

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-05-19T15:24:13.370  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 6052826289893718656  
 2Mass ID (if available) : 16284204-1946174

Saturn 2045-05-19T15:24:13 K9.39 G14.54 PgtRgt

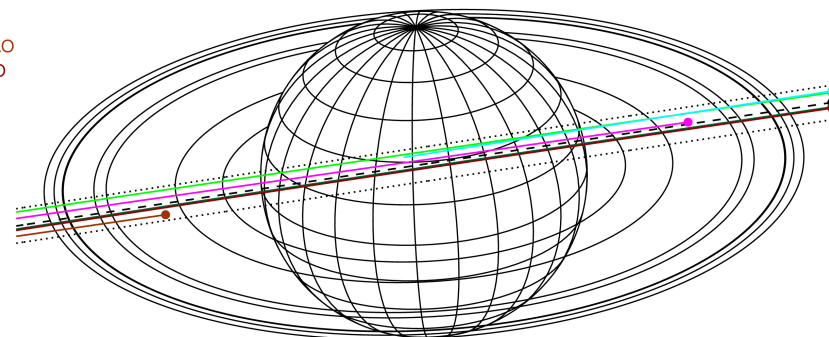
ICRS Star Coord at Epoch: 16h 28m 42.04529s -19:46:17.52180s

RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.395  
 G magnitude : 14.544  
 RP magnitude : 13.281  
 BP magnitude : 16.337  
 DUPflag : 0  
 Distance (au) : 9.002  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.74  
 Sun-Target sep (deg) : 169.67  
 Sun-Moon sep (deg) : 151.31  
 B (ring opening deg) : 25.56  
 PA of pole (deg) : 3.22

Saturn 2045-05-19T15:24:13 K9.39 G14.54  
 PgtRgt



Earth  
 PMO  
 IRTF  
 KAV  
 AAT  
 SAAO  
 MSO

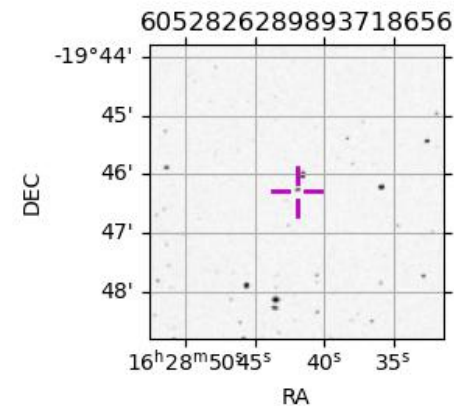


2045-05-19T15:24:13.3700 at: 16 28 42.0453 s: -19 46 17.522 C/A 0.574° PA 188.61 deg v\_sky -19.74 km/s D 09.00 AU  
 Credit: Styled after SORA/Lucky Star

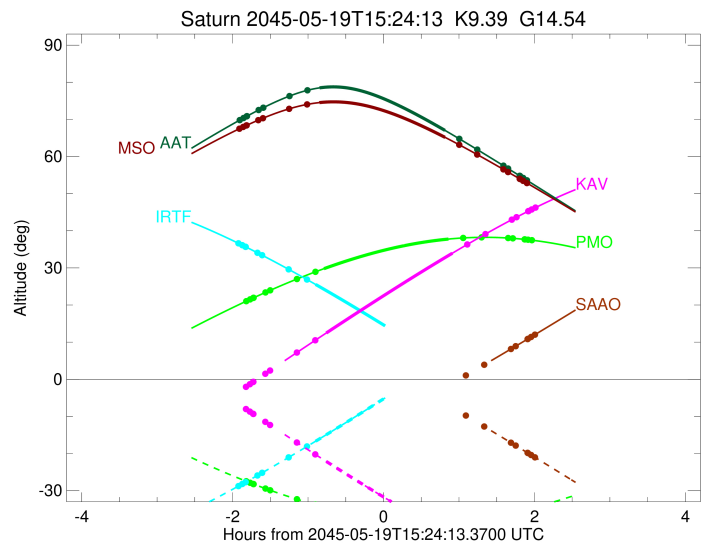
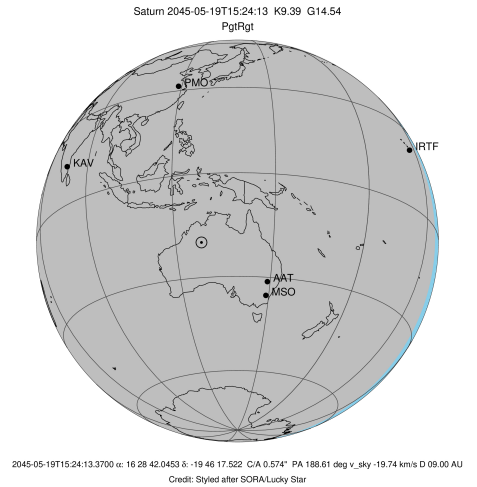
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

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					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8	+	+	+	MAY 19 13:35 - MAY 19 17:22	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	+	+		MAY 19 13:28 - MAY 19 14:30	PinRin
KAV	Kavalur Observ	12.6	78.8		+	+	MAY 19 14:15 - MAY 19 17:25	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	+	+	+	MAY 19 13:29 - MAY 19 17:18	PieRie
SAAO	So. Afr. Astro	-32.4	20.8			+	MAY 19 17:05 - MAY 19 17:24	PnnRne
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	MAY 19 13:29 - MAY 19 17:18	PieRie



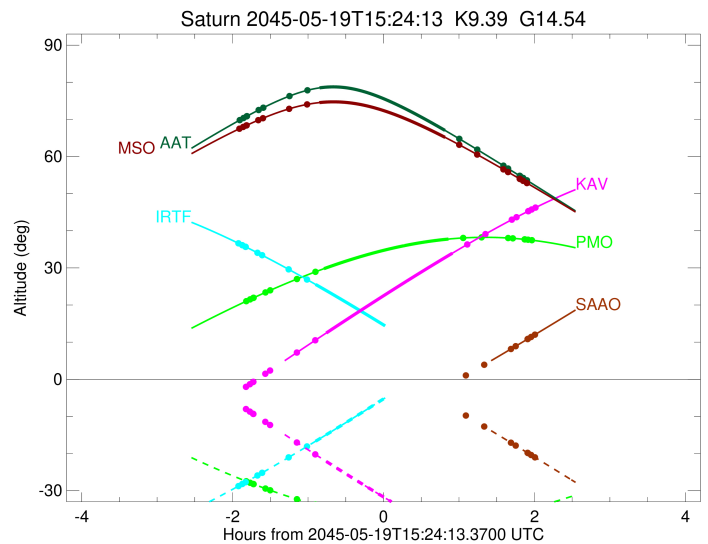
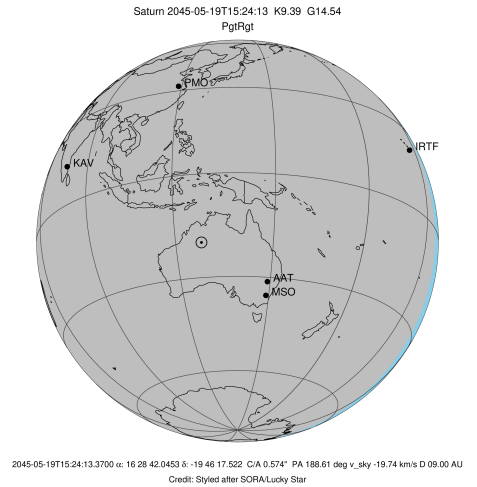
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-05-19T15:26:18.840  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 6052826289893718656  
 2Mass ID (if available) : 16284204-1946174  
 ICRS Star Coord at Epoch: 16h 28m 42.04529s -19:46:17.52180s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.395  
 G magnitude : 14.544  
 RP magnitude : 13.281  
 BP magnitude : 16.337  
 DUPflag : 0  
 Distance (au) : 9.002  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.74  
 Sun-Target sep (deg) : 169.67  
 Sun-Moon sep (deg) : 152.05  
 B (ring opening deg) : 25.56  
 PA of pole (deg) : 3.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.275  
 C/A sky separation (km) : 8325.7  
 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	2045-05-19T13:35:05.088		21.03	-27.47	140461.00	-20.12		
A (OER)	I	2045-05-19T13:38:08.386		21.51	-27.88	136774.40	-20.11		
Encke (OEG)	I	2045-05-19T13:40:39.058		21.90	-28.21	133744.88	-20.10		
Encke (IEG)	I	2045-05-19T13:40:55.054		21.95	-28.24	133423.31	-20.10		
A (IER)	I	2045-05-19T13:50:21.149		23.39	-29.44	122050.38	-20.08		
B (OER)	I	2045-05-19T13:54:04.350		23.95	-29.90	117571.16	-20.06		
B (IER)	I	2045-05-19T14:15:23.783		27.00	-32.31	91984.69	-19.91		
C (IER)	I	2045-05-19T14:30:06.591		28.94	-33.77	74490.58	-19.69		
Saturn	I	2045-05-19T14:36:48.554		29.78	-34.37	60213.09		11.75	14.32
Saturn	E	2045-05-19T16:15:46.586		37.76	-38.04	60265.46		2.51	3.08
C (IER)	E	2045-05-19T16:27:33.444		38.07	-37.77	74490.58	19.79		
B (IER)	E	2045-05-19T16:42:11.291		38.23	-37.23	91984.69	20.04		
B (OER)	E	2045-05-19T17:03:21.784		38.05	-36.05	117571.16	20.22		
A (IER)	E	2045-05-19T17:07:03.212		37.96	-35.80	122050.38	20.24		
Encke (IEG)	E	2045-05-19T17:16:24.528		37.69	-35.10	133423.31	20.28		
Encke (OEG)	E	2045-05-19T17:16:40.383		37.68	-35.08	133744.89	20.28		
A (OER)	E	2045-05-19T17:19:09.712		37.59	-34.88	136774.40	20.29		
F ring	E	2045-05-19T17:22:11.339		37.47	-34.63	140461.00	20.30		

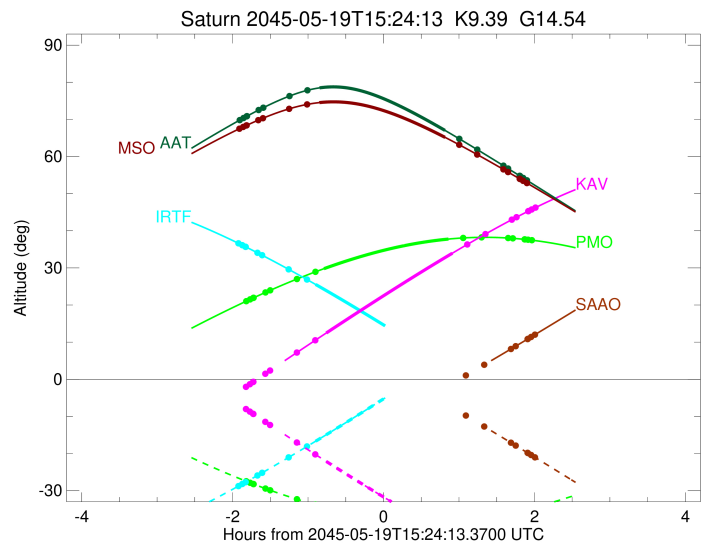
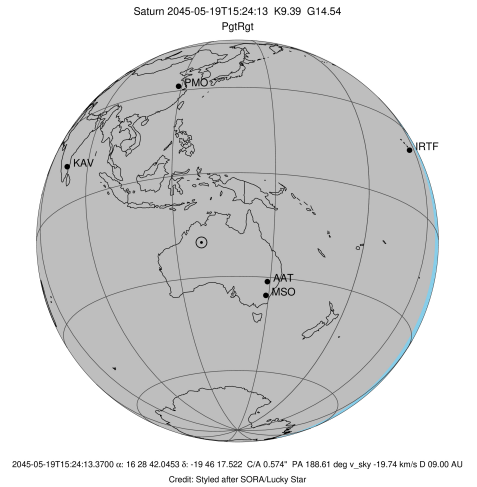
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-05-19T15:20:05.150  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : IRTF  
 Location : Mauna Kea/IRTF  
 Latitude (deg) : 19.82622  
 E. Longitude (deg) : 204.52800  
 Altitude (km) : 4.168  
 Gaia source ID : 6052826289893718656  
 2Mass ID (if available) : 16284204-1946174  
 ICRS Star Coord at Epoch: 16h 28m 42.04529s -19:46:17.52180s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.395  
 G magnitude : 14.544  
 RP magnitude : 13.281  
 BP magnitude : 16.337  
 DUPflag : 0  
 Distance (au) : 9.002  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.74  
 Sun-Target sep (deg) : 169.67  
 Sun-Moon sep (deg) : 150.87  
 B (ring opening deg) : 25.56  
 PA of pole (deg) : 3.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.134  
 C/A sky separation (km) : 7406.2  
 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	2045-05-19T13:28:52.402		36.63	-28.79	140461.00	-20.33		
A (OER)	I	2045-05-19T13:31:53.779		36.13	-28.22	136774.40	-20.32		
Encke (OEG)	I	2045-05-19T13:34:22.900		35.71	-27.75	133744.89	-20.31		
Encke (IEG)	I	2045-05-19T13:34:38.733		35.67	-27.70	133423.31	-20.31		
A (IER)	I	2045-05-19T13:43:59.224		34.07	-25.92	122050.38	-20.27		
B (OER)	I	2045-05-19T13:47:40.299		33.43	-25.21	117571.16	-20.25		
B (IER)	I	2045-05-19T14:08:48.094		29.61	-21.05	91984.69	-20.09		
C (IER)	I	2045-05-19T14:23:22.644		26.87	-18.10	74490.58	-19.89		
Saturn	I	2045-05-19T14:30:14.352		25.55	-16.69	60215.61		11.47	13.99
Saturn	E	2045-05-19T16:10:10.552		4.85x	4.79x	60267.43		1.19	1.46
C (IER)	E	2045-05-19T16:22:10.133		2.24x	7.46x	74490.58	19.73		
B (IER)	E	2045-05-19T16:36:52.585		-0.99x	10.75x	91984.69	19.89		
B (OER)	E	2045-05-19T16:58:14.933		-5.74x	15.56x	117571.16	19.99		
A (IER)	E	2045-05-19T17:01:58.910		-6.57x	16.41x	122050.38	20.00		
Encke (IEG)	E	2045-05-19T17:11:27.230		-8.69x	18.56x	133423.31	20.02		
Encke (OEG)	E	2045-05-19T17:11:43.294		-8.75x	18.62x	133744.89	20.02		
A (OER)	E	2045-05-19T17:14:14.616		-9.32x	19.19x	136774.40	20.02		
F ring	E	2045-05-19T17:17:18.732		-10.01x	19.89x	140461.00	20.02		

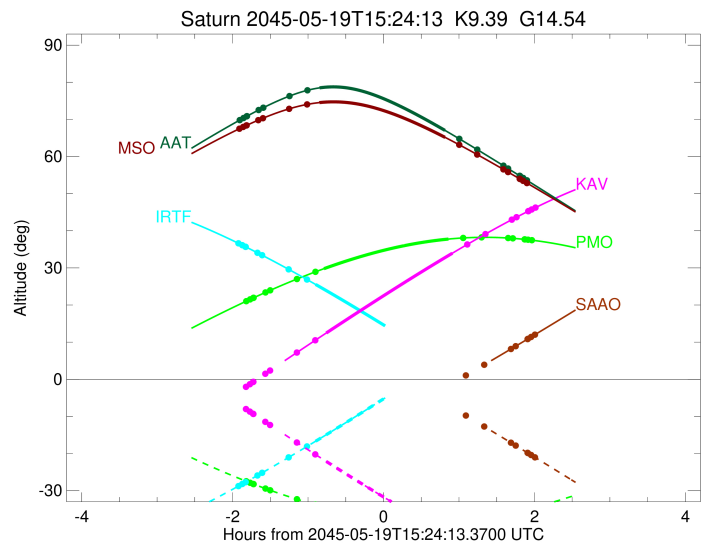
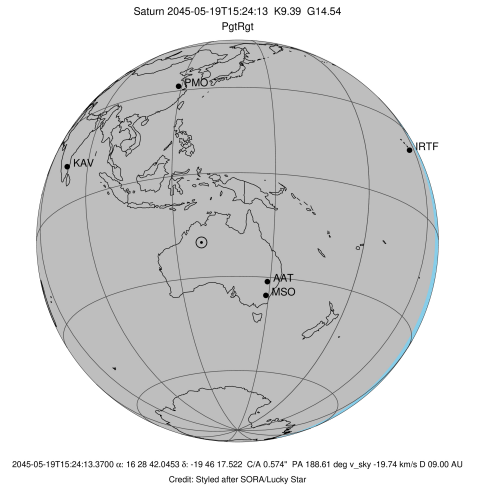
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-05-19T15:28:56.380  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 6052826289893718656  
 2Mass ID (if available) : 16284204-1946174  
 ICRS Star Coord at Epoch: 16h 28m 42.04529s -19:46:17.52180s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.395  
 G magnitude : 14.544  
 RP magnitude : 13.281  
 BP magnitude : 16.337  
 DUPflag : 0  
 Distance (au) : 9.002  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.74  
 Sun-Target sep (deg) : 169.67  
 Sun-Moon sep (deg) : 152.30  
 B (ring opening deg) : 25.56  
 PA of pole (deg) : 3.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.816  
 C/A sky separation (km) : 5330.2  
 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\_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	2045-05-19T13:34:52.545	-2.05x	-8.02	140461.00	-19.97			
A (OER)	I	2045-05-19T13:37:57.153	-1.34x	-8.71	136774.40	-19.97			
Encke (OEG)	I	2045-05-19T13:40:28.846	-0.76x	-9.28	133744.89	-19.97			
Encke (IEG)	I	2045-05-19T13:40:44.948	-0.70x	-9.34	133423.31	-19.97			
A (IER)	I	2045-05-19T13:50:14.361	1.48x	-11.47	122050.38	-19.97			
B (OER)	I	2045-05-19T13:53:58.623	2.34x	-12.30	117571.16	-19.97			
B (IER)	I	2045-05-19T14:15:20.366	7.20	-17.04	91984.69	-19.94			
C (IER)	I	2045-05-19T14:29:58.864	10.50	-20.24	74490.58	-19.87			
Saturn	I	2045-05-19T14:38:41.918	12.46	-22.13	60235.44			9.02	11.03
Saturn	E	2045-05-19T16:18:58.977	33.96	-42.29	60267.99			0.12	0.14
C (IER)	E	2045-05-19T16:30:47.708	36.31	-44.38	74490.58	20.09			
B (IER)	E	2045-05-19T16:45:15.606	39.11	-46.80	91984.69	20.21			
B (OER)	E	2045-05-19T17:06:18.061	43.00	-50.03	117571.16	20.31			
A (IER)	E	2045-05-19T17:09:58.490	43.66	-50.55	122050.38	20.33			
Encke (IEG)	E	2045-05-19T17:19:17.570	45.27	-51.80	133423.31	20.36			
Encke (OEG)	E	2045-05-19T17:19:33.367	45.32	-51.84	133744.89	20.36			
A (OER)	E	2045-05-19T17:22:02.157	45.74	-52.16	136774.40	20.36			
F ring	E	2045-05-19T17:25:03.152	46.24	-52.53	140461.00	20.37			

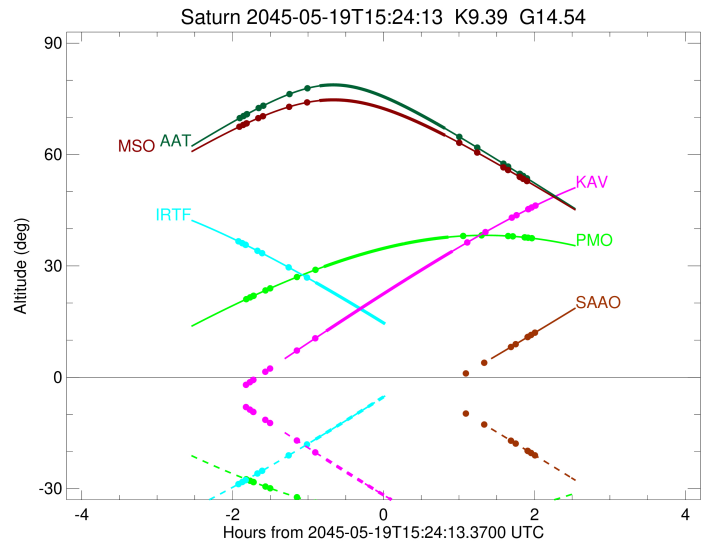
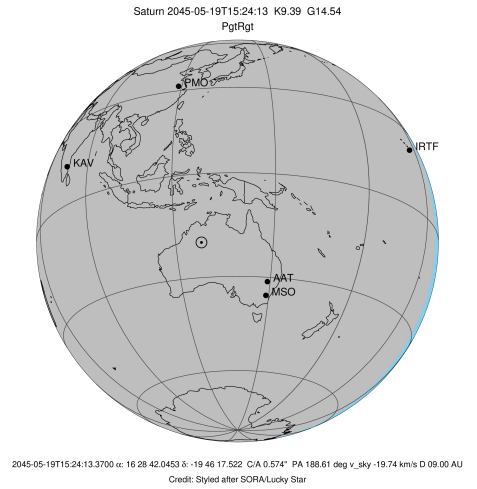
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-05-19T15:23:17.350  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 6052826289893718656  
 2Mass ID (if available) : 16284204-1946174  
 ICRS Star Coord at Epoch: 16h 28m 42.04529s -19:46:17.52180s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.395  
 G magnitude : 14.544  
 RP magnitude : 13.281  
 BP magnitude : 16.337  
 DUPflag : 0  
 Distance (au) : 9.002  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.74  
 Sun-Target sep (deg) : 169.67  
 Sun-Moon sep (deg) : 151.59  
 B (ring opening deg) : 25.56  
 PA of pole (deg) : 3.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.402  
 C/A sky separation (km) : 2624.5  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_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	2045-05-19T13:29:55.222		69.81	-76.91	140461.00	-20.42		
A (OER)	I	2045-05-19T13:32:55.755		70.37	-77.25	136774.40	-20.42		
Encke (OEG)	I	2045-05-19T13:35:24.101		70.83	-77.51	133744.89	-20.42		
Encke (IEG)	I	2045-05-19T13:35:39.847		70.87	-77.54	133423.31	-20.42		
A (IER)	I	2045-05-19T13:44:56.684		72.52	-78.31	122050.38	-20.43		
B (OER)	I	2045-05-19T13:48:35.976		73.15	-78.53	117571.16	-20.43		
B (IER)	I	2045-05-19T14:09:28.677		76.29	-78.64	91984.69	-20.42		
C (IER)	I	2045-05-19T14:23:45.661		77.85	-77.64	74490.58	-20.40		
Saturn	I	2045-05-19T14:33:27.073		78.50	-76.56	60248.31		7.00	8.58
Saturn	E	2045-05-19T16:13:09.561		67.03	-58.15	60265.32		-2.58	-3.17
C (IER)	E	2045-05-19T16:24:29.330		64.78	-55.78	74490.58	20.41		
B (IER)	E	2045-05-19T16:38:45.834		61.87	-52.76	91984.69	20.43		
B (OER)	E	2045-05-19T16:59:37.686		57.53	-48.32	117571.16	20.44		
A (IER)	E	2045-05-19T17:03:16.810		56.76	-47.54	122050.38	20.44		
Encke (IEG)	E	2045-05-19T17:12:33.194		54.80	-45.56	133423.31	20.44		
Encke (OEG)	E	2045-05-19T17:12:48.927		54.75	-45.50	133744.89	20.44		
A (OER)	E	2045-05-19T17:15:17.145		54.23	-44.98	136774.40	20.44		
F ring	E	2045-05-19T17:18:17.519		53.59	-44.33	140461.00	20.44		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-05-19T15:27:43.940  
 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 : 6052826289893718656  
 2Mass ID (if available) : 16284204-1946174  
 ICRS Star Coord at Epoch: 16h 28m 42.04529s -19:46:17.52180s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.395  
 G magnitude : 14.544  
 RP magnitude : 13.281  
 BP magnitude : 16.337  
 DUPflag : 0  
 Distance (au) : 9.002  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.74  
 Sun-Target sep (deg) : 169.67  
 Sun-Moon sep (deg) : 151.63  
 B (ring opening deg) : 25.56  
 PA of pole (deg) : 3.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.145  
 C/A sky separation (km) : 946.2  
 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\_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

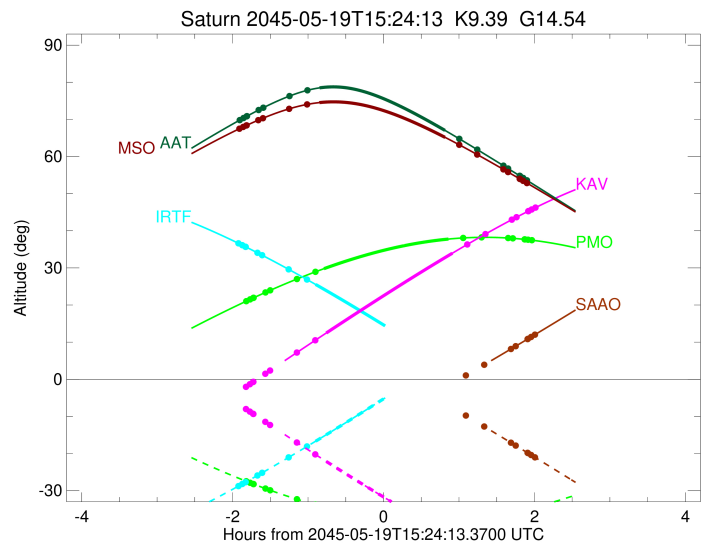
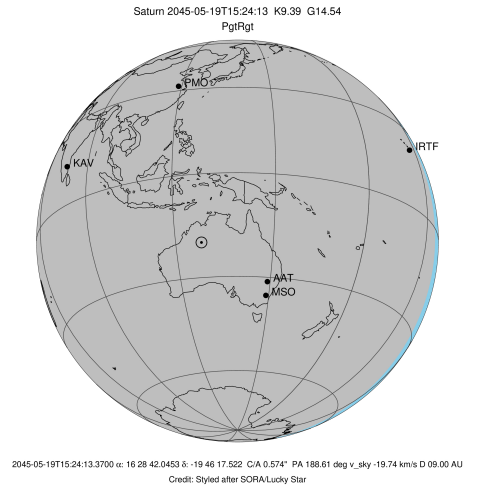


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2045-05-19T13:29:16.736	-29.12x	22.98x	140461.00	-19.75			
A (OER)	I	2045-05-19T13:32:23.400	-28.73x	22.51x	136774.40	-19.75			
Encke (OEG)	I	2045-05-19T13:34:56.780	-28.41x	22.12x	133744.89	-19.75			
Encke (IEG)	I	2045-05-19T13:35:13.060	-28.37x	22.08x	133423.31	-19.75			
A (IER)	I	2045-05-19T13:44:48.738	-27.11x	20.58x	122050.38	-19.76			
B (OER)	I	2045-05-19T13:48:35.417	-26.60x	19.98x	117571.16	-19.76			
B (IER)	I	2045-05-19T14:10:09.698	-23.52x	16.45x	91984.69	-19.78			
C (IER)	I	2045-05-19T14:24:54.092	-21.27x	13.93x	74490.58	-19.79			
Saturn	I	2045-05-19T14:36:14.619	-19.47x	11.93x	60261.99			3.86	4.74
Saturn	E	2045-05-19T16:19:00.571	-1.04x	-7.62	60256.19			-5.42	-6.64
C (IER)	E	2045-05-19T16:29:41.449	1.03x	-9.77	74490.58	19.95			
B (IER)	E	2045-05-19T16:44:17.505	3.91x	-12.73	91984.69	19.98			
B (OER)	E	2045-05-19T17:05:36.579	8.16	-17.10	117571.16	20.02			
A (IER)	E	2045-05-19T17:09:20.237	8.91	-17.87	122050.38	20.03			
Encke (IEG)	E	2045-05-19T17:18:47.777	10.83	-19.82	133423.31	20.05			
Encke (OEG)	E	2045-05-19T17:19:03.817	10.88	-19.88	133744.89	20.05			
A (OER)	E	2045-05-19T17:21:34.913	11.40	-20.40	136774.40	20.05			
F ring	E	2045-05-19T17:24:38.735	12.02	-21.04	140461.00	20.06			



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-05-19T15:23:16.560  
 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 : 6052826289893718656  
 2Mass ID (if available) : 16284204-1946174  
 ICRS Star Coord at Epoch: 16h 28m 42.04529s -19:46:17.52180s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.395  
 G magnitude : 14.544  
 RP magnitude : 13.281  
 BP magnitude : 16.337  
 DUPflag : 0  
 Distance (au) : 9.002  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.74  
 Sun-Target sep (deg) : 169.67  
 Sun-Moon sep (deg) : 151.57  
 B (ring opening deg) : 25.56  
 PA of pole (deg) : 3.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.335  
 C/A sky separation (km) : 2187.8  
 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\_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	2045-05-19T13:29:38.775		67.49	-73.35	140461.00	-20.41		
A (OER)	I	2045-05-19T13:32:39.390		67.97	-73.61	136774.40	-20.41		
Encke (OEG)	I	2045-05-19T13:35:07.802		68.36	-73.80	133744.89	-20.41		
Encke (IEG)	I	2045-05-19T13:35:23.555		68.40	-73.82	133423.31	-20.41		
A (IER)	I	2045-05-19T13:44:40.623		69.80	-74.40	122050.38	-20.42		
B (OER)	I	2045-05-19T13:48:19.998		70.32	-74.56	117571.16	-20.42		
B (IER)	I	2045-05-19T14:09:13.033		72.85	-74.68	91984.69	-20.42		
C (IER)	I	2045-05-19T14:23:30.009		74.04	-73.97	74490.58	-20.41		
Saturn	I	2045-05-19T14:33:22.699		74.53	-73.16	60250.33		6.63	8.13
Saturn	E	2045-05-19T16:13:12.147		65.16	-57.11	60264.48		-2.95	-3.63
C (IER)	E	2045-05-19T16:24:26.696		63.17	-54.91	74490.58	20.42		
B (IER)	E	2045-05-19T16:38:43.183		60.53	-52.09	91984.69	20.43		
B (OER)	E	2045-05-19T16:59:35.350		56.53	-47.90	117571.16	20.43		
A (IER)	E	2045-05-19T17:03:14.552		55.82	-47.16	122050.38	20.43		
Encke (IEG)	E	2045-05-19T17:12:31.155		53.99	-45.29	133423.31	20.43		
Encke (OEG)	E	2045-05-19T17:12:46.895		53.94	-45.23	133744.89	20.43		
A (OER)	E	2045-05-19T17:15:15.176		53.45	-44.73	136774.40	20.43		
F ring	E	2045-05-19T17:18:15.627		52.85	-44.12	140461.00	20.43		