

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T07:04:05.580  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394

Saturn 2047-06-02T07:04:05 K8.47 G11.24 PgtRgt

ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s

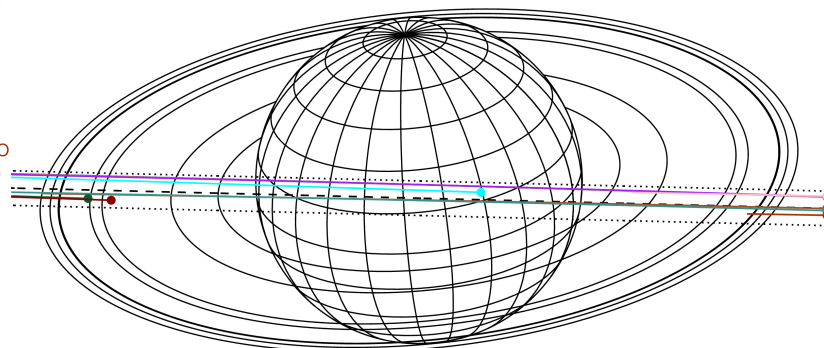
RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 100.76  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69

#	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



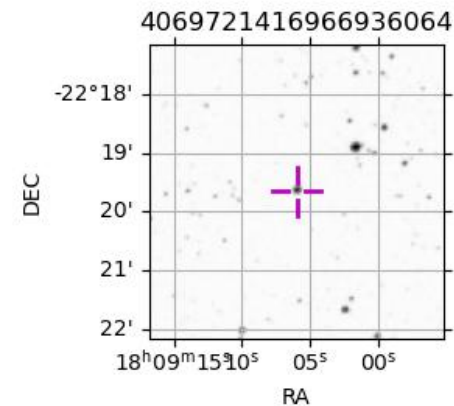
2047-06-02T07:04:05.5800 at: 18 09 06.07300 s: -22 19 39.695 C/A 0.9911° PA 358.57 deg v\_sky -18.19 km/s D 09.09 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PAL  
 KPNO  
 MCD  
 TEN  
 IRTF  
 RIO  
 ESO  
 AAT  
 SAAO  
 MSO

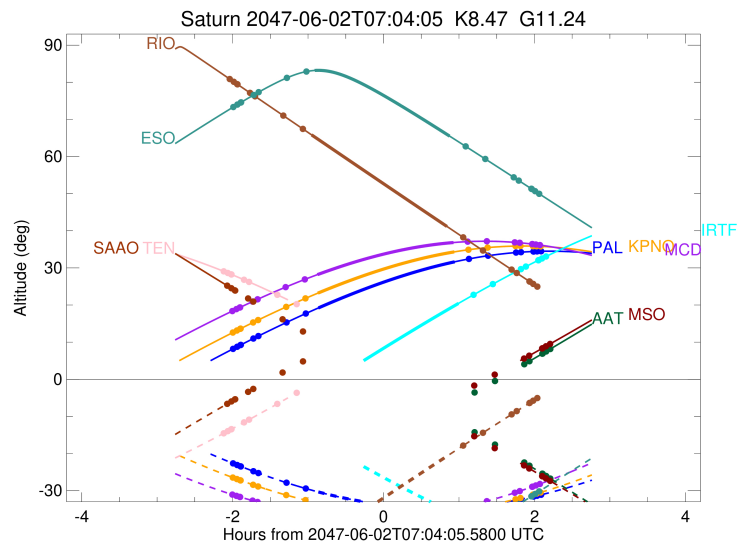
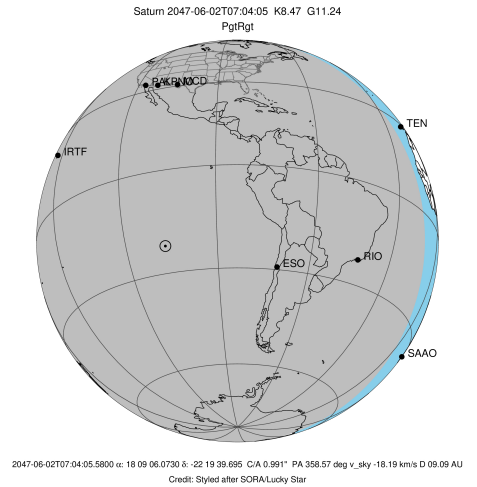


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 02 05:04 - JUN 02 09:09	PieRie
PMO	Purple Mtn Obs	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl	32.0	248.4	+	+	+	JUN 02 05:04 - JUN 02 09:09	PieRie
MCD	McDonald Obs.	30.7	256.0	+	+	+	JUN 02 05:03 - JUN 02 09:08	PieRie
TEN	Teide Obs./Ten	28.3	343.5	+	+	+	JUN 02 04:57 - JUN 02 05:39	PnnRin
IRTF	Mauna Kea/IRTF	19.8	204.5		+	+	JUN 02 08:03 - JUN 02 09:13	PneRne
KAV	Kavalur Observ	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+	+	+	JUN 02 05:01 - JUN 02 09:06	PieRie
ESO	European South	-29.3	289.3	+	+	+	JUN 02 05:04 - JUN 02 09:07	PieRie
AAT	Siding Spring	-31.3	149.1			+	JUN 02 09:10 - JUN 02 09:16	PnnRne
SAAO	So. Afr. Astro	-32.4	20.8	+	+	+	JUN 02 04:59 - JUN 02 05:06	PnnRin
MSO	Mt. Stromlo Ob	-35.3	149.0			+	JUN 02 08:55 - JUN 02 09:16	PnnRne

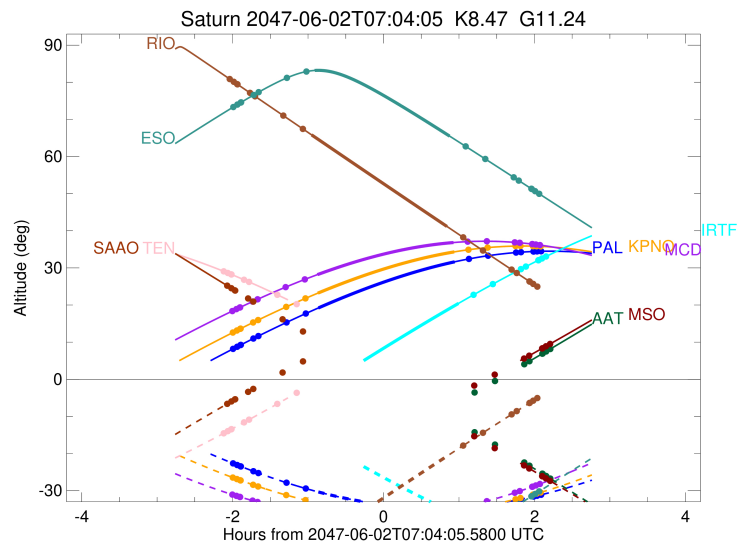
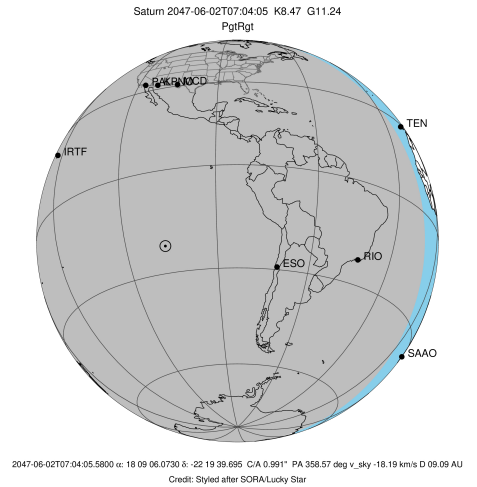


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T07:06:35.250  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 101.26  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.230  
 C/A sky separation (km) : 1518.6  
 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	2047-06-02T05:04:32.177		8.20	-22.67	140461.00	-18.98		
A (OER)	I	2047-06-02T05:07:46.384		8.76	-23.10	136774.40	-18.98		
Encke (OEG)	I	2047-06-02T05:10:25.944		9.22	-23.46	133744.89	-18.99		
Encke (IEG)	I	2047-06-02T05:10:42.879		9.27	-23.49	133423.31	-18.99		
A (IER)	I	2047-06-02T05:20:41.598		10.98	-24.78	122050.38	-19.00		
B (OER)	I	2047-06-02T05:24:37.295		11.64	-25.27	117571.16	-19.01		
B (IER)	I	2047-06-02T05:47:02.623		15.32	-27.87	91984.69	-19.03		
C (IER)	I	2047-06-02T06:02:21.681		17.71	-29.44	74490.58	-19.04		
Saturn	I	2047-06-02T06:12:18.049		19.21	-30.36	60241.45		-7.88	-9.64
Saturn	E	2047-06-02T08:00:43.602		31.64	-34.51	60256.37		5.20	6.38
C (IER)	E	2047-06-02T08:11:59.892		32.42	-34.27	74490.58	19.14		
B (IER)	E	2047-06-02T08:27:13.698		33.28	-33.74	91984.69	19.15		
B (OER)	E	2047-06-02T08:49:29.447		34.14	-32.56	117571.16	19.16		
A (IER)	E	2047-06-02T08:53:23.236		34.24	-32.30	122050.38	19.16		
Encke (IEG)	E	2047-06-02T09:03:16.810		34.42	-31.59	133423.31	19.16		
Encke (OEG)	E	2047-06-02T09:03:33.594		34.42	-31.57	133744.89	19.16		
A (OER)	E	2047-06-02T09:06:11.706		34.45	-31.37	136774.40	19.16		
F ring	E	2047-06-02T09:09:24.112		34.48	-31.11	140461.00	19.16		

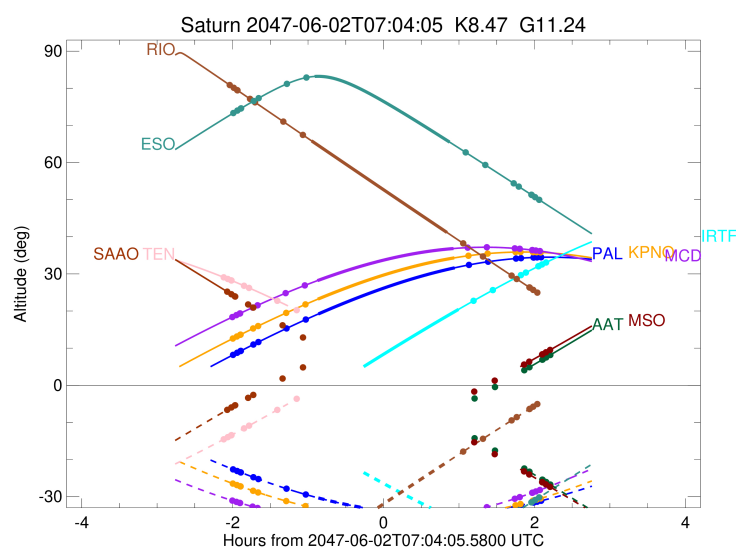
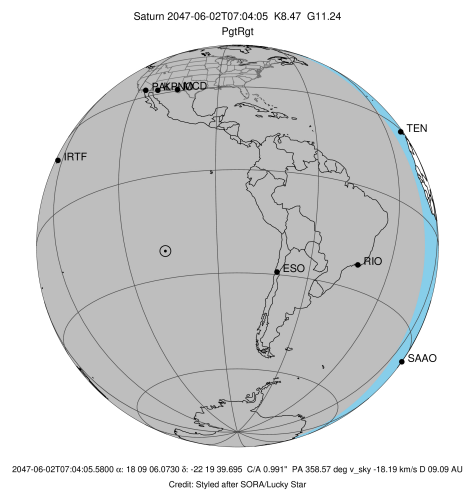
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T07:06:14.370  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 101.30  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.232  
 C/A sky separation (km) : 1530.9  
 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	2047-06-02T05:04:21.243		12.60	-26.49	140461.00	-19.01		
A (OER)	I	2047-06-02T05:07:35.126		13.15	-26.89	136774.40	-19.02		
Encke (OEG)	I	2047-06-02T05:10:14.420		13.60	-27.22	133744.89	-19.02		
Encke (IEG)	I	2047-06-02T05:10:31.327		13.65	-27.25	133423.31	-19.02		
A (IER)	I	2047-06-02T05:20:29.071		15.31	-28.43	122050.38	-19.03		
B (OER)	I	2047-06-02T05:24:24.392		15.95	-28.88	117571.16	-19.04		
B (IER)	I	2047-06-02T05:46:47.679		19.50	-31.20	91984.69	-19.06		
C (IER)	I	2047-06-02T06:02:05.447		21.79	-32.55	74490.58	-19.06		
Saturn	I	2047-06-02T06:12:01.690		23.22	-33.32	60241.57		-7.86	-9.62
Saturn	E	2047-06-02T08:00:19.376		34.31	-35.34	60256.56		5.16	6.33
C (IER)	E	2047-06-02T08:11:36.443		34.89	-34.85	74490.58	19.14		
B (IER)	E	2047-06-02T08:26:49.944		35.47	-33.98	91984.69	19.16		
B (OER)	E	2047-06-02T08:49:05.447		35.87	-32.33	117571.16	19.16		
A (IER)	E	2047-06-02T08:52:59.219		35.89	-32.00	122050.38	19.16		
Encke (IEG)	E	2047-06-02T09:02:52.781		35.86	-31.09	133423.31	19.16		
Encke (OEG)	E	2047-06-02T09:03:09.565		35.86	-31.06	133744.88	19.16		
A (OER)	E	2047-06-02T09:05:47.683		35.83	-30.81	136774.40	19.16		
F ring	E	2047-06-02T09:09:00.101		35.79	-30.49	140461.00	19.16		

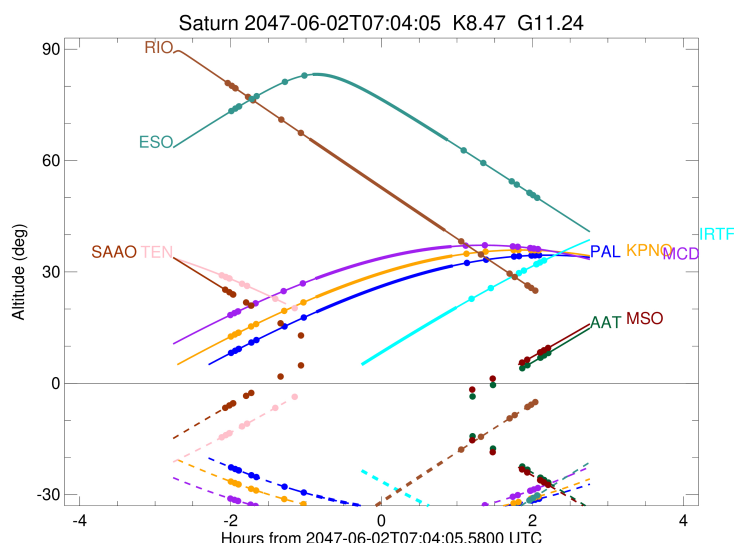
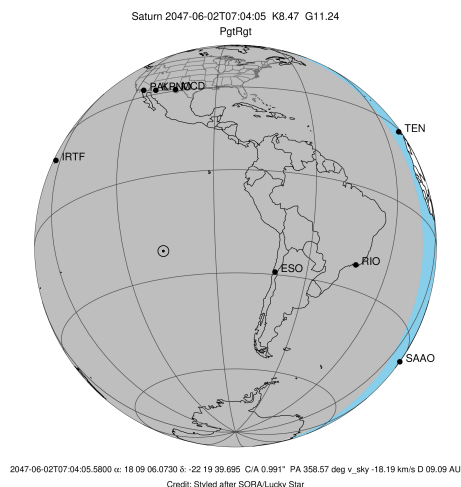
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T07:05:40.260  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 101.34  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.232  
 C/A sky separation (km) : 1529.0  
 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	2047-06-02T05:03:58.056		18.38	-31.07	140461.00	-19.05		
A (OER)	I	2047-06-02T05:07:11.528		18.91	-31.41	136774.40	-19.06		
Encke (OEG)	I	2047-06-02T05:09:50.489		19.33	-31.69	133744.89	-19.06		
Encke (IEG)	I	2047-06-02T05:10:07.361		19.38	-31.72	133423.31	-19.06		
A (IER)	I	2047-06-02T05:20:03.890		20.94	-32.70	122050.38	-19.07		
B (OER)	I	2047-06-02T05:23:58.747		21.54	-33.06	117571.16	-19.07		
B (IER)	I	2047-06-02T05:46:19.549		24.83	-34.87	91984.69	-19.09		
C (IER)	I	2047-06-02T06:01:35.788		26.91	-35.84	74490.58	-19.09		
Saturn	I	2047-06-02T06:11:32.850		28.18	-36.34	60241.89		-7.81	-9.56
Saturn	E	2047-06-02T07:59:41.890		36.83	-35.00	60256.78		5.11	6.27
C (IER)	E	2047-06-02T08:11:00.068		37.07	-34.16	74490.58	19.15		
B (IER)	E	2047-06-02T08:26:13.556		37.18	-32.85	91984.69	19.15		
B (OER)	E	2047-06-02T08:48:29.344		36.88	-30.57	117571.16	19.15		
A (IER)	E	2047-06-02T08:52:23.202		36.77	-30.13	122050.38	19.15		
Encke (IEG)	E	2047-06-02T09:02:17.034		36.42	-28.97	133423.31	19.15		
Encke (OEG)	E	2047-06-02T09:02:33.827		36.41	-28.93	133744.89	19.15		
A (OER)	E	2047-06-02T09:05:12.029		36.30	-28.61	136774.40	19.15		
F ring	E	2047-06-02T09:08:24.556		36.15	-28.21	140461.00	19.15		

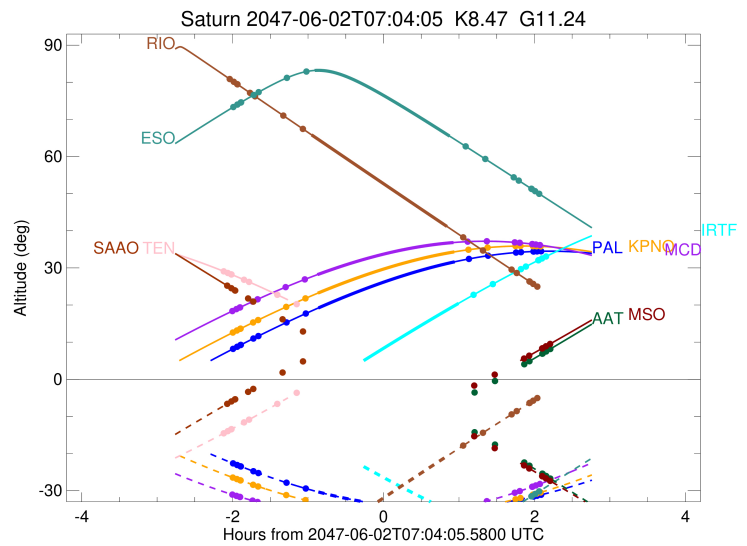
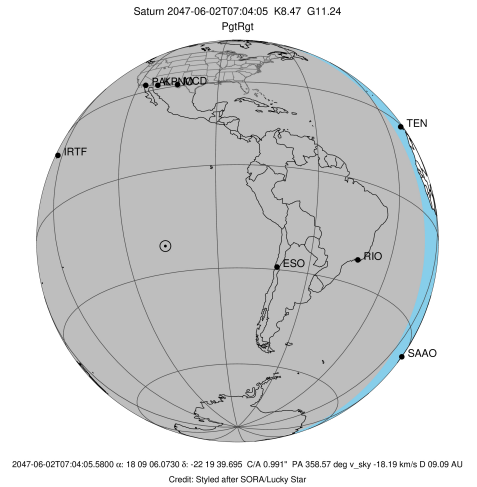
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T06:59:15.870  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 100.74  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.462  
 C/A sky separation (km) : 3044.8  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



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

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-02T04:57:06.616		29.07	-14.55	140461.00	-19.01		
A (OER)	I	2047-06-02T05:00:20.582		28.63	-13.97	136774.40	-19.00		
Encke (OEG)	I	2047-06-02T05:03:00.017		28.26	-13.48	133744.89	-19.00		
Encke (IEG)	I	2047-06-02T05:03:16.943		28.22	-13.43	133423.31	-19.00		
A (IER)	I	2047-06-02T05:13:15.832		26.80	-11.61	122050.38	-18.98		
B (OER)	I	2047-06-02T05:17:11.865		26.22	-10.88	117571.17	-18.97		
B (IER)	I	2047-06-02T05:39:42.190		22.75	-6.63	91984.69	-18.92		
C (IER)	I	2047-06-02T05:55:08.009		20.23	-3.64x	74490.58	-18.87		
Saturn	I	2047-06-02T06:04:44.678		18.61	-1.75x	60236.73		-8.55	-10.47
Saturn	E	2047-06-02T07:54:03.333		-1.96x	20.81x	60263.24		3.33	4.09
C (IER)	E	2047-06-02T08:06:16.624		-4.44x	23.42x	74490.58	18.65		
B (IER)	E	2047-06-02T08:21:54.404		-7.64x	26.78x	91984.69	18.65		
B (OER)	E	2047-06-02T08:44:46.572		-12.39x	31.73x	117571.16	18.64		
A (IER)	E	2047-06-02T08:48:46.944		-13.23x	32.60x	122050.38	18.63		
Encke (IEG)	E	2047-06-02T08:58:57.523		-15.37x	34.81x	133423.31	18.62		
Encke (OEG)	E	2047-06-02T08:59:14.793		-15.43x	34.88x	133744.89	18.62		
A (OER)	E	2047-06-02T09:01:57.510		-16.00x	35.47x	136774.40	18.62		
F ring	E	2047-06-02T09:05:15.559		-16.70x	36.19x	140461.00	18.61		

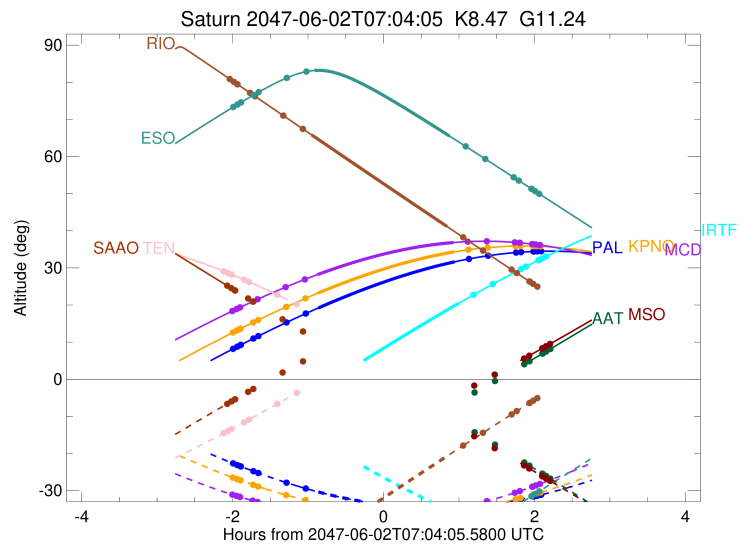
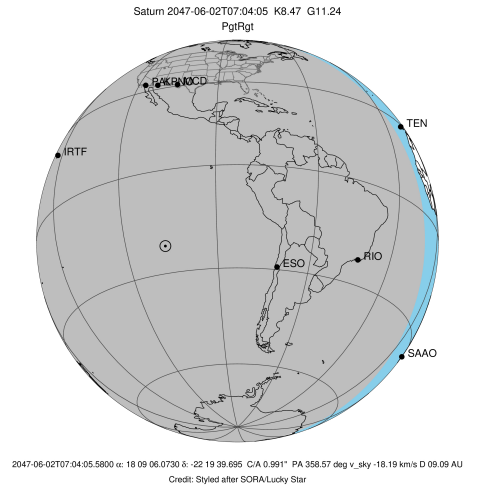
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T07:09:13.730  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : IRTF  
 Location : Mauna Kea/IRTF  
 Latitude (deg) : 19.82622  
 E. Longitude (deg) : 204.52800  
 Altitude (km) : 4.168  
 Gaia source ID : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 101.06  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.548  
 C/A sky separation (km) : 3615.7  
 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	2047-06-02T05:07:02.416		-17.18x	-2.93x	140461.00	-18.71		
A (OER)	I	2047-06-02T05:10:19.436		-16.44x	-3.63x	136774.40	-18.71		
Encke (OEG)	I	2047-06-02T05:13:01.299		-15.84x	-4.21x	133744.89	-18.72		
Encke (IEG)	I	2047-06-02T05:13:18.479		-15.77x	-4.27x	133423.31	-18.72		
A (IER)	I	2047-06-02T05:23:25.799		-13.51x	-6.41	122050.38	-18.73		
B (OER)	I	2047-06-02T05:27:24.869		-12.62x	-7.25	117571.16	-18.74		
B (IER)	I	2047-06-02T05:50:09.513		-7.59x	-11.98	91984.69	-18.76		
C (IER)	I	2047-06-02T06:05:42.293		-4.18x	-15.15	74490.58	-18.75		
Saturn	I	2047-06-02T06:14:26.380		-2.27x	-16.91	60226.43		-9.87	-12.07
Saturn	E	2047-06-02T08:03:44.343		20.44	-36.53	60262.22		3.66	4.50
C (IER)	E	2047-06-02T08:15:40.030		22.74	-38.28	74490.58	18.98		
B (IER)	E	2047-06-02T08:30:59.940		25.63	-40.38	91984.69	19.05		
B (OER)	E	2047-06-02T08:53:21.153		29.67	-43.08	117571.16	19.10		
A (IER)	E	2047-06-02T08:57:15.566		30.35	-43.50	122050.38	19.11		
Encke (IEG)	E	2047-06-02T09:07:10.333		32.05	-44.50	133423.31	19.13		
Encke (OEG)	E	2047-06-02T09:07:27.142		32.09	-44.52	133744.89	19.13		
A (OER)	E	2047-06-02T09:10:05.478		32.54	-44.77	136774.40	19.14		
F ring	E	2047-06-02T09:13:18.108		33.07	-45.06	140461.00	19.14		

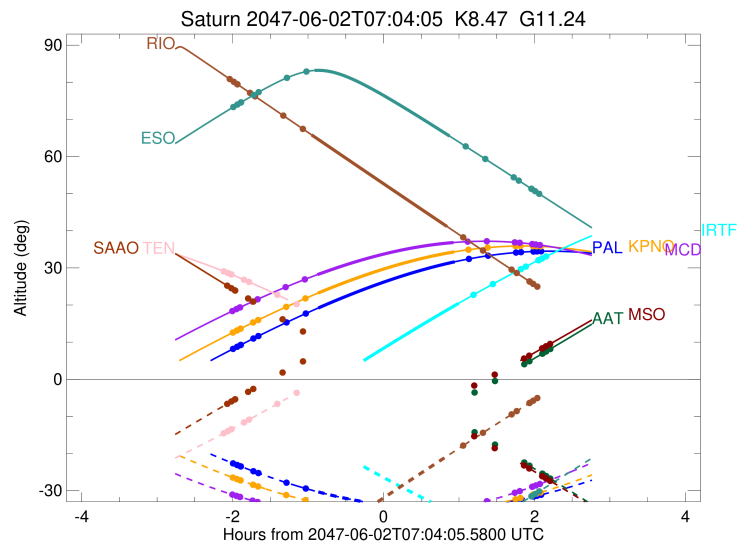
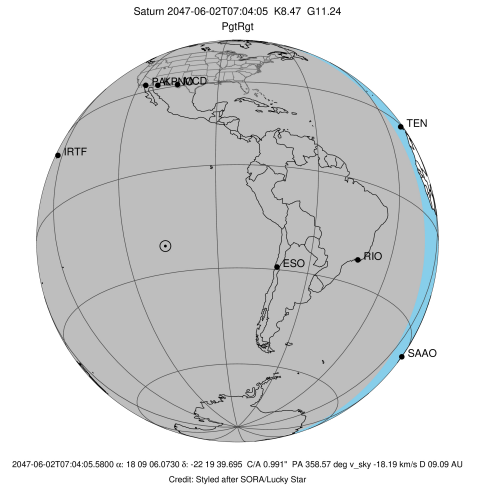
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T07:00:37.900  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 101.42  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.094  
 C/A sky separation (km) : 7212.2  
 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	2047-06-02T05:01:52.870		80.86	-59.78	140461.00	-19.04		
A (OER)	I	2047-06-02T05:05:06.577		80.12	-59.04	136774.40	-19.03		
Encke (OEG)	I	2047-06-02T05:07:45.827		79.50	-58.43	133744.89	-19.02		
Encke (IEG)	I	2047-06-02T05:08:02.735		79.44	-58.36	133423.31	-19.02		
A (IER)	I	2047-06-02T05:18:01.227		77.13	-56.08	122050.38	-18.99		
B (OER)	I	2047-06-02T05:21:57.256		76.22	-55.18	117571.16	-18.97		
B (IER)	I	2047-06-02T05:44:30.304		71.01	-50.02	91984.69	-18.84		
C (IER)	I	2047-06-02T06:00:02.866		67.42	-46.47	74490.58	-18.67		
Saturn	I	2047-06-02T06:06:54.527		65.84	-44.91	60204.64		-12.23	-14.90
Saturn	E	2047-06-02T07:54:34.936		41.16	-20.71	60267.99		-0.16	-0.20
C (IER)	E	2047-06-02T08:07:26.011		38.24	-17.87	74490.58	18.50		
B (IER)	E	2047-06-02T08:23:08.112		34.68	-14.42	91984.69	18.62		
B (OER)	E	2047-06-02T08:45:58.701		29.53	-9.45	117571.16	18.70		
A (IER)	E	2047-06-02T08:49:58.224		28.64	-8.59	122050.38	18.70		
Encke (IEG)	E	2047-06-02T09:00:06.135		26.36	-6.41	133423.31	18.71		
Encke (OEG)	E	2047-06-02T09:00:23.321		26.30	-6.35	133744.89	18.71		
A (OER)	E	2047-06-02T09:03:05.218		25.70	-5.77	136774.40	18.71		
F ring	E	2047-06-02T09:06:22.219		24.96	-5.07	140461.00	18.71		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T07:02:58.430  
 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 : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 101.66  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.119  
 C/A sky separation (km) : 7378.6  
 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

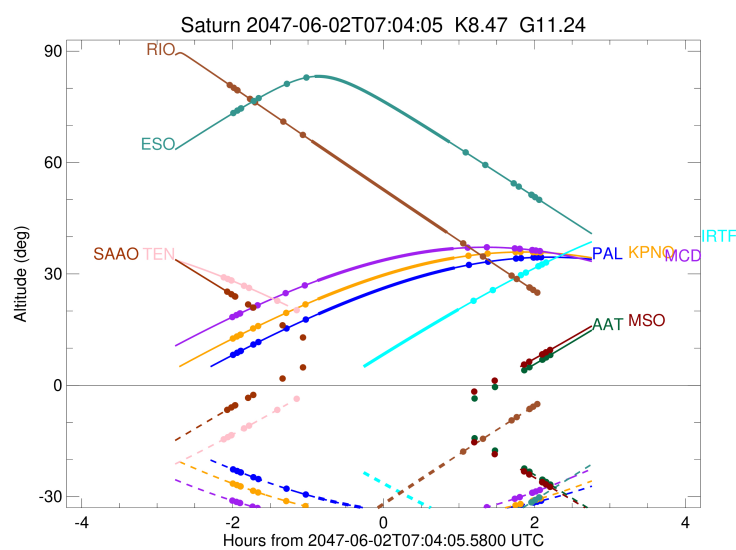
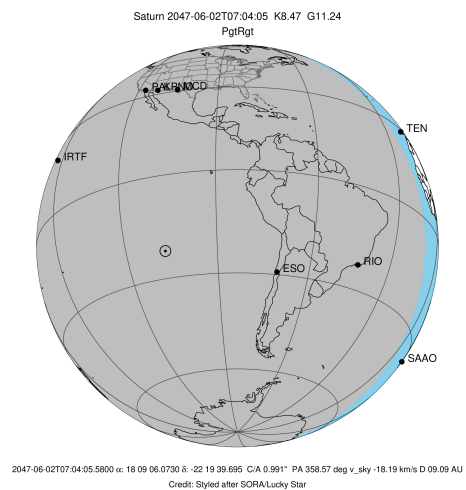


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-02T05:04:45.359		73.35	-81.23	140461.00	-19.04		
A (OER)	I	2047-06-02T05:07:59.062		74.01	-80.77	136774.40	-19.03		
Encke (OEG)	I	2047-06-02T05:10:38.290		74.55	-80.36	133744.89	-19.02		
Encke (IEG)	I	2047-06-02T05:10:55.194		74.61	-80.32	133423.31	-19.02		
A (IER)	I	2047-06-02T05:20:53.441		76.59	-78.64	122050.38	-19.00		
B (OER)	I	2047-06-02T05:24:49.309		77.34	-77.92	117571.16	-18.98		
B (IER)	I	2047-06-02T05:47:20.795		81.20	-73.52	91984.69	-18.87		
C (IER)	I	2047-06-02T06:02:51.769		82.90	-70.30	74490.58	-18.70		
Saturn	I	2047-06-02T06:09:24.418		83.19	-68.92	60201.16		-12.56	-15.30
Saturn	E	2047-06-02T07:56:38.734		65.51	-45.65	60267.99		-0.13	-0.16
C (IER)	E	2047-06-02T08:09:24.870		62.74	-42.87	74490.58	18.63		
B (IER)	E	2047-06-02T08:25:00.039		59.35	-39.48	91984.69	18.77		
B (OER)	E	2047-06-02T08:47:39.322		54.39	-34.56	117571.17	18.86		
A (IER)	E	2047-06-02T08:51:36.748		53.53	-33.71	122050.38	18.87		
Encke (IEG)	E	2047-06-02T09:01:39.197		51.33	-31.54	133423.31	18.88		
Encke (OEG)	E	2047-06-02T09:01:56.225		51.26	-31.48	133744.89	18.88		
A (OER)	E	2047-06-02T09:04:36.633		50.68	-30.91	136774.40	18.89		
F ring	E	2047-06-02T09:07:51.806		49.97	-30.21	140461.00	18.89		



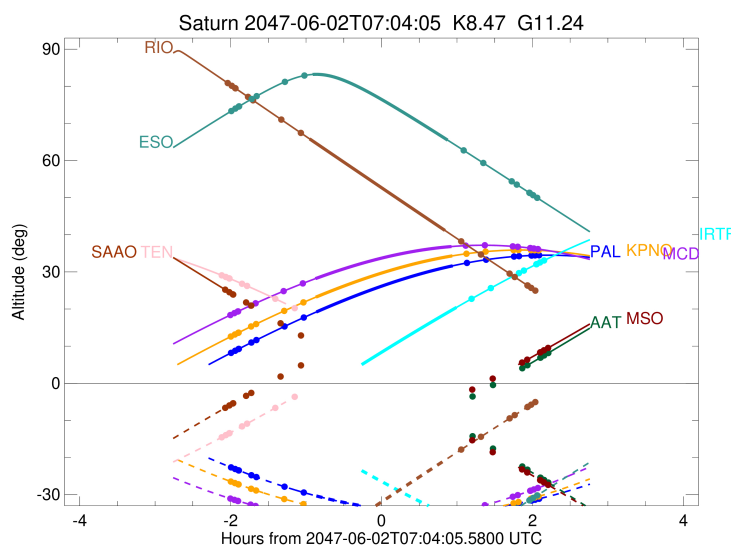
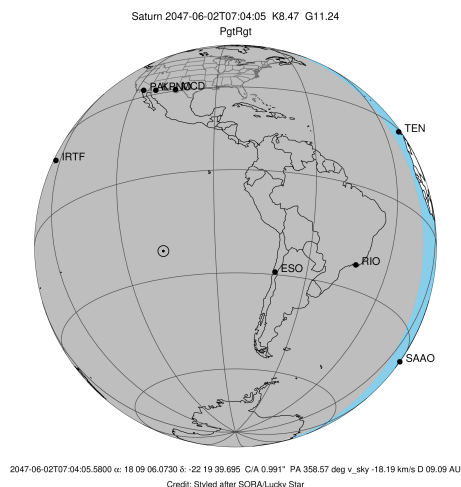
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T07:08:19.040  
 Event type : PgtRgt  
 : Ring occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 100.63  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.618  
 C/A sky separation (km) : 10671.7  
 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	2047-06-02T05:08:21.464	-31.91x	20.42x	140461.00	-18.13			
A (OER)	I	2047-06-02T05:11:44.858	-31.59x	19.90x	136774.40	-18.12			
Encke (OEG)	I	2047-06-02T05:14:32.090	-31.31x	19.46x	133744.89	-18.11			
Encke (IEG)	I	2047-06-02T05:14:49.846	-31.28x	19.42x	133423.31	-18.11			
A (IER)	I	2047-06-02T05:25:18.551	-30.19x	17.75x	122050.38	-18.07			
B (OER)	I	2047-06-02T05:29:26.625	-29.74x	17.08x	117571.16	-18.04			
B (IER)	I	2047-06-02T05:53:11.606	-26.90x	13.09x	91984.69	-17.84			
C (IER)	I	2047-06-02T06:09:39.914	-24.71x	10.20x	74490.58	-17.53			
Saturn	I	2047-06-02T06:13:14.323	-24.21x	9.56x	60163.30	-15.81		-19.15	
Saturn	E	2047-06-02T08:03:13.943	-6.04x	-11.57	60265.51	-2.40		-2.95	
C (IER)	E	2047-06-02T08:16:29.147	-3.56x	-14.26	74490.58	17.75			
B (IER)	E	2047-06-02T08:32:43.614	-0.48x	-17.59	91984.69	18.12			
B (OER)	E	2047-06-02T08:56:03.681	4.06x	-22.43	117571.16	18.40			
A (IER)	E	2047-06-02T09:00:06.825	4.85x	-23.28	122050.38	18.44			
Encke (IEG)	E	2047-06-02T09:10:22.265	6.89	-25.42	133423.31	18.52			
Encke (OEG)	E	2047-06-02T09:10:39.631	6.94	-25.48	133744.89	18.52			
A (OER)	E	2047-06-02T09:13:23.142	7.49	-26.05	136774.40	18.54			
F ring	E	2047-06-02T09:16:41.908	8.15	-26.75	140461.00	18.56			

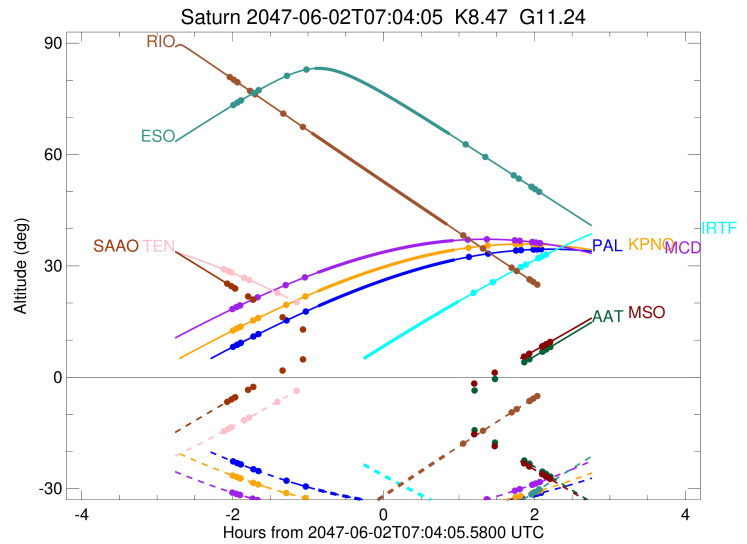
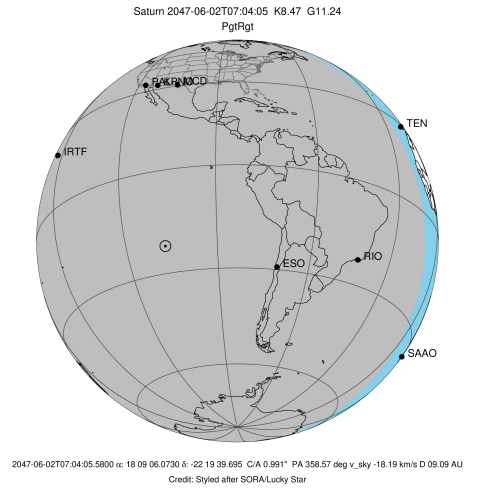
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T06:59:18.700  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : SAAO  
 Location : So. Afr. Astro. Obs. (Sutherland)  
 Latitude (deg) : -32.37953  
 E. Longitude (deg) : 20.81070  
 Altitude (km) : 1.768  
 Gaia source ID : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 100.63  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.563  
 C/A sky separation (km) : 10308.7  
 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	2047-06-02T04:59:54.210		25.20	-6.61	140461.00	-18.53		
A (OER)	I	2047-06-02T05:03:13.263		24.51	-5.96	136774.40	-18.51		
Encke (OEG)	I	2047-06-02T05:05:56.996		23.94	-5.43	133744.89	-18.49		
Encke (IEG)	I	2047-06-02T05:06:14.385		23.88	-5.37	133423.31	-18.49		
A (IER)	I	2047-06-02T05:16:30.542		21.76	-3.38x	122050.38	-18.42		
B (OER)	I	2047-06-02T05:20:33.915		20.92	-2.60x	117571.16	-18.39		
B (IER)	I	2047-06-02T05:43:54.558		16.14	1.83x	91984.69	-18.12		
C (IER)	I	2047-06-02T06:00:08.384		12.86	4.83x	74490.58	-17.78		
Saturn	I	2047-06-02T06:04:49.575		11.92	5.68x	60176.57		-14.74	-17.89
Saturn	E	2047-06-02T07:54:08.093		-8.87x	23.43x	60264.45		-2.87	-3.52
C (IER)	E	2047-06-02T08:07:22.196		-11.19x	25.20x	74490.58	17.60		
B (IER)	E	2047-06-02T08:23:47.161		-13.97x	27.24x	91984.69	17.89		
B (OER)	E	2047-06-02T08:47:28.301		-17.80x	29.86x	117571.16	18.09		
A (IER)	E	2047-06-02T08:51:35.749		-18.45x	30.27x	122050.38	18.11		
Encke (IEG)	E	2047-06-02T09:02:02.881		-20.04x	31.26x	133423.31	18.16		
Encke (OEG)	E	2047-06-02T09:02:20.593		-20.09x	31.28x	133744.89	18.16		
A (OER)	E	2047-06-02T09:05:07.405		-20.50x	31.53x	136774.40	18.17		
F ring	E	2047-06-02T09:08:30.288		-21.00x	31.82x	140461.00	18.18		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-06-02T07:08:08.190  
 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 : 4069721416966936064  
 2Mass ID (if available) : 18090606-2219394  
 ICRS Star Coord at Epoch: 18h 09m 06.07300s -22:19:39.69487s  
 RUWE (>1.4 is poor) : 0.81  
 K magnitude : 8.473  
 G magnitude : 11.242  
 RP magnitude : 10.425  
 BP magnitude : 11.956  
 DUPflag : 0  
 Distance (au) : 9.093  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.19  
 Sun-Target sep (deg) : 158.92  
 Sun-Moon sep (deg) : 100.66  
 B (ring opening deg) : 26.26  
 PA of pole (deg) : 5.69  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.664  
 C/A sky separation (km) : 10971.8  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



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

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-02T05:08:28.875	-28.28x	17.61x	140461.00	-18.13			
A (OER)	I	2047-06-02T05:11:52.271	-27.98x	17.12x	136774.40	-18.12			
Encke (OEG)	I	2047-06-02T05:14:39.512	-27.73x	16.71x	133744.89	-18.11			
Encke (IEG)	I	2047-06-02T05:14:57.270	-27.70x	16.67x	133423.31	-18.11			
A (IER)	I	2047-06-02T05:25:26.097	-26.70x	15.09x	122050.38	-18.06			
B (OER)	I	2047-06-02T05:29:34.260	-26.28x	14.46x	117571.16	-18.04			
B (IER)	I	2047-06-02T05:53:20.371	-23.64x	10.69x	91984.69	-17.81			
C (IER)	I	2047-06-02T06:09:50.488	-21.60x	7.95x	74490.58	-17.49			
Saturn	I	2047-06-02T06:13:08.858	-21.17x	7.39x	60160.15	-16.05		-19.44	
Saturn	E	2047-06-02T08:02:58.582	-4.06x	-12.77	60264.90	-2.68		-3.30	
C (IER)	E	2047-06-02T08:16:13.082	-1.71x	-15.35	74490.58	17.70			
B (IER)	E	2047-06-02T08:32:29.933	1.25x	-18.56	91984.69	18.08			
B (OER)	E	2047-06-02T08:55:52.188	5.59	-23.21	117571.16	18.38			
A (IER)	E	2047-06-02T08:59:55.631	6.35	-24.02	122050.38	18.42			
Encke (IEG)	E	2047-06-02T09:10:11.759	8.30	-26.09	133423.31	18.50			
Encke (OEG)	E	2047-06-02T09:10:29.143	8.36	-26.15	133744.89	18.50			
A (OER)	E	2047-06-02T09:13:12.823	8.88	-26.70	136774.40	18.52			
F ring	E	2047-06-02T09:16:31.789	9.51	-27.37	140461.00	18.54			