

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T12:32:28.870  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4070277284502708608  
 2Mass ID (if available) : 17571567-2223327

Saturn 2047-07-10T12:32:28 K8.36 G14.66 PgtRgt

ICRS Star Coord at Epoch: 17h 57m 15.68024s -22:23:32.67293s

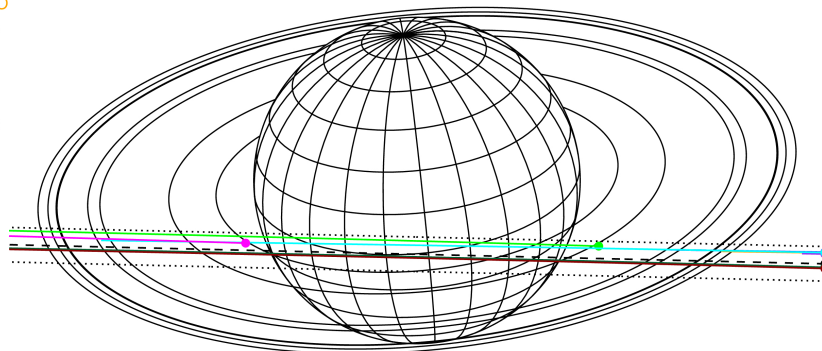
RUWE (>1.4 is poor) : 0.96  
 K magnitude : 8.359  
 G magnitude : 14.661  
 RP magnitude : 13.238  
 BP magnitude : 17.263  
 DUPflag : 0  
 Distance (au) : 9.075  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.69  
 Sun-Target sep (deg) : 161.78  
 Sun-Moon sep (deg) : 56.98  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 # a(km) ring

Saturn 2047-07-10T12:32:28 K8.36 G14.66  
 PgtRgt



2047-07-10T12:32:28.8700 at: 17 57 15.6802 s: -22 23 32.673 C/A 4.138° PA 358.66 deg v\_sky -18.69 km/s D 09.08 AU  
 Credit: Styled after SORA/Lucky Star

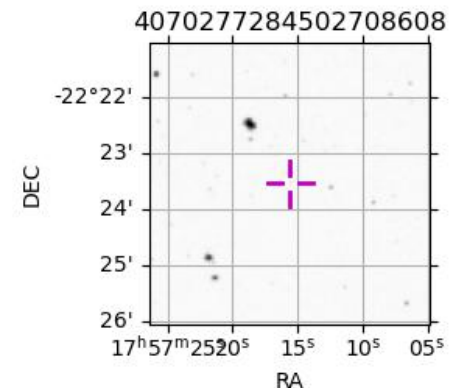
Earth  
 PAL  
 PMO  
 KPNO  
 MCD  
 IRTF  
 KAV  
 AAT  
 MSO



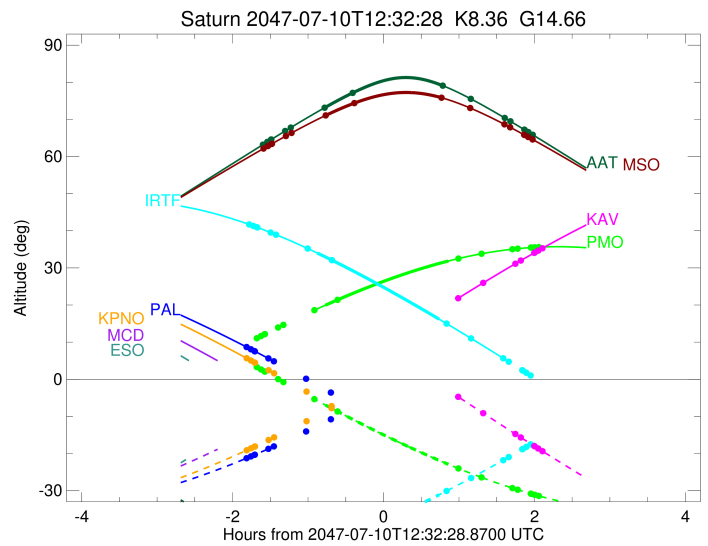
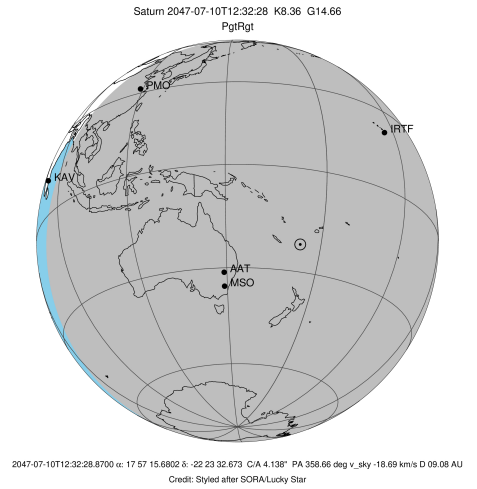
- 1 74490.6 C (IER)
- 2 91984.7 B (IER)
- 3 117571.2 B (OER)
- 4 122050.4 A (IER)
- 5 133423.3 Encke (IEG)
- 6 133744.9 Encke (OEG)
- 7 136774.4 A (OER)
- 8 140461.0 F ring

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

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (20	33.4	243.1	+			JUL 10 10:43 - JUL 10 11:01	PnnRin
PMO	Purple Mtn Obs	32.1	118.8		+	+	JUL 10 11:37 - JUL 10 14:36	PieRie
KPNO	Kitt Peak Natl	32.0	248.4	+			JUL 10 10:43 - JUL 10 10:47	PnnRin
MCD	McDonald Obs.	30.7	256.0					PnnRnn
TEN	Teide Obs./Ten	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+	+	+	JUL 10 10:45 - JUL 10 14:07	PieRie
KAV	Kavalur Observ	12.6	78.8			+	JUL 10 13:51 - JUL 10 14:38	PnnRne
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European South	-29.3	289.3					PnnRnn
AAT	Siding Spring	-31.3	149.1	+	+	+	JUL 10 10:56 - JUL 10 14:31	PieRie
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JUL 10 10:57 - JUL 10 14:31	PieRie

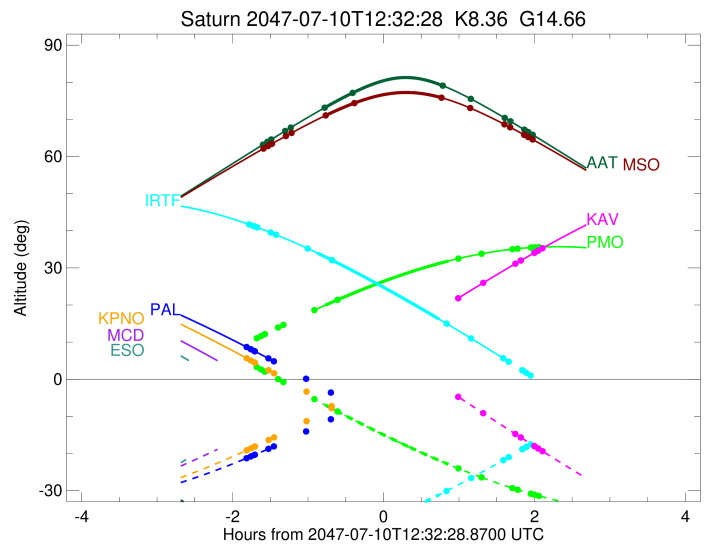
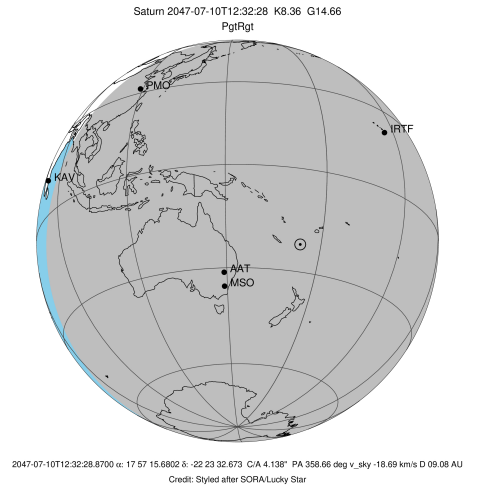


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T12:27:28.470  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4070277284502708608  
 2Mass ID (if available) : 17571567-2223327  
 ICRS Star Coord at Epoch: 17h 57m 15.68024s -22:23:32.67293s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 8.359  
 G magnitude : 14.661  
 RP magnitude : 13.238  
 BP magnitude : 17.263  
 DUPflag : 0  
 Distance (au) : 9.075  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.69  
 Sun-Target sep (deg) : 161.78  
 Sun-Moon sep (deg) : 56.37  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.662  
 C/A sky separation (km) : 24107.1  
 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	2047-07-10T10:43:40.216		8.67	-21.26	140461.00	-17.94		
A (OER)	I	2047-07-10T10:47:06.255		8.08	-20.77	136774.40	-17.85		
Encke (OEG)	I	2047-07-10T10:49:56.345		7.58	-20.36	133744.89	-17.77		
Encke (IEG)	I	2047-07-10T10:50:14.443		7.52	-20.32	133423.31	-17.76		
A (IER)	I	2047-07-10T11:01:00.614		5.61	-18.74	122050.38	-17.42		
B (OER)	I	2047-07-10T11:05:18.898		4.84x	-18.09	117571.16	-17.26		
B (IER)	I	2047-07-10T11:30:59.679		0.13x	-14.05	91984.69	-15.78		
C (IER)	I	2047-07-10T11:50:43.071	b	-3.60x	-10.77	74490.58	-13.56		
Saturn	I	2047-07-10T11:38:38.227		-1.31x	-12.80	59978.26		-26.58	-31.46
Saturn	E	2047-07-10T13:16:43.681		-20.63x	4.88x	60165.15		-15.42	-18.70
C (IER)	E	2047-07-10T13:22:28.940		-21.80x	5.99x	74490.58	13.46		
B (IER)	E	2047-07-10T13:42:24.012		-25.89x	9.87x	91984.69	15.58		
B (OER)	E	2047-07-10T14:08:28.262		-31.29x	15.04x	117571.16	16.96		
A (IER)	E	2047-07-10T14:12:51.278		-32.20x	15.92x	122050.38	17.10		
Encke (IEG)	E	2047-07-10T14:23:50.240		-34.49x	18.13x	133423.31	17.40		
Encke (OEG)	E	2047-07-10T14:24:08.716		-34.55x	18.19x	133744.89	17.41		
A (OER)	E	2047-07-10T14:27:02.404		-35.16x	18.78x	136774.40	17.47		
F ring	E	2047-07-10T14:30:32.924		-35.89x	19.49x	140461.00	17.55		

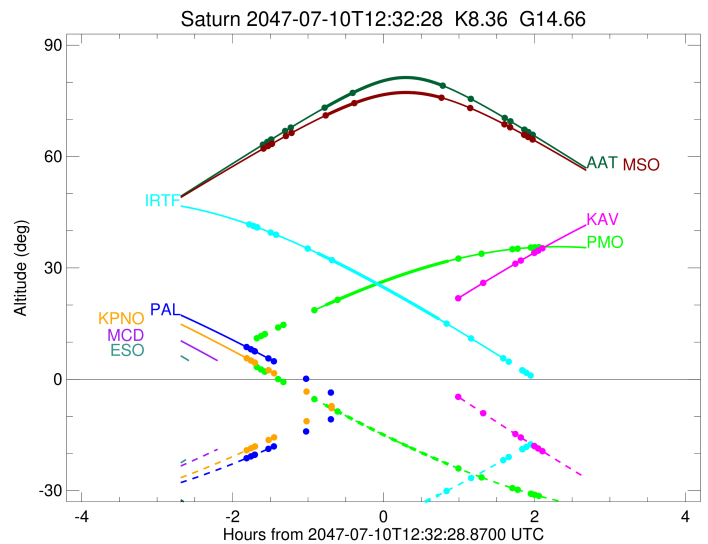
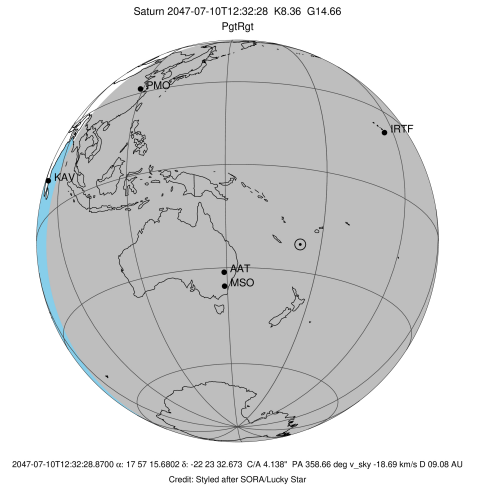
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T12:35:08.190  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 4070277284502708608  
 2Mass ID (if available) : 17571567-2223327  
 ICRS Star Coord at Epoch: 17h 57m 15.68024s -22:23:32.67293s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 8.359  
 G magnitude : 14.661  
 RP magnitude : 13.238  
 BP magnitude : 17.263  
 DUPflag : 0  
 Distance (au) : 9.075  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.69  
 Sun-Target sep (deg) : 161.78  
 Sun-Moon sep (deg) : 57.56  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.393  
 C/A sky separation (km) : 22331.2  
 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	2047-07-10T10:51:46.711		11.06	3.29x	140461.00	-18.30		
A (OER)	I	2047-07-10T10:55:08.509		11.64	2.64x	136774.40	-18.24		
Encke (OEG)	I	2047-07-10T10:57:54.893		12.12	2.10x	133744.89	-18.18		
Encke (IEG)	I	2047-07-10T10:58:12.585		12.17	2.05x	133423.31	-18.17		
A (IER)	I	2047-07-10T11:08:42.724		13.95	0.04x	122050.38	-17.91		
B (OER)	I	2047-07-10T11:12:53.672		14.65	-0.76x	117571.16	-17.78		
B (IER)	I	2047-07-10T11:37:35.392		18.62	-5.36	91984.69	-16.60		
C (IER)	I	2047-07-10T11:56:02.169	b	21.41	-8.69	74490.58	-14.82		
Saturn	I	2047-07-10T11:46:17.575		19.95	-6.94	59997.66		-25.60	-30.38
Saturn	E	2047-07-10T13:24:03.407		31.85	-22.91	60191.81		-13.23	-16.09
C (IER)	E	2047-07-10T13:32:04.175		32.51	-24.02	74490.58	14.89		
B (IER)	E	2047-07-10T13:50:26.089		33.81	-26.44	91984.69	16.68		
B (OER)	E	2047-07-10T14:15:00.587		35.03	-29.32	117571.16	17.88		
A (IER)	E	2047-07-10T14:19:10.157		35.18	-29.76	122050.38	18.01		
Encke (IEG)	E	2047-07-10T14:29:36.620		35.47	-30.82	133423.31	18.28		
Encke (OEG)	E	2047-07-10T14:29:54.205		35.48	-30.85	133744.89	18.29		
A (OER)	E	2047-07-10T14:32:39.562		35.54	-31.11	136774.40	18.35		
F ring	E	2047-07-10T14:36:00.087		35.60	-31.43	140461.00	18.42		

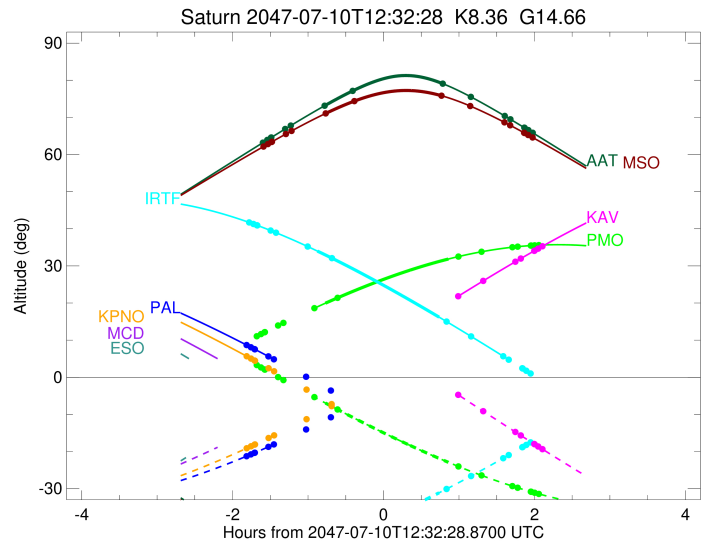
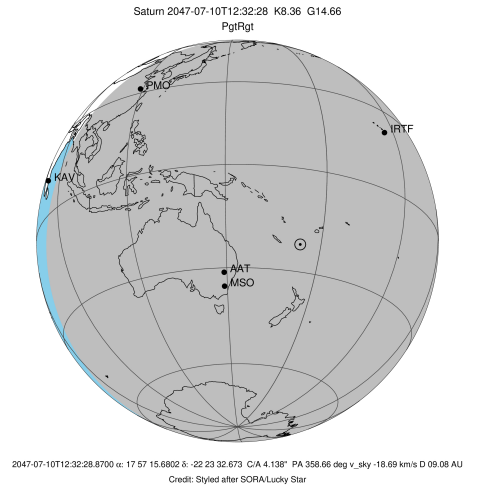
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T12:27:24.690  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 4070277284502708608  
 2Mass ID (if available) : 17571567-2223327  
 ICRS Star Coord at Epoch: 17h 57m 15.68024s -22:23:32.67293s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 8.359  
 G magnitude : 14.661  
 RP magnitude : 13.238  
 BP magnitude : 17.263  
 DUPflag : 0  
 Distance (au) : 9.075  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.69  
 Sun-Target sep (deg) : 161.78  
 Sun-Moon sep (deg) : 56.31  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.710  
 C/A sky separation (km) : 24417.3  
 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	2047-07-10T10:43:44.713		5.66	-19.12	140461.00	-17.86		
A (OER)	I	2047-07-10T10:47:11.599		5.02	-18.58	136774.40	-17.77		
Encke (OEG)	I	2047-07-10T10:50:02.414		4.50x	-18.14	133744.89	-17.70		
Encke (IEG)	I	2047-07-10T10:50:20.590		4.44x	-18.09	133423.31	-17.69		
A (IER)	I	2047-07-10T11:01:09.761		2.43x	-16.36	122050.38	-17.34		
B (OER)	I	2047-07-10T11:05:29.368		1.61x	-15.65	117571.16	-17.17		
B (IER)	I	2047-07-10T11:31:20.371		-3.34x	-11.29	91984.69	-15.65		
C (IER)	I	2047-07-10T11:51:17.240	b	-7.24x	-7.76	74490.58	-13.35		
Saturn	I	2047-07-10T11:38:36.488		-4.75x	-10.02	59972.73		-26.86	-31.77
Saturn	E	2047-07-10T13:16:38.206		-24.63x	8.45x	60161.40		-15.71	-19.04
C (IER)	E	2047-07-10T13:22:02.776		-25.75x	9.53x	74490.58	13.26		
B (IER)	E	2047-07-10T13:42:11.269		-29.98x	13.57x	91984.69	15.45		
B (OER)	E	2047-07-10T14:08:25.771		-35.52x	18.92x	117571.16	16.87		
A (IER)	E	2047-07-10T14:12:50.119		-36.45x	19.83x	122050.38	17.02		
Encke (IEG)	E	2047-07-10T14:23:52.103		-38.80x	22.10x	133423.31	17.33		
Encke (OEG)	E	2047-07-10T14:24:10.658		-38.86x	22.17x	133744.89	17.33		
A (OER)	E	2047-07-10T14:27:05.077		-39.48x	22.77x	136774.40	17.40		
F ring	E	2047-07-10T14:30:36.453		-40.23x	23.50x	140461.00	17.48		

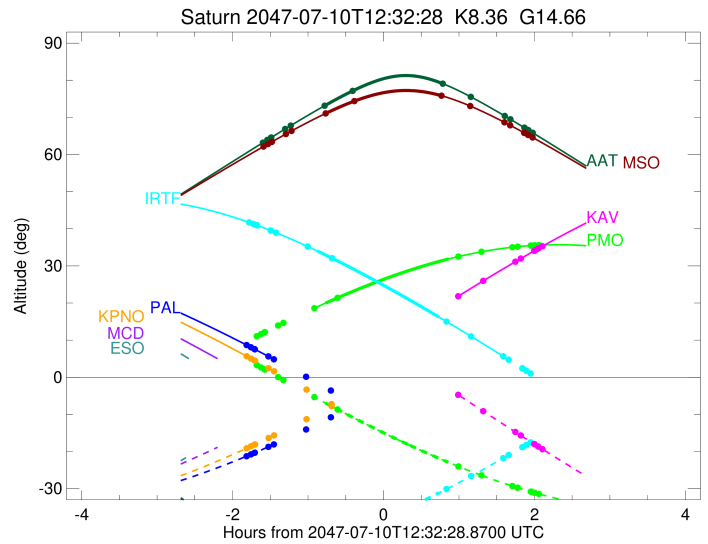
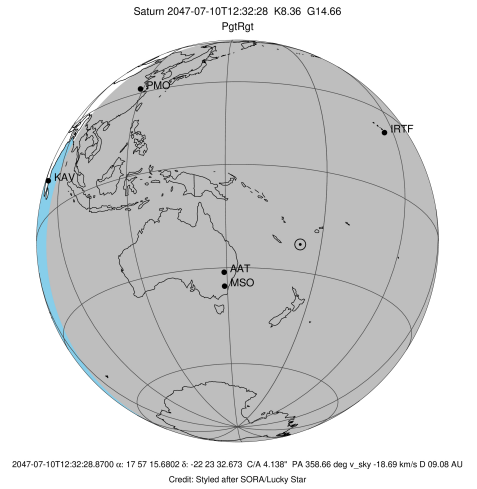
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T12:28:08.670  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : IRTF  
 Location : Mauna Kea/IRTF  
 Latitude (deg) : 19.82622  
 E. Longitude (deg) : 204.52800  
 Altitude (km) : 4.168  
 Gaia source ID : 4070277284502708608  
 2Mass ID (if available) : 17571567-2223327  
 ICRS Star Coord at Epoch: 17h 57m 15.68024s -22:23:32.67293s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 8.359  
 G magnitude : 14.661  
 RP magnitude : 13.238  
 BP magnitude : 17.263  
 DUPflag : 0  
 Distance (au) : 9.075  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.69  
 Sun-Target sep (deg) : 161.78  
 Sun-Moon sep (deg) : 56.92  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.632  
 C/A sky separation (km) : 23907.0  
 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	2047-07-10T10:45:43.014		41.70	-47.85	140461.00	-18.21		
A (OER)	I	2047-07-10T10:49:05.910		41.29	-47.76	136774.40	-18.13		
Encke (OEG)	I	2047-07-10T10:51:53.375		40.94	-47.66	133744.89	-18.05		
Encke (IEG)	I	2047-07-10T10:52:11.192		40.91	-47.65	133423.31	-18.04		
A (IER)	I	2047-07-10T11:02:47.109		39.52	-47.21	122050.38	-17.71		
B (OER)	I	2047-07-10T11:07:01.165		38.94	-46.98	117571.16	-17.55		
B (IER)	I	2047-07-10T11:32:14.715		35.21	-45.19	91984.69	-16.09		
C (IER)	I	2047-07-10T11:51:33.167	b	32.07	-43.31	74490.58	-13.89		
Saturn	I	2047-07-10T11:39:54.992		33.99	-44.50	59980.55		-26.47	-31.34
Saturn	E	2047-07-10T13:16:44.918		16.19	-31.11	60167.66		-15.23	-18.47
C (IER)	E	2047-07-10T13:22:38.715		15.00	-30.09	74490.58	13.79		
B (IER)	E	2047-07-10T13:42:08.343		11.01	-26.60	91984.69	15.89		
B (OER)	E	2047-07-10T14:07:44.378		5.65	-21.79	117571.16	17.25		
A (IER)	E	2047-07-10T14:12:02.975		4.73x	-20.96	122050.38	17.39		
Encke (IEG)	E	2047-07-10T14:22:51.177		2.43x	-18.85	133423.31	17.68		
Encke (OEG)	E	2047-07-10T14:23:09.357		2.36x	-18.79	133744.89	17.69		
A (OER)	E	2047-07-10T14:26:00.281		1.75x	-18.22	136774.40	17.76		
F ring	E	2047-07-10T14:29:27.488		1.01x	-17.54	140461.00	17.83		

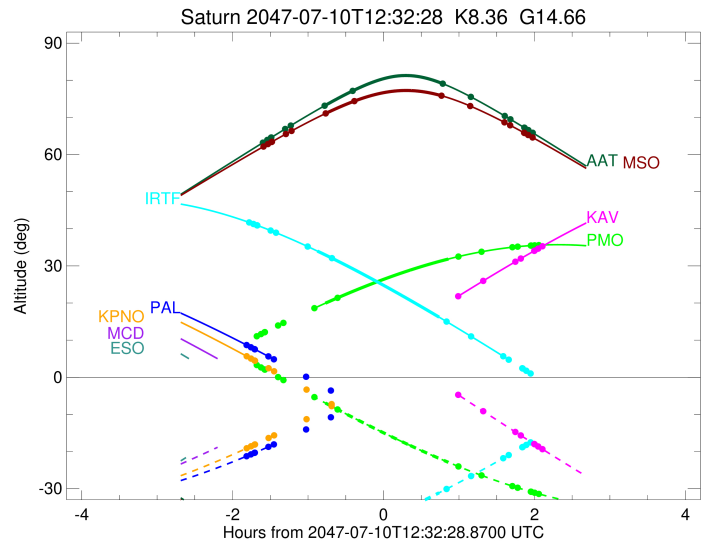
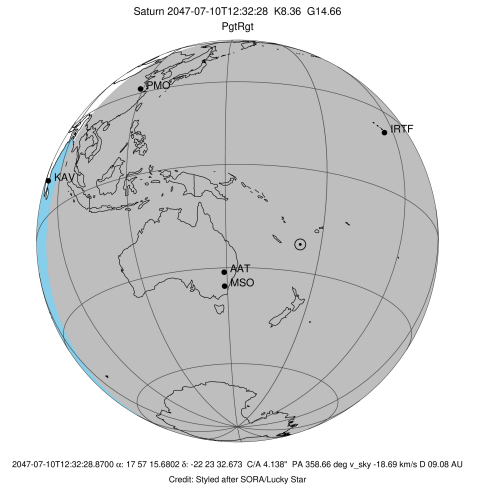
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T12:37:56.470  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 4070277284502708608  
 2Mass ID (if available) : 17571567-2223327  
 ICRS Star Coord at Epoch: 17h 57m 15.68024s -22:23:32.67293s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 8.359  
 G magnitude : 14.661  
 RP magnitude : 13.238  
 BP magnitude : 17.263  
 DUPflag : 0  
 Distance (au) : 9.075  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.69  
 Sun-Target sep (deg) : 161.78  
 Sun-Moon sep (deg) : 57.57  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.815  
 C/A sky separation (km) : 25111.8  
 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	2047-07-10T10:56:54.201	-12.60x	30.66x	140461.00	-17.73			
A (OER)	I	2047-07-10T11:00:22.566	-11.81x	29.86x	136774.40	-17.65			
Encke (OEG)	I	2047-07-10T11:03:14.527	-11.15x	29.20x	133744.89	-17.58			
Encke (IEG)	I	2047-07-10T11:03:32.822	-11.08x	29.13x	133423.31	-17.57			
A (IER)	I	2047-07-10T11:14:25.769	-8.59x	26.61x	122050.38	-17.25			
B (OER)	I	2047-07-10T11:18:46.674	-7.60x	25.61x	117571.16	-17.09			
B (IER)	I	2047-07-10T11:44:44.450	-1.71x	19.62x	91984.69	-15.57			
C (IER)	I	2047-07-10T12:04:50.701	b	2.82x	15.00x	74490.58	-13.18		
Saturn	I	2047-07-10T11:49:38.870	-0.60x	18.49x	59942.30			-28.34	-33.39
Saturn	E	2047-07-10T13:26:13.612	20.63	-3.47x	60163.64			-15.54	-18.84
C (IER)	E	2047-07-10T13:31:53.882	21.83	-4.73x	74490.58	13.32			
B (IER)	E	2047-07-10T13:51:46.564	25.97	-9.14	91984.69	15.76			
B (OER)	E	2047-07-10T14:17:22.507	31.14	-14.75	117571.16	17.36			
A (IER)	E	2047-07-10T14:21:39.162	31.98	-15.67	122050.38	17.54			
Encke (IEG)	E	2047-07-10T14:32:20.704	34.05	-17.98	133423.31	17.90			
Encke (OEG)	E	2047-07-10T14:32:38.664	34.11	-18.04	133744.89	17.91			
A (OER)	E	2047-07-10T14:35:27.431	34.65	-18.64	136774.40	17.99			
F ring	E	2047-07-10T14:38:51.824	35.29	-19.37	140461.00	18.08			

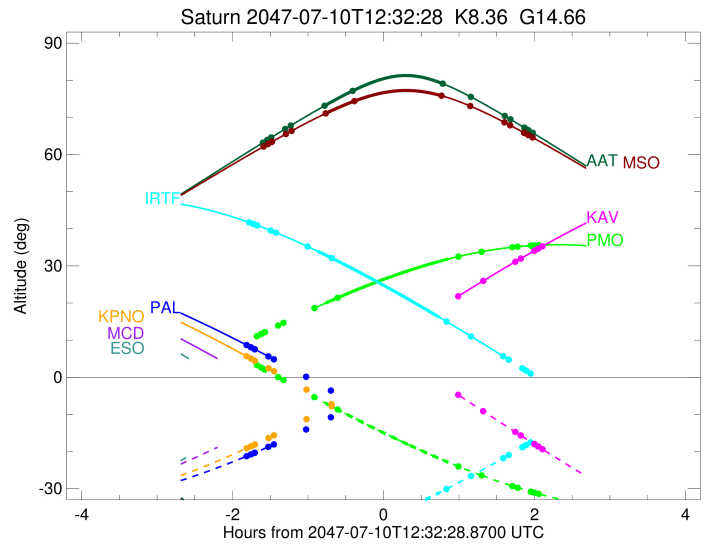
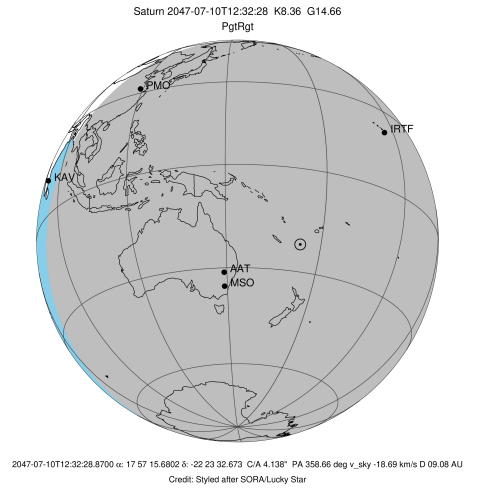
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T12:32:52.530  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4070277284502708608  
 2Mass ID (if available) : 17571567-2223327  
 ICRS Star Coord at Epoch: 17h 57m 15.68024s -22:23:32.67293s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 8.359  
 G magnitude : 14.661  
 RP magnitude : 13.238  
 BP magnitude : 17.263  
 DUPflag : 0  
 Distance (au) : 9.075  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.69  
 Sun-Target sep (deg) : 161.78  
 Sun-Moon sep (deg) : 57.81  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.284  
 C/A sky separation (km) : 28195.6  
 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	2047-07-10T10:56:38.536		63.21	-46.43	140461.00	-17.67		
A (OER)	I	2047-07-10T11:00:07.872		63.94	-47.18	136774.40	-17.55		
Encke (OEG)	I	2047-07-10T11:03:00.949		64.54	-47.79	133744.89	-17.45		
Encke (IEG)	I	2047-07-10T11:03:19.381		64.61	-47.86	133423.31	-17.44		
A (IER)	I	2047-07-10T11:14:19.758		66.89	-50.21	122050.38	-16.98		
B (OER)	I	2047-07-10T11:18:45.254		67.80	-51.16	117571.16	-16.76		
B (IER)	I	2047-07-10T11:45:42.435		73.16	-56.91	91984.69	-14.62		
C (IER)	I	2047-07-10T12:08:04.407	b	77.17	-61.64	74490.58	-11.07		
Saturn	I	2047-07-10T11:46:45.094		73.36	-57.13	59889.79		-30.78	-36.04
Saturn	E	2047-07-10T13:19:13.321		79.14	-75.75	60115.48		-18.91	-22.78
C (IER)	E	2047-07-10T13:19:36.976		79.09	-75.81	74490.58	11.11		
B (IER)	E	2047-07-10T13:41:57.860		75.53	-79.22	91984.69	14.61		
B (OER)	E	2047-07-10T14:08:58.383		70.38	-81.08	117571.16	16.71		
A (IER)	E	2047-07-10T14:13:24.681		69.49	-81.03	122050.38	16.93		
Encke (IEG)	E	2047-07-10T14:24:27.292		67.24	-80.44	133423.31	17.38		
Encke (OEG)	E	2047-07-10T14:24:45.791		67.17	-80.42	133744.89	17.39		
A (OER)	E	2047-07-10T14:27:39.509		66.58	-80.16	136774.40	17.49		
F ring	E	2047-07-10T14:31:09.648		65.85	-79.81	140461.00	17.60		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-07-10T12:32:52.500  
 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 : 4070277284502708608  
 2Mass ID (if available) : 17571567-2223327  
 ICRS Star Coord at Epoch: 17h 57m 15.68024s -22:23:32.67293s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 8.359  
 G magnitude : 14.661  
 RP magnitude : 13.238  
 BP magnitude : 17.263  
 DUPflag : 0  
 Distance (au) : 9.075  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.69  
 Sun-Target sep (deg) : 161.78  
 Sun-Moon sep (deg) : 57.80  
 B (ring opening deg) : 26.59  
 PA of pole (deg) : 5.46  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.351  
 C/A sky separation (km) : 28635.9  
 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\_itr93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



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

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-07-10T10:57:06.994		62.16	-46.36	140461.00	-17.58		
A (OER)	I	2047-07-10T11:00:37.337		62.83	-47.07	136774.40	-17.47		
Encke (OEG)	I	2047-07-10T11:03:31.291		63.39	-47.66	133744.89	-17.36		
Encke (IEG)	I	2047-07-10T11:03:49.818		63.45	-47.72	133423.31	-17.35		
A (IER)	I	2047-07-10T11:14:53.989		65.53	-49.97	122050.38	-16.87		
B (OER)	I	2047-07-10T11:19:21.245		66.35	-50.88	117571.16	-16.64		
B (IER)	I	2047-07-10T11:46:34.214		71.08	-56.35	91984.69	-14.42		
C (IER)	I	2047-07-10T12:09:26.302	b	74.41	-60.85	74490.58	-10.68		
Saturn	I	2047-07-10T11:46:55.429		71.14	-56.42	59880.74		-31.20	-36.48
Saturn	E	2047-07-10T13:19:03.152		75.80	-73.02	60108.91		-19.33	-23.27
C (IER)	E	2047-07-10T13:18:37.214	b	75.84	-72.96	74490.58	10.73		
B (IER)	E	2047-07-10T13:41:27.795		73.06	-75.69	91984.69	14.41		
B (OER)	E	2047-07-10T14:08:43.901		68.66	-77.05	117571.16	16.60		
A (IER)	E	2047-07-10T14:13:11.928		67.87	-77.02	122050.38	16.82		
Encke (IEG)	E	2047-07-10T14:24:18.253		65.85	-76.64	133423.31	17.29		
Encke (OEG)	E	2047-07-10T14:24:36.845		65.80	-76.62	133744.89	17.30		
A (OER)	E	2047-07-10T14:27:31.418		65.26	-76.45	136774.40	17.40		
F ring	E	2047-07-10T14:31:02.538		64.60	-76.20	140461.00	17.52		