

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-04T06:50:43.750  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4068972370405701248  
 2Mass ID (if available) : 17482431-2230257

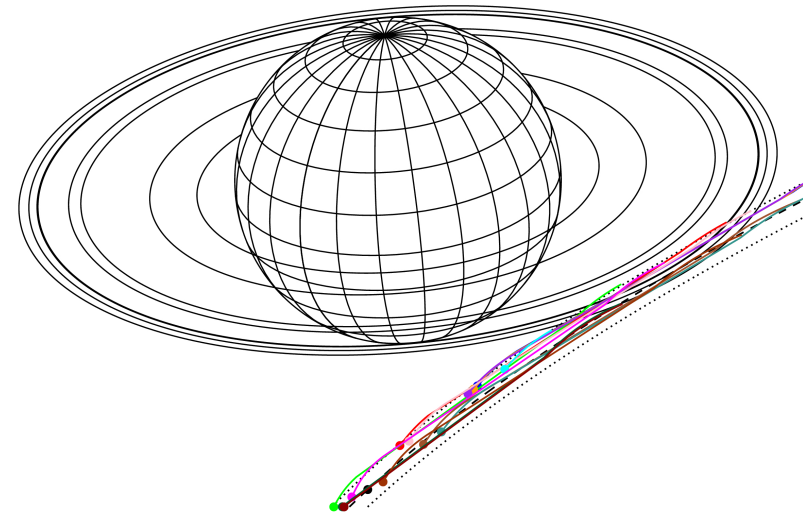
Saturn 2047-09-04T06:50:43 K8.02 G14.99 XRgt

ICRS Star Coord at Epoch: 17h 48m 24.30212s -22:30:26.04068s

RUWE (>1.4 is poor) : 0.90  
 K magnitude : 8.020  
 G magnitude : 14.990  
 RP magnitude : 13.386  
 BP magnitude : 18.845  
 DUPflag : 0  
 Distance (au) : 9.716  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 1.46  
 Sun-Target sep (deg) : 106.29  
 Sun-Moon sep (deg) : 72.67  
 B (ring opening deg) : 26.89  
 PA of pole (deg) : 5.29



Earth  
 PIC  
 PAL  
 PMO  
 KPNO  
 MCD  
 TEN  
 IRTF  
 KAV  
 RIO  
 ESO  
 AAT  
 SAAO  
 MSO

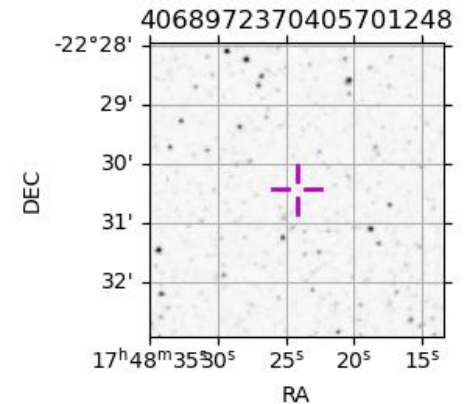


2047-09-04T06:50:43.7500 α: 17 48 24.3021 δ: -22 30 26.041 C/A \*\*\*\*\* PA 34.60 deg v\_sky + 1.46 km/s D 09.72 AU  
 Credit: Styled after SORA/Lucky Star

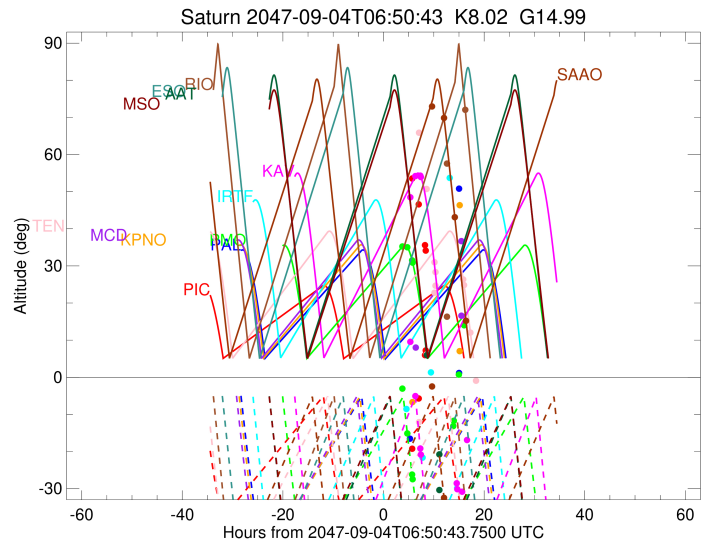
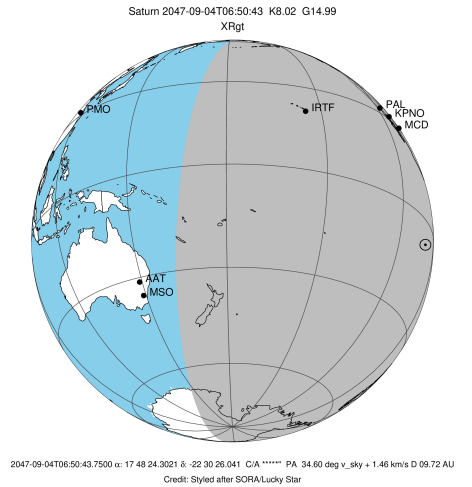
#	a(km) ring
1	74490.6 C (IER)
2	91984.7 B (IER)
3	117571.2 B (OER)
4	122050.4 A (IER)
5	133423.3 Encke (IEG)
6	133744.9 Encke (OEG)
7	136774.4 A (OER)
8	140461.0 F ring

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	+			SEP 04 11:34 - SEP 04 12:38	PnnRin
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			+	SEP 04 22:39 - SEP 05 00:05	PnnRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observ	12.6	78.8	+			SEP 04 13:10 - SEP 04 14:16	PnnRin
RIO	Rio de Janeiro	-22.9	316.8			+	SEP 04 23:03 - SEP 04 23:03	PnnRne
ESO	European South	-29.3	289.3					PnnRnn
AAT	Siding Spring	-31.3	149.1	+			SEP 04 15:27 - SEP 04 15:27	PnnRin
SAAO	So. Afr. Astro	-32.4	20.8			+	SEP 04 18:54 - SEP 04 23:13	PnnRie
MSO	Mt. Stromlo Ob	-35.3	149.0					PnnRnn



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-04T08:38:11.770  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4068972370405701248  
 2Mass ID (if available) : 17482431-2230257  
 ICRS Star Coord at Epoch: 17h 48m 24.30212s -22:30:26.04068s  
 RUWE (>1.4 is poor) : 0.90  
 K magnitude : 8.020  
 G magnitude : 14.990  
 RP magnitude : 13.386  
 BP magnitude : 18.845  
 DUPflag : 0  
 Distance (au) : 9.717  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 1.46  
 Sun-Target sep (deg) : 106.29  
 Sun-Moon sep (deg) : 73.01  
 B (ring opening deg) : 26.89  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 11.654  
 C/A sky separation (km) : 82132.4  
 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



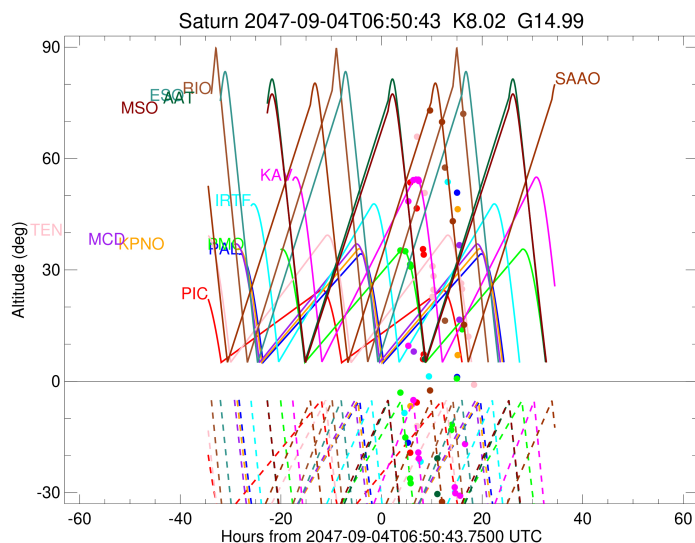
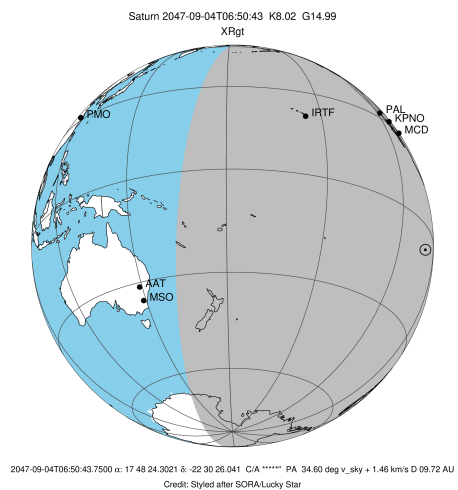
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-09-04T10:35:58.747		35.23	-3.03x	140461.00	-1.12		
A (OER)	I	2047-09-04T11:34:47.947		35.02	-15.12	136774.40	-0.97		
Encke (OEG)	I	2047-09-04T12:31:41.601		31.48	-26.23	133744.89	-0.81		
Encke (IEG)	I	2047-09-04T12:38:26.046		30.87	-27.49	133423.31	-0.79		

No planet occultations

Encke (IEG)	E	2047-09-04T20:41:42.876		-57.94x	-13.34	133423.31	0.75		
Encke (OEG)	E	2047-09-04T20:48:46.133		-59.43x	-11.90	133744.89	0.77		
A (OER)	E	2047-09-04T21:48:44.525		-71.60x	0.54x	136774.40	0.91		
F ring	E	2047-09-04T22:51:37.168		-80.44x	13.84x	140461.00	1.04		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-04T05:05:03.130  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4068972370405701248  
 2Mass ID (if available) : 17482431-2230257  
 ICRS Star Coord at Epoch: 17h 48m 24.30212s -22:30:26.04068s  
 RUWE (>1.4 is poor) : 0.90  
 K magnitude : 8.020  
 G magnitude : 14.990  
 RP magnitude : 13.386  
 BP magnitude : 18.845  
 DUPflag : 0  
 Distance (au) : 9.715  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 1.46  
 Sun-Target sep (deg) : 106.29  
 Sun-Moon sep (deg) : 71.75  
 B (ring opening deg) : 26.89  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 11.430  
 C/A sky separation (km) : 80537.3  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



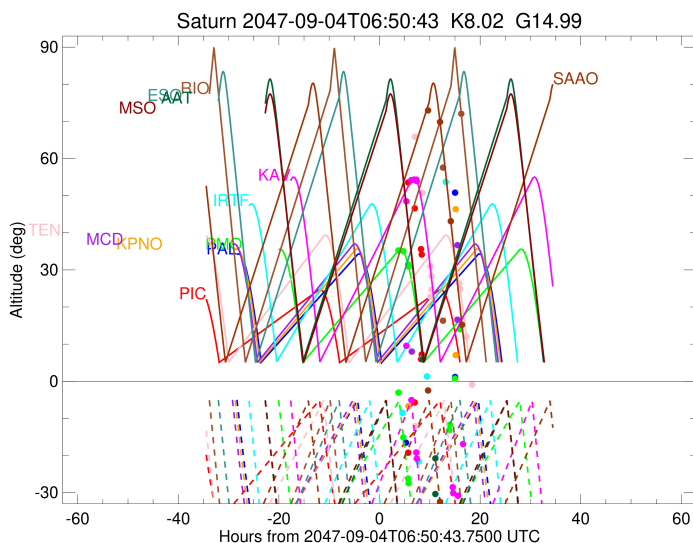
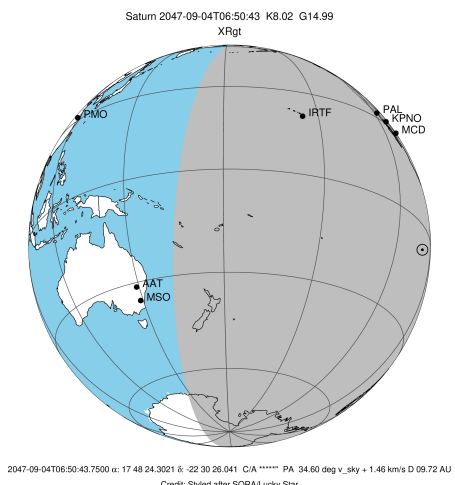
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-09-04T13:54:48.503	-12.04x	65.85x	140461.00	-0.73			
A (OER)	I	2047-09-04T15:25:44.329	6.26	50.61x	136774.40	-0.61			
Encke (OEG)	I	2047-09-04T17:00:03.833	22.96	30.73x	133744.89	-0.45			
Encke (IEG)	I	2047-09-04T17:12:20.356	24.86	28.05x	133423.31	-0.42			

No planet occultations

Encke (IEG)	E	2047-09-04T22:39:21.304	26.60	-40.40	133423.31	0.50			
Encke (OEG)	E	2047-09-04T22:49:45.302	25.06	-42.14	133744.89	0.53			
A (OER)	E	2047-09-05T00:05:54.478	12.22	-52.19	136774.40	0.79			
F ring	E	2047-09-05T01:13:28.888	-0.77x	-54.92	140461.00	1.02			

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-04T06:24:00.470  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4068972370405701248  
 2Mass ID (if available) : 17482431-2230257  
 ICRS Star Coord at Epoch: 17h 48m 24.30212s -22:30:26.04068s  
 RUWE (>1.4 is poor) : 0.90  
 K magnitude : 8.020  
 G magnitude : 14.990  
 RP magnitude : 13.386  
 BP magnitude : 18.845  
 DUPflag : 0  
 Distance (au) : 9.716  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 1.46  
 Sun-Target sep (deg) : 106.29  
 Sun-Moon sep (deg) : 72.68  
 B (ring opening deg) : 26.89  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.182  
 C/A sky separation (km) : 85846.2  
 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



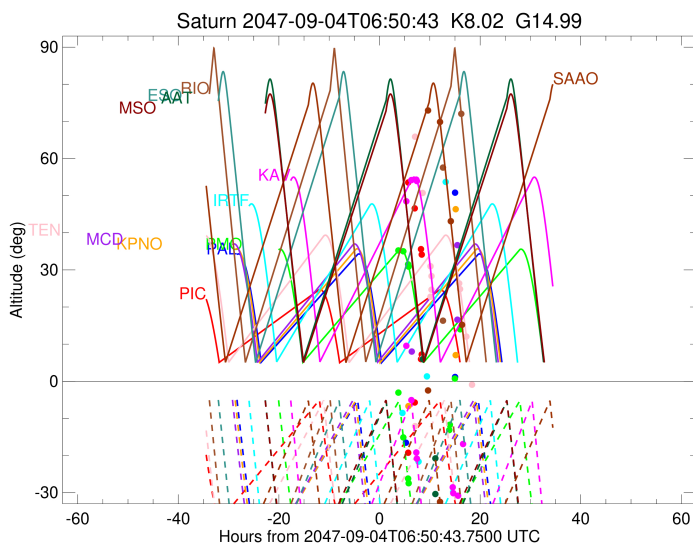
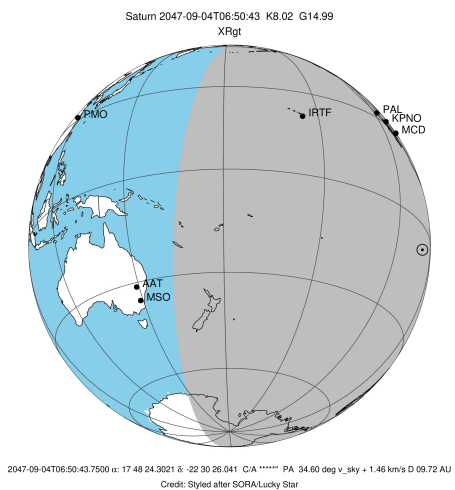
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-09-04T12:10:33.660		48.48	9.56x	140461.00	-1.09		
A (OER)	I	2047-09-04T13:10:59.268		54.20	-5.09	136774.40	-0.94		
Encke (OEG)	I	2047-09-04T14:09:54.105		54.30	-19.25	133744.89	-0.77		
Encke (IEG)	I	2047-09-04T14:16:57.122		53.92	-20.93	133423.31	-0.75		

No planet occultations

Encke (IEG)	E	2047-09-04T21:23:10.504		-28.34x	-45.82	133423.31	0.76		
Encke (OEG)	E	2047-09-04T21:30:05.284		-29.94x	-44.27	133744.89	0.79		
A (OER)	E	2047-09-04T22:27:41.276		-43.27x	-31.01	136774.40	0.96		
F ring	E	2047-09-04T23:26:27.607		-56.75x	-17.08	140461.00	1.12		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-04T05:43:26.140  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4068972370405701248  
 2Mass ID (if available) : 17482431-2230257  
 ICRS Star Coord at Epoch: 17h 48m 24.30212s -22:30:26.04068s  
 RUWE (>1.4 is poor) : 0.90  
 K magnitude : 8.020  
 G magnitude : 14.990  
 RP magnitude : 13.386  
 BP magnitude : 18.845  
 DUPflag : 0  
 Distance (au) : 9.716  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 1.46  
 Sun-Target sep (deg) : 106.29  
 Sun-Moon sep (deg) : 72.10  
 B (ring opening deg) : 26.89  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 11.866  
 C/A sky separation (km) : 83610.4  
 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

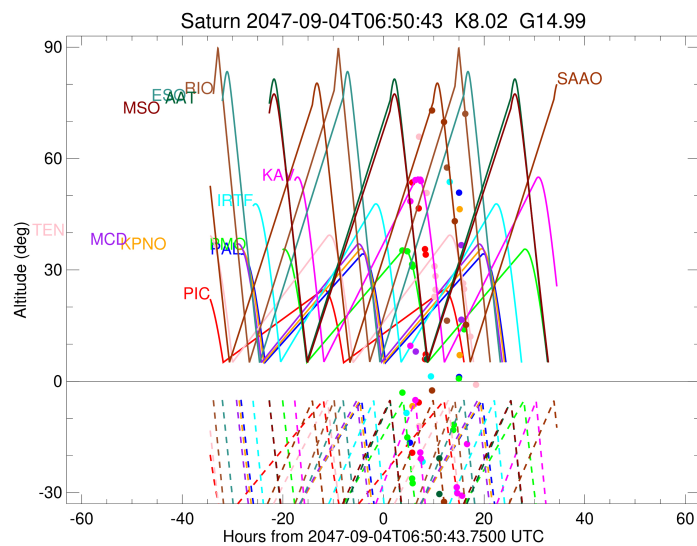
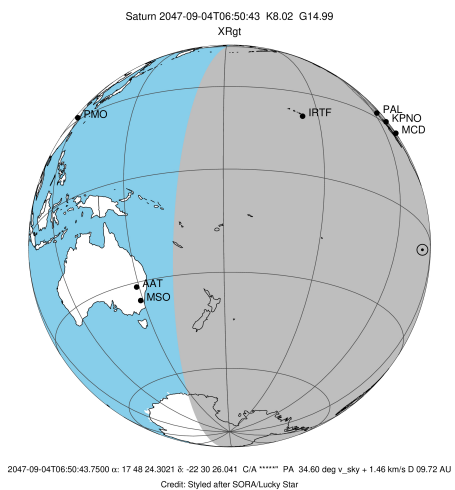


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-09-04T19:30:02.383		58.08	15.81x	140461.00	-0.26		
No planet occultations									
F ring	E	2047-09-04T23:03:21.182		72.65	-32.96	140461.00	0.30		

```

target                : Saturn
target radius (km)   : 60268.00
C/A epoch             : 2047-09-04T09:27:44.100
Event type            : XRgt
: No Saturn occs
: 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        : 4068972370405701248
2Mass ID (if available) : 17482431-2230257
ICRS Star Coord at Epoch: 17h 48m 24.30212s -22:30:26.04069s
RUWE (>1.4 is poor) : 0.90
K magnitude           : 8.020
G magnitude           : 14.990
RP magnitude          : 13.386
BP magnitude          : 18.845
DUPflag              : 0
Distance (au)         : 9.718
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : 1.46
Sun-Target sep (deg) : 106.29
Sun-Moon sep (deg)   : 73.57
B (ring opening deg) : 26.89
PA of pole (deg)     : 5.29
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 11.981
C/A sky separation (km) : 84443.7
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
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IAU_SATURN_for_RINGFIT.tpc
naif0012.tls
earth_flat_IAU.spk
  
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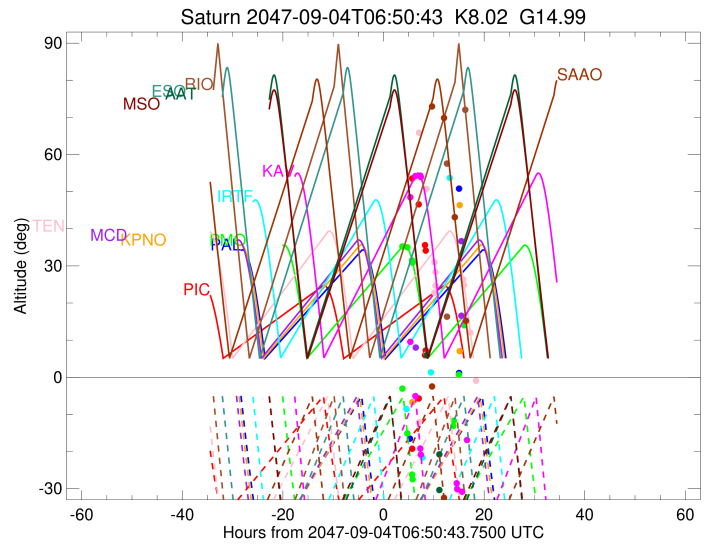
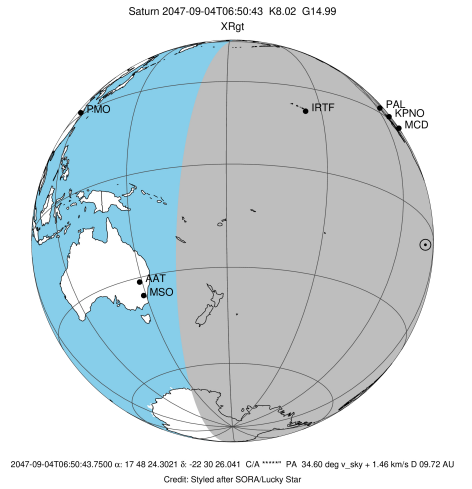
```

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  2047-09-04T15:27:58.755  5.87 -58.75  140461.00  -0.20

No planet occultations

F ring    E  2047-09-04T17:55:16.828  -20.51x -30.75  140461.00  0.19
  
```

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-04T05:25:52.040  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4068972370405701248  
 2Mass ID (if available) : 17482431-2230257  
 ICRS Star Coord at Epoch: 17h 48m 24.30212s -22:30:26.04068s  
 RUWE (>1.4 is poor) : 0.90  
 K magnitude : 8.020  
 G magnitude : 14.990  
 RP magnitude : 13.386  
 BP magnitude : 18.845  
 DUPflag : 0  
 Distance (au) : 9.715  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 1.46  
 Sun-Target sep (deg) : 106.29  
 Sun-Moon sep (deg) : 72.29  
 B (ring opening deg) : 26.89  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.450  
 C/A sky separation (km) : 87726.4  
 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	2047-09-04T16:30:09.092		73.04	-2.58x	140461.00	-0.63		
A (OER)	I	2047-09-04T18:54:54.005		69.38	-32.98	136774.40	-0.21		
No planet occultations									
A (OER)	E	2047-09-04T20:57:58.563		43.76	-56.04	136774.40	0.21		
F ring	E	2047-09-04T23:13:44.293		15.44	-63.20	140461.00	0.69		