

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-24T20:52:06.010  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4115644920969040128  
 2Mass ID (if available) : 17092779-2123160

Saturn 2046-06-24T20:52:06 K8.90 G11.51 PgtRgt

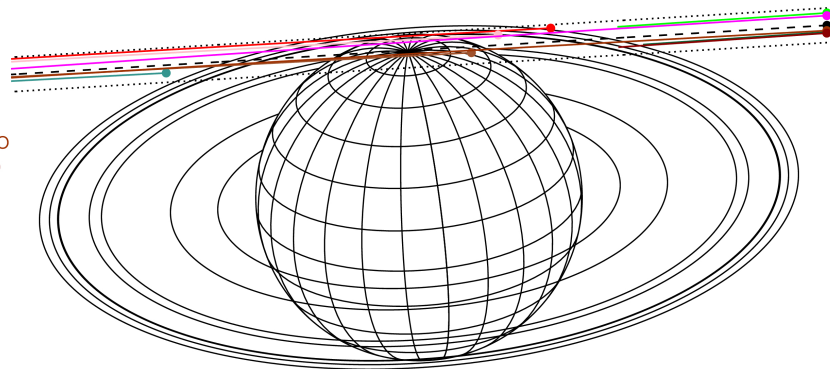
ICRS Star Coord at Epoch: 17h 09m 27.71647s -21:23:16.87603s

RUWE (>1.4 is poor) : 1.05  
 K magnitude : 8.899  
 G magnitude : 11.510  
 RP magnitude : 10.717  
 BP magnitude : 12.183  
 DUPflag : 0  
 Distance (au) : 9.048  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.23  
 Sun-Target sep (deg) : 165.29  
 Sun-Moon sep (deg) : 87.36  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.35

Saturn 2046-06-24T20:52:06 K8.90 G11.51  
 PgtRgt



Earth  
 PIC  
 PMO  
 TEN  
 KAV  
 RIO  
 ESO  
 AAT  
 SAAO  
 MSO

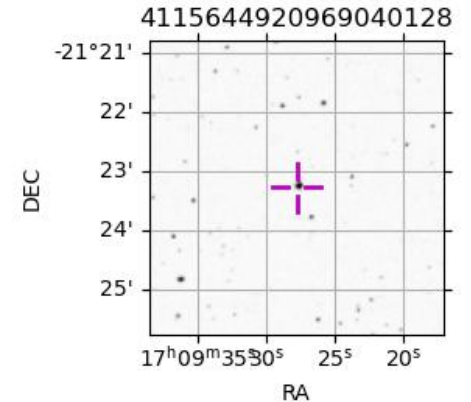


2046-06-24T20:52:06.0100 at: 17 09 27.7165 S: -21 23 16.876 C/A 8.289° PA 183.45 deg v\_sky -19.23 km/s D 09.05 AU  
 Credit: Styled after SORA/Lucky Star

#	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

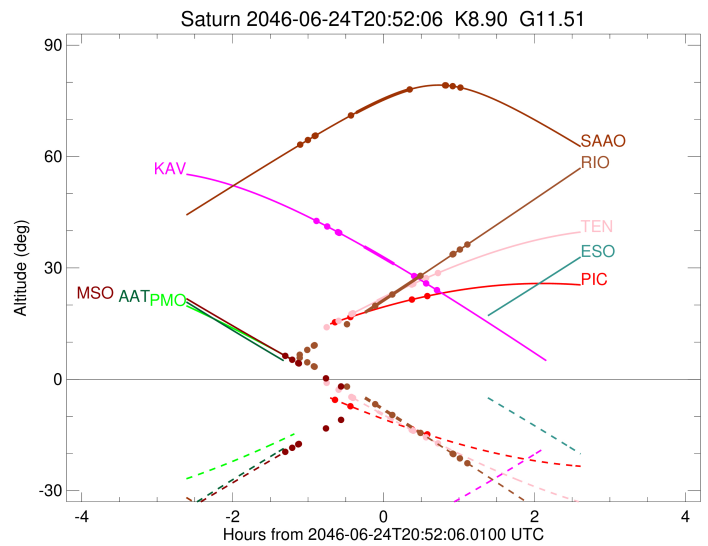
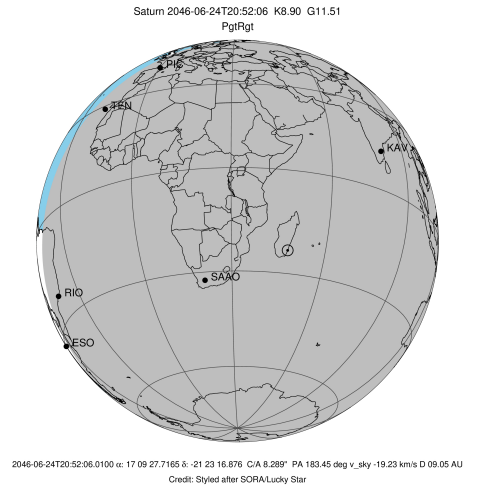
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+	+		JUN 24 20:13 - JUN 24 21:27	PnnRie
PAL	Palomar Mt (20	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8					PnnRnn
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		+	+	JUN 24 20:47 - JUN 24 21:35	PieRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observ	12.6	78.8	+	+	+	JUN 24 19:58 - JUN 24 21:34	PieRie
RIO	Rio de Janeiro	-22.9	316.8		+		JUN 24 21:20 - JUN 24 21:58	PneRne
ESO	European South	-29.3	289.3					PnnRnn
AAT	Siding Spring	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro	-32.4	20.8	+	+	+	JUN 24 19:45 - JUN 24 21:53	PieRie
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+		JUN 24 19:33 - JUN 24 19:39	PnnRin



```

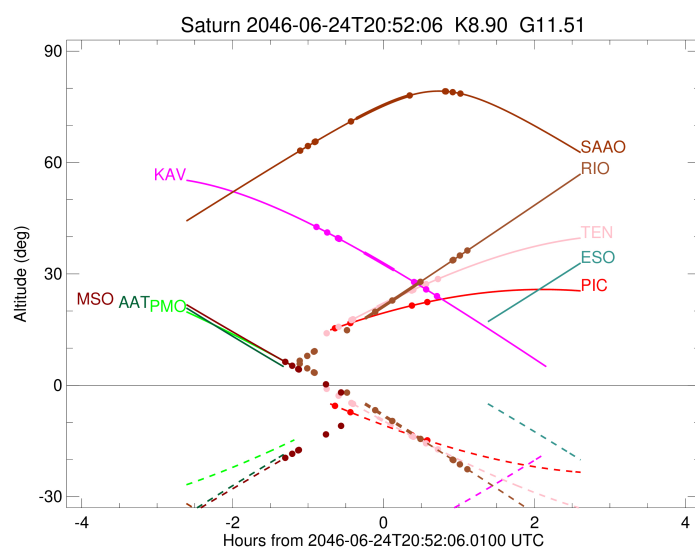
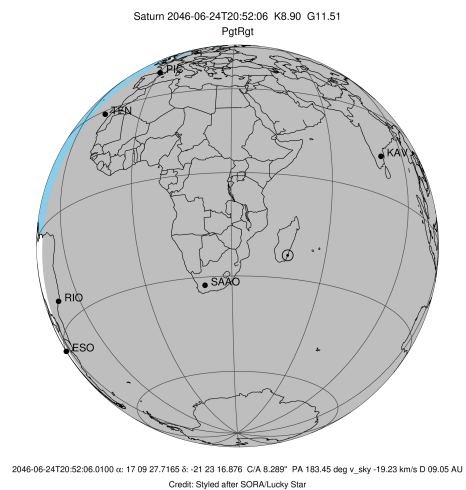
target                : Saturn
target radius (km)   : 60268.00
C/A epoch             : 2046-06-24T20:54:14.680
Event type            : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : PIC
Location              : Pic du Midi
Latitude (deg)       : 42.93656
E. Longitude (deg)   : 0.14231
Altitude (km)        : 2.890
Gaia source ID       : 4115644920969040128
2Mass ID (if available) : 17092779-2123160
ICRS Star Coord at Epoch: 17h 09m 27.71647s -21:23:16.87603s
RUWE (>1.4 is poor) : 1.05
K magnitude           : 8.899
G magnitude           : 11.510
RP magnitude          : 10.717
BP magnitude          : 12.183
DUPflag              : 0
Distance (au)        : 9.048
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -19.23
Sun-Target sep (deg) : 165.29
Sun-Moon sep (deg)   : 87.67
B (ring opening deg) : 26.54
PA of pole (deg)     : 4.35
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation ("): 9.105
C/A sky separation (km): 59748.7
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	2046-06-24T20:13:13.995		15.32	-5.50	140461.00	-5.96		
A (OER)	I	2046-06-24T20:25:24.762		16.72	-7.21	136774.40	-4.10		
No planet occultations									
A (OER)	E	2046-06-24T21:14:53.823		21.49	-13.49	136774.40	4.10		
F ring	E	2046-06-24T21:27:03.866		22.42	-14.86	140461.00	5.97		

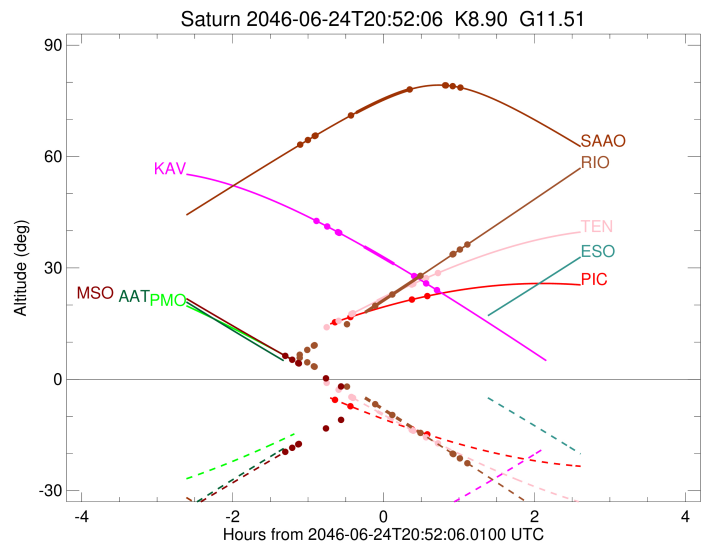
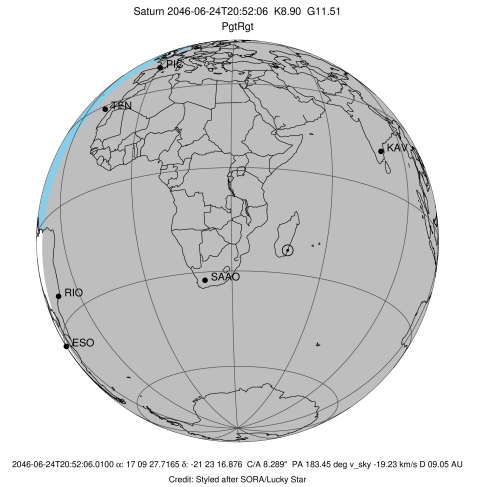
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-24T20:55:33.650  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 4115644920969040128  
 2Mass ID (if available) : 17092779-2123160  
 ICRS Star Coord at Epoch: 17h 09m 27.71647s -21:23:16.87603s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 8.899  
 G magnitude : 11.510  
 RP magnitude : 10.717  
 BP magnitude : 12.183  
 DUPflag : 0  
 Distance (au) : 9.048  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.23  
 Sun-Target sep (deg) : 165.29  
 Sun-Moon sep (deg) : 87.72  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.35  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.892  
 C/A sky separation (km) : 58354.9  
 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	2046-06-24T20:06:38.492		13.97	-0.91x	140461.00	-7.16		
A (OER)	I	2046-06-24T20:16:06.915		15.69	-2.76x	136774.40	-5.79		
Encke (OEG)	I	2046-06-24T20:26:11.341		17.48	-4.70x	133744.89	-4.22		
Encke (IEG)	I	2046-06-24T20:27:29.562		17.71	-4.95x	133423.31	-4.01		
Saturn	I	2046-06-24T20:47:09.018		21.09	-8.66	59177.42		61.52	65.85
Saturn	E	2046-06-24T21:03:53.021		23.84	-11.73	59161.30		62.33	66.57
Encke (IEG)	E	2046-06-24T21:14:41.826		25.54	-13.67	133423.31	4.01		
Encke (OEG)	E	2046-06-24T21:15:59.918		25.74	-13.90	133744.89	4.22		
A (OER)	E	2046-06-24T21:26:02.963		27.26	-15.66	136774.40	5.81		
F ring	E	2046-06-24T21:35:29.410		28.64	-17.28	140461.00	7.19		

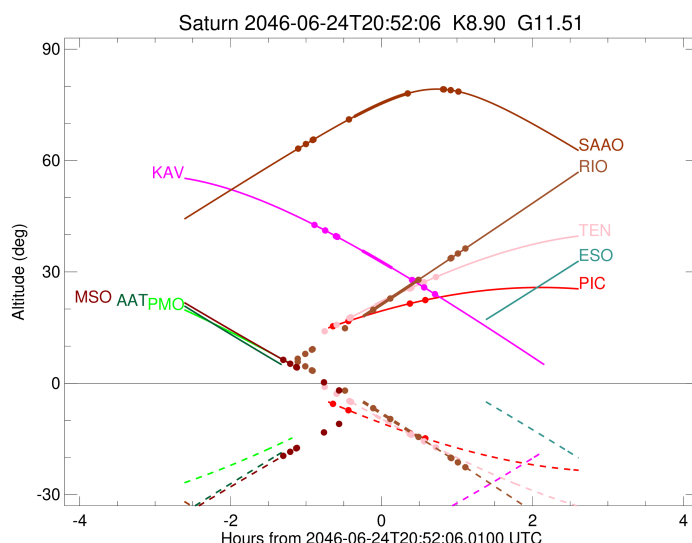
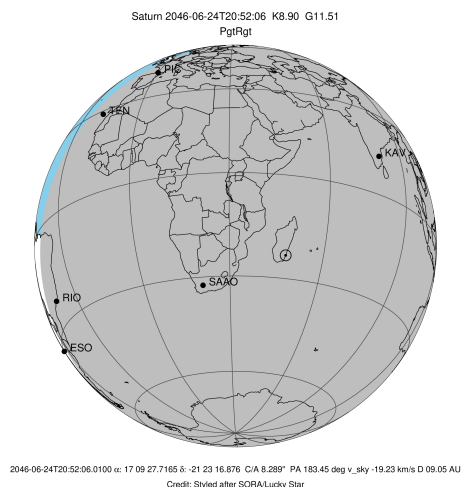
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-24T20:48:36.780  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 4115644920969040128  
 2Mass ID (if available) : 17092779-2123160  
 ICRS Star Coord at Epoch: 17h 09m 27.71647s -21:23:16.87603s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 8.899  
 G magnitude : 11.510  
 RP magnitude : 10.717  
 BP magnitude : 12.183  
 DUPflag : 0  
 Distance (au) : 9.048  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.23  
 Sun-Target sep (deg) : 165.29  
 Sun-Moon sep (deg) : 87.82  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.35  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.763  
 C/A sky separation (km) : 57509.0  
 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	2046-06-24T19:58:32.973		42.69	-50.10	140461.00	-7.81		
A (OER)	I	2046-06-24T20:07:04.668		41.20	-49.15	136774.40	-6.59		
Encke (OEG)	I	2046-06-24T20:15:34.917		39.68	-48.11	133744.89	-5.28		
Encke (IEG)	I	2046-06-24T20:16:36.842		39.49	-47.98	133423.31	-5.11		
Saturn	I	2046-06-24T20:36:36.599		35.75	-45.24	59206.20		60.11	64.60
Saturn	E	2046-06-24T21:00:35.337		31.03	-41.51	59195.65		60.62	65.06
Encke (IEG)	E	2046-06-24T21:16:31.625		27.79	-38.81	133423.31	5.09		
Encke (OEG)	E	2046-06-24T21:17:33.839		27.57	-38.63	133744.89	5.25		
A (OER)	E	2046-06-24T21:26:06.788		25.80	-37.11	136774.40	6.55		
F ring	E	2046-06-24T21:34:41.745		24.00	-35.56	140461.00	7.75		

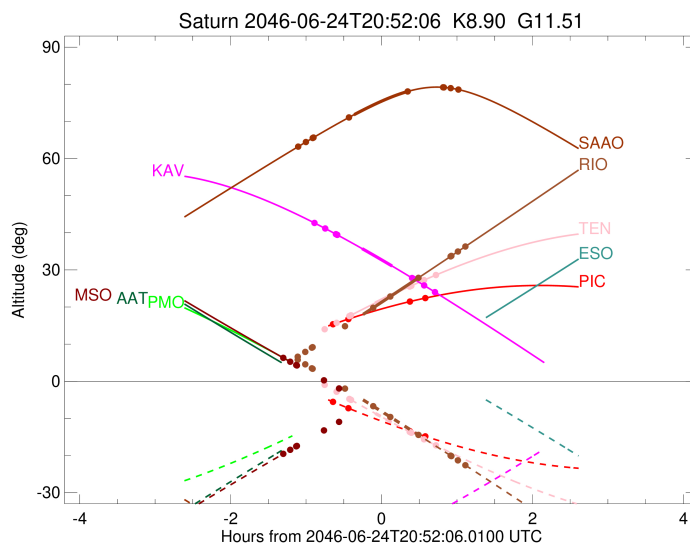
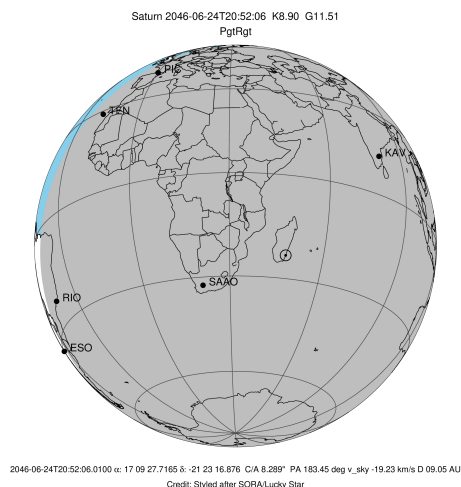
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-24T20:56:32.350  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 4115644920969040128  
 2Mass ID (if available) : 17092779-2123160  
 ICRS Star Coord at Epoch: 17h 09m 27.71647s -21:23:16.87603s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 8.899  
 G magnitude : 11.510  
 RP magnitude : 10.717  
 BP magnitude : 12.183  
 DUPflag : 0  
 Distance (au) : 9.048  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.23  
 Sun-Target sep (deg) : 165.29  
 Sun-Moon sep (deg) : 87.72  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.35  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.984  
 C/A sky separation (km) : 52392.4  
 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	2046-06-24T19:45:18.362		6.57	5.82x	140461.00	-10.61		
A (OER)	I	2046-06-24T19:51:17.341		7.87	4.60x	136774.40	-9.92		
Encke (OEG)	I	2046-06-24T19:56:32.767		9.01	3.52x	133744.89	-9.28		
Encke (IEG)	I	2046-06-24T19:57:07.567		9.14	3.41x	133423.31	-9.20		
A (IER)	I	2046-06-24T20:22:49.197		14.77	-1.92x	122050.38	-5.38		
B (OER)	I	2046-06-24T20:44:18.429	b	19.53	-6.46	117571.23	-1.50		
Saturn	I	2046-06-24T20:32:22.569		16.89	-3.93x	59406.17		51.18	56.45
Saturn	E	2046-06-24T21:20:34.242		27.65	-14.25	59361.79		53.07	58.21
B (OER)	E	2046-06-24T21:00:06.616	b	23.06	-9.84	117571.19	1.50		
A (IER)	E	2046-06-24T21:21:33.536		27.88	-14.47	122050.38	5.39		
Encke (IEG)	E	2046-06-24T21:47:06.458		33.65	-20.04	133423.31	9.28		
Encke (OEG)	E	2046-06-24T21:47:40.981		33.78	-20.17	133744.89	9.34		
A (OER)	E	2046-06-24T21:52:53.744		34.96	-21.32	136774.40	10.01		
F ring	E	2046-06-24T21:58:49.362		36.31	-22.62	140461.00	10.71		

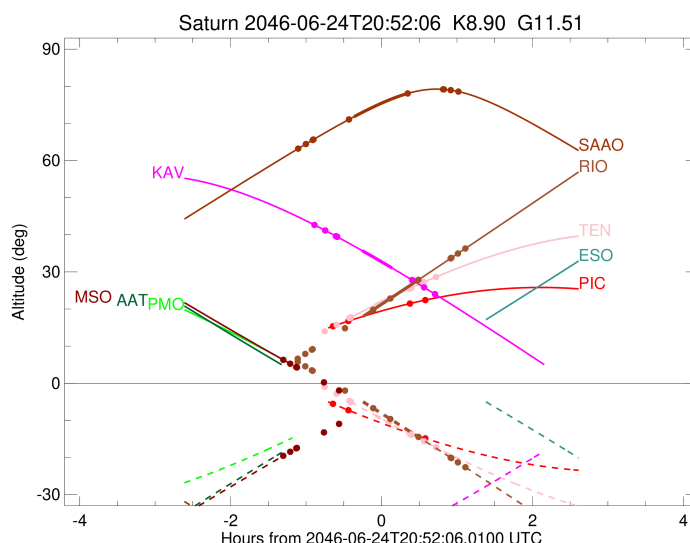
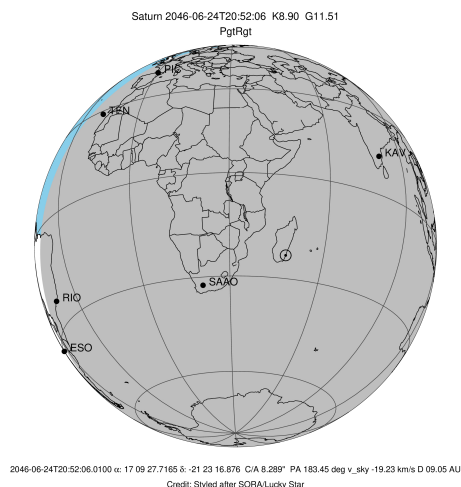
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-24T20:52:48.360  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : SAAO  
 Location : So. Afr. Astro. Obs. (Sutherland)  
 Latitude (deg) : -32.37953  
 E. Longitude (deg) : 20.81070  
 Altitude (km) : 1.768  
 Gaia source ID : 4115644920969040128  
 2Mass ID (if available) : 17092779-2123160  
 ICRS Star Coord at Epoch: 17h 09m 27.71647s -21:23:16.87603s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 8.899  
 G magnitude : 11.510  
 RP magnitude : 10.717  
 BP magnitude : 12.183  
 DUPflag : 0  
 Distance (au) : 9.048  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.23  
 Sun-Target sep (deg) : 165.29  
 Sun-Moon sep (deg) : 88.24  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.35  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.095  
 C/A sky separation (km) : 53122.4  
 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	2046-06-24T19:45:40.754		63.17	-50.88	140461.00	-10.40		
A (OER)	I	2046-06-24T19:51:48.088		64.40	-52.17	136774.40	-9.66		
Encke (OEG)	I	2046-06-24T19:57:13.555		65.49	-53.32	133744.89	-8.95		
Encke (IEG)	I	2046-06-24T19:57:49.653		65.61	-53.45	133423.31	-8.87		
A (IER)	I	2046-06-24T20:25:57.706		71.02	-59.36	122050.38	-4.41		
Saturn	I	2046-06-24T20:30:14.790		71.80	-60.26	59375.25		52.49	57.68
Saturn	E	2046-06-24T21:15:17.822		78.29	-69.49	59342.90		53.89	58.97
A (IER)	E	2046-06-24T21:13:00.951	b	78.08	-69.03	122050.38	4.41		
Encke (IEG)	E	2046-06-24T21:41:09.057		79.18	-74.43	133423.31	8.87		
Encke (OEG)	E	2046-06-24T21:41:45.137		79.17	-74.54	133744.89	8.95		
A (OER)	E	2046-06-24T21:47:10.403		78.96	-75.50	136774.40	9.67		
F ring	E	2046-06-24T21:53:17.444		78.57	-76.55	140461.00	10.41		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-06-24T20:48:09.340  
 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 : 4115644920969040128  
 2Mass ID (if available) : 17092779-2123160  
 ICRS Star Coord at Epoch: 17h 09m 27.71647s -21:23:16.87603s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 8.899  
 G magnitude : 11.510  
 RP magnitude : 10.717  
 BP magnitude : 12.183  
 DUPflag : 0  
 Distance (au) : 9.048  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.23  
 Sun-Target sep (deg) : 165.29  
 Sun-Moon sep (deg) : 87.20  
 B (ring opening deg) : 26.54  
 PA of pole (deg) : 4.35  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.682  
 C/A sky separation (km) : 50414.5  
 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	2046-06-24T19:33:49.862		6.34	-19.58	140461.00	-11.43		
A (OER)	I	2046-06-24T19:39:20.933		5.29	-18.50	136774.40	-10.84		
Encke (OEG)	I	2046-06-24T19:44:07.680		4.39x	-17.56	133744.89	-10.29		
Encke (IEG)	I	2046-06-24T19:44:39.033		4.29x	-17.46	133423.31	-10.23		
A (IER)	I	2046-06-24T20:06:09.526		0.29x	-13.28	122050.38	-7.27		
B (OER)	I	2046-06-24T20:17:58.415		-1.87x	-11.01	117571.16	-5.33		
Saturn	I	2046-06-24T20:20:38.391		-2.35x	-10.50	59457.87		49.01	54.41
Saturn	E	2046-06-24T21:15:42.302		-11.84x	-0.31x	59440.93		49.72	55.08
B (OER)	E	2046-06-24T21:15:20.337	b	-11.78x	-0.37x	117571.16	5.31		
A (IER)	E	2046-06-24T21:27:13.102		-13.69x	1.74x	122050.38	7.23		
Encke (IEG)	E	2046-06-24T21:48:53.540		-17.04x	5.49x	133423.31	10.13		
Encke (OEG)	E	2046-06-24T21:49:25.181		-17.12x	5.58x	133744.89	10.19		
A (OER)	E	2046-06-24T21:54:14.670		-17.84x	6.40x	136774.40	10.73		
F ring	E	2046-06-24T21:59:49.141		-18.65x	7.33x	140461.00	11.31		