

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-12T04:23:11.720  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569

ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s

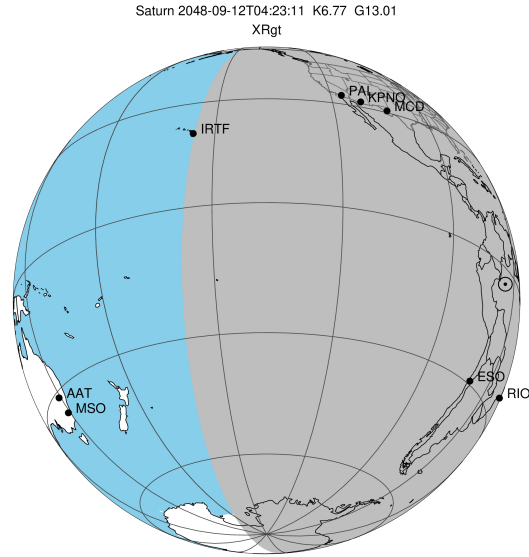
RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.655  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 59.53  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19

# 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

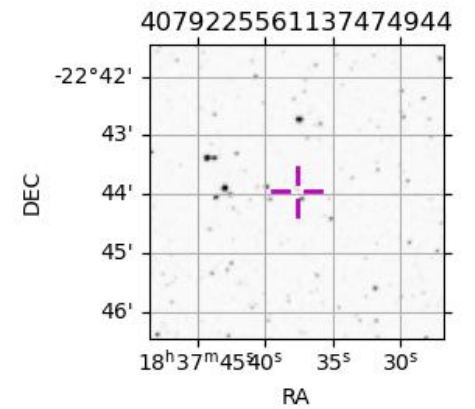
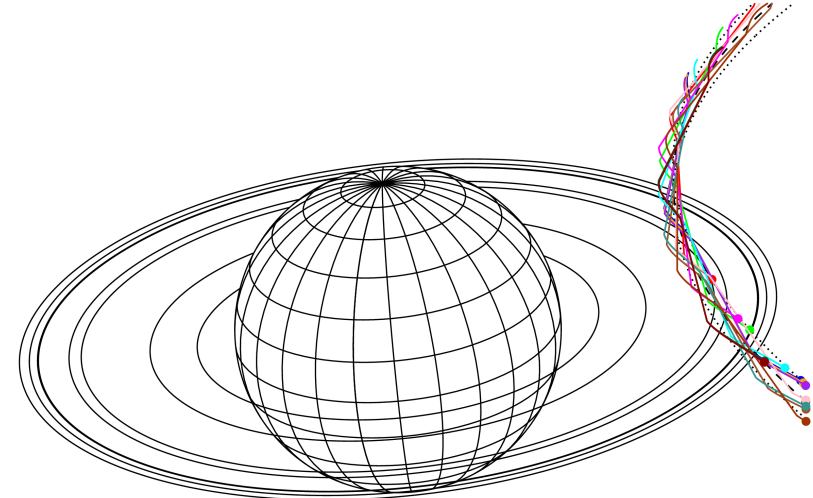
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events	Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+			SEP 11 18:57 - SEP 11 18:57		PnnRin
PAL	Palomar Mt (20	33.4	243.1	+			SEP 11 07:02 - SEP 11 07:02		PnnRin
PMO	Purple Mtn Obs	32.1	118.8	+			SEP 11 13:21 - SEP 11 14:48		PnnRin
KPNO	Kitt Peak Natl	32.0	248.4	+		+	SEP 11 07:00 - SEP 12 02:15		PnnRie
MCD	McDonald Obs.	30.7	256.0			+	SEP 12 03:20 - SEP 12 03:20		PnnRne
TEN	Teide Obs./Ten	28.3	343.5	+			SEP 11 19:39 - SEP 11 19:39		PnnRin
IRTF	Mauna Kea/IRTF	19.8	204.5	+		+	SEP 11 07:31 - SEP 12 09:53		PnnRie
KAV	Kavalur Observ	12.6	78.8	+			SEP 11 14:25 - SEP 11 15:43		PnnRin
RIO	Rio de Janeiro	-22.9	316.8						PnnRnn
ESO	European South	-29.3	289.3						PnnRnn
AAT	Siding Spring	-31.3	149.1	+		+	SEP 11 09:16 - SEP 12 14:35		PnnRie
SAAO	So. Afr. Astro	-32.4	20.8				SEP 11 17:40 - SEP 11 17:40		PnnRin
MSO	Mt. Stromlo Ob	-35.3	149.0	+		+	SEP 11 09:20 - SEP 12 14:46		PnnRie



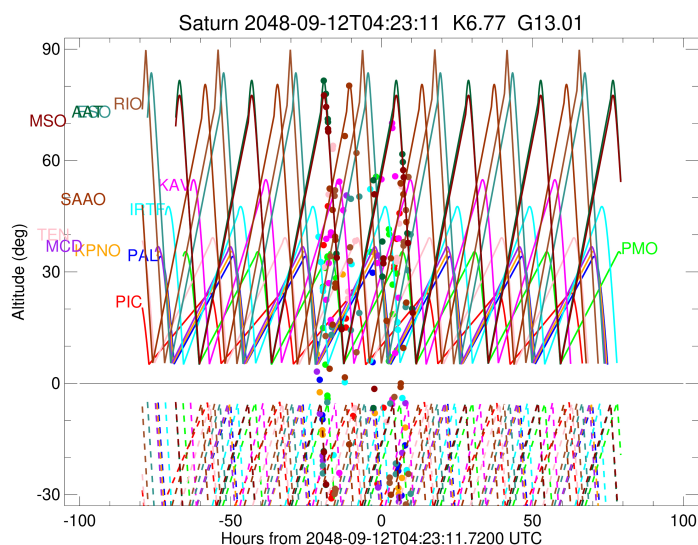
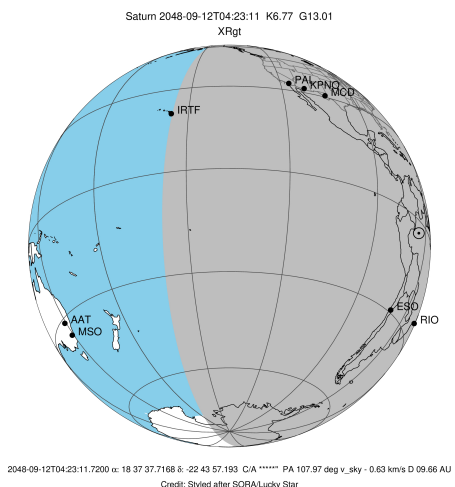
2048-09-12T04:23:11.7200 α: 18 37 37.7168 δ: -22 43 57.193 C/A \*\*\*\*\* PA 107.97 deg v\_sky - 0.63 km/s D 09.66 AU  
 Credit: Styled after SORA/Lucky Star

Saturn 2048-09-12T04:23:11 K6.77 G13.01 XRgt

- Earth
- PIC
- PAL
- PMO
- KPNO
- MCD
- TEN
- IRTF
- KAV
- RIO
- ESO
- AAT
- SAAO
- MSO



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-12T02:10:46.280  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.654  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 59.16  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.330  
 C/A sky separation (km) : 107334.5  
 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

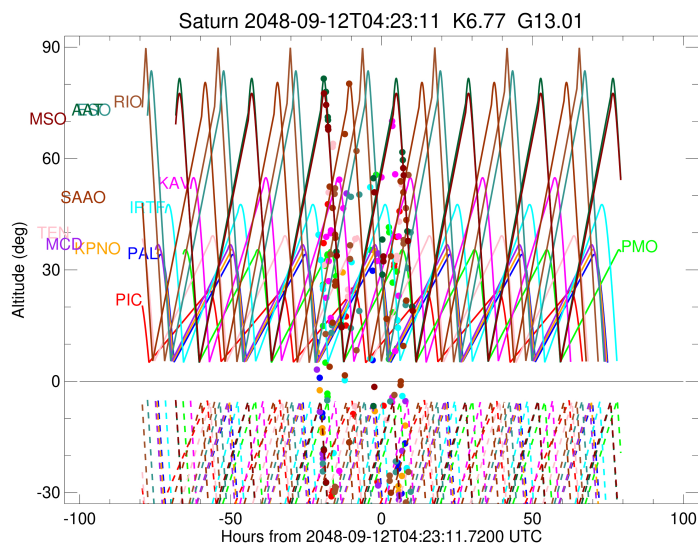
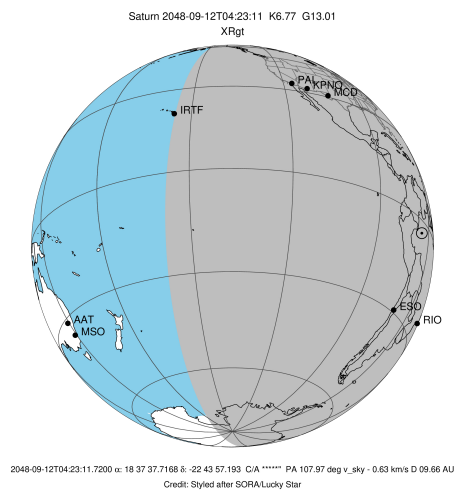


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-09-11T09:14:09.868	-58.29x	37.42x	140461.00	-0.74			
A (OER)	I	2048-09-11T10:38:28.692	-43.65x	47.81x	136774.40	-0.72			
Encke (OEG)	I	2048-09-11T11:48:33.961	-30.78x	51.40x	133744.89	-0.72			
Encke (IEG)	I	2048-09-11T11:56:02.536	-29.41x	51.43x	133423.31	-0.72			
A (IER)	I	2048-09-11T16:36:00.014	15.09	17.34x	122050.38	-0.60			
B (OER)	I	2048-09-11T18:57:25.197	24.46	-8.46	117571.16	-0.44			

No planet occultations

B (OER)	E	2048-09-12T03:05:47.949	-35.65x	-26.59	117571.16	0.50			
A (IER)	E	2048-09-12T05:05:47.784	-57.00x	-6.39	122050.38	0.74			
Encke (IEG)	E	2048-09-12T08:35:01.621	-63.53x	31.04x	133423.31	1.05			
Encke (OEG)	E	2048-09-12T08:40:08.543	-62.82x	31.87x	133744.89	1.05			
A (OER)	E	2048-09-12T09:27:13.536	-55.51x	39.07x	136774.40	1.09			
F ring	E	2048-09-12T10:22:28.064	-45.84x	45.94x	140461.00	1.13			

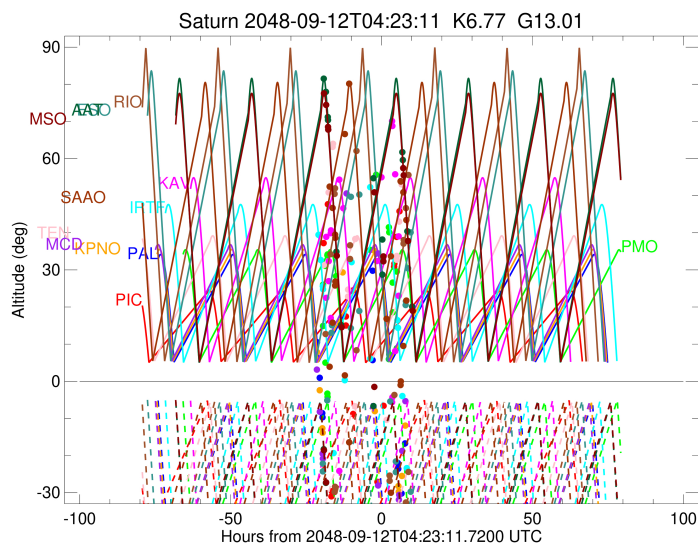
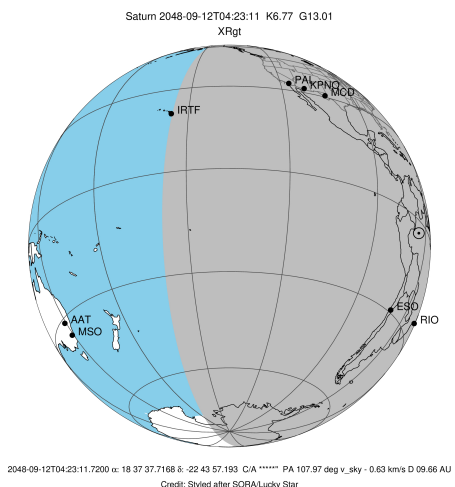
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-12T08:05:50.330  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.658  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 60.16  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.402  
 C/A sky separation (km) : 107882.7  
 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	2048-09-11T07:02:20.844		10.36	-51.30	140461.00	-1.21		
A (OER)	I	2048-09-11T07:56:19.572		0.75x	-52.46	136774.40	-1.07		
Encke (OEG)	I	2048-09-11T08:46:29.600		-8.81x	-49.75	133744.89	-0.94		
Encke (IEG)	I	2048-09-11T08:52:13.347		-9.93x	-49.24	133423.31	-0.93		
A (IER)	I	2048-09-11T14:48:35.120		-79.05x	15.82x	122050.38	-0.22		
No planet occultations									
A (IER)	E	2048-09-12T01:30:45.341		30.14	4.84x	122050.38	0.15		
Encke (IEG)	E	2048-09-12T09:50:39.014		-22.44x	-42.31	133423.31	0.70		
Encke (OEG)	E	2048-09-12T09:58:15.706		-24.00x	-41.16	133744.89	0.71		
A (OER)	E	2048-09-12T11:04:09.883		-37.66x	-29.89	136774.40	0.82		
F ring	E	2048-09-12T12:13:43.858		-52.24x	-16.39	140461.00	0.94		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-11T20:15:10.800  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.650  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 58.82  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.815  
 C/A sky separation (km) : 110689.6  
 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

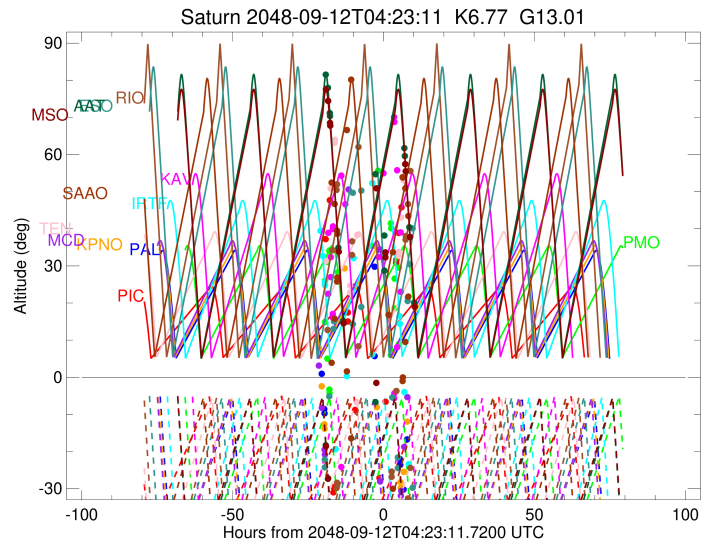
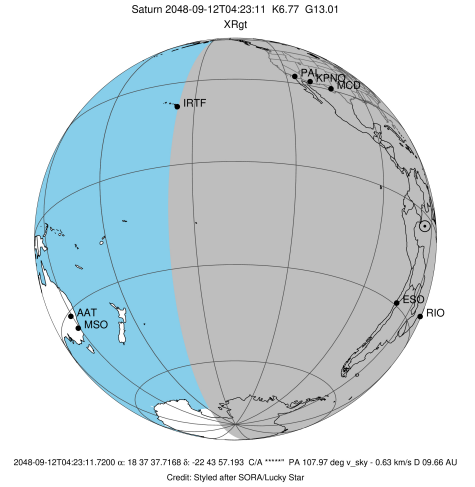


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-09-11T09:02:05.084		26.11	14.73x	140461.00	-1.34		
A (OER)	I	2048-09-11T09:48:34.593		31.13	4.86x	136774.40	-1.30		
Encke (OEG)	I	2048-09-11T10:27:58.050		33.98	-3.48x	133744.89	-1.26		
Encke (IEG)	I	2048-09-11T10:32:13.818		34.20	-4.37x	133423.31	-1.25		
A (IER)	I	2048-09-11T13:21:15.622		28.22	-37.67	122050.38	-0.96		
B (OER)	I	2048-09-11T14:48:08.087		16.15	-50.03	117571.16	-0.75		

No planet occultations

B (OER)	E	2048-09-12T00:42:17.196		-69.26x	35.82x	117571.16	0.60		
A (IER)	E	2048-09-12T02:36:17.451		-45.39x	55.74x	122050.38	0.70		
Encke (IEG)	E	2048-09-12T06:51:24.231		6.24	41.19x	133423.31	0.75		
Encke (OEG)	E	2048-09-12T06:58:31.596		7.53	39.82x	133744.89	0.75		
A (OER)	E	2048-09-12T08:06:10.485		18.84	26.20x	136774.40	0.74		
F ring	E	2048-09-12T09:30:21.678		29.76	8.46x	140461.00	0.72		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-12T07:51:14.590  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.658  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 60.19  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.360  
 C/A sky separation (km) : 107585.6  
 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



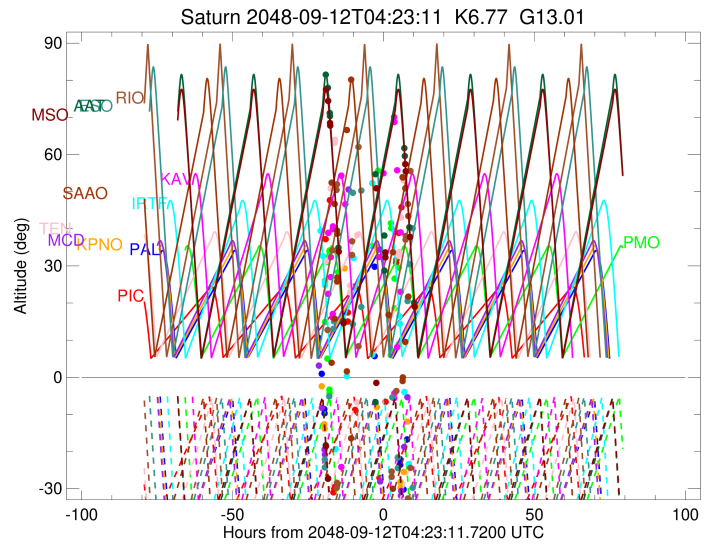
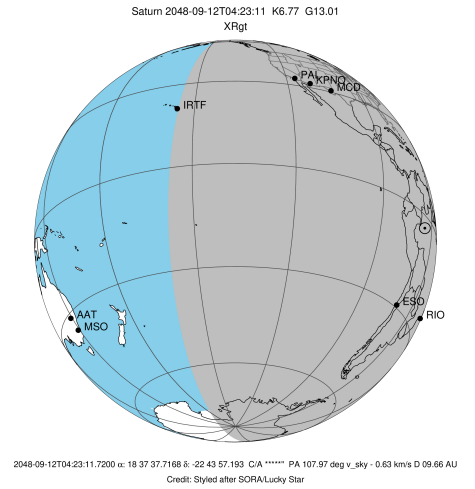
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-09-11T07:00:58.304		7.72	-53.58	140461.00	-1.18		
A (OER)	I	2048-09-11T07:56:27.760		-2.62x	-53.08	136774.40	-1.04		
Encke (OEG)	I	2048-09-11T08:48:29.786		-12.90x	-48.60	133744.89	-0.90		
Encke (IEG)	I	2048-09-11T08:54:28.304		-14.10x	-47.89	133423.31	-0.89		
A (IER)	I	2048-09-11T15:35:19.888		-74.99x	30.11x	122050.38	-0.17		

No planet occultations

A (IER)	E	2048-09-12T02:15:00.755		35.20	-9.00	122050.38	0.16		
Encke (IEG)	E	2048-09-12T10:00:58.591		-28.64x	-38.16	133423.31	0.74		
Encke (OEG)	E	2048-09-12T10:08:11.292		-30.16x	-36.90	133744.89	0.75		
A (OER)	E	2048-09-12T11:10:55.748		-43.45x	-25.16	136774.40	0.86		
F ring	E	2048-09-12T12:17:43.917		-57.65x	-11.60	140461.00	0.98		

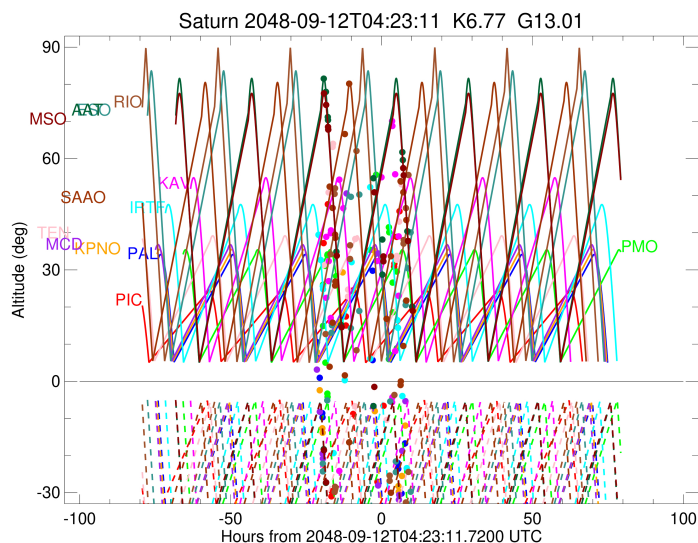
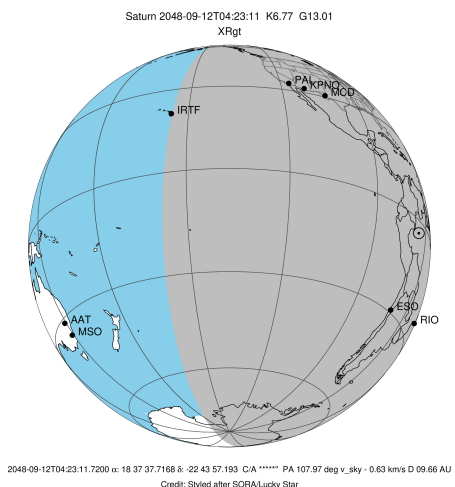
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-12T07:29:12.890  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.657  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 60.21  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.311  
 C/A sky separation (km) : 107239.0  
 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	2048-09-11T07:00:07.896		2.95x	-55.19	140461.00	-1.13		
A (OER)	I	2048-09-11T07:58:17.770		-8.43x	-51.86	136774.40	-0.98		
Encke (OEG)	I	2048-09-11T08:53:36.288		-19.77x	-44.79	133744.89	-0.84		
Encke (IEG)	I	2048-09-11T09:00:00.696		-21.10x	-43.80	133423.31	-0.83		
A (IER)	I	2048-09-11T16:52:01.867		-53.36x	51.26x	122050.38	-0.14		
No planet occultations									
A (IER)	E	2048-09-12T03:20:29.270		34.13	-28.92	122050.38	0.20		
Encke (IEG)	E	2048-09-12T10:10:24.117		-36.87x	-31.56	133423.31	0.79		
Encke (OEG)	E	2048-09-12T10:17:07.894		-38.31x	-30.27	133744.89	0.80		
A (OER)	E	2048-09-12T11:16:05.777		-51.02x	-18.41	136774.40	0.91		
F ring	E	2048-09-12T12:19:39.121		-64.66x	-5.02	140461.00	1.02		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-12T03:00:12.340  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.654  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 59.41  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.129  
 C/A sky separation (km) : 105932.6  
 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

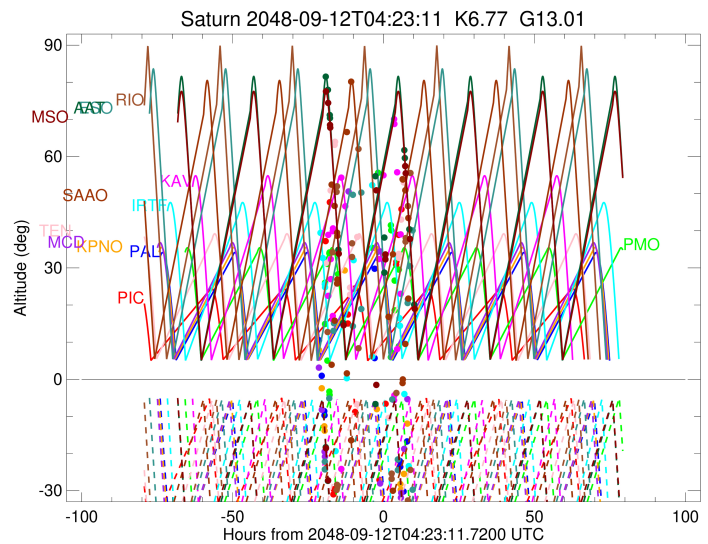
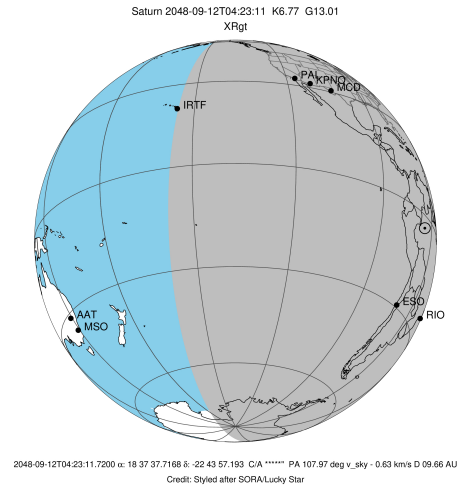


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-09-11T09:17:42.094	-76.34x	31.64x	140461.00	-0.65			
A (OER)	I	2048-09-11T10:53:28.057	-55.48x	51.14x	136774.40	-0.64			
Encke (OEG)	I	2048-09-11T12:12:31.259	-38.06x	63.28x	133744.89	-0.64			
Encke (IEG)	I	2048-09-11T12:20:52.409	-36.23x	64.09x	133423.31	-0.64			
A (IER)	I	2048-09-11T17:19:15.411	22.92	24.55x	122050.38	-0.59			
B (OER)	I	2048-09-11T19:39:49.386	38.24	-6.35	117571.16	-0.46			
No planet occultations									
B (OER)	E	2048-09-12T04:15:47.060	-35.35x	-33.47	117571.16	0.55			
A (IER)	E	2048-09-12T06:07:16.129	-59.91x	-10.15	122050.38	0.79			
Encke (IEG)	E	2048-09-12T09:24:36.205	-74.06x	32.99x	133423.31	1.11			
Encke (OEG)	E	2048-09-12T09:29:26.174	-73.03x	34.02x	133744.89	1.11			
A (OER)	E	2048-09-12T10:13:54.939	-63.34x	43.26x	136774.40	1.16			
F ring	E	2048-09-12T11:06:05.309	-51.82x	53.25x	140461.00	1.20			

```

target                : Saturn
target radius (km)   : 60268.00
C/A epoch             : 2048-09-12T10:16:01.500
Event type           : XRgt
: No Saturn occs
: 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       : 4079225561137474944
2Mass ID (if available) : 18373771-2243569
ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s
RUWE (>1.4 is poor) : 1.07
K magnitude          : 6.769
G magnitude          : 13.013
RP magnitude         : 11.482
BP magnitude         : 16.324
DUPflag              : 0
Distance (au)        : 9.659
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -0.63
Sun-Target sep (deg) : 109.25
Sun-Moon sep (deg)   : 60.03
B (ring opening deg) : 25.98
PA of pole (deg)     : 6.19
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 15.473
C/A sky separation (km) : 108395.5
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
    
```



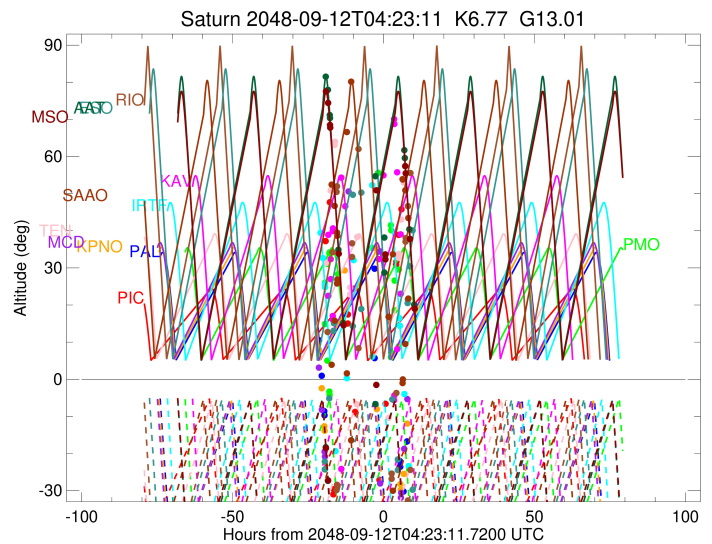
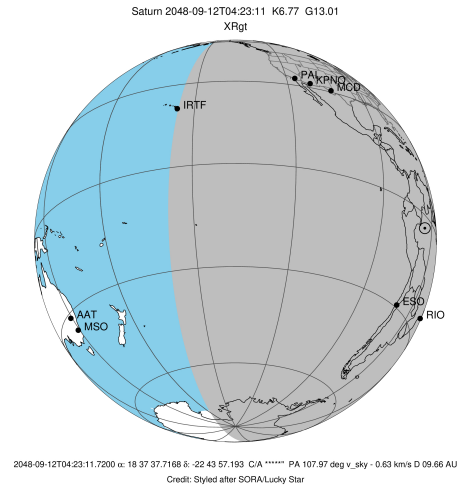
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-09-11T07:31:57.257		39.35	-42.64	140461.00	-1.41		
A (OER)	I	2048-09-11T08:17:15.618		32.53	-51.83	136774.40	-1.30		
Encke (OEG)	I	2048-09-11T08:57:35.026		25.46	-58.93	133744.89	-1.20		
Encke (IEG)	I	2048-09-11T09:02:04.143		24.63	-59.62	133423.31	-1.19		
A (IER)	I	2048-09-11T12:32:34.870		-19.68x	-49.25	122050.38	-0.61		
B (OER)	I	2048-09-11T16:10:33.631		-69.67x	-0.39x	117571.16	-0.11		

No planet occultations

B (OER)	E	2048-09-11T18:34:36.587		-76.14x	33.43x	117571.17	0.09		
A (IER)	E	2048-09-12T00:40:09.264		6.41	51.96x	122050.38	0.26		
Encke (IEG)	E	2048-09-12T09:43:07.726		15.91	-64.96	133423.31	0.52		
Encke (OEG)	E	2048-09-12T09:53:23.269		13.84	-65.71	133744.89	0.53		
A (OER)	E	2048-09-12T11:20:11.879		-4.51x	-61.93	136774.40	0.64		
F ring	E	2048-09-12T12:47:16.148		-23.87x	-46.42	140461.00	0.78		



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-11T22:02:12.290  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.651  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 58.55  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.360  
 C/A sky separation (km) : 107518.7  
 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

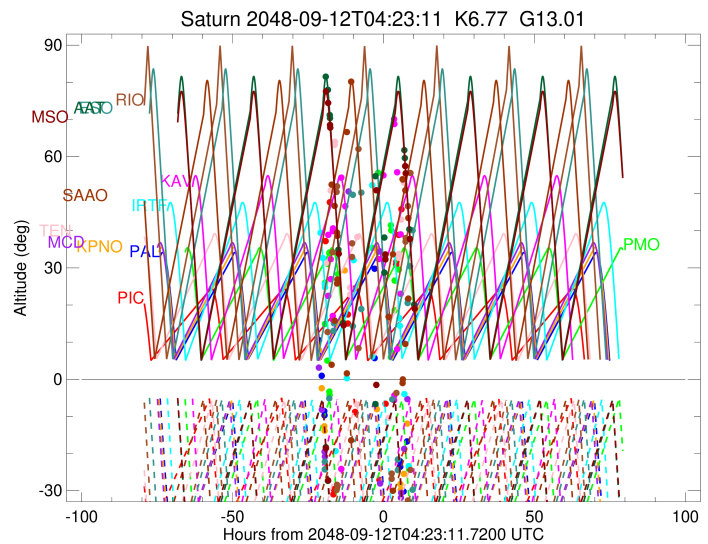
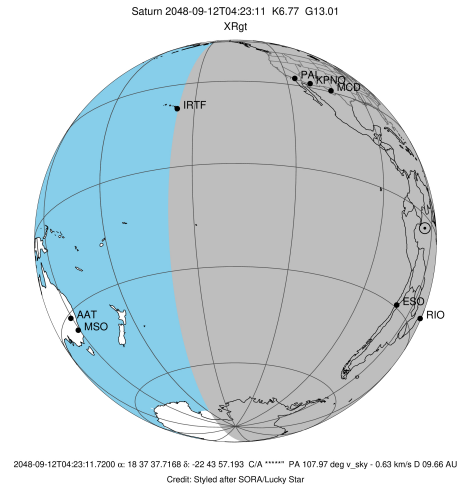


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-09-11T10:05:59.547		22.63	38.70x	140461.00	-1.26		
A (OER)	I	2048-09-11T10:54:51.388		32.51	26.79x	136774.40	-1.25		
Encke (OEG)	I	2048-09-11T11:35:27.470		40.01	16.88x	133744.89	-1.23		
Encke (IEG)	I	2048-09-11T11:39:48.491		40.77	15.81x	133423.31	-1.23		
A (IER)	I	2048-09-11T14:25:02.844		54.29	-24.32	122050.38	-1.03		
B (OER)	I	2048-09-11T15:42:59.679		46.68	-42.79	117571.16	-0.88		

No planet occultations

B (OER)	E	2048-09-12T02:51:51.948		-73.62x	32.83x	117571.16	0.76		
A (IER)	E	2048-09-12T04:23:57.643		-53.80x	55.13x	122050.38	0.85		
Encke (IEG)	E	2048-09-12T07:54:33.139		-5.37x	69.80x	133423.31	0.91		
Encke (OEG)	E	2048-09-12T08:00:25.561		-4.04x	68.48x	133744.89	0.91		
A (OER)	E	2048-09-12T08:56:10.380		8.44	55.41x	136774.40	0.90		
F ring	E	2048-09-12T10:05:37.128		23.37	38.62x	140461.00	0.87		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-12T13:01:25.520  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19280s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.661  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 59.46  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.633  
 C/A sky separation (km) : 109537.0  
 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

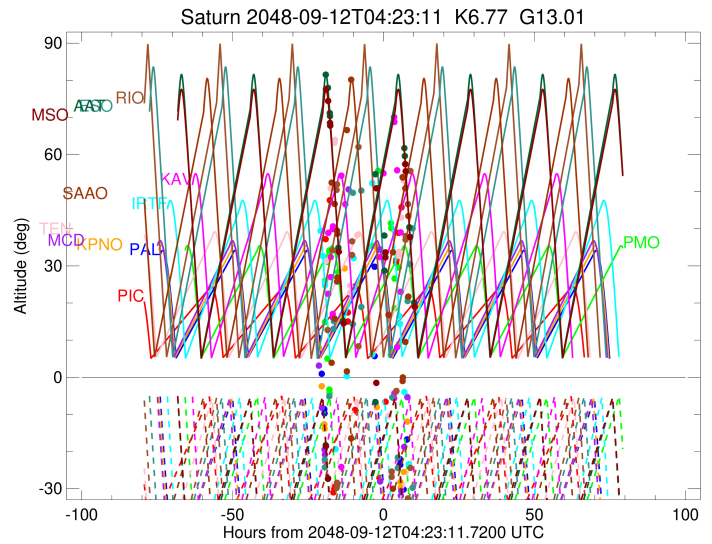
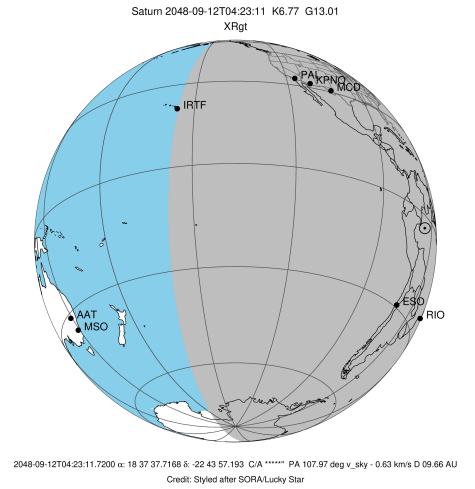


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-09-11T09:16:14.457		81.53	-18.46	140461.00	-1.46		
A (OER)	I	2048-09-11T09:59:09.956		77.85	-27.52	136774.40	-1.40		
Encke (OEG)	I	2048-09-11T10:36:12.808		71.01	-35.15	133744.89	-1.33		
Encke (IEG)	I	2048-09-11T10:40:15.656		70.20	-35.97	133423.31	-1.32		
A (IER)	I	2048-09-11T13:27:35.223		34.68	-61.99	122050.38	-0.93		
B (OER)	I	2048-09-11T15:00:38.027		15.21	-59.48	117571.16	-0.68		

No planet occultations

B (OER)	E	2048-09-12T01:45:48.591		-6.17x	54.77x	117571.16	0.40		
A (IER)	E	2048-09-12T04:41:32.869		29.01	37.94x	122050.38	0.44		
Encke (IEG)	E	2048-09-12T11:19:49.431		61.17	-43.56	133423.31	0.53		
Encke (OEG)	E	2048-09-12T11:29:52.218		59.03	-45.44	133744.89	0.54		
A (OER)	E	2048-09-12T12:59:23.615		39.86	-59.21	136774.40	0.60		
F ring	E	2048-09-12T14:35:22.023		19.60	-61.38	140461.00	0.69		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-12T01:19:25.090  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19279s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.653  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 59.19  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.026  
 C/A sky separation (km) : 105198.3  
 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

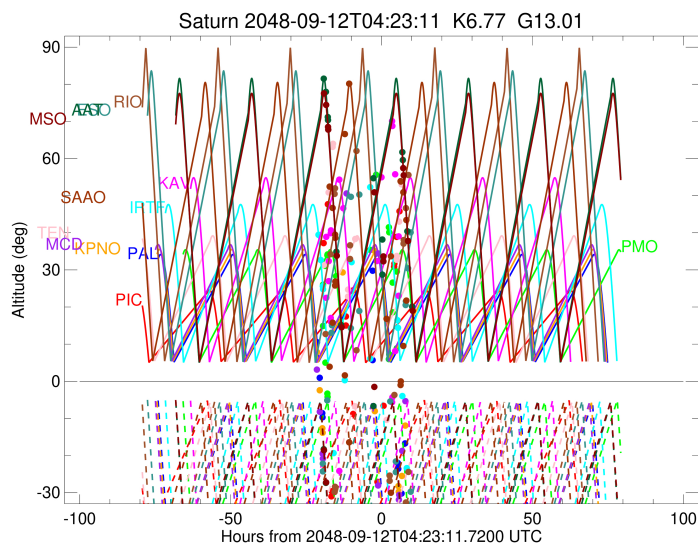
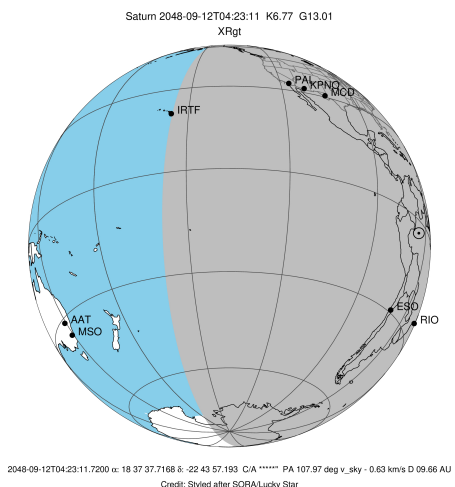


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-09-11T11:13:07.158		4.11x	52.38x	140461.00	-1.02		
A (OER)	I	2048-09-11T12:12:55.504		15.97	46.57x	136774.40	-1.03		
Encke (OEG)	I	2048-09-11T13:01:38.546		25.98	39.34x	133744.89	-1.04		
Encke (IEG)	I	2048-09-11T13:06:48.581		27.06	38.48x	133423.31	-1.04		
A (IER)	I	2048-09-11T16:15:47.499		66.74	1.43x	122050.38	-0.94		
B (OER)	I	2048-09-11T17:40:00.923		80.14	-16.35	117571.16	-0.83		

No planet occultations

B (OER)	E	2048-09-12T06:05:27.996		-34.97x	17.22x	117571.16	0.82		
A (IER)	E	2048-09-12T07:31:07.316		-29.95x	33.83x	122050.38	0.92		
Encke (IEG)	E	2048-09-12T10:43:26.306		-0.80x	53.88x	133423.31	1.02		
Encke (OEG)	E	2048-09-12T10:48:41.094		0.19x	53.78x	133744.89	1.02		
A (OER)	E	2048-09-12T11:38:05.722		9.78	50.78x	136774.40	1.02		
F ring	E	2048-09-12T12:38:37.740		22.04	43.22x	140461.00	1.01		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-09-12T12:55:21.830  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4079225561137474944  
 2Mass ID (if available) : 18373771-2243569  
 ICRS Star Coord at Epoch: 18h 37m 37.71685s -22:43:57.19280s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 6.769  
 G magnitude : 13.013  
 RP magnitude : 11.482  
 BP magnitude : 16.324  
 DUPflag : 0  
 Distance (au) : 9.661  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.63  
 Sun-Target sep (deg) : 109.25  
 Sun-Moon sep (deg) : 59.48  
 B (ring opening deg) : 25.98  
 PA of pole (deg) : 6.19  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 15.633  
 C/A sky separation (km) : 109540.0  
 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	2048-09-11T09:20:10.424		77.55	-18.72	140461.00	-1.45		
A (OER)	I	2048-09-11T10:03:35.282		74.34	-27.40	136774.40	-1.38		
Encke (OEG)	I	2048-09-11T10:41:05.661		68.38	-34.66	133744.89	-1.31		
Encke (IEG)	I	2048-09-11T10:45:11.644		67.64	-35.43	133423.31	-1.30		
A (IER)	I	2048-09-11T13:35:07.692		33.62	-58.48	122050.38	-0.91		
B (OER)	I	2048-09-11T15:10:10.976		14.57	-55.02	117571.16	-0.66		

No planet occultations

B (OER)	E	2048-09-12T02:03:28.189		-0.98x	50.90x	117571.16	0.39		
A (IER)	E	2048-09-12T05:02:43.603		33.93	32.06x	122050.38	0.44		
Encke (IEG)	E	2048-09-12T11:36:57.000		56.92	-44.47	133423.31	0.55		
Encke (OEG)	E	2048-09-12T11:46:40.753		54.96	-46.06	133744.89	0.55		
A (OER)	E	2048-09-12T13:13:13.470		37.29	-56.83	136774.40	0.62		
F ring	E	2048-09-12T14:46:07.348		18.53	-56.84	140461.00	0.71		