

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:48:05.610  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237

Saturn 2047-05-03T06:48:05 K7.44 G11.84 PgtRgt

ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s

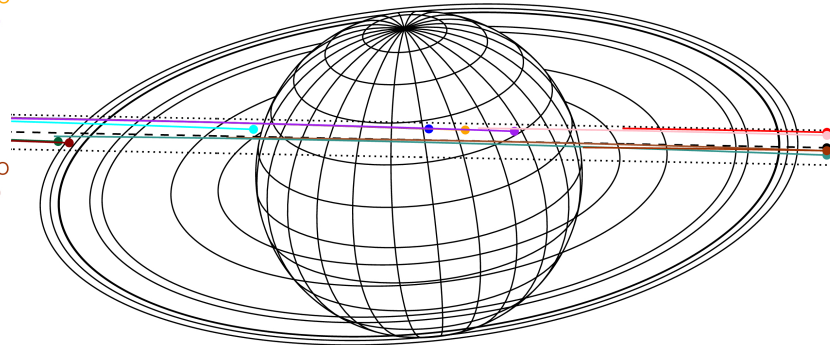
RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 139.78  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80

#	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



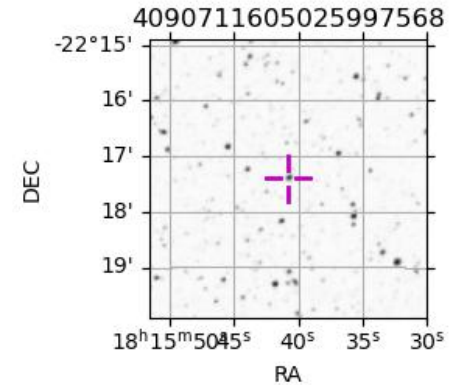
2047-05-03T06:48:05.6100 α: 18 15 40.8778 δ: -22 17 23.989 C/A 1.878° PA 178.89 deg v\_sky - 8.96 km/s D 09.39 AU  
 Credit: Styled after SORA/Lucky Star

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

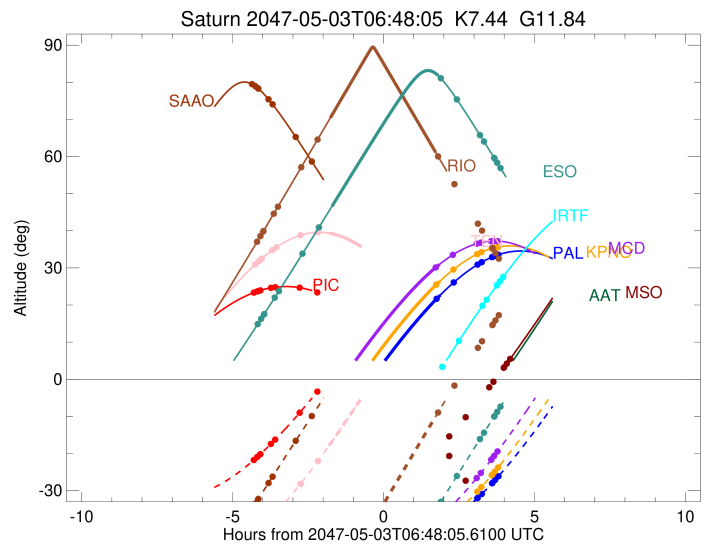
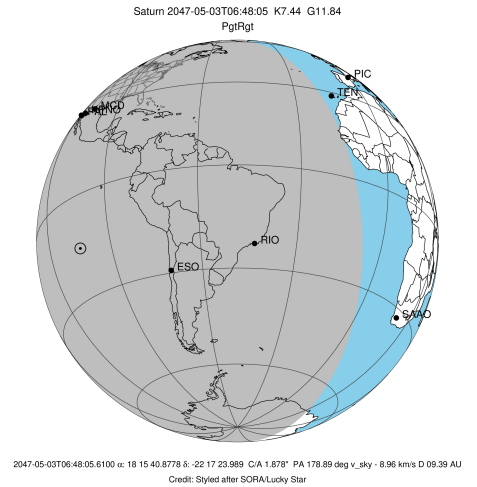


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+ + + + + + +			MAY 03 02:30 - MAY 03 04:01	PnnRin
PAL	Palomar Mt (20	33.4	243.1		+	+ + + + + + +	MAY 03 08:40 - MAY 03 10:36	PneRne
PMO	Purple Mtn Obs	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl	32.0	248.4		+	+ + + + + + +	MAY 03 08:40 - MAY 03 10:35	PneRne
MCD	McDonald Obs.	30.7	256.0		+	+ + + + + + +	MAY 03 08:39 - MAY 03 10:34	PneRne
TEN	Teide Obs./Ten	28.3	343.5	+ + + + + + +	+		MAY 03 02:33 - MAY 03 04:59	PinRin
IRTF	Mauna Kea/IRTF	19.8	204.5			+ + + + + + +	MAY 03 09:18 - MAY 03 10:45	PnnRne
KAV	Kavalur Observ	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+ + + + + + +	++	+	MAY 03 02:36 - MAY 03 08:36	PieRie
ESO	European South	-29.3	289.3	+ + + + + + +	++	+ + + + + + +	MAY 03 02:38 - MAY 03 10:40	PieRie
AAT	Siding Spring	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro	-32.4	20.8	+ + + + + + +			MAY 03 02:26 - MAY 03 04:25	PnnRin
MSO	Mt. Stromlo Ob	-35.3	149.0			+	MAY 03 10:59 - MAY 03 10:59	PnnRne

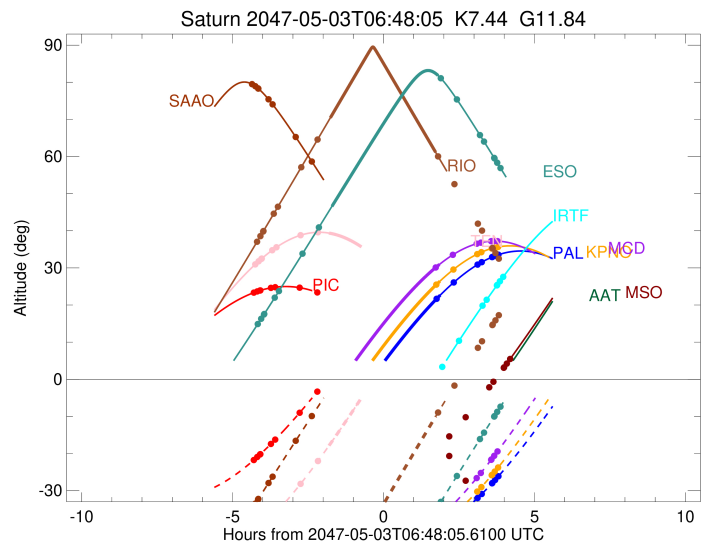
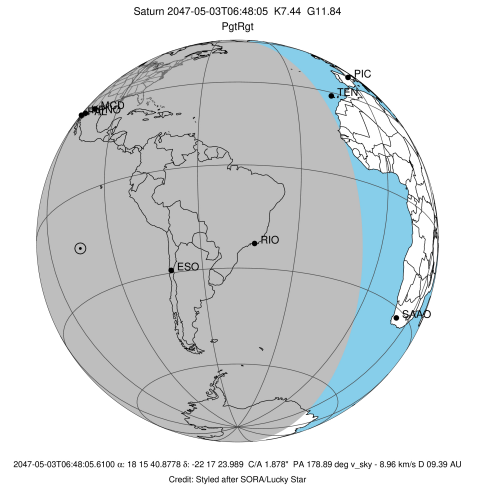


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:41:50.850  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 139.45  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.631  
 C/A sky separation (km) : 17910.1  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-05-03T02:30:21.245		23.34	-21.75	140461.00	-9.08		
A (OER)	I	2047-05-03T02:37:07.868		23.67	-20.94	136774.40	-9.06		
Encke (OEG)	I	2047-05-03T02:42:42.687		23.91	-20.25	133744.89	-9.04		
Encke (IEG)	I	2047-05-03T02:43:18.266		23.94	-20.17	133423.31	-9.04		
A (IER)	I	2047-05-03T03:04:22.038		24.62	-17.42	122050.38	-8.96		
B (OER)	I	2047-05-03T03:12:43.238		24.80	-16.27	117571.16	-8.92		
B (IER)	I	2047-05-03T04:01:26.140		24.67	-9.02	91984.69	-8.54		
C (IER)	I	2047-05-03T04:36:33.674		23.39	-3.33x	74490.58	-8.00		
Saturn	I	2047-05-03T04:57:51.636		22.15	0.27x	60227.82		9.79	11.96
Saturn	E	2047-05-03T08:26:30.484		-3.58x	37.92x	60090.28		20.99	25.18
C (IER)	E	2047-05-03T08:19:56.735	b	-2.51x	36.75x	74490.58	7.84		
B (IER)	E	2047-05-03T08:55:52.918		-8.48x	43.06x	91984.69	8.33		
B (OER)	E	2047-05-03T09:45:59.363		-17.21x	51.22x	117571.16	8.64		
A (IER)	E	2047-05-03T09:54:36.541		-18.75x	52.51x	122050.38	8.68		
Encke (IEG)	E	2047-05-03T10:16:22.383		-22.68x	55.56x	133423.31	8.74		
Encke (OEG)	E	2047-05-03T10:16:59.179		-22.79x	55.64x	133744.89	8.74		
A (OER)	E	2047-05-03T10:22:45.545		-23.84x	56.39x	136774.40	8.75		
F ring	E	2047-05-03T10:29:46.378		-25.12x	57.25x	140461.00	8.77		

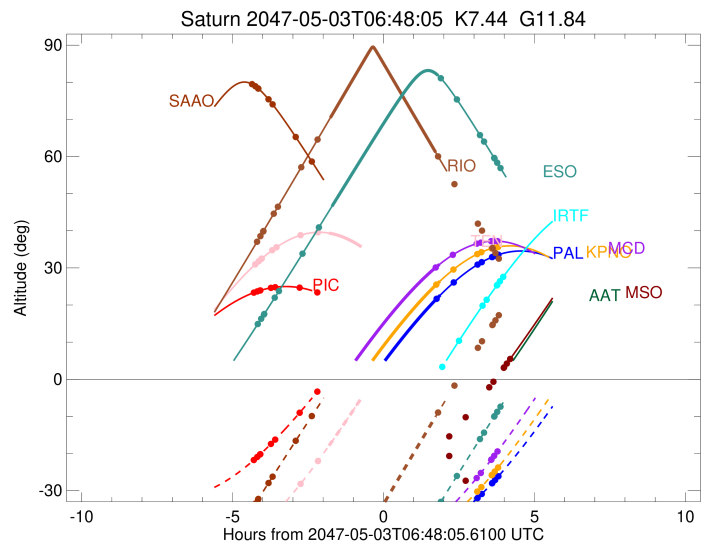
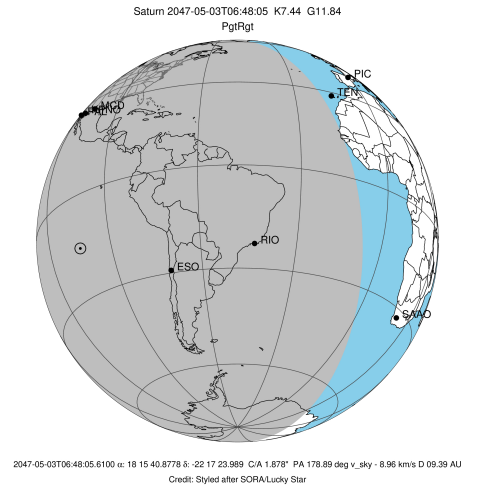
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:56:32.010  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 140.36  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.489  
 C/A sky separation (km) : 16947.4  
 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	2047-05-03T02:34:46.735		-46.40x	-1.64x	140461.00	-8.64		
A (OER)	I	2047-05-03T02:41:53.427		-44.91x	-3.04x	136774.40	-8.64		
Encke (OEG)	I	2047-05-03T02:47:44.318		-43.68x	-4.18x	133744.89	-8.63		
Encke (IEG)	I	2047-05-03T02:48:21.579		-43.55x	-4.30x	133423.31	-8.63		
A (IER)	I	2047-05-03T03:10:21.810		-38.93x	-8.52	122050.38	-8.60		
B (OER)	I	2047-05-03T03:19:03.477		-37.11x	-10.16	117571.16	-8.58		
B (IER)	I	2047-05-03T04:09:19.125		-26.66x	-19.21	91984.69	-8.35		
C (IER)	I	2047-05-03T04:44:56.038		-19.36x	-25.08	74490.58	-7.97		
Saturn	I	2047-05-03T05:09:41.920		-14.36x	-28.80	60243.14		7.68	9.41
Saturn	E	2047-05-03T08:40:53.899		22.67	-39.29	60083.72		21.40	25.64
C (IER)	E	2047-05-03T08:33:33.973	b	21.66	-39.73	74490.58	8.28		
B (IER)	E	2047-05-03T09:07:38.632		26.07	-37.22	91984.69	8.78		
B (OER)	E	2047-05-03T09:55:07.328		30.89	-31.99	117571.16	9.14		
A (IER)	E	2047-05-03T10:03:16.221		31.54	-30.92	122050.38	9.18		
Encke (IEG)	E	2047-05-03T10:23:48.894		32.90	-28.03	133423.31	9.27		
Encke (OEG)	E	2047-05-03T10:24:23.592		32.94	-27.95	133744.89	9.27		
A (OER)	E	2047-05-03T10:29:50.112		33.23	-27.14	136774.40	9.29		
F ring	E	2047-05-03T10:36:26.605		33.55	-26.14	140461.00	9.31		

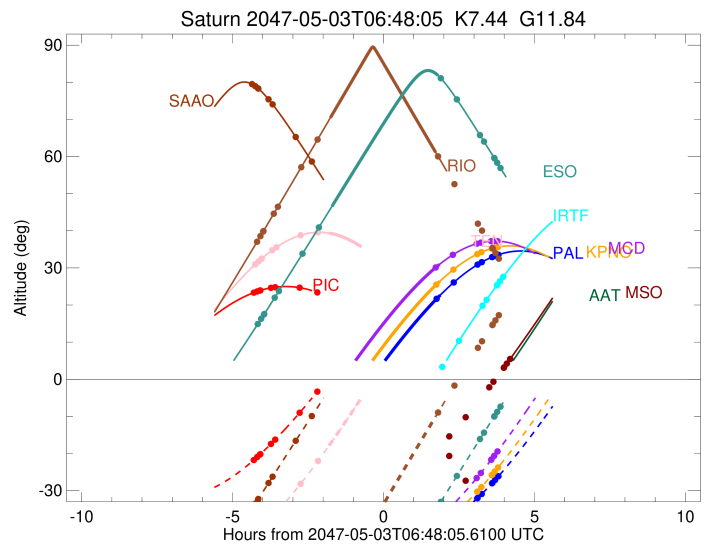
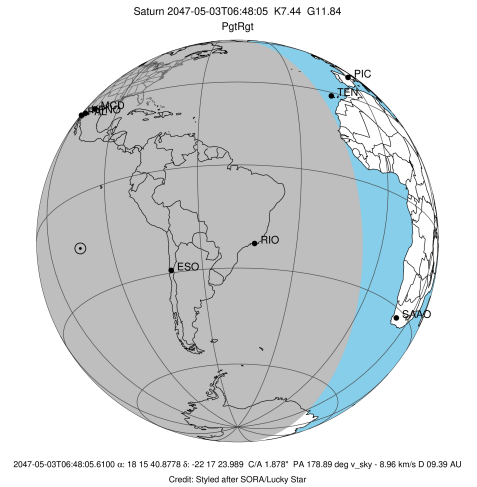
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:56:17.040  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 140.40  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.497  
 C/A sky separation (km) : 17003.3  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



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

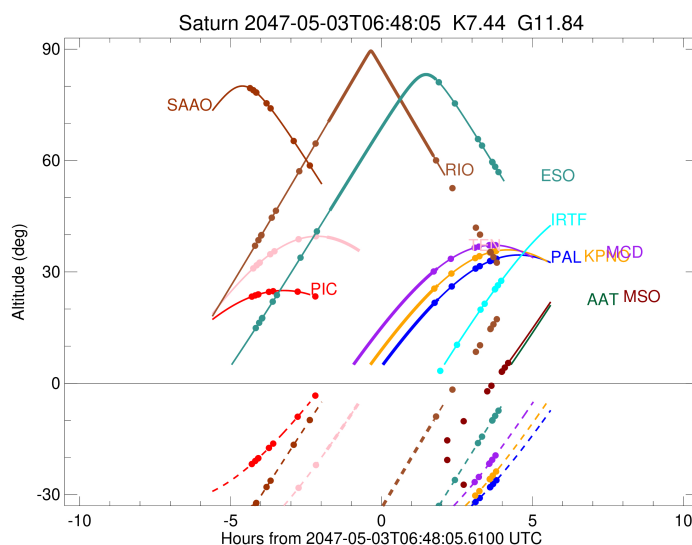
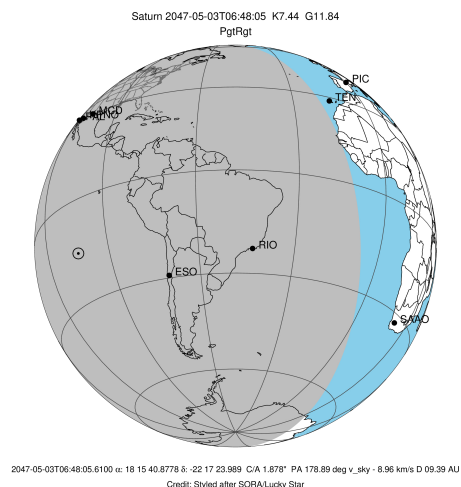
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-05-03T02:35:30.335		-41.79x	-6.43	140461.00	-8.67		
A (OER)	I	2047-05-03T02:42:35.815		-40.29x	-7.81	136774.40	-8.66		
Encke (OEG)	I	2047-05-03T02:48:25.695		-39.05x	-8.94	133744.89	-8.66		
Encke (IEG)	I	2047-05-03T02:49:02.848		-38.91x	-9.06	133423.31	-8.66		
A (IER)	I	2047-05-03T03:10:59.166		-34.26x	-13.23	122050.38	-8.62		
B (OER)	I	2047-05-03T03:19:39.255		-32.43x	-14.84	117571.16	-8.60		
B (IER)	I	2047-05-03T04:09:45.750		-21.93x	-23.68	91984.69	-8.38		
C (IER)	I	2047-05-03T04:45:16.738		-14.64x	-29.31	74490.58	-7.99		
Saturn	I	2047-05-03T05:09:53.669		-9.67x	-32.79	60242.74		7.75	9.49
Saturn	E	2047-05-03T08:40:16.975		26.43	-39.05	60083.62		21.40	25.65
C (IER)	E	2047-05-03T08:32:56.298	b	25.48	-39.66	74490.58	8.29		
B (IER)	E	2047-05-03T09:06:59.250		29.55	-36.39	91984.69	8.79		
B (OER)	E	2047-05-03T09:54:26.059		33.71	-30.26	117571.16	9.15		
A (IER)	E	2047-05-03T10:02:34.752		34.23	-29.05	122050.38	9.19		
Encke (IEG)	E	2047-05-03T10:23:07.121		35.23	-25.86	133423.31	9.27		
Encke (OEG)	E	2047-05-03T10:23:41.815		35.25	-25.76	133744.89	9.27		
A (OER)	E	2047-05-03T10:29:08.308		35.44	-24.88	136774.40	9.29		
F ring	E	2047-05-03T10:35:44.798		35.63	-23.79	140461.00	9.31		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:55:43.040  
 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 : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 140.42  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.515  
 C/A sky separation (km) : 17122.9  
 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



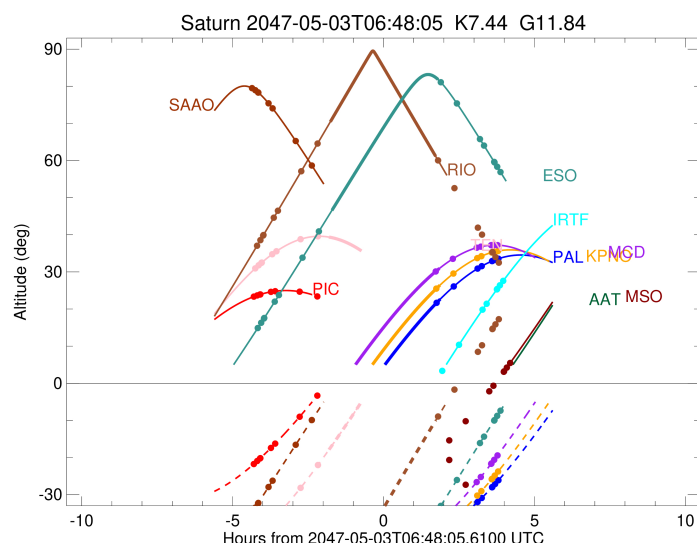
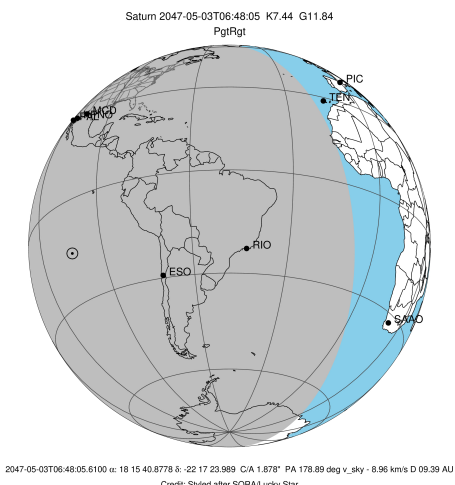
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-05-03T02:36:22.487	-35.04x	-13.02	140461.00	-8.71			
A (OER)	I	2047-05-03T02:43:26.096	-33.53x	-14.36	136774.40	-8.70			
Encke (OEG)	I	2047-05-03T02:49:14.428	-32.29x	-15.46	133744.89	-8.69			
Encke (IEG)	I	2047-05-03T02:49:51.416	-32.15x	-15.57	133423.31	-8.69			
A (IER)	I	2047-05-03T03:11:41.881	-27.50x	-19.60	122050.38	-8.66			
B (OER)	I	2047-05-03T03:20:19.663	-25.68x	-21.15	117571.16	-8.64			
B (IER)	I	2047-05-03T04:10:13.491	-15.24x	-29.50	91984.69	-8.41			
C (IER)	I	2047-05-03T04:45:37.286	-8.02x	-34.61	74490.58	-8.01			
Saturn	I	2047-05-03T05:09:58.059	-3.17x	-37.62	60241.81			7.89	9.66
Saturn	E	2047-05-03T08:39:13.786		30.93	60083.12			21.43	25.68
C (IER)	E	2047-05-03T08:31:47.910	b	30.10	-38.04	74490.58	8.28		
B (IER)	E	2047-05-03T09:05:51.336		33.52	-33.81	91984.69	8.79		
B (OER)	E	2047-05-03T09:53:18.854		36.51	-26.62	117571.16	9.14		
A (IER)	E	2047-05-03T10:01:27.807		36.80	-25.26	122050.38	9.18		
Encke (IEG)	E	2047-05-03T10:22:01.084		37.19	-21.71	133423.31	9.26		
Encke (OEG)	E	2047-05-03T10:22:35.810		37.20	-21.61	133744.89	9.26		
A (OER)	E	2047-05-03T10:28:02.612		37.22	-20.64	136774.40	9.28		
F ring	E	2047-05-03T10:34:39.516		37.21	-19.45	140461.00	9.30		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:42:50.940  
 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 : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 139.71  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.545  
 C/A sky separation (km) : 17328.6  
 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	2047-05-03T02:33:14.005		30.95	-41.08	140461.00	-9.14		
A (OER)	I	2047-05-03T02:39:57.694		31.79	-40.33	136774.40	-9.12		
Encke (OEG)	I	2047-05-03T02:45:29.944		32.44	-39.68	133744.89	-9.11		
Encke (IEG)	I	2047-05-03T02:46:05.241		32.51	-39.61	133423.31	-9.11		
A (IER)	I	2047-05-03T03:06:57.947		34.76	-36.92	122050.38	-9.04		
B (OER)	I	2047-05-03T03:15:14.156		35.55	-35.76	117571.16	-9.01		
B (IER)	I	2047-05-03T04:03:19.803		38.81	-28.17	91984.69	-8.68		
C (IER)	I	2047-05-03T04:37:48.296		39.59	-22.03	74490.58	-8.18		
Saturn	I	2047-05-03T04:59:42.401		39.38	-17.90	60232.90		9.14	11.18
Saturn	E	2047-05-03T08:26:27.240		15.63	25.50x	60098.19		20.50	24.61
C (IER)	E	2047-05-03T08:21:26.981	b	16.52	24.40x	74490.58	8.04		
B (IER)	E	2047-05-03T08:56:37.423		10.13	32.14x	91984.69	8.49		
B (OER)	E	2047-05-03T09:45:55.366		0.59x	43.01x	117571.16	8.77		
A (IER)	E	2047-05-03T09:54:25.444		-1.11x	44.88x	122050.38	8.79		
Encke (IEG)	E	2047-05-03T10:15:54.741		-5.46x	49.58x	133423.31	8.84		
Encke (OEG)	E	2047-05-03T10:16:31.099		-5.59x	49.71x	133744.89	8.85		
A (OER)	E	2047-05-03T10:22:13.410		-6.76x	50.95x	136774.40	8.85		
F ring	E	2047-05-03T10:29:09.492		-8.19x	52.45x	140461.00	8.87		

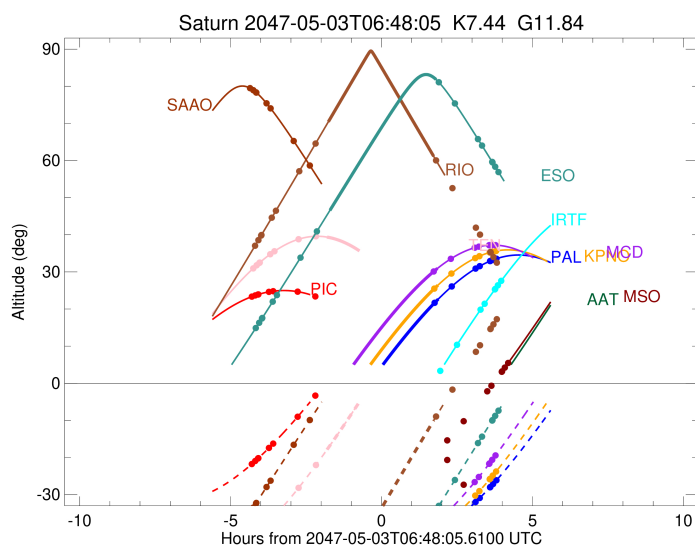
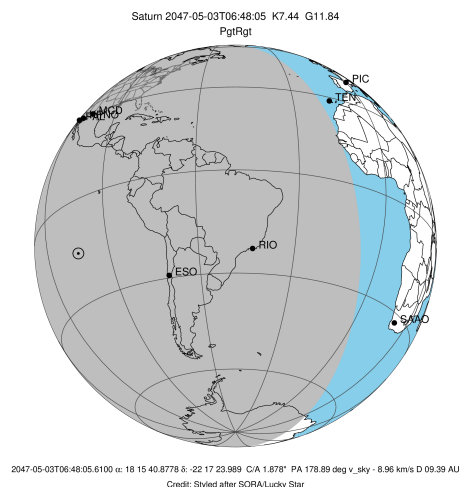
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:58:21.200  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : IRTF  
 Location : Mauna Kea/IRTF  
 Latitude (deg) : 19.82622  
 E. Longitude (deg) : 204.52800  
 Altitude (km) : 4.168  
 Gaia source ID : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 140.20  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.108  
 C/A sky separation (km) : 14354.2  
 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	2047-05-03T02:29:00.618		-82.02x	30.56x	140461.00	-8.54		
A (OER)	I	2047-05-03T02:36:12.563		-80.41x	28.88x	136774.40	-8.53		
Encke (OEG)	I	2047-05-03T02:42:07.755		-79.07x	27.50x	133744.89	-8.53		
Encke (IEG)	I	2047-05-03T02:42:45.472		-78.92x	27.36x	133423.31	-8.53		
A (IER)	I	2047-05-03T03:05:01.312		-73.82x	22.18x	122050.38	-8.50		
B (OER)	I	2047-05-03T03:13:48.693		-71.78x	20.14x	117571.16	-8.49		
B (IER)	I	2047-05-03T04:04:25.151		-60.05x	8.48x	91984.69	-8.34		
C (IER)	I	2047-05-03T04:39:49.082		-51.85x	0.44x	74490.58	-8.10		
Saturn	I	2047-05-03T05:06:52.936		-45.59x	-5.63	60256.04		5.32	6.53
Saturn	E	2047-05-03T08:46:43.795		3.74x	-47.99	60114.46		19.44	23.40
C (IER)	E	2047-05-03T08:44:47.541	b	3.32x	-47.74	74490.58	8.55		
B (IER)	E	2047-05-03T09:18:06.247		10.35	-51.58	91984.69	8.92		
B (OER)	E	2047-05-03T10:05:00.293		19.83	-54.42	117571.16	9.23		
A (IER)	E	2047-05-03T10:13:04.522		21.40	-54.55	122050.38	9.27		
Encke (IEG)	E	2047-05-03T10:33:25.854		25.27	-54.39	133423.31	9.35		
Encke (OEG)	E	2047-05-03T10:34:00.235		25.38	-54.38	133744.89	9.35		
A (OER)	E	2047-05-03T10:39:23.762		26.38	-54.21	136774.40	9.37		
F ring	E	2047-05-03T10:45:56.587		27.57	-53.95	140461.00	9.40		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:47:11.520  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 140.33  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.867  
 C/A sky separation (km) : 12709.7  
 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

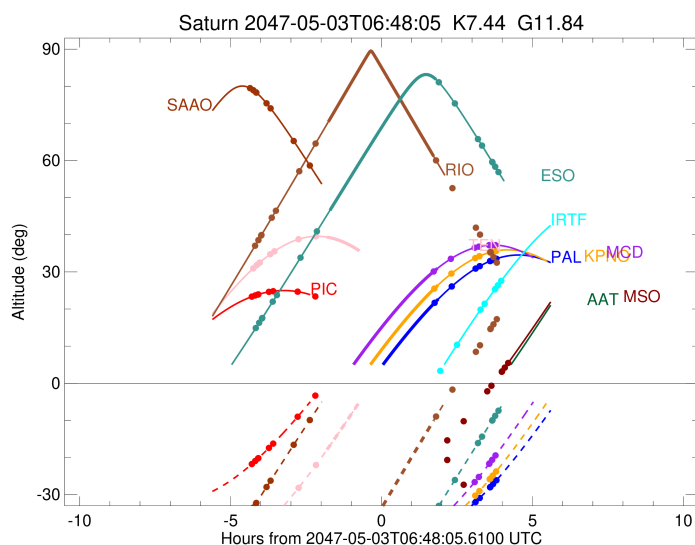
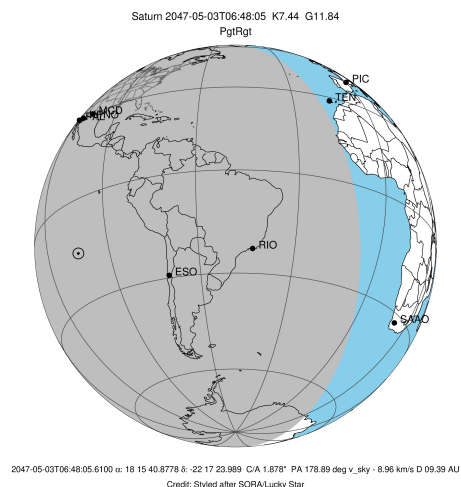


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-05-03T02:36:50.604		37.06	-82.24	140461.00	-9.24		
A (OER)	I	2047-05-03T02:43:29.591		38.57	-82.72	136774.40	-9.24		
Encke (OEG)	I	2047-05-03T02:48:57.486		39.81	-82.87	133744.89	-9.24		
Encke (IEG)	I	2047-05-03T02:49:32.294		39.95	-82.87	133423.31	-9.24		
A (IER)	I	2047-05-03T03:10:04.010		44.62	-81.41	122050.38	-9.23		
B (OER)	I	2047-05-03T03:18:09.744		46.47	-80.22	117571.16	-9.22		
B (IER)	I	2047-05-03T04:04:41.201		57.13	-70.95	91984.69	-9.09		
C (IER)	I	2047-05-03T04:37:06.561		64.59	-63.72	74490.58	-8.87		
Saturn	I	2047-05-03T05:02:17.816		70.40	-57.98	60258.70		4.69	5.76
Saturn	E	2047-05-03T08:31:46.708		61.14	-10.03	60152.77		16.75	20.26
C (IER)	E	2047-05-03T08:36:28.746		60.06	-8.97	74490.58	8.84		
B (IER)	E	2047-05-03T09:09:01.308		52.58	-1.72x	91984.69	9.06		
B (OER)	E	2047-05-03T09:55:43.789		41.91	8.47x	117571.16	9.18		
A (IER)	E	2047-05-03T10:03:51.459		40.06	10.22x	122050.38	9.19		
Encke (IEG)	E	2047-05-03T10:24:27.994		35.39	14.58x	133423.31	9.20		
Encke (OEG)	E	2047-05-03T10:25:02.935		35.26	14.70x	133744.89	9.20		
A (OER)	E	2047-05-03T10:30:32.075		34.02	15.85x	136774.40	9.21		
F ring	E	2047-05-03T10:37:12.547		32.51	17.24x	140461.00	9.21		

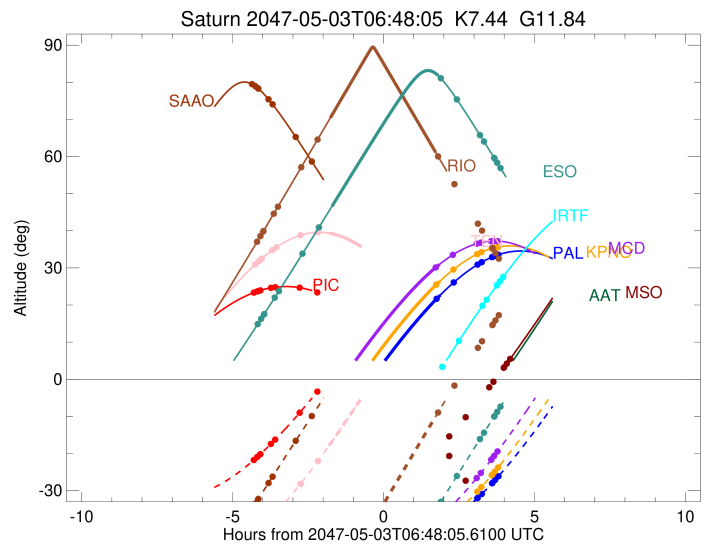
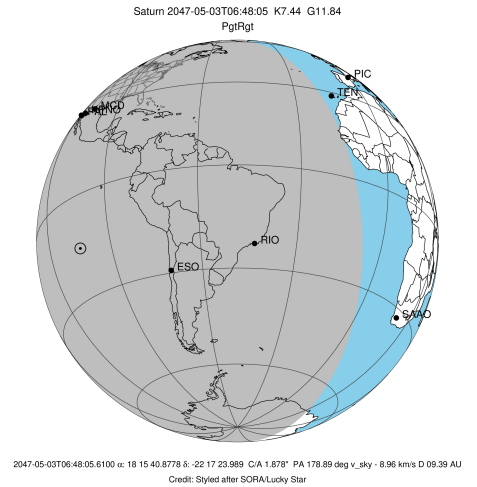


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:51:47.010  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 140.60  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.753  
 C/A sky separation (km) : 11933.1  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



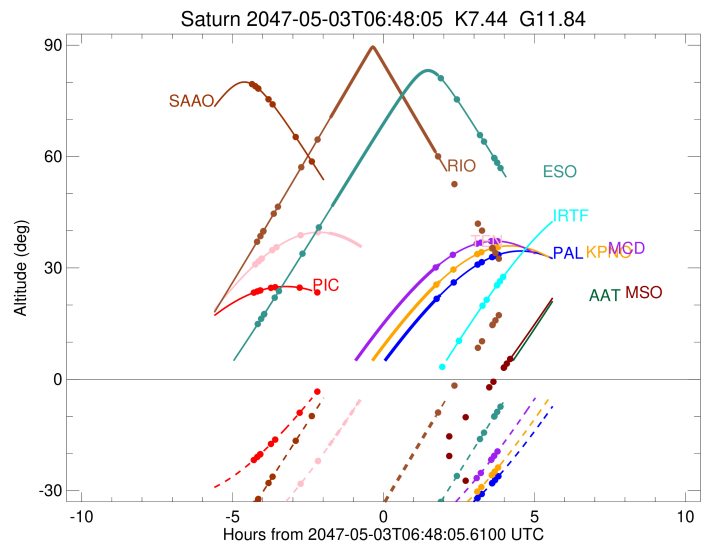
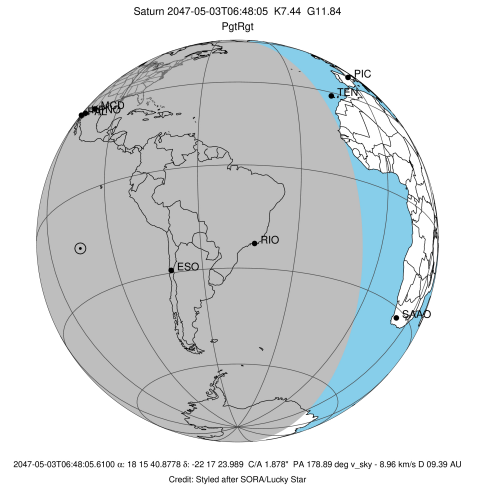
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-05-03T02:38:16.553		14.89	-58.98	140461.00	-9.10		
A (OER)	I	2047-05-03T02:45:01.764		16.31	-60.37	136774.40	-9.10		
Encke (OEG)	I	2047-05-03T02:50:34.636		17.47	-61.49	133744.89	-9.10		
Encke (IEG)	I	2047-05-03T02:51:09.965		17.60	-61.61	133423.31	-9.10		
A (IER)	I	2047-05-03T03:11:59.094		22.00	-65.72	122050.38	-9.10		
B (OER)	I	2047-05-03T03:20:11.106		23.74	-67.26	117571.16	-9.10		
B (IER)	I	2047-05-03T04:07:10.515		33.85	-74.59	91984.69	-9.03		
C (IER)	I	2047-05-03T04:39:44.080		40.93	-76.55	74490.58	-8.86		
Saturn	I	2047-05-03T05:05:37.856		46.59	-75.30	60262.37		3.65	4.48
Saturn	E	2047-05-03T08:36:41.078		81.82	-34.19	60156.50		16.47	19.93
C (IER)	E	2047-05-03T08:41:56.681		81.11	-33.04	74490.58	9.00		
B (IER)	E	2047-05-03T09:13:55.256		75.39	-26.07	91984.69	9.21		
B (OER)	E	2047-05-03T09:59:49.993		65.77	-16.11	117571.16	9.34		
A (IER)	E	2047-05-03T10:07:49.099		64.05	-14.39	122050.38	9.35		
Encke (IEG)	E	2047-05-03T10:28:03.400		59.65	-10.06	133423.31	9.37		
Encke (OEG)	E	2047-05-03T10:28:37.701		59.52	-9.94	133744.89	9.38		
A (OER)	E	2047-05-03T10:34:00.783		58.35	-8.79	136774.40	9.38		
F ring	E	2047-05-03T10:40:33.806		56.92	-7.40	140461.00	9.38		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:39:15.400  
 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 : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 139.52  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.515  
 C/A sky separation (km) : 10317.4  
 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	2047-05-03T02:26:52.349		79.50	-34.86	140461.00	-9.39		
A (OER)	I	2047-05-03T02:33:25.013		78.94	-33.48	136774.40	-9.38		
Encke (OEG)	I	2047-05-03T02:38:47.953		78.36	-32.34	133744.89	-9.38		
Encke (IEG)	I	2047-05-03T02:39:22.248		78.30	-32.22	133423.31	-9.38		
A (IER)	I	2047-05-03T02:59:37.228		75.41	-27.94	122050.38	-9.34		
B (OER)	I	2047-05-03T03:07:37.064		74.06	-26.25	117571.16	-9.33		
B (IER)	I	2047-05-03T03:53:39.245		65.25	-16.56	91984.69	-9.18		
C (IER)	I	2047-05-03T04:25:41.977		58.64	-9.90	74490.58	-9.00		
Saturn	I	2047-05-03T04:51:20.230		53.25	-4.64x	60263.18		3.38	4.15
Saturn	E	2047-05-03T08:28:40.724		8.04	33.53x	60184.75		14.18	17.22
C (IER)	E	2047-05-03T08:39:19.195		5.95	34.83x	74490.58	8.69		
B (IER)	E	2047-05-03T09:12:37.554		-0.47x	38.31x	91984.69	8.80		
B (OER)	E	2047-05-03T10:00:51.753		-9.30x	41.44x	117571.16	8.86		
A (IER)	E	2047-05-03T10:09:16.949		-10.77x	41.72x	122050.38	8.87		
Encke (IEG)	E	2047-05-03T10:30:38.831		-14.39x	42.07x	133423.31	8.87		
Encke (OEG)	E	2047-05-03T10:31:15.065		-14.49x	42.07x	133744.89	8.88		
A (OER)	E	2047-05-03T10:36:56.396		-15.43x	42.06x	136774.40	8.88		
F ring	E	2047-05-03T10:43:51.716		-16.55x	42.01x	140461.00	8.88		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-05-03T06:51:17.450  
 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 : 4090711605025997568  
 2Mass ID (if available) : 18154085-2217237  
 ICRS Star Coord at Epoch: 18h 15m 40.87780s -22:17:23.98928s  
 RUWE (>1.4 is poor) : 0.76  
 K magnitude : 7.443  
 G magnitude : 11.836  
 RP magnitude : 10.667  
 BP magnitude : 13.288  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.96  
 Sun-Target sep (deg) : 128.50  
 Sun-Moon sep (deg) : 139.68  
 B (ring opening deg) : 26.07  
 PA of pole (deg) : 5.80  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.110  
 C/A sky separation (km) : 7558.5  
 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	2047-05-03T02:21:13.372	-15.94x	39.01x	140461.00	-8.80			
A (OER)	I	2047-05-03T02:28:12.424	-16.97x	38.82x	136774.40	-8.79			
Encke (OEG)	I	2047-05-03T02:33:57.096	-17.81x	38.63x	133744.89	-8.79			
Encke (IEG)	I	2047-05-03T02:34:33.699	-17.89x	38.61x	133423.31	-8.79			
A (IER)	I	2047-05-03T02:56:10.266	-20.88x	37.56x	122050.38	-8.76			
B (OER)	I	2047-05-03T03:04:42.040	-21.98x	37.02x	117571.16	-8.75			
B (IER)	I	2047-05-03T03:53:39.056	-27.44x	32.60x	91984.69	-8.67			
C (IER)	I	2047-05-03T04:27:24.852	-30.18x	28.46x	74490.58	-8.59			
Saturn	I	2047-05-03T04:55:04.772	-31.68x	24.53x	60267.99			0.18	0.22
Saturn	E	2047-05-03T08:46:08.030	-17.26x	-18.09	60196.26			13.14	15.99
C (IER)	E	2047-05-03T08:58:42.471	-15.40x	-20.65	74490.58	8.86			
B (IER)	E	2047-05-03T09:31:21.221	-10.24x	-27.32	91984.69	9.00			
B (OER)	E	2047-05-03T10:18:20.568	-2.16x	-36.91	117571.16	9.15			
A (IER)	E	2047-05-03T10:26:29.674	-0.69x	-38.56	122050.38	9.17			
Encke (IEG)	E	2047-05-03T10:47:06.307	3.08x	-42.72	133423.31	9.22			
Encke (OEG)	E	2047-05-03T10:47:41.168	3.19x	-42.84	133744.89	9.23			
A (OER)	E	2047-05-03T10:53:09.321	4.21x	-43.93	136774.40	9.24			
F ring	E	2047-05-03T10:59:47.990	5.45	-45.25	140461.00	9.26			