

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-06-30T16:21:35.150
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 4069543605322220800
 2Mass ID (if available) : 18001627-2222366

Saturn 2047-06-30T16:21:35 K9.33 G14.76 PgtRgt

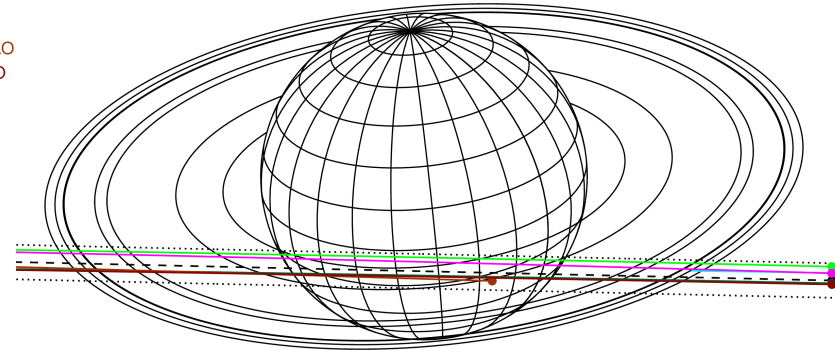
ICRS Star Coord at Epoch: 18h 00m 16.28974s -22:22:36.63136s

RUWE (>1.4 is poor) : 1.08
 K magnitude : 9.329
 G magnitude : 14.762
 RP magnitude : 13.609
 BP magnitude : 16.143
 DUPflag : 0
 Distance (au) : 9.039
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.88
 Sun-Target sep (deg) : 171.82
 Sun-Moon sep (deg) : 82.71
 B (ring opening deg) : 26.51
 PA of pole (deg) : 5.52

Saturn 2047-06-30T16:21:35 K9.33 G14.76
 PgtRgt



Earth
 PMO
 IRTF
 KAV
 AAT
 SAAO
 MSO

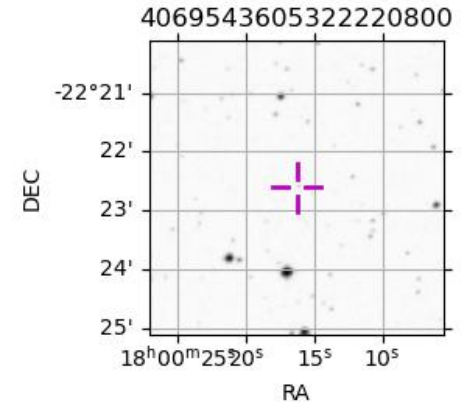


2047-06-30T16:21:35.1500 at: 18 00 16.28974 s: -22 22 36.631 C/A 5.339° PA 358.71 deg v_sky -19.88 km/s D 09.04 AU
 Credit: Styled after SORA/Lucky Star

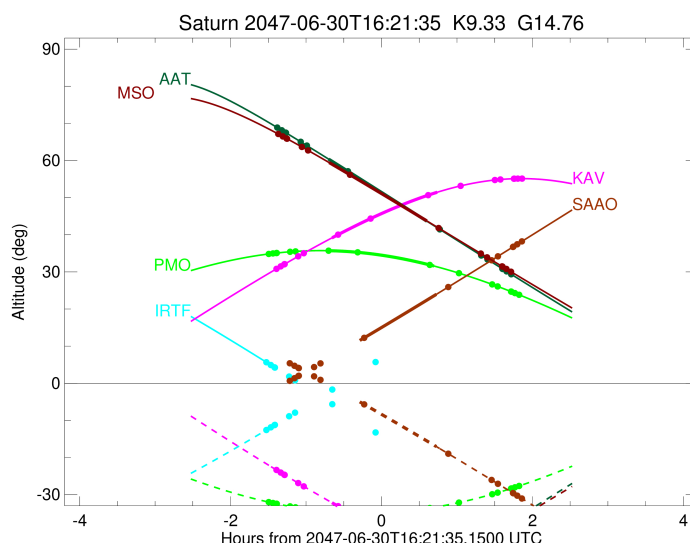
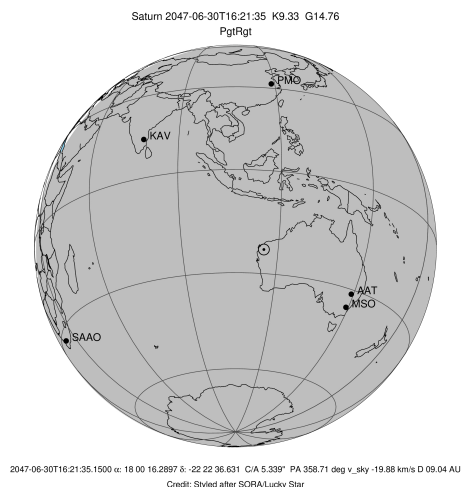
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

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	+	+	+	JUN 30 14:51 - JUN 30 18:11	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	+			JUN 30 14:50 - JUN 30 14:50	PnnRin
KAV	Kavalur Observ	12.6	78.8	+	+	+	JUN 30 14:58 - JUN 30 18:13	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 30 14:58 - JUN 30 18:04	PieRie
SAAO	So. Afr. Astro	-32.4	20.8		+	+	JUN 30 17:05 - JUN 30 18:13	PneRne
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JUN 30 14:59 - JUN 30 18:04	PieRie



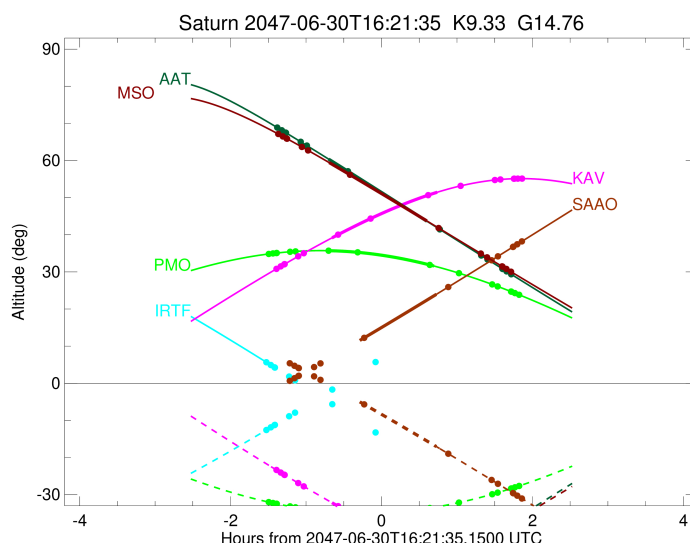
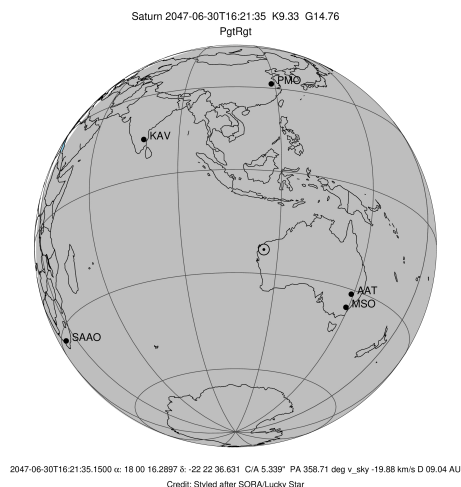
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-06-30T16:20:29.070
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 4069543605322220800
 2Mass ID (if available) : 18001627-2222366
 ICRS Star Coord at Epoch: 18h 00m 16.28974s -22:22:36.63136s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 9.329
 G magnitude : 14.762
 RP magnitude : 13.609
 BP magnitude : 16.143
 DUPflag : 0
 Distance (au) : 9.039
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.88
 Sun-Target sep (deg) : 171.82
 Sun-Moon sep (deg) : 83.30
 B (ring opening deg) : 26.51
 PA of pole (deg) : 5.52
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 4.561
 C/A sky separation (km) : 29899.5
 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_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

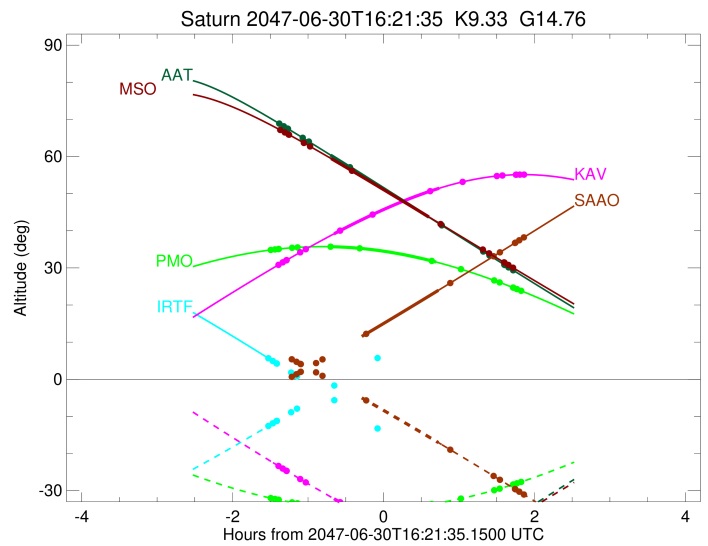
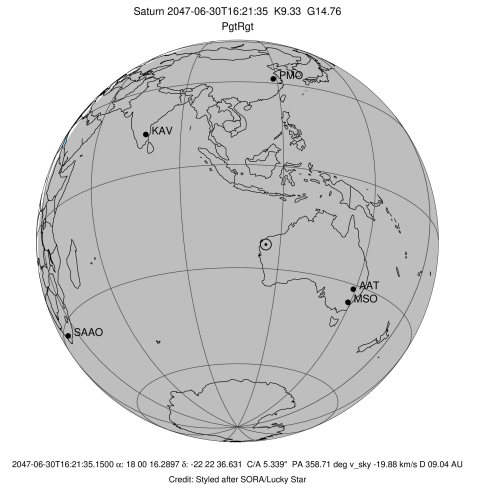
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-30T14:51:58.341		34.84	-32.01	140461.00	-18.48		
A (OER)	I	2047-06-30T14:55:18.543		34.97	-32.26	136774.40	-18.34		
Encke (OEG)	I	2047-06-30T14:58:04.259		35.08	-32.45	133744.89	-18.22		
Encke (IEG)	I	2047-06-30T14:58:21.917		35.09	-32.47	133423.31	-18.20		
A (IER)	I	2047-06-30T15:08:56.163		35.42	-33.16	122050.38	-17.63		
B (OER)	I	2047-06-30T15:13:12.175		35.52	-33.41	117571.16	-17.35		
B (IER)	I	2047-06-30T15:39:33.796	b	35.71	-34.54	91984.69	-14.67		
C (IER)	I	2047-06-30T16:02:47.026	b	35.27	-34.95	74490.58	-9.95		
Saturn	I	2047-06-30T15:37:51.564		35.72	-34.48	59858.76		-32.31	-37.67
Saturn	E	2047-06-30T17:03:21.973		31.58	-33.42	60088.72		-20.66	-24.79
C (IER)	E	2047-06-30T16:59:59.566	b	31.88	-33.61	74490.58	9.99		
B (IER)	E	2047-06-30T17:23:12.362		29.66	-32.14	91984.69	14.64		
B (OER)	E	2047-06-30T17:49:40.746		26.62	-29.88	117571.16	17.26		
A (IER)	E	2047-06-30T17:53:58.273		26.09	-29.46	122050.38	17.53		
Encke (IEG)	E	2047-06-30T18:04:36.690		24.70	-28.36	133423.31	18.08		
Encke (OEG)	E	2047-06-30T18:04:54.472		24.66	-28.33	133744.89	18.09		
A (OER)	E	2047-06-30T18:07:41.375		24.29	-28.03	136774.40	18.21		
F ring	E	2047-06-30T18:11:03.062		23.83	-27.65	140461.00	18.35		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-06-30T16:16:18.680
 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 : 4069543605322220800
 2Mass ID (if available) : 18001627-2222366
 ICRS Star Coord at Epoch: 18h 00m 16.28974s -22:22:36.63136s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 9.329
 G magnitude : 14.762
 RP magnitude : 13.609
 BP magnitude : 16.143
 DUPflag : 0
 Distance (au) : 9.039
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.88
 Sun-Target sep (deg) : 171.82
 Sun-Moon sep (deg) : 82.59
 B (ring opening deg) : 26.51
 PA of pole (deg) : 5.52
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 5.100
 C/A sky separation (km) : 33432.7
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-30T14:50:05.297		5.66	-12.58	140461.00	-17.48		
A (OER)	I	2047-06-30T14:53:37.369		4.91x	-11.87	136774.40	-17.29		
Encke (OEG)	I	2047-06-30T14:56:33.424		4.28x	-11.27	133744.89	-17.12		
Encke (IEG)	I	2047-06-30T14:56:52.213		4.22x	-11.20	133423.31	-17.11		
A (IER)	I	2047-06-30T15:08:11.445		1.80x	-8.88	122050.38	-16.35		
B (OER)	I	2047-06-30T15:12:48.493		0.80x	-7.92	117571.16	-15.98		
B (IER)	I	2047-06-30T15:42:30.486	b	-5.65x	-1.68x	91984.69	-12.30		
C (IER)	I	2047-06-30T16:17:13.469	b	-13.33x	5.79x	74490.58	-3.64		
Saturn	I	2047-06-30T15:34:43.181		-3.95x	-3.33x	59788.80		-35.38	-40.89
Saturn	E	2047-06-30T16:58:18.812		-22.55x	14.81x	60021.84		-24.44	-29.08
C (IER)	E	2047-06-30T16:39:20.671	b	-18.28x	10.62x	74490.58	3.65		
B (IER)	E	2047-06-30T17:14:04.453		-26.12x	18.31x	91984.69	12.22		
B (OER)	E	2047-06-30T17:44:05.934		-32.96x	25.04x	117571.17	15.75		
A (IER)	E	2047-06-30T17:48:47.166		-34.03x	26.09x	122050.38	16.10		
Encke (IEG)	E	2047-06-30T18:00:17.800		-36.67x	28.69x	133423.31	16.80		
Encke (OEG)	E	2047-06-30T18:00:36.927		-36.74x	28.76x	133744.89	16.82		
A (OER)	E	2047-06-30T18:03:36.206		-37.43x	29.44x	136774.40	16.97		
F ring	E	2047-06-30T18:07:12.298		-38.25x	30.25x	140461.00	17.14		

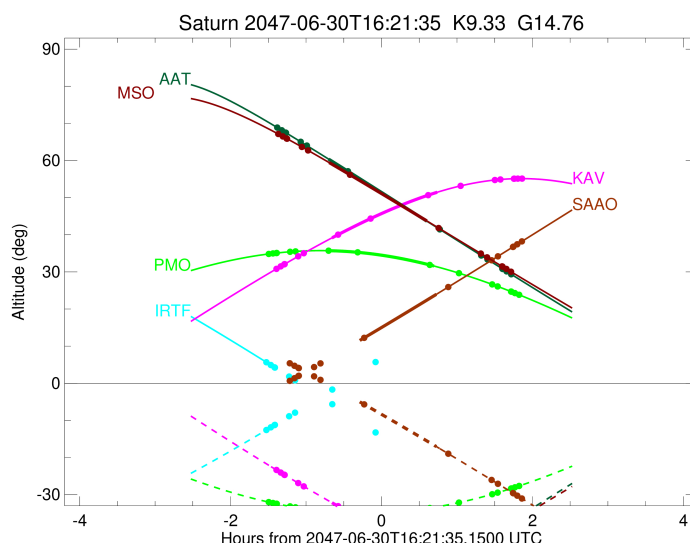
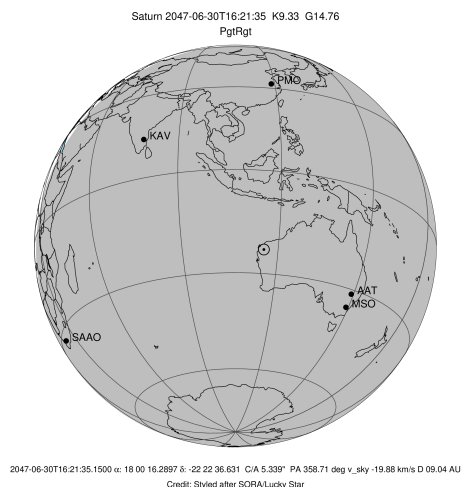
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-06-30T16:23:59.210
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 4069543605322220800
 2Mass ID (if available) : 18001627-2222366
 ICRS Star Coord at Epoch: 18h 00m 16.28974s -22:22:36.63136s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 9.329
 G magnitude : 14.762
 RP magnitude : 13.609
 BP magnitude : 16.143
 DUPflag : 0
 Distance (au) : 9.039
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.88
 Sun-Target sep (deg) : 171.82
 Sun-Moon sep (deg) : 83.37
 B (ring opening deg) : 26.51
 PA of pole (deg) : 5.52
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 4.811
 C/A sky separation (km) : 31535.7
 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	2047-06-30T14:58:06.333		30.82	-23.36	140461.00	-18.17		
A (OER)	I	2047-06-30T15:01:30.029		31.49	-24.06	136774.40	-18.02		
Encke (OEG)	I	2047-06-30T15:04:18.777		32.05	-24.64	133744.89	-17.88		
Encke (IEG)	I	2047-06-30T15:04:36.767		32.11	-24.70	133423.31	-17.87		
A (IER)	I	2047-06-30T15:15:24.181		34.20	-26.89	122050.38	-17.24		
B (OER)	I	2047-06-30T15:19:46.373		35.03	-27.77	117571.16	-16.93		
B (IER)	I	2047-06-30T15:47:08.192	b	40.04	-33.12	91984.69	-13.86		
C (IER)	I	2047-06-30T16:13:06.078	b	44.39	-37.92	74490.58	-7.99		
Saturn	I	2047-06-30T15:42:11.737		39.17	-32.18	59817.35		-34.14	-39.60
Saturn	E	2047-06-30T17:05:56.720		51.46	-46.44	60066.04		-22.00	-26.32
C (IER)	E	2047-06-30T16:58:44.357	b	50.68	-45.40	74490.58	8.06		
B (IER)	E	2047-06-30T17:24:32.708		53.18	-48.89	91984.69	13.92		
B (OER)	E	2047-06-30T17:51:48.173		54.76	-51.78	117571.16	16.99		
A (IER)	E	2047-06-30T17:56:09.328		54.90	-52.15	122050.38	17.31		
Encke (IEG)	E	2047-06-30T18:06:54.052		55.10	-52.96	133423.31	17.95		
Encke (OEG)	E	2047-06-30T18:07:11.964		55.11	-52.98	133744.89	17.96		
A (OER)	E	2047-06-30T18:09:59.974		55.13	-53.16	136774.40	18.10		
F ring	E	2047-06-30T18:13:22.757		55.13	-53.36	140461.00	18.26		

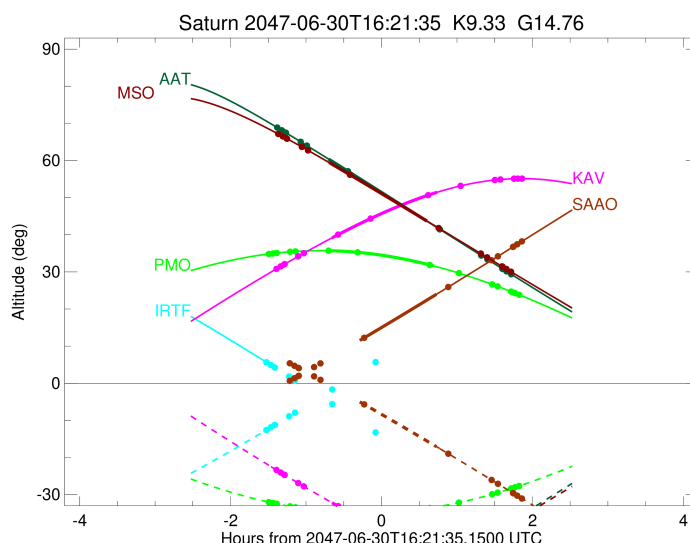
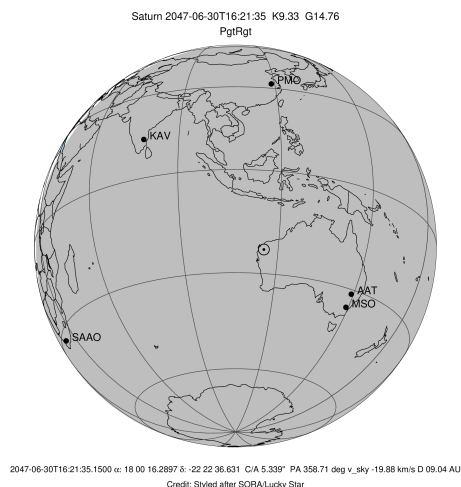
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-06-30T16:18:25.170
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : AAT
 Location : Siding Spring (AAT)
 Latitude (deg) : -31.27703
 E. Longitude (deg) : 149.06608
 Altitude (km) : 1.164
 Gaia source ID : 4069543605322220800
 2Mass ID (if available) : 18001627-2222366
 ICRS Star Coord at Epoch: 18h 00m 16.28974s -22:22:36.63136s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 9.329
 G magnitude : 14.762
 RP magnitude : 13.609
 BP magnitude : 16.143
 DUPflag : 0
 Distance (au) : 9.039
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.88
 Sun-Target sep (deg) : 171.82
 Sun-Moon sep (deg) : 83.54
 B (ring opening deg) : 26.51
 PA of pole (deg) : 5.52
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 5.581
 C/A sky separation (km) : 36586.8
 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

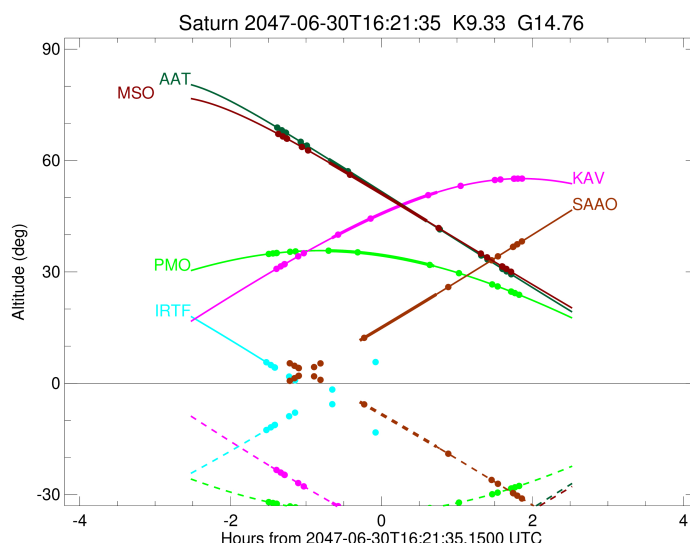
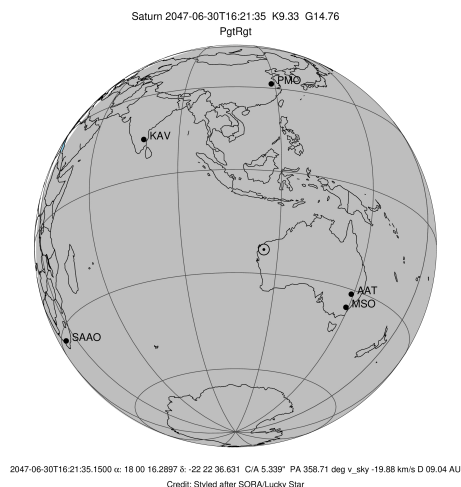
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-06-30T14:58:44.067		68.88	-76.10	140461.00	-17.11		
A (OER)	I	2047-06-30T15:02:20.960		68.14	-75.43	136774.40	-16.88		
Encke (OEG)	I	2047-06-30T15:05:21.512		67.53	-74.87	133744.89	-16.68		
Encke (IEG)	I	2047-06-30T15:05:40.810		67.46	-74.81	133423.31	-16.65		
A (IER)	I	2047-06-30T15:17:22.968		65.04	-72.55	122050.38	-15.70		
B (OER)	I	2047-06-30T15:22:12.552		64.03	-71.59	117571.16	-15.23		
B (IER)	I	2047-06-30T15:54:59.047	b	57.10	-64.86	91984.69	-10.19		
Saturn	I	2047-06-30T15:39:29.243		60.39	-68.08	59710.62		-38.68	-44.29
Saturn	E	2047-06-30T16:57:42.336		43.65	-51.53	59960.13		-27.59	-32.57
B (IER)	E	2047-06-30T17:08:00.664		41.44	-49.32	91984.69	10.17		
B (OER)	E	2047-06-30T17:40:59.352		34.40	-42.27	117571.16	15.08		
A (IER)	E	2047-06-30T17:45:51.942		33.36	-41.23	122050.38	15.53		
Encke (IEG)	E	2047-06-30T17:57:42.413		30.84	-38.70	133423.31	16.44		
Encke (OEG)	E	2047-06-30T17:58:01.959		30.77	-38.63	133744.89	16.46		
A (OER)	E	2047-06-30T18:01:04.881		30.13	-37.99	136774.40	16.66		
F ring	E	2047-06-30T18:04:44.736		29.35	-37.21	140461.00	16.88		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-06-30T16:26:23.450
 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 : 4069543605322220800
 2Mass ID (if available) : 18001627-2222366
 ICRS Star Coord at Epoch: 18h 00m 16.28974s -22:22:36.63136s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 9.329
 G magnitude : 14.762
 RP magnitude : 13.609
 BP magnitude : 16.143
 DUPflag : 0
 Distance (au) : 9.039
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.88
 Sun-Target sep (deg) : 171.82
 Sun-Moon sep (deg) : 82.86
 B (ring opening deg) : 26.51
 PA of pole (deg) : 5.52
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 5.766
 C/A sky separation (km) : 37798.5
 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_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	2047-06-30T15:08:40.951		0.65x	5.38x	140461.00	-16.55		
A (OER)	I	2047-06-30T15:12:25.289		1.37x	4.71x	136774.40	-16.32		
Encke (OEG)	I	2047-06-30T15:15:32.153		1.96x	4.14x	133744.89	-16.11		
Encke (IEG)	I	2047-06-30T15:15:52.133		2.03x	4.08x	133423.31	-16.08		
A (IER)	I	2047-06-30T15:28:00.350		4.37x	1.85x	122050.38	-15.11		
B (OER)	I	2047-06-30T15:33:01.661		5.35	0.92x	117571.16	-14.62		
B (IER)	I	2047-06-30T16:07:54.085	b	12.25	-5.70	91984.69	-9.17		
Saturn	I	2047-06-30T15:47:41.893		8.23	-1.83x	59666.76		-40.50	-46.12
Saturn	E	2047-06-30T17:05:15.524		23.97	-17.07	59947.07		-28.22	-33.26
B (IER)	E	2047-06-30T17:14:45.294		25.94	-18.99	91984.69	9.26		
B (OER)	E	2047-06-30T17:49:14.704		33.16	-26.07	117571.16	14.80		
A (IER)	E	2047-06-30T17:54:12.205		34.21	-27.10	122050.38	15.30		
Encke (IEG)	E	2047-06-30T18:06:10.412		36.73	-29.58	133423.31	16.32		
Encke (OEG)	E	2047-06-30T18:06:30.101		36.80	-29.65	133744.89	16.35		
A (OER)	E	2047-06-30T18:09:34.195		37.45	-30.29	136774.40	16.56		
F ring	E	2047-06-30T18:13:15.101		38.23	-31.06	140461.00	16.81		

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2047-06-30T16:18:34.380
 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 : 4069543605322220800
 2Mass ID (if available) : 18001627-2222366
 ICRS Star Coord at Epoch: 18h 00m 16.28974s -22:22:36.63136s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 9.329
 G magnitude : 14.762
 RP magnitude : 13.609
 BP magnitude : 16.143
 DUPflag : 0
 Distance (au) : 9.039
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.88
 Sun-Target sep (deg) : 171.82
 Sun-Moon sep (deg) : 83.53
 B (ring opening deg) : 26.51
 PA of pole (deg) : 5.52
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 5.644
 C/A sky separation (km) : 36998.2
 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	2047-06-30T14:59:30.056		67.15	-73.54	140461.00	-17.00		
A (OER)	I	2047-06-30T15:03:08.359		66.49	-72.99	136774.40	-16.77		
Encke (OEG)	I	2047-06-30T15:06:10.164		65.93	-72.51	133744.89	-16.56		
Encke (IEG)	I	2047-06-30T15:06:29.600		65.87	-72.46	133423.31	-16.53		
A (IER)	I	2047-06-30T15:18:17.526		63.66	-70.51	122050.38	-15.55		
B (OER)	I	2047-06-30T15:23:10.005		62.73	-69.67	117571.16	-15.07		
B (IER)	I	2047-06-30T15:56:35.595	b	56.15	-63.48	91984.69	-9.82		
Saturn	I	2047-06-30T15:39:53.350		59.47	-66.65	59700.38		-39.11	-44.72
Saturn	E	2047-06-30T16:57:36.558		43.74	-51.33	59951.47		-28.01	-33.03
B (IER)	E	2047-06-30T17:07:03.907		41.80	-49.40	91984.69	9.81		
B (OER)	E	2047-06-30T17:40:40.715		34.92	-42.54	117571.16	14.93		
A (IER)	E	2047-06-30T17:45:36.059		33.91	-41.53	122050.38	15.40		
Encke (IEG)	E	2047-06-30T17:57:31.927		31.48	-39.10	133423.31	16.33		
Encke (OEG)	E	2047-06-30T17:57:51.601		31.41	-39.03	133744.89	16.36		
A (OER)	E	2047-06-30T18:00:55.673		30.79	-38.40	136774.40	16.56		
F ring	E	2047-06-30T18:04:36.813		30.04	-37.65	140461.00	16.78		