

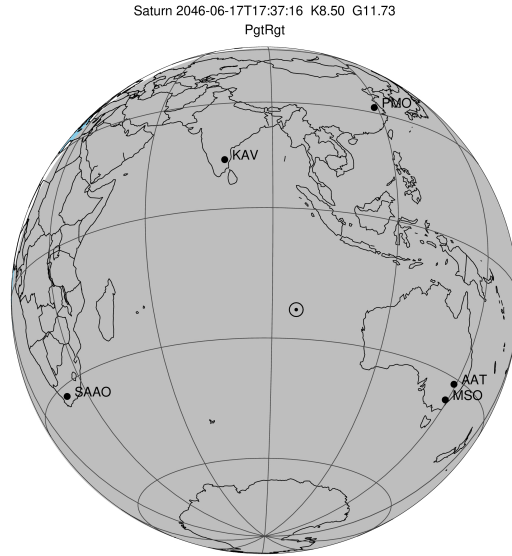
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-17T17:37:16.870  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4115631417595355264  
 2Mass ID (if available) : 17113953-2125255

Saturn 2046-06-17T17:37:16 K8.50 G11.73 PgtRgt

ICRS Star Coord at Epoch: 17h 11m 39.55416s -21:25:25.86012s

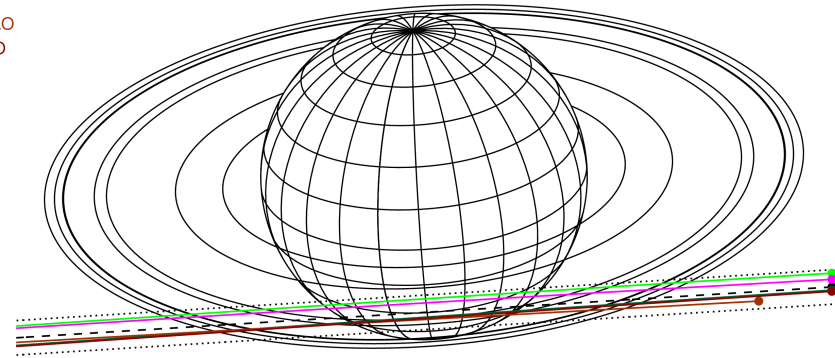
RUWE (>1.4 is poor) : 1.18  
 K magnitude : 8.499  
 G magnitude : 11.728  
 RP magnitude : 10.810  
 BP magnitude : 12.602  
 DUPflag : 0  
 Distance (au) : 9.026  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.93  
 Sun-Target sep (deg) : 172.53  
 Sun-Moon sep (deg) : 6.14  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.40

#	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



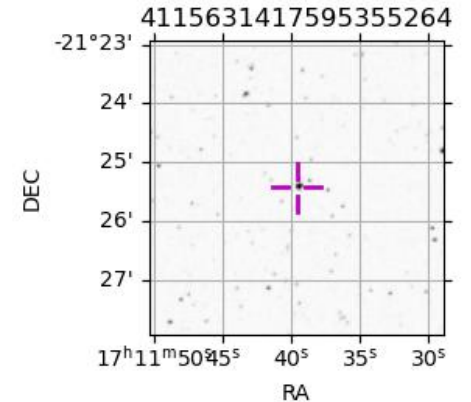
2046-06-17T17:37:16.8700 a: 17 11 39.5542 δ: -21 25 25.860 C/A 7.653° PA 3.56 deg v\_sky -19.93 km/s D 09.03 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PMO  
 KAV  
 AAT  
 SAAO  
 MSO

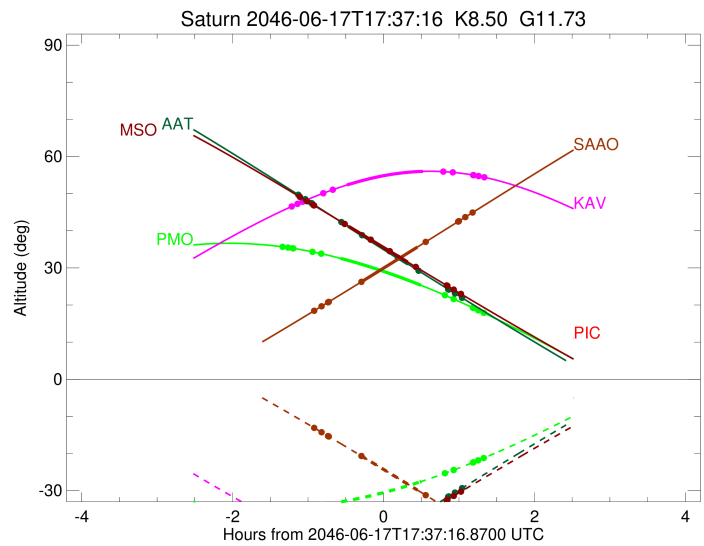
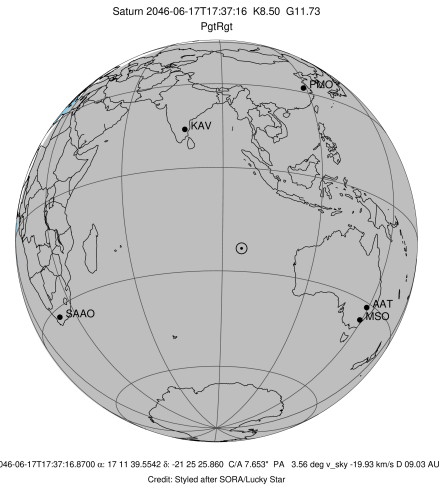


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEncode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (20	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8	+	+	+	JUN 17 16:17 - JUN 17 18:57	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					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observ	12.6	78.8	+	+	+	JUN 17 16:24 - JUN 17 18:57	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	+	+	+	JUN 17 16:29 - JUN 17 18:39	PieRie
SAAO	So. Afr. Astro	-32.4	20.8	+	+	+	JUN 17 16:42 - JUN 17 18:48	PieRie
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JUN 17 16:30 - JUN 17 18:39	PieRie

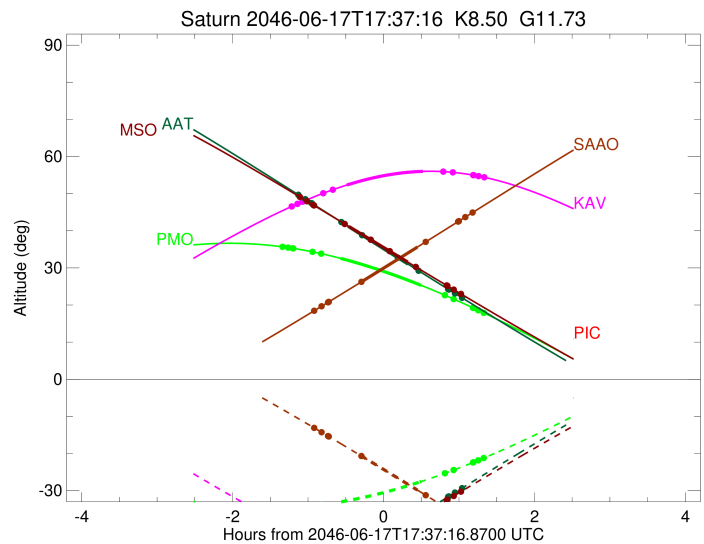
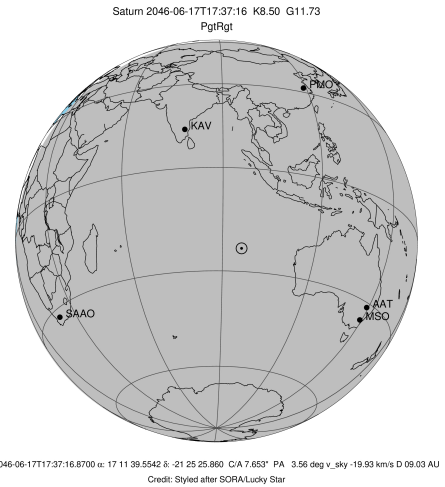


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-17T17:35:08.770  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 4115631417595355264  
 2Mass ID (if available) : 17113953-2125255  
 ICRS Star Coord at Epoch: 17h 11m 39.55416s -21:25:25.86012s  
 RUWE (>1.4 is poor) : 1.18  
 K magnitude : 8.499  
 G magnitude : 11.728  
 RP magnitude : 10.810  
 BP magnitude : 12.602  
 DUPflag : 0  
 Distance (au) : 9.026  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.93  
 Sun-Target sep (deg) : 172.53  
 Sun-Moon sep (deg) : 7.03  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.40  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 6.890  
 C/A sky separation (km) : 45102.3  
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2046-06-17T16:17:02.564		35.68	-34.65	140461.00	-14.17		
A (OER)	I	2046-06-17T16:21:26.601		35.47	-34.59	136774.40	-13.75		
Encke (OEG)	I	2046-06-17T16:25:10.047		35.28	-34.52	133744.89	-13.36		
Encke (IEG)	I	2046-06-17T16:25:34.150		35.26	-34.51	133423.31	-13.32		
A (IER)	I	2046-06-17T16:40:49.871		34.33	-34.08	122050.38	-11.43		
B (OER)	I	2046-06-17T16:47:39.433		33.84	-33.81	117571.16	-10.42		
Saturn	I	2046-06-17T17:03:09.833		32.57	-33.03	59600.49		-43.17	-48.77
Saturn	E	2046-06-17T18:07:12.375		25.30	-27.55	59626.82		-42.10	-47.71
B (OER)	E	2046-06-17T18:26:19.610		22.61	-25.30	117571.16	10.37		
A (IER)	E	2046-06-17T18:33:11.138		21.59	-24.44	122050.38	11.38		
Encke (IEG)	E	2046-06-17T18:48:32.296		19.23	-22.40	133423.31	13.23		
Encke (OEG)	E	2046-06-17T18:48:56.561		19.17	-22.34	133744.89	13.27		
A (OER)	E	2046-06-17T18:52:41.554		18.57	-21.82	136774.40	13.65		
F ring	E	2046-06-17T18:57:07.520		17.86	-21.20	140461.00	14.07		

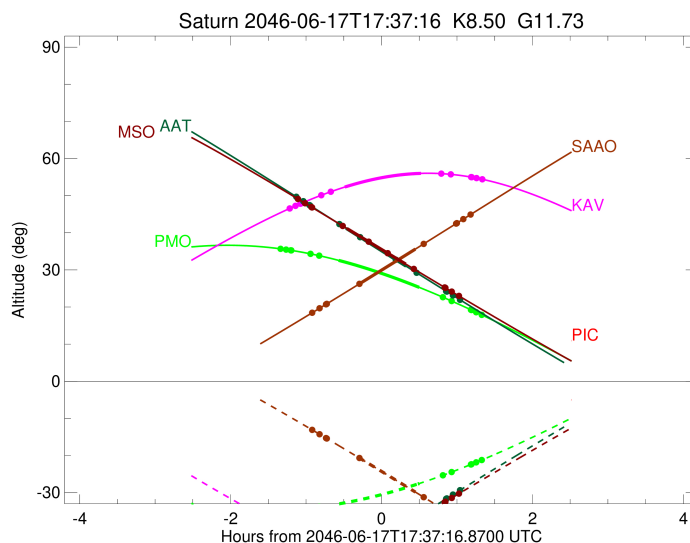
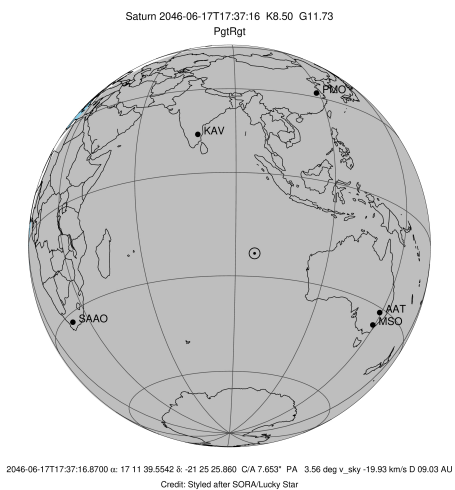
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-17T17:38:21.870  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 4115631417595355264  
 2Mass ID (if available) : 17113953-2125255  
 ICRS Star Coord at Epoch: 17h 11m 39.55416s -21:25:25.86012s  
 RUWE (>1.4 is poor) : 1.18  
 K magnitude : 8.499  
 G magnitude : 11.728  
 RP magnitude : 10.810  
 BP magnitude : 12.602  
 DUPflag : 0  
 Distance (au) : 9.026  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.93  
 Sun-Target sep (deg) : 172.53  
 Sun-Moon sep (deg) : 6.61  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.40  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.122  
 C/A sky separation (km) : 46622.3  
 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	2046-06-17T16:24:18.518		46.56	-40.17	140461.00	-13.66		
A (OER)	I	2046-06-17T16:28:53.064		47.25	-40.94	136774.40	-13.19		
Encke (OEG)	I	2046-06-17T16:32:46.451		47.82	-41.58	133744.89	-12.76		
Encke (IEG)	I	2046-06-17T16:33:11.690		47.88	-41.65	133423.31	-12.72		
A (IER)	I	2046-06-17T16:49:23.944		50.11	-44.21	122050.38	-10.58		
B (OER)	I	2046-06-17T16:56:51.922		51.04	-45.32	117571.16	-9.39		
Saturn	I	2046-06-17T17:08:04.742		52.32	-46.90	59549.91		-45.25	-50.80
Saturn	E	2046-06-17T18:08:41.084		56.00	-52.99	59587.29		-43.72	-49.31
B (OER)	E	2046-06-17T18:25:04.420		55.93	-53.76	117571.16	9.41		
A (IER)	E	2046-06-17T18:32:31.586		55.74	-53.97	122050.38	10.60		
Encke (IEG)	E	2046-06-17T18:48:41.932		54.99	-54.10	133423.31	12.74		
Encke (OEG)	E	2046-06-17T18:49:07.118		54.97	-54.10	133744.89	12.79		
A (OER)	E	2046-06-17T18:53:00.002		54.72	-54.07	136774.40	13.22		
F ring	E	2046-06-17T18:57:33.933		54.40	-54.00	140461.00	13.69		

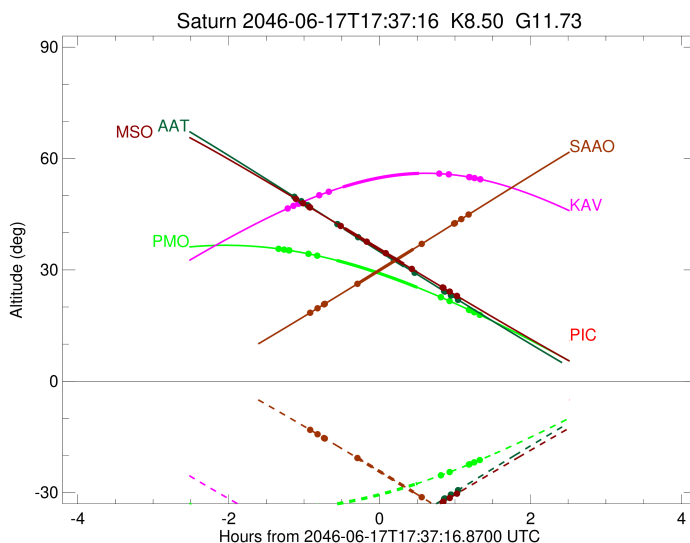
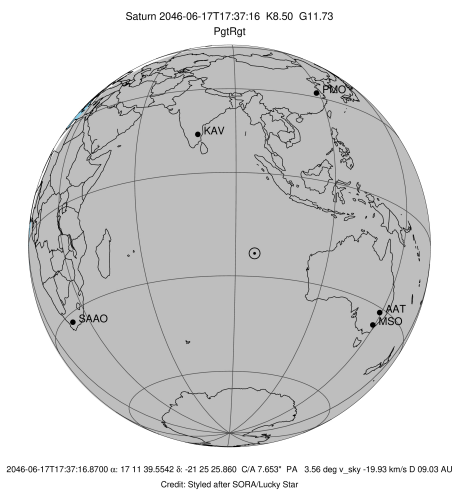
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-17T17:32:59.790  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4115631417595355264  
 2Mass ID (if available) : 17113953-2125255  
 ICRS Star Coord at Epoch: 17h 11m 39.55416s -21:25:25.86012s  
 RUWE (>1.4 is poor) : 1.18  
 K magnitude : 8.499  
 G magnitude : 11.728  
 RP magnitude : 10.810  
 BP magnitude : 12.602  
 DUPflag : 0  
 Distance (au) : 9.026  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.93  
 Sun-Target sep (deg) : 172.53  
 Sun-Moon sep (deg) : 6.37  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.40  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.926  
 C/A sky separation (km) : 51883.8  
 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	2046-06-17T16:29:31.187		49.70	-57.07	140461.00	-11.39		
A (OER)	I	2046-06-17T16:35:04.858		48.51	-55.88	136774.40	-10.69		
Encke (OEG)	I	2046-06-17T16:39:57.105		47.47	-54.84	133744.89	-10.03		
Encke (IEG)	I	2046-06-17T16:40:29.280		47.35	-54.72	133423.31	-9.96		
A (IER)	I	2046-06-17T17:03:45.373		42.36	-49.75	122050.38	-6.17		
B (OER)	I	2046-06-17T17:19:51.882	b	38.90	-46.30	117571.16	-3.04		
Saturn	I	2046-06-17T17:09:06.588		41.21	-48.60	59392.73		-51.77	-57.01
Saturn	E	2046-06-17T17:56:57.328		30.98	-38.39	59409.31		-51.07	-56.35
B (OER)	E	2046-06-17T17:49:15.022	b	32.62	-40.03	117571.17	3.04		
A (IER)	E	2046-06-17T18:05:24.789		29.18	-36.59	122050.38	6.14		
Encke (IEG)	E	2046-06-17T18:28:50.434		24.23	-31.64	133423.31	9.87		
Encke (OEG)	E	2046-06-17T18:29:22.897		24.12	-31.52	133744.89	9.94		
A (OER)	E	2046-06-17T18:34:17.897		23.08	-30.49	136774.40	10.59		
F ring	E	2046-06-17T18:39:55.012		21.91	-29.30	140461.00	11.27		

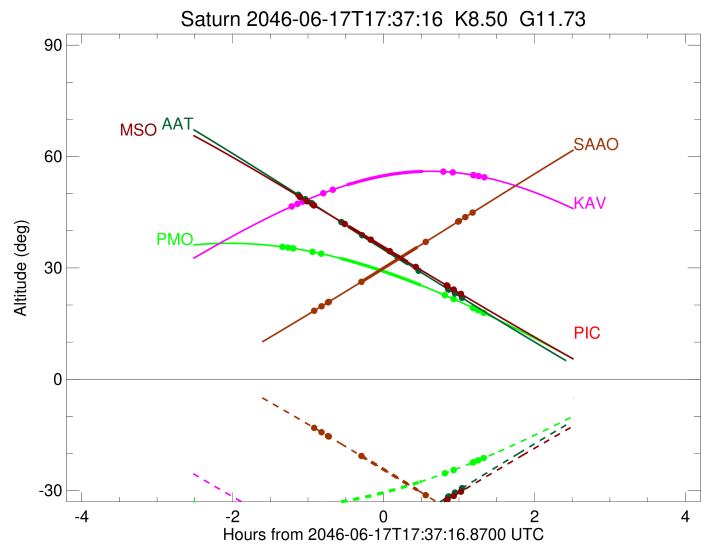
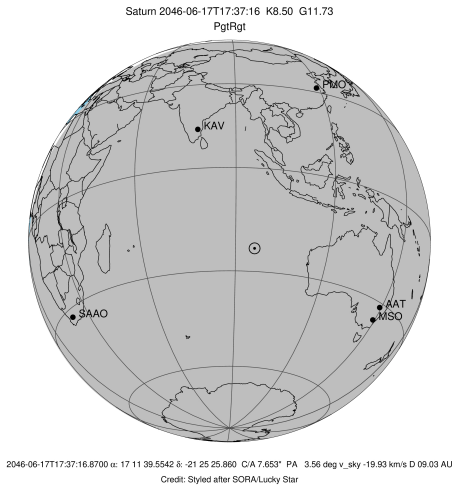
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-17T17:41:35.780  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : SAAO  
 Location : So. Afr. Astro. Obs. (Sutherland)  
 Latitude (deg) : -32.37953  
 E. Longitude (deg) : 20.81070  
 Altitude (km) : 1.768  
 Gaia source ID : 4115631417595355264  
 2Mass ID (if available) : 17113953-2125255  
 ICRS Star Coord at Epoch: 17h 11m 39.55416s -21:25:25.86012s  
 RUWE (>1.4 is poor) : 1.18  
 K magnitude : 8.499  
 G magnitude : 11.728  
 RP magnitude : 10.810  
 BP magnitude : 12.602  
 DUPflag : 0  
 Distance (au) : 9.026  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.93  
 Sun-Target sep (deg) : 172.53  
 Sun-Moon sep (deg) : 5.49  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.40  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.057  
 C/A sky separation (km) : 52741.8  
 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	2046-06-17T16:42:07.831		18.45	-13.09	140461.00	-10.85		
A (OER)	I	2046-06-17T16:47:59.395		19.65	-14.26	136774.40	-10.11		
Encke (OEG)	I	2046-06-17T16:53:09.492		20.72	-15.29	133744.89	-9.42		
Encke (IEG)	I	2046-06-17T16:53:43.787		20.84	-15.41	133423.31	-9.34		
A (IER)	I	2046-06-17T17:19:39.590	b	26.23	-20.66	122050.38	-5.09		
Saturn	I	2046-06-17T17:18:59.531		26.09	-20.52	59352.58		-53.49	-58.60
Saturn	E	2046-06-17T18:04:13.897		35.61	-29.85	59392.10		-51.80	-57.03
A (IER)	E	2046-06-17T18:11:05.478		37.06	-31.28	122050.38	5.12		
Encke (IEG)	E	2046-06-17T18:36:49.903		42.52	-36.67	133423.31	9.42		
Encke (OEG)	E	2046-06-17T18:37:23.884		42.64	-36.79	133744.89	9.50		
A (OER)	E	2046-06-17T18:42:31.003		43.72	-37.86	136774.40	10.22		
F ring	E	2046-06-17T18:48:18.909		44.95	-39.08	140461.00	10.97		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-17T17:33:09.920  
 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 : 4115631417595355264  
 2Mass ID (if available) : 17113953-2125255  
 ICRS Star Coord at Epoch: 17h 11m 39.55416s -21:25:25.86012s  
 RUWE (>1.4 is poor) : 1.18  
 K magnitude : 8.499  
 G magnitude : 11.728  
 RP magnitude : 10.810  
 BP magnitude : 12.602  
 DUPflag : 0  
 Distance (au) : 9.026  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.93  
 Sun-Target sep (deg) : 172.53  
 Sun-Moon sep (deg) : 6.30  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.40  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.987  
 C/A sky separation (km) : 52288.8  
 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	2046-06-17T16:30:48.821		49.12	-56.32	140461.00	-11.19		
A (OER)	I	2046-06-17T16:36:29.145		47.96	-55.18	136774.40	-10.46		
Encke (OEG)	I	2046-06-17T16:41:28.329		46.95	-54.17	133744.89	-9.78		
Encke (IEG)	I	2046-06-17T16:42:01.345		46.83	-54.06	133423.31	-9.70		
A (IER)	I	2046-06-17T17:06:23.896		41.85	-49.11	122050.38	-5.68		
B (OER)	I	2046-06-17T17:26:20.069	b	37.76	-45.04	117571.17	-1.75		
Saturn	I	2046-06-17T17:09:54.054		41.13	-48.39	59379.00		-52.36	-57.55
Saturn	E	2046-06-17T17:56:29.948		31.59	-38.87	59395.76		-51.64	-56.89
B (OER)	E	2046-06-17T17:43:13.369	b	34.30	-41.59	117571.19	1.74		
A (IER)	E	2046-06-17T18:03:12.570		30.22	-37.51	122050.38	5.65		
Encke (IEG)	E	2046-06-17T18:27:44.204		25.23	-32.52	133423.31	9.62		
Encke (OEG)	E	2046-06-17T18:28:17.495		25.12	-32.40	133744.89	9.70		
A (OER)	E	2046-06-17T18:33:19.312		24.11	-31.39	136774.40	10.37		
F ring	E	2046-06-17T18:39:02.932		22.95	-30.23	140461.00	11.08		