

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2029-10-23T19:01:26.430  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 54500699740746240  
 2Mass ID (if available) : 03235420+1603400

Saturn 2029-10-23T19:01:26 K9.56 G11.22 PgtRgt

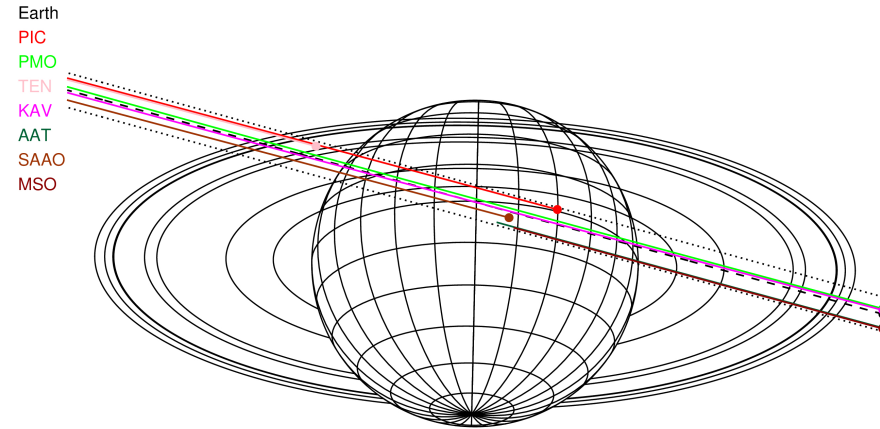
ICRS Star Coord at Epoch: 03h 23m 54.21865s +16:03:39.93389s

RUWE (>1.4 is poor) : 4.29  
 K magnitude : 9.565  
 G magnitude : 11.224  
 RP magnitude : 10.679  
 BP magnitude : 11.586  
 DUPflag : 0  
 Distance (au) : 8.211  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.79  
 Sun-Target sep (deg) : 157.39  
 Sun-Moon sep (deg) : 9.35  
 B (ring opening deg) : -22.45  
 PA of pole (deg) : -1.27

#	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

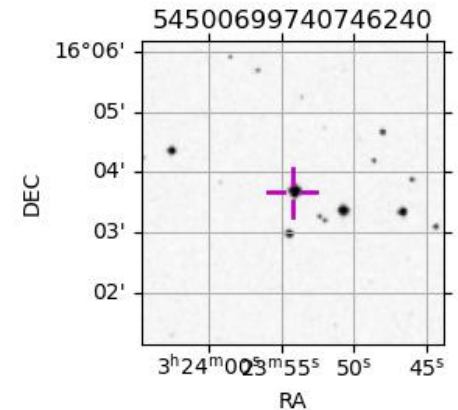


2029-10-23T19:01:26.4300 ra: 03 23 54.2187 s: +16 03 39.934 C/A 3.672° PA 164.64 deg v\_sky -17.79 km/s D 08.21 AU  
 Credit: Styled after SORA/Lucky Star

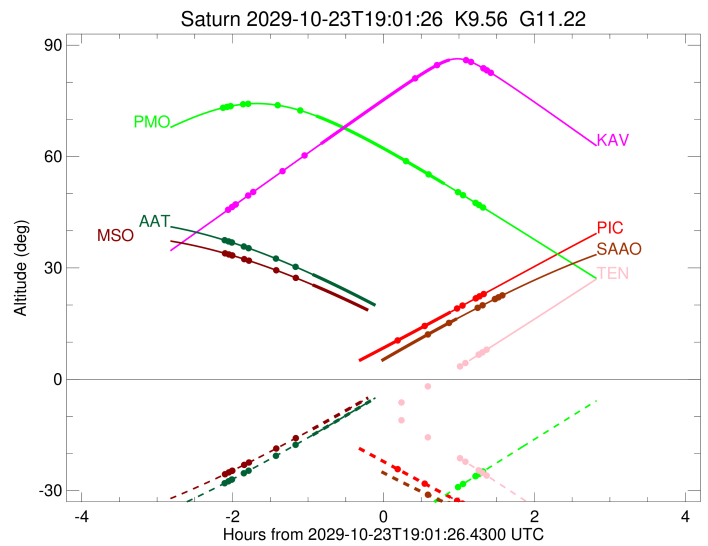
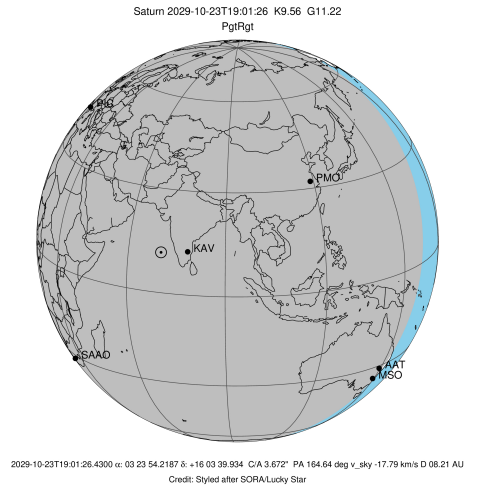


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEncode
PIC	Pic du Midi	42.9	0.1		+	+	OCT 23 19:54 - OCT 23 20:21	PneRne
PAL	Palomar Mt (20	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8	+	+	+	OCT 23 16:53 - OCT 23 20:20	PieRie
KPNO	Kitt Peak Natl	32.0	248.4					PnnRnn
MCD	McDonald Obs.	30.7	256.0					PnnRnn
TEN	Teide Obs./Ten	28.3	343.5			+	OCT 23 20:17 - OCT 23 20:23	PnnRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observ	12.6	78.8	+	+	+	OCT 23 16:57 - OCT 23 20:26	PieRie
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European South	-29.3	289.3					PnnRnn
AAT	Siding Spring	-31.3	149.1	+	+		OCT 23 16:55 - OCT 23 18:04	PinRin
SAAO	So. Afr. Astro	-32.4	20.8		+	+	OCT 23 19:59 - OCT 23 20:36	PneRne
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	OCT 23 16:55 - OCT 23 18:05	PinRin



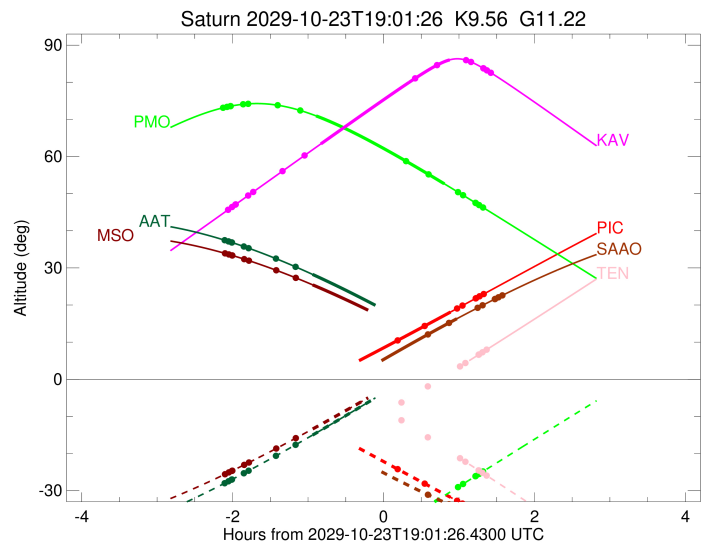
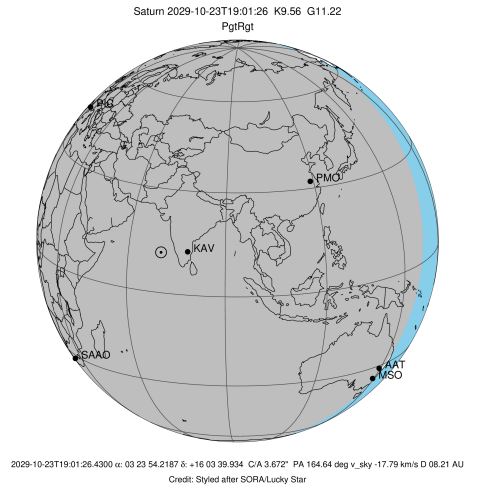
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2029-10-23T19:04:45.330  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 54500699740746240  
 2Mass ID (if available) : 03235420+1603400  
 ICRS Star Coord at Epoch: 03h 23m 54.21865s +16:03:39.93389s  
 RUWE (>1.4 is poor) : 4.29  
 K magnitude : 9.565  
 G magnitude : 11.224  
 RP magnitude : 10.679  
 BP magnitude : 11.586  
 DUPflag : 0  
 Distance (au) : 8.211  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.79  
 Sun-Target sep (deg) : 157.39  
 Sun-Moon sep (deg) : 8.54  
 B (ring opening deg) : -22.45  
 PA of pole (deg) : -1.27  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.561  
 C/A sky separation (km) : 27160.7  
 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	2029-10-23T16:55:28.329		-12.45x	0.73x	140461.00	-18.27		
A (OER)	I	2029-10-23T16:58:50.767		-11.95x	0.14x	136774.40	-18.15		
Encke (OEG)	I	2029-10-23T17:01:38.139		-11.53x	-0.35x	133744.89	-18.05		
Encke (IEG)	I	2029-10-23T17:01:55.962		-11.48x	-0.41x	133423.31	-18.04		
A (IER)	I	2029-10-23T17:12:34.542		-9.86x	-2.30x	122050.38	-17.56		
B (OER)	I	2029-10-23T17:16:51.259		-9.20x	-3.06x	117571.16	-17.33		
B (IER)	I	2029-10-23T17:42:54.665		-5.04x	-7.76	91984.69	-15.13		
C (IER)	I	2029-10-23T18:04:31.434		-1.45x	-11.70	74490.58	-11.46		
Saturn	I	2029-10-23T18:14:09.083		0.18x	-13.47	60225.89		11.96	14.58
Saturn	E	2029-10-23T19:54:48.299		18.12	-31.82	59913.72		37.11	42.68
C (IER)	E	2029-10-23T19:12:37.132	b	10.45	-24.20	74490.58	11.44		
B (IER)	E	2029-10-23T19:34:13.535	b	14.36	-28.12	91984.69	15.18		
B (OER)	E	2029-10-23T20:00:06.993		19.10	-32.76	117571.16	17.49		
A (IER)	E	2029-10-23T20:04:21.316		19.88	-33.51	122050.38	17.73		
Encke (IEG)	E	2029-10-23T20:14:53.217		21.81	-35.36	133423.31	18.24		
Encke (OEG)	E	2029-10-23T20:15:10.840		21.87	-35.41	133744.89	18.25		
A (OER)	E	2029-10-23T20:17:56.295		22.37	-35.89	136774.40	18.37		
F ring	E	2029-10-23T20:21:16.330		22.99	-36.47	140461.00	18.49		

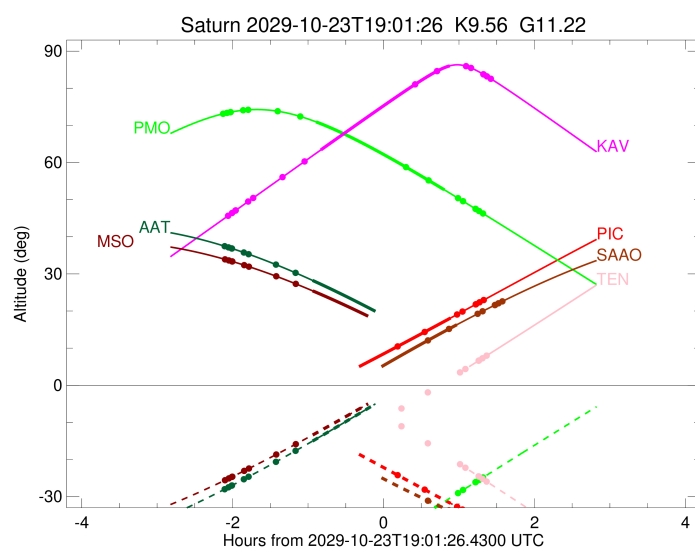
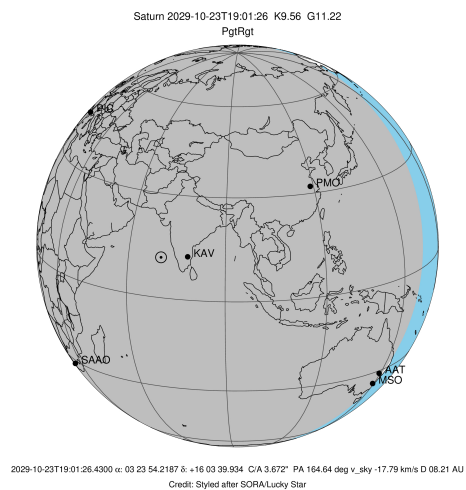
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2029-10-23T18:59:00.050  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 54500699740746240  
 2Mass ID (if available) : 03235420+1603400  
 ICRS Star Coord at Epoch: 03h 23m 54.21865s +16:03:39.93389s  
 RUWE (>1.4 is poor) : 4.29  
 K magnitude : 9.565  
 G magnitude : 11.224  
 RP magnitude : 10.679  
 BP magnitude : 11.586  
 DUPflag : 0  
 Distance (au) : 8.211  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.79  
 Sun-Target sep (deg) : 157.39  
 Sun-Moon sep (deg) : 9.68  
 B (ring opening deg) : -22.45  
 PA of pole (deg) : -1.27  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.875  
 C/A sky separation (km) : 23075.4  
 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	2029-10-23T16:53:53.508		73.13	-64.86	140461.00	-19.45		
A (OER)	I	2029-10-23T16:57:03.490		73.38	-64.42	136774.40	-19.36		
Encke (OEG)	I	2029-10-23T16:59:40.242		73.56	-64.04	133744.89	-19.29		
Encke (IEG)	I	2029-10-23T16:59:56.916		73.58	-64.00	133423.31	-19.28		
A (IER)	I	2029-10-23T17:09:51.681		74.08	-62.52	122050.38	-18.95		
B (OER)	I	2029-10-23T17:13:49.094		74.20	-61.89	117571.16	-18.78		
B (IER)	I	2029-10-23T17:37:20.984		73.82	-57.91	91984.69	-17.27		
C (IER)	I	2029-10-23T17:55:18.188		72.40	-54.62	74490.58	-14.96		
Saturn	I	2029-10-23T18:07:55.381		70.94	-52.21	60249.15		7.97	9.76
Saturn	E	2029-10-23T19:49:51.880		52.64	-31.34	59971.63		33.47	38.89
C (IER)	E	2029-10-23T19:19:20.105	b	58.77	-37.75	74490.58	14.89		
B (IER)	E	2029-10-23T19:37:19.832	b	55.19	-33.98	91984.69	17.27		
B (OER)	E	2029-10-23T20:00:50.183		50.38	-29.02	117571.16	18.82		
A (IER)	E	2029-10-23T20:04:47.061		49.56	-28.19	122050.38	18.99		
Encke (IEG)	E	2029-10-23T20:14:40.247		47.51	-26.09	133423.31	19.34		
Encke (OEG)	E	2029-10-23T20:14:56.873		47.45	-26.03	133744.89	19.35		
A (OER)	E	2029-10-23T20:17:33.156		46.90	-25.48	136774.40	19.42		
F ring	E	2029-10-23T20:20:42.544		46.24	-24.81	140461.00	19.51		

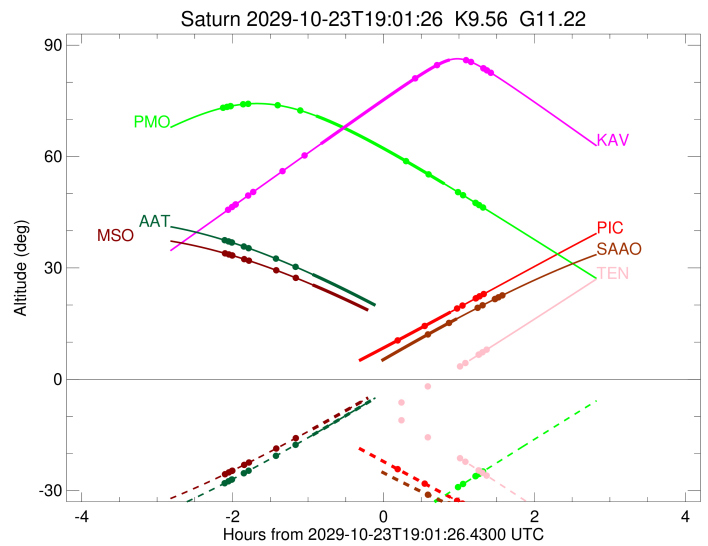
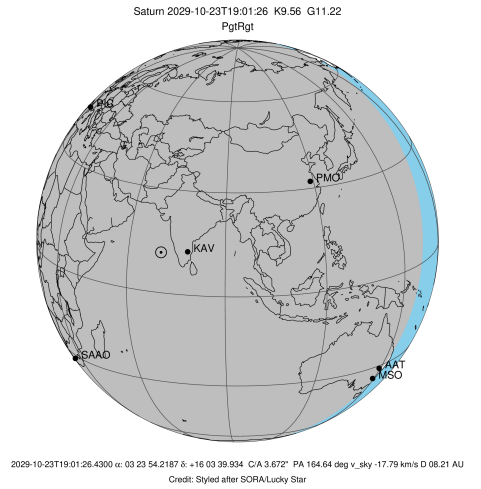
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2029-10-23T19:05:30.440  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 54500699740746240  
 2Mass ID (if available) : 03235420+1603400  
 ICRS Star Coord at Epoch: 03h 23m 54.21865s +16:03:39.93389s  
 RUWE (>1.4 is poor) : 4.29  
 K magnitude : 9.565  
 G magnitude : 11.224  
 RP magnitude : 10.679  
 BP magnitude : 11.586  
 DUPflag : 0  
 Distance (au) : 8.211  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.79  
 Sun-Target sep (deg) : 157.39  
 Sun-Moon sep (deg) : 8.46  
 B (ring opening deg) : -22.45  
 PA of pole (deg) : -1.27  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.457  
 C/A sky separation (km) : 26543.3  
 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	2029-10-23T16:55:25.164	-32.21x	18.63x	140461.00	-18.28			
A (OER)	I	2029-10-23T16:58:47.429	-31.68x	17.95x	136774.40	-18.17			
Encke (OEG)	I	2029-10-23T17:01:34.607	-31.24x	17.39x	133744.89	-18.07			
Encke (IEG)	I	2029-10-23T17:01:52.407	-31.19x	17.33x	133423.31	-18.06			
A (IER)	I	2029-10-23T17:12:29.686	-29.46x	15.18x	122050.38	-17.61			
B (OER)	I	2029-10-23T17:16:45.580	-28.75x	14.31x	117571.16	-17.39			
B (IER)	I	2029-10-23T17:42:37.339	-24.27x	8.95x	91984.69	-15.33			
C (IER)	I	2029-10-23T18:03:42.712	-20.41x	4.50x	74490.58	-11.96			
Saturn	I	2029-10-23T18:14:15.088	-18.43x	2.26x	60230.45			11.28	13.77
Saturn	E	2029-10-23T19:56:10.941	2.17x	-19.93	59922.58			36.56	42.12
C (IER)	E	2029-10-23T19:15:38.493	b	-6.27x	-11.03	74490.58	11.94		
B (IER)	E	2029-10-23T19:36:43.775	b	-1.91x	-15.65	91984.69	15.38		
B (OER)	E	2029-10-23T20:02:26.351		3.50x	-21.31	117571.16	17.54		
A (IER)	E	2029-10-23T20:06:40.036		4.40x	-22.24	122050.38	17.77		
Encke (IEG)	E	2029-10-23T20:17:11.150		6.64	-24.56	133423.31	18.25		
Encke (OEG)	E	2029-10-23T20:17:28.765		6.70	-24.63	133744.89	18.26		
A (OER)	E	2029-10-23T20:20:14.174		7.29	-25.23	136774.40	18.37		
F ring	E	2029-10-23T20:23:34.222		8.01	-25.97	140461.00	18.49		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2029-10-23T19:03:05.030  
 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 : 54500699740746240  
 2Mass ID (if available) : 03235420+1603400  
 ICRS Star Coord at Epoch: 03h 23m 54.21865s +16:03:39.93389s  
 RUWE (>1.4 is poor) : 4.29  
 K magnitude : 9.565  
 G magnitude : 11.224  
 RP magnitude : 10.679  
 BP magnitude : 11.586  
 DUPflag : 0  
 Distance (au) : 8.211  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.79  
 Sun-Target sep (deg) : 157.39  
 Sun-Moon sep (deg) : 9.31  
 B (ring opening deg) : -22.45  
 PA of pole (deg) : -1.27  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.683  
 C/A sky separation (km) : 21931.4  
 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

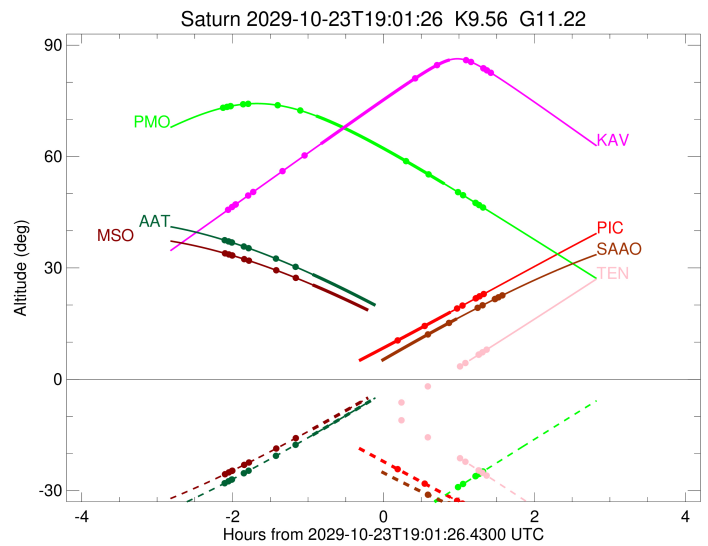
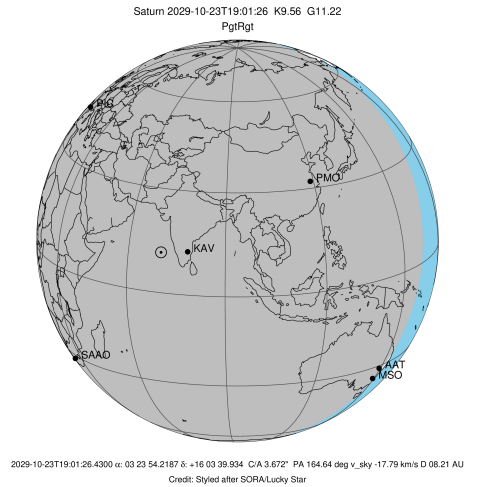


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2029-10-23T16:57:52.649		45.65	-67.73	140461.00	-19.41		
A (OER)	I	2029-10-23T17:01:02.963		46.41	-68.51	136774.40	-19.34		
Encke (OEG)	I	2029-10-23T17:03:39.903		47.04	-69.15	133744.89	-19.27		
Encke (IEG)	I	2029-10-23T17:03:56.593		47.11	-69.21	133423.31	-19.26		
A (IER)	I	2029-10-23T17:13:51.228		49.50	-71.63	122050.38	-18.97		
B (OER)	I	2029-10-23T17:17:48.176		50.45	-72.60	117571.16	-18.83		
B (IER)	I	2029-10-23T17:41:09.985		56.07	-78.30	91984.69	-17.51		
C (IER)	I	2029-10-23T17:58:43.529		60.30	-82.57	74490.58	-15.49		
Saturn	I	2029-10-23T18:11:39.128		63.41	-85.70	60252.83		7.14	8.75
Saturn	E	2029-10-23T19:54:08.931		86.05	-69.16	59992.23		32.13	37.48
C (IER)	E	2029-10-23T19:26:35.118	b	81.06	-75.88	74490.58	15.50		
B (IER)	E	2029-10-23T19:44:04.539	b	84.64	-71.62	91984.69	17.62		
B (OER)	E	2029-10-23T20:07:13.585		85.95	-65.96	117571.17	19.05		
A (IER)	E	2029-10-23T20:11:07.800		85.46	-65.01	122050.38	19.20		
Encke (IEG)	E	2029-10-23T20:20:54.948		83.76	-62.62	133423.31	19.52		
Encke (OEG)	E	2029-10-23T20:21:11.415		83.71	-62.56	133744.89	19.53		
A (OER)	E	2029-10-23T20:23:46.228		83.19	-61.93	136774.40	19.60		
F ring	E	2029-10-23T20:26:53.885		82.54	-61.16	140461.00	19.69		



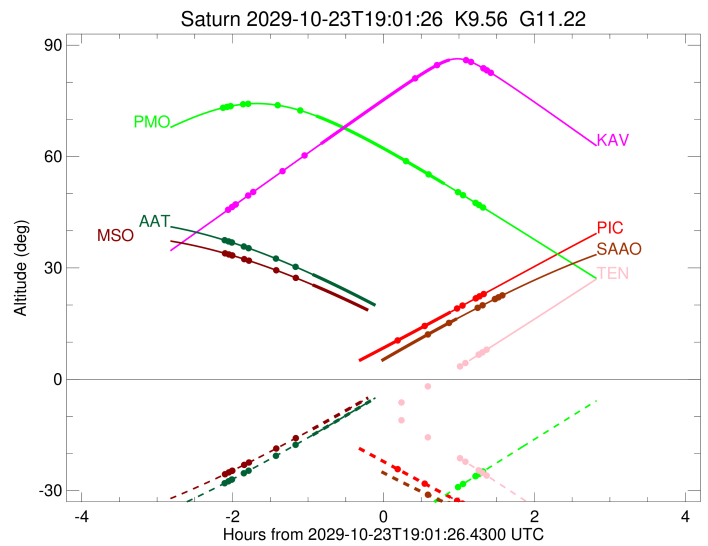
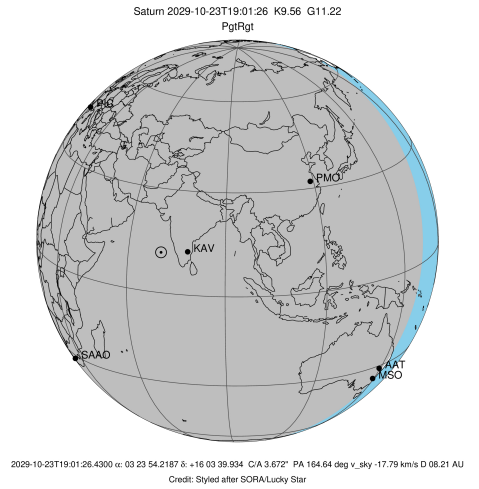
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2029-10-23T18:58:22.920  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 54500699740746240  
 2Mass ID (if available) : 03235420+1603400  
 ICRS Star Coord at Epoch: 03h 23m 54.21865s +16:03:39.93389s  
 RUWE (>1.4 is poor) : 4.29  
 K magnitude : 9.565  
 G magnitude : 11.224  
 RP magnitude : 10.679  
 BP magnitude : 11.586  
 DUPflag : 0  
 Distance (au) : 8.211  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.79  
 Sun-Target sep (deg) : 157.39  
 Sun-Moon sep (deg) : 10.20  
 B (ring opening deg) : -22.45  
 PA of pole (deg) : -1.27  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.821  
 C/A sky separation (km) : 16800.8  
 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	2029-10-23T16:55:08.517		37.47	-28.01	140461.00	-20.23		
A (OER)	I	2029-10-23T16:58:10.945		37.14	-27.48	136774.40	-20.19		
Encke (OEG)	I	2029-10-23T17:00:41.159		36.87	-27.04	133744.89	-20.15		
Encke (IEG)	I	2029-10-23T17:00:57.121		36.84	-27.00	133423.31	-20.14		
A (IER)	I	2029-10-23T17:10:23.995		35.76	-25.32	122050.38	-19.97		
B (OER)	I	2029-10-23T17:14:08.717		35.32	-24.65	117571.16	-19.89		
B (IER)	I	2029-10-23T17:35:56.578		32.50	-20.62	91984.69	-19.15		
C (IER)	I	2029-10-23T17:51:33.506		30.28	-17.65	74490.58	-18.09		
Saturn	I	2029-10-23T18:04:59.338		28.26	-15.05	60266.92		1.90	2.33
Saturn	E	2029-10-23T19:51:45.118		9.35	6.82x	60053.21		27.97	32.99
C (IER)	E	2029-10-23T19:33:19.536	b	12.89	2.94x	74490.58	17.99		
B (IER)	E	2029-10-23T19:49:00.791	b	9.88	6.24x	91984.69	19.06		
B (OER)	E	2029-10-23T20:10:54.341		5.60	10.87x	117571.16	19.80		
A (IER)	E	2029-10-23T20:14:40.101		4.85x	11.67x	122050.38	19.88		
Encke (IEG)	E	2029-10-23T20:24:09.711		2.96x	13.70x	133423.31	20.04		
Encke (OEG)	E	2029-10-23T20:24:25.753		2.90x	13.75x	133744.89	20.05		
A (OER)	E	2029-10-23T20:26:56.724		2.40x	14.29x	136774.40	20.08		
F ring	E	2029-10-23T20:30:00.089		1.78x	14.94x	140461.00	20.13		

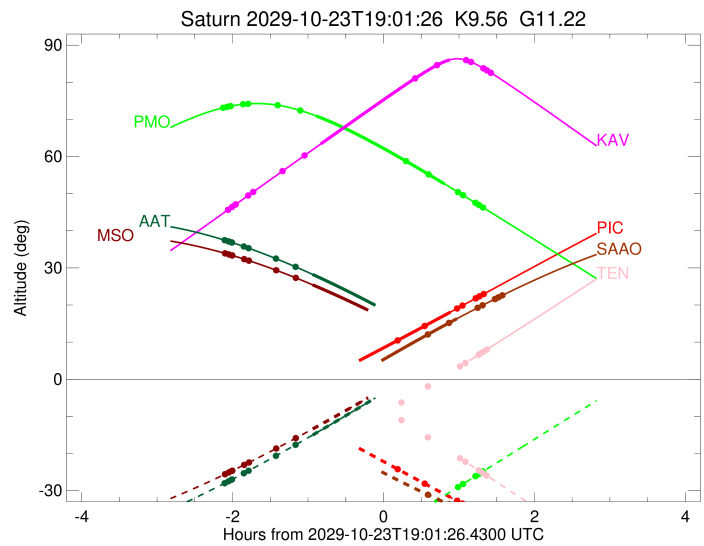
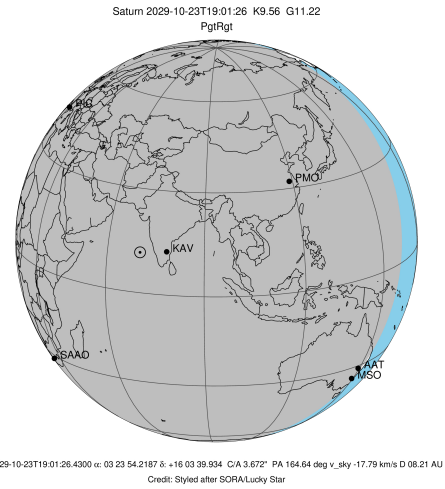
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2029-10-23T19:07:07.030  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : SAAO  
 Location : So. Afr. Astro. Obs. (Sutherland)  
 Latitude (deg) : -32.37953  
 E. Longitude (deg) : 20.81070  
 Altitude (km) : 1.768  
 Gaia source ID : 54500699740746240  
 2Mass ID (if available) : 03235420+1603400  
 ICRS Star Coord at Epoch: 03h 23m 54.21865s +16:03:39.93389s  
 RUWE (>1.4 is poor) : 4.29  
 K magnitude : 9.565  
 G magnitude : 11.224  
 RP magnitude : 10.679  
 BP magnitude : 11.586  
 DUPflag : 0  
 Distance (au) : 8.211  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.79  
 Sun-Target sep (deg) : 157.39  
 Sun-Moon sep (deg) : 8.95  
 B (ring opening deg) : -22.45  
 PA of pole (deg) : -1.27  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.291  
 C/A sky separation (km) : 19598.7  
 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	2029-10-23T17:00:06.657		-19.48x	-1.88x	140461.00	-19.33		
A (OER)	I	2029-10-23T17:03:17.656		-18.81x	-2.53x	136774.40	-19.27		
Encke (OEG)	I	2029-10-23T17:05:55.037		-18.26x	-3.07x	133744.89	-19.22		
Encke (IEG)	I	2029-10-23T17:06:11.767		-18.20x	-3.12x	133423.31	-19.22		
A (IER)	I	2029-10-23T17:16:06.813		-16.12x	-5.13	122050.38	-19.00		
B (OER)	I	2029-10-23T17:20:03.279		-15.30x	-5.93	117571.16	-18.89		
B (IER)	I	2029-10-23T17:43:10.149		-10.49x	-10.53	91984.69	-17.88		
C (IER)	I	2029-10-23T18:00:05.965		-7.00x	-13.84	74490.58	-16.40		
Saturn	I	2029-10-23T18:13:51.618		-4.18x	-16.48	60260.90		4.88	5.99
Saturn	E	2029-10-23T19:59:51.852		16.33	-34.62	60024.45		29.97	35.17
C (IER)	E	2029-10-23T19:36:46.420	b	12.08	-31.11	74490.58	16.46		
B (IER)	E	2029-10-23T19:53:35.296	b	15.19	-33.70	91984.69	18.05		
B (OER)	E	2029-10-23T20:16:25.914		19.27	-36.93	117571.16	19.15		
A (IER)	E	2029-10-23T20:20:19.010		19.94	-37.45	122050.38	19.28		
Encke (IEG)	E	2029-10-23T20:30:04.888		21.61	-38.69	133423.31	19.54		
Encke (OEG)	E	2029-10-23T20:30:21.346		21.66	-38.72	133744.89	19.54		
A (OER)	E	2029-10-23T20:32:56.135		22.10	-39.04	136774.40	19.60		
F ring	E	2029-10-23T20:36:03.901		22.62	-39.41	140461.00	19.67		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2029-10-23T18:58:38.620  
 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 : 54500699740746240  
 2Mass ID (if available) : 03235420+1603400  
 ICRS Star Coord at Epoch: 03h 23m 54.21865s +16:03:39.93389s  
 RUWE (>1.4 is poor) : 4.29  
 K magnitude : 9.565  
 G magnitude : 11.224  
 RP magnitude : 10.679  
 BP magnitude : 11.586  
 DUPflag : 0  
 Distance (au) : 8.211  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.79  
 Sun-Target sep (deg) : 157.39  
 Sun-Moon sep (deg) : 10.19  
 B (ring opening deg) : -22.45  
 PA of pole (deg) : -1.27  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.778  
 C/A sky separation (km) : 16544.8  
 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	2029-10-23T16:55:25.344		33.92	-25.58	140461.00	-20.24		
A (OER)	I	2029-10-23T16:58:27.703		33.63	-25.09	136774.40	-20.20		
Encke (OEG)	I	2029-10-23T17:00:57.850		33.38	-24.68	133744.89	-20.16		
Encke (IEG)	I	2029-10-23T17:01:13.804		33.35	-24.63	133423.31	-20.15		
A (IER)	I	2029-10-23T17:10:40.326		32.36	-23.06	122050.38	-19.99		
B (OER)	I	2029-10-23T17:14:24.860		31.95	-22.43	117571.17	-19.91		
B (IER)	I	2029-10-23T17:36:10.787		29.36	-18.65	91984.69	-19.19		
C (IER)	I	2029-10-23T17:51:44.740		27.31	-15.85	74490.58	-18.17		
Saturn	I	2029-10-23T18:05:08.675		25.43	-13.39	60267.17		1.67	2.05
Saturn	E	2029-10-23T19:52:06.865		7.58	7.50x	60056.50		27.73	32.73
C (IER)	E	2029-10-23T19:34:07.607	b	10.86	3.88x	74490.58	18.07		
B (IER)	E	2029-10-23T19:49:45.682	b	8.02	7.02x	91984.69	19.11		
B (OER)	E	2029-10-23T20:11:37.017		3.94x	11.45x	117571.16	19.82		
A (IER)	E	2029-10-23T20:15:22.537		3.23x	12.22x	122050.38	19.90		
Encke (IEG)	E	2029-10-23T20:24:51.655		1.42x	14.15x	133423.31	20.06		
Encke (OEG)	E	2029-10-23T20:25:07.685		1.37x	14.20x	133744.89	20.06		
A (OER)	E	2029-10-23T20:27:38.549		0.89x	14.72x	136774.40	20.10		
F ring	E	2029-10-23T20:30:41.796		0.30x	15.34x	140461.00	20.14		