

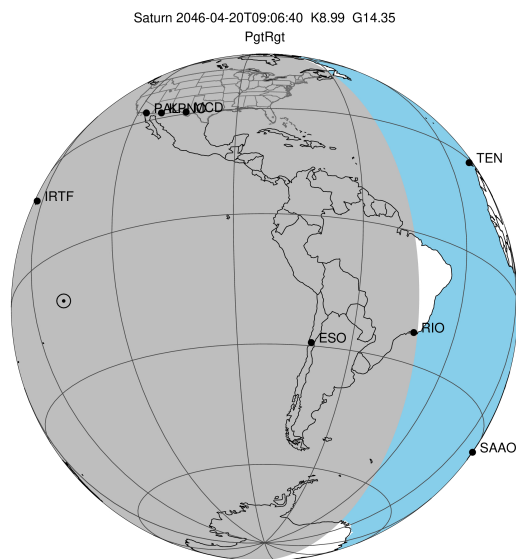
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-04-20T09:06:40.510  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4120809400145112448  
 2Mass ID (if available) : 17264862-2139392

Saturn 2046-04-20T09:06:40 K8.99 G14.35 PgtRgt

ICRS Star Coord at Epoch: 17h 26m 48.60253s -21:39:39.52600s

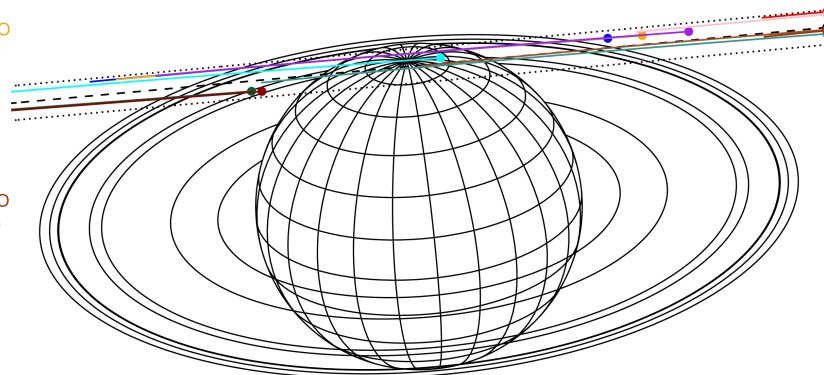
RUWE (>1.4 is poor) : 1.06  
 K magnitude : 8.993  
 G magnitude : 14.355  
 RP magnitude : 13.021  
 BP magnitude : 16.470  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.56  
 Sun-Target sep (deg) : 127.52  
 Sun-Moon sep (deg) : 58.13  
 B (ring opening deg) : 26.49  
 PA of pole (deg) : 4.77

#	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



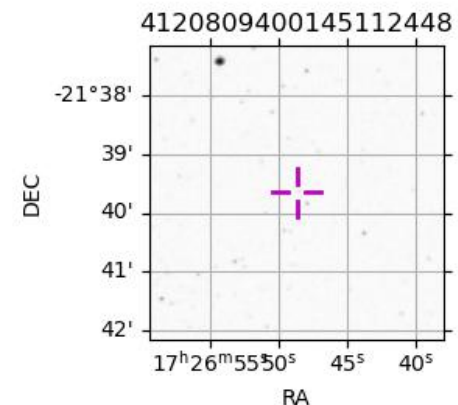
2046-04-20T09:06:40.5100 α: 17 26 48.60253 δ: -21 39 39.526 C/A 7.617° PA 185.31 deg v\_sky - 8.56 km/s D 09.39 AU  
 Credit: Styled after SORA/Lucky Star

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

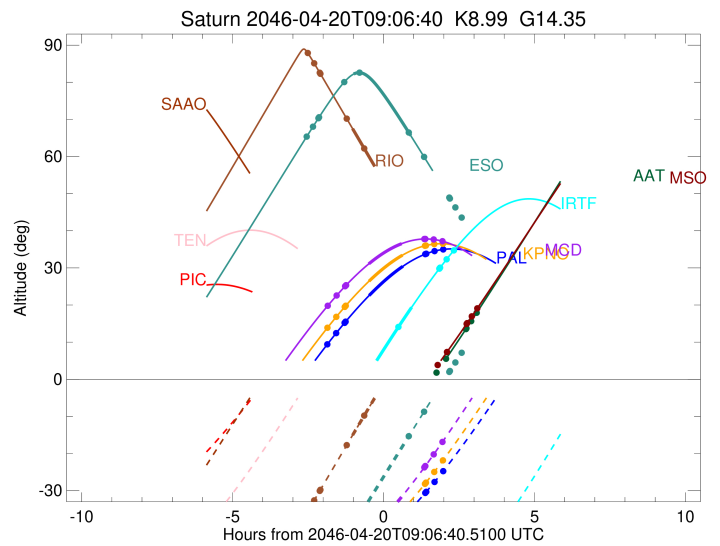
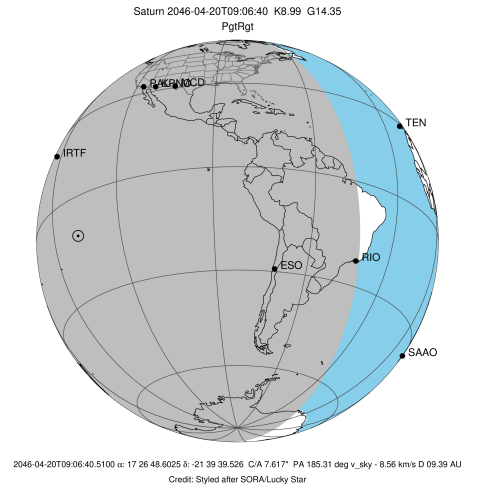


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (20	33.4	243.1	+	+	+	APR 20 07:14 - APR 20 11:05	PieRie
PMO	Purple Mtn Obs	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl	32.0	248.4	+	+	+	APR 20 07:14 - APR 20 11:04	PieRie
MCD	McDonald Obs.	30.7	256.0	+	+	+	APR 20 07:15 - APR 20 11:03	PieRie
TEN	Teide Obs./Ten	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5		+	+	APR 20 10:02 - APR 20 11:26	PneRne
KAV	Kavalur Observ	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+	+	+	APR 20 06:35 - APR 20 08:05	PinRin
ESO	European South	-29.3	289.3	+	+	+	APR 20 06:33 - APR 20 10:27	PieRie
AAT	Siding Spring	-31.3	149.1			+	APR 20 11:10 - APR 20 12:11	PnnRne
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0			+	APR 20 11:12 - APR 20 12:13	PnnRne

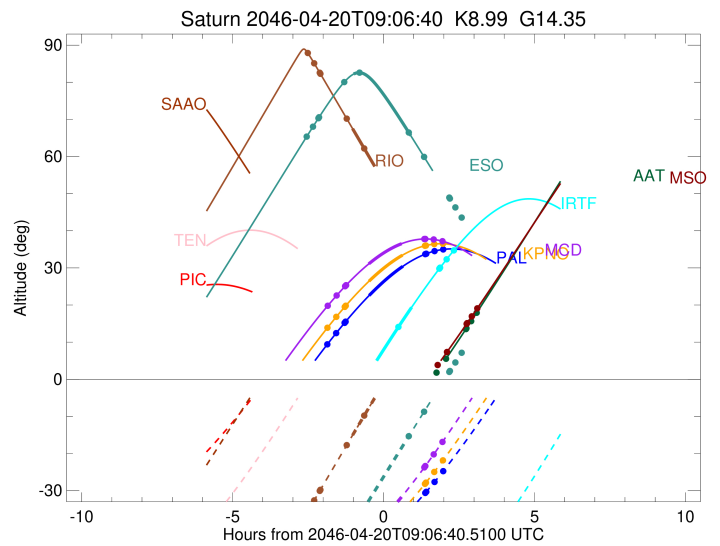
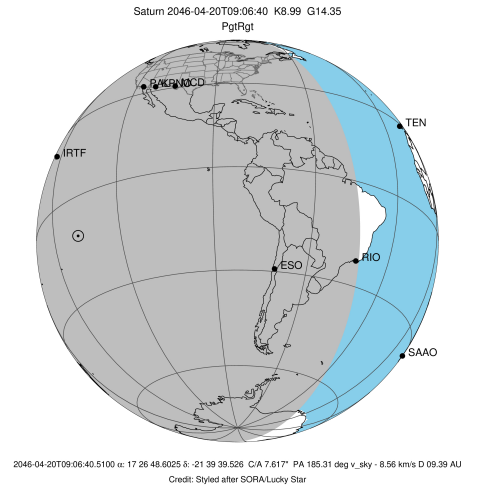


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-04-20T09:11:46.750  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4120809400145112448  
 2Mass ID (if available) : 17264862-2139392  
 ICRS Star Coord at Epoch: 17h 26m 48.60253s -21:39:39.52600s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 8.993  
 G magnitude : 14.355  
 RP magnitude : 13.021  
 BP magnitude : 16.470  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.56  
 Sun-Target sep (deg) : 127.52  
 Sun-Moon sep (deg) : 58.29  
 B (ring opening deg) : 26.49  
 PA of pole (deg) : 4.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.297  
 C/A sky separation (km) : 56488.8  
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-04-20T07:14:30.204		9.32	-44.58	140461.00	-3.72		
A (OER)	I	2046-04-20T07:32:05.801		12.34	-45.08	136774.40	-3.26		
Encke (OEG)	I	2046-04-20T07:48:50.163		15.11	-45.20	133744.89	-2.77		
Encke (IEG)	I	2046-04-20T07:50:47.434		15.43	-45.19	133423.31	-2.71		
Saturn	I	2046-04-20T08:38:07.087		22.56	-43.52	59244.05		58.52	63.18
Saturn	E	2046-04-20T09:45:16.520		30.44	-36.96	59241.32		58.64	63.29
Encke (IEG)	E	2046-04-20T10:29:50.728		33.72	-30.60	133423.31	2.76		
Encke (OEG)	E	2046-04-20T10:31:46.120		33.82	-30.30	133744.89	2.82		
A (OER)	E	2046-04-20T10:48:12.588		34.53	-27.65	136774.40	3.32		
F ring	E	2046-04-20T11:05:25.966		34.98	-24.74	140461.00	3.81		

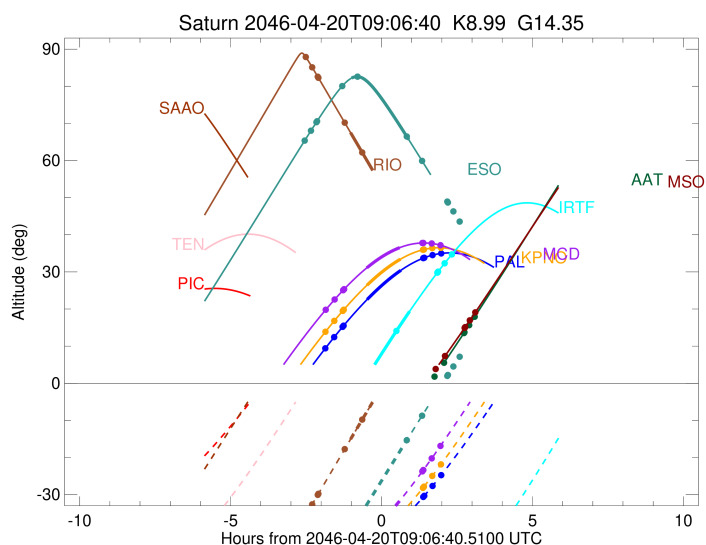
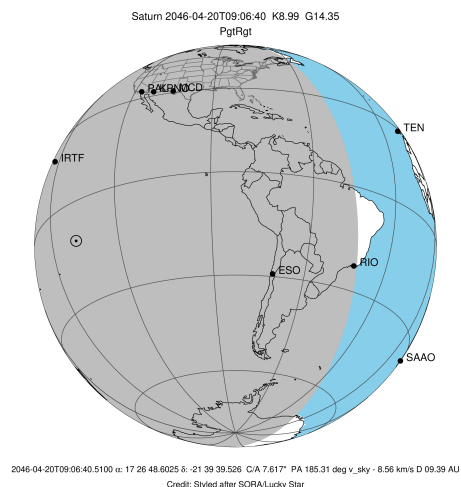
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-04-20T09:11:09.490  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 4120809400145112448  
 2Mass ID (if available) : 17264862-2139392  
 ICRS Star Coord at Epoch: 17h 26m 48.60253s -21:39:39.52600s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 8.993  
 G magnitude : 14.355  
 RP magnitude : 13.021  
 BP magnitude : 16.470  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.56  
 Sun-Target sep (deg) : 127.52  
 Sun-Moon sep (deg) : 58.37  
 B (ring opening deg) : 26.49  
 PA of pole (deg) : 4.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.301  
 C/A sky separation (km) : 56515.8  
 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

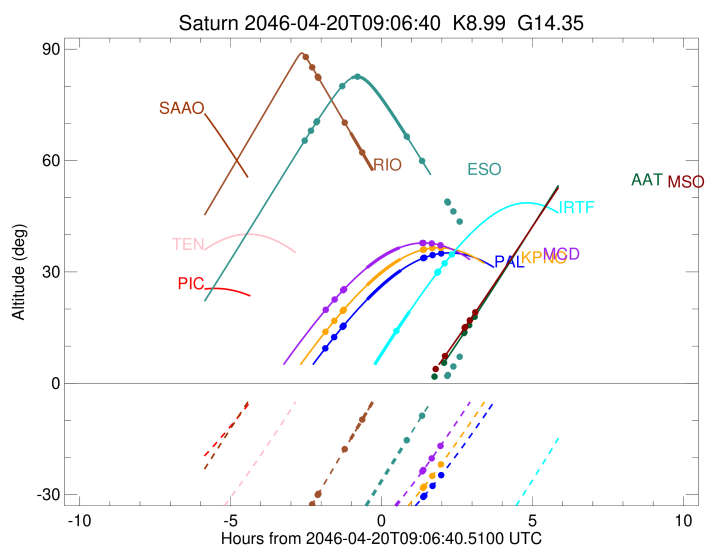
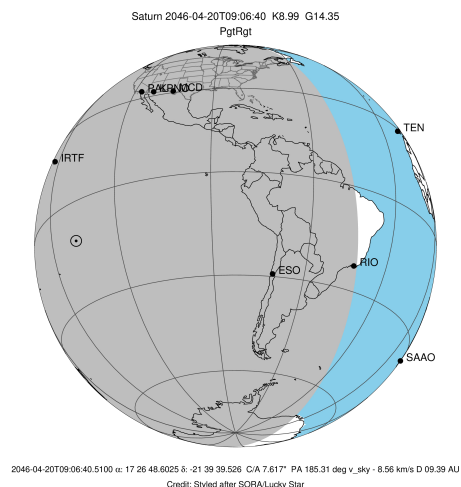
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-04-20T07:14:45.272		13.79	-46.53	140461.00	-3.72		
A (OER)	I	2046-04-20T07:32:21.161		16.73	-46.56	136774.40	-3.25		
Encke (OEG)	I	2046-04-20T07:49:06.964		19.41	-46.22	133744.89	-2.77		
Encke (IEG)	I	2046-04-20T07:51:04.509		19.72	-46.15	133423.31	-2.71		
Saturn	I	2046-04-20T08:37:45.309		26.40	-43.24	59242.48		58.59	63.24
Saturn	E	2046-04-20T09:44:25.186		33.43	-35.26	59241.01		58.66	63.31
Encke (IEG)	E	2046-04-20T10:29:12.401		35.96	-28.16	133423.31	2.75		
Encke (OEG)	E	2046-04-20T10:31:08.252		36.03	-27.83	133744.89	2.81		
A (OER)	E	2046-04-20T10:47:37.928		36.41	-24.95	136774.40	3.31		
F ring	E	2046-04-20T11:04:53.790		36.50	-21.83	140461.00	3.80		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-04-20T09:10:09.550  
 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 : 4120809400145112448  
 2Mass ID (if available) : 17264862-2139392  
 ICRS Star Coord at Epoch: 17h 26m 48.60253s -21:39:39.52600s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 8.993  
 G magnitude : 14.355  
 RP magnitude : 13.021  
 BP magnitude : 16.470  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.56  
 Sun-Target sep (deg) : 127.52  
 Sun-Moon sep (deg) : 58.48  
 B (ring opening deg) : 26.49  
 PA of pole (deg) : 4.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.311  
 C/A sky separation (km) : 56583.9  
 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	2046-04-20T07:15:20.633		19.72	-47.60	140461.00	-3.71		
A (OER)	I	2046-04-20T07:33:00.054		22.49	-46.90	136774.40	-3.24		
Encke (OEG)	I	2046-04-20T07:49:52.132		24.98	-45.86	133744.89	-2.74		
Encke (IEG)	I	2046-04-20T07:51:50.677		25.27	-45.71	133423.31	-2.68		
Saturn	I	2046-04-20T08:37:17.253		31.07	-41.21	59239.00		58.75	63.39
Saturn	E	2046-04-20T09:42:55.717		36.54	-31.64	59239.58		58.73	63.37
Encke (IEG)	E	2046-04-20T10:27:58.134		37.79	-23.71	133423.31	2.71		
Encke (OEG)	E	2046-04-20T10:29:55.281		37.80	-23.35	133744.89	2.78		
A (OER)	E	2046-04-20T10:46:34.053		37.66	-20.22	136774.40	3.28		
F ring	E	2046-04-20T11:03:56.956		37.19	-16.87	140461.00	3.78		

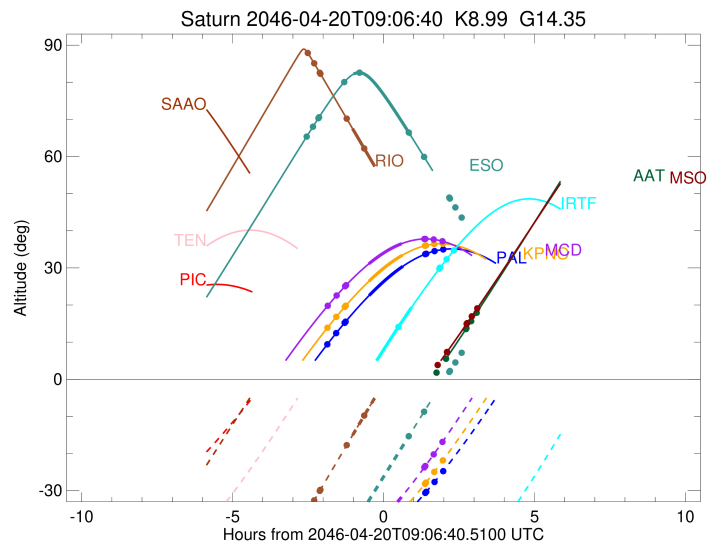
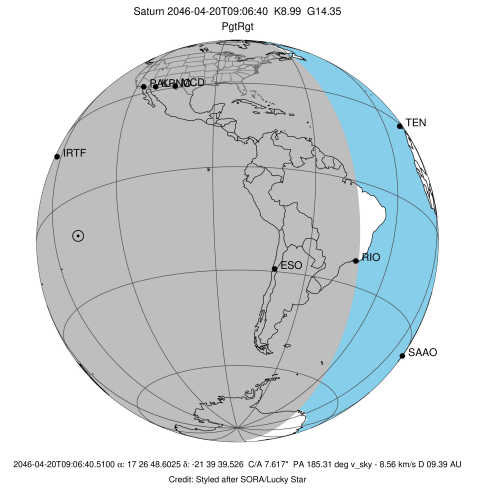
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-04-20T09:16:06.130  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : IRTF  
 Location : Mauna Kea/IRTF  
 Latitude (deg) : 19.82622  
 E. Longitude (deg) : 204.52800  
 Altitude (km) : 4.168  
 Gaia source ID : 4120809400145112448  
 2Mass ID (if available) : 17264862-2139392  
 ICRS Star Coord at Epoch: 17h 26m 48.60253s -21:39:39.52600s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 8.993  
 G magnitude : 14.355  
 RP magnitude : 13.021  
 BP magnitude : 16.470  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.56  
 Sun-Target sep (deg) : 127.52  
 Sun-Moon sep (deg) : 57.78  
 B (ring opening deg) : 26.49  
 PA of pole (deg) : 4.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.948  
 C/A sky separation (km) : 54109.8  
 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

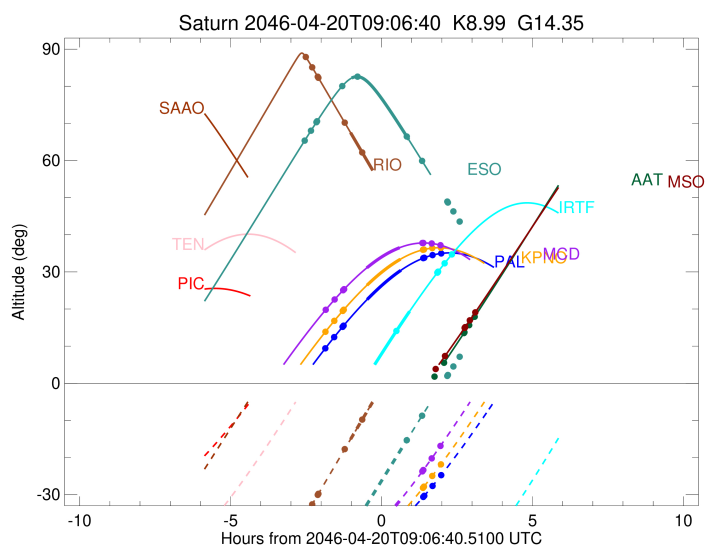
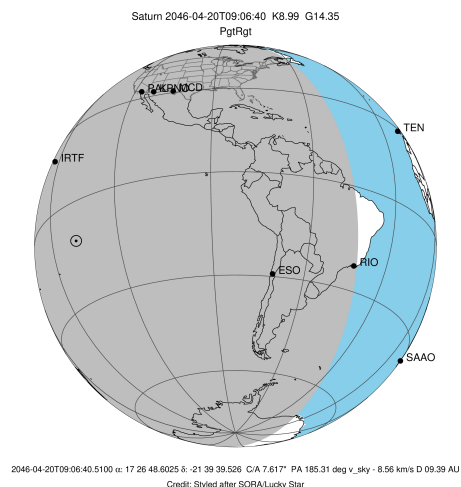
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-04-20T06:54:18.116		-21.22x	-30.33	140461.00	-4.25		
A (OER)	I	2046-04-20T07:09:21.180		-17.82x	-33.44	136774.40	-3.91		
Encke (OEG)	I	2046-04-20T07:22:51.401		-14.78x	-36.18	133744.89	-3.57		
Encke (IEG)	I	2046-04-20T07:24:22.037		-14.44x	-36.48	133423.31	-3.53		
A (IER)	I	2046-04-20T08:47:23.687	b	3.81x	-51.15	122050.38	-0.90		
Saturn	I	2046-04-20T08:29:11.477		-0.12x	-48.34	59335.35		54.38	59.42
Saturn	E	2046-04-20T10:02:26.766		19.36	-58.33	59320.02		55.06	60.04
A (IER)	E	2046-04-20T09:36:35.268	b	14.14	-56.83	122050.38	0.91		
Encke (IEG)	E	2046-04-20T10:57:44.550		29.81	-57.34	133423.31	3.66		
Encke (OEG)	E	2046-04-20T10:59:11.877		30.06	-57.23	133744.89	3.70		
A (OER)	E	2046-04-20T11:12:10.644		32.32	-56.17	136774.40	4.07		
F ring	E	2046-04-20T11:26:34.774		34.72	-54.68	140461.00	4.46		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-04-20T09:00:18.540  
 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 : 4120809400145112448  
 2Mass ID (if available) : 17264862-2139392  
 ICRS Star Coord at Epoch: 17h 26m 48.60253s -21:39:39.52600s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 8.993  
 G magnitude : 14.355  
 RP magnitude : 13.021  
 BP magnitude : 16.470  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.56  
 Sun-Target sep (deg) : 127.52  
 Sun-Moon sep (deg) : 59.13  
 B (ring opening deg) : 26.49  
 PA of pole (deg) : 4.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.578  
 C/A sky separation (km) : 51596.0  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-04-20T06:35:48.762		87.96	-35.64	140461.00	-4.98		
A (OER)	I	2046-04-20T06:48:31.149		85.19	-32.71	136774.40	-4.69		
Encke (OEG)	I	2046-04-20T06:59:37.150		82.66	-30.15	133744.89	-4.41		
Encke (IEG)	I	2046-04-20T07:00:50.362		82.38	-29.87	133423.31	-4.38		
A (IER)	I	2046-04-20T07:53:11.828		70.29	-17.83	122050.38	-2.79		
B (OER)	I	2046-04-20T08:27:22.546	b	62.40	-10.01	117571.16	-1.55		
Saturn	I	2046-04-20T08:05:10.231		67.52	-15.08	59398.36		51.66	56.90
Saturn	E	2046-04-20T09:55:50.831		42.08	9.87x	59432.65		50.21	55.55
B (OER)	E	2046-04-20T09:47:05.754	b	44.08	7.93x	117571.16	1.55		
A (IER)	E	2046-04-20T10:21:30.808		36.24	15.47x	122050.38	2.77		
Encke (IEG)	E	2046-04-20T11:14:33.277		24.28	26.67x	133423.31	4.31		
Encke (OEG)	E	2046-04-20T11:15:47.702		24.00	26.93x	133744.89	4.34		
A (OER)	E	2046-04-20T11:27:05.215		21.48	29.22x	136774.40	4.60		
F ring	E	2046-04-20T11:40:01.814		18.60	31.80x	140461.00	4.89		

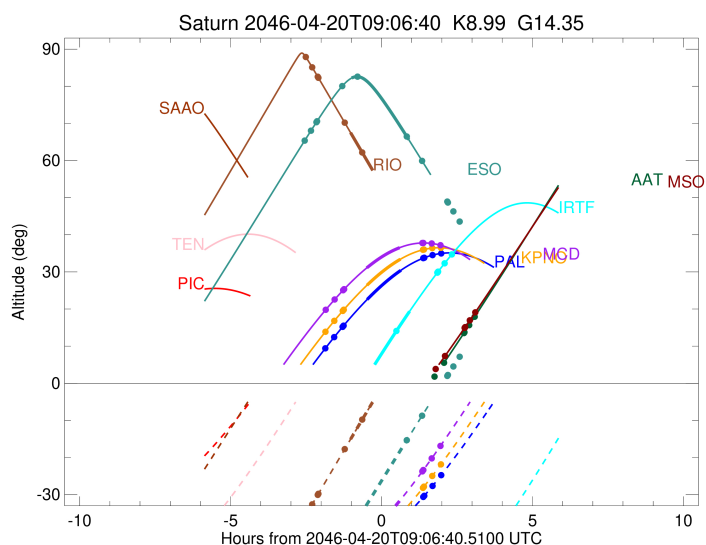
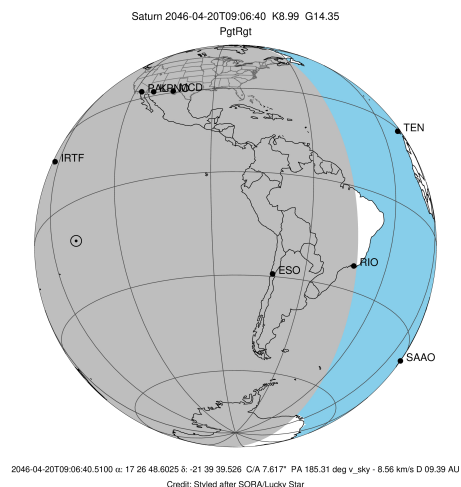
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-04-20T09:04:18.230  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 4120809400145112448  
 2Mass ID (if available) : 17264862-2139392  
 ICRS Star Coord at Epoch: 17h 26m 48.60253s -21:39:39.52600s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 8.993  
 G magnitude : 14.355  
 RP magnitude : 13.021  
 BP magnitude : 16.470  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.56  
 Sun-Target sep (deg) : 127.52  
 Sun-Moon sep (deg) : 59.06  
 B (ring opening deg) : 26.49  
 PA of pole (deg) : 4.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.505  
 C/A sky separation (km) : 51093.6  
 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	2046-04-20T06:33:37.842		65.29	-58.63	140461.00	-5.05		
A (OER)	I	2046-04-20T06:46:07.823		67.96	-56.18	136774.40	-4.77		
Encke (OEG)	I	2046-04-20T06:56:59.937		70.25	-54.00	133744.89	-4.51		
Encke (IEG)	I	2046-04-20T06:58:11.422		70.50	-53.76	133423.31	-4.48		
A (IER)	I	2046-04-20T07:48:16.516		80.00	-43.29	122050.38	-3.02		
B (OER)	I	2046-04-20T08:18:12.150	b	82.60	-36.85	117571.16	-1.95		
Saturn	I	2046-04-20T08:07:40.093		82.24	-39.13	59422.83		50.63	55.93
Saturn	E	2046-04-20T10:01:01.006		65.59	-14.45	59441.55		49.84	55.19
B (OER)	E	2046-04-20T09:57:26.527	b	66.36	-15.23	117571.16	1.95		
A (IER)	E	2046-04-20T10:27:22.028		59.90	-8.74	122050.38	3.02		
Encke (IEG)	E	2046-04-20T11:17:27.839		48.94	1.98x	133423.31	4.48		
Encke (OEG)	E	2046-04-20T11:18:39.348		48.68	2.23x	133744.89	4.51		
A (OER)	E	2046-04-20T11:29:31.671		46.30	4.52x	136774.40	4.77		
F ring	E	2046-04-20T11:42:01.866		43.56	7.13x	140461.00	5.05		

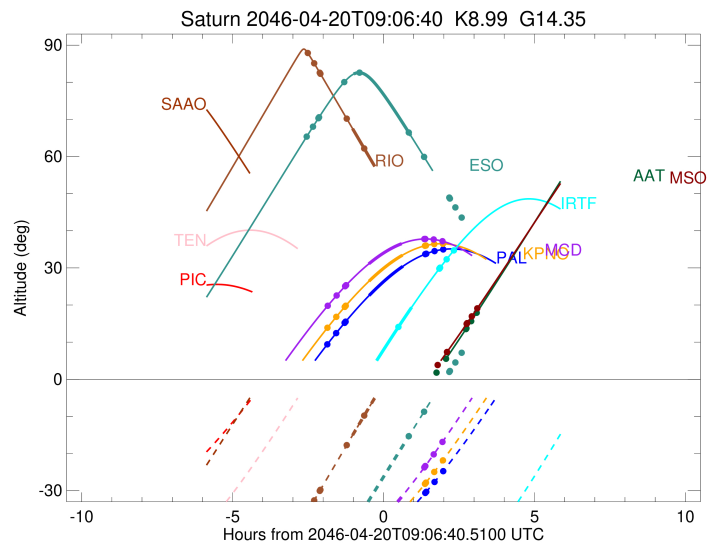
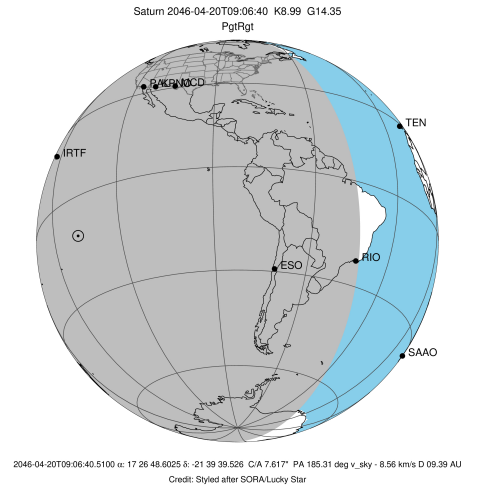
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-04-20T09:13:23.630  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4120809400145112448  
 2Mass ID (if available) : 17264862-2139392  
 ICRS Star Coord at Epoch: 17h 26m 48.60253s -21:39:39.52600s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 8.993  
 G magnitude : 14.355  
 RP magnitude : 13.021  
 BP magnitude : 16.470  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.56  
 Sun-Target sep (deg) : 127.52  
 Sun-Moon sep (deg) : 57.49  
 B (ring opening deg) : 26.49  
 PA of pole (deg) : 4.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 6.938  
 C/A sky separation (km) : 47234.3  
 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	2046-04-20T06:08:15.162		-36.74x	17.30x	140461.00	-5.43		
A (OER)	I	2046-04-20T06:19:46.091		-36.30x	15.06x	136774.40	-5.24		
Encke (OEG)	I	2046-04-20T06:29:34.757		-35.83x	13.13x	133744.89	-5.05		
Encke (IEG)	I	2046-04-20T06:30:38.501		-35.77x	12.92x	133423.31	-5.03		
A (IER)	I	2046-04-20T07:11:51.500		-32.69x	4.59x	122050.38	-4.12		
B (OER)	I	2046-04-20T07:31:09.878		-30.74x	0.60x	117571.16	-3.60		
Saturn	I	2046-04-20T08:00:29.793		-27.22x	-5.54	59552.03		45.26	50.81
Saturn	E	2046-04-20T10:25:17.660		-3.37x	-36.41	59548.40		45.41	50.96
B (OER)	E	2046-04-20T10:52:18.375		1.84x	-42.09	117571.16	3.71		
A (IER)	E	2046-04-20T11:10:58.997		5.52	-45.96	122050.38	4.27		
Encke (IEG)	E	2046-04-20T11:50:32.509		13.51	-53.88	133423.31	5.27		
Encke (OEG)	E	2046-04-20T11:51:33.371		13.72	-54.08	133744.89	5.29		
A (OER)	E	2046-04-20T12:00:54.718		15.64	-55.87	136774.40	5.50		
F ring	E	2046-04-20T12:11:52.006		17.91	-57.91	140461.00	5.72		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-04-20T09:13:00.060  
 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 : 4120809400145112448  
 2Mass ID (if available) : 17264862-2139392  
 ICRS Star Coord at Epoch: 17h 26m 48.60253s -21:39:39.52600s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 8.993  
 G magnitude : 14.355  
 RP magnitude : 13.021  
 BP magnitude : 16.470  
 DUPflag : 0  
 Distance (au) : 9.387  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -8.56  
 Sun-Target sep (deg) : 127.52  
 Sun-Moon sep (deg) : 57.54  
 B (ring opening deg) : 26.49  
 PA of pole (deg) : 4.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 6.897  
 C/A sky separation (km) : 46955.0  
 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	2046-04-20T06:06:49.309		-32.79x	15.82x	140461.00	-5.48		
A (OER)	I	2046-04-20T06:18:13.798		-32.42x	13.73x	136774.40	-5.29		
Encke (OEG)	I	2046-04-20T06:27:56.374		-32.01x	11.92x	133744.89	-5.11		
Encke (IEG)	I	2046-04-20T06:28:59.421		-31.96x	11.72x	133423.31	-5.09		
A (IER)	I	2046-04-20T07:09:37.270		-29.26x	3.92x	122050.38	-4.20		
B (OER)	I	2046-04-20T07:28:30.548		-27.53x	0.20x	117571.16	-3.70		
Saturn	I	2046-04-20T07:59:26.804		-24.14x	-5.98	59559.96		44.94	50.50
Saturn	E	2046-04-20T10:25:35.047		-1.46x	-35.71	59557.58		45.03	50.59
B (OER)	E	2046-04-20T10:54:35.746		3.88x	-41.46	117571.16	3.81		
A (IER)	E	2046-04-20T11:12:52.682		7.34	-45.00	122050.38	4.35		
Encke (IEG)	E	2046-04-20T11:51:54.750		14.91	-52.21	133423.31	5.32		
Encke (OEG)	E	2046-04-20T11:52:55.022		15.11	-52.39	133744.89	5.35		
A (OER)	E	2046-04-20T12:02:11.286		16.94	-54.00	136774.40	5.54		
F ring	E	2046-04-20T12:13:03.368		19.10	-55.83	140461.00	5.76		