

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-07-18T10:24:35.130  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4127635408818049664  
 2Mass ID (if available) : 17031669-2118528

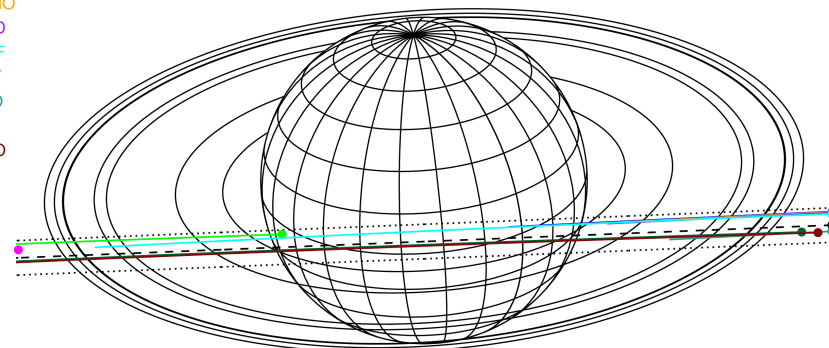
Saturn 2046-07-18T10:24:35 K6.02 G11.03 PgtRgt

ICRS Star Coord at Epoch: 17h 03m 16.69747s -21:18:52.85790s

RUWE (>1.4 is poor) : 0.87  
 K magnitude : 6.020  
 G magnitude : 11.030  
 RP magnitude : 9.759  
 BP magnitude : 12.882  
 DUPflag : 0  
 Distance (au) : 9.221  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -13.73  
 Sun-Target sep (deg) : 141.43  
 Sun-Moon sep (deg) : 43.16  
 B (ring opening deg) : 26.57  
 PA of pole (deg) : 4.19  
 # a(km) ring



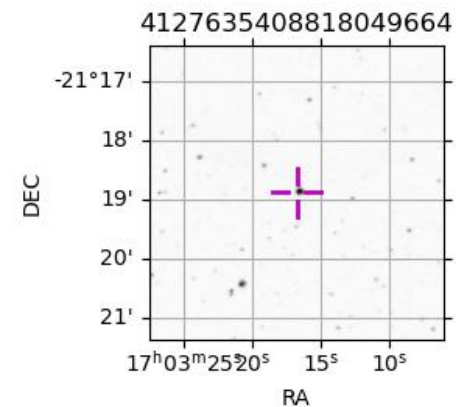
Earth  
 PAL  
 PMO  
 KPNO  
 MCD  
 IRTF  
 KAV  
 ESO  
 AAT  
 MSO



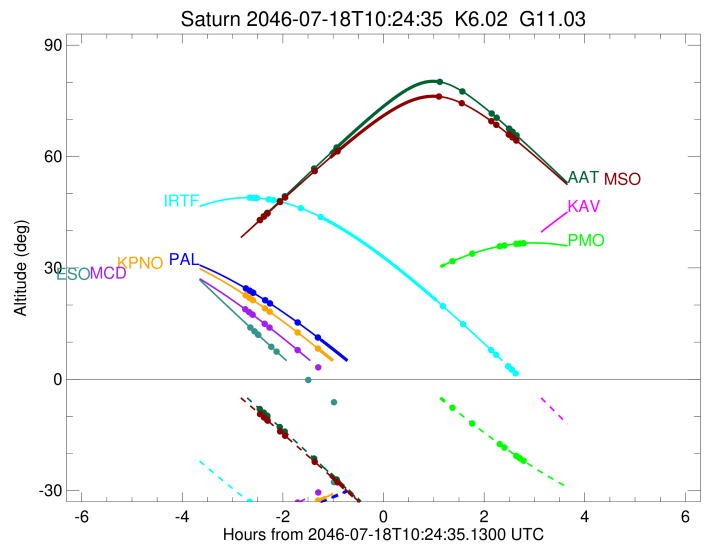
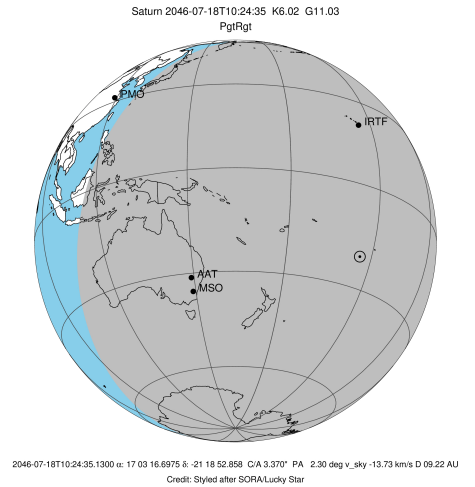
2046-07-18T10:24:35.1300 a: 17 03 16.6975 s: -21 18 52.858 C/A 3.370° PA 2.30 deg v\_sky -13.73 km/s D 09.22 AU  
 Credit: Styled after SORA/Lucky Star

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	+	+		JUL 18 07:40 - JUL 18 09:09	PinRin
PMO	Purple Mtn Obs	32.1	118.8		+	+	JUL 18 11:37 - JUL 18 13:11	PneRne
KPNO	Kitt Peak Natl	32.0	248.4	+	+		JUL 18 07:40 - JUL 18 09:09	PinRin
MCD	McDonald Obs.	30.7	256.0	+			JUL 18 07:39 - JUL 18 08:42	PnnRin
TEN	Teide Obs./Ten	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+	+	+	JUL 18 07:45 - JUL 18 12:38	PieRie
KAV	Kavalur Observ	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European South	-29.3	289.3	+			JUL 18 07:45 - JUL 18 08:17	PnnRin
AAT	Siding Spring	-31.3	149.1	+	+	+	JUL 18 07:57 - JUL 18 13:03	PieRie
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JUL 18 07:57 - JUL 18 13:03	PieRie

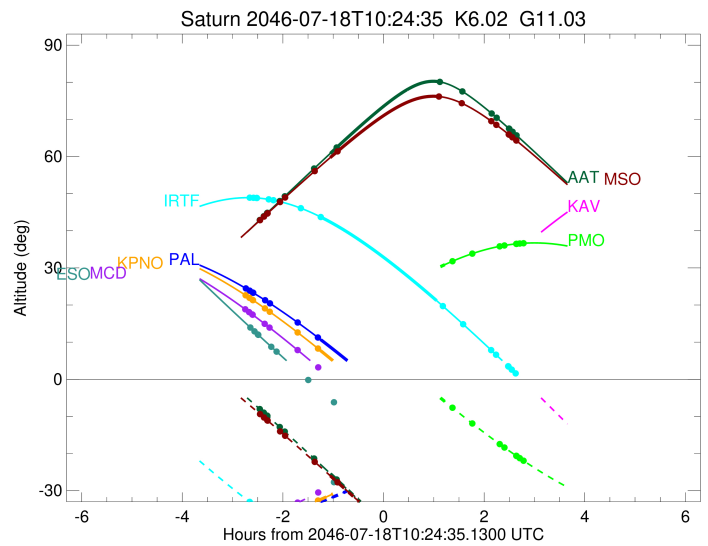
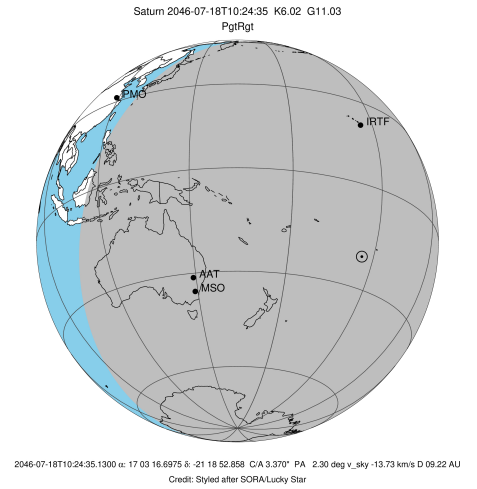


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-07-18T10:18:12.060  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4127635408818049664  
 2Mass ID (if available) : 17031669-2118528  
 ICRS Star Coord at Epoch: 17h 03m 16.69747s -21:18:52.85790s  
 RUWE (>1.4 is poor) : 0.87  
 K magnitude : 6.020  
 G magnitude : 11.030  
 RP magnitude : 9.759  
 BP magnitude : 12.882  
 DUPflag : 0  
 Distance (au) : 9.221  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -13.73  
 Sun-Target sep (deg) : 141.43  
 Sun-Moon sep (deg) : 42.63  
 B (ring opening deg) : 26.57  
 PA of pole (deg) : 4.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.794  
 C/A sky separation (km) : 18684.4  
 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



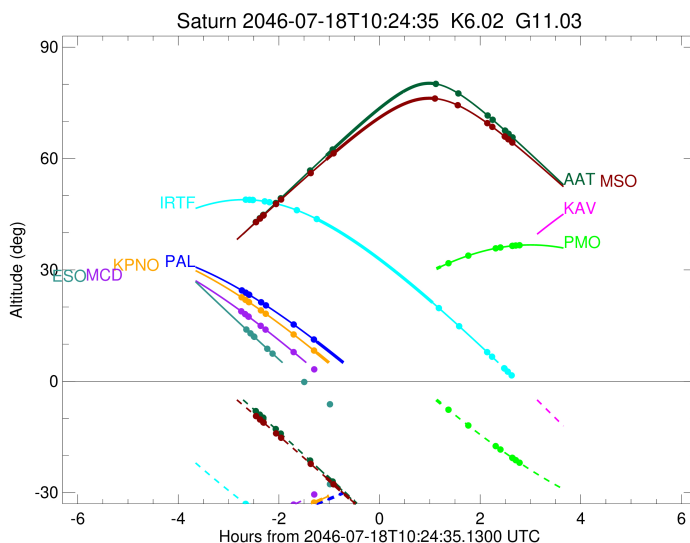
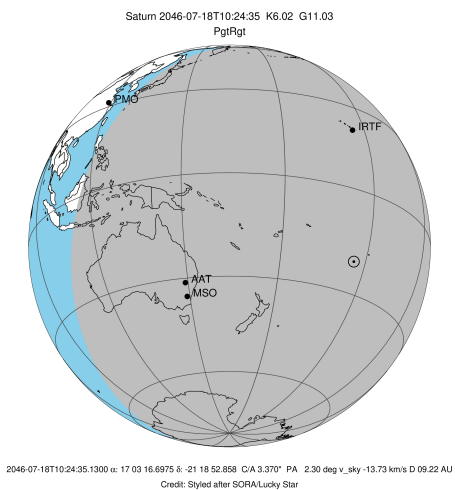
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-07-18T07:40:30.978		24.47	-35.77	140461.00	-13.48		
A (OER)	I	2046-07-18T07:45:04.908		23.86	-35.82	136774.40	-13.44		
Encke (OEG)	I	2046-07-18T07:48:50.674		23.34	-35.85	133744.89	-13.40		
Encke (IEG)	I	2046-07-18T07:49:14.675		23.29	-35.85	133423.31	-13.40		
A (IER)	I	2046-07-18T08:03:28.617		21.28	-35.81	122050.38	-13.23		
B (OER)	I	2046-07-18T08:09:08.053		20.45	-35.74	117571.17	-13.16		
B (IER)	I	2046-07-18T08:42:17.446		15.28	-34.64	91984.69	-12.49		
C (IER)	I	2046-07-18T09:06:26.251		11.24	-33.15	74490.58	-11.57		
Saturn	I	2046-07-18T09:09:35.406		10.69	-32.92	60139.47		-17.32	-20.93
Saturn	E	2046-07-18T11:27:29.774		-15.49x	-15.67	60170.87		-14.99	-18.19
C (IER)	E	2046-07-18T11:34:55.587		-16.99x	-14.44	74490.58	11.33		
B (IER)	E	2046-07-18T11:59:39.839		-22.04x	-10.23	91984.69	12.15		
B (OER)	E	2046-07-18T12:33:53.727		-29.12x	-4.09x	117571.16	12.69		
A (IER)	E	2046-07-18T12:39:45.928		-30.34x	-3.01x	122050.38	12.74		
Encke (IEG)	E	2046-07-18T12:54:34.172		-33.43x	-0.23x	133423.31	12.86		
Encke (OEG)	E	2046-07-18T12:54:59.182		-33.52x	-0.16x	133744.89	12.86		
A (OER)	E	2046-07-18T12:58:54.553		-34.34x	0.59x	136774.40	12.88		
F ring	E	2046-07-18T13:03:40.421		-35.33x	1.49x	140461.00	12.91		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-07-18T10:29:30.230  
 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 : 4127635408818049664  
 2Mass ID (if available) : 17031669-2118528  
 ICRS Star Coord at Epoch: 17h 03m 16.69747s -21:18:52.85790s  
 RUWE (>1.4 is poor) : 0.87  
 K magnitude : 6.020  
 G magnitude : 11.030  
 RP magnitude : 9.759  
 BP magnitude : 12.882  
 DUPflag : 0  
 Distance (au) : 9.222  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -13.73  
 Sun-Target sep (deg) : 141.43  
 Sun-Moon sep (deg) : 43.86  
 B (ring opening deg) : 26.57  
 PA of pole (deg) : 4.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.708  
 C/A sky separation (km) : 18111.0  
 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



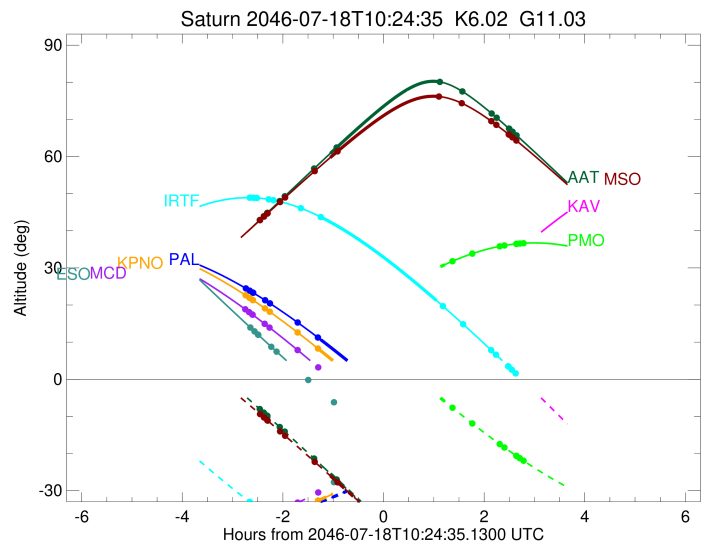
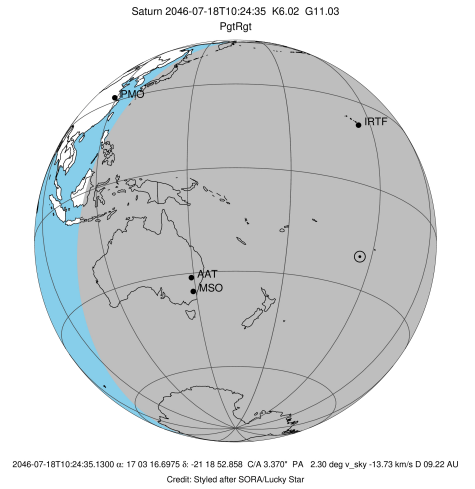
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-07-18T07:52:38.011	-5.69x	39.72x	140461.00	-13.28			
A (OER)	I	2046-07-18T07:57:15.938	-4.78x	38.73x	136774.40	-13.25			
Encke (OEG)	I	2046-07-18T08:01:04.752	-4.03x	37.92x	133744.89	-13.23			
Encke (IEG)	I	2046-07-18T08:01:29.064	-3.95x	37.84x	133423.31	-13.23			
A (IER)	I	2046-07-18T08:15:52.372	-1.14x	34.79x	122050.38	-13.12			
B (OER)	I	2046-07-18T08:21:34.585	-0.04x	33.58x	117571.16	-13.06			
B (IER)	I	2046-07-18T08:54:48.148	6.22	26.59x	91984.69	-12.54			
C (IER)	I	2046-07-18T09:18:43.822	10.55	21.59x	74490.58	-11.75			
Saturn	I	2046-07-18T09:21:07.441	10.97	21.10x	60133.68			-17.72	-21.39
Saturn	E	2046-07-18T11:37:37.040	30.87	-5.97	60187.49			-13.62	-16.56
C (IER)	E	2046-07-18T11:46:52.491	31.80	-7.67	74490.58	11.87			
B (IER)	E	2046-07-18T12:10:31.109	33.84	-11.91	91984.69	12.71			
B (OER)	E	2046-07-18T12:43:14.201	35.81	-17.48	117571.16	13.29			
A (IER)	E	2046-07-18T12:48:50.414	36.04	-18.39	122050.38	13.35			
Encke (IEG)	E	2046-07-18T13:02:57.634	36.48	-20.62	133423.31	13.49			
Encke (OEG)	E	2046-07-18T13:03:21.474	36.49	-20.68	133744.89	13.49			
A (OER)	E	2046-07-18T13:07:05.791	36.56	-21.26	136774.40	13.52			
F ring	E	2046-07-18T13:11:38.134	36.64	-21.95	140461.00	13.55			

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-07-18T10:17:58.460  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 4127635408818049664  
 2Mass ID (if available) : 17031669-2118528  
 ICRS Star Coord at Epoch: 17h 03m 16.69747s -21:18:52.85790s  
 RUWE (>1.4 is poor) : 0.87  
 K magnitude : 6.020  
 G magnitude : 11.030  
 RP magnitude : 9.759  
 BP magnitude : 12.882  
 DUPflag : 0  
 Distance (au) : 9.221  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -13.73  
 Sun-Target sep (deg) : 141.43  
 Sun-Moon sep (deg) : 42.57  
 B (ring opening deg) : 26.57  
 PA of pole (deg) : 4.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.836  
 C/A sky separation (km) : 18969.6  
 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	2046-07-18T07:40:10.992		22.62	-37.22	140461.00	-13.44		
A (OER)	I	2046-07-18T07:44:45.753		21.94	-37.17	136774.40	-13.40		
Encke (OEG)	I	2046-07-18T07:48:32.234		21.37	-37.11	133744.89	-13.36		
Encke (IEG)	I	2046-07-18T07:48:56.313		21.31	-37.10	133423.31	-13.35		
A (IER)	I	2046-07-18T08:03:13.233		19.09	-36.74	122050.38	-13.18		
B (OER)	I	2046-07-18T08:08:53.984		18.18	-36.54	117571.16	-13.10		
B (IER)	I	2046-07-18T08:42:13.177		12.59	-34.68	91984.69	-12.41		
C (IER)	I	2046-07-18T09:06:32.959		8.27	-32.66	74490.58	-11.46		
Saturn	I	2046-07-18T09:09:19.374		7.76	-32.40	60136.21		-17.55	-21.19
Saturn	E	2046-07-18T11:27:19.913		-19.40x	-12.98	60167.44		-15.26	-18.51
C (IER)	E	2046-07-18T11:34:22.516		-20.86x	-11.74	74490.58	11.22		
B (IER)	E	2046-07-18T11:59:19.004		-26.07x	-7.25	91984.69	12.07		
B (OER)	E	2046-07-18T12:33:44.942		-33.33x	-0.78x	117571.16	12.63		
A (IER)	E	2046-07-18T12:39:38.896		-34.58x	0.35x	122050.38	12.68		
Encke (IEG)	E	2046-07-18T12:54:31.286		-37.74x	3.25x	133423.31	12.80		
Encke (OEG)	E	2046-07-18T12:54:56.408		-37.83x	3.33x	133744.89	12.80		
A (OER)	E	2046-07-18T12:58:52.818		-38.67x	4.10x	136774.40	12.83		
F ring	E	2046-07-18T13:03:39.918		-39.69x	5.05x	140461.00	12.85		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-07-18T10:17:48.150  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 4127635408818049664  
 2Mass ID (if available) : 17031669-2118528  
 ICRS Star Coord at Epoch: 17h 03m 16.69747s -21:18:52.85790s  
 RUWE (>1.4 is poor) : 0.87  
 K magnitude : 6.020  
 G magnitude : 11.030  
 RP magnitude : 9.759  
 BP magnitude : 12.882  
 DUPflag : 0  
 Distance (au) : 9.221  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -13.73  
 Sun-Target sep (deg) : 141.43  
 Sun-Moon sep (deg) : 42.49  
 B (ring opening deg) : 26.57  
 PA of pole (deg) : 4.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.892  
 C/A sky separation (km) : 19338.6  
 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

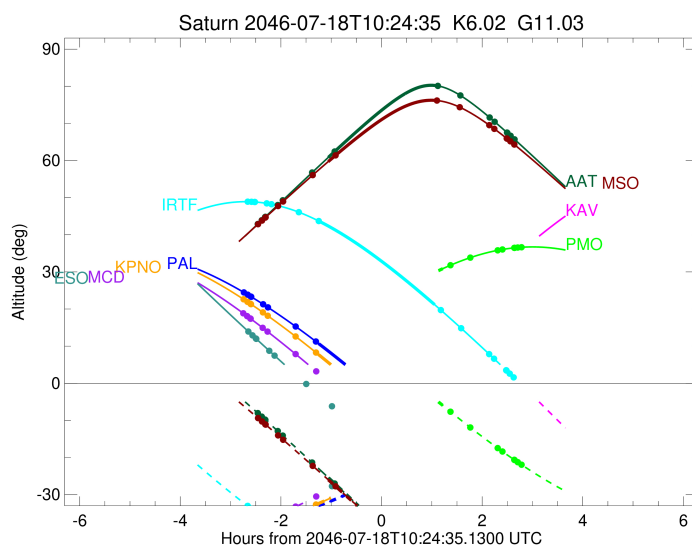
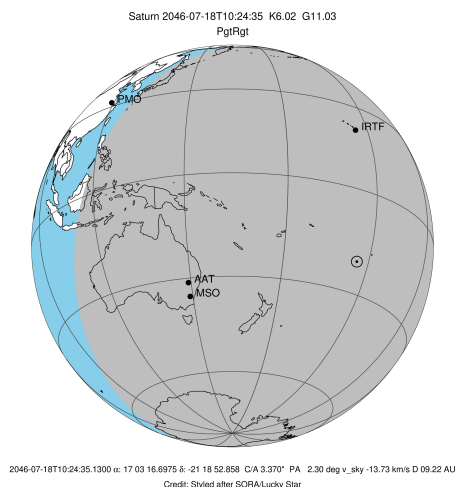


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-07-18T07:39:46.409		18.84	-37.75	140461.00	-13.38		
A (OER)	I	2046-07-18T07:44:22.484		18.08	-37.55	136774.40	-13.33		
Encke (OEG)	I	2046-07-18T07:48:10.086		17.45	-37.37	133744.89	-13.29		
Encke (IEG)	I	2046-07-18T07:48:34.286		17.38	-37.35	133423.31	-13.29		
A (IER)	I	2046-07-18T08:02:55.815		14.92	-36.52	122050.38	-13.11		
B (OER)	I	2046-07-18T08:08:38.572		13.93	-36.13	117571.16	-13.03		
B (IER)	I	2046-07-18T08:42:12.316		7.85	-33.22	91984.69	-12.31		
C (IER)	I	2046-07-18T09:06:47.884		3.20x	-30.49	74490.58	-11.31		
Saturn	I	2046-07-18T09:09:03.389		2.76x	-30.21	60131.85		-17.85	-21.54
Saturn	E	2046-07-18T11:27:16.422		-25.45x	-8.22	60163.04		-15.60	-18.91
C (IER)	E	2046-07-18T11:33:49.054		-26.84x	-7.00	74490.58	11.06		
B (IER)	E	2046-07-18T11:59:02.451		-32.22x	-2.19x	91984.69	11.96		
B (OER)	E	2046-07-18T12:33:44.920		-39.69x	4.65x	117571.16	12.54		
A (IER)	E	2046-07-18T12:39:41.262		-40.97x	5.85x	122050.38	12.60		
Encke (IEG)	E	2046-07-18T12:54:39.270		-44.20x	8.87x	133423.31	12.72		
Encke (OEG)	E	2046-07-18T12:55:04.542		-44.29x	8.96x	133744.89	12.73		
A (OER)	E	2046-07-18T12:59:02.352		-45.15x	9.77x	136774.40	12.75		
F ring	E	2046-07-18T13:03:51.109		-46.18x	10.75x	140461.00	12.78		

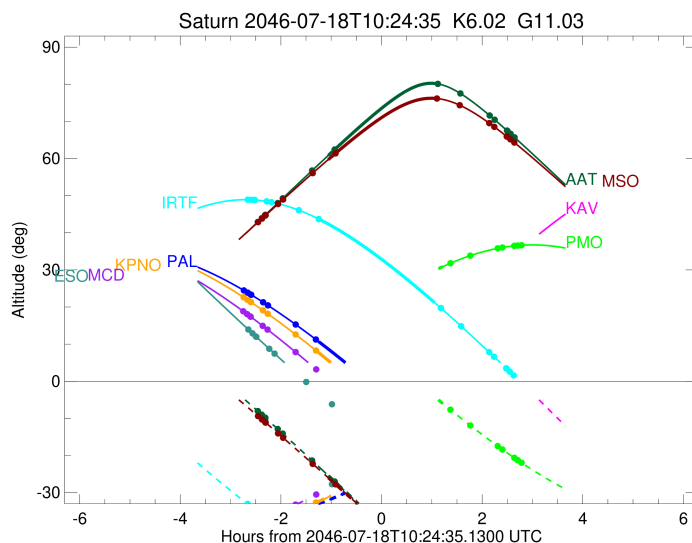
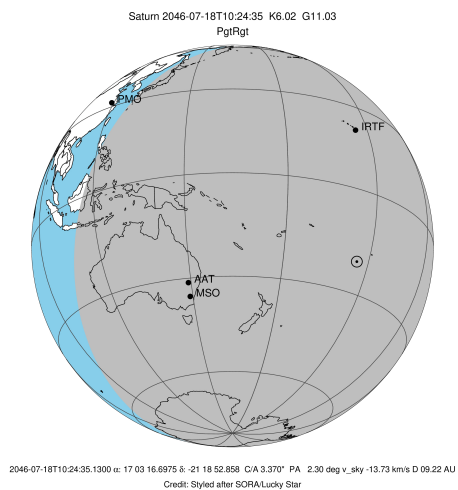
```

target                : Saturn
target radius (km)   : 60268.00
C/A epoch             : 2046-07-18T10:19:58.340
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       : 4127635408818049664
2Mass ID (if available) : 17031669-2118528
ICRS Star Coord at Epoch: 17h 03m 16.69747s -21:18:52.85790s
RUWE (>1.4 is poor) : 0.87
K magnitude           : 6.020
G magnitude           : 11.030
RP magnitude          : 9.759
BP magnitude          : 12.882
DUPflag              : 0
Distance (au)        : 9.221
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -13.73
Sun-Target sep (deg) : 141.43
Sun-Moon sep (deg)   : 43.15
B (ring opening deg) : 26.57
PA of pole (deg)     : 4.19
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 2.797
C/A sky separation (km) : 18704.8
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_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
  
```



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-07-18T07:45:04.172		48.91	-33.04	140461.00	-13.62		
A (OER)	I	2046-07-18T07:49:35.167		48.88	-33.81	136774.40	-13.58		
Encke (OEG)	I	2046-07-18T07:53:18.446		48.84	-34.43	133744.89	-13.55		
Encke (IEG)	I	2046-07-18T07:53:42.179		48.83	-34.50	133423.31	-13.55		
A (IER)	I	2046-07-18T08:07:46.140		48.46	-36.78	122050.38	-13.40		
B (OER)	I	2046-07-18T08:13:21.373		48.24	-37.65	117571.16	-13.32		
B (IER)	I	2046-07-18T08:46:03.610		46.08	-42.29	91984.69	-12.68		
C (IER)	I	2046-07-18T09:09:50.195		43.69	-45.06	74490.58	-11.75		
Saturn	I	2046-07-18T09:12:31.297		43.39	-45.34	60136.07		-17.56	-21.20
Saturn	E	2046-07-18T11:27:55.630		21.18	-46.81	60172.25		-14.88	-18.06
C (IER)	E	2046-07-18T11:35:22.949		19.71	-46.16	74490.58	11.57		
B (IER)	E	2046-07-18T11:59:35.554		14.82	-43.61	91984.69	12.42		
B (OER)	E	2046-07-18T12:33:05.449		7.83	-39.16	117571.16	12.97		
A (IER)	E	2046-07-18T12:38:50.152		6.61	-38.30	122050.38	13.02		
Encke (IEG)	E	2046-07-18T12:53:19.619		3.51x	-36.04	133423.31	13.13		
Encke (OEG)	E	2046-07-18T12:53:44.103		3.42x	-35.97	133744.89	13.14		
A (OER)	E	2046-07-18T12:57:34.540		2.59x	-35.35	136774.40	13.16		
F ring	E	2046-07-18T13:02:14.441		1.58x	-34.58	140461.00	13.18		

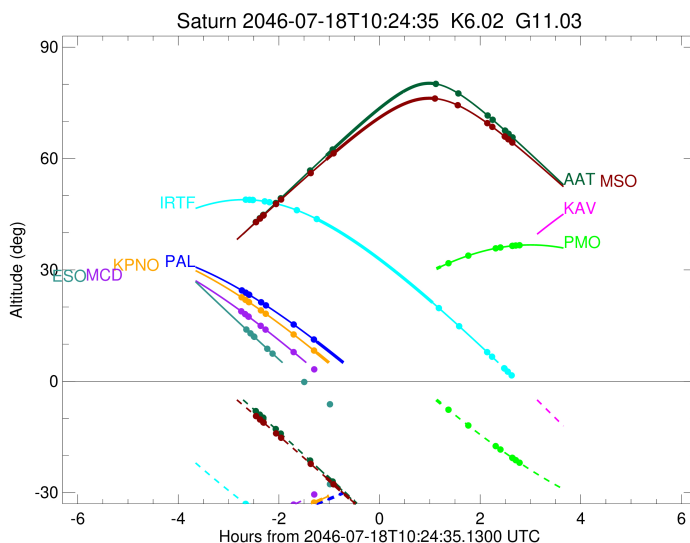
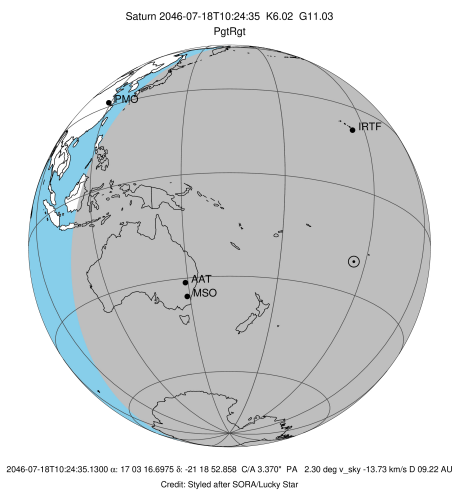
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-07-18T10:18:29.190  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 4127635408818049664  
 2Mass ID (if available) : 17031669-2118528  
 ICRS Star Coord at Epoch: 17h 03m 16.69747s -21:18:52.85790s  
 RUWE (>1.4 is poor) : 0.87  
 K magnitude : 6.020  
 G magnitude : 11.030  
 RP magnitude : 9.759  
 BP magnitude : 12.882  
 DUPflag : 0  
 Distance (au) : 9.221  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -13.73  
 Sun-Target sep (deg) : 141.43  
 Sun-Moon sep (deg) : 42.44  
 B (ring opening deg) : 26.57  
 PA of pole (deg) : 4.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.945  
 C/A sky separation (km) : 26382.8  
 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	2046-07-18T07:45:51.484		13.92	-49.40	140461.00	-12.54		
A (OER)	I	2046-07-18T07:50:46.540		12.89	-48.32	136774.40	-12.45		
Encke (OEG)	I	2046-07-18T07:54:50.535		12.05	-47.43	133744.89	-12.38		
Encke (IEG)	I	2046-07-18T07:55:16.521		11.96	-47.34	133423.31	-12.37		
A (IER)	I	2046-07-18T08:10:47.616		8.74	-43.95	122050.38	-12.05		
B (OER)	I	2046-07-18T08:17:01.859		7.45	-42.59	117571.16	-11.89		
B (IER)	I	2046-07-18T08:54:53.083		-0.20x	-34.35	91984.69	-10.48		
C (IER)	I	2046-07-18T09:25:35.748	b	-6.21x	-27.71	74490.58	-8.28		
Saturn	I	2046-07-18T09:12:14.911		-3.63x	-30.59	60023.79		-24.27	-28.89
Saturn	E	2046-07-18T11:25:20.778		-26.82x	-2.61x	60065.79		-21.95	-26.27
C (IER)	E	2046-07-18T11:17:53.683	b	-25.72x	-4.12x	74490.58	8.17		
B (IER)	E	2046-07-18T11:49:10.555		-30.10x	2.15x	91984.69	10.25		
B (OER)	E	2046-07-18T12:28:04.608		-34.59x	9.65x	117571.16	11.52		
A (IER)	E	2046-07-18T12:34:31.252		-35.22x	10.86x	122050.38	11.65		
Encke (IEG)	E	2046-07-18T12:50:35.596		-36.61x	13.81x	133423.31	11.92		
Encke (OEG)	E	2046-07-18T12:51:02.557		-36.64x	13.89x	133744.89	11.93		
A (OER)	E	2046-07-18T12:55:15.840		-36.96x	14.65x	136774.40	11.99		
F ring	E	2046-07-18T13:00:22.426		-37.33x	15.57x	140461.00	12.06		

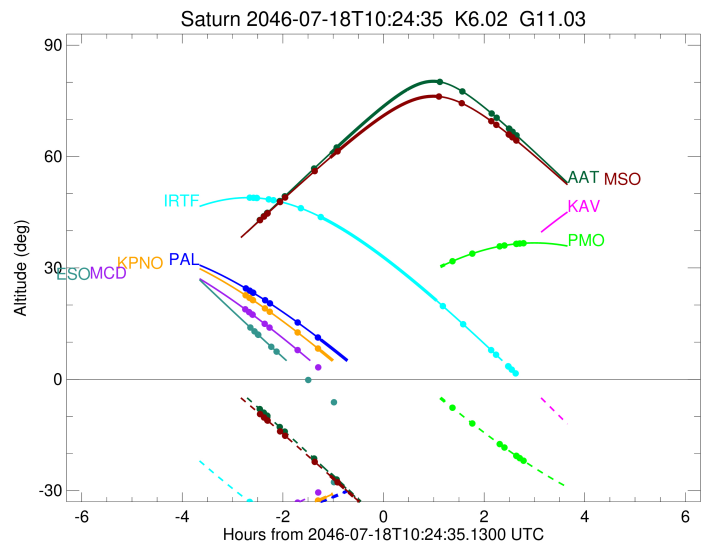
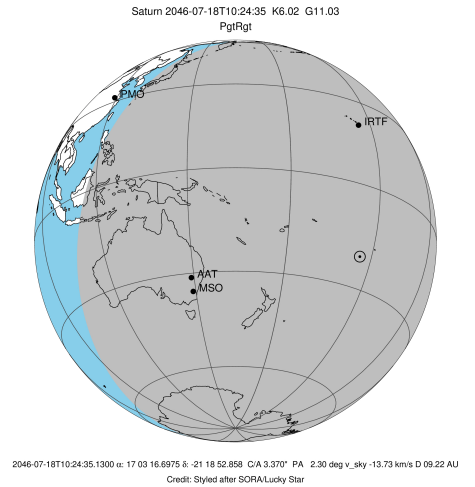
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-07-18T10:26:17.390  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4127635408818049664  
 2Mass ID (if available) : 17031669-2118528  
 ICRS Star Coord at Epoch: 17h 03m 16.69747s -21:18:52.85790s  
 RUWE (>1.4 is poor) : 0.87  
 K magnitude : 6.020  
 G magnitude : 11.030  
 RP magnitude : 9.759  
 BP magnitude : 12.882  
 DUPflag : 0  
 Distance (au) : 9.221  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -13.73  
 Sun-Target sep (deg) : 141.43  
 Sun-Moon sep (deg) : 43.91  
 B (ring opening deg) : 26.57  
 PA of pole (deg) : 4.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.546  
 C/A sky separation (km) : 23718.9  
 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	2046-07-18T07:57:06.092		42.91	-8.05	140461.00	-13.04		
A (OER)	I	2046-07-18T08:01:49.326		43.92	-9.00	136774.40	-12.99		
Encke (OEG)	I	2046-07-18T08:05:43.000		44.76	-9.79	133744.89	-12.94		
Encke (IEG)	I	2046-07-18T08:06:07.856		44.85	-9.87	133423.31	-12.93		
A (IER)	I	2046-07-18T08:20:54.387		48.02	-12.88	122050.38	-12.71		
B (OER)	I	2046-07-18T08:26:48.262		49.28	-14.09	117571.16	-12.60		
B (IER)	I	2046-07-18T09:01:54.255		56.78	-21.37	91984.69	-11.56		
C (IER)	I	2046-07-18T09:28:47.644	b	62.45	-27.02	74490.58	-9.95		
Saturn	I	2046-07-18T09:21:06.889		60.84	-25.40	60054.87		-22.57	-26.97
Saturn	E	2046-07-18T11:31:28.106		80.12	-53.18	60115.61		-18.92	-22.79
C (IER)	E	2046-07-18T11:31:51.144		80.11	-53.26	74490.58	9.97		
B (IER)	E	2046-07-18T11:58:41.075		77.53	-58.94	91984.69	11.59		
B (OER)	E	2046-07-18T12:33:41.866		71.57	-66.17	117571.16	12.64		
A (IER)	E	2046-07-18T12:39:34.757		70.44	-67.34	122050.38	12.75		
Encke (IEG)	E	2046-07-18T12:54:18.686		67.52	-70.23	133423.31	12.97		
Encke (OEG)	E	2046-07-18T12:54:43.467		67.44	-70.31	133744.89	12.98		
A (OER)	E	2046-07-18T12:58:36.421		66.65	-71.05	136774.40	13.03		
F ring	E	2046-07-18T13:03:18.768		65.69	-71.92	140461.00	13.08		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-07-18T10:26:12.150  
 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 : 4127635408818049664  
 2Mass ID (if available) : 17031669-2118528  
 ICRS Star Coord at Epoch: 17h 03m 16.69747s -21:18:52.85790s  
 RUWE (>1.4 is poor) : 0.87  
 K magnitude : 6.020  
 G magnitude : 11.030  
 RP magnitude : 9.759  
 BP magnitude : 12.882  
 DUPflag : 0  
 Distance (au) : 9.221  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -13.73  
 Sun-Target sep (deg) : 141.43  
 Sun-Moon sep (deg) : 43.89  
 B (ring opening deg) : 26.57  
 PA of pole (deg) : 4.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.611  
 C/A sky separation (km) : 24153.1  
 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\_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	2046-07-18T07:57:22.123		42.87	-9.39	140461.00	-12.99		
A (OER)	I	2046-07-18T08:02:06.517		43.84	-10.31	136774.40	-12.93		
Encke (OEG)	I	2046-07-18T08:06:01.194		44.64	-11.07	133744.89	-12.88		
Encke (IEG)	I	2046-07-18T08:06:26.160		44.72	-11.15	133423.31	-12.88		
A (IER)	I	2046-07-18T08:21:16.985		47.75	-14.05	122050.38	-12.64		
B (OER)	I	2046-07-18T08:27:12.817		48.96	-15.22	117571.16	-12.53		
B (IER)	I	2046-07-18T09:02:35.063		56.08	-22.26	91984.69	-11.44		
C (IER)	I	2046-07-18T09:29:52.109	b	61.41	-27.77	74490.58	-9.74		
Saturn	I	2046-07-18T09:21:10.919		59.74	-26.01	60047.92		-22.96	-27.41
Saturn	E	2046-07-18T11:31:14.030		76.15	-52.46	60109.32		-19.32	-23.26
C (IER)	E	2046-07-18T11:30:44.257	b	76.16	-52.36	74490.58	9.77		
B (IER)	E	2046-07-18T11:57:58.008		74.36	-57.75	91984.69	11.47		
B (OER)	E	2046-07-18T12:33:15.443		69.51	-64.43	117571.16	12.56		
A (IER)	E	2046-07-18T12:39:10.370		68.53	-65.49	122050.38	12.68		
Encke (IEG)	E	2046-07-18T12:53:58.810		65.95	-68.05	133423.31	12.91		
Encke (OEG)	E	2046-07-18T12:54:23.707		65.88	-68.12	133744.89	12.92		
A (OER)	E	2046-07-18T12:58:17.727		65.17	-68.76	136774.40	12.97		
F ring	E	2046-07-18T13:03:01.308		64.30	-69.52	140461.00	13.03		