

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T16:46:22.410  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4070277254475098368  
 2Mass ID (if available) : 17571257-2223371

Saturn 2047-07-10T16:46:22 K8.70 G13.72 PgtRgt

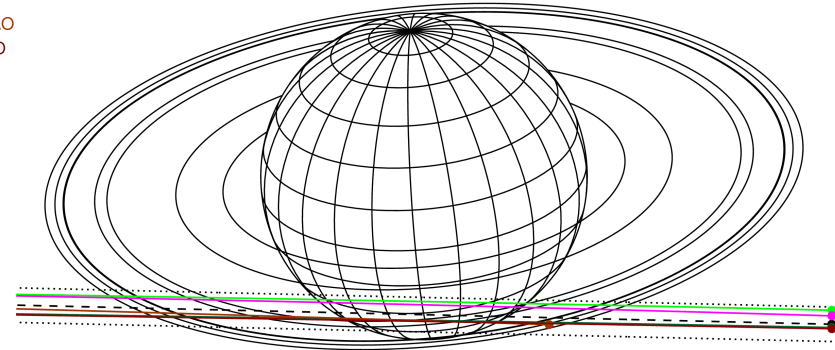
ICRS Star Coord at Epoch: 17h 57m 12.57086s -22:23:37.29770s

RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.699  
 G magnitude : 13.722  
 RP magnitude : 12.462  
 BP magnitude : 15.512  
 DUPflag : 0  
 Distance (au) : 9.076  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.66  
 Sun-Target sep (deg) : 161.60  
 Sun-Moon sep (deg) : 59.28  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46

Saturn 2047-07-10T16:46:22 K8.70 G13.72  
 PgtRgt



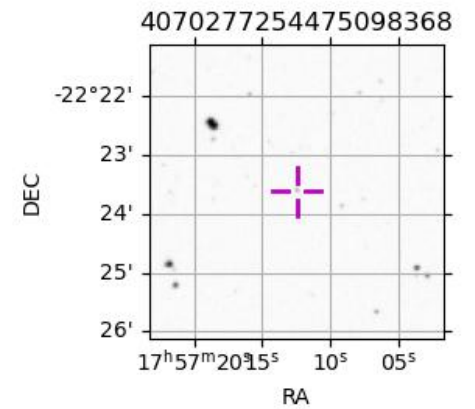
Earth  
 PMO  
 KAV  
 AAT  
 SAAO  
 MSO



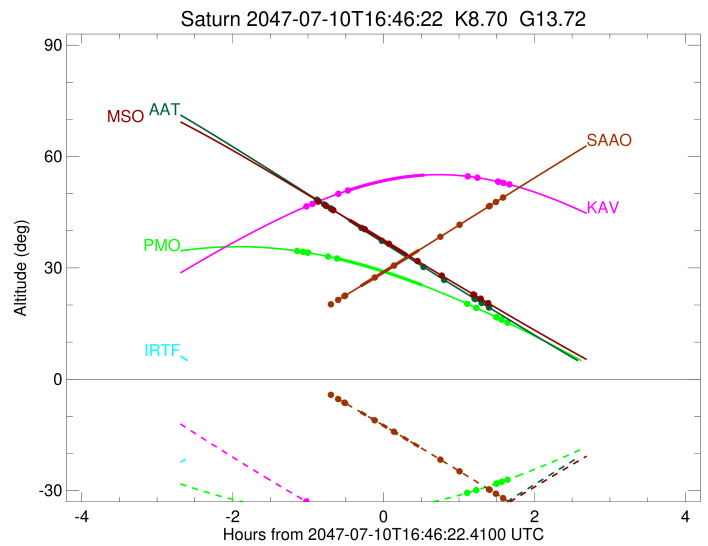
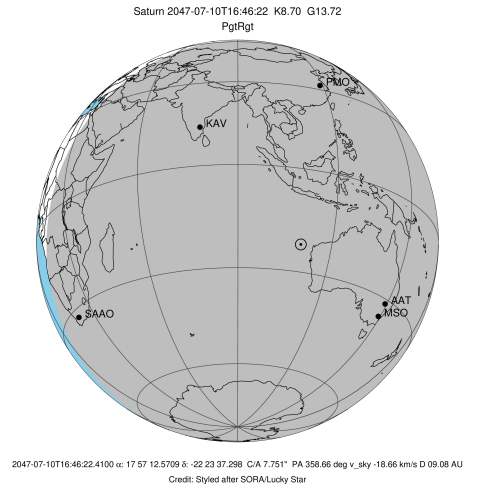
2047-07-10T16:46:22.410 at: 17 57 12.5709 s: -22 23 37.298 C/A 7.751" PA 358.66 deg v\_sky -18.66 km/s D 09.08 AU  
 Credit: Styled after SORA/Lucky Star

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 10 15:37 - JUL 10 18:25	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 10 15:45 - JUL 10 18:26	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 10 15:53 - JUL 10 18:10	PieRie
SAAO	So. Afr. Astro	-32.4	20.8	+ + + +	+ +	+ + + + +	JUL 10 16:10 - JUL 10 18:21	PieRie
MSO	Mt. Stromlo Ob	-35.3	149.0	+ + + +	+ +	+ + + + +	JUL 10 15:54 - JUL 10 18:09	PieRie



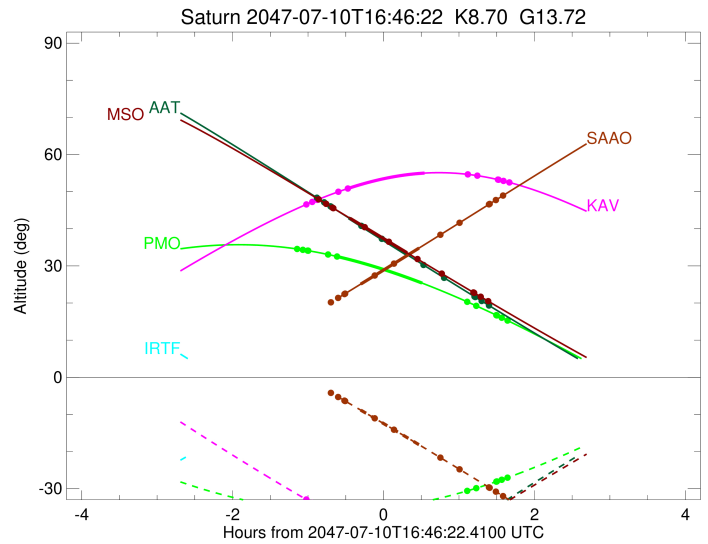
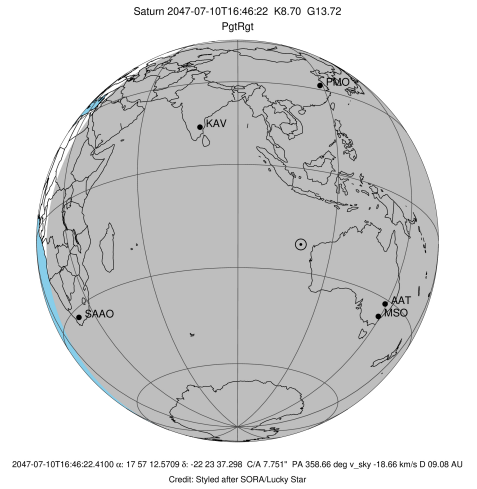
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T16:43:46.890  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 4070277254475098368  
 2Mass ID (if available) : 17571257-2223371  
 ICRS Star Coord at Epoch: 17h 57m 12.57086s -22:23:37.29770s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.699  
 G magnitude : 13.722  
 RP magnitude : 12.462  
 BP magnitude : 15.512  
 DUPflag : 0  
 Distance (au) : 9.076  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.66  
 Sun-Target sep (deg) : 161.60  
 Sun-Moon sep (deg) : 59.46  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.014  
 C/A sky separation (km) : 46170.0  
 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	2047-07-10T15:37:42.153		34.56	-35.38	140461.00	-13.68		
A (OER)	I	2047-07-10T15:42:15.666		34.33	-35.52	136774.40	-13.27		
Encke (OEG)	I	2047-07-10T15:46:07.068		34.12	-35.63	133744.89	-12.91		
Encke (IEG)	I	2047-07-10T15:46:32.025		34.09	-35.64	133423.31	-12.86		
A (IER)	I	2047-07-10T16:02:19.324		33.07	-35.90	122050.38	-11.07		
B (OER)	I	2047-07-10T16:09:22.126		32.54	-35.93	117571.16	-10.10		
Saturn	I	2047-07-10T16:10:58.719		32.41	-35.93	59455.16		-48.97	-54.37
Saturn	E	2047-07-10T17:16:59.559		25.38	-33.62	59710.13		-38.53	-44.13
B (OER)	E	2047-07-10T17:53:09.800		20.30	-30.59	117571.16	10.05		
A (IER)	E	2047-07-10T18:00:15.107		19.22	-29.86	122050.38	10.99		
Encke (IEG)	E	2047-07-10T18:16:10.242		16.72	-28.10	133423.31	12.74		
Encke (OEG)	E	2047-07-10T18:16:35.443		16.65	-28.05	133744.89	12.78		
A (OER)	E	2047-07-10T18:20:29.200		16.02	-27.59	136774.40	13.14		
F ring	E	2047-07-10T18:25:05.692		15.26	-27.04	140461.00	13.53		

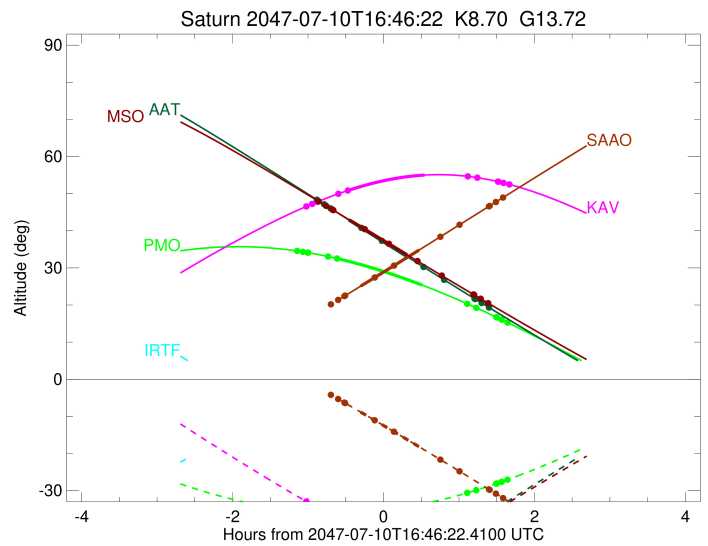
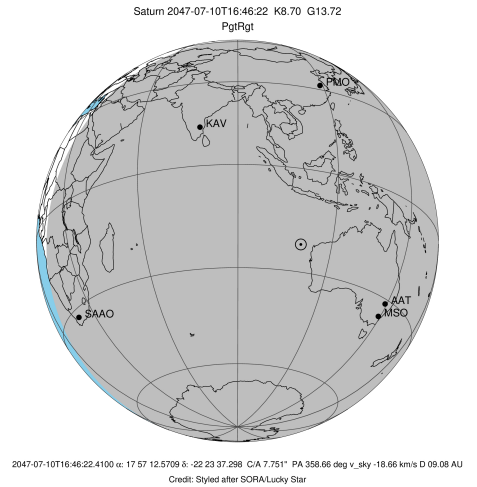
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T16:47:21.900  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 4070277254475098368  
 2Mass ID (if available) : 17571257-2223371  
 ICRS Star Coord at Epoch: 17h 57m 12.57086s -22:23:37.29770s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.699  
 G magnitude : 13.722  
 RP magnitude : 12.462  
 BP magnitude : 15.512  
 DUPflag : 0  
 Distance (au) : 9.076  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.66  
 Sun-Target sep (deg) : 161.60  
 Sun-Moon sep (deg) : 60.01  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.198  
 C/A sky separation (km) : 47384.4  
 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	2047-07-10T15:45:03.302		46.56	-32.93	140461.00	-13.38		
A (OER)	I	2047-07-10T15:49:43.303		47.24	-33.83	136774.40	-12.95		
Encke (OEG)	I	2047-07-10T15:53:40.896		47.79	-34.59	133744.89	-12.55		
Encke (IEG)	I	2047-07-10T15:54:06.564		47.85	-34.67	133423.31	-12.51		
A (IER)	I	2047-07-10T16:10:29.715		49.97	-37.74	122050.38	-10.54		
B (OER)	I	2047-07-10T16:17:57.036	b	50.84	-39.09	117571.16	-9.46		
Saturn	I	2047-07-10T16:16:06.929		50.63	-38.76	59416.00		-50.60	-55.91
Saturn	E	2047-07-10T17:18:58.752		55.00	-48.77	59678.08		-39.86	-45.47
B (OER)	E	2047-07-10T17:53:39.848		54.64	-52.69	117571.16	9.48		
A (IER)	E	2047-07-10T18:01:06.685		54.30	-53.32	122050.38	10.55		
Encke (IEG)	E	2047-07-10T18:17:29.874		53.24	-54.44	133423.31	12.50		
Encke (OEG)	E	2047-07-10T18:17:55.560		53.20	-54.46	133744.89	12.54		
A (OER)	E	2047-07-10T18:21:53.352		52.88	-54.66	136774.40	12.93		
F ring	E	2047-07-10T18:26:33.659		52.48	-54.87	140461.00	13.36		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T16:41:56.920  
 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 : 4070277254475098368  
 2Mass ID (if available) : 17571257-2223371  
 ICRS Star Coord at Epoch: 17h 57m 12.57086s -22:23:37.29770s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.699  
 G magnitude : 13.722  
 RP magnitude : 12.462  
 BP magnitude : 15.512  
 DUPflag : 0  
 Distance (au) : 9.076  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.66  
 Sun-Target sep (deg) : 161.60  
 Sun-Moon sep (deg) : 59.43  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.067  
 C/A sky separation (km) : 53100.4  
 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

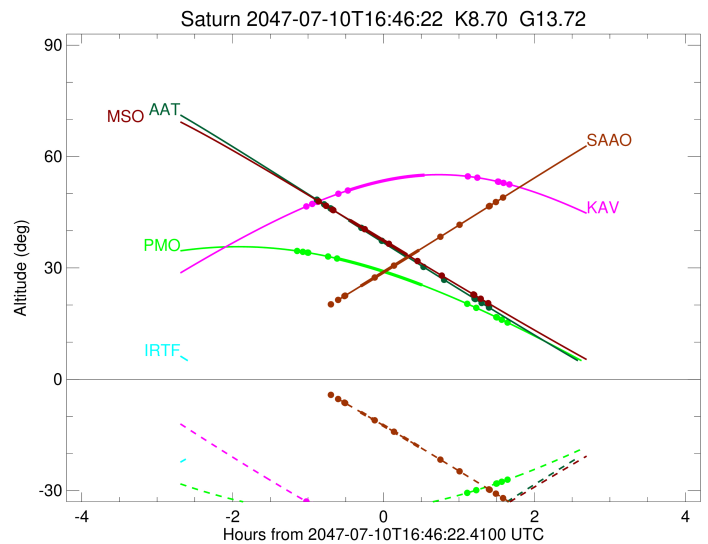
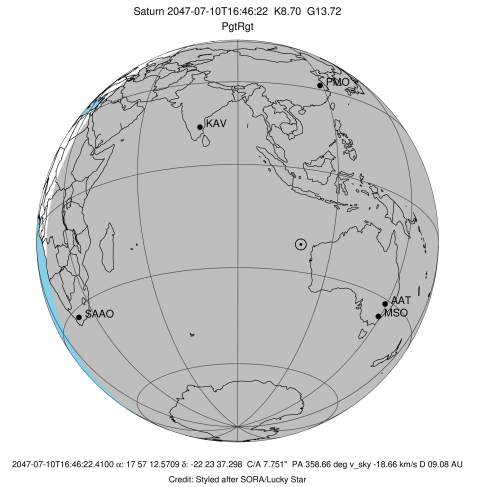


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-10T15:53:25.049		48.37	-65.12	140461.00	-10.98		
A (OER)	I	2047-07-10T15:59:11.098		47.13	-63.92	136774.40	-10.32		
Encke (OEG)	I	2047-07-10T16:04:13.889		46.05	-62.87	133744.89	-9.69		
Encke (IEG)	I	2047-07-10T16:04:47.204		45.93	-62.75	133423.31	-9.62		
A (IER)	I	2047-07-10T16:28:43.778	b	40.79	-57.70	122050.38	-6.07		
B (OER)	I	2047-07-10T16:44:39.833	b	37.38	-54.31	117571.16	-3.25		
Saturn	I	2047-07-10T16:18:44.171		42.94	-59.82	59263.67		-57.20	-61.99
Saturn	E	2047-07-10T17:05:36.489		32.92	-49.83	59465.98		-48.53	-53.95
B (OER)	E	2047-07-10T17:18:50.652		30.11	-47.00	117571.17	3.25		
A (IER)	E	2047-07-10T17:34:48.809		26.74	-43.58	122050.38	6.04		
Encke (IEG)	E	2047-07-10T17:58:54.990		21.69	-38.43	133423.31	9.52		
Encke (OEG)	E	2047-07-10T17:59:28.636		21.57	-38.31	133744.89	9.59		
A (OER)	E	2047-07-10T18:04:34.661		20.51	-37.23	136774.40	10.20		
F ring	E	2047-07-10T18:10:24.888		19.30	-35.98	140461.00	10.84		

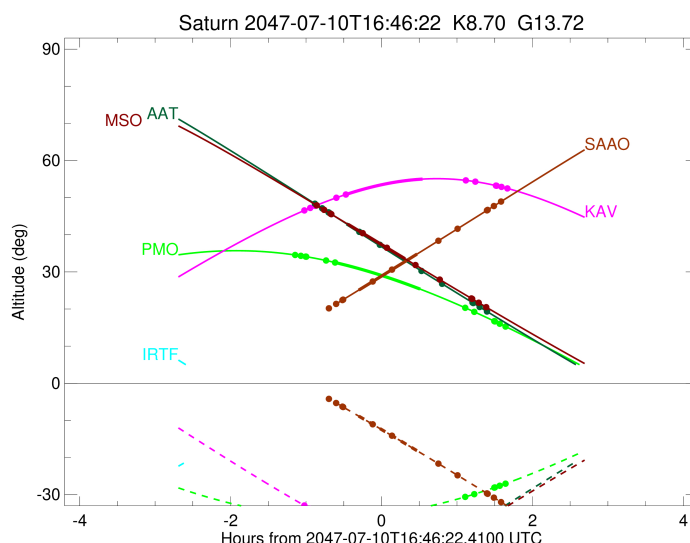
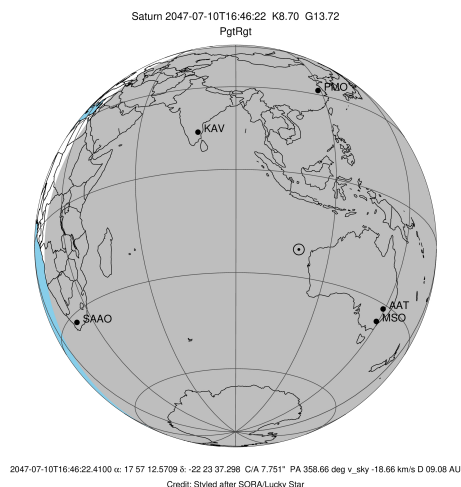
```

target                : Saturn
target radius (km)   : 60268.00
C/A epoch            : 2047-07-10T16:51:13.950
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       : 4070277254475098368
2Mass ID (if available) : 17571257-2223371
ICRS Star Coord at Epoch: 17h 57m 12.57086s -22:23:37.29770s
RUWE (>1.4 is poor) : 1.00
K magnitude          : 8.699
G magnitude          : 13.722
RP magnitude         : 12.462
BP magnitude         : 15.512
DUPflag              : 0
Distance (au)        : 9.076
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -18.66
Sun-Target sep (deg) : 161.60
Sun-Moon sep (deg)   : 60.06
B (ring opening deg) : 26.59
PA of pole (deg)     : 5.46
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 8.089
C/A sky separation (km) : 53245.9
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
    
```



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-10T16:04:31.816		20.19	-4.20x	140461.00	-11.01		
A (OER)	I	2047-07-10T16:10:16.626		21.37	-5.31	136774.40	-10.37		
Encke (OEG)	I	2047-07-10T16:15:17.571		22.40	-6.29	133744.89	-9.76		
Encke (IEG)	I	2047-07-10T16:15:50.634		22.52	-6.40	133423.31	-9.69		
A (IER)	I	2047-07-10T16:39:21.939	b	27.40	-11.05	122050.38	-6.27		
B (OER)	I	2047-07-10T16:54:20.331	b	30.54	-14.05	117571.16	-3.65		
Saturn	I	2047-07-10T16:28:11.832		25.08	-8.83	59249.59		-57.84	-62.57
Saturn	E	2047-07-10T17:14:40.600		34.81	-18.18	59475.38		-48.14	-53.58
B (OER)	E	2047-07-10T17:32:13.463		38.52	-21.78	117571.16	3.67		
A (IER)	E	2047-07-10T17:47:05.705		41.67	-24.85	122050.38	6.32		
Encke (IEG)	E	2047-07-10T18:10:23.758		46.61	-29.70	133423.31	9.79		
Encke (OEG)	E	2047-07-10T18:10:56.475		46.73	-29.81	133744.89	9.86		
A (OER)	E	2047-07-10T18:15:54.198		47.78	-30.85	136774.40	10.48		
F ring	E	2047-07-10T18:21:35.152		48.99	-32.04	140461.00	11.14		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T16:42:09.510  
 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 : 4070277254475098368  
 2Mass ID (if available) : 17571257-2223371  
 ICRS Star Coord at Epoch: 17h 57m 12.57086s -22:23:37.29770s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.699  
 G magnitude : 13.722  
 RP magnitude : 12.462  
 BP magnitude : 15.512  
 DUPflag : 0  
 Distance (au) : 9.076  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.66  
 Sun-Target sep (deg) : 161.60  
 Sun-Moon sep (deg) : 59.45  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.126  
 C/A sky separation (km) : 53489.9  
 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	2047-07-10T15:54:51.366		47.93	-63.60	140461.00	-10.80		
A (OER)	I	2047-07-10T16:00:43.655		46.73	-62.48	136774.40	-10.12		
Encke (OEG)	I	2047-07-10T16:05:52.925		45.67	-61.49	133744.89	-9.47		
Encke (IEG)	I	2047-07-10T16:06:27.023		45.55	-61.38	133423.31	-9.39		
A (IER)	I	2047-07-10T16:31:23.521	b	40.44	-56.48	122050.38	-5.65		
B (OER)	I	2047-07-10T16:50:00.530	b	36.63	-52.74	117571.17	-2.31		
Saturn	I	2047-07-10T16:19:39.724		42.85	-58.80	59252.72		-57.70	-62.44
Saturn	E	2047-07-10T17:05:06.090		33.54	-49.69	59450.74		-49.15	-54.55
B (OER)	E	2047-07-10T17:14:19.654		31.66	-47.81	117571.17	2.31		
A (IER)	E	2047-07-10T17:32:58.385		27.87	-44.01	122050.38	5.63		
Encke (IEG)	E	2047-07-10T17:58:03.699		22.81	-38.88	133423.31	9.31		
Encke (OEG)	E	2047-07-10T17:58:38.107		22.70	-38.76	133744.89	9.38		
A (OER)	E	2047-07-10T18:03:50.425		21.66	-37.70	136774.40	10.01		
F ring	E	2047-07-10T18:09:46.674		20.47	-36.49	140461.00	10.68		