

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-06-29T02:31:30.390
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 6865157575123037312
 2Mass ID (if available) : 19460783-2110150

Saturn 2049-06-29T02:31:30 K9.14 G11.61 PgtRgt

ICRS Star Coord at Epoch: 19h 46m 07.85030s -21:10:15.40632s

RUWE (>1.4 is poor) : 1.00
 K magnitude : 9.142
 G magnitude : 11.610
 RP magnitude : 10.870
 BP magnitude : 12.211
 DUPflag : 0
 Distance (au) : 9.033
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.78
 Sun-Target sep (deg) : 162.51
 Sun-Moon sep (deg) : 150.46
 B (ring opening deg) : 22.61
 PA of pole (deg) : 6.84

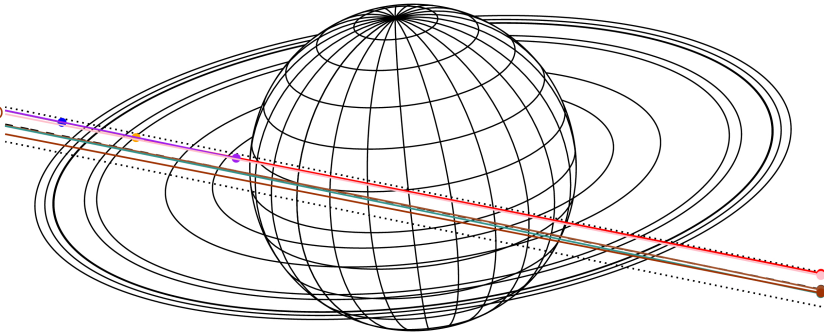
a(km) ring

- 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



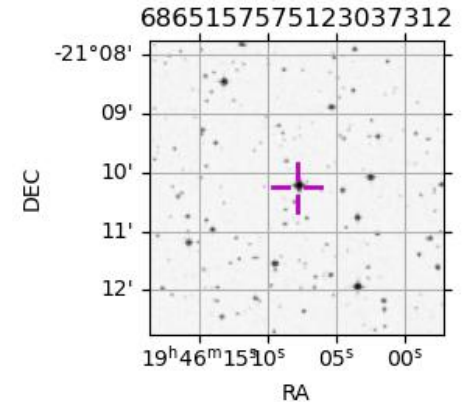
2049-06-29T02:31:30.3900 at: 19 46 07.8503 s: -21 10 15.406 C/A 2.173° PA 348.57 deg v_sky -18.78 km/s D 09.03 AU
 Credit: Styled after SORA/Lucky Star

Earth
 PIC
 PAL
 KPNO
 MCD
 TEN
 RIO
 ESO
 SAAO

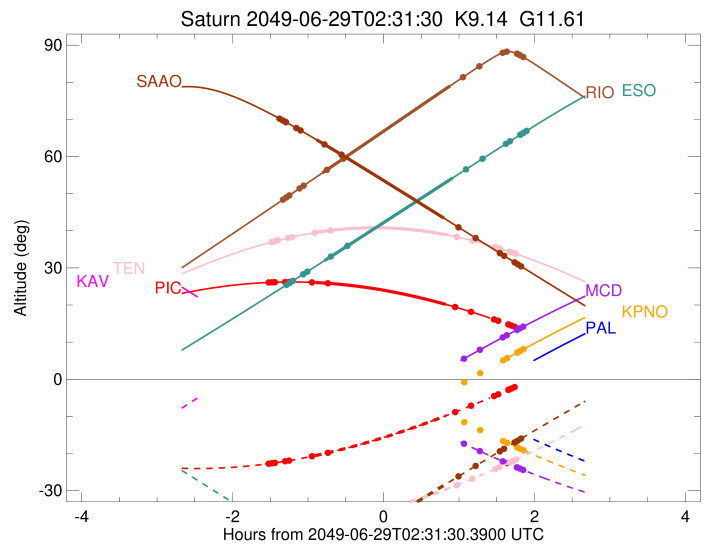
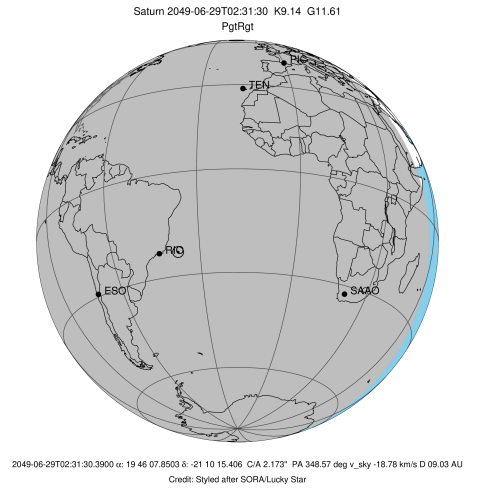


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEncode
PIC	Pic du Midi	42.9	0.1	+	+	+	JUN 29 01:00 - JUN 29 03:41	PieRie
PAL	Palomar Mt (20	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl	32.0	248.4			+	JUN 29 04:06 - JUN 29 04:22	PnnRne
MCD	McDonald Obs.	30.7	256.0			+	JUN 29 03:35 - JUN 29 04:22	PnnRne
TEN	Teide Obs./Ten	28.3	343.5	+	+	+	JUN 29 01:02 - JUN 29 04:16	PieRie
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	+	+	+	JUN 29 01:11 - JUN 29 04:22	PieRie
ESO	European South	-29.3	289.3	+	+	+	JUN 29 01:14 - JUN 29 04:25	PieRie
AAT	Siding Spring	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro	-32.4	20.8	+	+	+	JUN 29 01:08 - JUN 29 04:20	PieRie
MSO	Mt. Stromlo Ob	-35.3	149.0					PnnRnn



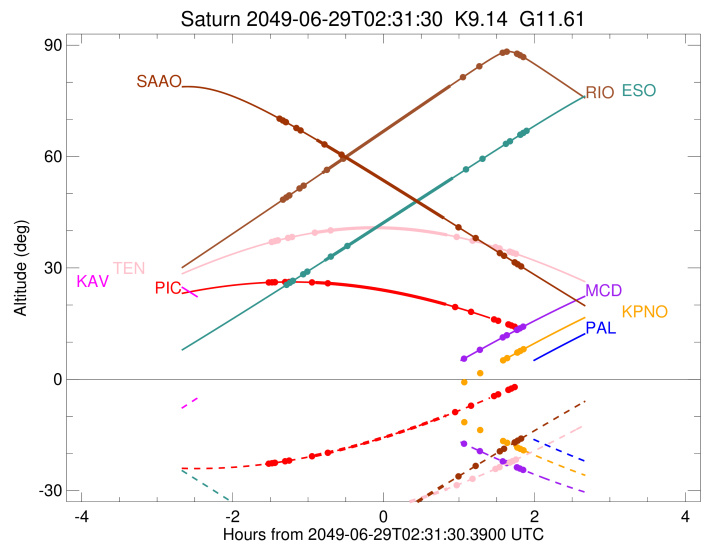
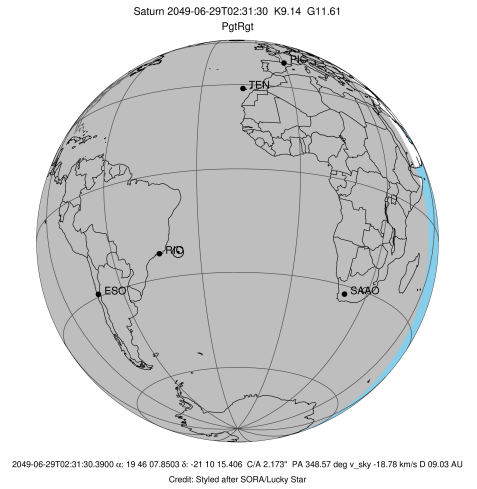
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-06-29T02:29:12.250
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 6865157575123037312
 2Mass ID (if available) : 19460783-2110150
 ICRS Star Coord at Epoch: 19h 46m 07.85030s -21:10:15.40632s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 9.142
 G magnitude : 11.610
 RP magnitude : 10.870
 BP magnitude : 12.211
 DUPflag : 0
 Distance (au) : 9.033
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.78
 Sun-Target sep (deg) : 162.51
 Sun-Moon sep (deg) : 150.90
 B (ring opening deg) : 22.61
 PA of pole (deg) : 6.84
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 1.374
 C/A sky separation (km) : 9004.6
 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	2049-06-29T01:00:21.143		26.08	-22.73	140461.00	-23.62		
A (OER)	I	2049-06-29T01:02:57.288		26.12	-22.61	136774.40	-23.60		
Encke (OEG)	I	2049-06-29T01:05:05.674		26.14	-22.51	133744.89	-23.59		
Encke (IEG)	I	2049-06-29T01:05:19.306		26.14	-22.50	133423.31	-23.59		
A (IER)	I	2049-06-29T01:13:21.956		26.20	-22.08	122050.38	-23.54		
B (OER)	I	2049-06-29T01:16:32.376		26.21	-21.90	117571.16	-23.51		
B (IER)	I	2049-06-29T01:34:45.242		26.10	-20.74	91984.69	-23.29		
C (IER)	I	2049-06-29T01:47:20.741	b	25.85	-19.80	74490.58	-22.99		
Saturn	I	2049-06-29T01:37:21.361		26.06	-20.55	60098.05		-24.39	-29.03
Saturn	E	2049-06-29T03:21:14.773		20.15	-9.80	60245.75		8.58	10.50
C (IER)	E	2049-06-29T03:28:25.211		19.46	-8.86	74490.58	22.90		
B (IER)	E	2049-06-29T03:41:04.299		18.17	-7.14	91984.69	23.16		
B (OER)	E	2049-06-29T03:59:24.441		16.13	-4.53x	117571.16	23.33		
A (IER)	E	2049-06-29T04:02:36.347		15.76	-4.07x	122050.38	23.35		
Encke (IEG)	E	2049-06-29T04:10:43.036		14.79	-2.87x	133423.31	23.38		
Encke (OEG)	E	2049-06-29T04:10:56.788		14.76	-2.84x	133744.89	23.39		
A (OER)	E	2049-06-29T04:13:06.314		14.49	-2.51x	136774.40	23.39		
F ring	E	2049-06-29T04:15:43.883		14.17	-2.12x	140461.00	23.40		

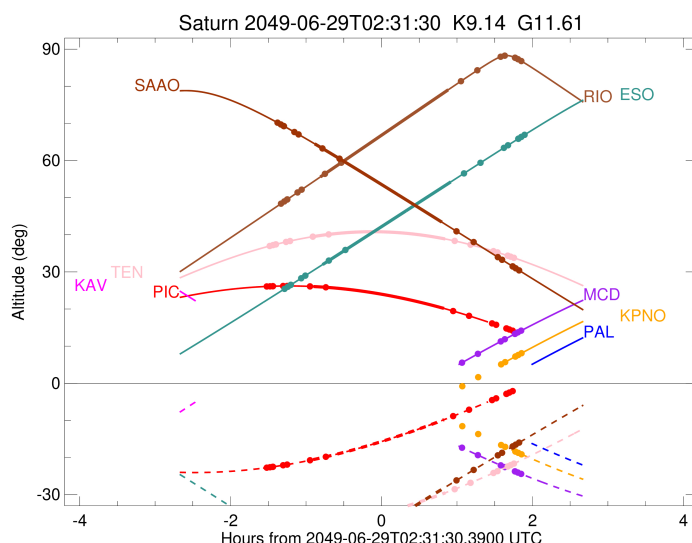
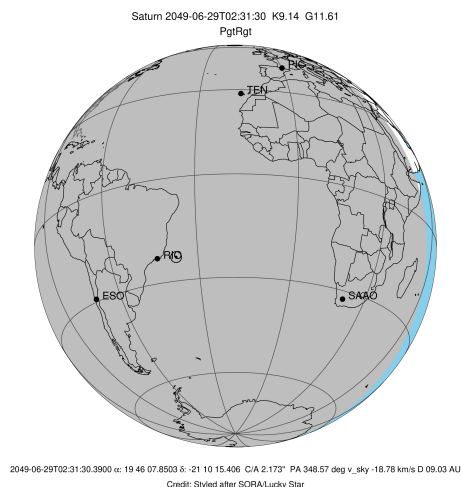
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-06-29T02:35:43.750
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KPNO
 Location : Kitt Peak Natl Obs
 Latitude (deg) : 31.96333
 E. Longitude (deg) : 248.40000
 Altitude (km) : 2.120
 Gaia source ID : 6865157575123037312
 2Mass ID (if available) : 19460783-2110150
 ICRS Star Coord at Epoch: 19h 46m 07.85030s -21:10:15.40632s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 9.142
 G magnitude : 11.610
 RP magnitude : 10.870
 BP magnitude : 12.211
 DUPflag : 0
 Distance (au) : 9.033
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.78
 Sun-Target sep (deg) : 162.51
 Sun-Moon sep (deg) : 149.74
 B (ring opening deg) : 22.61
 PA of pole (deg) : 6.84
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 1.548
 C/A sky separation (km) : 10141.2
 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	2049-06-29T01:07:46.054		-31.06x	16.42x	140461.00	-23.28		
A (OER)	I	2049-06-29T01:10:24.426		-30.50x	15.88x	136774.40	-23.27		
Encke (OEG)	I	2049-06-29T01:12:34.622		-30.05x	15.45x	133744.89	-23.26		
Encke (IEG)	I	2049-06-29T01:12:48.445		-30.00x	15.40x	133423.31	-23.26		
A (IER)	I	2049-06-29T01:20:57.747		-28.28x	13.76x	122050.38	-23.22		
B (OER)	I	2049-06-29T01:24:10.736		-27.60x	13.11x	117571.16	-23.20		
B (IER)	I	2049-06-29T01:42:38.092		-23.72x	9.44x	91984.69	-22.98		
C (IER)	I	2049-06-29T01:55:24.140	b	-21.06x	6.93x	74490.58	-22.65		
Saturn	I	2049-06-29T01:43:05.328		-23.63x	9.35x	60075.93		-26.05	-30.88
Saturn	E	2049-06-29T03:28:15.555		-2.25x	-10.28	60247.41		8.25	10.10
C (IER)	E	2049-06-29T03:35:41.622		-0.80x	-11.55	74490.58	22.86		
B (IER)	E	2049-06-29T03:48:20.510		1.64x	-13.67	91984.69	23.21		
B (OER)	E	2049-06-29T04:06:35.653		5.09	-16.63	117571.17	23.48		
A (IER)	E	2049-06-29T04:09:46.254		5.68	-17.13	122050.38	23.52		
Encke (IEG)	E	2049-06-29T04:17:49.139		7.17	-18.37	133423.31	23.59		
Encke (OEG)	E	2049-06-29T04:18:02.773		7.22	-18.41	133744.89	23.59		
A (OER)	E	2049-06-29T04:20:11.171		7.61	-18.73	136774.40	23.60		
F ring	E	2049-06-29T04:22:47.306		8.09	-19.13	140461.00	23.62		

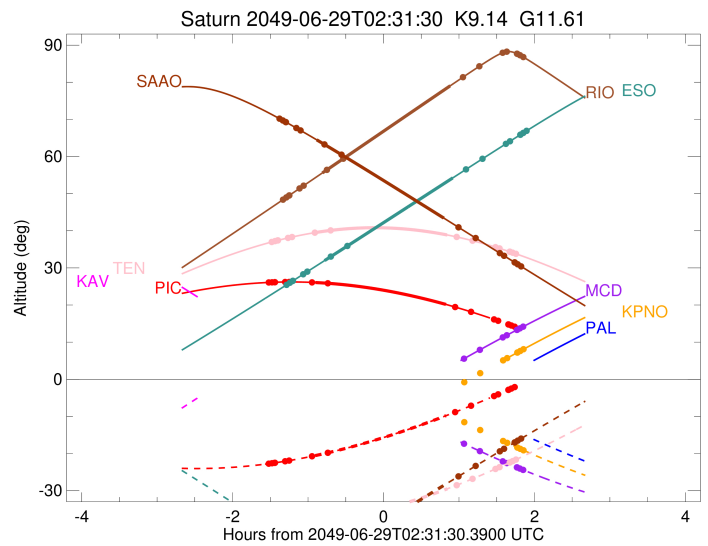
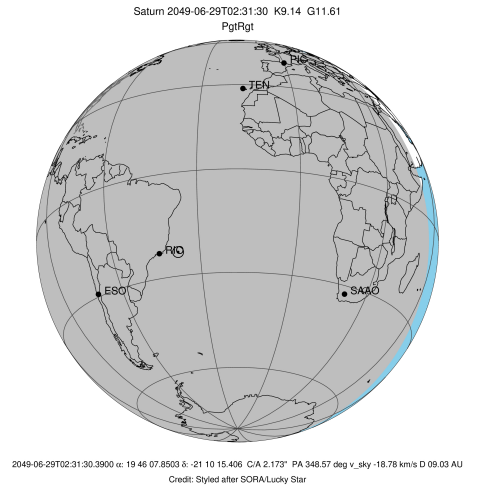
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-06-29T02:35:44.720
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : MCD
 Location : McDonald Obs. 2.7m
 Latitude (deg) : 30.67158
 E. Longitude (deg) : 255.97844
 Altitude (km) : 2.075
 Gaia source ID : 6865157575123037312
 2Mass ID (if available) : 19460783-2110150
 ICRS Star Coord at Epoch: 19h 46m 07.85030s -21:10:15.40632s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 9.142
 G magnitude : 11.610
 RP magnitude : 10.870
 BP magnitude : 12.211
 DUPflag : 0
 Distance (au) : 9.033
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.78
 Sun-Target sep (deg) : 162.51
 Sun-Moon sep (deg) : 149.78
 B (ring opening deg) : 22.61
 PA of pole (deg) : 6.84
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 1.524
 C/A sky separation (km) : 9987.5
 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

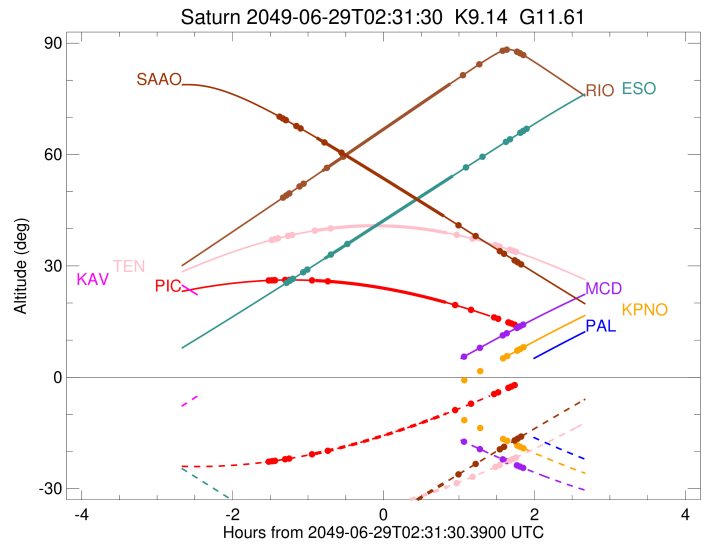
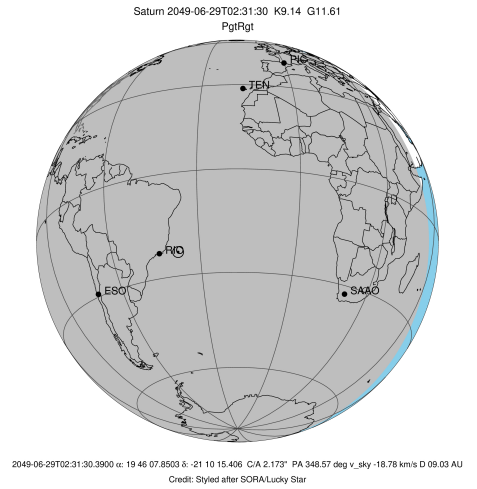
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2049-06-29T01:07:48.341		-24.45x	9.87x	140461.00	-23.35		
A (OER)	I	2049-06-29T01:10:26.260		-23.89x	9.34x	136774.40	-23.34		
Encke (OEG)	I	2049-06-29T01:12:36.081		-23.43x	8.91x	133744.89	-23.33		
Encke (IEG)	I	2049-06-29T01:12:49.864		-23.38x	8.86x	133423.31	-23.33		
A (IER)	I	2049-06-29T01:20:57.740		-21.67x	7.24x	122050.38	-23.29		
B (OER)	I	2049-06-29T01:24:10.159		-20.99x	6.60x	117571.16	-23.27		
B (IER)	I	2049-06-29T01:42:34.094		-17.13x	2.99x	91984.69	-23.06		
C (IER)	I	2049-06-29T01:55:17.513	b	-14.48x	0.52x	74490.58	-22.74		
Saturn	I	2049-06-29T01:43:13.512		-16.99x	2.86x	60078.04		-25.90	-30.71
Saturn	E	2049-06-29T03:28:09.264		4.14x	-16.16	60246.89		8.35	10.23
C (IER)	E	2049-06-29T03:35:29.496		5.54	-17.36	74490.58	22.93		
B (IER)	E	2049-06-29T03:48:06.273		7.92	-19.36	91984.69	23.27		
B (OER)	E	2049-06-29T04:06:18.916		11.27	-22.11	117571.16	23.53		
A (IER)	E	2049-06-29T04:09:29.128		11.85	-22.57	122050.38	23.56		
Encke (IEG)	E	2049-06-29T04:17:31.078		13.29	-23.72	133423.31	23.63		
Encke (OEG)	E	2049-06-29T04:17:44.687		13.33	-23.75	133744.89	23.63		
A (OER)	E	2049-06-29T04:19:52.848		13.70	-24.05	136774.40	23.65		
F ring	E	2049-06-29T04:22:28.701		14.16	-24.41	140461.00	23.66		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-06-29T02:30:28.270
 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 : 6865157575123037312
 2Mass ID (if available) : 19460783-2110150
 ICRS Star Coord at Epoch: 19h 46m 07.85030s -21:10:15.40632s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 9.142
 G magnitude : 11.610
 RP magnitude : 10.870
 BP magnitude : 12.211
 DUPflag : 0
 Distance (au) : 9.033
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.78
 Sun-Target sep (deg) : 162.51
 Sun-Moon sep (deg) : 150.84
 B (ring opening deg) : 22.61
 PA of pole (deg) : 6.84
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 1.456
 C/A sky separation (km) : 9538.6
 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	2049-06-29T01:02:42.698		36.99	-38.64	140461.00	-23.70		
A (OER)	I	2049-06-29T01:05:18.288		37.22	-38.66	136774.40	-23.69		
Encke (OEG)	I	2049-06-29T01:07:26.220		37.41	-38.66	133744.89	-23.67		
Encke (IEG)	I	2049-06-29T01:07:39.804		37.43	-38.66	133423.31	-23.67		
A (IER)	I	2049-06-29T01:15:40.783		38.08	-38.64	122050.38	-23.62		
B (OER)	I	2049-06-29T01:18:50.564		38.32	-38.62	117571.16	-23.59		
B (IER)	I	2049-06-29T01:37:00.170		39.50	-38.24	91984.69	-23.35		
C (IER)	I	2049-06-29T01:49:34.236	b	40.10	-37.76	74490.58	-23.02		
Saturn	I	2049-06-29T01:38:55.183		39.60	-38.18	60091.15		-24.92	-29.62
Saturn	E	2049-06-29T03:22:10.269		38.87	-29.52	60247.98		8.13	9.96
C (IER)	E	2049-06-29T03:29:38.900		38.35	-28.55	74490.58	22.95		
B (IER)	E	2049-06-29T03:42:15.889		37.33	-26.82	91984.69	23.24		
B (OER)	E	2049-06-29T04:00:31.621		35.59	-24.16	117571.16	23.44		
A (IER)	E	2049-06-29T04:03:42.662		35.26	-23.68	122050.38	23.46		
Encke (IEG)	E	2049-06-29T04:11:47.073		34.37	-22.43	133423.31	23.50		
Encke (OEG)	E	2049-06-29T04:12:00.759		34.35	-22.40	133744.89	23.50		
A (OER)	E	2049-06-29T04:14:09.662		34.10	-22.06	136774.40	23.51		
F ring	E	2049-06-29T04:16:46.464		33.80	-21.65	140461.00	23.52		

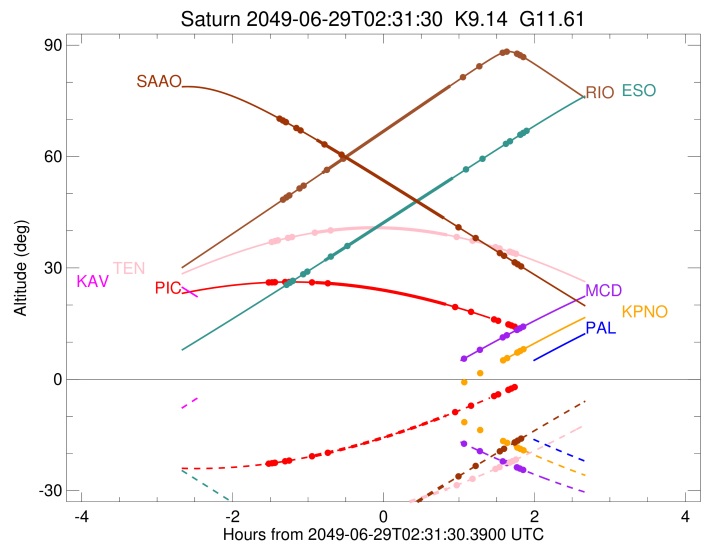
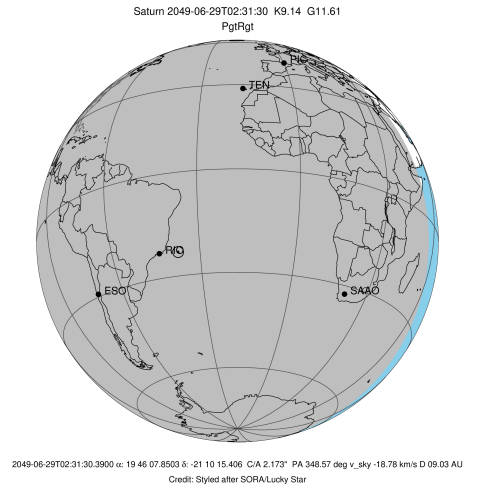
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-06-29T02:33:40.520
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : RIO
 Location : Rio de Janeiro
 Latitude (deg) : -22.89506
 E. Longitude (deg) : 316.77708
 Altitude (km) : 0.033
 Gaia source ID : 6865157575123037312
 2Mass ID (if available) : 19460783-2110150
 ICRS Star Coord at Epoch: 19h 46m 07.85030s -21:10:15.40632s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 9.142
 G magnitude : 11.610
 RP magnitude : 10.870
 BP magnitude : 12.211
 DUPflag : 0
 Distance (au) : 9.033
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.78
 Sun-Target sep (deg) : 162.51
 Sun-Moon sep (deg) : 150.56
 B (ring opening deg) : 22.61
 PA of pole (deg) : 6.84
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 2.154
 C/A sky separation (km) : 14110.9
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 Saturn_ring_plane.tf
 sat378.bsp
 sat286.bsp
 vgr1.sat286.bsp
 vgr2.sat286.bsp
 HST1081HSPephemUTC.bsp
 pfb10000r.bsp
 cassini.bsp
 earthstns_itrf93_040916.bsp
 earth_200101_990628_predict.bpc
 earth_720101_070426.bpc
 cpck28Mar2008.tpc
 pck.sat440.tpc
 IAU_SATURN_for_RINGFIT.tpc
 naif0012.tls
 earth_flat_IAU.spk



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

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2049-06-29T01:11:42.216		48.40	-65.95	140461.00	-23.43		
A (OER)	I	2049-06-29T01:14:19.628		49.01	-66.55	136774.40	-23.41		
Encke (OEG)	I	2049-06-29T01:16:29.133		49.50	-67.04	133744.89	-23.38		
Encke (IEG)	I	2049-06-29T01:16:42.888		49.56	-67.10	133423.31	-23.38		
A (IER)	I	2049-06-29T01:24:50.524		51.42	-68.96	122050.38	-23.26		
B (OER)	I	2049-06-29T01:28:03.303		52.16	-69.70	117571.16	-23.21		
B (IER)	I	2049-06-29T01:46:36.432	b	56.44	-73.95	91984.69	-22.70		
C (IER)	I	2049-06-29T01:59:38.082	b	59.44	-76.95	74490.58	-21.98		
Saturn	I	2049-06-29T01:42:54.729		55.59	-73.11	60032.15		-29.14	-34.27
Saturn	E	2049-06-29T03:24:32.747		79.05	-83.50	60262.56		4.23	5.19
C (IER)	E	2049-06-29T03:34:39.084		81.37	-81.18	74490.58	22.02		
B (IER)	E	2049-06-29T03:47:40.271		84.30	-78.18	91984.69	22.70		
B (OER)	E	2049-06-29T04:06:14.149		87.96	-73.92	117571.16	23.18		
A (IER)	E	2049-06-29T04:09:27.152		88.25	-73.18	122050.38	23.23		
Encke (IEG)	E	2049-06-29T04:17:35.445		87.71	-71.31	133423.31	23.34		
Encke (OEG)	E	2049-06-29T04:17:49.221		87.67	-71.26	133744.89	23.35		
A (OER)	E	2049-06-29T04:19:58.921		87.30	-70.77	136774.40	23.37		
F ring	E	2049-06-29T04:22:36.581		86.81	-70.16	140461.00	23.40		

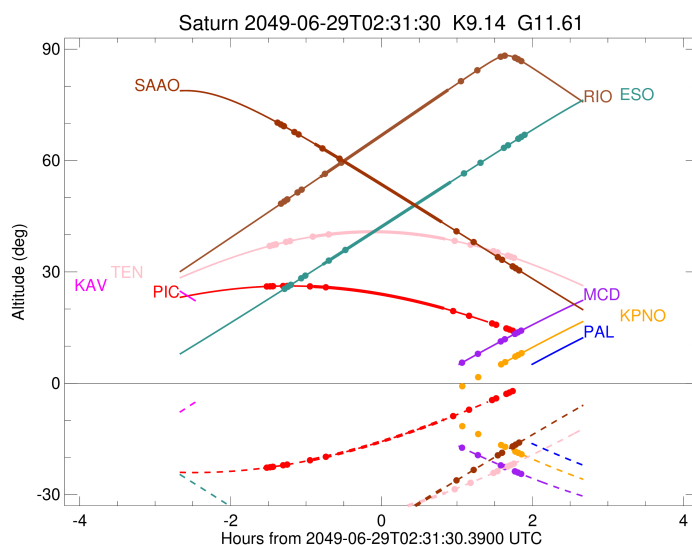
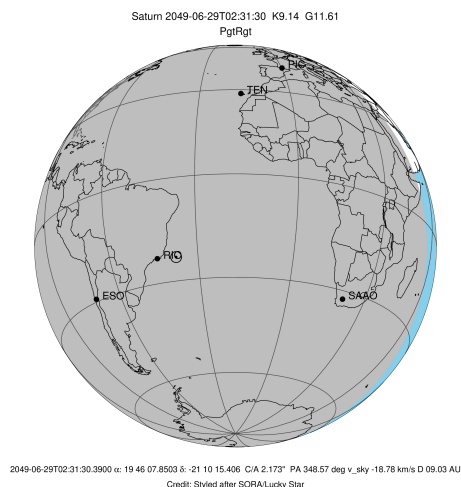
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-06-29T02:35:37.810
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : ESO
 Location : European Southern Obs. (3.6m)
 Latitude (deg) : -29.26097
 E. Longitude (deg) : 289.26831
 Altitude (km) : 2.400
 Gaia source ID : 6865157575123037312
 2Mass ID (if available) : 19460783-2110150
 ICRS Star Coord at Epoch: 19h 46m 07.85030s -21:10:15.40632s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 9.142
 G magnitude : 11.610
 RP magnitude : 10.870
 BP magnitude : 12.211
 DUPflag : 0
 Distance (au) : 9.033
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.78
 Sun-Target sep (deg) : 162.51
 Sun-Moon sep (deg) : 150.20
 B (ring opening deg) : 22.61
 PA of pole (deg) : 6.84
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 2.284
 C/A sky separation (km) : 14961.1
 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	2049-06-29T01:14:31.099		25.45	-42.48	140461.00	-23.25		
A (OER)	I	2049-06-29T01:17:09.730		26.02	-43.06	136774.40	-23.22		
Encke (OEG)	I	2049-06-29T01:19:20.246		26.49	-43.53	133744.89	-23.20		
Encke (IEG)	I	2049-06-29T01:19:34.109		26.54	-43.58	133423.31	-23.20		
A (IER)	I	2049-06-29T01:27:45.645		28.31	-45.36	122050.38	-23.07		
B (OER)	I	2049-06-29T01:31:00.018		29.01	-46.07	117571.16	-23.01		
B (IER)	I	2049-06-29T01:49:43.444	b	33.07	-50.15	91984.69	-22.47		
C (IER)	I	2049-06-29T02:02:54.609	b	35.94	-53.03	74490.58	-21.67		
Saturn	I	2049-06-29T01:44:41.609		31.97	-49.05	60017.99		-30.10	-35.30
Saturn	E	2049-06-29T03:26:36.054		54.24	-71.18	60263.89		3.68	4.52
C (IER)	E	2049-06-29T03:37:03.424		56.53	-73.38	74490.58	21.79		
B (IER)	E	2049-06-29T03:50:10.652		59.38	-76.09	91984.69	22.57		
B (OER)	E	2049-06-29T04:08:48.701		63.41	-79.71	117571.16	23.13		
A (IER)	E	2049-06-29T04:12:02.088		64.10	-80.30	122050.38	23.19		
Encke (IEG)	E	2049-06-29T04:20:11.017		65.84	-81.67	133423.31	23.32		
Encke (OEG)	E	2049-06-29T04:20:24.804		65.89	-81.71	133744.89	23.33		
A (OER)	E	2049-06-29T04:22:34.597		66.35	-82.04	136774.40	23.36		
F ring	E	2049-06-29T04:25:12.334		66.91	-82.42	140461.00	23.39		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-06-29T02:28:46.740
 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 : 6865157575123037312
 2Mass ID (if available) : 19460783-2110150
 ICRS Star Coord at Epoch: 19h 46m 07.85030s -21:10:15.40632s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 9.142
 G magnitude : 11.610
 RP magnitude : 10.870
 BP magnitude : 12.211
 DUPflag : 0
 Distance (au) : 9.033
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.78
 Sun-Target sep (deg) : 162.51
 Sun-Moon sep (deg) : 151.20
 B (ring opening deg) : 22.61
 PA of pole (deg) : 6.84
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 2.523
 C/A sky separation (km) : 16530.1
 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	2049-06-29T01:08:56.196		70.19	-56.06	140461.00	-23.04		
A (OER)	I	2049-06-29T01:11:36.334		69.69	-55.49	136774.40	-23.00		
Encke (OEG)	I	2049-06-29T01:13:48.174		69.28	-55.03	133744.89	-22.96		
Encke (IEG)	I	2049-06-29T01:14:02.182		69.24	-54.98	133423.31	-22.95		
A (IER)	I	2049-06-29T01:22:19.484		67.66	-53.23	122050.38	-22.78		
B (OER)	I	2049-06-29T01:25:36.498		67.02	-52.54	117571.16	-22.69		
B (IER)	I	2049-06-29T01:44:40.518	b	63.24	-48.51	91984.69	-21.95		
C (IER)	I	2049-06-29T01:58:14.792	b	60.47	-45.64	74490.58	-20.91		
Saturn	I	2049-06-29T01:38:25.024		64.50	-49.83	60005.83		-30.90	-36.17
Saturn	E	2049-06-29T03:19:31.147		43.40	-28.57	60267.11		1.71	2.10
C (IER)	E	2049-06-29T03:31:06.037		40.94	-26.17	74490.58	20.84		
B (IER)	E	2049-06-29T03:44:44.843		38.05	-23.35	91984.69	21.79		
B (OER)	E	2049-06-29T04:03:59.440		33.98	-19.42	117571.16	22.45		
A (IER)	E	2049-06-29T04:07:18.664		33.28	-18.74	122050.38	22.52		
Encke (IEG)	E	2049-06-29T04:15:41.997		31.51	-17.04	133423.31	22.66		
Encke (OEG)	E	2049-06-29T04:15:56.185		31.46	-16.99	133744.89	22.67		
A (OER)	E	2049-06-29T04:18:09.734		30.99	-16.54	136774.40	22.70		
F ring	E	2049-06-29T04:20:52.007		30.42	-16.00	140461.00	22.74		