

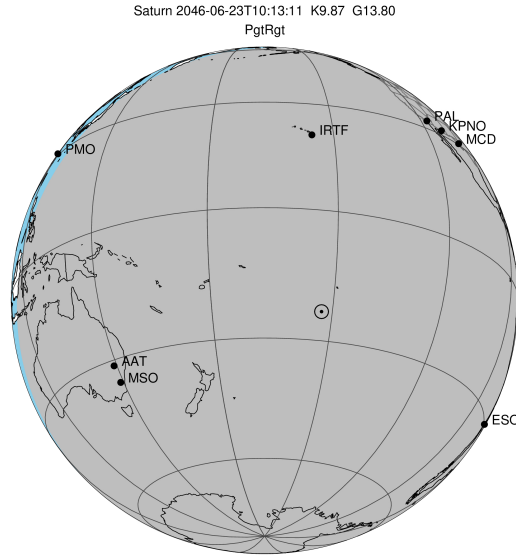
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:13:11.650  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488

Saturn 2046-06-23T10:13:11 K9.87 G13.80 PgtRgt

ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s

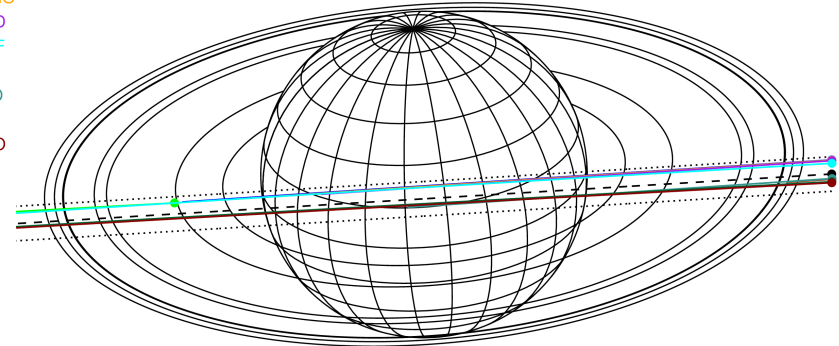
RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 70.07  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36

#	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



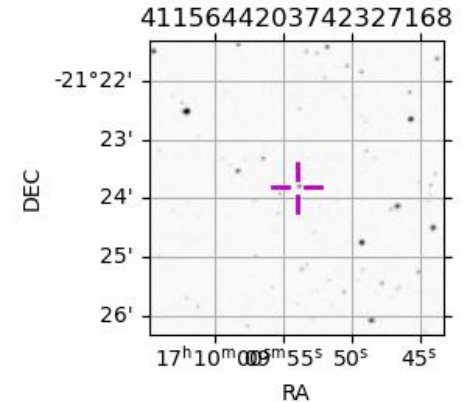
2046-06-23T10:13:11.6500 a: 17 09 53.9265 s -21 23 48.711 C/A 1.367 PA 3.48 deg v\_sky -19.41 km/s D 09.04 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PAL  
 PMO  
 KPNO  
 MCD  
 IRTF  
 RIO  
 ESO  
 AAT  
 MSO

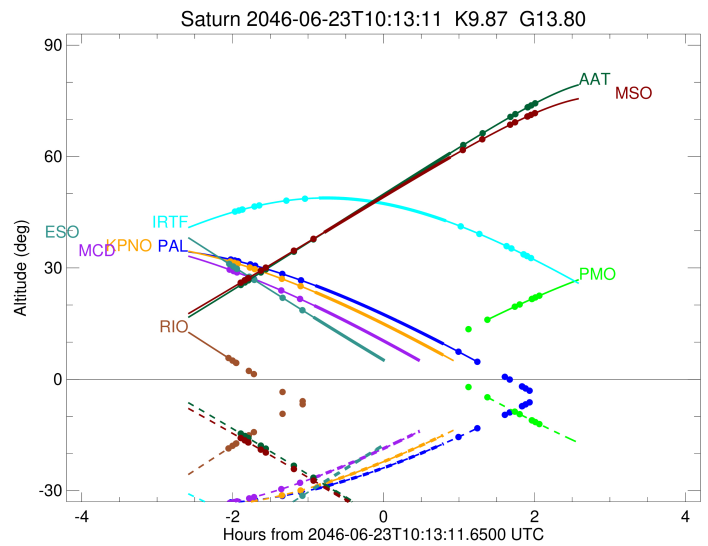
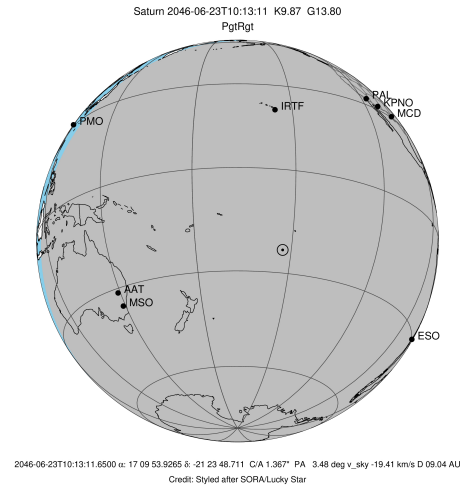


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	+	+	+	JUN 23 08:11 - JUN 23 11:12	PieRie
PMO	Purple Mtn Obs	32.1	118.8			+	JUN 23 11:57 - JUN 23 12:17	PnnRne
KPNO	Kitt Peak Natl	32.0	248.4	+	+	+	JUN 23 08:11 - JUN 23 11:00	PieRin
MCD	McDonald Obs.	30.7	256.0	+	+	+	JUN 23 08:10 - JUN 23 09:18	PinRin
TEN	Teide Obs./Ten	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+	+	+	JUN 23 08:15 - JUN 23 12:10	PieRie
KAV	Kavalur Observ	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+	+		JUN 23 08:09 - JUN 23 08:13	PnnRin
ESO	European South	-29.3	289.3	+	+	+	JUN 23 08:10 - JUN 23 09:17	PinRin
AAT	Siding Spring	-31.3	149.1	+	+	+	JUN 23 08:19 - JUN 23 12:13	PieRie
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JUN 23 08:19 - JUN 23 12:13	PieRie



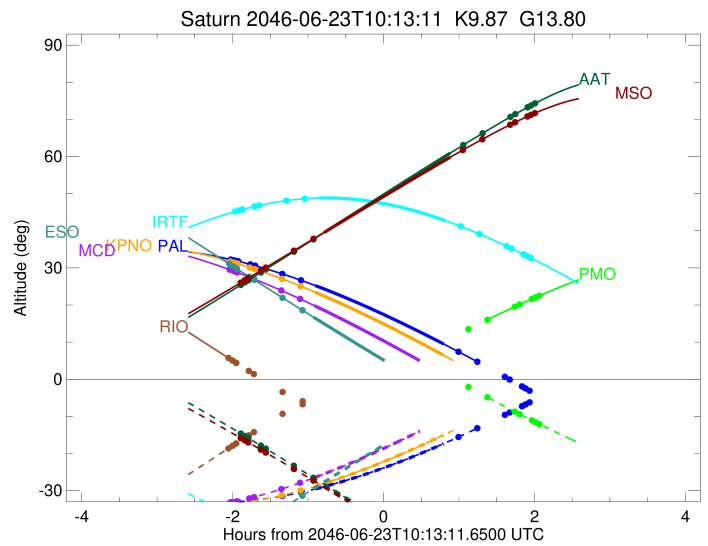
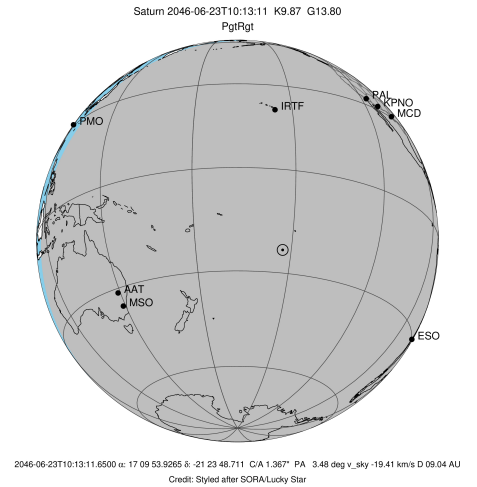
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:09:55.820  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488  
 ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 70.14  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.644  
 C/A sky separation (km) : 4222.6  
 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\_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	2046-06-23T08:11:47.967		32.25	-33.16	140461.00	-19.75		
A (OER)	I	2046-06-23T08:14:54.644		32.01	-33.09	136774.40	-19.75		
Encke (OEG)	I	2046-06-23T08:17:28.083		31.80	-33.02	133744.89	-19.74		
Encke (IEG)	I	2046-06-23T08:17:44.372		31.78	-33.01	133423.31	-19.74		
A (IER)	I	2046-06-23T08:27:20.702		30.94	-32.70	122050.38	-19.72		
B (OER)	I	2046-06-23T08:31:07.836		30.59	-32.55	117571.16	-19.72		
B (IER)	I	2046-06-23T08:52:47.374		28.37	-31.44	91984.69	-19.66		
C (IER)	I	2046-06-23T09:07:38.922		26.65	-30.43	74490.58	-19.58		
Saturn	I	2046-06-23T09:19:04.485		25.23	-29.53	60260.41		-4.15	-5.09
Saturn	E	2046-06-23T11:00:57.903		9.51	-17.35	60263.75		-3.10	-3.81
C (IER)	E	2046-06-23T11:12:47.454		7.42	-15.56	74490.58	19.41		
B (IER)	E	2046-06-23T11:27:47.617		4.71x	-13.20	91984.69	19.45		
B (OER)	E	2046-06-23T11:49:42.901		0.65x	-9.59	117571.17	19.45		
A (IER)	E	2046-06-23T11:53:33.169		-0.07x	-8.94	122050.38	19.45		
Encke (IEG)	E	2046-06-23T12:03:17.951		-1.92x	-7.27	133423.31	19.44		
Encke (OEG)	E	2046-06-23T12:03:34.490		-1.98x	-7.22	133744.89	19.44		
A (OER)	E	2046-06-23T12:06:10.304		-2.47x	-6.77	136774.40	19.44		
F ring	E	2046-06-23T12:09:19.939		-3.08x	-6.22	140461.00	19.44		

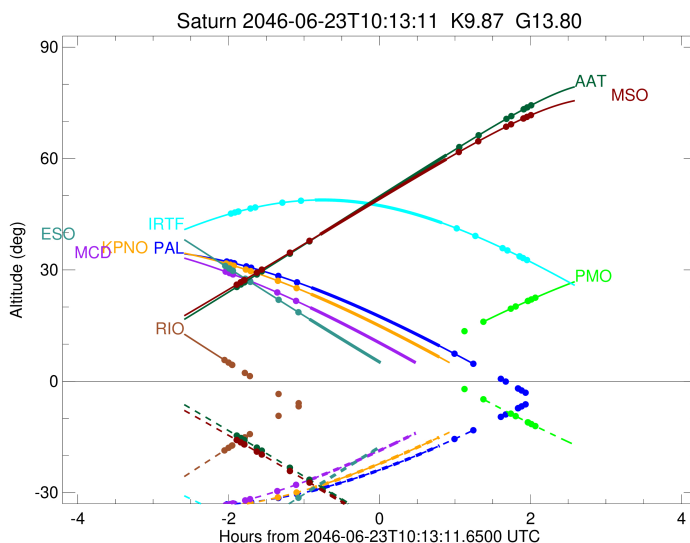
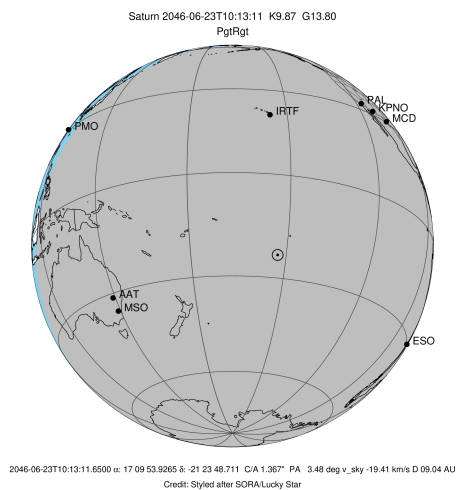
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:17:50.780  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488  
 ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 70.35  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.846  
 C/A sky separation (km) : 5548.5  
 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	2046-06-23T08:18:19.570		-21.84x	34.44x	140461.00	-19.26		
A (OER)	I	2046-06-23T08:21:30.981		-21.17x	33.77x	136774.40	-19.26		
Encke (OEG)	I	2046-06-23T08:24:08.270		-20.63x	33.22x	133744.89	-19.26		
Encke (IEG)	I	2046-06-23T08:24:24.966		-20.57x	33.16x	133423.31	-19.26		
A (IER)	I	2046-06-23T08:34:15.427		-18.54x	31.10x	122050.38	-19.26		
B (OER)	I	2046-06-23T08:38:07.997		-17.74x	30.29x	117571.16	-19.26		
B (IER)	I	2046-06-23T09:00:17.451		-13.20x	25.68x	91984.69	-19.22		
C (IER)	I	2046-06-23T09:15:28.916		-10.13x	22.55x	74490.58	-19.15		
Saturn	I	2046-06-23T09:26:29.790		-7.92x	20.29x	60252.82		-5.87	-7.20
Saturn	E	2046-06-23T11:08:59.506		11.45	0.09x	60262.30		-3.59	-4.41
C (IER)	E	2046-06-23T11:20:45.540		13.49	-2.10x	74490.58	19.35		
B (IER)	E	2046-06-23T11:35:46.760		16.03	-4.85x	91984.69	19.47		
B (OER)	E	2046-06-23T11:57:37.547		19.55	-8.73	117571.17	19.57		
A (IER)	E	2046-06-23T12:01:26.409		20.14	-9.39	122050.38	19.58		
Encke (IEG)	E	2046-06-23T12:11:06.878		21.62	-11.06	133423.31	19.61		
Encke (OEG)	E	2046-06-23T12:11:23.279		21.66	-11.10	133744.89	19.61		
A (OER)	E	2046-06-23T12:13:57.763		22.04	-11.54	136774.40	19.61		
F ring	E	2046-06-23T12:17:05.683		22.51	-12.07	140461.00	19.62		

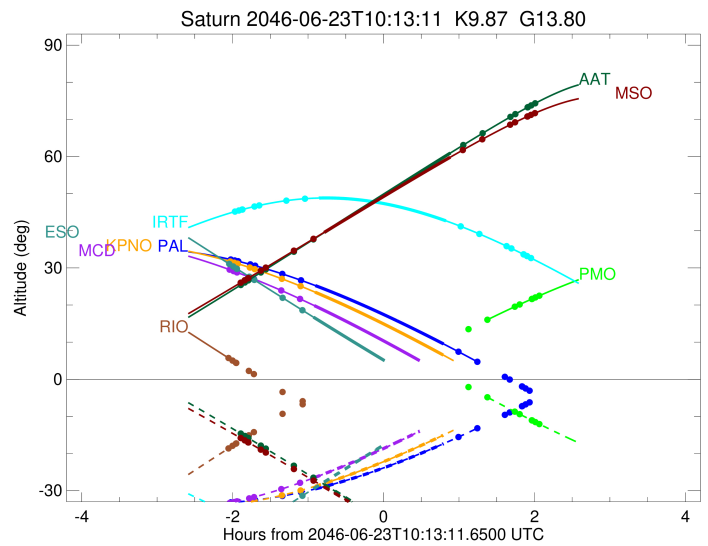
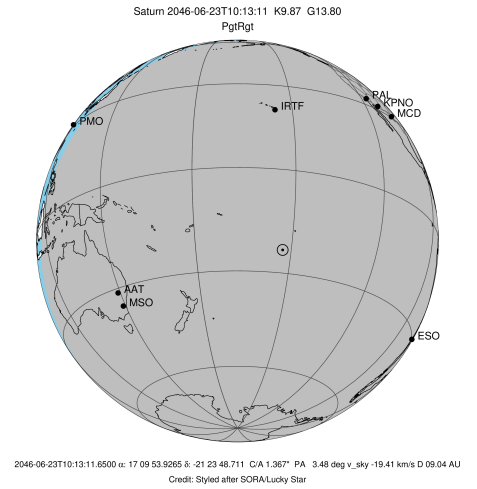
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:09:36.100  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488  
 ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 70.08  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.678  
 C/A sky separation (km) : 4443.6  
 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\_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	2046-06-23T08:11:24.173		31.71	-33.85	140461.00	-19.74		
A (OER)	I	2046-06-23T08:14:30.971		31.40	-33.71	136774.40	-19.73		
Encke (OEG)	I	2046-06-23T08:17:04.513		31.14	-33.59	133744.89	-19.73		
Encke (IEG)	I	2046-06-23T08:17:20.814		31.11	-33.58	133423.31	-19.73		
A (IER)	I	2046-06-23T08:26:57.581		30.09	-33.06	122050.38	-19.71		
B (OER)	I	2046-06-23T08:30:44.907		29.67	-32.83	117571.16	-19.70		
B (IER)	I	2046-06-23T08:52:25.819		27.06	-31.27	91984.69	-19.63		
C (IER)	I	2046-06-23T09:07:18.668		25.08	-29.96	74490.58	-19.55		
Saturn	I	2046-06-23T09:18:42.471		23.48	-28.84	60259.82		-4.31	-5.29
Saturn	E	2046-06-23T11:00:41.449		6.53	-15.07	60263.14		-3.32	-4.08
C (IER)	E	2046-06-23T11:12:29.646		4.33x	-13.14	74490.58	19.37		
B (IER)	E	2046-06-23T11:27:31.885		1.49x	-10.60	91984.69	19.41		
B (OER)	E	2046-06-23T11:49:29.958		-2.75x	-6.76	117571.16	19.41		
A (IER)	E	2046-06-23T11:53:20.699		-3.50x	-6.07	122050.38	19.41		
Encke (IEG)	E	2046-06-23T12:03:06.676		-5.42x	-4.31x	133423.31	19.41		
Encke (OEG)	E	2046-06-23T12:03:23.247		-5.48x	-4.26x	133744.89	19.40		
A (OER)	E	2046-06-23T12:05:59.378		-5.99x	-3.78x	136774.40	19.40		
F ring	E	2046-06-23T12:09:09.398		-6.62x	-3.20x	140461.00	19.40		

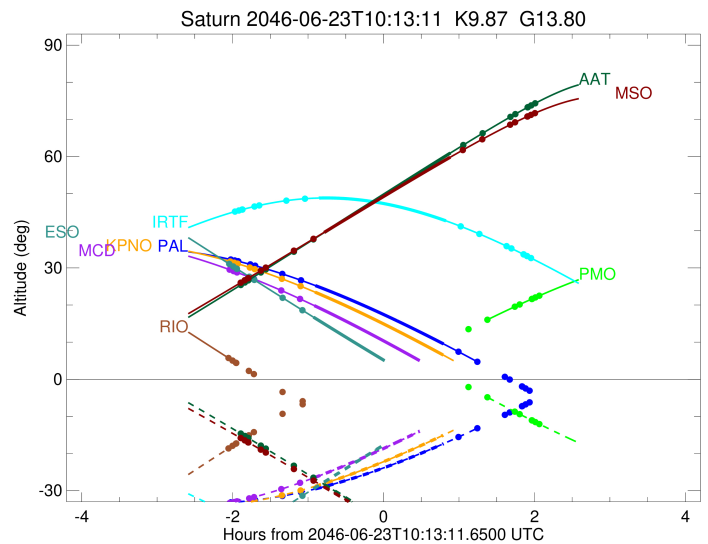
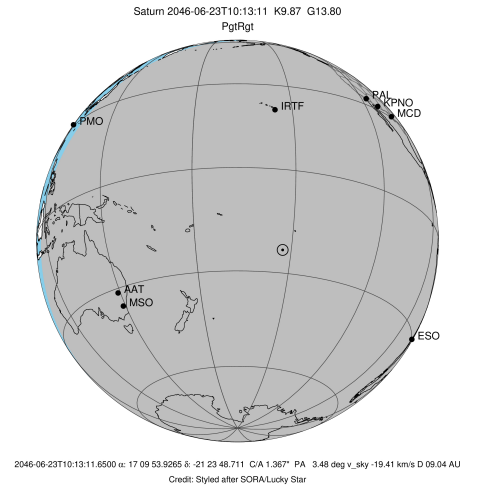
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:09:12.350  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488  
 ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 70.00  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.723  
 C/A sky separation (km) : 4739.0  
 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\_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	2046-06-23T08:10:51.594		29.53	-33.34	140461.00	-19.71		
A (OER)	I	2046-06-23T08:13:58.648		29.14	-33.11	136774.40	-19.71		
Encke (OEG)	I	2046-06-23T08:16:32.408		28.82	-32.91	133744.89	-19.70		
Encke (IEG)	I	2046-06-23T08:16:48.731		28.78	-32.89	133423.31	-19.70		
A (IER)	I	2046-06-23T08:26:26.382		27.52	-32.09	122050.38	-19.68		
B (OER)	I	2046-06-23T08:30:14.085		27.01	-31.75	117571.16	-19.67		
B (IER)	I	2046-06-23T08:51:57.534		23.92	-29.58	91984.69	-19.59		
C (IER)	I	2046-06-23T09:06:52.623		21.64	-27.89	74490.58	-19.49		
Saturn	I	2046-06-23T09:18:14.256		19.83	-26.49	60259.00		-4.52	-5.55
Saturn	E	2046-06-23T11:00:23.374		1.47x	-10.81	60262.27		-3.60	-4.43
C (IER)	E	2046-06-23T11:12:09.811		-0.83x	-8.72	74490.58	19.29		
B (IER)	E	2046-06-23T11:27:15.252		-3.81x	-5.99	91984.69	19.34		
B (OER)	E	2046-06-23T11:49:17.612		-8.25x	-1.89x	117571.16	19.35		
A (IER)	E	2046-06-23T11:53:09.078		-9.03x	-1.16x	122050.38	19.35		
Encke (IEG)	E	2046-06-23T12:02:56.873		-11.03x	0.71x	133423.31	19.35		
Encke (OEG)	E	2046-06-23T12:03:13.496		-11.09x	0.77x	133744.89	19.35		
A (OER)	E	2046-06-23T12:05:50.107		-11.62x	1.27x	136774.40	19.34		
F ring	E	2046-06-23T12:09:00.709		-12.28x	1.88x	140461.00	19.34		

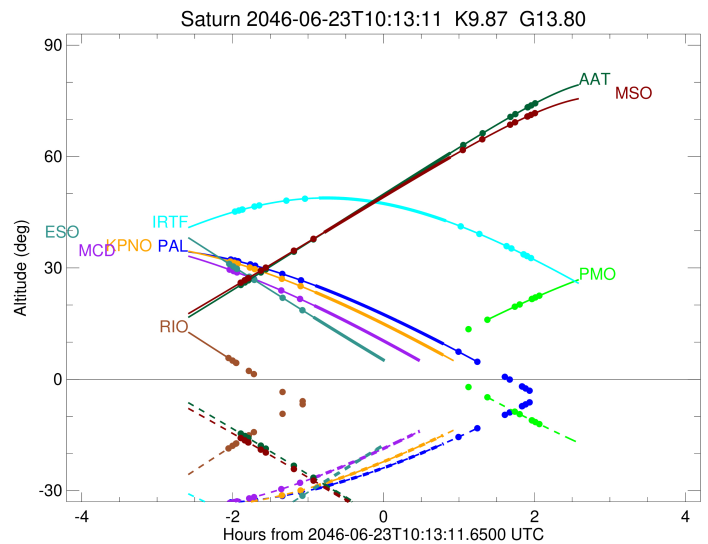
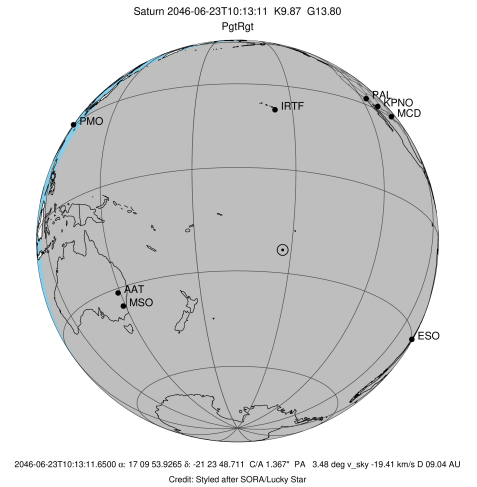
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:12:23.340  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : IRTF  
 Location : Mauna Kea/IRTF  
 Latitude (deg) : 19.82622  
 E. Longitude (deg) : 204.52800  
 Altitude (km) : 4.168  
 Gaia source ID : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488  
 ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 70.66  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.724  
 C/A sky separation (km) : 4746.2  
 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	2046-06-23T08:15:06.909		45.17	-36.63	140461.00	-19.79		
A (OER)	I	2046-06-23T08:18:13.195		45.47	-37.07	136774.40	-19.79		
Encke (OEG)	I	2046-06-23T08:20:46.290		45.70	-37.43	133744.89	-19.79		
Encke (IEG)	I	2046-06-23T08:21:02.542		45.73	-37.47	133423.31	-19.79		
A (IER)	I	2046-06-23T08:30:37.415		46.54	-38.77	122050.38	-19.78		
B (OER)	I	2046-06-23T08:34:23.909		46.83	-39.26	117571.16	-19.77		
B (IER)	I	2046-06-23T08:55:59.196		48.12	-41.82	91984.69	-19.73		
C (IER)	I	2046-06-23T09:10:47.490		48.64	-43.32	74490.58	-19.65		
Saturn	I	2046-06-23T09:21:56.581		48.82	-44.29	60257.71		-4.83	-5.93
Saturn	E	2046-06-23T11:02:53.526		42.67	-45.86	60263.07		-3.34	-4.10
C (IER)	E	2046-06-23T11:14:33.388		41.20	-45.16	74490.58	19.60		
B (IER)	E	2046-06-23T11:29:24.472		39.15	-44.04	91984.69	19.66		
B (OER)	E	2046-06-23T11:51:04.875		35.86	-41.95	117571.16	19.69		
A (IER)	E	2046-06-23T11:54:52.389		35.25	-41.54	122050.38	19.69		
Encke (IEG)	E	2046-06-23T12:04:30.017		33.66	-40.42	133423.31	19.69		
Encke (OEG)	E	2046-06-23T12:04:46.349		33.62	-40.39	133744.89	19.69		
A (OER)	E	2046-06-23T12:07:20.220		33.19	-40.08	136774.40	19.69		
F ring	E	2046-06-23T12:10:27.470		32.66	-39.69	140461.00	19.69		

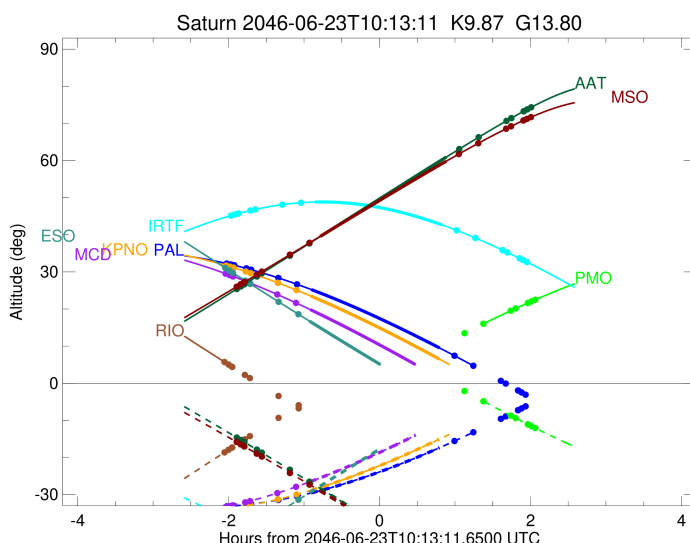
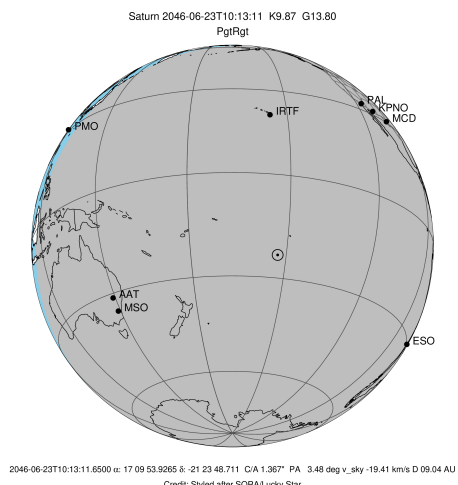
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:08:42.080  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488  
 ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 69.53  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.850  
 C/A sky separation (km) : 12131.8  
 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\_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

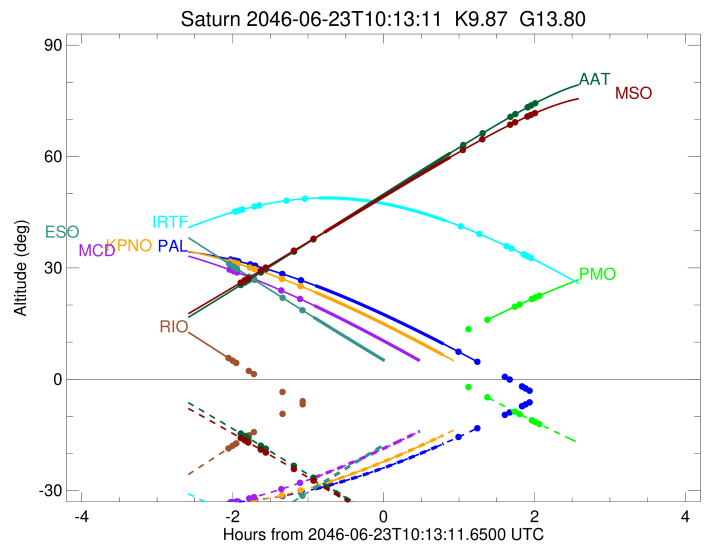
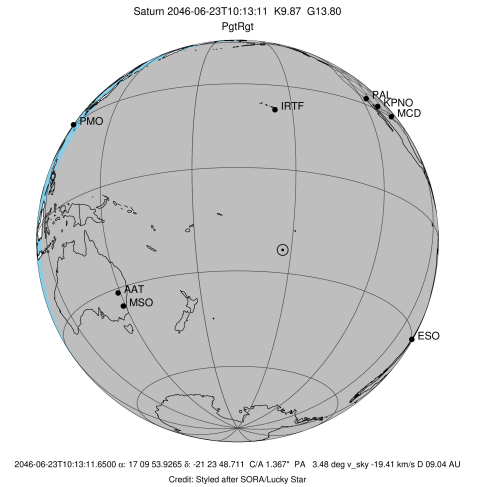
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-06-23T08:09:58.775		5.72	-18.62	140461.00	-19.04		
A (OER)	I	2046-06-23T08:13:12.557		5.02	-17.92	136774.40	-19.01		
Encke (OEG)	I	2046-06-23T08:15:52.010		4.45x	-17.34	133744.89	-18.99		
Encke (IEG)	I	2046-06-23T08:16:08.947		4.39x	-17.27	133423.31	-18.99		
A (IER)	I	2046-06-23T08:26:09.519		2.24x	-15.09	122050.38	-18.88		
B (OER)	I	2046-06-23T08:30:06.990		1.40x	-14.24	117571.16	-18.84		
B (IER)	I	2046-06-23T08:52:57.705		-3.43x	-9.31	91984.69	-18.45		
C (IER)	I	2046-06-23T09:08:57.524		-6.76x	-5.90	74490.58	-17.95		
Saturn	I	2046-06-23T09:17:34.662		-8.54x	-4.07x	60217.62		-10.75	-13.12
Saturn	E	2046-06-23T11:00:03.660		-28.04x	16.56x	60224.41		-9.99	-12.20
C (IER)	E	2046-06-23T11:09:25.865		-29.62x	18.31x	74490.58	17.76		
B (IER)	E	2046-06-23T11:25:37.296		-32.24x	21.27x	91984.69	18.21		
B (OER)	E	2046-06-23T11:48:49.181		-35.71x	25.33x	117571.16	18.52		
A (IER)	E	2046-06-23T11:52:50.856		-36.28x	26.01x	122050.38	18.55		
Encke (IEG)	E	2046-06-23T12:03:02.749		-37.65x	27.70x	133423.31	18.62		
Encke (OEG)	E	2046-06-23T12:03:20.019		-37.69x	27.75x	133744.89	18.62		
A (OER)	E	2046-06-23T12:06:02.649		-38.04x	28.19x	136774.40	18.64		
F ring	E	2046-06-23T12:09:20.384		-38.46x	28.72x	140461.00	18.65		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:08:12.630  
 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 : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488  
 ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 69.87  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.785  
 C/A sky separation (km) : 11707.5  
 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	2046-06-23T08:10:33.816		31.07	-43.95	140461.00	-19.26		
A (OER)	I	2046-06-23T08:13:45.385		30.37	-43.26	136774.40	-19.23		
Encke (OEG)	I	2046-06-23T08:16:22.998		29.81	-42.69	133744.89	-19.21		
Encke (IEG)	I	2046-06-23T08:16:39.739		29.75	-42.63	133423.31	-19.21		
A (IER)	I	2046-06-23T08:26:33.214		27.61	-40.48	122050.38	-19.12		
B (OER)	I	2046-06-23T08:30:27.803		26.77	-39.63	117571.16	-19.07		
B (IER)	I	2046-06-23T08:53:00.782		21.94	-34.76	91984.69	-18.71		
C (IER)	I	2046-06-23T09:08:46.476		18.59	-31.38	74490.58	-18.24		
Saturn	I	2046-06-23T09:17:32.275		16.73	-29.50	60220.86		-10.39	-12.69
Saturn	E	2046-06-23T10:59:08.105		-3.98x	-8.31	60227.27		-9.65	-11.80
C (IER)	E	2046-06-23T11:08:36.937		-5.81x	-6.40	74490.58	18.03		
B (IER)	E	2046-06-23T11:24:35.079		-8.86x	-3.22x	91984.69	18.44		
B (OER)	E	2046-06-23T11:47:30.780		-13.10x	1.27x	117571.16	18.72		
A (IER)	E	2046-06-23T11:51:29.885		-13.82x	2.03x	122050.38	18.75		
Encke (IEG)	E	2046-06-23T12:01:35.530		-15.62x	3.96x	133423.31	18.81		
Encke (OEG)	E	2046-06-23T12:01:52.629		-15.67x	4.02x	133744.89	18.81		
A (OER)	E	2046-06-23T12:04:33.660		-16.15x	4.53x	136774.40	18.82		
F ring	E	2046-06-23T12:07:49.482		-16.72x	5.14x	140461.00	18.83		

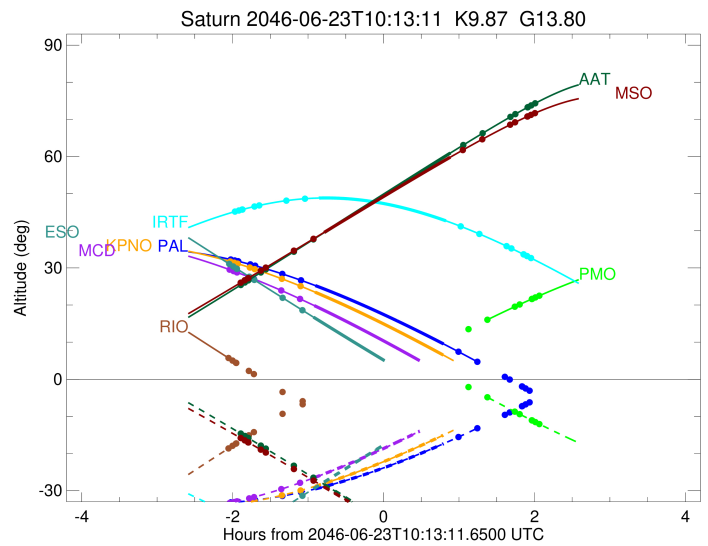
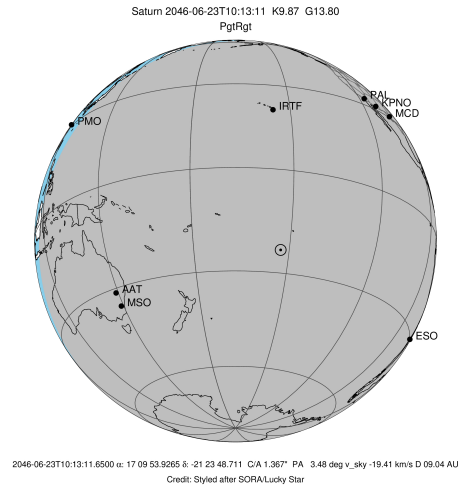
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:16:22.560  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488  
 ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 70.90  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.644  
 C/A sky separation (km) : 10778.8  
 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\_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	2046-06-23T08:19:44.756		25.40	-14.63	140461.00	-19.26		
A (OER)	I	2046-06-23T08:22:56.213		26.08	-15.28	136774.40	-19.25		
Encke (OEG)	I	2046-06-23T08:25:33.633		26.63	-15.81	133744.89	-19.24		
Encke (IEG)	I	2046-06-23T08:25:50.348		26.69	-15.87	133423.31	-19.24		
A (IER)	I	2046-06-23T08:35:42.205		28.78	-17.88	122050.38	-19.19		
B (OER)	I	2046-06-23T08:39:35.767		29.60	-18.68	117571.16	-19.17		
B (IER)	I	2046-06-23T09:01:57.974		34.37	-23.29	91984.69	-18.93		
C (IER)	I	2046-06-23T09:17:29.992		37.69	-26.53	74490.58	-18.57		
Saturn	I	2046-06-23T09:26:09.244		39.54	-28.34	60221.66		-10.30	-12.58
Saturn	E	2046-06-23T11:06:28.023		60.97	-49.65	60238.66		-8.18	-10.01
C (IER)	E	2046-06-23T11:16:36.201		63.09	-51.82	74490.58	18.70		
B (IER)	E	2046-06-23T11:32:01.100		66.27	-55.11	91984.69	19.09		
B (OER)	E	2046-06-23T11:54:10.352		70.69	-59.84	117571.16	19.37		
A (IER)	E	2046-06-23T11:58:01.340		71.43	-60.66	122050.38	19.41		
Encke (IEG)	E	2046-06-23T12:07:46.260		73.26	-62.72	133423.31	19.48		
Encke (OEG)	E	2046-06-23T12:08:02.770		73.31	-62.78	133744.89	19.48		
A (OER)	E	2046-06-23T12:10:38.241		73.78	-63.33	136774.40	19.49		
F ring	E	2046-06-23T12:13:47.274		74.34	-63.99	140461.00	19.51		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-23T10:16:12.990  
 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 : 4115644203742327168  
 2Mass ID (if available) : 17095394-2123488  
 ICRS Star Coord at Epoch: 17h 09m 53.92654s -21:23:48.71122s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 9.866  
 G magnitude : 13.797  
 RP magnitude : 12.752  
 BP magnitude : 14.926  
 DUPflag : 0  
 Distance (au) : 9.043  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.41  
 Sun-Target sep (deg) : 166.76  
 Sun-Moon sep (deg) : 70.88  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.36  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.706  
 C/A sky separation (km) : 11185.5  
 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	2046-06-23T08:19:40.937		26.03	-15.84	140461.00	-19.23		
A (OER)	I	2046-06-23T08:22:52.688		26.68	-16.46	136774.40	-19.22		
Encke (OEG)	I	2046-06-23T08:25:30.360		27.21	-16.98	133744.89	-19.21		
Encke (IEG)	I	2046-06-23T08:25:47.102		27.27	-17.03	133423.31	-19.21		
A (IER)	I	2046-06-23T08:35:40.018		29.27	-18.97	122050.38	-19.15		
B (OER)	I	2046-06-23T08:39:34.050		30.07	-19.74	117571.16	-19.13		
B (IER)	I	2046-06-23T09:01:59.785		34.65	-24.19	91984.69	-18.86		
C (IER)	I	2046-06-23T09:17:35.619		37.85	-27.31	74490.58	-18.48		
Saturn	I	2046-06-23T09:26:01.846		39.58	-29.01	60218.61		-10.64	-12.99
Saturn	E	2046-06-23T11:06:16.700		59.82	-49.42	60236.02		-8.54	-10.45
C (IER)	E	2046-06-23T11:16:14.476		61.74	-51.45	74490.58	18.60		
B (IER)	E	2046-06-23T11:31:43.492		64.64	-54.59	91984.69	19.02		
B (OER)	E	2046-06-23T11:53:56.829		68.58	-59.05	117571.16	19.33		
A (IER)	E	2046-06-23T11:57:48.397		69.22	-59.81	122050.38	19.36		
Encke (IEG)	E	2046-06-23T12:07:34.675		70.78	-61.74	133423.31	19.43		
Encke (OEG)	E	2046-06-23T12:07:51.221		70.82	-61.80	133744.89	19.44		
A (OER)	E	2046-06-23T12:10:27.029		71.22	-62.30	136774.40	19.45		
F ring	E	2046-06-23T12:13:36.458		71.69	-62.92	140461.00	19.47		