

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-07-22T03:22:11.020
 Event type : PtRgt
 : Saturn occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 4070253546298504960
 2Mass ID (if available) : 17540351-2224455

Saturn 2047-07-22T03:22:11 K9.17 G14.58 PtRgt

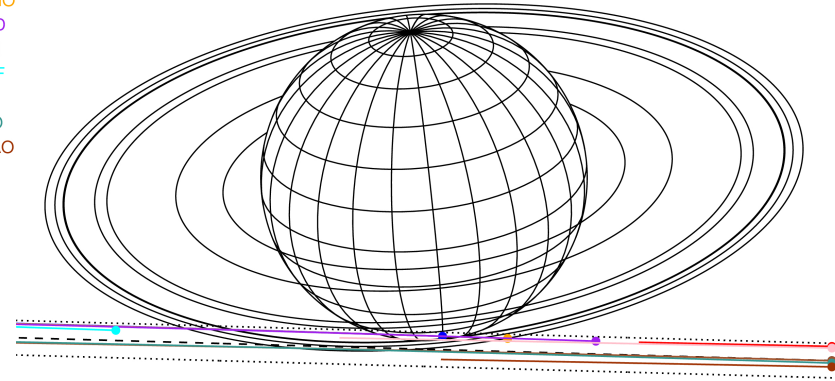
ICRS Star Coord at Epoch: 17h 54m 03.50606s -22:24:45.52419s

RUWE (>1.4 is poor) : 1.04
 K magnitude : 9.171
 G magnitude : 14.576
 RP magnitude : 13.235
 BP magnitude : 16.675
 DUPflag : 0
 Distance (au) : 9.154
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.22
 Sun-Target sep (deg) : 149.97
 Sun-Moon sep (deg) : 159.78
 B (ring opening deg) : 26.68
 PA of pole (deg) : 5.40
 # a(km) ring



2047-07-22T03:22:11.0200 at: 17 54 03.5061 S: -22 24 45.524 C/A 9.5477 PA 358.39 deg v_sky -16.22 km/s D 09.15 AU
 Credit: Styled after SORA/Lucky Star

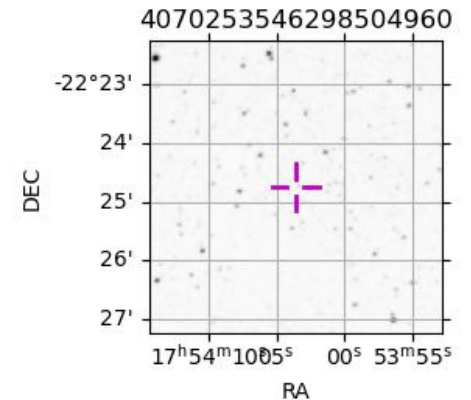
Earth
 PIC
 PAL
 KPNO
 MCD
 TEN
 IRTF
 RIO
 ESO
 SAAO



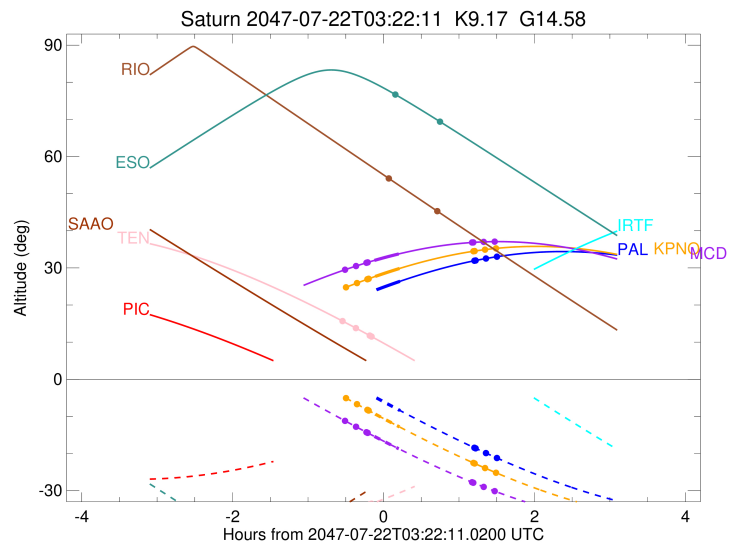
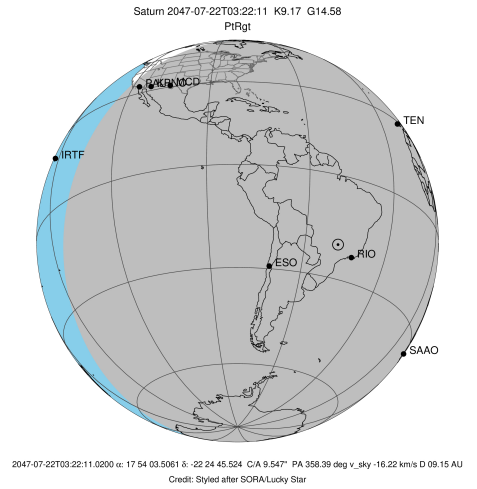
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

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		+	+	JUL 22 03:35 - JUL 22 04:52	PneRne
PMO	Purple Mtn Obs	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl	32.0	248.4	+	+	+	JUL 22 02:52 - JUL 22 04:51	PieRie
MCD	McDonald Obs.	30.7	256.0	+	+	+	JUL 22 02:51 - JUL 22 04:50	PieRie
TEN	Teide Obs./Ten	28.3	343.5	+	+	+	JUL 22 02:49 - JUL 22 03:12	PnnRin
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	+		+	JUL 22 03:25 - JUL 22 04:05	PnnRie
ESO	European South	-29.3	289.3	+		+	JUL 22 03:31 - JUL 22 04:07	PnnRie
AAT	Siding Spring	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0					PnnRnn



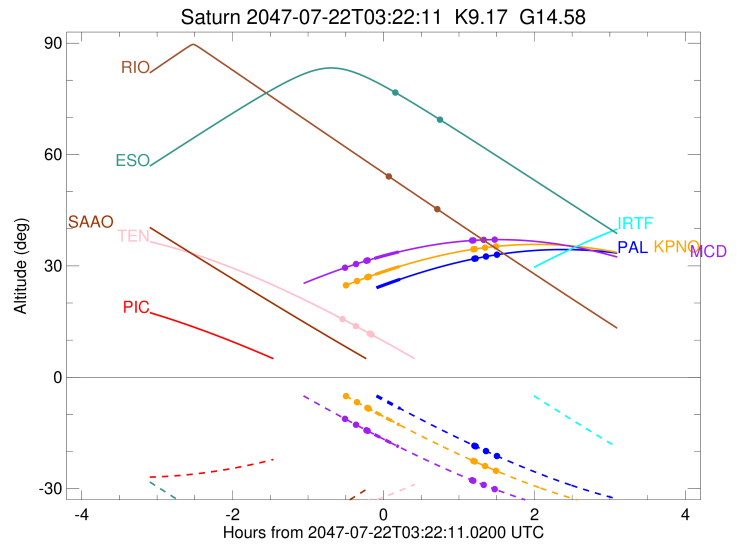
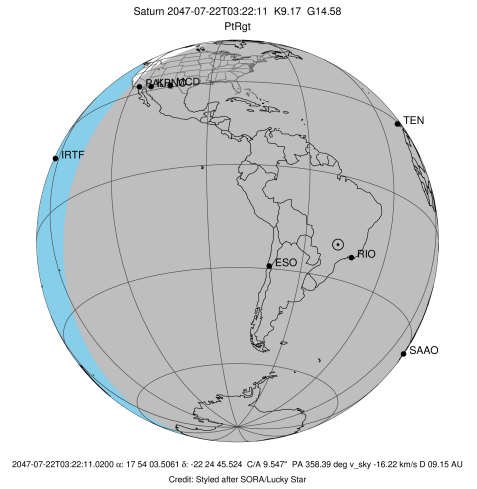
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-07-22T03:25:25.280
 Event type : PtRgt
 : Saturn occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 4070253546298504960
 2Mass ID (if available) : 17540351-2224455
 ICRS Star Coord at Epoch: 17h 54m 03.50606s -22:24:45.52419s
 RUWE (>1.4 is poor) : 1.04
 K magnitude : 9.171
 G magnitude : 14.576
 RP magnitude : 13.235
 BP magnitude : 16.675
 DUPflag : 0
 Distance (au) : 9.154
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.22
 Sun-Target sep (deg) : 149.97
 Sun-Moon sep (deg) : 160.36
 B (ring opening deg) : 26.68
 PA of pole (deg) : 5.40
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 8.795
 C/A sky separation (km) : 58386.2
 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	2047-07-22T02:52:41.986		20.87	-0.54x	140461.00	-7.49		
A (OER)	I	2047-07-22T03:01:25.357		22.09	-2.19x	136774.40	-6.58		
Encke (OEG)	I	2047-07-22T03:09:40.205		23.20	-3.73x	133744.89	-5.65		
Encke (IEG)	I	2047-07-22T03:10:37.665		23.33	-3.91x	133423.31	-5.54		
Saturn	I	2047-07-22T03:16:00.895		24.03	-4.91x	59128.77		-63.29	-67.42
Saturn	E	2047-07-22T03:35:23.645		26.40	-8.44	59220.99		-58.80	-63.43
Encke (IEG)	E	2047-07-22T04:34:47.521		31.95	-18.50	133423.31	5.57		
Encke (OEG)	E	2047-07-22T04:35:44.707		32.02	-18.65	133744.89	5.68		
A (OER)	E	2047-07-22T04:43:57.112		32.54	-19.93	136774.40	6.61		
F ring	E	2047-07-22T04:52:37.802		33.03	-21.25	140461.00	7.53		

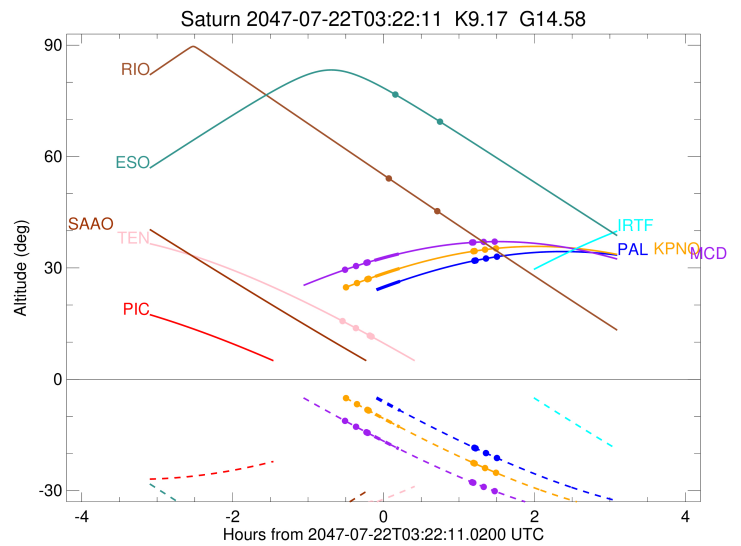
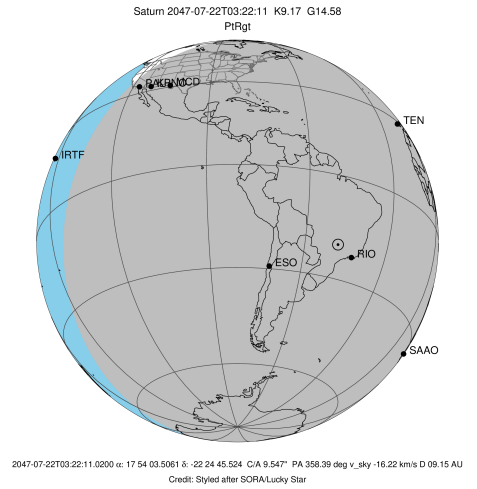
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-07-22T03:25:00.410
 Event type : PtRgt
 : Saturn occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Observer code : KPNO
 Location : Kitt Peak Natl Obs
 Latitude (deg) : 31.96333
 E. Longitude (deg) : 248.40000
 Altitude (km) : 2.120
 Gaia source ID : 4070253546298504960
 2Mass ID (if available) : 17540351-2224455
 ICRS Star Coord at Epoch: 17h 54m 03.50606s -22:24:45.52419s
 RUWE (>1.4 is poor) : 1.04
 K magnitude : 9.171
 G magnitude : 14.576
 RP magnitude : 13.235
 BP magnitude : 16.675
 DUPflag : 0
 Distance (au) : 9.154
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.22
 Sun-Target sep (deg) : 149.97
 Sun-Moon sep (deg) : 160.33
 B (ring opening deg) : 26.68
 PA of pole (deg) : 5.40
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 8.796
 C/A sky separation (km) : 58392.5
 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	2047-07-22T02:52:18.431		24.76	-5.06	140461.00	-7.49		
A (OER)	I	2047-07-22T03:01:02.059		25.90	-6.70	136774.40	-6.58		
Encke (OEG)	I	2047-07-22T03:09:17.598		26.94	-8.23	133744.89	-5.64		
Encke (IEG)	I	2047-07-22T03:10:15.178		27.05	-8.40	133423.31	-5.53		
Saturn	I	2047-07-22T03:15:39.286		27.70	-9.39	59128.75		-63.29	-67.42
Saturn	E	2047-07-22T03:34:55.355		29.85	-12.84	59220.14		-58.84	-63.47
Encke (IEG)	E	2047-07-22T04:34:00.989		34.50	-22.59	133423.31	5.55		
Encke (OEG)	E	2047-07-22T04:34:58.340		34.55	-22.73	133744.89	5.66		
A (OER)	E	2047-07-22T04:43:11.876		34.93	-23.96	136774.40	6.60		
F ring	E	2047-07-22T04:51:53.371		35.26	-25.22	140461.00	7.52		

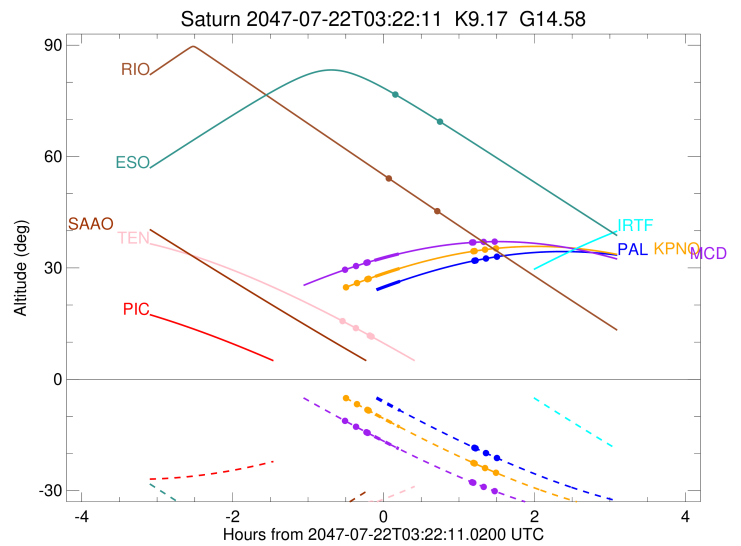
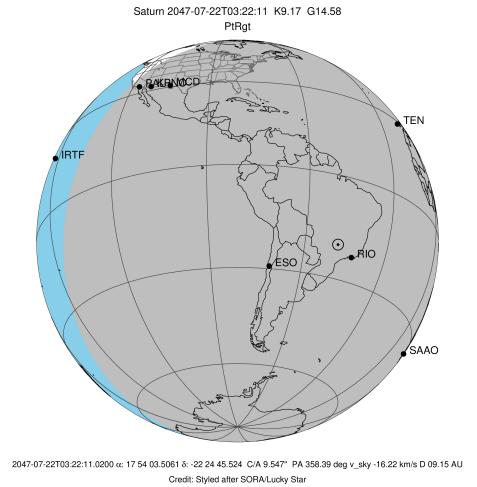
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-07-22T03:24:19.490
 Event type : PtRgt
 : Saturn occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Observer code : MCD
 Location : McDonald Obs. 2.7m
 Latitude (deg) : 30.67158
 E. Longitude (deg) : 255.97844
 Altitude (km) : 2.075
 Gaia source ID : 4070253546298504960
 2Mass ID (if available) : 17540351-2224455
 ICRS Star Coord at Epoch: 17h 54m 03.50606s -22:24:45.52419s
 RUWE (>1.4 is poor) : 1.04
 K magnitude : 9.171
 G magnitude : 14.576
 RP magnitude : 13.235
 BP magnitude : 16.675
 DUPflag : 0
 Distance (au) : 9.154
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.22
 Sun-Target sep (deg) : 149.97
 Sun-Moon sep (deg) : 160.26
 B (ring opening deg) : 26.68
 PA of pole (deg) : 5.40
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 8.794
 C/A sky separation (km) : 58382.0
 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	2047-07-22T02:51:32.166		29.50	-11.19	140461.00	-7.50		
A (OER)	I	2047-07-22T03:00:15.698		30.49	-12.78	136774.40	-6.57		
Encke (OEG)	I	2047-07-22T03:08:31.521		31.37	-14.26	133744.89	-5.64		
Encke (IEG)	I	2047-07-22T03:09:29.166		31.47	-14.43	133423.31	-5.52		
Saturn	I	2047-07-22T03:14:55.295		32.02	-15.39	59128.92		-63.28	-67.41
Saturn	E	2047-07-22T03:34:17.202		33.76	-18.72	59220.12		-58.84	-63.47
Encke (IEG)	E	2047-07-22T04:32:56.016		36.85	-27.79	133423.31	5.54		
Encke (OEG)	E	2047-07-22T04:33:53.503		36.87	-27.92	133744.89	5.65		
A (OER)	E	2047-07-22T04:42:07.994		37.01	-29.04	136774.40	6.59		
F ring	E	2047-07-22T04:50:50.232		37.08	-30.17	140461.00	7.51		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-07-22T03:16:21.340
 Event type : PtRgt
 : Saturn occs: topocentric, not geocentric
 : 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 : 4070253546298504960
 2Mass ID (if available) : 17540351-2224455
 ICRS Star Coord at Epoch: 17h 54m 03.50606s -22:24:45.52419s
 RUWE (>1.4 is poor) : 1.04
 K magnitude : 9.171
 G magnitude : 14.576
 RP magnitude : 13.235
 BP magnitude : 16.675
 DUPflag : 0
 Distance (au) : 9.153
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.22
 Sun-Target sep (deg) : 149.97
 Sun-Moon sep (deg) : 159.15
 B (ring opening deg) : 26.68
 PA of pole (deg) : 5.40
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 9.008
 C/A sky separation (km) : 59801.7
 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

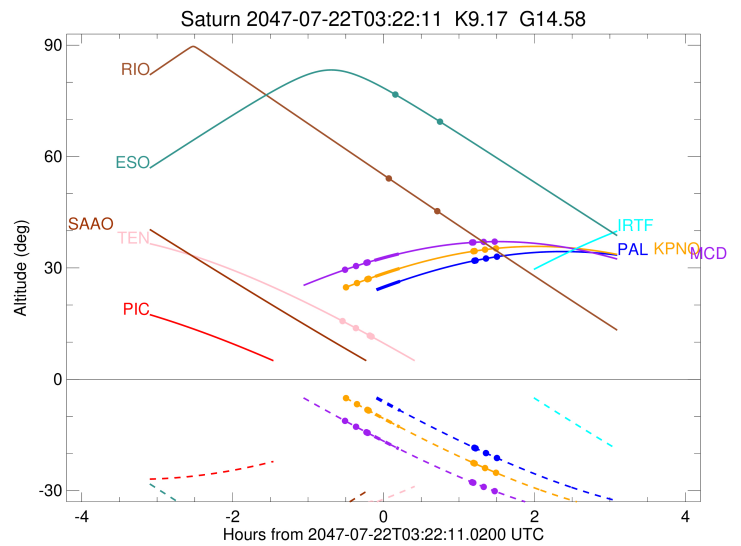
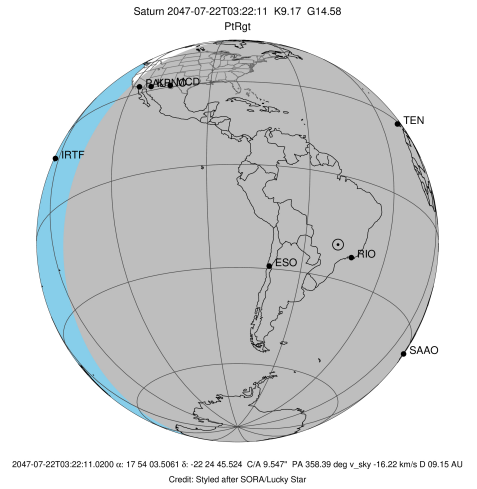
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-22T02:49:31.007		15.69	-36.19	140461.00	-6.38		
A (OER)	I	2047-07-22T03:00:05.359		13.80	-35.03	136774.40	-5.23		
Encke (OEG)	I	2047-07-22T03:11:05.329		11.80	-33.73	133744.89	-3.94		
Encke (IEG)	I	2047-07-22T03:12:28.708		11.54	-33.55	133423.31	-3.77		

No planet occultations

Encke (IEG)	E	2047-07-22T04:11:56.154		0.10x	-25.01	133423.31	3.75		
Encke (OEG)	E	2047-07-22T04:13:20.013		-0.18x	-24.78	133744.89	3.92		
A (OER)	E	2047-07-22T04:24:24.792		-2.40x	-22.96	136774.40	5.18		
F ring	E	2047-07-22T04:35:05.643		-4.57x	-21.15	140461.00	6.31		

```

target                : Saturn
target radius (km)   : 60268.00
C/A epoch            : 2047-07-22T03:18:08.290
Event type          : PtRgt
: Saturn occs: topocentric, not geocentric
: 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      : 4070253546298504960
2Mass ID (if available) : 17540351-2224455
ICRS Star Coord at Epoch: 17h 54m 03.50606s -22:24:45.52419s
RUWE (>1.4 is poor) : 1.04
K magnitude         : 9.171
G magnitude         : 14.576
RP magnitude        : 13.235
BP magnitude        : 16.675
DUPflag            : 0
Distance (au)       : 9.154
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -16.22
Sun-Target sep (deg) : 149.97
Sun-Moon sep (deg)  : 159.55
B (ring opening deg) : 26.68
PA of pole (deg)    : 5.40
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 9.638
C/A sky separation (km) : 63982.2
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
  
```



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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 2047-07-22T03:25:56.020  54.21 -83.34 140461.00 -2.46

No planet occultations

F ring    E 2047-07-22T04:05:43.488  45.11 -74.37 140461.00 2.45
  
```

