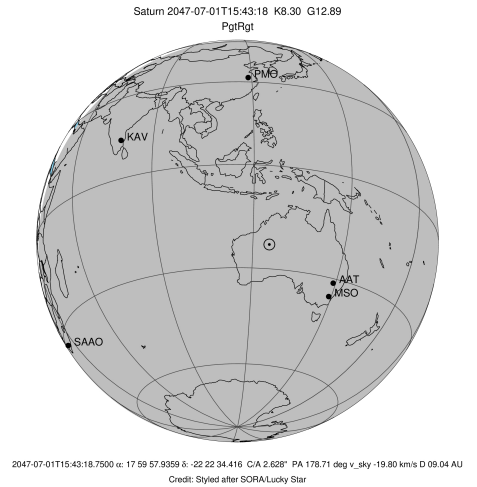
```

target                : Saturn
target radius (km)   : 60268.00
C/A epoch            : 2047-07-01T15:38:20.900
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      : 4069538687564667136
2Mass ID (if available) : 17595793-2222344
ICRS Star Coord at Epoch: 17h 59m 57.93586s -22:22:34.41557s
RUWE (>1.4 is poor) : 0.84
K magnitude          : 8.300
G magnitude          : 12.894
RP magnitude         : 11.705
BP magnitude         : 14.434
DUPflag             : 0
Distance (au)       : 9.041
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -19.80
Sun-Target sep (deg) : 170.83
Sun-Moon sep (deg)  : 69.12
B (ring opening deg) : 26.51
PA of pole (deg)    : 5.51
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 2.919
C/A sky separation (km) : 19137.6
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
    
```



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-01T13:42:05.784		18.74	-25.79	140461.00	-19.57		
A (OER)	I	2047-07-01T13:45:14.393		18.11	-25.22	136774.40	-19.52		
Encke (OEG)	I	2047-07-01T13:47:49.818		17.60	-24.74	133744.89	-19.47		
Encke (IEG)	I	2047-07-01T13:48:06.340		17.55	-24.69	133423.31	-19.46		
A (IER)	I	2047-07-01T13:57:54.019		15.58	-22.87	122050.38	-19.23		
B (OER)	I	2047-07-01T14:01:47.528		14.80	-22.14	117571.16	-19.13		
B (IER)	I	2047-07-01T14:24:34.952		10.12	-17.75	91984.69	-18.19		
C (IER)	I	2047-07-01T14:41:09.457		6.65	-14.46	74490.58	-16.86		
Saturn	I	2047-07-01T14:50:25.273		4.68x	-12.59	60215.99		10.93	13.34
Saturn	E	2047-07-01T16:26:22.000		-16.32x	7.72x	60063.76		22.12	26.46
C (IER)	E	2047-07-01T16:22:16.055	b	-15.40x	6.82x	74490.58	16.68		
B (IER)	E	2047-07-01T16:39:02.314		-19.16x	10.50x	91984.69	17.95		
B (OER)	E	2047-07-01T17:02:10.349		-24.38x	15.61x	117571.16	18.81		
A (IER)	E	2047-07-01T17:06:07.922		-25.28x	16.49x	122050.38	18.90		
Encke (IEG)	E	2047-07-01T17:16:06.531		-27.55x	18.71x	133423.31	19.09		
Encke (OEG)	E	2047-07-01T17:16:23.375		-27.61x	18.77x	133744.89	19.09		
A (OER)	E	2047-07-01T17:19:01.866		-28.21x	19.36x	136774.40	19.14		
F ring	E	2047-07-01T17:22:14.288		-28.94x	20.08x	140461.00	19.18		

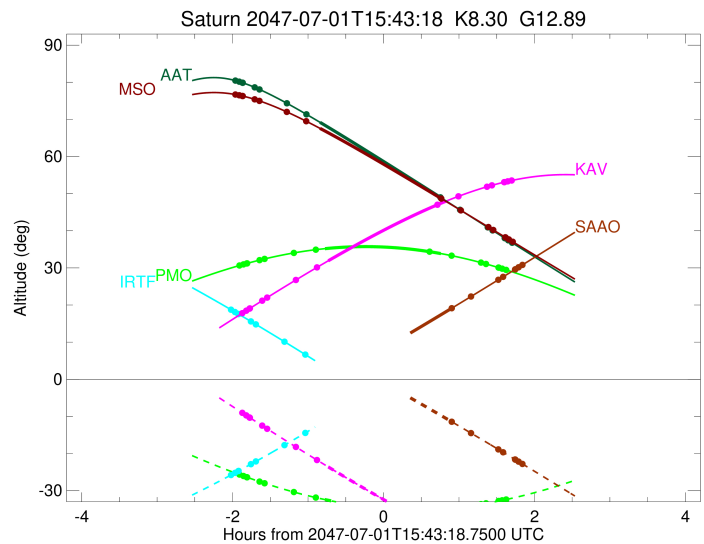
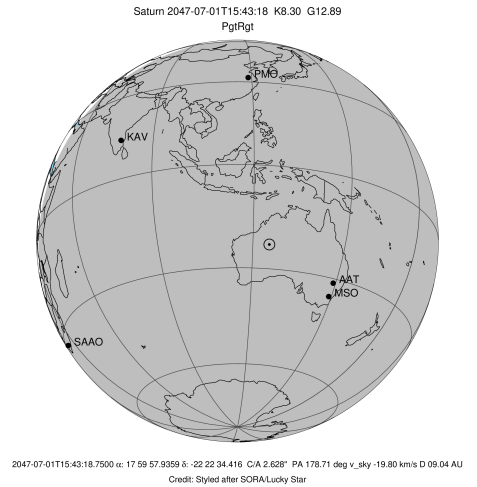
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-01T15:46:12.960  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 4069538687564667136  
 2Mass ID (if available) : 17595793-2222344  
 ICRS Star Coord at Epoch: 17h 59m 57.93586s -22:22:34.41557s  
 RUWE (>1.4 is poor) : 0.84  
 K magnitude : 8.300  
 G magnitude : 12.894  
 RP magnitude : 11.705  
 BP magnitude : 14.434  
 DUPflag : 0  
 Distance (au) : 9.041  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.80  
 Sun-Target sep (deg) : 170.83  
 Sun-Moon sep (deg) : 69.30  
 B (ring opening deg) : 26.51  
 PA of pole (deg) : 5.51  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.132  
 C/A sky separation (km) : 20537.8  
 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	2047-07-01T13:51:03.345		17.80	-9.04	140461.00	-19.54		
A (OER)	I	2047-07-01T13:54:12.270		18.48	-9.73	136774.40	-19.49		
Encke (OEG)	I	2047-07-01T13:56:47.944		19.03	-10.30	133744.89	-19.44		
Encke (IEG)	I	2047-07-01T13:57:04.492		19.09	-10.36	133423.31	-19.43		
A (IER)	I	2047-07-01T14:06:53.105		21.17	-12.49	122050.38	-19.20		
B (OER)	I	2047-07-01T14:10:47.032		22.00	-13.34	117571.16	-19.09		
B (IER)	I	2047-07-01T14:33:39.410		26.75	-18.23	91984.69	-18.07		
C (IER)	I	2047-07-01T14:50:25.467		30.14	-21.76	74490.58	-16.55		
Saturn	I	2047-07-01T14:59:21.946		31.91	-23.61	60210.56		11.50	14.02
Saturn	E	2047-07-01T16:32:47.516		47.94	-41.33	60030.40		23.97	28.56
C (IER)	E	2047-07-01T16:26:09.979	b	47.01	-40.21	74490.58	16.59		
B (IER)	E	2047-07-01T16:42:52.444		49.28	-42.98	91984.69	18.15		
B (OER)	E	2047-07-01T17:05:37.111		51.86	-46.42	117571.16	19.22		
A (IER)	E	2047-07-01T17:09:29.459		52.24	-46.96	122050.38	19.34		
Encke (IEG)	E	2047-07-01T17:19:13.787		53.09	-48.25	133423.31	19.58		
Encke (OEG)	E	2047-07-01T17:19:30.208		53.11	-48.29	133744.89	19.59		
A (OER)	E	2047-07-01T17:22:04.671		53.31	-48.61	136774.40	19.64		
F ring	E	2047-07-01T17:25:12.088		53.54	-49.00	140461.00	19.70		

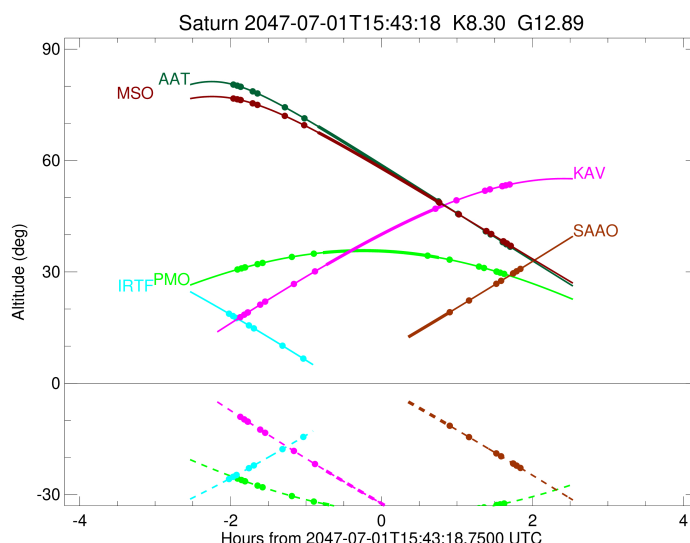
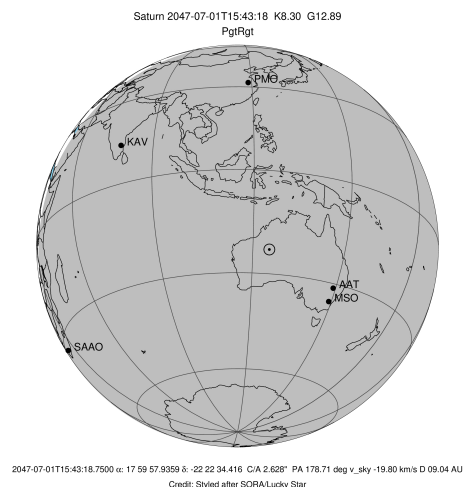
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-01T15:40:53.240  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4069538687564667136  
 2Mass ID (if available) : 17595793-2222344  
 ICRS Star Coord at Epoch: 17h 59m 57.93586s -22:22:34.41557s  
 RUWE (>1.4 is poor) : 0.84  
 K magnitude : 8.300  
 G magnitude : 12.894  
 RP magnitude : 11.705  
 BP magnitude : 14.434  
 DUPflag : 0  
 Distance (au) : 9.041  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.80  
 Sun-Target sep (deg) : 170.83  
 Sun-Moon sep (deg) : 69.83  
 B (ring opening deg) : 26.51  
 PA of pole (deg) : 5.51  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.417  
 C/A sky separation (km) : 15847.7  
 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\_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	2047-07-01T13:45:34.257		80.46	-80.60	140461.00	-20.09		
A (OER)	I	2047-07-01T13:48:37.912		80.16	-80.93	136774.40	-20.05		
Encke (OEG)	I	2047-07-01T13:51:09.097		79.89	-81.18	133744.89	-20.02		
Encke (IEG)	I	2047-07-01T13:51:25.160		79.86	-81.20	133423.31	-20.02		
A (IER)	I	2047-07-01T14:00:55.290		78.63	-81.84	122050.38	-19.87		
B (OER)	I	2047-07-01T14:04:41.092		78.08	-81.95	117571.16	-19.80		
B (IER)	I	2047-07-01T14:26:31.338		74.34	-80.94	91984.69	-19.18		
C (IER)	I	2047-07-01T14:42:02.230		71.37	-78.91	74490.58	-18.32		
Saturn	I	2047-07-01T14:52:48.276		69.22	-77.14	60241.49		7.78	9.53
Saturn	E	2047-07-01T16:28:58.354		48.91	-57.68	60109.12		19.39	23.33
C (IER)	E	2047-07-01T16:28:32.204	b	49.00	-57.77	74490.58	18.19		
B (IER)	E	2047-07-01T16:44:10.144		45.65	-54.44	91984.69	19.02		
B (OER)	E	2047-07-01T17:06:12.781		40.92	-49.72	117571.16	19.59		
A (IER)	E	2047-07-01T17:10:01.027		40.11	-48.91	122050.38	19.65		
Encke (IEG)	E	2047-07-01T17:19:37.737		38.05	-46.85	133423.31	19.78		
Encke (OEG)	E	2047-07-01T17:19:53.993		37.99	-46.79	133744.89	19.78		
A (OER)	E	2047-07-01T17:22:27.025		37.45	-46.25	136774.40	19.81		
F ring	E	2047-07-01T17:25:32.978		36.79	-45.58	140461.00	19.84		

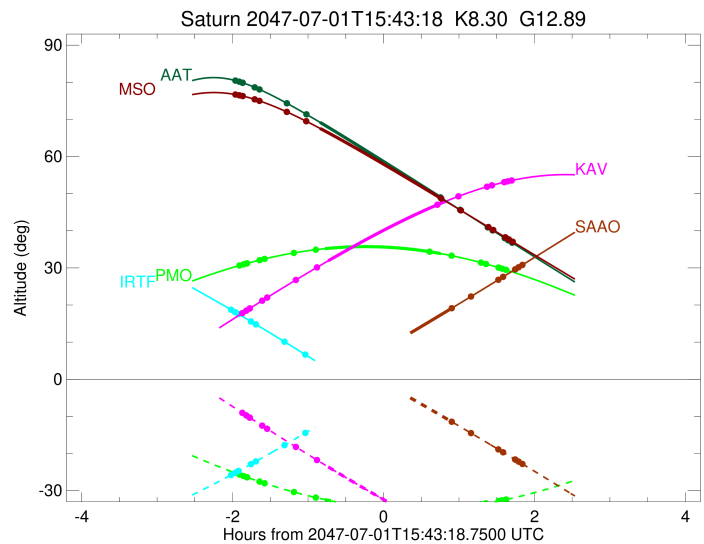
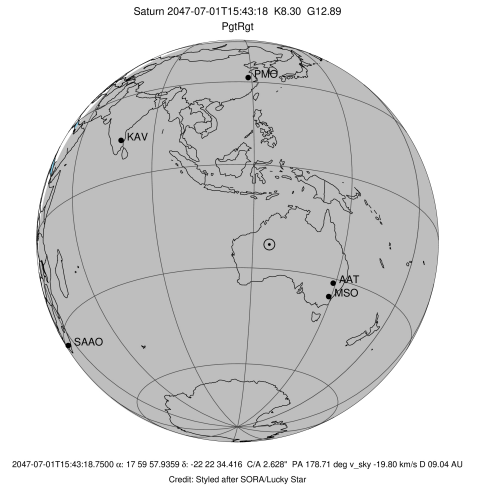
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-01T15:47:49.760  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : SAAO  
 Location : So. Afr. Astro. Obs. (Sutherland)  
 Latitude (deg) : -32.37953  
 E. Longitude (deg) : 20.81070  
 Altitude (km) : 1.768  
 Gaia source ID : 4069538687564667136  
 2Mass ID (if available) : 17595793-2222344  
 ICRS Star Coord at Epoch: 17h 59m 57.93586s -22:22:34.41557s  
 RUWE (>1.4 is poor) : 0.84  
 K magnitude : 8.300  
 G magnitude : 12.894  
 RP magnitude : 11.705  
 BP magnitude : 14.434  
 DUPflag : 0  
 Distance (au) : 9.041  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.80  
 Sun-Target sep (deg) : 170.83  
 Sun-Moon sep (deg) : 68.70  
 B (ring opening deg) : 26.51  
 PA of pole (deg) : 5.51  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.155  
 C/A sky separation (km) : 14128.4  
 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	2047-07-01T13:49:40.515	-12.84x	18.62x	140461.00	-19.72			
A (OER)	I	2047-07-01T13:52:47.595	-12.31x	18.15x	136774.40	-19.69			
Encke (OEG)	I	2047-07-01T13:55:21.498	-11.87x	17.76x	133744.89	-19.67			
Encke (IEG)	I	2047-07-01T13:55:37.843	-11.83x	17.72x	133423.31	-19.67			
A (IER)	I	2047-07-01T14:05:17.266	-10.16x	16.21x	122050.38	-19.58			
B (OER)	I	2047-07-01T14:09:06.303	-9.49x	15.61x	117571.16	-19.53			
B (IER)	I	2047-07-01T14:31:08.702	-5.55x	12.00x	91984.69	-19.11			
C (IER)	I	2047-07-01T14:46:37.673	-2.70x	9.35x	74490.58	-18.49			
Saturn	I	2047-07-01T14:58:22.154	-0.50x	7.30x	60253.82			5.68	6.97
Saturn	E	2047-07-01T16:36:58.403	19.01	-11.33	60122.28			18.53	22.34
C (IER)	E	2047-07-01T16:37:31.995	19.13	-11.44	74490.58	18.64			
B (IER)	E	2047-07-01T16:52:51.930	22.28	-14.50	91984.69	19.32			
B (OER)	E	2047-07-01T17:14:37.425	26.80	-18.89	117571.16	19.82			
A (IER)	E	2047-07-01T17:18:23.082	27.59	-19.66	122050.38	19.88			
Encke (IEG)	E	2047-07-01T17:27:53.381	29.57	-21.60	133423.31	20.00			
Encke (OEG)	E	2047-07-01T17:28:09.457	29.63	-21.66	133744.89	20.00			
A (OER)	E	2047-07-01T17:30:40.794	30.16	-22.17	136774.40	20.03			
F ring	E	2047-07-01T17:33:44.681	30.80	-22.80	140461.00	20.06			

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-01T15:41:00.500  
 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 : 4069538687564667136  
 2Mass ID (if available) : 17595793-2222344  
 ICRS Star Coord at Epoch: 17h 59m 57.93586s -22:22:34.41557s  
 RUWE (>1.4 is poor) : 0.84  
 K magnitude : 8.300  
 G magnitude : 12.894  
 RP magnitude : 11.705  
 BP magnitude : 14.434  
 DUPflag : 0  
 Distance (au) : 9.041  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.80  
 Sun-Target sep (deg) : 170.83  
 Sun-Moon sep (deg) : 69.82  
 B (ring opening deg) : 26.51  
 PA of pole (deg) : 5.51  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.353  
 C/A sky separation (km) : 15427.3  
 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	2047-07-01T13:45:33.938		76.71	-77.00	140461.00	-20.11		
A (OER)	I	2047-07-01T13:48:37.420		76.50	-77.24	136774.40	-20.07		
Encke (OEG)	I	2047-07-01T13:51:08.447		76.31	-77.41	133744.89	-20.04		
Encke (IEG)	I	2047-07-01T13:51:24.492		76.29	-77.42	133423.31	-20.04		
A (IER)	I	2047-07-01T14:00:53.883		75.41	-77.85	122050.38	-19.90		
B (OER)	I	2047-07-01T14:04:39.322		74.99	-77.92	117571.16	-19.84		
B (IER)	I	2047-07-01T14:26:26.275		72.02	-77.28	91984.69	-19.25		
C (IER)	I	2047-07-01T14:41:52.669		69.51	-75.85	74490.58	-18.43		
Saturn	I	2047-07-01T14:52:47.574		67.60	-74.47	60244.00		7.40	9.06
Saturn	E	2047-07-01T16:29:13.482		48.68	-57.06	60114.65		19.03	22.92
C (IER)	E	2047-07-01T16:29:12.678	b	48.69	-57.07	74490.58	18.31		
B (IER)	E	2047-07-01T16:44:45.830		45.51	-53.94	91984.69	19.10		
B (OER)	E	2047-07-01T17:06:44.671		41.00	-49.48	117571.16	19.63		
A (IER)	E	2047-07-01T17:10:32.455		40.22	-48.70	122050.38	19.69		
Encke (IEG)	E	2047-07-01T17:20:08.160		38.25	-46.75	133423.31	19.81		
Encke (OEG)	E	2047-07-01T17:20:24.391		38.20	-46.69	133744.89	19.81		
A (OER)	E	2047-07-01T17:22:57.190		37.68	-46.17	136774.40	19.84		
F ring	E	2047-07-01T17:26:02.876		37.04	-45.54	140461.00	19.87		