

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-08-16T18:33:33.010  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4068976978949729664  
 2Mass ID (if available) : 17491681-2227245

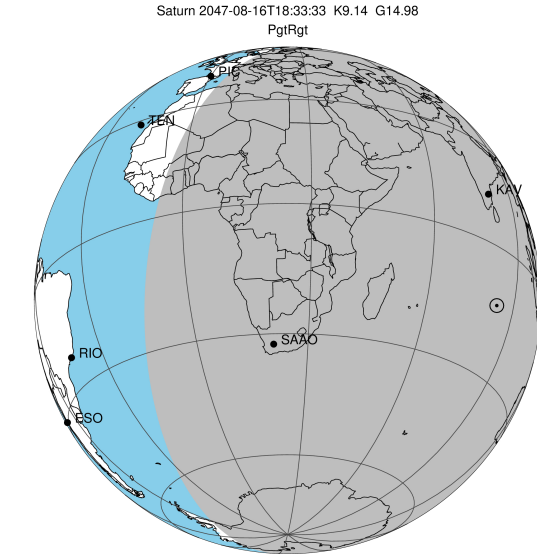
Saturn 2047-08-16T18:33:33 K9.14 G14.98 PgtRgt

ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s

RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.145  
 G magnitude : 14.983  
 RP magnitude : 13.574  
 BP magnitude : 17.565  
 DUPflag : 0  
 Distance (au) : 9.440  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -7.28  
 Sun-Target sep (deg) : 124.34  
 Sun-Moon sep (deg) : 177.39  
 B (ring opening deg) : 26.82  
 PA of pole (deg) : 5.30

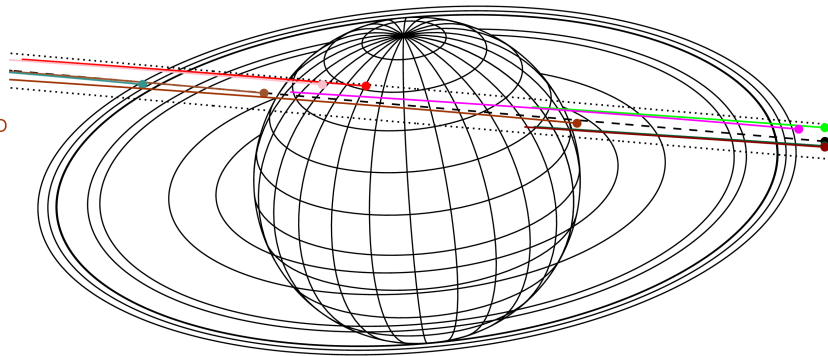
# a(km) ring

- 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



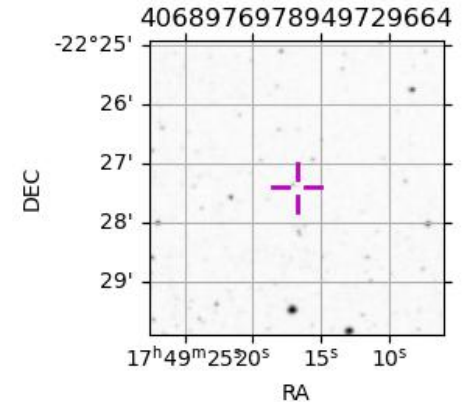
2047-08-16T18:33:33.0100 α: 17 49 16.7941 δ: -22 27 24.744 C/A 3.988° PA 175.03 deg v\_sky - 7.28 km/s D 09.44 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PIC  
 PMO  
 TEN  
 KAV  
 RIO  
 ESO  
 AAT  
 SAAO  
 MSO



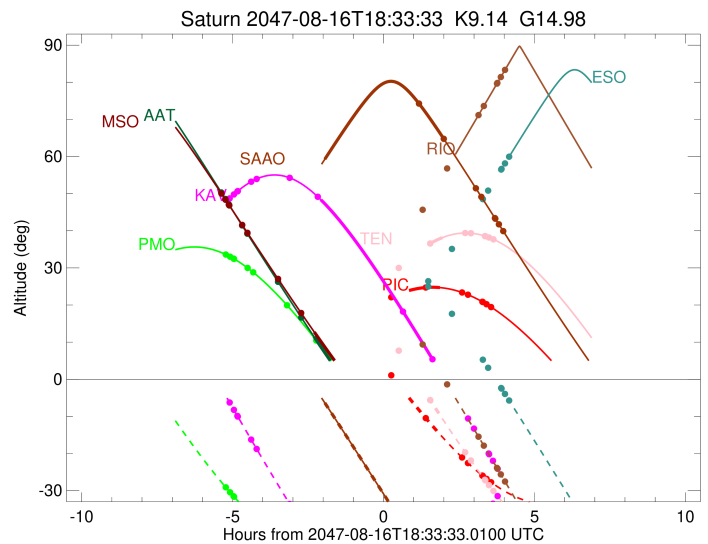
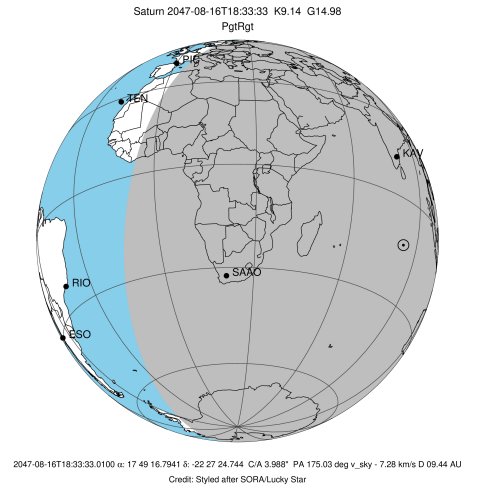
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEncode
PIC	Pic du Midi	42.9	0.1		+	+	AUG 16 20:25 - AUG 16 22:07	PneRne
PAL	Palomar Mt (20	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8	+	+		AUG 16 13:20 - AUG 16 16:24	PinRin
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		+	+	AUG 16 20:30 - AUG 16 22:12	PneRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observ	12.6	78.8	+	+		AUG 16 13:27 - AUG 16 16:29	PinRin
RIO	Rio de Janeiro	-22.9	316.8			+	AUG 16 21:42 - AUG 16 22:35	PnnRne
ESO	European South	-29.3	289.3			+	AUG 16 22:43 - AUG 16 22:43	PnnRne
AAT	Siding Spring	-31.3	149.1	+	+		AUG 16 13:11 - AUG 16 16:15	PinRin
SAAO	So. Afr. Astro	-32.4	20.8		+	+	AUG 16 16:36 - AUG 16 22:31	PieRne
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	AUG 16 13:11 - AUG 16 16:15	PinRin



```

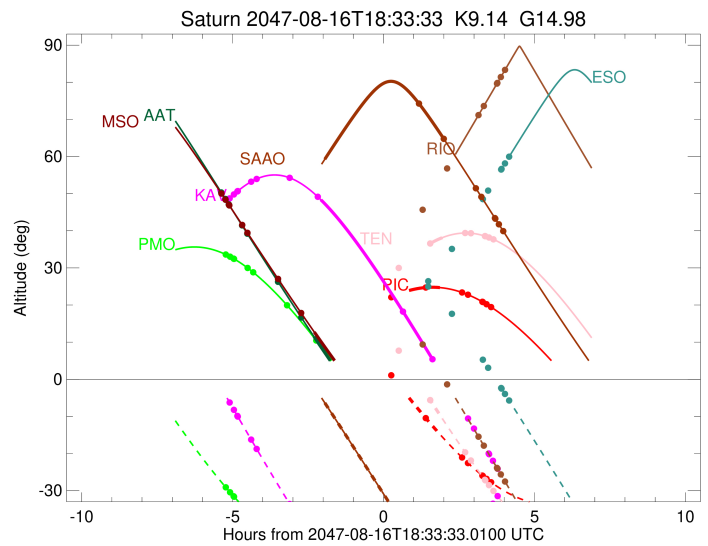
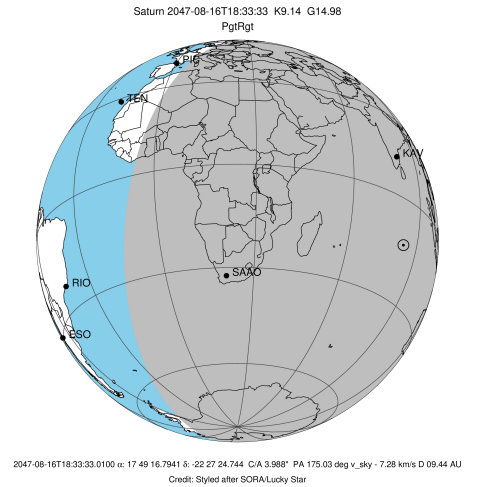
target                : Saturn
target radius (km)   : 60268.00
C/A epoch            : 2047-08-16T18:36:25.080
Event type           : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : PIC
Location             : Pic du Midi
Latitude (deg)       : 42.93656
E. Longitude (deg)   : 0.14231
Altitude (km)        : 2.890
Gaia source ID       : 4068976978949729664
2Mass ID (if available) : 17491681-2227245
ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s
RUWE (>1.4 is poor) : 1.00
K magnitude           : 9.145
G magnitude           : 14.983
RP magnitude          : 13.574
BP magnitude          : 17.565
DUPflag              : 0
Distance (au)        : 9.440
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -7.28
Sun-Target sep (deg) : 124.34
Sun-Moon sep (deg)   : 178.06
B (ring opening deg) : 26.82
PA of pole (deg)     : 5.30
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 4.834
C/A sky separation (km) : 33097.4
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	2047-08-16T13:33:09.998		-21.95x	55.08x	140461.00	-6.80		
A (OER)	I	2047-08-16T13:42:13.879		-20.32x	53.96x	136774.40	-6.75		
Encke (OEG)	I	2047-08-16T13:49:44.078		-18.97x	52.99x	133744.89	-6.71		
Encke (IEG)	I	2047-08-16T13:50:32.052		-18.83x	52.89x	133423.31	-6.70		
A (IER)	I	2047-08-16T14:19:16.145		-13.74x	48.78x	122050.38	-6.48		
B (OER)	I	2047-08-16T14:30:53.087		-11.72x	46.99x	117571.16	-6.37		
B (IER)	I	2047-08-16T15:43:23.461		0.29x	34.73x	91984.69	-5.24		
C (IER)	I	2047-08-16T16:52:09.543	b	10.28	22.24x	74490.58	-2.99		
Saturn	I	2047-08-16T16:45:41.567		9.42	23.43x	60090.81		20.23	24.30
Saturn	E	2047-08-16T20:25:44.011		24.69	-14.83	59706.47		38.20	43.79
C (IER)	E	2047-08-16T18:48:32.404	b	22.06	1.15x	74490.58	2.98		
B (IER)	E	2047-08-16T19:57:28.290	b	24.71	-10.45	91984.69	5.24		
B (OER)	E	2047-08-16T21:09:49.085		23.38	-21.07	117571.16	6.39		
A (IER)	E	2047-08-16T21:21:23.803		22.78	-22.57	122050.38	6.50		
Encke (IEG)	E	2047-08-16T21:50:02.474		20.87	-25.94	133423.31	6.72		
Encke (OEG)	E	2047-08-16T21:50:50.305		20.81	-26.03	133744.89	6.73		
A (OER)	E	2047-08-16T21:58:19.185		20.22	-26.83	136774.40	6.77		
F ring	E	2047-08-16T22:07:21.562		19.45	-27.74	140461.00	6.82		

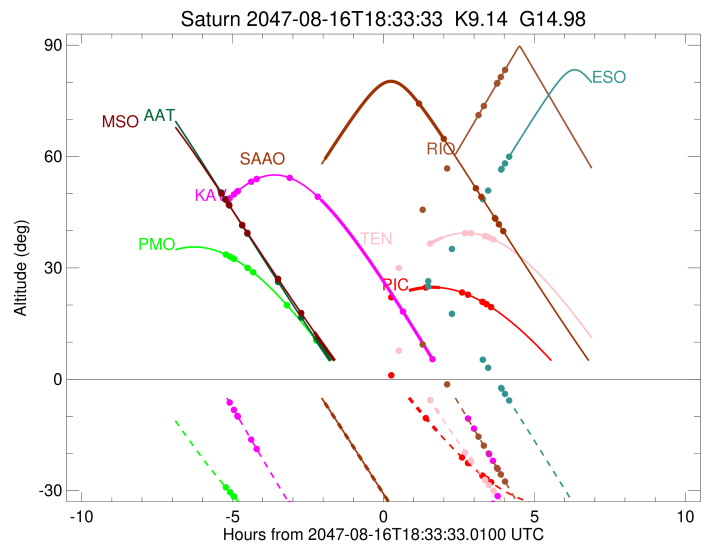
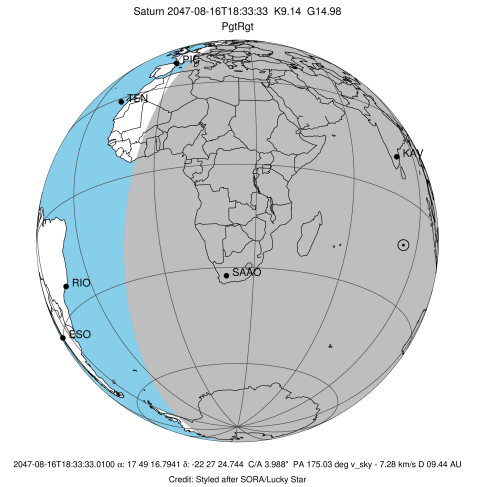
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-08-16T18:21:59.280  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 4068976978949729664  
 2Mass ID (if available) : 17491681-2227245  
 ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.145  
 G magnitude : 14.983  
 RP magnitude : 13.574  
 BP magnitude : 17.565  
 DUPflag : 0  
 Distance (au) : 9.440  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -7.28  
 Sun-Target sep (deg) : 124.34  
 Sun-Moon sep (deg) : 177.88  
 B (ring opening deg) : 26.82  
 PA of pole (deg) : 5.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.364  
 C/A sky separation (km) : 29874.8  
 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	2047-08-16T13:20:03.840		33.60	-29.11	140461.00	-7.23		
A (OER)	I	2047-08-16T13:28:35.629		33.02	-30.45	136774.40	-7.17		
Encke (OEG)	I	2047-08-16T13:35:39.433		32.49	-31.52	133744.89	-7.12		
Encke (IEG)	I	2047-08-16T13:36:24.601		32.43	-31.63	133423.31	-7.12		
A (IER)	I	2047-08-16T14:03:28.004		29.99	-35.45	122050.38	-6.89		
B (OER)	I	2047-08-16T14:14:23.732		28.83	-36.85	117571.16	-6.77		
B (IER)	I	2047-08-16T15:21:49.388		19.94	-43.12	91984.69	-5.76		
C (IER)	I	2047-08-16T16:19:48.686		10.45	-44.43	74490.58	-4.14		
Saturn	I	2047-08-16T16:24:09.331		9.69	-44.36	60119.47		18.45	22.24
Saturn	E	2047-08-16T20:22:41.751		-37.85x	-14.19	59800.35		34.31	39.78
C (IER)	E	2047-08-16T19:09:57.468	b	-22.57x	-27.20	74490.58	3.96		
B (IER)	E	2047-08-16T20:11:11.916	b	-35.41x	-16.36	91984.69	5.40		
B (OER)	E	2047-08-16T21:23:56.800		-50.87x	-2.13x	117571.16	6.21		
A (IER)	E	2047-08-16T21:35:52.947		-53.40x	0.30x	122050.38	6.29		
Encke (IEG)	E	2047-08-16T22:05:34.858		-59.67x	6.41x	133423.31	6.46		
Encke (OEG)	E	2047-08-16T22:06:24.604		-59.85x	6.58x	133744.89	6.47		
A (OER)	E	2047-08-16T22:14:11.772		-61.47x	8.20x	136774.40	6.50		
F ring	E	2047-08-16T22:23:36.868		-63.43x	10.17x	140461.00	6.54		

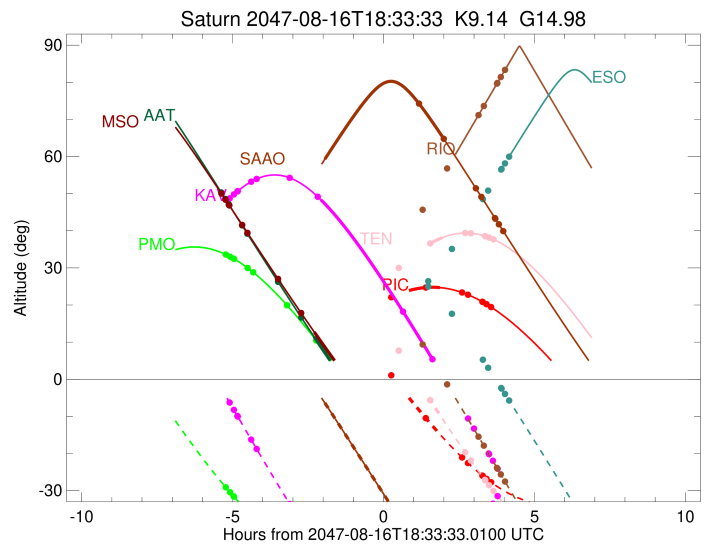
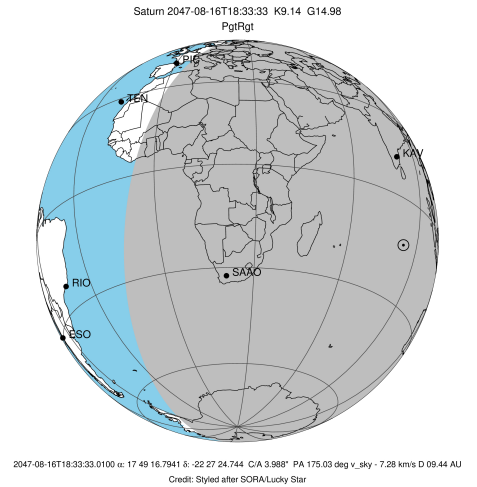
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-08-16T18:40:04.760  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 4068976978949729664  
 2Mass ID (if available) : 17491681-2227245  
 ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.145  
 G magnitude : 14.983  
 RP magnitude : 13.574  
 BP magnitude : 17.565  
 DUPflag : 0  
 Distance (au) : 9.440  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -7.28  
 Sun-Target sep (deg) : 124.34  
 Sun-Moon sep (deg) : 177.79  
 B (ring opening deg) : 26.82  
 PA of pole (deg) : 5.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.683  
 C/A sky separation (km) : 32063.2  
 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	2047-08-16T13:32:51.805		-32.88x	74.58x	140461.00	-6.79		
A (OER)	I	2047-08-16T13:41:56.135		-30.90x	73.73x	136774.40	-6.75		
Encke (OEG)	I	2047-08-16T13:49:26.234		-29.27x	72.87x	133744.89	-6.71		
Encke (IEG)	I	2047-08-16T13:50:14.171		-29.10x	72.77x	133423.31	-6.71		
A (IER)	I	2047-08-16T14:18:53.032		-22.93x	68.42x	122050.38	-6.52		
B (OER)	I	2047-08-16T14:30:25.358		-20.46x	66.37x	117571.16	-6.42		
B (IER)	I	2047-08-16T15:41:32.707		-5.58x	51.98x	91984.69	-5.44		
C (IER)	I	2047-08-16T16:44:55.158		6.98	38.20x	74490.58	-3.55		
Saturn	I	2047-08-16T16:47:28.812		7.47	37.64x	60113.00		18.86	22.72
Saturn	E	2047-08-16T20:30:25.903		38.15	-10.59	59724.24		37.48	43.05
C (IER)	E	2047-08-16T19:03:29.255	b	29.94	7.79x	74490.58	3.57		
B (IER)	E	2047-08-16T20:06:15.820	b	36.56	-5.59	91984.69	5.52		
B (OER)	E	2047-08-16T21:15:57.360		39.40	-19.70	117571.16	6.58		
A (IER)	E	2047-08-16T21:27:12.828		39.34	-21.87	122050.38	6.68		
Encke (IEG)	E	2047-08-16T21:55:07.558		38.58	-27.07	133423.31	6.89		
Encke (OEG)	E	2047-08-16T21:55:54.226		38.54	-27.21	133744.89	6.89		
A (OER)	E	2047-08-16T22:03:12.337		38.19	-28.52	136774.40	6.94		
F ring	E	2047-08-16T22:12:02.002		37.69	-30.07	140461.00	6.98		

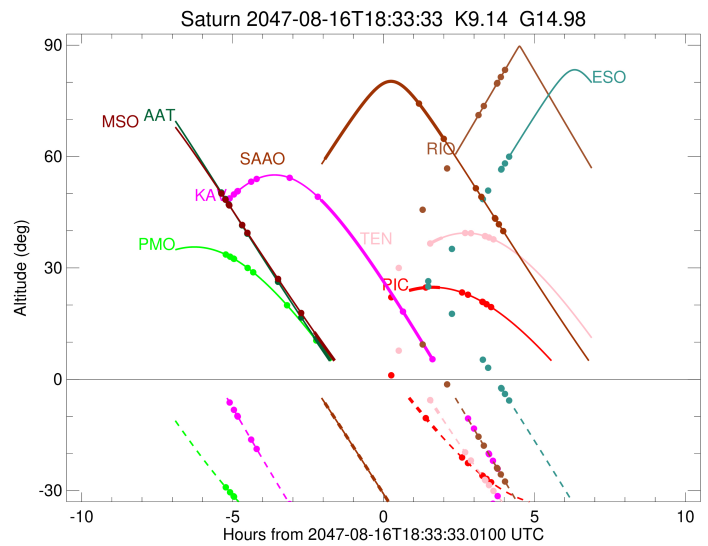
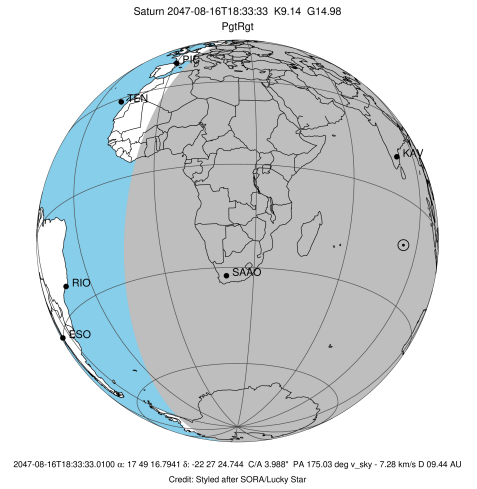
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-08-16T18:23:17.050  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 4068976978949729664  
 2Mass ID (if available) : 17491681-2227245  
 ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.145  
 G magnitude : 14.983  
 RP magnitude : 13.574  
 BP magnitude : 17.565  
 DUPflag : 0  
 Distance (au) : 9.440  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -7.28  
 Sun-Target sep (deg) : 124.34  
 Sun-Moon sep (deg) : 177.86  
 B (ring opening deg) : 26.82  
 PA of pole (deg) : 5.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.325  
 C/A sky separation (km) : 29612.2  
 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

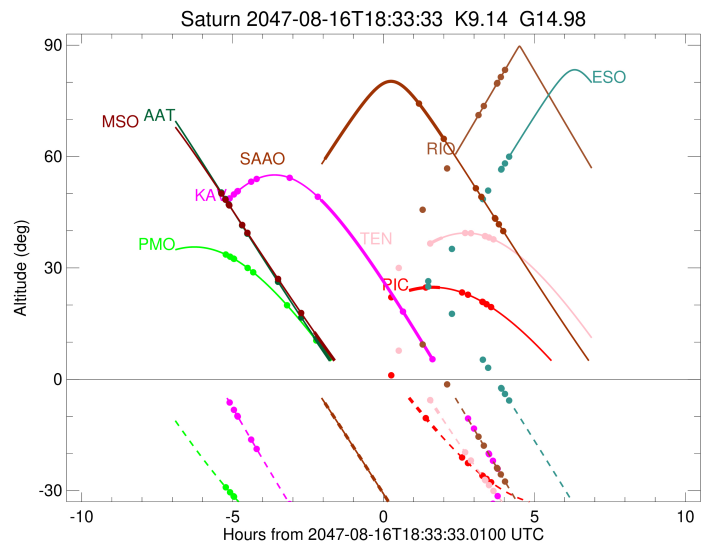
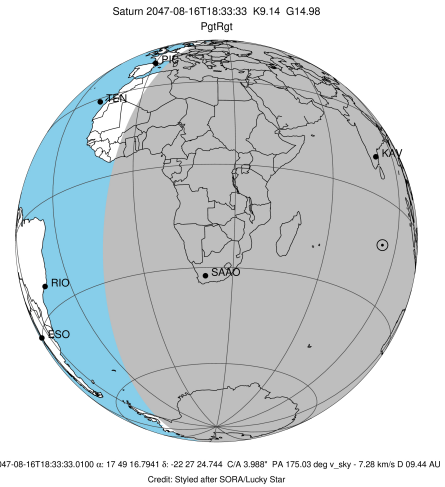
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-16T13:27:45.221		48.73	-6.26	140461.00	-7.32		
A (OER)	I	2047-08-16T13:36:10.865		49.79	-8.25	136774.40	-7.27		
Encke (OEG)	I	2047-08-16T13:43:09.121		50.61	-9.88	133744.89	-7.22		
Encke (IEG)	I	2047-08-16T13:43:53.673		50.69	-10.05	133423.31	-7.22		
A (IER)	I	2047-08-16T14:10:31.798		53.22	-16.26	122050.38	-7.01		
B (OER)	I	2047-08-16T14:21:15.565		53.95	-18.74	117571.16	-6.91		
B (IER)	I	2047-08-16T15:27:03.522		54.27	-33.59	91984.69	-5.94		
C (IER)	I	2047-08-16T16:22:52.599		49.16	-45.40	74490.58	-4.35		
Saturn	I	2047-08-16T16:29:00.184		48.37	-46.62	60125.62		18.05	21.77
Saturn	E	2047-08-16T20:19:55.330		3.39x	-55.54	59811.65		33.83	39.28
C (IER)	E	2047-08-16T19:11:58.757	b	18.29	-63.32	74490.58	4.16		
B (IER)	E	2047-08-16T20:10:48.472	b	5.42	-56.97	91984.69	5.58		
B (OER)	E	2047-08-16T21:21:38.634		-10.59x	-44.05	117571.16	6.34		
A (IER)	E	2047-08-16T21:33:20.616		-13.27x	-41.64	122050.38	6.42		
Encke (IEG)	E	2047-08-16T22:02:33.051		-19.98x	-35.40	133423.31	6.56		
Encke (OEG)	E	2047-08-16T22:03:22.095		-20.17x	-35.22	133744.89	6.56		
A (OER)	E	2047-08-16T22:11:02.989		-21.94x	-33.54	136774.40	6.59		
F ring	E	2047-08-16T22:20:21.287		-24.09x	-31.49	140461.00	6.62		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-08-16T18:44:54.190  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 4068976978949729664  
 2Mass ID (if available) : 17491681-2227245  
 ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.145  
 G magnitude : 14.983  
 RP magnitude : 13.574  
 BP magnitude : 17.565  
 DUPflag : 0  
 Distance (au) : 9.440  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -7.28  
 Sun-Target sep (deg) : 124.34  
 Sun-Moon sep (deg) : 176.94  
 B (ring opening deg) : 26.82  
 PA of pole (deg) : 5.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.869  
 C/A sky separation (km) : 26486.2  
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-16T13:27:06.078	-33.14x	47.45x	140461.00	-6.96			
A (OER)	I	2047-08-16T13:35:56.769	-31.81x	48.53x	136774.40	-6.93			
Encke (OEG)	I	2047-08-16T13:43:14.408	-30.67x	49.36x	133744.89	-6.91			
Encke (IEG)	I	2047-08-16T13:44:00.950	-30.55x	49.44x	133423.31	-6.91			
A (IER)	I	2047-08-16T14:11:39.616	-25.97x	51.95x	122050.38	-6.80			
B (OER)	I	2047-08-16T14:22:40.998	-24.04x	52.65x	117571.16	-6.74			
B (IER)	I	2047-08-16T15:28:12.021	-11.65x	52.84x	91984.69	-6.19			
C (IER)	I	2047-08-16T16:18:34.693	-1.35x	48.53x	74490.58	-5.27			
Saturn	I	2047-08-16T16:42:41.110	3.74x	45.39x	60191.77			13.09	15.93
Saturn	E	2047-08-16T20:43:43.052	57.65	-2.20x	59837.45			32.73	38.11
C (IER)	E	2047-08-16T19:51:09.422	b	45.61	9.41x	74490.58	5.41		
B (IER)	E	2047-08-16T20:39:54.594	b	56.77	-1.35x	91984.69	6.45		
B (OER)	E	2047-08-16T21:42:27.180		71.18	-15.49	117571.16	7.11		
A (IER)	E	2047-08-16T21:52:54.419		73.59	-17.87	122050.38	7.17		
Encke (IEG)	E	2047-08-16T22:19:03.732		79.63	-23.86	133423.31	7.31		
Encke (OEG)	E	2047-08-16T22:19:47.702		79.80	-24.03	133744.89	7.32		
A (OER)	E	2047-08-16T22:26:41.009		81.40	-25.61	136774.40	7.34		
F ring	E	2047-08-16T22:35:01.876		83.33	-27.53	140461.00	7.38		

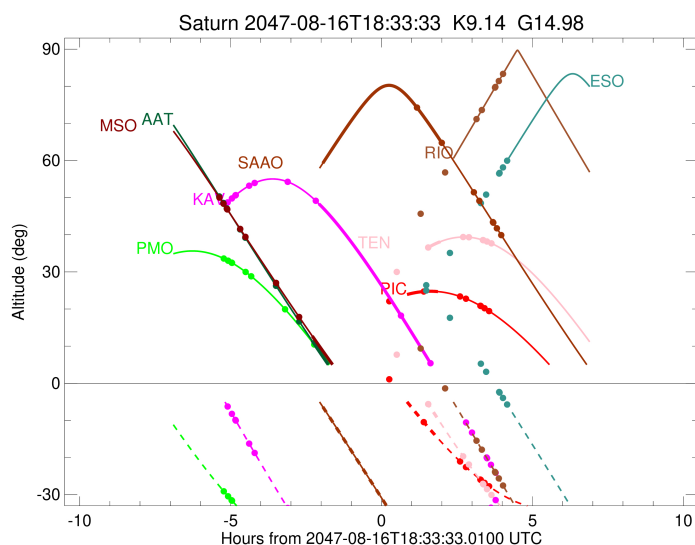
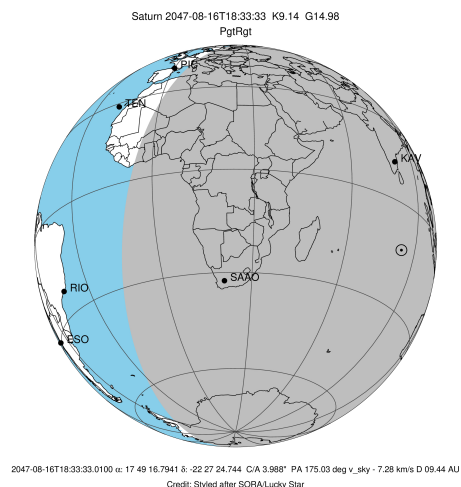
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-08-16T18:45:38.310  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 4068976978949729664  
 2Mass ID (if available) : 17491681-2227245  
 ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.145  
 G magnitude : 14.983  
 RP magnitude : 13.574  
 BP magnitude : 17.565  
 DUPflag : 0  
 Distance (au) : 9.440  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -7.28  
 Sun-Target sep (deg) : 124.34  
 Sun-Moon sep (deg) : 176.70  
 B (ring opening deg) : 26.82  
 PA of pole (deg) : 5.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.636  
 C/A sky separation (km) : 24895.0  
 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	2047-08-16T13:20:42.362		-38.08x	24.37x	140461.00	-6.96		
A (OER)	I	2047-08-16T13:29:33.328		-37.79x	25.97x	136774.40	-6.93		
Encke (OEG)	I	2047-08-16T13:36:51.244		-37.48x	27.27x	133744.89	-6.91		
Encke (IEG)	I	2047-08-16T13:37:37.816		-37.44x	27.41x	133423.31	-6.90		
A (IER)	I	2047-08-16T14:05:17.350		-35.76x	32.10x	122050.38	-6.80		
B (OER)	I	2047-08-16T14:16:18.677		-34.87x	33.86x	117571.16	-6.75		
B (IER)	I	2047-08-16T15:21:31.628		-27.55x	42.55x	91984.69	-6.27		
C (IER)	I	2047-08-16T16:10:40.877		-20.17x	46.40x	74490.58	-5.51		
Saturn	I	2047-08-16T16:38:27.433		-15.50x	47.25x	60208.50		11.54	14.07
Saturn	E	2047-08-16T20:48:57.758		34.98	17.75x	59863.76		31.58	36.89
C (IER)	E	2047-08-16T20:02:18.823	b	24.94	26.46x	74490.58	5.70		
B (IER)	E	2047-08-16T20:49:27.455		35.09	17.65x	91984.69	6.58		
B (OER)	E	2047-08-16T21:51:07.438		48.54	5.25x	117571.16	7.18		
A (IER)	E	2047-08-16T22:01:28.578		50.80	3.11x	122050.38	7.24		
Encke (IEG)	E	2047-08-16T22:27:23.666		56.48	-2.34x	133423.31	7.38		
Encke (OEG)	E	2047-08-16T22:28:07.247		56.64	-2.50x	133744.89	7.38		
A (OER)	E	2047-08-16T22:34:56.904		58.13	-3.94x	136774.40	7.41		
F ring	E	2047-08-16T22:43:13.334		59.94	-5.71	140461.00	7.44		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-08-16T18:24:42.660  
 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 : 4068976978949729664  
 2Mass ID (if available) : 17491681-2227245  
 ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.145  
 G magnitude : 14.983  
 RP magnitude : 13.574  
 BP magnitude : 17.565  
 DUPflag : 0  
 Distance (au) : 9.440  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -7.28  
 Sun-Target sep (deg) : 124.34  
 Sun-Moon sep (deg) : 176.84  
 B (ring opening deg) : 26.82  
 PA of pole (deg) : 5.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.324  
 C/A sky separation (km) : 22755.4  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
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 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

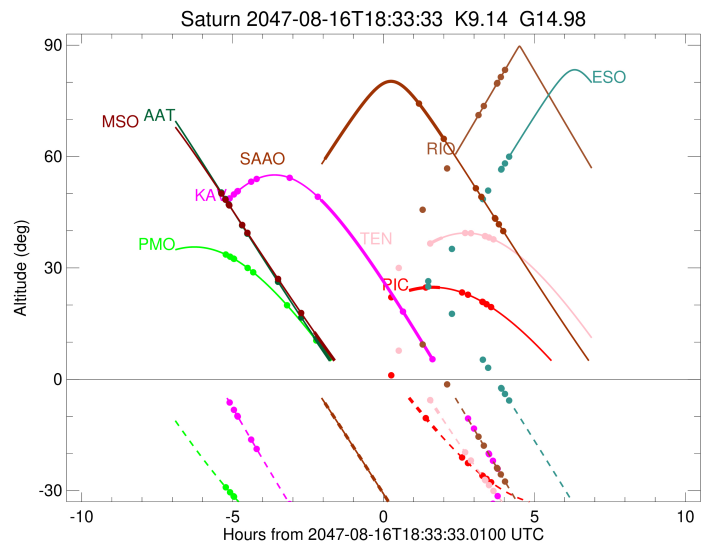
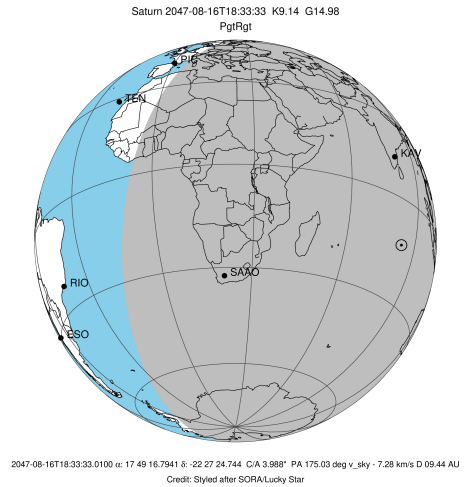


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-16T13:11:07.107		50.31	-68.19	140461.00	-7.53		
A (OER)	I	2047-08-16T13:19:18.162		48.56	-69.26	136774.40	-7.49		
Encke (OEG)	I	2047-08-16T13:26:03.706		47.11	-70.05	133744.89	-7.45		
Encke (IEG)	I	2047-08-16T13:26:46.865		46.95	-70.13	133423.31	-7.45		
A (IER)	I	2047-08-16T13:52:28.601		41.44	-72.17	122050.38	-7.30		
B (OER)	I	2047-08-16T14:02:45.094		39.24	-72.48	117571.16	-7.23		
B (IER)	I	2047-08-16T15:03:54.498		26.26	-68.29	91984.69	-6.66		
C (IER)	I	2047-08-16T15:50:04.987		16.64	-60.74	74490.58	-5.90		
Saturn	I	2047-08-16T16:15:29.993		11.46	-55.90	60207.57		11.63	14.18
Saturn	E	2047-08-16T20:37:12.119		-31.51x	-0.85x	59937.95		28.21	33.26
C (IER)	E	2047-08-16T20:02:04.642	b	-27.64x	-8.18	74490.58	5.61		
B (IER)	E	2047-08-16T20:50:55.815		-32.75x	1.97x	91984.69	6.25		
B (OER)	E	2047-08-16T21:56:34.157		-36.24x	15.03x	117571.16	6.69		
A (IER)	E	2047-08-16T22:07:41.201		-36.40x	17.14x	122050.38	6.74		
Encke (IEG)	E	2047-08-16T22:35:34.822		-36.19x	22.29x	133423.31	6.85		
Encke (OEG)	E	2047-08-16T22:36:21.775		-36.17x	22.43x	133744.89	6.85		
A (OER)	E	2047-08-16T22:43:43.203		-35.98x	23.75x	136774.40	6.88		
F ring	E	2047-08-16T22:52:38.264		-35.66x	25.31x	140461.00	6.90		

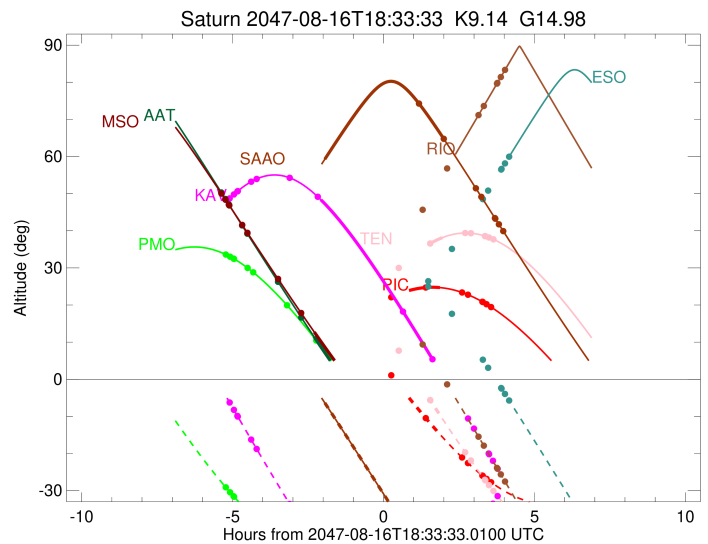
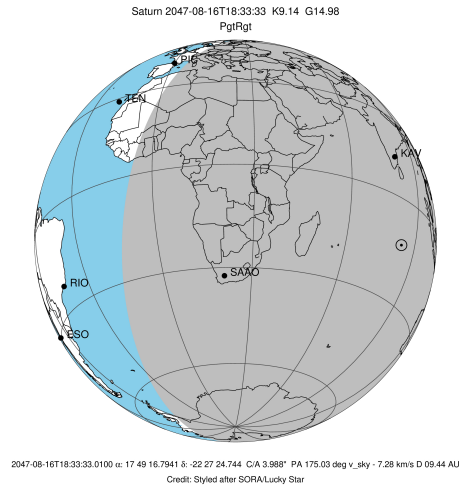


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-08-16T18:34:43.550  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : SAAO  
 Location : So. Afr. Astro. Obs. (Sutherland)  
 Latitude (deg) : -32.37953  
 E. Longitude (deg) : 20.81070  
 Altitude (km) : 1.768  
 Gaia source ID : 4068976978949729664  
 2Mass ID (if available) : 17491681-2227245  
 ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.145  
 G magnitude : 14.983  
 RP magnitude : 13.574  
 BP magnitude : 17.565  
 DUPflag : 0  
 Distance (au) : 9.440  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -7.28  
 Sun-Target sep (deg) : 124.34  
 Sun-Moon sep (deg) : 177.27  
 B (ring opening deg) : 26.82  
 PA of pole (deg) : 5.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.837  
 C/A sky separation (km) : 26267.8  
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-16T13:31:37.858		20.32	28.62x	140461.00	-7.30		
A (OER)	I	2047-08-16T13:40:03.701		22.05	27.27x	136774.40	-7.27		
Encke (OEG)	I	2047-08-16T13:47:00.900		23.49	26.12x	133744.89	-7.25		
Encke (IEG)	I	2047-08-16T13:47:45.272		23.64	26.00x	133423.31	-7.25		
A (IER)	I	2047-08-16T14:14:07.367		29.13	21.47x	122050.38	-7.12		
B (OER)	I	2047-08-16T14:24:38.800		31.34	19.59x	117571.16	-7.06		
B (IER)	I	2047-08-16T15:27:24.119		44.60	7.70x	91984.69	-6.44		
C (IER)	I	2047-08-16T16:16:02.785		54.90	-2.07x	74490.58	-5.43		
Saturn	I	2047-08-16T16:36:45.060		59.24	-6.33	60182.81		13.85	16.84
Saturn	E	2047-08-16T20:32:21.120		64.98	-55.22	59866.14		31.47	36.78
C (IER)	E	2047-08-16T19:43:53.555	b	74.30	-45.57	74490.58	5.36		
B (IER)	E	2047-08-16T20:33:16.088		64.79	-55.40	91984.69	6.34		
B (OER)	E	2047-08-16T21:37:12.131		51.44	-66.31	117571.16	6.91		
A (IER)	E	2047-08-16T21:47:57.454		49.16	-67.74	122050.38	6.97		
Encke (IEG)	E	2047-08-16T22:14:57.054		43.43	-70.40	133423.31	7.07		
Encke (OEG)	E	2047-08-16T22:15:42.534		43.27	-70.45	133744.89	7.07		
A (OER)	E	2047-08-16T22:22:50.303		41.76	-70.86	136774.40	7.09		
F ring	E	2047-08-16T22:31:29.326		39.93	-71.19	140461.00	7.11		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-08-16T18:25:12.480  
 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 : 4068976978949729664  
 2Mass ID (if available) : 17491681-2227245  
 ICRS Star Coord at Epoch: 17h 49m 16.79412s -22:27:24.74355s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.145  
 G magnitude : 14.983  
 RP magnitude : 13.574  
 BP magnitude : 17.565  
 DUPflag : 0  
 Distance (au) : 9.440  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -7.28  
 Sun-Target sep (deg) : 124.34  
 Sun-Moon sep (deg) : 176.80  
 B (ring opening deg) : 26.82  
 PA of pole (deg) : 5.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.283  
 C/A sky separation (km) : 22478.0  
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-16T13:11:24.742		50.02	-64.98	140461.00	-7.53		
A (OER)	I	2047-08-16T13:19:35.495		48.35	-65.87	136774.40	-7.49		
Encke (OEG)	I	2047-08-16T13:26:20.728		46.97	-66.52	133744.89	-7.46		
Encke (IEG)	I	2047-08-16T13:27:03.851		46.82	-66.59	133423.31	-7.46		
A (IER)	I	2047-08-16T13:52:43.806		41.56	-68.21	122050.38	-7.31		
B (OER)	I	2047-08-16T14:02:59.296		39.46	-68.46	117571.16	-7.24		
B (IER)	I	2047-08-16T15:03:57.815		27.03	-65.07	91984.69	-6.69		
C (IER)	I	2047-08-16T15:49:50.324		17.85	-58.57	74490.58	-5.95		
Saturn	I	2047-08-16T16:15:48.581		12.76	-54.10	60210.58		11.33	13.82
Saturn	E	2047-08-16T20:37:44.754		-27.92x	-1.85x	59942.68		27.99	33.01
C (IER)	E	2047-08-16T20:03:48.237	b	-24.49x	-8.62	74490.58	5.67		
B (IER)	E	2047-08-16T20:52:15.060		-29.12x	0.99x	91984.69	6.30		
B (OER)	E	2047-08-16T21:57:32.274		-32.24x	13.34x	117571.16	6.72		
A (IER)	E	2047-08-16T22:08:36.448		-32.37x	15.33x	122050.38	6.77		
Encke (IEG)	E	2047-08-16T22:36:23.509		-32.17x	20.17x	133423.31	6.87		
Encke (OEG)	E	2047-08-16T22:37:10.289		-32.15x	20.30x	133744.89	6.88		
A (OER)	E	2047-08-16T22:44:30.131		-31.97x	21.52x	136774.40	6.90		
F ring	E	2047-08-16T22:53:23.339		-31.67x	22.98x	140461.00	6.93		