

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T09:01:51.810  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442

Saturn 2047-09-01T09:01:51 K6.76 G14.47 XRgt

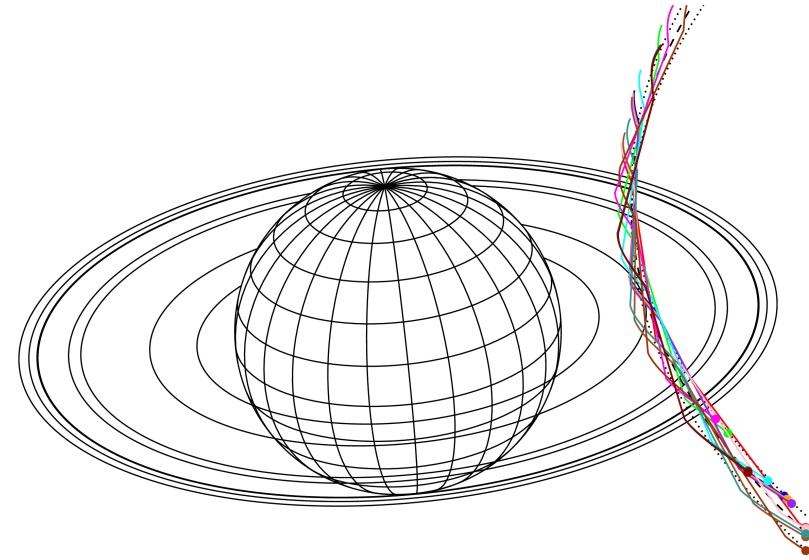
ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s

RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.670  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 34.96  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29



2047-09-01T09:01:51.8100 α: 17 48 22.5621 δ: -22 29 44.379 C/A \*\*\*\*\* PA 102.91 deg v\_sky - 0.82 km/s D 09.67 AU  
 Credit: Styled after SORA/Lucky Star

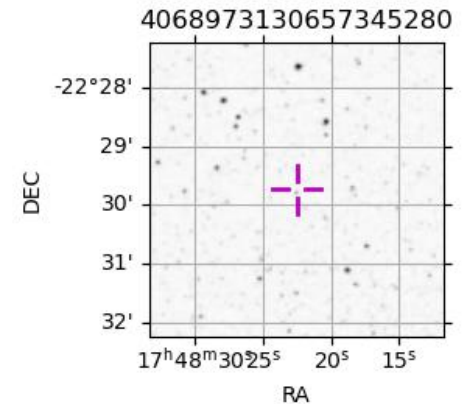
Earth  
 PIC  
 PAL  
 PMO  
 KPNO  
 MCD  
 TEN  
 IRTF  
 KAV  
 RIO  
 ESO  
 AAT  
 SAAO  
 MSO



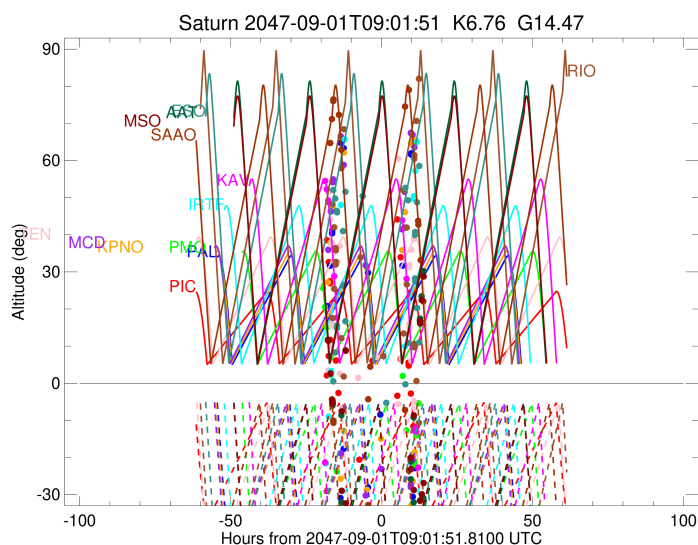
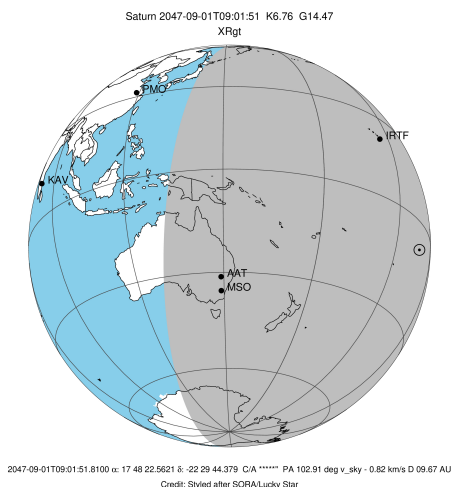
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

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	OEncode
PIC	Pic du Midi	42.9	0.1			+	SEP 01 19:36 - SEP 01 19:36		PnnRne
PAL	Palomar Mt (20	33.4	243.1	+			SEP 01 04:34 - SEP 01 04:34		PnnRin
PMO	Purple Mtn Obs	32.1	118.8	+			AUG 31 13:41 - AUG 31 14:53		PnnRin
KPNO	Kitt Peak Natl	32.0	248.4	+			SEP 01 04:12 - SEP 01 04:12		PnnRin
MCD	McDonald Obs.	30.7	256.0	+			SEP 01 03:47 - SEP 01 03:47		PnnRin
TEN	Teide Obs./Ten	28.3	343.5			+	SEP 01 19:47 - SEP 01 19:47		PnnRne
IRTF	Mauna Kea/IRTF	19.8	204.5						PnnRnn
KAV	Kavalur Observ	12.6	78.8	+		+	AUG 31 14:22 - SEP 01 17:22		PnnRie
RIO	Rio de Janeiro	-22.9	316.8			+	SEP 01 02:09 - SEP 01 21:27		PnnRie
ESO	European South	-29.3	289.3			+	SEP 01 02:48 - SEP 01 02:48		PnnRin
AAT	Siding Spring	-31.3	149.1	+			AUG 31 15:14 - AUG 31 15:14		PnnRin
SAAO	So. Afr. Astro	-32.4	20.8	+		+	AUG 31 17:03 - SEP 01 22:54		PnnRie
MSO	Mt. Stromlo Ob	-35.3	149.0	+		+	AUG 31 15:23 - AUG 31 15:23		PnnRin



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T03:50:01.640  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.667  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 34.77  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.897  
 C/A sky separation (km) : 90421.7  
 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

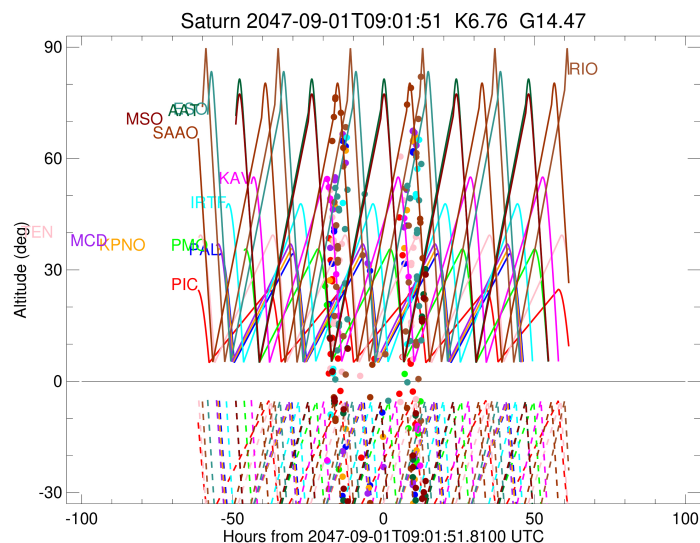
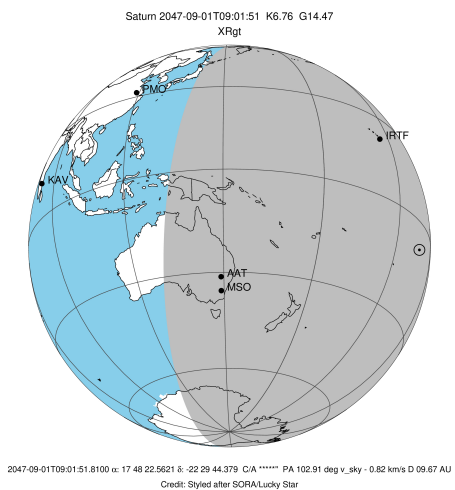


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T14:55:54.789		2.18x	38.48x	140461.00	-1.73		
A (OER)	I	2047-08-31T15:31:25.516		7.40	32.55x	136774.40	-1.72		
Encke (OEG)	I	2047-08-31T16:00:48.762		11.36	27.40x	133744.89	-1.71		
Encke (IEG)	I	2047-08-31T16:03:56.835		11.76	26.84x	133423.31	-1.71		
A (IER)	I	2047-08-31T17:58:02.190		22.60	6.02x	122050.38	-1.60		
B (OER)	I	2047-08-31T18:45:44.530		24.49	-2.61x	117571.16	-1.53		
B (IER)	I	2047-09-01T01:42:35.329		-20.86x	-33.77	91984.69	-0.41		

No planet occultations

B (IER)	E	2047-09-01T06:01:12.627		-65.31x	5.93x	91984.69	0.38		
B (OER)	E	2047-09-01T14:18:30.254		-3.10x	43.89x	117571.16	1.15		
A (IER)	E	2047-09-01T15:22:21.312		6.67	33.78x	122050.38	1.18		
Encke (IEG)	E	2047-09-01T18:00:14.598		22.94	5.31x	133423.31	1.21		
Encke (OEG)	E	2047-09-01T18:04:40.048		23.17	4.51x	133744.89	1.21		
A (OER)	E	2047-09-01T18:46:18.257		24.57	-3.02x	136774.40	1.21		
F ring	E	2047-09-01T19:36:53.431		24.38	-11.83	140461.00	1.22		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T08:58:00.130  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.670  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 34.18  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.426  
 C/A sky separation (km) : 87149.9  
 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



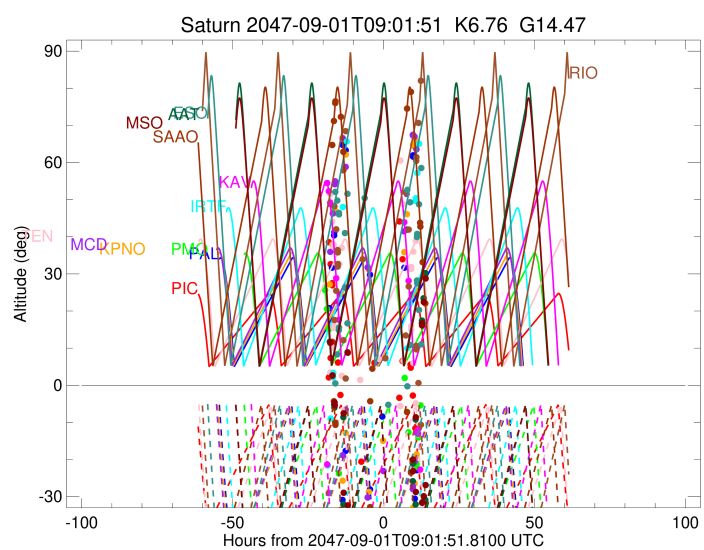
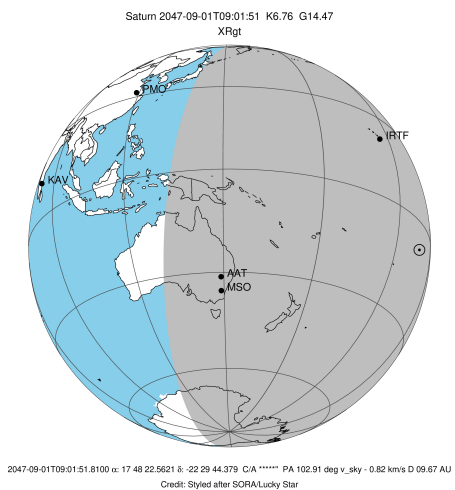
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T15:05:32.161	-79.25x	20.90x	140461.00	-1.17			
A (OER)	I	2047-08-31T15:58:04.688	-73.26x	31.79x	136774.40	-1.17			
Encke (OEG)	I	2047-08-31T16:41:17.996	-65.18x	40.51x	133744.89	-1.17			
Encke (IEG)	I	2047-08-31T16:45:53.045	-64.26x	41.41x	133423.31	-1.17			
A (IER)	I	2047-08-31T19:27:11.206	-30.73x	64.81x	122050.38	-1.18			
B (OER)	I	2047-08-31T20:30:49.223	-17.68x	63.31x	117571.16	-1.17			
B (IER)	I	2047-09-01T04:34:30.530	29.70	-28.20	91984.69	-0.37			

No planet occultations

B (IER)	E	2047-09-01T08:38:37.294	-8.52x	-46.83	91984.69	0.38			
B (OER)	E	2047-09-01T15:59:34.688	-72.33x	31.96x	117571.16	1.44			
A (IER)	E	2047-09-01T16:50:06.195	-62.63x	42.08x	122050.38	1.51			
Encke (IEG)	E	2047-09-01T18:50:44.196	-37.51x	61.70x	133423.31	1.62			
Encke (OEG)	E	2047-09-01T18:54:02.719	-36.82x	62.05x	133744.89	1.62			
A (OER)	E	2047-09-01T19:25:02.882	-30.36x	64.37x	136774.40	1.64			
F ring	E	2047-09-01T20:02:28.049	-22.65x	64.64x	140461.00	1.65			

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T14:27:29.090  
 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 : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.674  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 35.57  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 13.117  
 C/A sky separation (km) : 92031.3  
 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



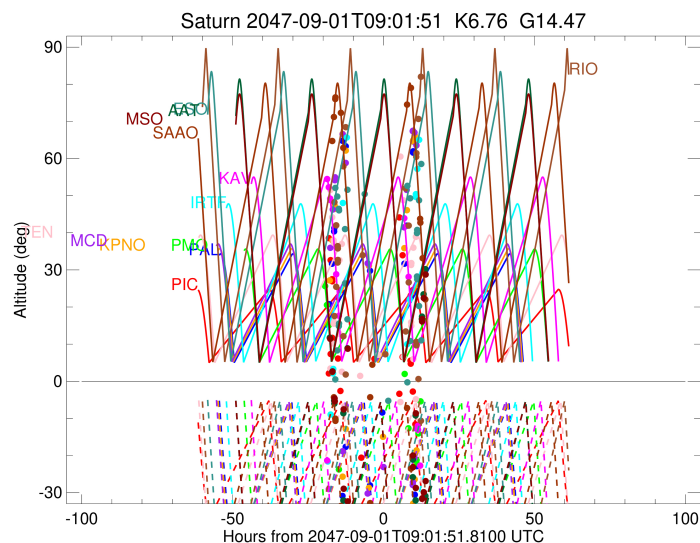
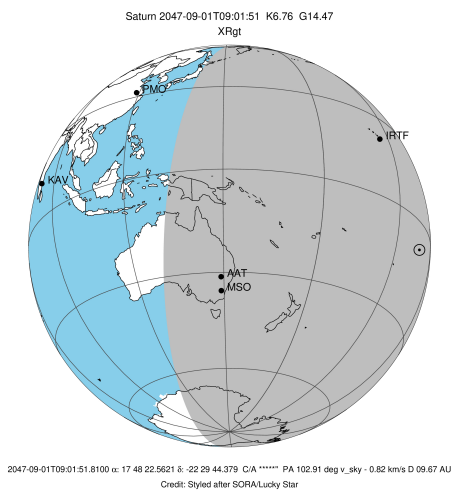
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T13:41:26.245		25.59	-37.01	140461.00	-1.71		
A (OER)	I	2047-08-31T14:18:09.111		20.48	-42.21	136774.40	-1.63		
Encke (OEG)	I	2047-08-31T14:49:48.103		15.53	-45.79	133744.89	-1.56		
Encke (IEG)	I	2047-08-31T14:53:15.020		14.96	-46.12	133423.31	-1.55		
A (IER)	I	2047-08-31T17:10:10.454		-10.38x	-46.73	122050.38	-1.22		
B (OER)	I	2047-08-31T18:15:39.965		-23.74x	-38.98	117571.16	-1.06		

No planet occultations

B (OER)	E	2047-09-01T16:04:51.731		1.55x	-49.98	117571.16	0.95		
A (IER)	E	2047-09-01T17:18:53.181		-12.92x	-46.24	122050.38	1.07		
Encke (IEG)	E	2047-09-01T19:56:37.288		-45.88x	-21.79	133423.31	1.34		
Encke (OEG)	E	2047-09-01T20:00:36.599		-46.73x	-21.02	133744.89	1.35		
A (OER)	E	2047-09-01T20:37:11.808		-54.50x	-13.81	136774.40	1.41		
F ring	E	2047-09-01T21:19:33.802		-63.39x	-5.16	140461.00	1.49		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T08:43:54.680  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.670  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 34.14  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.405  
 C/A sky separation (km) : 86998.8  
 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

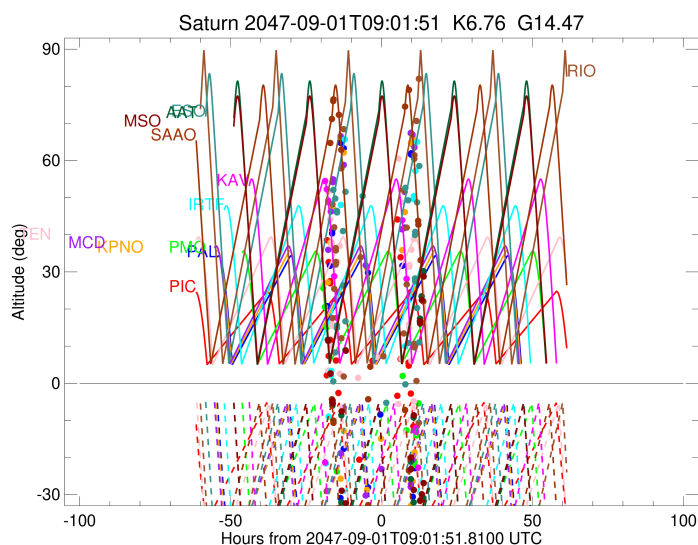
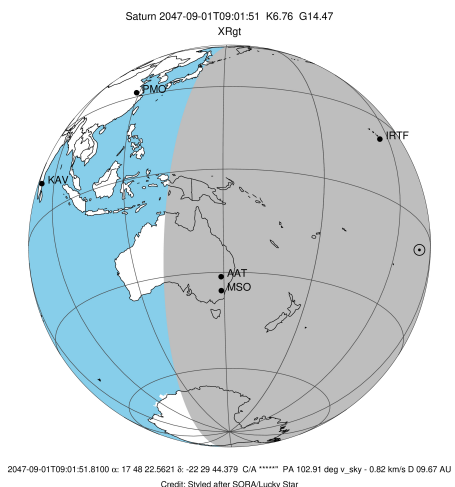


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T15:14:21.748	-77.79x	27.30x	140461.00	-1.19			
A (OER)	I	2047-08-31T16:06:04.645	-68.48x	38.07x	136774.40	-1.19			
Encke (OEG)	I	2047-08-31T16:48:24.656	-59.75x	46.54x	133744.89	-1.20			
Encke (IEG)	I	2047-08-31T16:52:53.510	-58.81x	47.41x	133423.31	-1.20			
A (IER)	I	2047-08-31T19:29:54.609	-25.55x	66.63x	122050.38	-1.21			
B (OER)	I	2047-08-31T20:31:42.074	-12.85x	62.16x	117571.16	-1.20			
B (IER)	I	2047-09-01T04:12:54.682	31.00	-28.85	91984.69	-0.43			

No planet occultations

B (IER)	E	2047-09-01T08:52:39.094	-15.04x	-44.98	91984.69	0.44			
B (OER)	E	2047-09-01T15:57:21.752	-69.43x	36.14x	117571.16	1.45			
A (IER)	E	2047-09-01T16:47:41.124	-59.08x	46.24x	122050.38	1.51			
Encke (IEG)	E	2047-09-01T18:48:23.308	-33.45x	64.71x	133423.31	1.61			
Encke (OEG)	E	2047-09-01T18:51:42.560	-32.75x	64.97x	133744.89	1.61			
A (OER)	E	2047-09-01T19:22:51.076	-26.21x	66.27x	136774.40	1.63			
F ring	E	2047-09-01T20:00:29.933	-18.41x	64.97x	140461.00	1.64			

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T08:23:09.800  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.670  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 34.09  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.386  
 C/A sky separation (km) : 86869.8  
 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

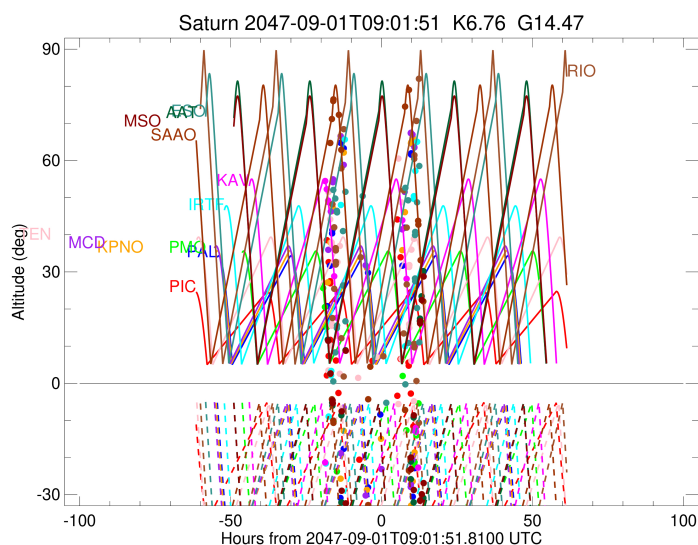
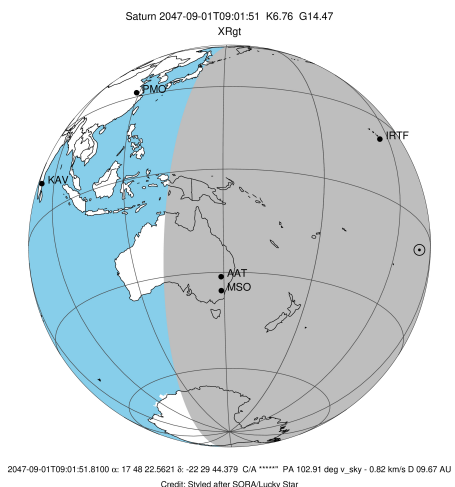


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T15:24:38.799	-71.18x	36.07x	140461.00	-1.22			
A (OER)	I	2047-08-31T16:14:51.427	-60.66x	46.41x	136774.40	-1.23			
Encke (OEG)	I	2047-08-31T16:55:45.627	-51.86x	54.28x	133744.89	-1.24			
Encke (IEG)	I	2047-08-31T17:00:04.925	-50.93x	55.06x	133423.31	-1.24			
A (IER)	I	2047-08-31T19:31:04.958	-18.70x	66.48x	122050.38	-1.26			
B (OER)	I	2047-08-31T20:30:28.307	-6.58x	58.83x	117571.16	-1.25			
B (IER)	I	2047-09-01T03:47:14.948	31.71	-30.37	91984.69	-0.50			

No planet occultations

B (IER)	E	2047-09-01T09:03:26.364	-23.19x	-40.67	91984.69	0.51			
B (OER)	E	2047-09-01T15:52:35.602	-64.56x	41.75x	117571.16	1.45			
A (IER)	E	2047-09-01T16:42:51.281	-53.80x	51.70x	122050.38	1.51			
Encke (IEG)	E	2047-09-01T18:44:07.531	-27.74x	67.41x	133423.31	1.60			
Encke (OEG)	E	2047-09-01T18:47:28.524	-27.03x	67.50x	133744.89	1.60			
A (OER)	E	2047-09-01T19:18:55.374	-20.42x	66.94x	136774.40	1.61			
F ring	E	2047-09-01T19:57:01.167	-12.55x	63.41x	140461.00	1.61			

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T04:19:28.290  
 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 : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.667  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 34.57  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.653  
 C/A sky separation (km) : 88713.3  
 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



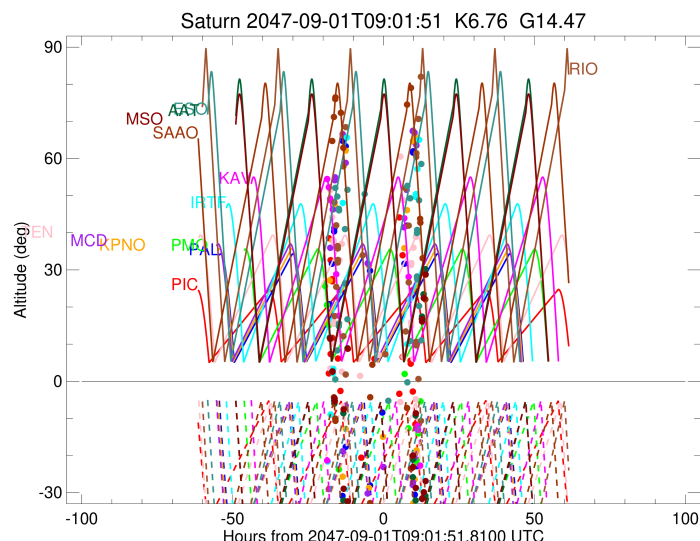
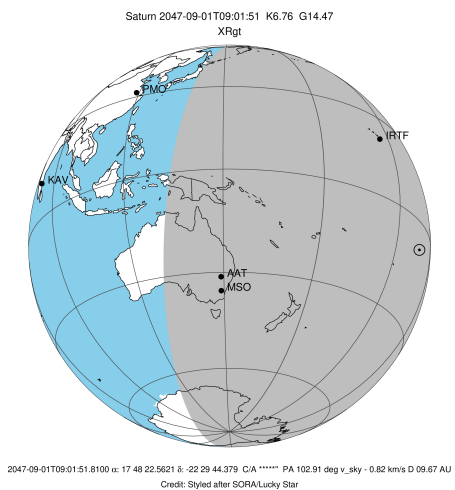
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T15:27:19.903		3.53x	51.41x	140461.00	-1.74		
A (OER)	I	2047-08-31T16:02:42.483		10.29	44.08x	136774.40	-1.74		
Encke (OEG)	I	2047-08-31T16:31:49.265		15.58	37.85x	133744.89	-1.73		
Encke (IEG)	I	2047-08-31T16:34:55.071		16.13	37.18x	133423.31	-1.73		
A (IER)	I	2047-08-31T18:26:32.031		32.70	12.67x	122050.38	-1.65		
B (OER)	I	2047-08-31T19:12:33.709		36.99	2.57x	117571.16	-1.59		
B (IER)	I	2047-09-01T01:19:06.363		1.24x	-53.38	91984.69	-0.61		

No planet occultations

B (IER)	E	2047-09-01T07:20:35.734		-76.37x	7.08x	91984.69	0.56		
B (OER)	E	2047-09-01T14:39:19.813		-5.28x	60.26x	117571.16	1.22		
A (IER)	E	2047-09-01T15:40:02.394		6.75	48.55x	122050.38	1.24		
Encke (IEG)	E	2047-09-01T18:12:08.396		31.47	15.61x	133423.31	1.24		
Encke (OEG)	E	2047-09-01T18:16:26.923		31.99	14.66x	133744.89	1.24		
A (OER)	E	2047-09-01T18:57:08.953		36.10	5.70x	136774.40	1.24		
F ring	E	2047-09-01T19:46:59.895		38.95	-5.15	140461.00	1.23		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T16:35:15.680  
 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 : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.675  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 35.79  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 13.375  
 C/A sky separation (km) : 93854.8  
 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

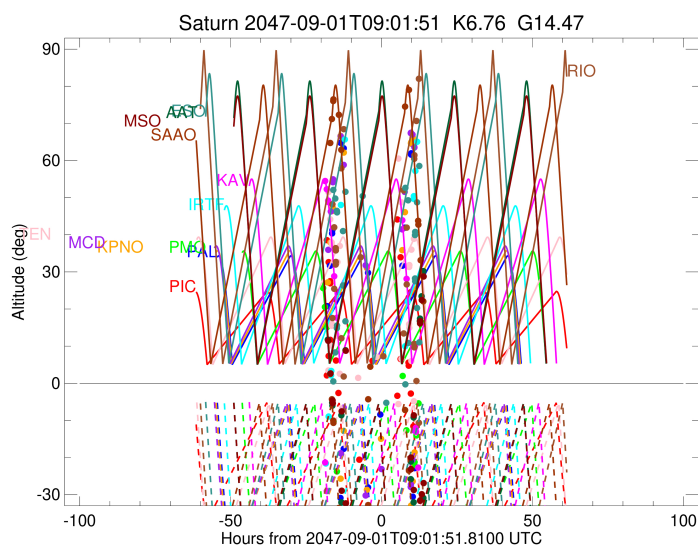
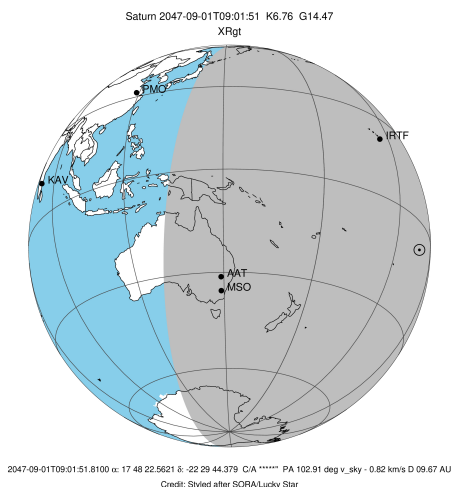


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T14:22:07.432		54.46	-21.43	140461.00	-1.90		
A (OER)	I	2047-08-31T14:54:58.446		52.22	-29.15	136774.40	-1.84		
Encke (OEG)	I	2047-08-31T15:22:53.120		49.15	-35.60	133744.89	-1.78		
Encke (IEG)	I	2047-08-31T15:25:54.215		48.76	-36.30	133423.31	-1.77		
A (IER)	I	2047-08-31T17:22:01.092		28.71	-60.62	122050.38	-1.48		
B (OER)	I	2047-08-31T18:14:58.017		17.67	-67.77	117571.16	-1.34		
No planet occultations									
B (OER)	E	2047-09-01T15:57:42.712		43.51	-43.70	117571.16	0.84		
A (IER)	E	2047-09-01T17:22:21.920		27.84	-60.99	122050.38	0.92		
Encke (IEG)	E	2047-09-01T20:25:27.406		-12.33x	-57.57	133423.31	1.16		
Encke (OEG)	E	2047-09-01T20:30:03.281		-13.39x	-56.68	133744.89	1.17		
A (OER)	E	2047-09-01T21:12:01.125		-23.04x	-47.99	136774.40	1.24		
F ring	E	2047-09-01T22:00:02.507		-34.15x	-37.26	140461.00	1.32		



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T05:46:27.230  
 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 : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.668  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 34.42  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.386  
 C/A sky separation (km) : 86849.0  
 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

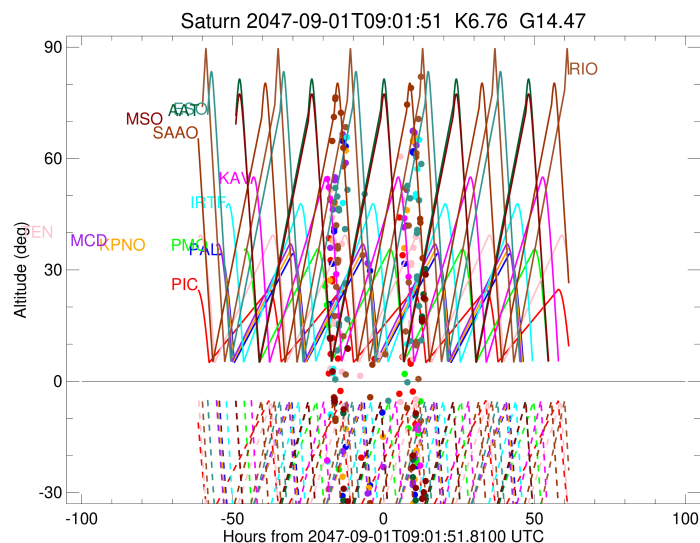
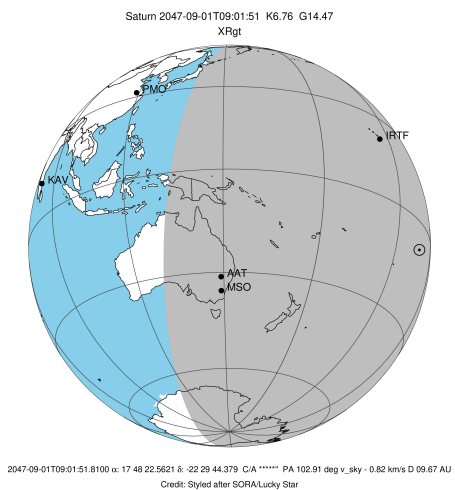


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T16:46:54.705		17.66	48.14x	140461.00	-1.72		
A (OER)	I	2047-08-31T17:22:26.873		25.55	41.92x	136774.40	-1.73		
Encke (OEG)	I	2047-08-31T17:51:35.532		32.08	36.31x	133744.89	-1.73		
Encke (IEG)	I	2047-08-31T17:54:41.214		32.78	35.70x	133423.31	-1.73		
A (IER)	I	2047-08-31T19:45:29.820		58.02	12.02x	122050.38	-1.67		
B (OER)	I	2047-08-31T20:30:44.346		68.44	1.83x	117571.16	-1.62		
B (IER)	I	2047-09-01T02:09:08.007		33.73	-72.15	91984.69	-0.78		

No planet occultations

B (IER)	E	2047-09-01T09:38:47.951		-44.38x	7.25x	91984.69	0.70		
B (OER)	E	2047-09-01T16:25:08.549		13.75	51.73x	117571.16	1.25		
A (IER)	E	2047-09-01T17:24:14.786		26.83	41.77x	122050.38	1.27		
Encke (IEG)	E	2047-09-01T19:53:22.458		60.74	10.34x	133423.31	1.26		
Encke (OEG)	E	2047-09-01T19:57:37.114		61.72	9.39x	133744.89	1.26		
A (OER)	E	2047-09-01T20:37:45.659		70.97	0.30x	136774.40	1.25		
F ring	E	2047-09-01T21:27:03.213		82.36	-10.98	140461.00	1.24		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T07:08:27.500  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.669  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 34.29  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.282  
 C/A sky separation (km) : 86130.2  
 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  
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 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk

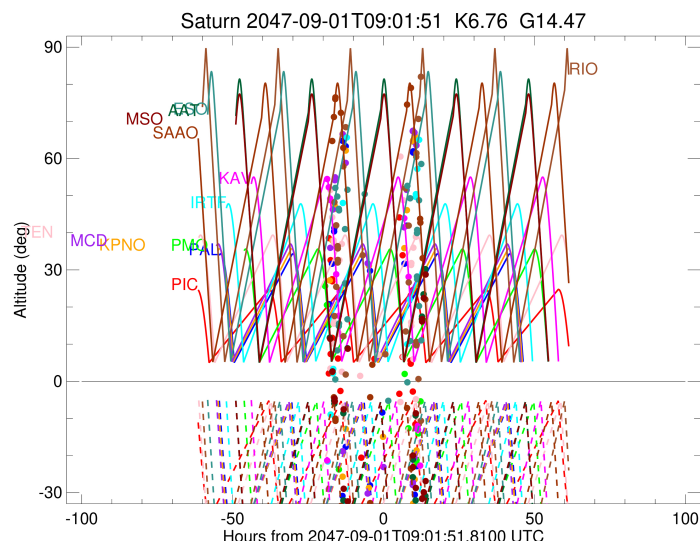
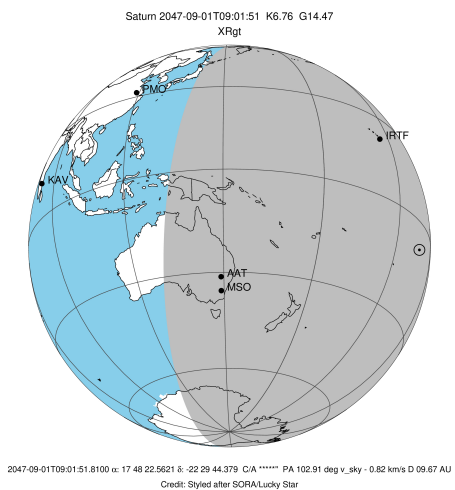


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T17:04:34.784	0.60x	52.07x	140461.00	-1.57			
A (OER)	I	2047-08-31T17:43:26.491	8.41	49.72x	136774.40	-1.59			
Encke (OEG)	I	2047-08-31T18:15:07.545	14.96	46.39x	133744.89	-1.60			
Encke (IEG)	I	2047-08-31T18:18:28.797	15.66	45.97x	133423.31	-1.60			
A (IER)	I	2047-08-31T20:17:16.477	41.12	26.25x	122050.38	-1.58			
B (OER)	I	2047-08-31T21:05:03.070	51.57	16.70x	117571.16	-1.54			
B (IER)	I	2047-09-01T02:48:26.525	50.25	-56.02	91984.69	-0.80			

No planet occultations

B (IER)	E	2047-09-01T10:37:04.526	-35.33x	-5.25	91984.69	0.75			
B (OER)	E	2047-09-01T16:57:33.749	-0.01x	52.62x	117571.16	1.35			
A (IER)	E	2047-09-01T17:52:12.814	11.02	49.21x	122050.38	1.38			
Encke (IEG)	E	2047-09-01T20:08:57.434	40.16	28.02x	133423.31	1.38			
Encke (OEG)	E	2047-09-01T20:12:49.696	41.01	27.27x	133744.89	1.38			
A (OER)	E	2047-09-01T20:49:24.099	49.00	20.03x	136774.40	1.38			
F ring	E	2047-09-01T21:34:15.093	58.82	10.76x	140461.00	1.36			

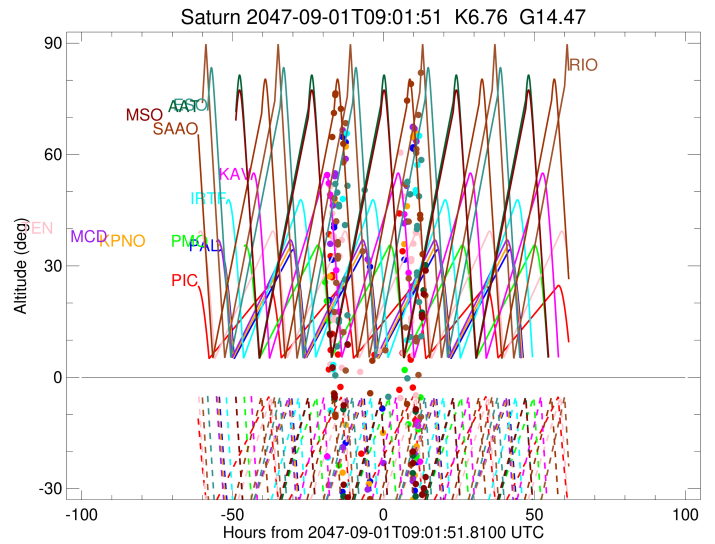
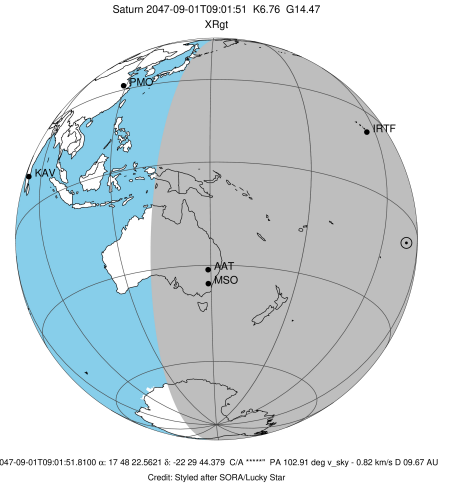
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T13:36:51.490  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.673  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 35.54  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.515  
 C/A sky separation (km) : 87799.2  
 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  
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 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	2047-08-31T15:14:47.530		11.65	-62.02	140461.00	-1.37		
A (OER)	I	2047-08-31T16:01:10.581		2.43x	-54.56	136774.40	-1.28		
Encke (OEG)	I	2047-08-31T16:41:50.881		-5.31x	-46.88	133744.89	-1.20		
Encke (IEG)	I	2047-08-31T16:46:18.716		-6.13x	-45.99	133423.31	-1.20		
A (IER)	I	2047-08-31T19:44:47.948		-32.17x	-8.42	122050.38	-0.95		
B (OER)	I	2047-08-31T21:06:52.893		-36.35x	8.87x	117571.16	-0.87		
No planet occultations									
B (OER)	E	2047-09-01T18:46:02.119		-26.06x	-20.74	117571.16	1.31		
A (IER)	E	2047-09-01T19:40:51.834		-32.17x	-9.00	122050.38	1.41		
Encke (IEG)	E	2047-09-01T21:45:13.890		-35.76x	16.95x	133423.31	1.62		
Encke (OEG)	E	2047-09-01T21:48:31.644		-35.63x	17.61x	133744.89	1.63		
A (OER)	E	2047-09-01T22:19:08.309		-33.94x	23.61x	136774.40	1.67		
F ring	E	2047-09-01T22:55:27.430		-30.80x	30.39x	140461.00	1.71		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T03:11:00.460  
 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 : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.667  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 35.30  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.972  
 C/A sky separation (km) : 90945.6  
 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



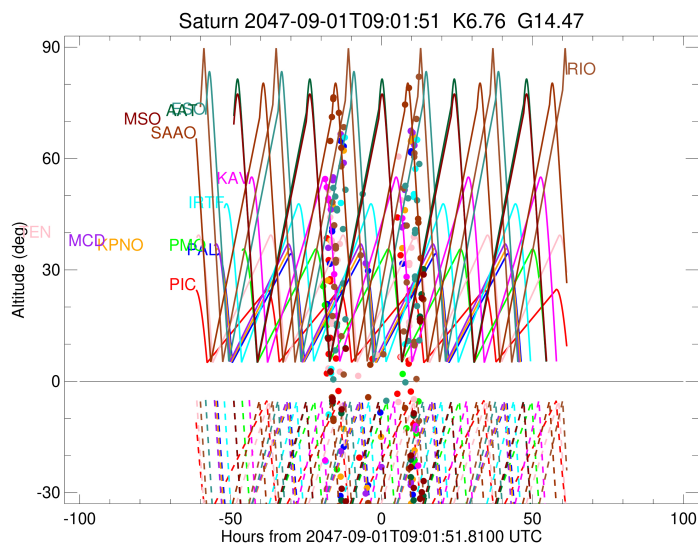
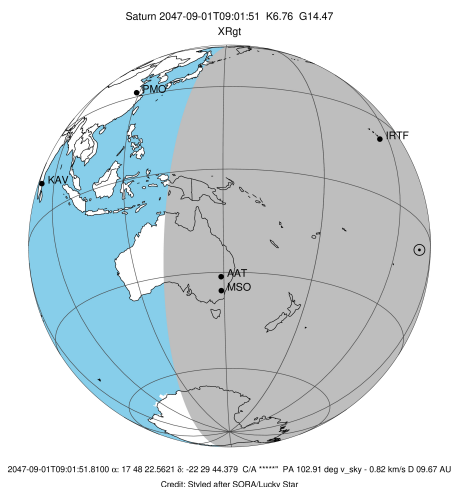
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2047-08-31T16:03:43.871		64.81	2.42x	140461.00	-1.90		
A (OER)	I	2047-08-31T16:36:23.640		71.27	-4.39x	136774.40	-1.86		
Encke (OEG)	I	2047-08-31T17:03:43.609		76.10	-10.14	133744.89	-1.83		
Encke (IEG)	I	2047-08-31T17:06:39.530		76.56	-10.76	133423.31	-1.83		
A (IER)	I	2047-08-31T18:55:41.217		72.22	-33.69	122050.38	-1.64		
B (OER)	I	2047-08-31T19:42:42.800		62.90	-43.22	117571.16	-1.53		
B (IER)	I	2047-09-01T05:18:36.256		-34.88x	4.30x	91989.26	-0.00		

No planet occultations

B (IER)	E	2047-09-01T04:23:40.723		-31.79x	-7.18	91989.15	0.00		
B (OER)	E	2047-09-01T16:52:29.367		74.90	-7.65	117571.16	0.96		
A (IER)	E	2047-09-01T18:08:57.100		78.90	-23.80	122050.38	0.99		
Encke (IEG)	E	2047-09-01T21:11:10.857		43.45	-58.75	133423.31	1.09		
Encke (OEG)	E	2047-09-01T21:16:04.617		42.41	-59.46	133744.89	1.10		
A (OER)	E	2047-09-01T22:01:25.800		32.83	-64.49	136774.40	1.13		
F ring	E	2047-09-01T22:54:38.729		21.74	-65.46	140461.00	1.18		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2047-09-01T13:34:13.340  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 4068973130657345280  
 2Mass ID (if available) : 17482257-2229442  
 ICRS Star Coord at Epoch: 17h 48m 22.56209s -22:29:44.37926s  
 RUWE (>1.4 is poor) : 0.92  
 K magnitude : 6.765  
 G magnitude : 14.471  
 RP magnitude : 12.719  
 BP magnitude : 18.568  
 DUPflag : 0  
 Distance (au) : 9.673  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -0.82  
 Sun-Target sep (deg) : 109.10  
 Sun-Moon sep (deg) : 35.54  
 B (ring opening deg) : 26.88  
 PA of pole (deg) : 5.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 12.526  
 C/A sky separation (km) : 87877.9  
 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	2047-08-31T15:23:20.939		11.34	-57.79	140461.00	-1.37		
A (OER)	I	2047-08-31T16:09:48.716		2.56x	-50.83	136774.40	-1.28		
Encke (OEG)	I	2047-08-31T16:50:26.123		-4.73x	-43.63	133744.89	-1.21		
Encke (IEG)	I	2047-08-31T16:54:53.201		-5.50x	-42.80	133423.31	-1.20		
A (IER)	I	2047-08-31T19:51:34.533		-29.02x	-7.40	122050.38	-0.96		
B (OER)	I	2047-08-31T21:12:04.180		-32.35x	8.75x	117571.16	-0.89		
No planet occultations									
B (OER)	E	2047-09-01T18:50:15.407		-23.32x	-19.66	117571.16	1.31		
A (IER)	E	2047-09-01T19:45:04.555		-28.82x	-8.45	122050.38	1.41		
Encke (IEG)	E	2047-09-01T21:49:47.727		-31.63x	16.31x	133423.31	1.62		
Encke (OEG)	E	2047-09-01T21:53:06.383		-31.50x	16.93x	133744.89	1.62		
A (OER)	E	2047-09-01T22:23:52.112		-29.82x	22.60x	136774.40	1.66		
F ring	E	2047-09-01T23:00:23.466		-26.78x	28.93x	140461.00	1.70		