

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-09T04:27:08.180  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4090691646387294848  
 2Mass ID (if available) : 18144604-2217451

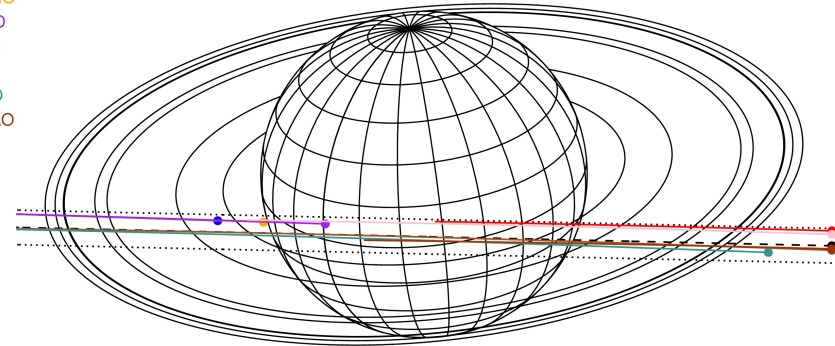
Saturn 2047-05-09T04:27:08 K6.91 G14.88 PgtRgt

ICRS Star Coord at Epoch: 18h 14m 46.05020s -22:17:45.39855s

RUWE (>1.4 is poor) : 1.15  
 K magnitude : 6.910  
 G magnitude : 14.876  
 RP magnitude : 13.197  
 BP magnitude : 19.760  
 DUPflag : 0  
 Distance (au) : 9.313  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -11.25  
 Sun-Target sep (deg) : 134.42  
 Sun-Moon sep (deg) : 54.15  
 B (ring opening deg) : 26.09  
 PA of pole (deg) : 5.79  
 # a(km) ring



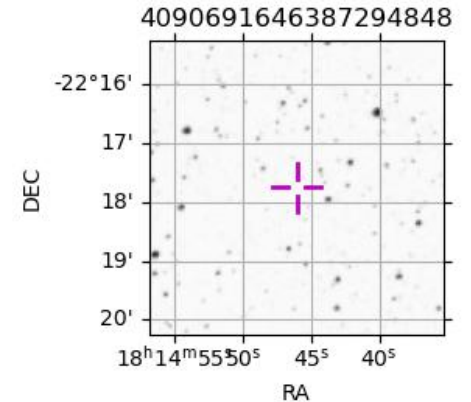
Earth  
 PIC  
 PAL  
 KPNO  
 MCD  
 TEN  
 RIO  
 ESO  
 SAAO



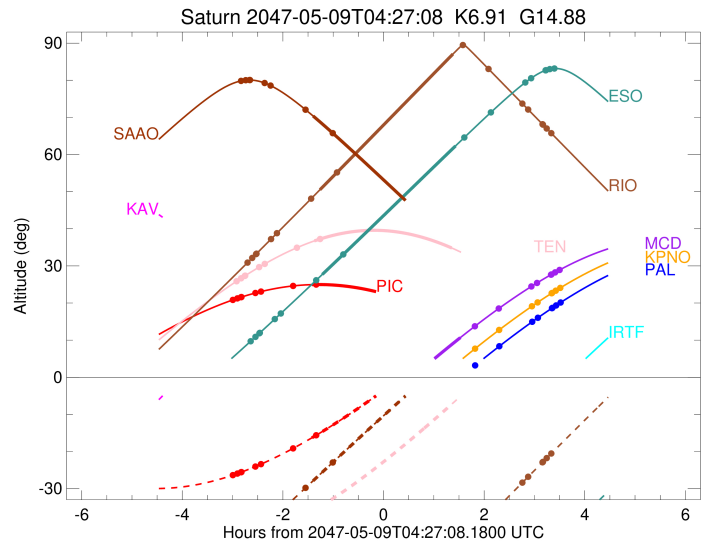
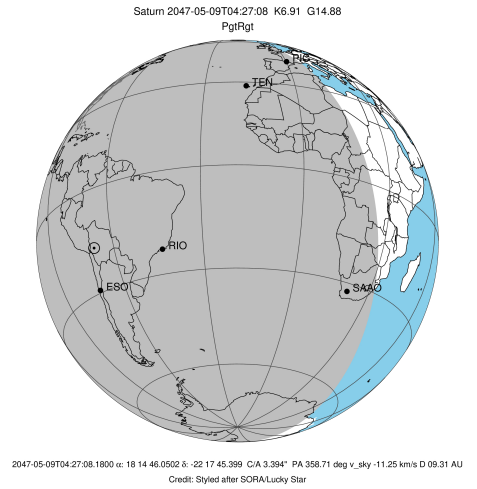
2047-05-09T04:27:08.1800 at: 18 14 46.05020 s: -22 17 45.399 C/A 3.394° PA 358.71 deg v\_sky -11.25 km/s D 09.31 AU  
 Credit: Styled after SORA/Lucky Star

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	OEncode
PIC	Pic du Midi	42.9	0.1	+ + + + + + +	+		MAY 09 01:27 - MAY 09 03:01	PinRin
PAL	Palomar Mt (20	33.4	243.1			+ + + + + + +	MAY 09 06:45 - MAY 09 07:58	PnnRne
PMO	Purple Mtn Obs	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl	32.0	248.4			+ + + + + + +	MAY 09 06:16 - MAY 09 07:57	PnnRne
MCD	McDonald Obs.	30.7	256.0		+	+ + + + + + +	MAY 09 05:58 - MAY 09 07:57	PneRne
TEN	Taide Obs./Ten	28.3	343.5	+ + + + + + +	+ +		MAY 09 01:32 - MAY 09 05:48	PieRin
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observ	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+ + + + + + +	+ +	+ + + + + + +	MAY 09 01:45 - MAY 09 07:47	PieRie
ESO	European South	-29.3	289.3	+ + + + + + +	+ +	+ + + + + + +	MAY 09 01:48 - MAY 09 07:50	PieRie
AAT	Siding Spring	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro	-32.4	20.8	+ + + + + + +	+		MAY 09 01:37 - MAY 09 03:03	PinRin
MSO	Mt. Stromlo Ob	-35.3	149.0					PnnRnn



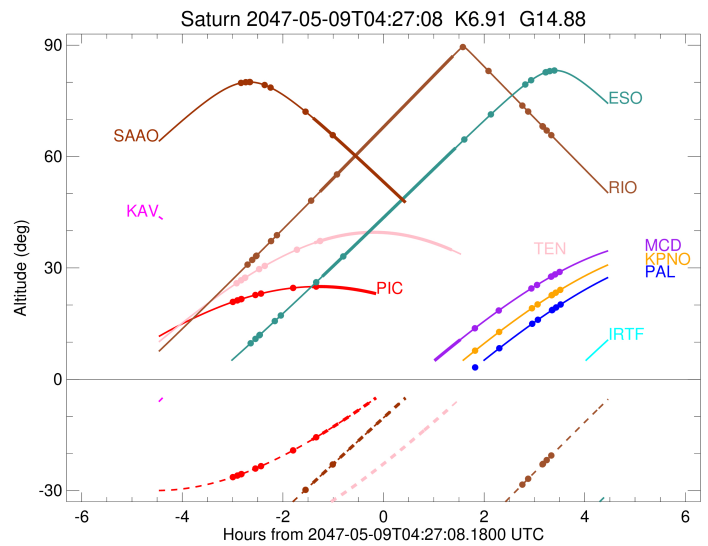
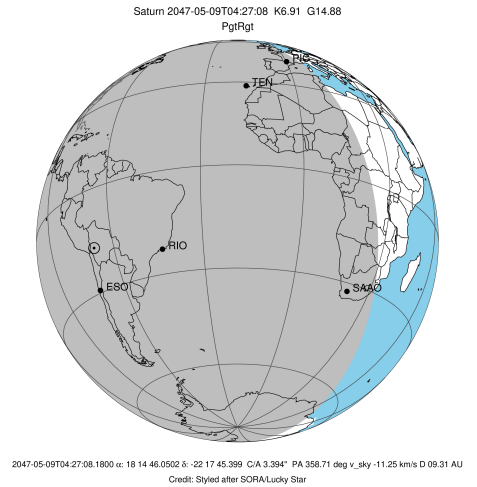
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-09T04:24:33.340  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 4090691646387294848  
 2Mass ID (if available) : 18144604-2217451  
 ICRS Star Coord at Epoch: 18h 14m 46.05020s -22:17:45.39855s  
 RUWE (>1.4 is poor) : 1.15  
 K magnitude : 6.910  
 G magnitude : 14.876  
 RP magnitude : 13.197  
 BP magnitude : 19.760  
 DUPflag : 0  
 Distance (au) : 9.314  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -11.25  
 Sun-Target sep (deg) : 134.42  
 Sun-Moon sep (deg) : 54.69  
 B (ring opening deg) : 26.09  
 PA of pole (deg) : 5.79  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.559  
 C/A sky separation (km) : 17288.0  
 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	2047-05-09T01:27:33.528		20.84	-26.36	140461.00	-11.47		
A (OER)	I	2047-05-09T01:32:55.121		21.25	-25.94	136774.40	-11.45		
Encke (OEG)	I	2047-05-09T01:37:19.878		21.58	-25.58	133744.89	-11.43		
Encke (IEG)	I	2047-05-09T01:37:48.009		21.61	-25.54	133423.31	-11.43		
A (IER)	I	2047-05-09T01:54:26.811		22.70	-24.05	122050.38	-11.34		
B (OER)	I	2047-05-09T02:01:02.652		23.08	-23.40	117571.16	-11.29		
B (IER)	I	2047-05-09T02:39:26.155		24.61	-19.15	91984.69	-10.87		
C (IER)	I	2047-05-09T03:06:57.923	b	24.98	-15.61	74490.58	-10.25		
Saturn	I	2047-05-09T03:01:42.971		24.95	-16.31	60088.08		-21.10	-25.30
Saturn	E	2047-05-09T05:47:45.851		15.41	10.23x	60234.22		-8.96	-10.96
C (IER)	E	2047-05-09T06:05:38.351		13.31	13.44x	74490.58	10.17		
B (IER)	E	2047-05-09T06:33:25.878		9.74	18.48x	91984.69	10.75		
B (OER)	E	2047-05-09T07:12:18.740		4.21x	25.60x	117571.16	11.13		
A (IER)	E	2047-05-09T07:19:00.371		3.20x	26.83x	122050.38	11.17		
Encke (IEG)	E	2047-05-09T07:35:54.642		0.60x	29.94x	133423.31	11.25		
Encke (OEG)	E	2047-05-09T07:36:23.225		0.52x	30.02x	133744.89	11.25		
A (OER)	E	2047-05-09T07:40:52.287		-0.18x	30.84x	136774.40	11.27		
F ring	E	2047-05-09T07:46:19.213		-1.05x	31.84x	140461.00	11.29		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-09T04:35:15.740  
 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 : 4090691646387294848  
 2Mass ID (if available) : 18144604-2217451  
 ICRS Star Coord at Epoch: 18h 14m 46.05020s -22:17:45.39855s  
 RUWE (>1.4 is poor) : 1.15  
 K magnitude : 6.910  
 G magnitude : 14.876  
 RP magnitude : 13.197  
 BP magnitude : 19.760  
 DUPflag : 0  
 Distance (au) : 9.313  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -11.25  
 Sun-Target sep (deg) : 134.42  
 Sun-Moon sep (deg) : 53.44  
 B (ring opening deg) : 26.09  
 PA of pole (deg) : 5.79  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.923  
 C/A sky separation (km) : 19747.1  
 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\_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

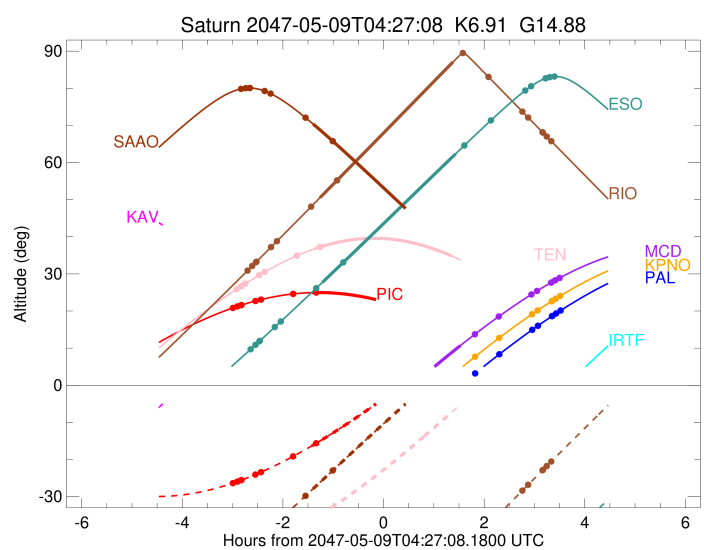
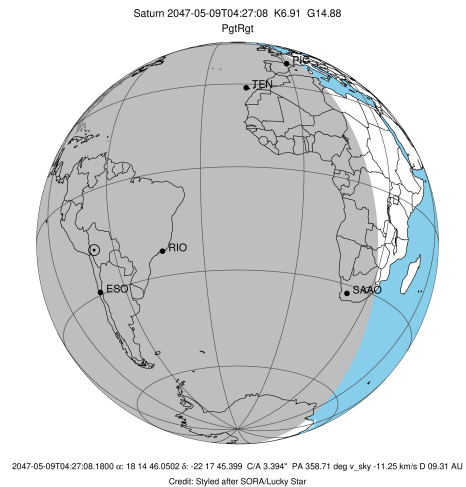


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-05-09T01:36:28.815		-53.47x	10.86x	140461.00	-10.73		
A (OER)	I	2047-05-09T01:42:12.749		-52.27x	9.70x	136774.40	-10.71		
Encke (OEG)	I	2047-05-09T01:46:55.921		-51.29x	8.74x	133744.89	-10.69		
Encke (IEG)	I	2047-05-09T01:47:26.010		-51.18x	8.64x	133423.31	-10.69		
A (IER)	I	2047-05-09T02:05:14.634		-47.45x	5.07x	122050.38	-10.59		
B (OER)	I	2047-05-09T02:12:18.392		-45.97x	3.66x	117571.16	-10.55		
B (IER)	I	2047-05-09T02:53:31.705		-37.33x	-4.38x	91984.69	-10.08		
C (IER)	I	2047-05-09T03:23:26.427	b	-31.09x	-9.99	74490.58	-9.33		
Saturn	I	2047-05-09T03:10:23.949		-33.80x	-7.57	60037.63		-24.06	-28.65
Saturn	E	2047-05-09T05:59:10.873		0.00x	-33.63	60224.43		-10.19	-12.44
C (IER)	E	2047-05-09T06:16:25.312		3.19x	-35.33	74490.58	9.64		
B (IER)	E	2047-05-09T06:45:15.308		8.35	-37.56	91984.69	10.50		
B (OER)	E	2047-05-09T07:24:34.111		14.96	-39.25	117571.16	11.13		
A (IER)	E	2047-05-09T07:31:15.408		16.02	-39.37	122050.38	11.20		
Encke (IEG)	E	2047-05-09T07:48:03.907		18.61	-39.44	133423.31	11.35		
Encke (OEG)	E	2047-05-09T07:48:32.233		18.68	-39.44	133744.89	11.35		
A (OER)	E	2047-05-09T07:52:58.628		19.34	-39.40	136774.40	11.39		
F ring	E	2047-05-09T07:58:21.744		20.13	-39.33	140461.00	11.43		

```

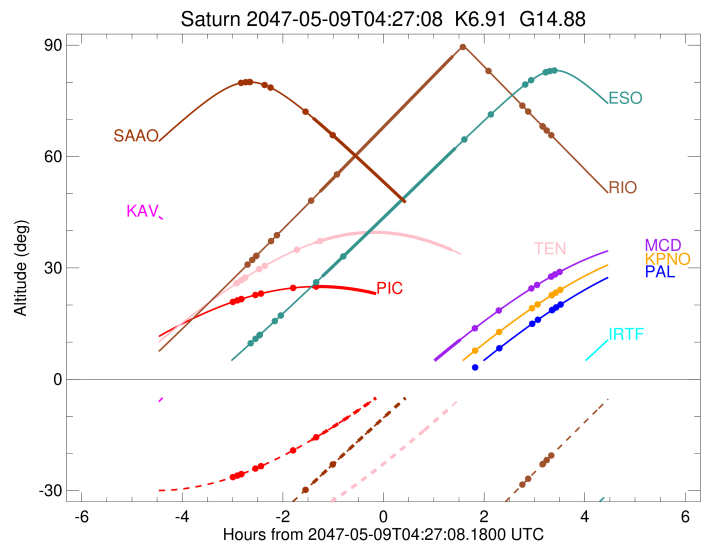
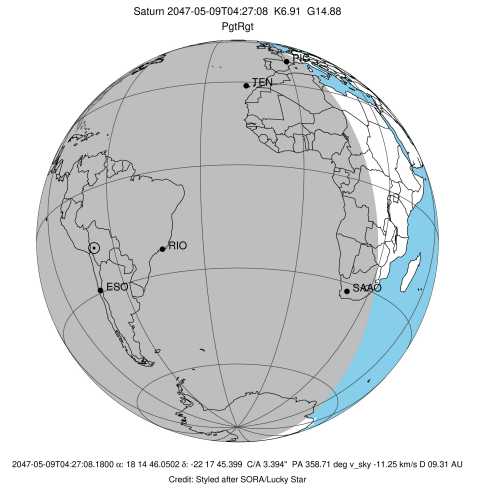
target                : Saturn
target radius (km)   : 60268.00
C/A epoch             : 2047-05-09T04:35:25.360
Event type            : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code         : KPNO
Location              : Kitt Peak Natl Obs
Latitude (deg)        : 31.96333
E. Longitude (deg)    : 248.40000
Altitude (km)         : 2.120
Gaia source ID        : 4090691646387294848
2Mass ID (if available) : 18144604-2217451
ICRS Star Coord at Epoch: 18h 14m 46.05020s -22:17:45.39855s
RUWE (>1.4 is poor) : 1.15
K magnitude           : 6.910
G magnitude           : 14.876
RP magnitude          : 13.197
BP magnitude          : 19.760
DUPflag              : 0
Distance (au)         : 9.313
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -11.25
Sun-Target sep (deg) : 134.42
Sun-Moon sep (deg)   : 53.49
B (ring opening deg) : 26.09
PA of pole (deg)     : 5.79
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation ("): 2.913
C/A sky separation (km): 19677.6
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	2047-05-09T01:37:07.586		-49.01x	6.08x	140461.00	-10.76		
A (OER)	I	2047-05-09T01:42:50.420		-47.80x	4.92x	136774.40	-10.74		
Encke (OEG)	I	2047-05-09T01:47:32.666		-46.79x	3.97x	133744.89	-10.72		
Encke (IEG)	I	2047-05-09T01:48:02.656		-46.69x	3.87x	133423.31	-10.72		
A (IER)	I	2047-05-09T02:05:47.605		-42.90x	0.31x	122050.38	-10.63		
B (OER)	I	2047-05-09T02:12:49.829		-41.41x	-1.09x	117571.16	-10.58		
B (IER)	I	2047-05-09T02:53:53.217		-32.70x	-9.05	91984.69	-10.12		
C (IER)	I	2047-05-09T03:23:39.296	b	-26.44x	-14.57	74490.58	-9.38		
Saturn	I	2047-05-09T03:10:47.277		-29.13x	-12.21	60038.41		-24.01	-28.60
Saturn	E	2047-05-09T05:59:06.118		4.55x	-36.92	60224.92		-10.13	-12.37
C (IER)	E	2047-05-09T06:16:20.532		7.70	-38.34	74490.58	9.69		
B (IER)	E	2047-05-09T06:45:02.848		12.75	-40.03	91984.69	10.54		
B (OER)	E	2047-05-09T07:24:13.303		19.14	-40.84	117571.16	11.16		
A (IER)	E	2047-05-09T07:30:53.357		20.16	-40.81	122050.38	11.23		
Encke (IEG)	E	2047-05-09T07:47:38.928		22.63	-40.48	133423.31	11.38		
Encke (OEG)	E	2047-05-09T07:48:07.175		22.70	-40.47	133744.89	11.39		
A (OER)	E	2047-05-09T07:52:32.844		23.33	-40.33	136774.40	11.42		
F ring	E	2047-05-09T07:57:55.105		24.07	-40.12	140461.00	11.46		

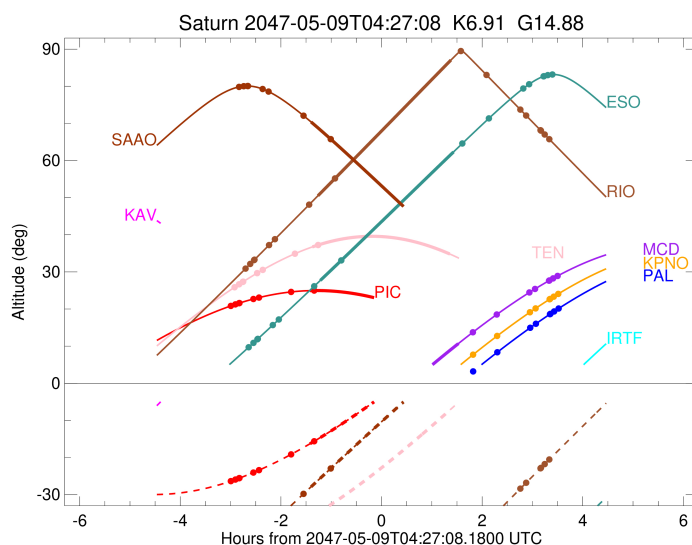
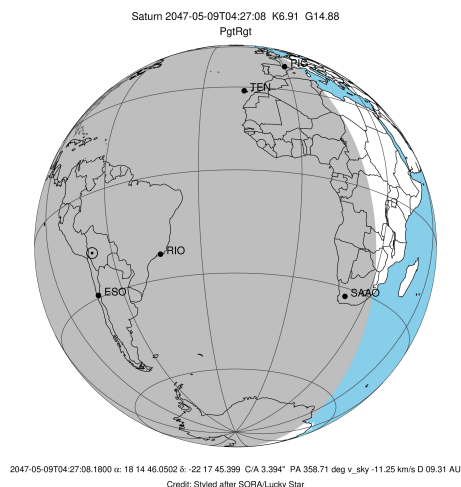
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-09T04:35:27.120  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 4090691646387294848  
 2Mass ID (if available) : 18144604-2217451  
 ICRS Star Coord at Epoch: 18h 14m 46.05020s -22:17:45.39855s  
 RUWE (>1.4 is poor) : 1.15  
 K magnitude : 6.910  
 G magnitude : 14.876  
 RP magnitude : 13.197  
 BP magnitude : 19.760  
 DUPflag : 0  
 Distance (au) : 9.313  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -11.25  
 Sun-Target sep (deg) : 134.42  
 Sun-Moon sep (deg) : 53.58  
 B (ring opening deg) : 26.09  
 PA of pole (deg) : 5.79  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.889  
 C/A sky separation (km) : 19515.2  
 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



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

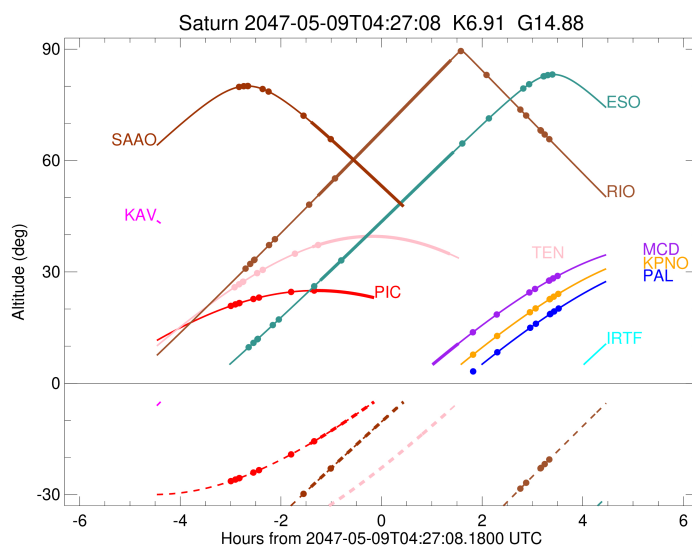
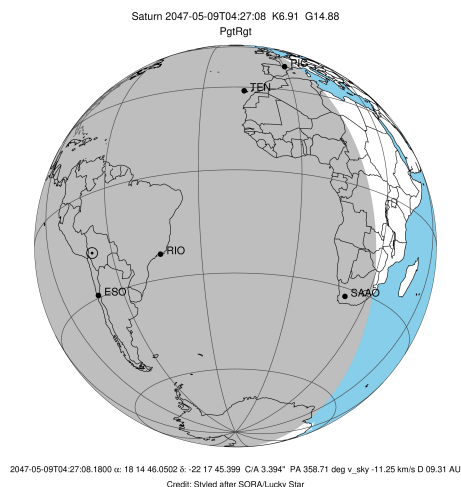
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-05-09T01:37:45.207		-42.38x	-0.60x	140461.00	-10.82		
A (OER)	I	2047-05-09T01:43:26.167		-41.15x	-1.74x	136774.40	-10.80		
Encke (OEG)	I	2047-05-09T01:48:06.840		-40.14x	-2.68x	133744.89	-10.78		
Encke (IEG)	I	2047-05-09T01:48:36.661		-40.04x	-2.78x	133423.31	-10.78		
A (IER)	I	2047-05-09T02:06:15.420		-36.24x	-6.27	122050.38	-10.70		
B (OER)	I	2047-05-09T02:13:15.078		-34.74x	-7.64	117571.16	-10.65		
B (IER)	I	2047-05-09T02:54:01.907		-26.06x	-15.37	91984.69	-10.20		
C (IER)	I	2047-05-09T03:23:33.312	b	-19.85x	-20.65	74490.58	-9.47		
Saturn	I	2047-05-09T03:11:07.808		-22.45x	-18.47	60040.80		-23.88	-28.45
Saturn	E	2047-05-09T05:58:49.591		10.69	-40.44	60225.96		-10.00	-12.22
C (IER)	E	2047-05-09T06:16:06.277		13.74	-41.35	74490.58	9.77		
B (IER)	E	2047-05-09T06:44:36.564		18.52	-42.10	91984.69	10.61		
B (OER)	E	2047-05-09T07:23:34.989		24.47	-41.55	117571.16	11.21		
A (IER)	E	2047-05-09T07:30:13.339		25.41	-41.28	122050.38	11.28		
Encke (IEG)	E	2047-05-09T07:46:54.995		27.63	-40.37	133423.31	11.42		
Encke (OEG)	E	2047-05-09T07:47:23.139		27.69	-40.34	133744.89	11.43		
A (OER)	E	2047-05-09T07:51:47.859		28.25	-40.05	136774.40	11.46		
F ring	E	2047-05-09T07:57:09.012		28.91	-39.66	140461.00	11.50		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-09T04:26:30.290  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 4090691646387294848  
 2Mass ID (if available) : 18144604-2217451  
 ICRS Star Coord at Epoch: 18h 14m 46.05020s -22:17:45.39855s  
 RUWE (>1.4 is poor) : 1.15  
 K magnitude : 6.910  
 G magnitude : 14.876  
 RP magnitude : 13.197  
 BP magnitude : 19.760  
 DUPflag : 0  
 Distance (au) : 9.313  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -11.25  
 Sun-Target sep (deg) : 134.42  
 Sun-Moon sep (deg) : 54.77  
 B (ring opening deg) : 26.09  
 PA of pole (deg) : 5.79  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.668  
 C/A sky separation (km) : 18022.6  
 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



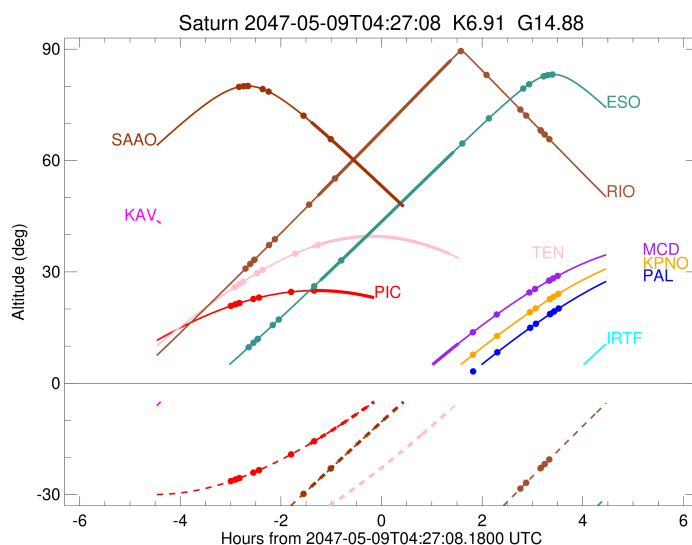
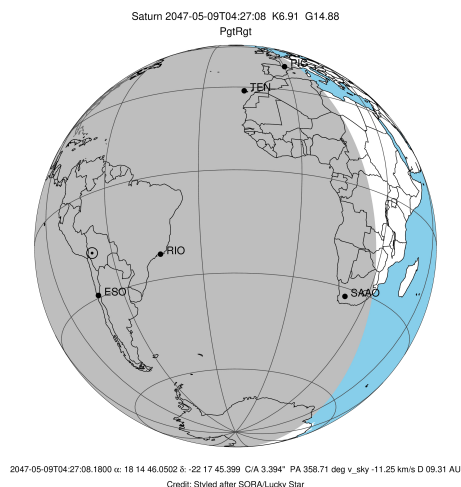
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-05-09T01:32:01.070		25.88	-44.01	140461.00	-11.47		
A (OER)	I	2047-05-09T01:37:22.844		26.67	-43.79	136774.40	-11.45		
Encke (OEG)	I	2047-05-09T01:41:47.740		27.31	-43.58	133744.89	-11.43		
Encke (IEG)	I	2047-05-09T01:42:15.885		27.38	-43.56	133423.31	-11.42		
A (IER)	I	2047-05-09T01:58:55.203		29.68	-42.55	122050.38	-11.33		
B (OER)	I	2047-05-09T02:05:31.287		30.54	-42.06	117571.16	-11.28		
B (IER)	I	2047-05-09T02:43:58.225		34.91	-38.34	91984.69	-10.84		
C (IER)	I	2047-05-09T03:11:38.496	b	37.25	-34.83	74490.58	-10.16		
Saturn	I	2047-05-09T03:04:31.290		36.72	-35.79	60074.72		-21.91	-26.23
Saturn	E	2047-05-09T05:48:38.283		34.82	-7.22	60230.06		-9.50	-11.61
C (IER)	E	2047-05-09T06:05:53.010		32.99	-3.72x	74490.58	10.13		
B (IER)	E	2047-05-09T06:33:39.837		29.56	2.03x	91984.69	10.78		
B (OER)	E	2047-05-09T07:12:19.732		23.94	10.21x	117571.16	11.21		
A (IER)	E	2047-05-09T07:18:58.383		22.89	11.63x	122050.38	11.26		
Encke (IEG)	E	2047-05-09T07:35:44.544		20.15	15.24x	133423.31	11.34		
Encke (OEG)	E	2047-05-09T07:36:12.888		20.07	15.34x	133744.89	11.35		
A (OER)	E	2047-05-09T07:40:39.682		19.32	16.30x	136774.40	11.36		
F ring	E	2047-05-09T07:46:03.802		18.40	17.47x	140461.00	11.38		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-09T04:30:42.170  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 4090691646387294848  
 2Mass ID (if available) : 18144604-2217451  
 ICRS Star Coord at Epoch: 18h 14m 46.05020s -22:17:45.39855s  
 RUWE (>1.4 is poor) : 1.15  
 K magnitude : 6.910  
 G magnitude : 14.876  
 RP magnitude : 13.197  
 BP magnitude : 19.760  
 DUPflag : 0  
 Distance (au) : 9.313  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -11.25  
 Sun-Target sep (deg) : 134.42  
 Sun-Moon sep (deg) : 54.70  
 B (ring opening deg) : 26.09  
 PA of pole (deg) : 5.79  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.419  
 C/A sky separation (km) : 23091.8  
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-05-09T01:45:05.092		30.91	-73.98	140461.00	-11.06		
A (OER)	I	2047-05-09T01:50:39.053		32.16	-75.20	136774.40	-11.02		
Encke (OEG)	I	2047-05-09T01:55:14.350		33.20	-76.19	133744.89	-10.99		
Encke (IEG)	I	2047-05-09T01:55:43.621		33.31	-76.30	133423.31	-10.98		
A (IER)	I	2047-05-09T02:13:05.999		37.24	-79.91	122050.38	-10.83		
B (OER)	I	2047-05-09T02:20:01.131		38.81	-81.23	117571.16	-10.75		
B (IER)	I	2047-05-09T03:00:57.051		48.14	-83.91	91984.69	-9.98		
C (IER)	I	2047-05-09T03:31:50.151	b	55.21	-78.63	74490.58	-8.76		
Saturn	I	2047-05-09T03:11:13.174		50.49	-82.51	59987.49		-26.75	-31.65
Saturn	E	2047-05-09T05:49:58.685		87.07	-47.38	60188.94		-13.79	-16.76
C (IER)	E	2047-05-09T06:01:48.197		89.50	-44.66	74490.58	8.85		
B (IER)	E	2047-05-09T06:32:23.591		83.05	-37.62	91984.69	10.09		
B (OER)	E	2047-05-09T07:12:50.733		73.70	-28.36	117571.16	10.89		
A (IER)	E	2047-05-09T07:19:40.241		72.12	-26.80	122050.38	10.98		
Encke (IEG)	E	2047-05-09T07:36:47.489		68.17	-22.91	133423.31	11.15		
Encke (OEG)	E	2047-05-09T07:37:16.314		68.05	-22.80	133744.89	11.16		
A (OER)	E	2047-05-09T07:41:47.364		67.01	-21.78	136774.40	11.20		
F ring	E	2047-05-09T07:47:16.036		65.75	-20.53	140461.00	11.24		

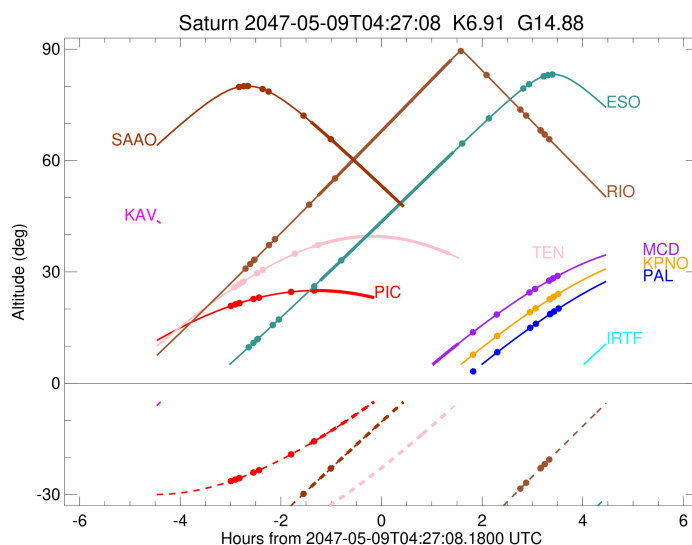
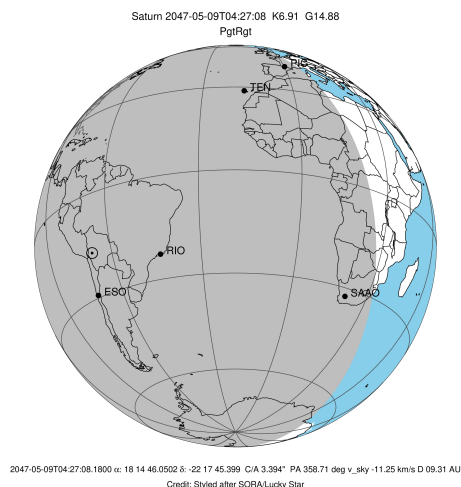
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-09T04:33:50.270  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 4090691646387294848  
 2Mass ID (if available) : 18144604-2217451  
 ICRS Star Coord at Epoch: 18h 14m 46.05020s -22:17:45.39855s  
 RUWE (>1.4 is poor) : 1.15  
 K magnitude : 6.910  
 G magnitude : 14.876  
 RP magnitude : 13.197  
 BP magnitude : 19.760  
 DUPflag : 0  
 Distance (au) : 9.313  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -11.25  
 Sun-Target sep (deg) : 134.42  
 Sun-Moon sep (deg) : 54.30  
 B (ring opening deg) : 26.09  
 PA of pole (deg) : 5.79  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.599  
 C/A sky separation (km) : 24311.5  
 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	2047-05-09T01:48:47.904		9.72	-49.32	140461.00	-10.78		
A (OER)	I	2047-05-09T01:54:30.599		10.90	-50.56	136774.40	-10.74		
Encke (OEG)	I	2047-05-09T01:59:13.179		11.87	-51.58	133744.89	-10.70		
Encke (IEG)	I	2047-05-09T01:59:43.229		11.97	-51.69	133423.31	-10.70		
A (IER)	I	2047-05-09T02:17:34.078		15.69	-55.52	122050.38	-10.53		
B (OER)	I	2047-05-09T02:24:41.031		17.18	-57.04	117571.16	-10.45		
B (IER)	I	2047-05-09T03:06:57.317		26.16	-65.80	91984.69	-9.61		
C (IER)	I	2047-05-09T03:39:19.322	b	33.13	-71.90	74490.58	-8.25		
Saturn	I	2047-05-09T03:14:05.137		27.69	-67.21	59961.47		-28.08	-33.11
Saturn	E	2047-05-09T05:53:03.548		62.32	-69.43	60179.20		-14.63	-17.76
C (IER)	E	2047-05-09T06:03:33.520		64.60	-67.42	74490.58	8.41		
B (IER)	E	2047-05-09T06:35:13.981		71.36	-61.01	91984.69	9.85		
B (OER)	E	2047-05-09T07:16:19.561		79.42	-52.27	117571.16	10.79		
A (IER)	E	2047-05-09T07:23:12.644		80.56	-50.79	122050.38	10.89		
Encke (IEG)	E	2047-05-09T07:40:26.251		82.68	-47.05	133423.31	11.10		
Encke (OEG)	E	2047-05-09T07:40:55.206		82.72	-46.95	133744.89	11.11		
A (OER)	E	2047-05-09T07:45:27.358		83.01	-45.96	136774.40	11.15		
F ring	E	2047-05-09T07:50:57.090		83.17	-44.77	140461.00	11.21		



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-09T04:21:52.220  
 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 : 4090691646387294848  
 2Mass ID (if available) : 18144604-2217451  
 ICRS Star Coord at Epoch: 18h 14m 46.05020s -22:17:45.39855s  
 RUWE (>1.4 is poor) : 1.15  
 K magnitude : 6.910  
 G magnitude : 14.876  
 RP magnitude : 13.197  
 BP magnitude : 19.760  
 DUPflag : 0  
 Distance (au) : 9.314  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -11.25  
 Sun-Target sep (deg) : 134.42  
 Sun-Moon sep (deg) : 55.11  
 B (ring opening deg) : 26.09  
 PA of pole (deg) : 5.79  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.637  
 C/A sky separation (km) : 24568.5  
 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	2047-05-09T01:37:21.509		79.84	-45.99	140461.00	-11.07		
A (OER)	I	2047-05-09T01:42:55.411		80.03	-44.82	136774.40	-11.01		
Encke (OEG)	I	2047-05-09T01:47:31.078		80.07	-43.86	133744.89	-10.97		
Encke (IEG)	I	2047-05-09T01:48:00.411		80.07	-43.76	133423.31	-10.96		
A (IER)	I	2047-05-09T02:05:28.094		79.26	-40.08	122050.38	-10.74		
B (OER)	I	2047-05-09T02:12:27.167		78.57	-38.61	117571.16	-10.63		
B (IER)	I	2047-05-09T02:54:15.396		72.06	-29.77	91984.69	-9.65		
C (IER)	I	2047-05-09T03:26:46.082	b	65.73	-22.92	74490.58	-8.13		
Saturn	I	2047-05-09T03:03:10.042		70.39	-27.89	59974.72		-27.41	-32.37
Saturn	E	2047-05-09T05:41:20.163		37.47	4.46x	60164.92		-15.80	-19.14
C (IER)	E	2047-05-09T05:49:18.816		35.78	6.00x	74490.58	8.03		
B (IER)	E	2047-05-09T06:22:22.302		28.83	12.21x	91984.69	9.45		
B (OER)	E	2047-05-09T07:05:13.997		19.94	19.78x	117571.16	10.33		
A (IER)	E	2047-05-09T07:12:25.667		18.46	20.98x	122050.38	10.42		
Encke (IEG)	E	2047-05-09T07:30:27.114		14.79	23.90x	133423.31	10.60		
Encke (OEG)	E	2047-05-09T07:30:57.438		14.69	23.98x	133744.89	10.61		
A (OER)	E	2047-05-09T07:35:42.528		13.73	24.72x	136774.40	10.65		
F ring	E	2047-05-09T07:41:28.119		12.57	25.61x	140461.00	10.69		