

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2030-12-29T10:13:43.190
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 50146633696229760
 2Mass ID (if available) : 04035781+1842376

Saturn 2030-12-29T10:13:43 K9.27 G12.38 PgtRgt

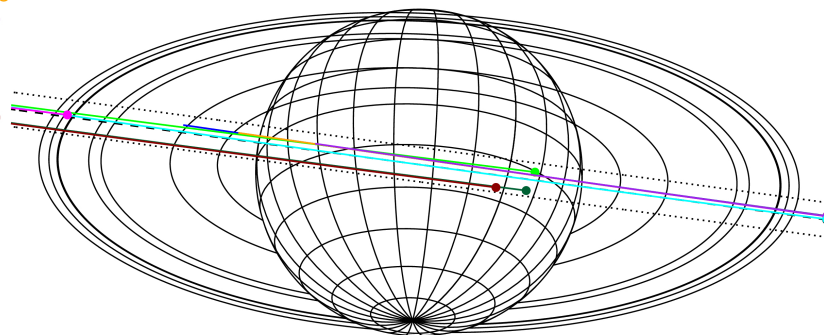
ICRS Star Coord at Epoch: 04h 03m 57.82183s +18:42:37.50214s

RUWE (>1.4 is poor) : 1.18
 K magnitude : 9.274
 G magnitude : 12.382
 RP magnitude : 11.478
 BP magnitude : 13.228
 DUPflag : 0
 Distance (au) : 8.238
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.82
 Sun-Target sep (deg) : 145.29
 Sun-Moon sep (deg) : 81.59
 B (ring opening deg) : -24.79
 PA of pole (deg) : -2.49

Saturn 2030-12-29T10:13:43 K9.27 G12.38
 PgtRgt



Earth
 PAL
 PMO
 KPNO
 MCD
 IRTF
 KAV
 AAT
 MSO



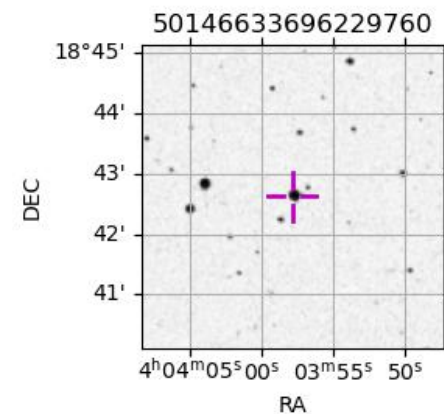
2030-12-29T10:13:43.1900 α: 04 03 57.8218 δ: +18 42 37.502 C/A 0.486° PA 172.28 deg v_sky -14.82 km/s D 08.24 AU
 Credit: Styled after SORA/Lucky Star

a(km) ring

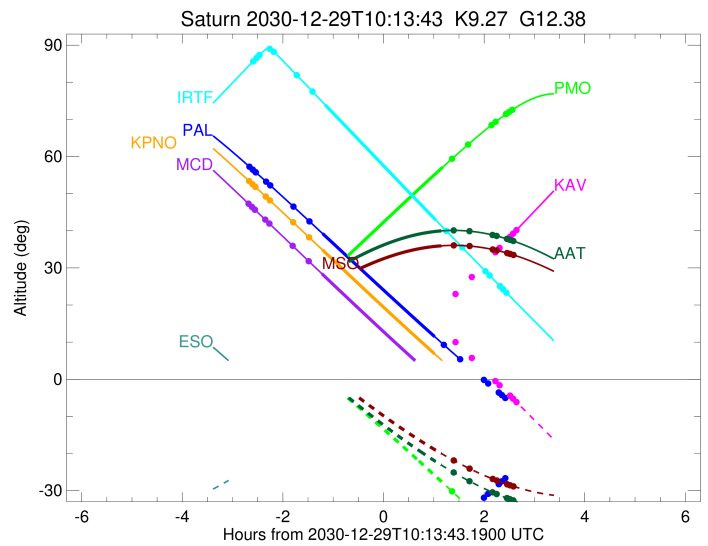
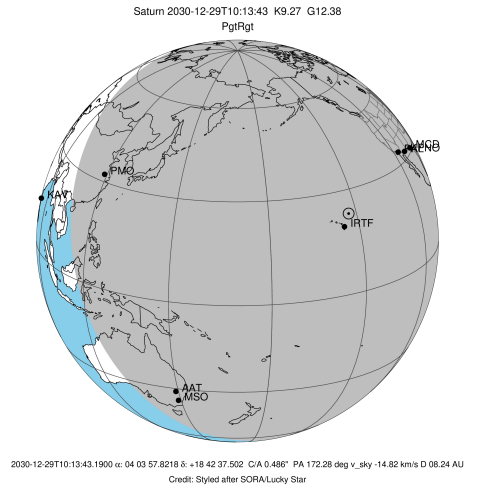
- 1 74490.6 C (IER)
- 2 91984.7 B (IER)
- 3 117571.2 B (OER)
- 4 122050.4 A (IER)
- 5 133423.3 Encke (IEG)
- 6 133744.9 Encke (OEG)
- 7 136774.4 A (OER)
- 8 140461.0 F ring

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	+ + + + + + +	+ +	+ +	DEC 29 07:33 - DEC 29 11:45	PieRie
PMO	Purple Mtn Obs	32.1	118.8		+	+ + + + + + + +	DEC 29 11:24 - DEC 29 12:47	PneRne
KPNO	Kitt Peak Natl	32.0	248.4	+ + + + + + +	+ +		DEC 29 07:33 - DEC 29 11:14	PieRin
MCD	McDonald Obs.	30.7	256.0	+ + + + + + +	+		DEC 29 07:32 - DEC 29 09:00	PinRin
TEN	Teide Obs./Ten	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+ + + + + + +	+ +	+ + + + + + + +	DEC 29 07:38 - DEC 29 12:40	PieRie
KAV	Kavalur Observ	12.6	78.8			+ +	DEC 29 12:48 - DEC 29 12:52	PnnRne
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European South	-29.3	289.3					PnnRnn
AAT	Siding Spring	-31.3	149.1		+	+ + + + + + + +	DEC 29 11:22 - DEC 29 12:48	PneRne
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0		+	+ + + + + + + +	DEC 29 11:22 - DEC 29 12:48	PneRne

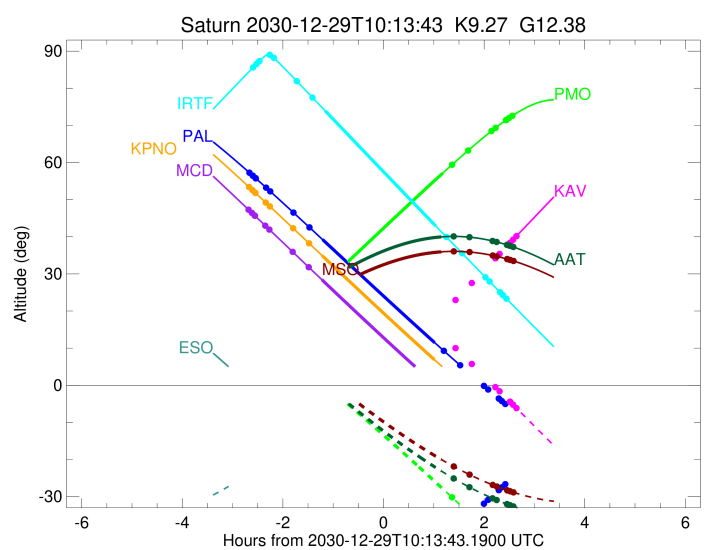
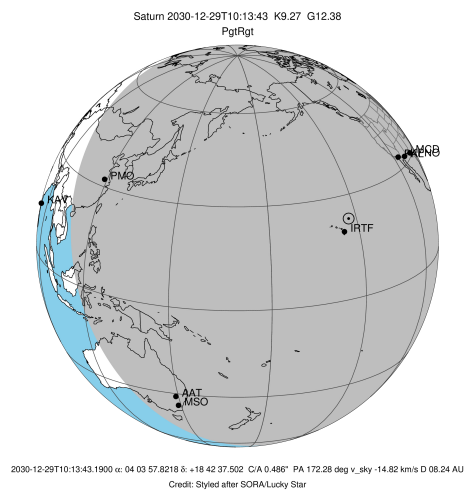


target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2030-12-29T10:07:38.080
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 50146633696229760
 2Mass ID (if available) : 04035781+1842376
 ICRS Star Coord at Epoch: 04h 03m 57.82183s +18:42:37.50214s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 9.274
 G magnitude : 12.382
 RP magnitude : 11.478
 BP magnitude : 13.228
 DUPflag : 0
 Distance (au) : 8.238
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.82
 Sun-Target sep (deg) : 145.29
 Sun-Moon sep (deg) : 82.09
 B (ring opening deg) : -24.79
 PA of pole (deg) : -2.49
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 0.834
 C/A sky separation (km) : 4984.5
 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



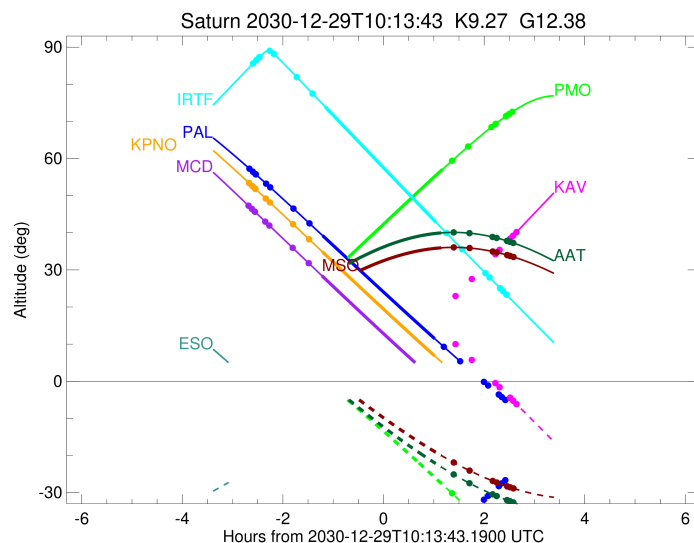
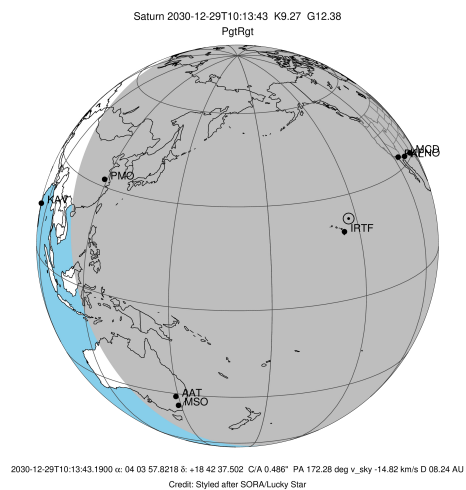
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2030-12-29T07:33:51.252		57.25	-79.47	140461.00	-15.44		
A (OER)	I	2030-12-29T07:37:49.997		56.46	-79.72	136774.40	-15.44		
Encke (OEG)	I	2030-12-29T07:41:06.265		55.80	-79.87	133744.89	-15.43		
Encke (IEG)	I	2030-12-29T07:41:27.102		55.73	-79.88	133423.31	-15.43		
A (IER)	I	2030-12-29T07:53:44.608		53.23	-79.99	122050.38	-15.41		
B (OER)	I	2030-12-29T07:58:35.399		52.24	-79.83	117571.16	-15.40		
B (IER)	I	2030-12-29T08:26:21.016		46.51	-77.15	91984.69	-15.32		
C (IER)	I	2030-12-29T08:45:26.198		42.52	-74.16	74490.58	-15.23		
Saturn	I	2030-12-29T09:00:59.208		39.27	-71.39	60267.78		-0.76	-0.93
Saturn	E	2030-12-29T11:14:46.642		11.48	-44.13	60234.75		9.45	11.56
C (IER)	E	2030-12-29T11:25:40.944		9.28	-41.85	74490.58	14.97		
B (IER)	E	2030-12-29T11:45:08.381		5.39	-37.79	91984.69	15.00		
B (OER)	E	2030-12-29T12:13:34.408		-0.19x	-31.89	117571.16	14.99		
A (IER)	E	2030-12-29T12:18:33.211		-1.15x	-30.86	122050.38	14.99		
Encke (IEG)	E	2030-12-29T12:31:12.282		-3.57x	-28.25	133423.31	14.98		
Encke (OEG)	E	2030-12-29T12:31:33.755		-3.63x	-28.18	133744.89	14.98		
A (OER)	E	2030-12-29T12:34:56.072		-4.27x	-27.49	136774.40	14.97		
F ring	E	2030-12-29T12:39:02.340		-5.05x	-26.64	140461.00	14.97		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2030-12-29T10:18:05.940
 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 : 50146633696229760
 2Mass ID (if available) : 04035781+1842376
 ICRS Star Coord at Epoch: 04h 03m 57.82183s +18:42:37.50214s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 9.274
 G magnitude : 12.382
 RP magnitude : 11.478
 BP magnitude : 13.228
 DUPflag : 0
 Distance (au) : 8.238
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.82
 Sun-Target sep (deg) : 145.29
 Sun-Moon sep (deg) : 82.15
 B (ring opening deg) : -24.79
 PA of pole (deg) : -2.49
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 0.923
 C/A sky separation (km) : 5516.0
 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	2030-12-29T07:42:22.990		10.44	14.54x	140461.00	-15.01		
A (OER)	I	2030-12-29T07:46:28.547		11.28	13.87x	136774.40	-15.01		
Encke (OEG)	I	2030-12-29T07:49:50.309		11.97	13.32x	133744.89	-15.02		
Encke (IEG)	I	2030-12-29T07:50:11.725		12.05	13.26x	133423.31	-15.02		
A (IER)	I	2030-12-29T08:02:48.974		14.65	11.14x	122050.38	-15.02		
B (OER)	I	2030-12-29T08:07:47.172		15.69	10.29x	117571.16	-15.02		
B (IER)	I	2030-12-29T08:36:11.153		21.62	5.27x	91984.69	-15.00		
C (IER)	I	2030-12-29T08:55:38.956		25.72	1.70x	74490.58	-14.95		
Saturn	I	2030-12-29T09:11:29.761		29.07	-1.27x	60267.91		0.47	0.58
Saturn	E	2030-12-29T11:24:19.931		57.14	-27.87	60237.18		9.10	11.13
C (IER)	E	2030-12-29T11:35:28.336		59.41	-30.19	74490.58	15.14		
B (IER)	E	2030-12-29T11:54:39.513		63.24	-34.21	91984.69	15.24		
B (OER)	E	2030-12-29T12:22:33.292		68.49	-40.09	117571.16	15.32		
A (IER)	E	2030-12-29T12:27:25.518		69.35	-41.12	122050.38	15.33		
Encke (IEG)	E	2030-12-29T12:39:46.726		71.41	-43.74	133423.31	15.35		
Encke (OEG)	E	2030-12-29T12:40:07.670		71.47	-43.81	133744.89	15.35		
A (OER)	E	2030-12-29T12:43:24.943		71.99	-44.51	136774.40	15.36		
F ring	E	2030-12-29T12:47:24.922		72.59	-45.36	140461.00	15.36		

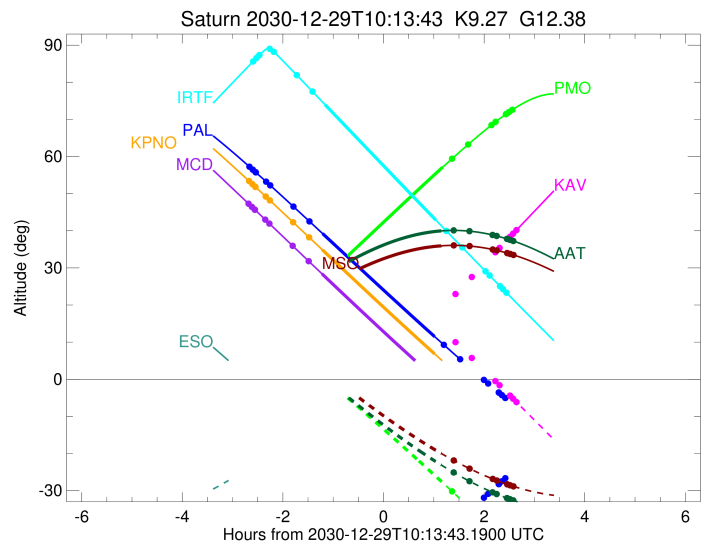
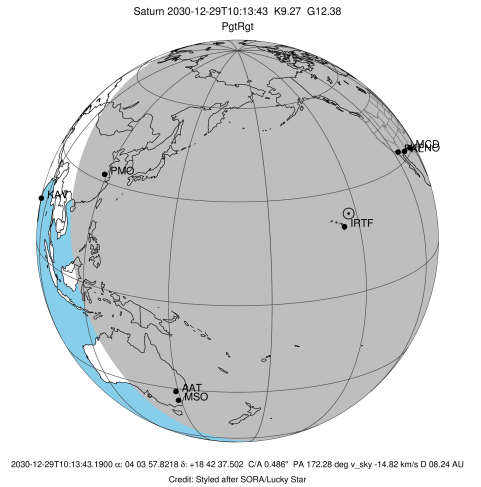
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2030-12-29T10:07:23.380
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KPNO
 Location : Kitt Peak Natl Obs
 Latitude (deg) : 31.96333
 E. Longitude (deg) : 248.40000
 Altitude (km) : 2.120
 Gaia source ID : 50146633696229760
 2Mass ID (if available) : 04035781+1842376
 ICRS Star Coord at Epoch: 04h 03m 57.82183s +18:42:37.50214s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 9.274
 G magnitude : 12.382
 RP magnitude : 11.478
 BP magnitude : 13.228
 DUPflag : 0
 Distance (au) : 8.238
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.82
 Sun-Target sep (deg) : 145.29
 Sun-Moon sep (deg) : 82.03
 B (ring opening deg) : -24.79
 PA of pole (deg) : -2.49
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 0.833
 C/A sky separation (km) : 4977.1
 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

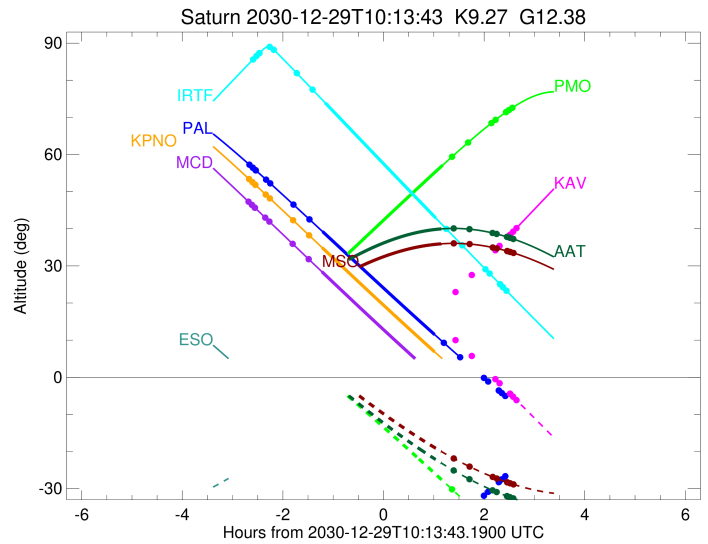
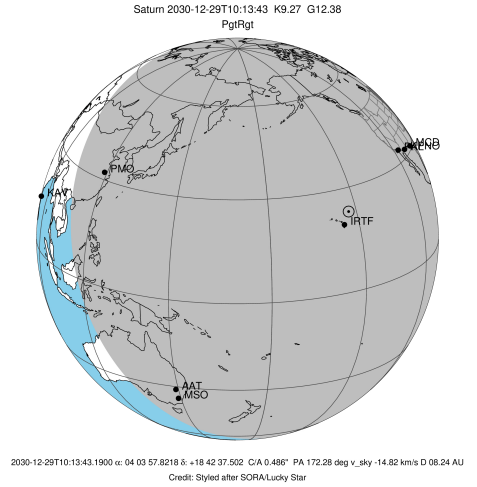
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2030-12-29T07:33:24.100		53.40	-81.35	140461.00	-15.44		
A (OER)	I	2030-12-29T07:37:22.986		52.57	-81.19	136774.40	-15.43		
Encke (OEG)	I	2030-12-29T07:40:39.377		51.88	-81.00	133744.89	-15.42		
Encke (IEG)	I	2030-12-29T07:41:00.228		51.81	-80.98	133423.31	-15.42		
A (IER)	I	2030-12-29T07:53:18.251		49.22	-79.80	122050.38	-15.40		
B (OER)	I	2030-12-29T07:58:09.269		48.19	-79.18	117571.16	-15.39		
B (IER)	I	2030-12-29T08:25:56.424		42.30	-74.64	91984.69	-15.30		
C (IER)	I	2030-12-29T08:45:02.888		38.23	-71.00	74490.58	-15.21		
Saturn	I	2030-12-29T09:00:36.837		34.91	-67.88	60267.76		-0.80	-0.98
Saturn	E	2030-12-29T11:14:41.115		6.85	-39.64	60234.59		9.47	11.58
C (IER)	E	2030-12-29T11:25:35.517		4.64x	-37.34	74490.58	14.93		
B (IER)	E	2030-12-29T11:45:05.594		0.75x	-33.23	91984.69	14.96		
B (OER)	E	2030-12-29T12:13:35.612		-4.81x	-27.27	117571.16	14.96		
A (IER)	E	2030-12-29T12:18:35.126		-5.77x	-26.23	122050.38	14.95		
Encke (IEG)	E	2030-12-29T12:31:16.012		-8.17x	-23.61	133423.31	14.94		
Encke (OEG)	E	2030-12-29T12:31:37.536		-8.24x	-23.53	133744.89	14.94		
A (OER)	E	2030-12-29T12:35:00.339		-8.87x	-22.84	136774.40	14.94		
F ring	E	2030-12-29T12:39:07.199		-9.64x	-21.99	140461.00	14.93		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2030-12-29T10:07:09.310
 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 : 50146633696229760
 2Mass ID (if available) : 04035781+1842376
 ICRS Star Coord at Epoch: 04h 03m 57.82183s +18:42:37.50214s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 9.274
 G magnitude : 12.382
 RP magnitude : 11.478
 BP magnitude : 13.228
 DUPflag : 0
 Distance (au) : 8.238
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.82
 Sun-Target sep (deg) : 145.29
 Sun-Moon sep (deg) : 81.93
 B (ring opening deg) : -24.79
 PA of pole (deg) : -2.49
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 0.847
 C/A sky separation (km) : 5058.5
 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_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	2030-12-29T07:32:46.493		47.30	-79.37	140461.00	-15.41		
A (OER)	I	2030-12-29T07:36:45.743		46.44	-78.71	136774.40	-15.40		
Encke (OEG)	I	2030-12-29T07:40:02.444		45.73	-78.14	133744.89	-15.40		
Encke (IEG)	I	2030-12-29T07:40:23.328		45.66	-78.08	133423.31	-15.40		
A (IER)	I	2030-12-29T07:52:42.604		43.00	-75.81	122050.38	-15.37		
B (OER)	I	2030-12-29T07:57:34.153		41.95	-74.87	117571.16	-15.36		
B (IER)	I	2030-12-29T08:25:24.771		35.93	-69.24	91984.69	-15.27		
C (IER)	I	2030-12-29T08:44:34.072		31.80	-65.22	74490.58	-15.17		
Saturn	I	2030-12-29T09:00:10.807		28.44	-61.90	60267.77		-0.77	-0.95
Saturn	E	2030-12-29T11:14:40.551		0.31x	-33.05	60233.87		9.58	11.71
C (IER)	E	2030-12-29T11:25:31.248		-1.85x	-30.75	74490.58	14.88		
B (IER)	E	2030-12-29T11:45:05.744		-5.70x	-26.62	91984.69	14.91		
B (OER)	E	2030-12-29T12:13:42.072		-11.17x	-20.64	117571.16	14.90		
A (IER)	E	2030-12-29T12:18:42.676		-12.10x	-19.60	122050.38	14.90		
Encke (IEG)	E	2030-12-29T12:31:26.315		-14.45x	-16.98	133423.31	14.89		
Encke (OEG)	E	2030-12-29T12:31:47.916		-14.51x	-16.90	133744.89	14.89		
A (OER)	E	2030-12-29T12:35:11.447		-15.13x	-16.21	136774.40	14.88		
F ring	E	2030-12-29T12:39:19.191		-15.87x	-15.36	140461.00	14.88		

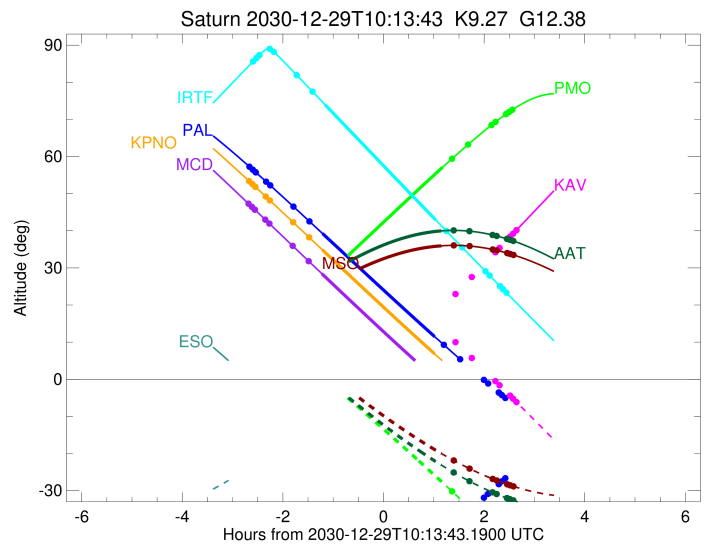
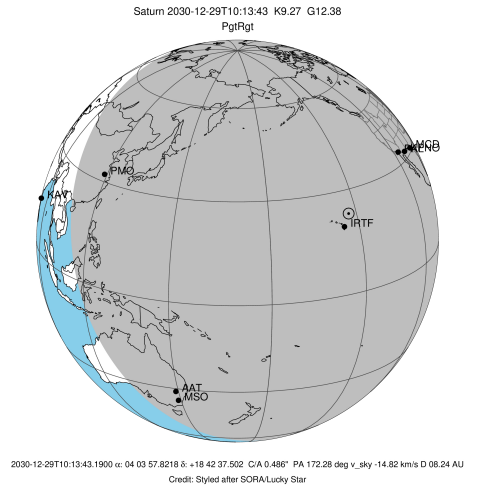
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2030-12-29T10:09:57.380
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : IRTF
 Location : Mauna Kea/IRTF
 Latitude (deg) : 19.82622
 E. Longitude (deg) : 204.52800
 Altitude (km) : 4.168
 Gaia source ID : 50146633696229760
 2Mass ID (if available) : 04035781+1842376
 ICRS Star Coord at Epoch: 04h 03m 57.82183s +18:42:37.50214s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 9.274
 G magnitude : 12.382
 RP magnitude : 11.478
 BP magnitude : 13.228
 DUPflag : 0
 Distance (au) : 8.238
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.82
 Sun-Target sep (deg) : 145.29
 Sun-Moon sep (deg) : 82.47
 B (ring opening deg) : -24.79
 PA of pole (deg) : -2.49
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 0.485
 C/A sky separation (km) : 2899.5
 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_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	2030-12-29T07:38:15.413		85.62	-51.44	140461.00	-15.54		
A (OER)	I	2030-12-29T07:42:12.663		86.53	-52.35	136774.40	-15.54		
Encke (OEG)	I	2030-12-29T07:45:27.630		87.26	-53.10	133744.89	-15.54		
Encke (IEG)	I	2030-12-29T07:45:48.325		87.34	-53.18	133423.31	-15.54		
A (IER)	I	2030-12-29T07:58:00.297		89.01	-55.98	122050.38	-15.54		
B (OER)	I	2030-12-29T08:02:48.624		88.22	-57.08	117571.16	-15.53		
B (IER)	I	2030-12-29T08:30:16.577		81.92	-63.39	91984.69	-15.51		
C (IER)	I	2030-12-29T08:49:05.080		77.49	-67.70	74490.58	-15.49		
Saturn	I	2030-12-29T09:04:04.839		73.95	-71.13	60266.04		-2.28	-2.80
Saturn	E	2030-12-29T11:16:09.085		42.87	-77.35	60247.38		7.43	9.10
C (IER)	E	2030-12-29T11:28:33.913		39.97	-74.56	74490.58	15.34		
B (IER)	E	2030-12-29T11:47:34.529		35.54	-70.24	91984.69	15.33		
B (OER)	E	2030-12-29T12:15:24.558		29.08	-63.87	117571.16	15.31		
A (IER)	E	2030-12-29T12:20:17.275		27.95	-62.75	122050.38	15.30		
Encke (IEG)	E	2030-12-29T12:32:41.082		25.08	-59.90	133423.31	15.28		
Encke (OEG)	E	2030-12-29T12:33:02.126		25.00	-59.82	133744.89	15.28		
A (OER)	E	2030-12-29T12:36:20.418		24.24	-59.06	136774.40	15.28		
F ring	E	2030-12-29T12:40:21.809		23.31	-58.14	140461.00	15.27		

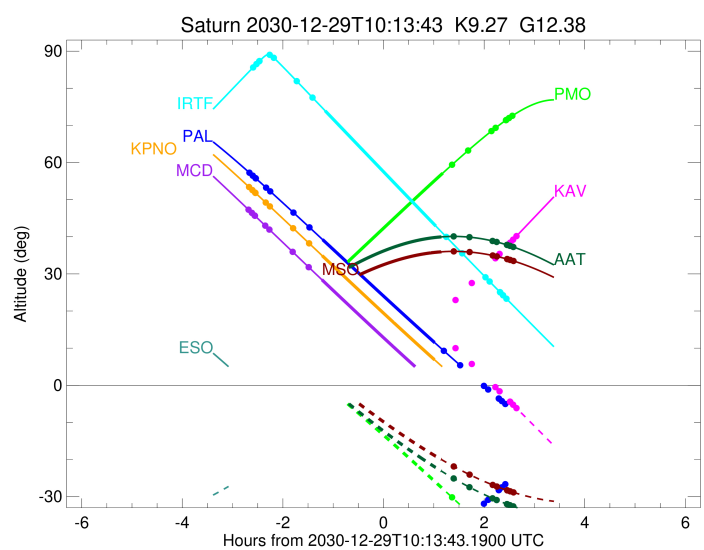
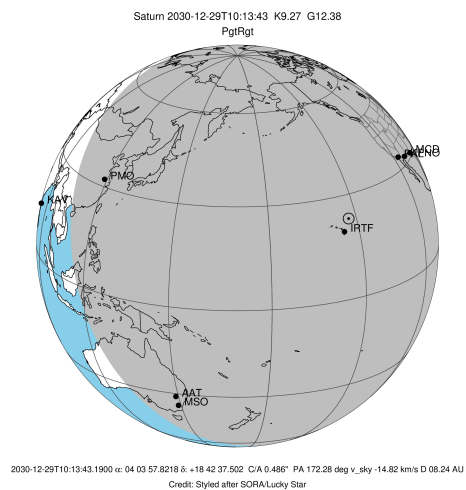
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2030-12-29T10:20:31.540
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 50146633696229760
 2Mass ID (if available) : 04035781+1842376
 ICRS Star Coord at Epoch: 04h 03m 57.82183s +18:42:37.50214s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 9.274
 G magnitude : 12.382
 RP magnitude : 11.478
 BP magnitude : 13.228
 DUPflag : 0
 Distance (au) : 8.238
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.82
 Sun-Target sep (deg) : 145.29
 Sun-Moon sep (deg) : 81.50
 B (ring opening deg) : -24.79
 PA of pole (deg) : -2.49
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 0.839
 C/A sky separation (km) : 5014.6
 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	2030-12-29T07:41:55.873	-31.06x	51.81x	140461.00	-14.74			
A (OER)	I	2030-12-29T07:46:05.913	-30.18x	51.44x	136774.40	-14.74			
Encke (OEG)	I	2030-12-29T07:49:31.368	-29.46x	51.11x	133744.89	-14.75			
Encke (IEG)	I	2030-12-29T07:49:53.176	-29.38x	51.08x	133423.31	-14.75			
A (IER)	I	2030-12-29T08:02:44.336	-26.64x	49.73x	122050.38	-14.75			
B (OER)	I	2030-12-29T08:07:48.021	-25.56x	49.14x	117571.16	-14.75			
B (IER)	I	2030-12-29T08:36:43.087	-19.23x	45.27x	91984.69	-14.74			
C (IER)	I	2030-12-29T08:56:31.358	-14.81x	42.20x	74490.58	-14.70			
Saturn	I	2030-12-29T09:12:38.442	-11.18x	39.50x	60268.00			0.05	0.06
Saturn	E	2030-12-29T11:27:50.313	20.18	12.56x	60240.73			8.55	10.47
C (IER)	E	2030-12-29T11:39:37.257	22.96	10.00x	74490.58	14.97			
B (IER)	E	2030-12-29T11:59:01.800	27.55	5.74x	91984.69	15.07			
B (OER)	E	2030-12-29T12:27:13.943	34.23	-0.52x	117571.16	15.17			
A (IER)	E	2030-12-29T12:32:09.161	35.39	-1.62x	122050.38	15.18			
Encke (IEG)	E	2030-12-29T12:44:37.616	38.35	-4.42x	133423.31	15.21			
Encke (OEG)	E	2030-12-29T12:44:58.757	38.44	-4.50x	133744.89	15.21			
A (OER)	E	2030-12-29T12:48:17.867	39.22	-5.25	136774.40	15.22			
F ring	E	2030-12-29T12:52:20.028	40.18	-6.16	140461.00	15.23			

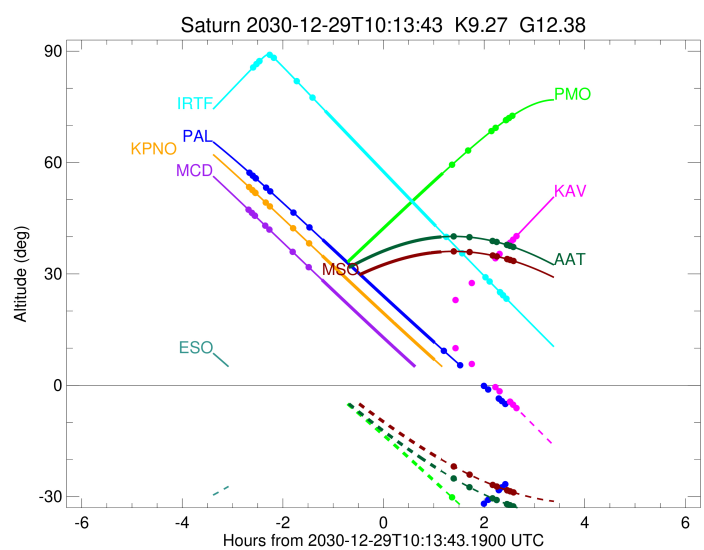
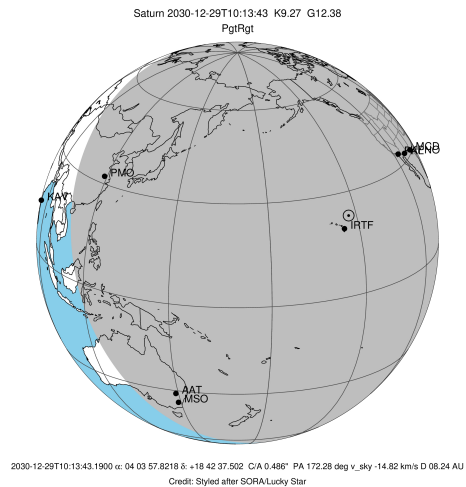
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2030-12-29T10:16:31.580
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : AAT
 Location : Siding Spring (AAT)
 Latitude (deg) : -31.27703
 E. Longitude (deg) : 149.06608
 Altitude (km) : 1.164
 Gaia source ID : 50146633696229760
 2Mass ID (if available) : 04035781+1842376
 ICRS Star Coord at Epoch: 04h 03m 57.82183s +18:42:37.50214s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 9.274
 G magnitude : 12.382
 RP magnitude : 11.478
 BP magnitude : 13.228
 DUPflag : 0
 Distance (au) : 8.238
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.82
 Sun-Target sep (deg) : 145.29
 Sun-Moon sep (deg) : 82.11
 B (ring opening deg) : -24.79
 PA of pole (deg) : -2.49
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 0.261
 C/A sky separation (km) : 1559.3
 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



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	2030-12-29T07:44:56.746		15.02	15.94x	140461.00	-15.28		
A (OER)	I	2030-12-29T07:48:58.043		15.74	15.12x	136774.40	-15.28		
Encke (OEG)	I	2030-12-29T07:52:16.274		16.32	14.45x	133744.89	-15.28		
Encke (IEG)	I	2030-12-29T07:52:37.312		16.39	14.38x	133423.31	-15.29		
A (IER)	I	2030-12-29T08:05:01.001		18.55	11.88x	122050.38	-15.30		
B (OER)	I	2030-12-29T08:09:53.711		19.38	10.90x	117571.16	-15.31		
B (IER)	I	2030-12-29T08:37:43.885		23.94	5.39x	91984.69	-15.33		
C (IER)	I	2030-12-29T08:56:44.344		26.84	1.71x	74490.58	-15.35		
Saturn	I	2030-12-29T09:10:19.623		28.79	-0.88x	60255.66		-5.74	-7.04
Saturn	E	2030-12-29T11:22:36.311		39.97	-23.10	60264.29		3.14	3.86
C (IER)	E	2030-12-29T11:37:22.965		40.10	-25.10	74490.58	15.44		
B (IER)	E	2030-12-29T11:56:15.477		39.90	-27.46	91984.69	15.45		
B (OER)	E	2030-12-29T12:23:51.300		38.87	-30.46	117571.16	15.45		
A (IER)	E	2030-12-29T12:28:41.178		38.60	-30.92	122050.38	15.45		
Encke (IEG)	E	2030-12-29T12:40:57.270		37.82	-32.02	133423.31	15.45		
Encke (OEG)	E	2030-12-29T12:41:18.086		37.79	-32.05	133744.89	15.45		
A (OER)	E	2030-12-29T12:44:34.192		37.56	-32.31	136774.40	15.45		
F ring	E	2030-12-29T12:48:32.851		37.25	-32.63	140461.00	15.45		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2030-12-29T10:16:28.650
 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 : 50146633696229760
 2Mass ID (if available) : 04035781+1842376
 ICRS Star Coord at Epoch: 04h 03m 57.82183s +18:42:37.50214s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 9.274
 G magnitude : 12.382
 RP magnitude : 11.478
 BP magnitude : 13.228
 DUPflag : 0
 Distance (au) : 8.238
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.82
 Sun-Target sep (deg) : 145.29
 Sun-Moon sep (deg) : 82.06
 B (ring opening deg) : -24.79
 PA of pole (deg) : -2.49
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 0.309
 C/A sky separation (km) : 1846.7
 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_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	2030-12-29T07:44:55.531		12.73	17.19x	140461.00	-15.27		
A (OER)	I	2030-12-29T07:48:56.977		13.41	16.40x	136774.40	-15.27		
Encke (OEG)	I	2030-12-29T07:52:15.334		13.96	15.76x	133744.89	-15.27		
Encke (IEG)	I	2030-12-29T07:52:36.386		14.02	15.69x	133423.31	-15.28		
A (IER)	I	2030-12-29T08:05:00.590		16.06	13.28x	122050.38	-15.29		
B (OER)	I	2030-12-29T08:09:53.520		16.85	12.34x	117571.16	-15.29		
B (IER)	I	2030-12-29T08:37:45.169		21.14	7.05x	91984.69	-15.32		
C (IER)	I	2030-12-29T08:56:46.909		23.85	3.52x	74490.58	-15.33		
Saturn	I	2030-12-29T09:10:13.226		25.65	1.07x	60254.51		-6.00	-7.36
Saturn	E	2030-12-29T11:22:37.417		35.95	-19.99	60264.83		2.91	3.57
C (IER)	E	2030-12-29T11:37:30.361		36.07	-21.87	74490.58	15.42		
B (IER)	E	2030-12-29T11:56:24.614		35.89	-24.07	91984.69	15.43		
B (OER)	E	2030-12-29T12:24:02.757		34.96	-26.86	117571.16	15.43		
A (IER)	E	2030-12-29T12:28:53.024		34.71	-27.28	122050.38	15.43		
Encke (IEG)	E	2030-12-29T12:41:10.085		34.00	-28.29	133423.31	15.43		
Encke (OEG)	E	2030-12-29T12:41:30.928		33.98	-28.32	133744.89	15.43		
A (OER)	E	2030-12-29T12:44:47.288		33.76	-28.57	136774.40	15.43		
F ring	E	2030-12-29T12:48:46.254		33.48	-28.86	140461.00	15.43		