

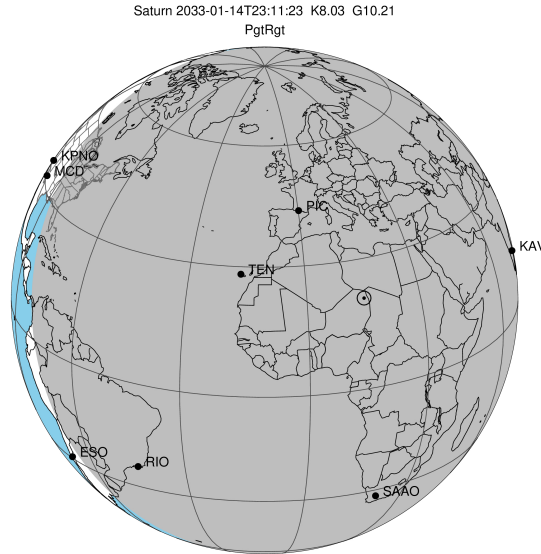
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2033-01-14T23:11:23.950
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3423761359289822592
 2Mass ID (if available) : 06064421+2230071

Saturn 2033-01-14T23:11:23 K8.03 G10.21 PgtRgt

ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s

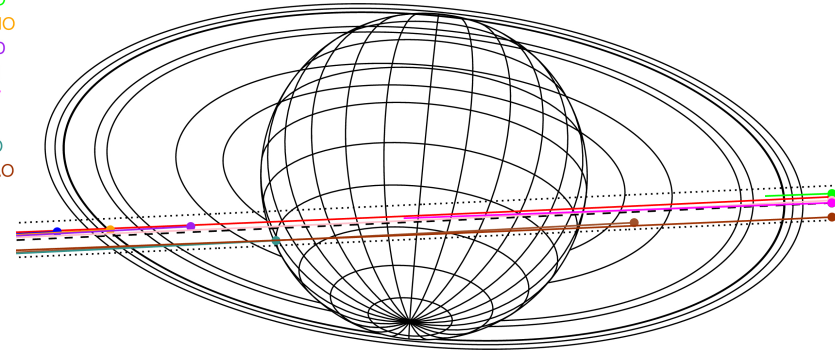
RUWE (>1.4 is poor) : 2.20
 K magnitude : 8.025
 G magnitude : 10.206
 RP magnitude : 9.528
 BP magnitude : 10.729
 DUPflag : 0
 Distance (au) : 8.102
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.72
 Sun-Target sep (deg) : 156.89
 Sun-Moon sep (deg) : 16.85
 B (ring opening deg) : -26.48
 PA of pole (deg) : -5.65

#	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



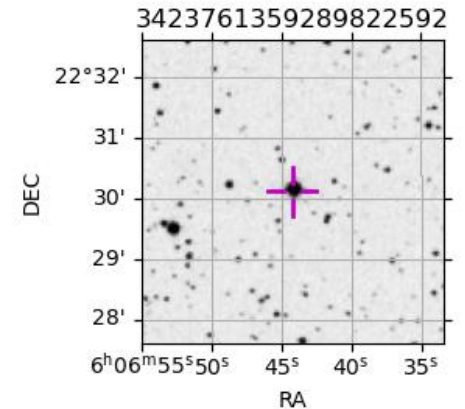
2033-01-14T23:11:23.9500 α: 06 06 44.2064 δ: +22 30 06.441 C/A 2.830° PA 2.61 deg v_sky -17.72 km/s D 08.10 AU
 Credit: Styled after SORA/Lucky Star

Earth
 PIC
 PAL
 PMO
 KPNO
 MCD
 TEN
 KAV
 RIO
 ESO
 SAAO

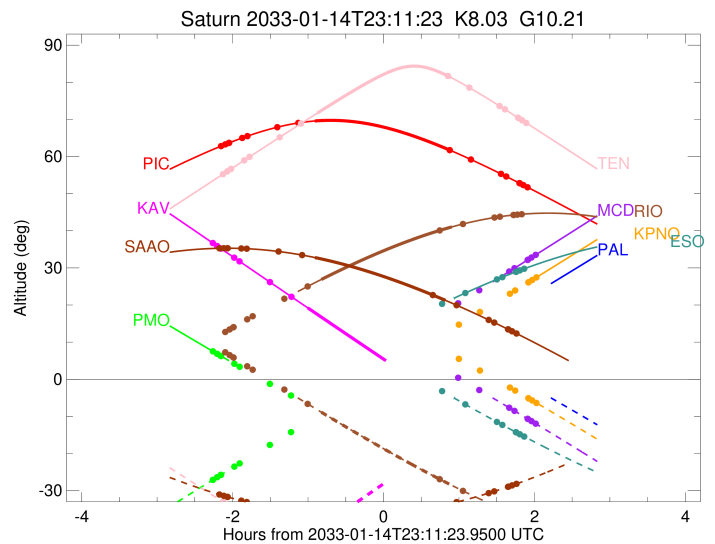
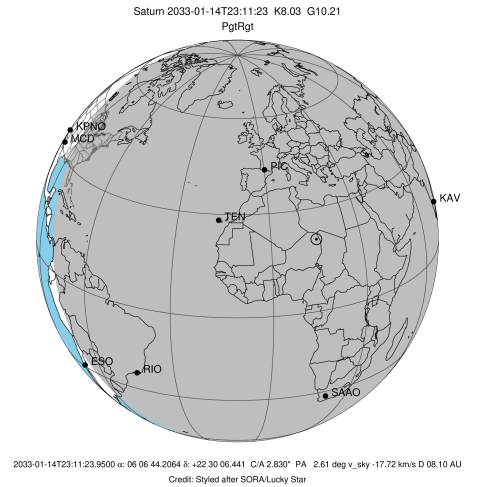


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+	+	+	JAN 14 21:02 - JAN 15 01:05	PieRie
PAL	Palomar Mt (20	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8	+	+	+	JAN 14 20:55 - JAN 14 21:02	PnnRin
KPNO	Kitt Peak Natl	32.0	248.4			+	JAN 15 01:06 - JAN 15 01:12	PnnRne
MCD	McDonald Obs.	30.7	256.0			+	JAN 15 00:51 - JAN 15 01:12	PnnRne
TEN	Teide Obs./Ten	28.3	343.5	+	+	+	JAN 14 21:03 - JAN 15 01:04	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observ	12.6	78.8	+	+	+	JAN 14 20:55 - JAN 14 22:11	PinRin
RIO	Rio de Janeiro	-22.9	316.8		+	+	JAN 14 22:11 - JAN 15 01:01	PieRie
ESO	European South	-29.3	289.3		+	+	JAN 15 00:07 - JAN 15 01:03	PneRne
AAT	Siding Spring	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro	-32.4	20.8	+	+	+	JAN 14 21:00 - JAN 15 00:57	PieRie
MSO	Mt. Stromlo Ob	-35.3	149.0					PnnRnn



target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2033-01-14T23:10:44.430
 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 : 3423761359289822592
 2Mass ID (if available) : 06064421+2230071
 ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s
 RUWE (>1.4 is poor) : 2.20
 K magnitude : 8.025
 G magnitude : 10.206
 RP magnitude : 9.528
 BP magnitude : 10.729
 DUPflag : 0
 Distance (au) : 8.102
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.72
 Sun-Target sep (deg) : 156.89
 Sun-Moon sep (deg) : 17.07
 B (ring opening deg) : -26.48
 PA of pole (deg) : -5.65
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 2.441
 C/A sky separation (km) : 14344.2
 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

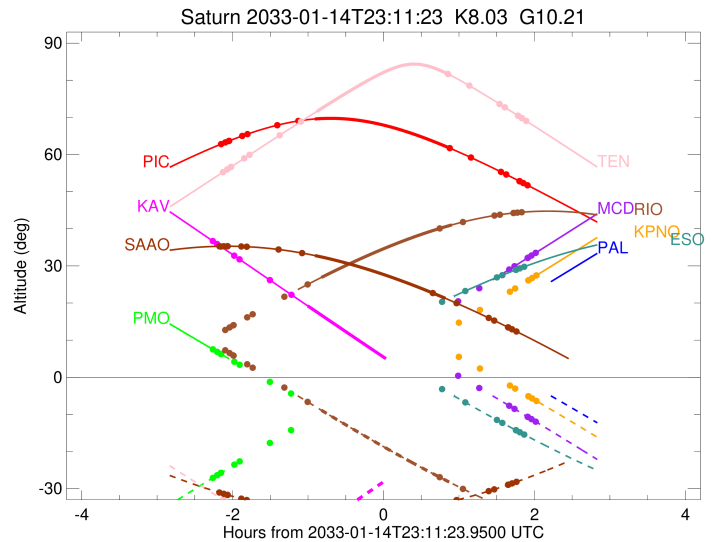
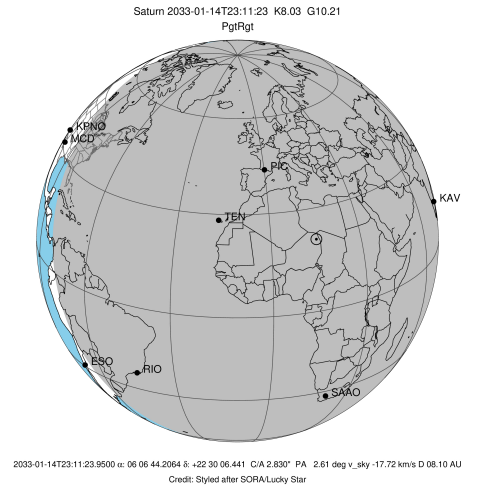


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2033-01-14T21:02:17.491		62.81	-45.67	140461.00	-18.33		
A (OER)	I	2033-01-14T21:05:38.704		63.27	-46.26	136774.40	-18.31		
Encke (OEG)	I	2033-01-14T21:08:24.271		63.64	-46.75	133744.89	-18.29		
Encke (IEG)	I	2033-01-14T21:08:41.858		63.68	-46.80	133423.31	-18.28		
A (IER)	I	2033-01-14T21:19:05.534		65.01	-48.63	122050.38	-18.18		
B (OER)	I	2033-01-14T21:23:12.213		65.50	-49.35	117571.16	-18.13		
B (IER)	I	2033-01-14T21:46:58.335		67.90	-53.39	91984.69	-17.70		
C (IER)	I	2033-01-14T22:03:42.430		69.05	-56.12	74490.58	-17.09		
Saturn	I	2033-01-14T22:16:44.470		69.58	-58.15	60256.88		-5.03	-6.18
Saturn	E	2033-01-15T00:04:40.107		61.64	-68.34	60108.15		-19.47	-23.43
C (IER)	E	2033-01-15T00:04:03.536	b	61.73	-68.33	74490.58	17.00		
B (IER)	E	2033-01-15T00:20:53.060		59.20	-68.20	91984.69	17.59		
B (OER)	E	2033-01-15T00:44:48.633		55.33	-67.07	117571.16	18.00		
A (IER)	E	2033-01-15T00:48:57.171		54.63	-66.77	122050.38	18.04		
Encke (IEG)	E	2033-01-15T00:59:25.850		52.85	-65.89	133423.31	18.13		
Encke (OEG)	E	2033-01-15T00:59:43.584		52.80	-65.86	133744.89	18.13		
A (OER)	E	2033-01-15T01:02:30.554		52.32	-65.60	136774.40	18.15		
F ring	E	2033-01-15T01:05:53.513		51.73	-65.26	140461.00	18.17		

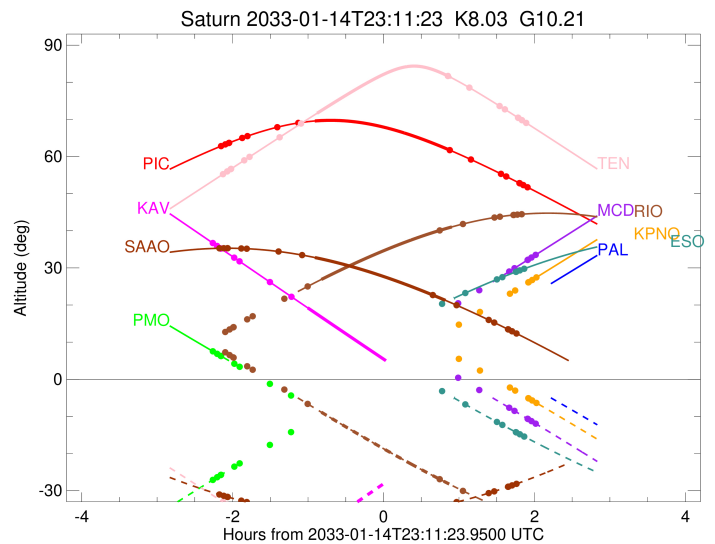
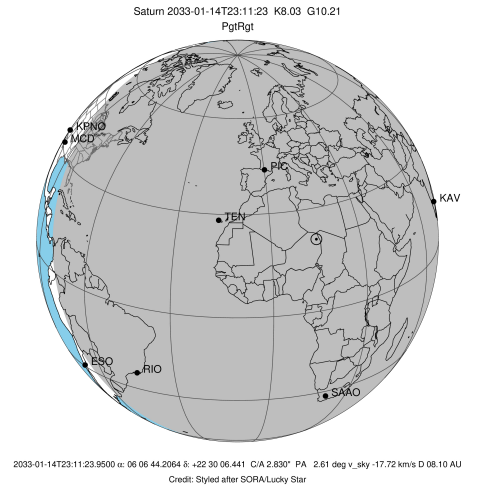
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target                : Saturn
target radius (km)   : 60268.00
C/A epoch            : 2033-01-14T23:07:40.920
Event type          : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code       : PMO
Location            : Purple Mtn Obs. Nanking
Latitude (deg)      : 32.06667
E. Longitude (deg)  : 118.82089
Altitude (km)       : 0.364
Gaia source ID      : 3423761359289822592
2Mass ID (if available) : 06064421+2230071
ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s
RUWE (>1.4 is poor) : 2.20
K magnitude          : 8.025
G magnitude          : 10.206
RP magnitude         : 9.528
BP magnitude         : 10.729
DUPflag             : 0
Distance (au)       : 8.102
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -17.72
Sun-Target sep (deg) : 156.89
Sun-Moon sep (deg)  : 16.39
B (ring opening deg) : -26.48
PA of pole (deg)    : -5.65
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 2.046
C/A sky separation (km) : 12021.5
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	2033-01-14T20:55:45.078		7.52	-27.10	140461.00	-18.03		
A (OER)	I	2033-01-14T20:59:09.683		6.85	-26.38	136774.40	-18.01		
Encke (OEG)	I	2033-01-14T21:01:58.026		6.30	-25.80	133744.89	-17.99		
Encke (IEG)	I	2033-01-14T21:02:15.907		6.24	-25.74	133423.31	-17.98		
A (IER)	I	2033-01-14T21:12:49.814		4.17x	-23.53	122050.38	-17.90		
B (OER)	I	2033-01-14T21:17:00.391		3.36x	-22.66	117571.16	-17.86		
B (IER)	I	2033-01-14T21:41:05.494		-1.24x	-17.68	91984.69	-17.52		
C (IER)	I	2033-01-14T21:57:55.201		-4.38x	-14.23	74490.58	-17.09		
Saturn	I	2033-01-14T22:11:30.629		-6.86x	-11.47	60263.26		-3.28	-4.03
Saturn	E	2033-01-15T00:03:59.907		-24.80x	10.11x	60140.00		-17.35	-20.96
C (IER)	E	2033-01-15T00:06:03.025		-25.07x	10.47x	74490.58	16.93		
B (IER)	E	2033-01-15T00:23:03.224		-27.20x	13.45x	91984.69	17.32		
B (OER)	E	2033-01-15T00:47:27.076		-29.91x	17.54x	117571.16	17.60		
A (IER)	E	2033-01-15T00:51:41.354		-30.34x	18.23x	122050.38	17.63		
Encke (IEG)	E	2033-01-15T01:02:25.210		-31.35x	19.93x	133423.31	17.69		
Encke (OEG)	E	2033-01-15T01:02:43.384		-31.38x	19.98x	133744.89	17.70		
A (OER)	E	2033-01-15T01:05:34.515		-31.63x	20.42x	136774.40	17.71		
F ring	E	2033-01-15T01:09:02.586		-31.93x	20.96x	140461.00	17.73		

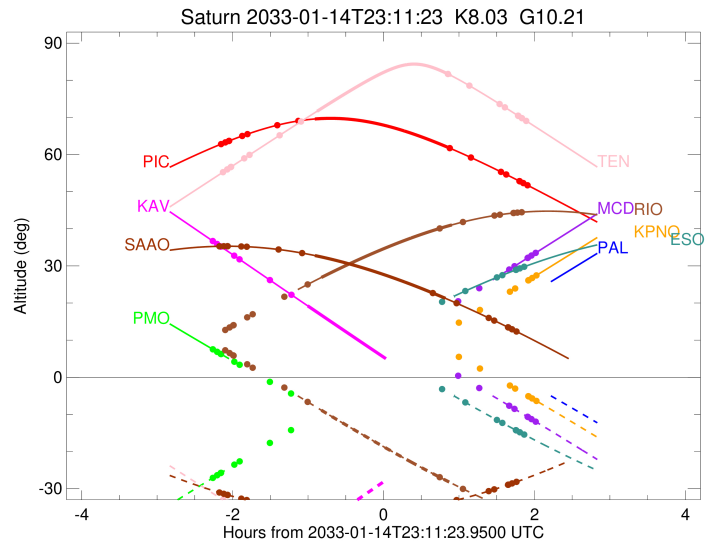
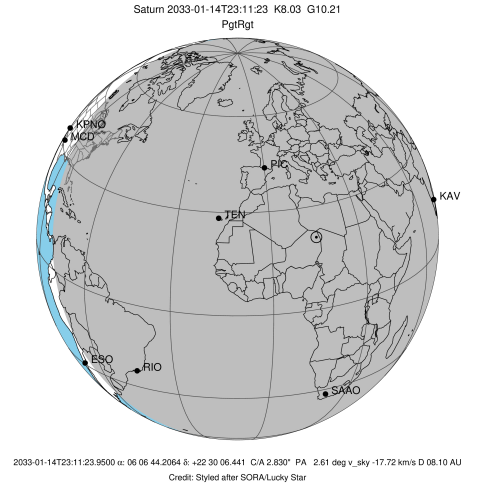
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2033-01-14T23:16:27.740
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KPNO
 Location : Kitt Peak Natl Obs
 Latitude (deg) : 31.96333
 E. Longitude (deg) : 248.40000
 Altitude (km) : 2.120
 Gaia source ID : 3423761359289822592
 2Mass ID (if available) : 06064421+2230071
 ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s
 RUWE (>1.4 is poor) : 2.20
 K magnitude : 8.025
 G magnitude : 10.206
 RP magnitude : 9.528
 BP magnitude : 10.729
 DUPflag : 0
 Distance (au) : 8.102
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.72
 Sun-Target sep (deg) : 156.89
 Sun-Moon sep (deg) : 17.70
 B (ring opening deg) : -26.48
 PA of pole (deg) : -5.65
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 2.284
 C/A sky separation (km) : 13423.4
 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	2033-01-14T21:04:39.952		-19.50x	32.95x	140461.00	-17.88		
A (OER)	I	2033-01-14T21:08:06.254		-18.97x	32.64x	136774.40	-17.86		
Encke (OEG)	I	2033-01-14T21:10:55.939		-18.53x	32.38x	133744.89	-17.85		
Encke (IEG)	I	2033-01-14T21:11:13.959		-18.49x	32.35x	133423.31	-17.84		
A (IER)	I	2033-01-14T21:21:52.500		-16.80x	31.29x	122050.38	-17.77		
B (OER)	I	2033-01-14T21:26:04.761		-16.12x	30.85x	117571.17	-17.74		
B (IER)	I	2033-01-14T21:50:18.885		-12.07x	28.04x	91984.69	-17.41		
C (IER)	I	2033-01-14T22:07:16.330		-9.11x	25.84x	74490.58	-16.93		
Saturn	I	2033-01-14T22:20:53.810		-6.67x	23.95x	60261.91		-3.72	-4.57
Saturn	E	2033-01-15T00:11:36.884		14.77	5.44x	60111.46		-19.26	-23.18
C (IER)	E	2033-01-15T00:11:16.681	b	14.70	5.50x	74490.58	17.10		
B (IER)	E	2033-01-15T00:28:02.377		18.12	2.36x	91984.69	17.64		
B (OER)	E	2033-01-15T00:51:54.675		23.05	-2.23x	117571.16	18.04		
A (IER)	E	2033-01-15T00:56:02.585		23.91	-3.04x	122050.38	18.09		
Encke (IEG)	E	2033-01-15T01:06:29.400		26.09	-5.09	133423.31	18.19		
Encke (OEG)	E	2033-01-15T01:06:47.075		26.15	-5.15	133744.89	18.20		
A (OER)	E	2033-01-15T01:09:33.468		26.73	-5.70	136774.40	18.22		
F ring	E	2033-01-15T01:12:55.675		27.44	-6.37	140461.00	18.24		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2033-01-14T23:16:34.950
 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 : 3423761359289822592
 2Mass ID (if available) : 06064421+2230071
 ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s
 RUWE (>1.4 is poor) : 2.20
 K magnitude : 8.025
 G magnitude : 10.206
 RP magnitude : 9.528
 BP magnitude : 10.729
 DUPflag : 0
 Distance (au) : 8.102
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.72
 Sun-Target sep (deg) : 156.89
 Sun-Moon sep (deg) : 17.74
 B (ring opening deg) : -26.48
 PA of pole (deg) : -5.65
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 2.351
 C/A sky separation (km) : 13815.9
 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
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 pck.sat440.tpc
 IAU_SATURN_for_RINGFIT.tpc
 naif0012.tls
 earth_flat_IAU.spk

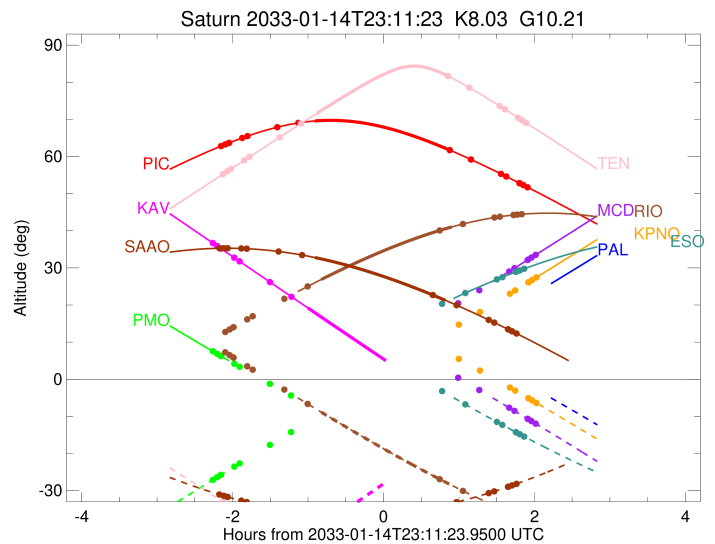
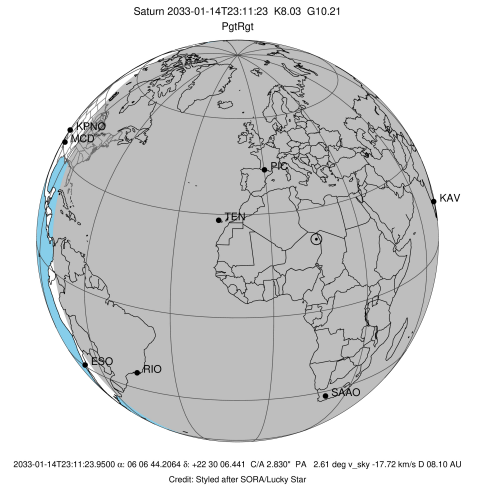


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2033-01-14T21:05:05.935		-15.41x	30.90x	140461.00	-17.90		
A (OER)	I	2033-01-14T21:08:31.999		-14.83x	30.49x	136774.40	-17.88		
Encke (OEG)	I	2033-01-14T21:11:21.496		-14.34x	30.15x	133744.89	-17.87		
Encke (IEG)	I	2033-01-14T21:11:39.497		-14.29x	30.12x	133423.31	-17.86		
A (IER)	I	2033-01-14T21:22:17.424		-12.45x	28.79x	122050.38	-17.79		
B (OER)	I	2033-01-14T21:26:29.488		-11.71x	28.24x	117571.16	-17.75		
B (IER)	I	2033-01-14T21:50:43.327		-7.34x	24.87x	91984.69	-17.40		
C (IER)	I	2033-01-14T22:07:42.152		-4.17x	22.31x	74490.58	-16.88		
Saturn	I	2033-01-14T22:21:15.661		-1.59x	20.17x	60260.78		-4.05	-4.98
Saturn	E	2033-01-15T00:11:28.967		20.62	0.26x	60106.19		-19.60	-23.57
C (IER)	E	2033-01-15T00:10:42.978	b	20.46	0.41x	74490.58	17.05		
B (IER)	E	2033-01-15T00:27:30.174		23.98	-2.89x	91984.69	17.63		
B (OER)	E	2033-01-15T00:51:22.372		29.03	-7.67	117571.16	18.05		
A (IER)	E	2033-01-15T00:55:30.120		29.91	-8.51	122050.38	18.10		
Encke (IEG)	E	2033-01-15T01:05:56.411		32.13	-10.64	133423.31	18.21		
Encke (OEG)	E	2033-01-15T01:06:14.069		32.19	-10.70	133744.89	18.21		
A (OER)	E	2033-01-15T01:09:00.299		32.79	-11.26	136774.40	18.24		
F ring	E	2033-01-15T01:12:22.298		33.51	-11.95	140461.00	18.26		

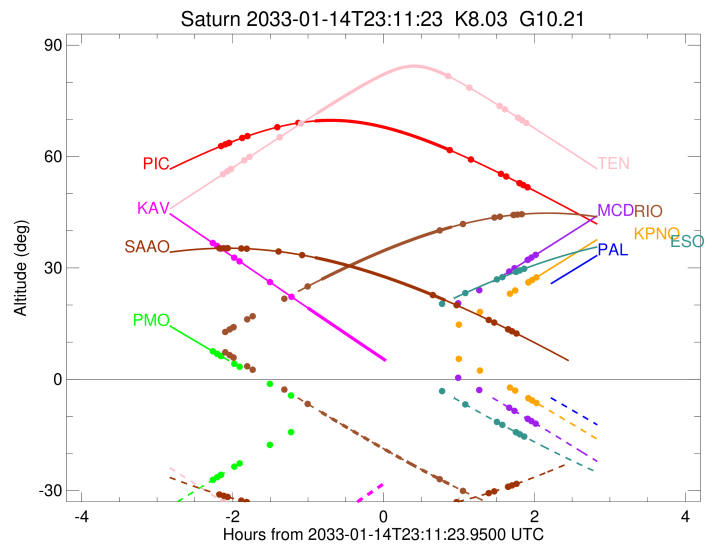
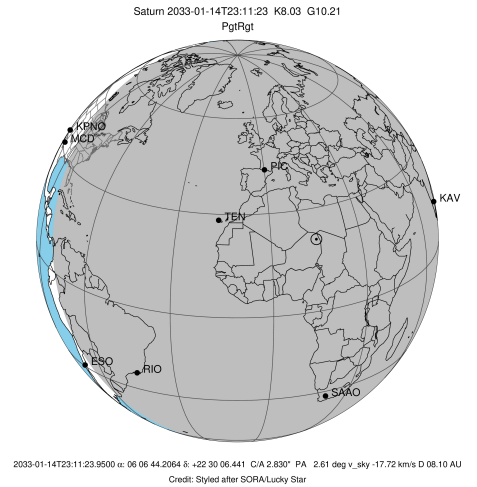
```

target                : Saturn
target radius (km)   : 60268.00
C/A epoch            : 2033-01-14T23:11:58.760
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       : 3423761359289822592
2Mass ID (if available) : 06064421+2230071
ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s
RUWE (>1.4 is poor) : 2.20
K magnitude           : 8.025
G magnitude           : 10.206
RP magnitude          : 9.528
BP magnitude          : 10.729
DUPflag              : 0
Distance (au)        : 8.102
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -17.72
Sun-Target sep (deg) : 156.89
Sun-Moon sep (deg)   : 17.23
B (ring opening deg) : -26.48
PA of pole (deg)     : -5.65
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 2.724
C/A sky separation (km) : 16008.7
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
  
```



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2033-01-14T21:03:48.564		55.25	-33.04	140461.00	-18.25		
A (OER)	I	2033-01-14T21:07:10.726		56.00	-33.77	136774.40	-18.22		
Encke (OEG)	I	2033-01-14T21:09:57.116		56.61	-34.38	133744.89	-18.19		
Encke (IEG)	I	2033-01-14T21:10:14.793		56.68	-34.44	133423.31	-18.19		
A (IER)	I	2033-01-14T21:20:42.012		58.99	-36.73	122050.38	-18.07		
B (OER)	I	2033-01-14T21:24:50.319		59.90	-37.64	117571.16	-18.01		
B (IER)	I	2033-01-14T21:48:49.945		65.18	-42.91	91984.69	-17.47		
C (IER)	I	2033-01-14T22:05:51.409		68.90	-46.65	74490.58	-16.70		
Saturn	I	2033-01-14T22:18:33.787		71.65	-49.45	60250.14		-6.39	-7.83
Saturn	E	2033-01-15T00:05:14.091		81.25	-72.62	60083.17		-21.01	-25.20
C (IER)	E	2033-01-15T00:02:34.483	b	81.71	-72.07	74490.58	16.66		
B (IER)	E	2033-01-15T00:19:38.630		78.57	-75.54	91984.69	17.42		
B (OER)	E	2033-01-15T00:43:42.552		73.61	-79.95	117571.17	17.95		
A (IER)	E	2033-01-15T00:47:51.687		72.72	-80.60	122050.38	18.01		
Encke (IEG)	E	2033-01-15T00:58:21.128		70.47	-81.98	133423.31	18.12		
Encke (OEG)	E	2033-01-15T00:58:38.870		70.40	-82.01	133744.89	18.13		
A (OER)	E	2033-01-15T01:01:25.882		69.80	-82.29	136774.40	18.15		
F ring	E	2033-01-15T01:04:48.817		69.07	-82.57	140461.00	18.18		

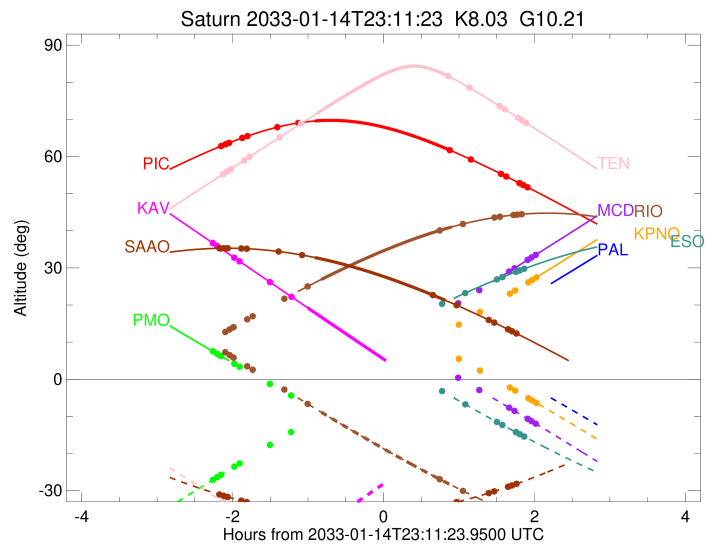
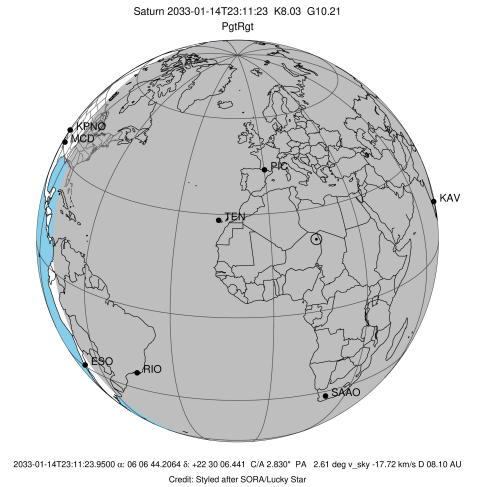
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2033-01-14T23:05:44.980
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 3423761359289822592
 2Mass ID (if available) : 06064421+2230071
 ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s
 RUWE (>1.4 is poor) : 2.20
 K magnitude : 8.025
 G magnitude : 10.206
 RP magnitude : 9.528
 BP magnitude : 10.729
 DUPflag : 0
 Distance (au) : 8.102
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.72
 Sun-Target sep (deg) : 156.89
 Sun-Moon sep (deg) : 16.09
 B (ring opening deg) : -26.48
 PA of pole (deg) : -5.65
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 2.575
 C/A sky separation (km) : 15130.8
 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

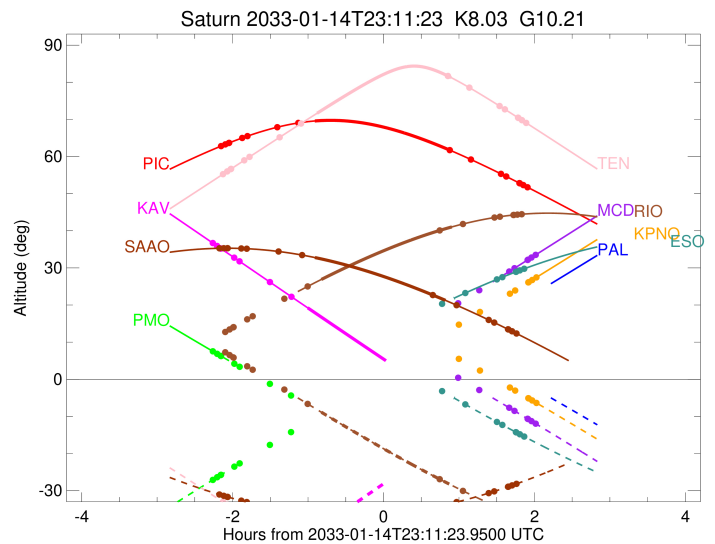
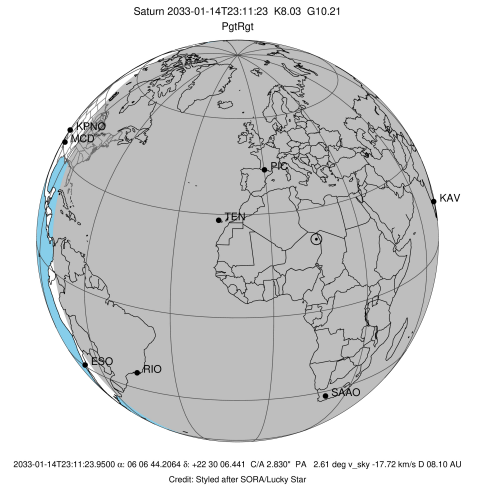
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2033-01-14T20:55:42.111		36.69	-59.67	140461.00	-18.12		
A (OER)	I	2033-01-14T20:59:05.742		35.90	-58.89	136774.40	-18.09		
Encke (OEG)	I	2033-01-14T21:01:53.384		35.26	-58.26	133744.89	-18.06		
Encke (IEG)	I	2033-01-14T21:02:11.195		35.19	-58.19	133423.31	-18.05		
A (IER)	I	2033-01-14T21:12:43.449		32.75	-55.77	122050.38	-17.92		
B (OER)	I	2033-01-14T21:16:53.859		31.78	-54.80	117571.16	-17.86		
B (IER)	I	2033-01-14T21:41:06.045		26.18	-49.20	91984.69	-17.32		
C (IER)	I	2033-01-14T21:58:14.843		22.21	-45.22	74490.58	-16.61		
Saturn	I	2033-01-14T22:11:07.130		19.25	-42.22	60251.39		-6.16	-7.55
Saturn	E	2033-01-15T00:00:35.482		-5.63x	-16.75	60102.66		-19.82	-23.83
C (IER)	E	2033-01-14T23:59:29.756	b	-5.39x	-17.00	74490.58	16.38		
B (IER)	E	2033-01-15T00:16:55.236		-9.25x	-12.98	91984.69	17.02		
B (OER)	E	2033-01-15T00:41:37.290		-14.66x	-7.30	117571.17	17.45		
A (IER)	E	2033-01-15T00:45:53.605		-15.58x	-6.32	122050.38	17.50		
Encke (IEG)	E	2033-01-15T00:56:41.746		-17.91x	-3.85x	133423.31	17.59		
Encke (OEG)	E	2033-01-15T00:57:00.026		-17.97x	-3.78x	133744.89	17.59		
A (OER)	E	2033-01-15T00:59:52.123		-18.59x	-3.13x	136774.40	17.61		
F ring	E	2033-01-15T01:03:21.295		-19.33x	-2.33x	140461.00	17.64		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2033-01-14T23:14:04.160
 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 : 3423761359289822592
 2Mass ID (if available) : 06064421+2230071
 ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s
 RUWE (>1.4 is poor) : 2.20
 K magnitude : 8.025
 G magnitude : 10.206
 RP magnitude : 9.528
 BP magnitude : 10.729
 DUPflag : 0
 Distance (au) : 8.102
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.72
 Sun-Target sep (deg) : 156.89
 Sun-Moon sep (deg) : 17.30
 B (ring opening deg) : -26.48
 PA of pole (deg) : -5.65
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 3.565
 C/A sky separation (km) : 20948.3
 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



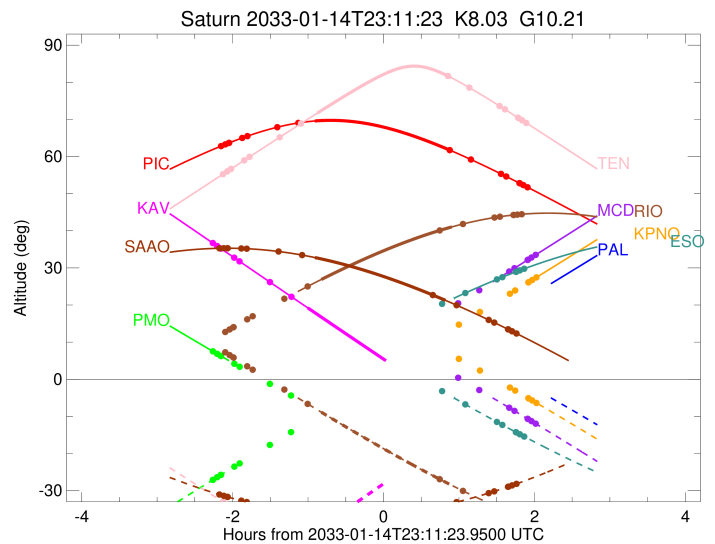
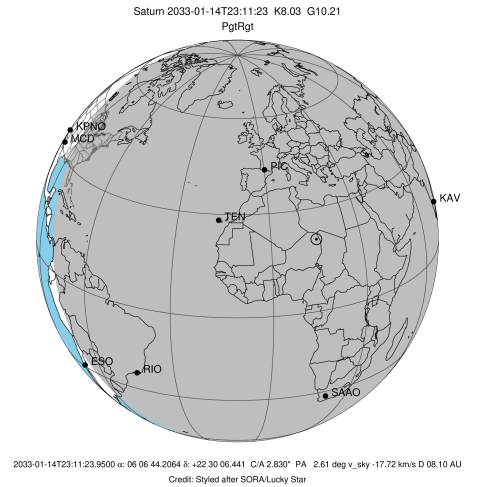
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2033-01-14T21:05:35.491		12.74	7.26x	140461.00	-17.73		
A (OER)	I	2033-01-14T21:09:03.698		13.43	6.51x	136774.40	-17.68		
Encke (OEG)	I	2033-01-14T21:11:55.268		13.99	5.89x	133744.89	-17.63		
Encke (IEG)	I	2033-01-14T21:12:13.506		14.05	5.83x	133423.31	-17.63		
A (IER)	I	2033-01-14T21:23:02.314		16.15	3.50x	122050.38	-17.42		
B (OER)	I	2033-01-14T21:27:20.208		16.97	2.58x	117571.16	-17.32		
B (IER)	I	2033-01-14T21:52:34.041		21.69	-2.77x	91984.69	-16.37		
C (IER)	I	2033-01-14T22:11:05.578		25.01	-6.63	74490.58	-14.96		
Saturn	I	2033-01-14T22:21:58.048		26.88	-8.87	60219.16		-10.60	-12.94
Saturn	E	2033-01-15T00:05:50.141		41.05	-28.60	60000.69		-25.57	-30.34
C (IER)	E	2033-01-14T23:56:01.870	b	40.09	-26.91	74490.58	14.98		
B (IER)	E	2033-01-15T00:14:30.645		41.82	-30.06	91984.69	16.42		
B (OER)	E	2033-01-15T00:39:38.020		43.57	-34.06	117571.16	17.40		
A (IER)	E	2033-01-15T00:43:54.578		43.79	-34.70	122050.38	17.51		
Encke (IEG)	E	2033-01-15T00:54:39.755		44.25	-36.25	133423.31	17.73		
Encke (OEG)	E	2033-01-15T00:54:57.886		44.26	-36.30	133744.89	17.74		
A (OER)	E	2033-01-15T00:57:48.431		44.36	-36.69	136774.40	17.79		
F ring	E	2033-01-15T01:01:15.360		44.46	-37.17	140461.00	17.84		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2033-01-14T23:15:34.850
 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 : 3423761359289822592
 2Mass ID (if available) : 06064421+2230071
 ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s
 RUWE (>1.4 is poor) : 2.20
 K magnitude : 8.025
 G magnitude : 10.206
 RP magnitude : 9.528
 BP magnitude : 10.729
 DUPflag : 0
 Distance (au) : 8.102
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.72
 Sun-Target sep (deg) : 156.89
 Sun-Moon sep (deg) : 17.43
 B (ring opening deg) : -26.48
 PA of pole (deg) : -5.65
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 3.540
 C/A sky separation (km) : 20800.9
 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	2033-01-14T21:05:48.479	-12.22x	32.69x	140461.00	-17.58			
A (OER)	I	2033-01-14T21:09:18.519	-11.50x	31.93x	136774.40	-17.53			
Encke (OEG)	I	2033-01-14T21:12:11.579	-10.90x	31.31x	133744.89	-17.48			
Encke (IEG)	I	2033-01-14T21:12:29.975	-10.84x	31.24x	133423.31	-17.48			
A (IER)	I	2033-01-14T21:23:24.235	-8.60x	28.89x	122050.38	-17.28			
B (OER)	I	2033-01-14T21:27:44.208	-7.72x	27.96x	117571.16	-17.18			
B (IER)	I	2033-01-14T21:53:08.867	-2.59x	22.51x	91984.69	-16.27			
C (IER)	I	2033-01-14T22:11:45.901	1.09x	18.55x	74490.58	-14.91			
Saturn	I	2033-01-14T22:22:56.954	3.27x	16.19x	60221.60	-10.33		-12.62	
Saturn	E	2033-01-15T00:07:47.233	21.89	-5.10	60000.01	-25.61		-30.38	
C (IER)	E	2033-01-14T23:57:55.542	b	20.31	-3.18x	74490.58	14.98		
B (IER)	E	2033-01-15T00:16:25.056		23.23	-6.76	91984.69	16.40		
B (OER)	E	2033-01-15T00:41:34.589		26.91	-11.50	117571.16	17.38		
A (IER)	E	2033-01-15T00:45:51.504		27.50	-12.29	122050.38	17.49		
Encke (IEG)	E	2033-01-15T00:56:37.493		28.92	-14.25	133423.31	17.71		
Encke (OEG)	E	2033-01-15T00:56:55.645		28.96	-14.30	133744.89	17.72		
A (OER)	E	2033-01-15T00:59:46.378		29.33	-14.81	136774.40	17.77		
F ring	E	2033-01-15T01:03:13.519		29.76	-15.43	140461.00	17.83		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2033-01-14T23:08:42.170
 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 : 3423761359289822592
 2Mass ID (if available) : 06064421+2230071
 ICRS Star Coord at Epoch: 06h 06m 44.20643s +22:30:06.44104s
 RUWE (>1.4 is poor) : 2.20
 K magnitude : 8.025
 G magnitude : 10.206
 RP magnitude : 9.528
 BP magnitude : 10.729
 DUPflag : 0
 Distance (au) : 8.102
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.72
 Sun-Target sep (deg) : 156.89
 Sun-Moon sep (deg) : 16.43
 B (ring opening deg) : -26.48
 PA of pole (deg) : -5.65
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 3.641
 C/A sky separation (km) : 21393.3
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2033-01-14T21:00:56.385		35.28	-31.05	140461.00	-17.79		
A (OER)	I	2033-01-14T21:04:24.001		35.30	-31.40	136774.40	-17.73		
Encke (OEG)	I	2033-01-14T21:07:15.166		35.30	-31.68	133744.89	-17.67		
Encke (IEG)	I	2033-01-14T21:07:33.366		35.30	-31.71	133423.31	-17.67		
A (IER)	I	2033-01-14T21:18:21.388		35.23	-32.70	122050.38	-17.42		
B (OER)	I	2033-01-14T21:22:39.310		35.17	-33.07	117571.16	-17.31		
B (IER)	I	2033-01-14T21:47:58.258		34.42	-34.90	91984.69	-16.26		
C (IER)	I	2033-01-14T22:06:41.810		33.45	-35.86	74490.58	-14.73		
Saturn	I	2033-01-14T22:16:48.873		32.79	-36.23	60210.94		-11.47	-13.99
Saturn	E	2033-01-15T00:00:32.237		21.28	-33.80	60001.47		-25.53	-30.30
C (IER)	E	2033-01-14T23:50:33.700	b	22.69	-34.51	74490.58	14.60		
B (IER)	E	2033-01-15T00:09:27.503		19.96	-33.09	91984.69	16.10		
B (OER)	E	2033-01-15T00:35:03.696		15.98	-30.67	117571.16	17.09		
A (IER)	E	2033-01-15T00:39:24.995		15.28	-30.20	122050.38	17.19		
Encke (IEG)	E	2033-01-15T00:50:22.088		13.47	-28.97	133423.31	17.41		
Encke (OEG)	E	2033-01-15T00:50:40.554		13.42	-28.94	133744.89	17.42		
A (OER)	E	2033-01-15T00:53:34.262		12.93	-28.60	136774.40	17.46		
F ring	E	2033-01-15T00:57:05.042		12.34	-28.18	140461.00	17.52		