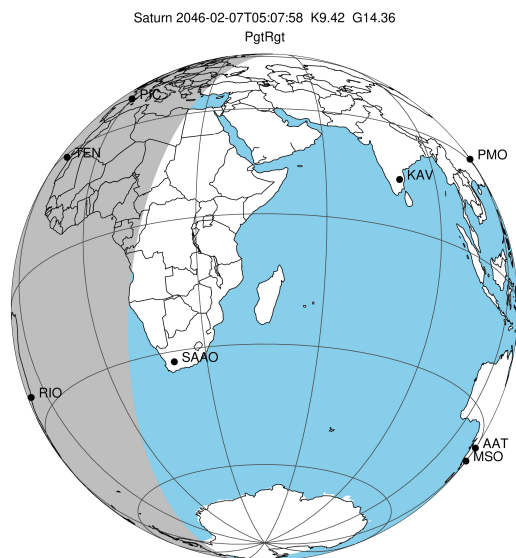


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-02-07T05:07:58.440  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4115004833408602496  
 2Mass ID (if available) : 17181919-2137491

Saturn 2046-02-07T05:07:58 K9.42 G14.36 PgtRgt

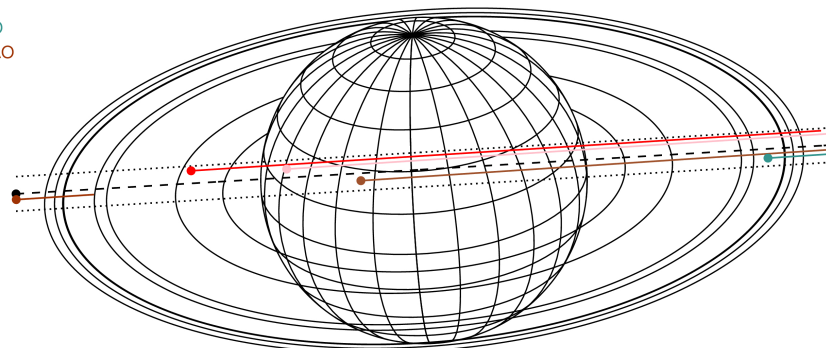
ICRS Star Coord at Epoch: 17h 18m 19.18729s -21:37:49.15865s

RUWE (>1.4 is poor) : 0.95  
 K magnitude : 9.420  
 G magnitude : 14.361  
 RP magnitude : 13.117  
 BP magnitude : 16.099  
 DUPflag : 0  
 Distance (au) : 10.519  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 25.54  
 Sun-Target sep (deg) : 57.63  
 Sun-Moon sep (deg) : 71.12  
 B (ring opening deg) : 26.62  
 PA of pole (deg) : 4.57



2046-02-07T05:07:58.4400 α: 17 18 19.1873 δ: -21 37 49.159 C/A 0.534° PA 183.42 deg v\_sky +25.54 km/s D 10.52 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PIC  
 TEN  
 RIO  
 ESO  
 SAAO

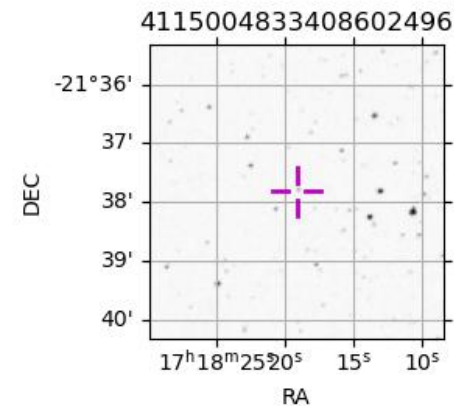


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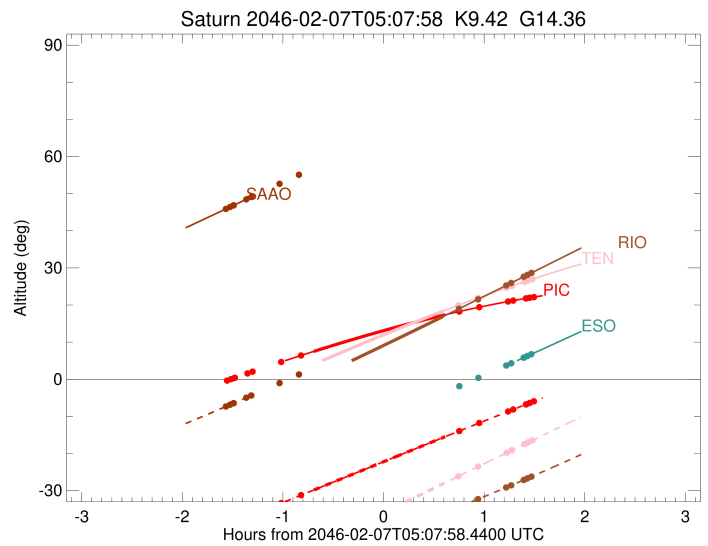
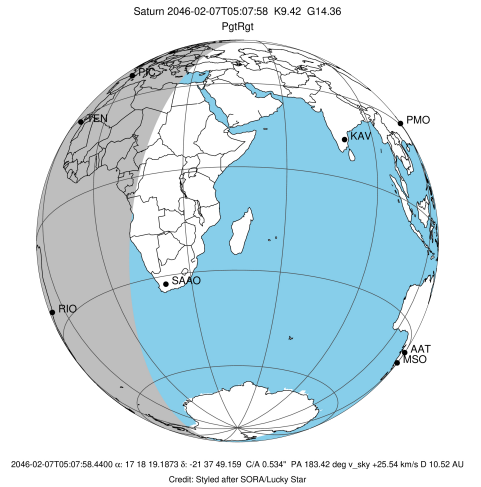
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

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	+	+	+	FEB 07 04:18 - FEB 07 06:37	PieRie
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		+	+	FEB 07 05:43 - FEB 07 06:36	PneRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observ	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8		+	+	FEB 07 05:43 - FEB 07 06:36	PneRne
ESO	European South	-29.3	289.3				FEB 07 06:31 - FEB 07 06:36	PnnRne
AAT	Siding Spring	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro	-32.4	20.8	+	+	+	FEB 07 03:34 - FEB 07 03:38	PnnRin
MSO	Mt. Stromlo Ob	-35.3	149.0					PnnRnn

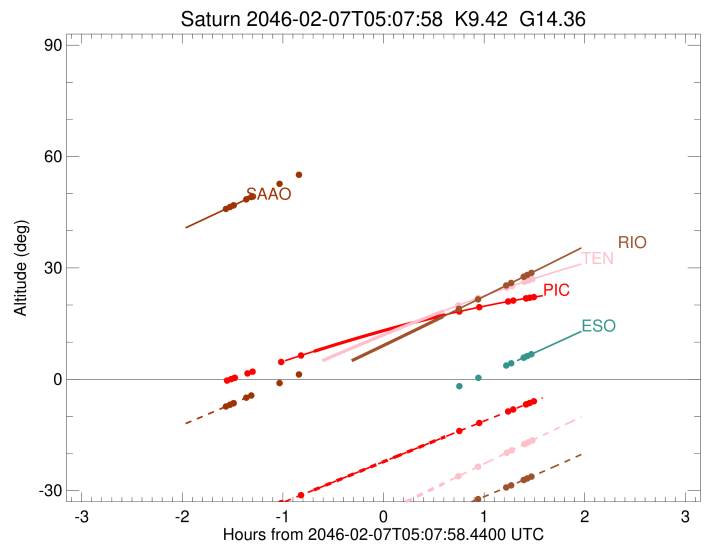
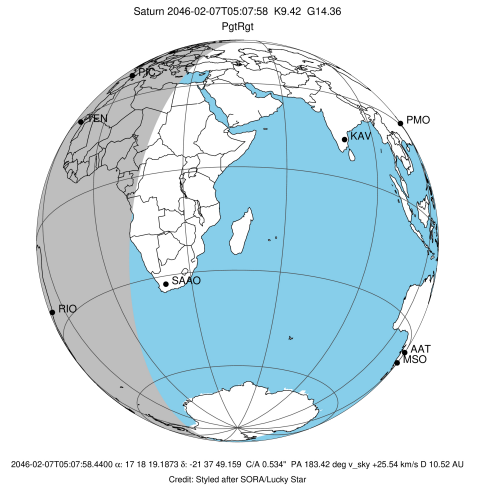


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-02-07T05:05:33.670  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 4115004833408602496  
 2Mass ID (if available) : 17181919-2137491  
 ICRS Star Coord at Epoch: 17h 18m 19.18729s -21:37:49.15865s  
 RUWE (>1.4 is poor) : 0.95  
 K magnitude : 9.420  
 G magnitude : 14.361  
 RP magnitude : 13.117  
 BP magnitude : 16.099  
 DUPflag : 0  
 Distance (au) : 10.519  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 25.54  
 Sun-Target sep (deg) : 57.63  
 Sun-Moon sep (deg) : 71.48  
 B (ring opening deg) : 26.62  
 PA of pole (deg) : 4.57  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.192  
 C/A sky separation (km) : 9094.0  
 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	2046-02-07T03:34:41.891	-0.35x	-39.13	140461.00	-25.19			
A (OER)	I	2046-02-07T03:37:08.298	0.04x	-38.70	136774.40	-25.17			
Encke (OEG)	I	2046-02-07T03:39:08.696	0.36x	-38.34	133744.89	-25.15			
Encke (IEG)	I	2046-02-07T03:39:21.480	0.40x	-38.31	133423.31	-25.15			
A (IER)	I	2046-02-07T03:46:54.263	1.58x	-36.97	122050.38	-25.08			
B (OER)	I	2046-02-07T03:49:52.970	2.05x	-36.44	117571.16	-25.05			
B (IER)	I	2046-02-07T04:06:59.531	4.66x	-33.36	91984.69	-24.77			
C (IER)	I	2046-02-07T04:18:50.404	6.41	-31.21	74490.58	-24.41			
Saturn	I	2046-02-07T04:26:23.455		7.50	-29.84	60235.85		8.53	10.44
Saturn	E	2046-02-07T05:44:49.456		17.38	-15.46	60246.58		6.96	8.52
C (IER)	E	2046-02-07T05:53:09.517		18.25	-13.94	74490.58	24.29		
B (IER)	E	2046-02-07T06:05:04.549		19.41	-11.78	91984.69	24.61		
B (OER)	E	2046-02-07T06:22:18.750		20.94	-8.67	117571.16	24.84		
A (IER)	E	2046-02-07T06:25:18.983		21.19	-8.14	122050.38	24.86		
Encke (IEG)	E	2046-02-07T06:32:55.883		21.79	-6.78	133423.31	24.92		
Encke (OEG)	E	2046-02-07T06:33:08.789		21.80	-6.74	133744.89	24.92		
A (OER)	E	2046-02-07T06:35:10.346		21.96	-6.38	136774.40	24.93		
F ring	E	2046-02-07T06:37:38.197		22.14	-5.94	140461.00	24.94		

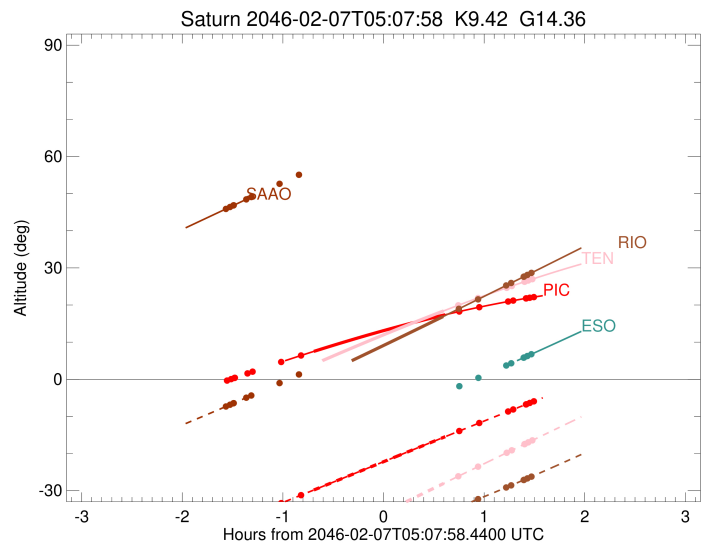
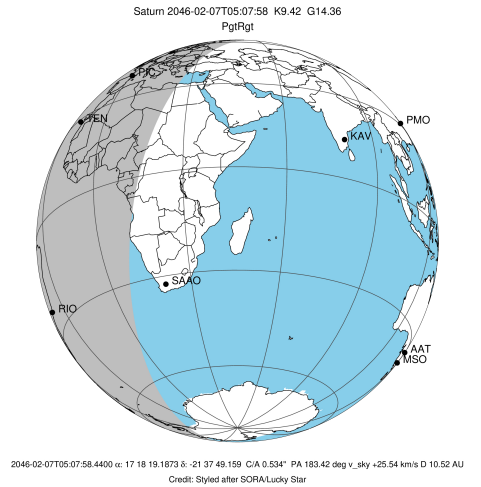
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-02-07T05:04:32.650  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 4115004833408602496  
 2Mass ID (if available) : 17181919-2137491  
 ICRS Star Coord at Epoch: 17h 18m 19.18729s -21:37:49.15865s  
 RUWE (>1.4 is poor) : 0.95  
 K magnitude : 9.420  
 G magnitude : 14.361  
 RP magnitude : 13.117  
 BP magnitude : 16.099  
 DUPflag : 0  
 Distance (au) : 10.519  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 25.54  
 Sun-Target sep (deg) : 57.63  
 Sun-Moon sep (deg) : 71.53  
 B (ring opening deg) : 26.62  
 PA of pole (deg) : 4.57  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.986  
 C/A sky separation (km) : 7524.7  
 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	2046-02-07T03:33:33.027	-6.65x	-56.55	140461.00	-25.37			
A (OER)	I	2046-02-07T03:35:58.383	-6.15x	-56.04	136774.40	-25.35			
Encke (OEG)	I	2046-02-07T03:37:57.900	-5.74x	-55.61	133744.89	-25.34			
Encke (IEG)	I	2046-02-07T03:38:10.590	-5.70x	-55.57	133423.31	-25.34			
A (IER)	I	2046-02-07T03:45:39.889	-4.16x	-53.96	122050.38	-25.28			
B (OER)	I	2046-02-07T03:48:37.136	-3.56x	-53.33	117571.17	-25.26			
B (IER)	I	2046-02-07T04:05:33.866	-0.13x	-49.66	91984.69	-25.05			
C (IER)	I	2046-02-07T04:17:15.429	2.20x	-47.11	74490.58	-24.80			
Saturn	I	2046-02-07T04:25:19.352	3.80x	-45.35	60245.62			7.11	8.71
Saturn	E	2046-02-07T05:43:53.299	18.43	-28.05	60253.60			5.70	6.99
C (IER)	E	2046-02-07T05:52:33.675	19.92	-26.14	74490.58	24.62			
B (IER)	E	2046-02-07T06:04:20.935	21.89	-23.55	91984.69	24.83			
B (OER)	E	2046-02-07T06:21:28.113	24.65	-19.80	117571.17	24.97			
A (IER)	E	2046-02-07T06:24:27.444	25.11	-19.14	122050.38	24.98			
Encke (IEG)	E	2046-02-07T06:32:02.371	26.27	-17.49	133423.31	25.01			
Encke (OEG)	E	2046-02-07T06:32:15.227	26.30	-17.44	133744.89	25.01			
A (OER)	E	2046-02-07T06:34:16.327	26.61	-17.00	136774.40	25.02			
F ring	E	2046-02-07T06:36:43.657	26.97	-16.46	140461.00	25.03			

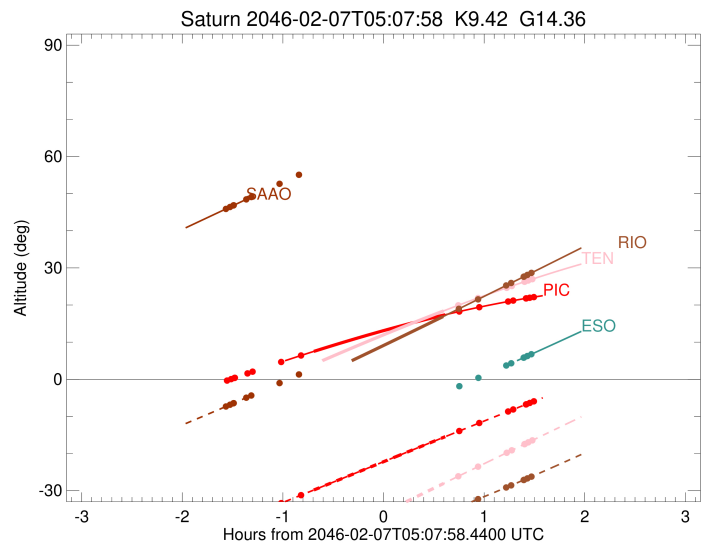
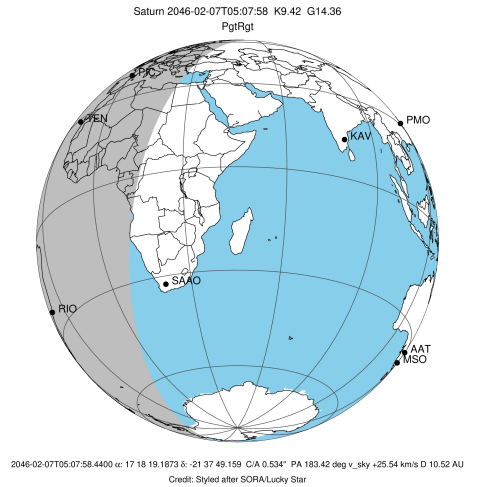
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-02-07T05:04:13.180  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 4115004833408602496  
 2Mass ID (if available) : 17181919-2137491  
 ICRS Star Coord at Epoch: 17h 18m 19.18729s -21:37:49.15865s  
 RUWE (>1.4 is poor) : 0.95  
 K magnitude : 9.420  
 G magnitude : 14.361  
 RP magnitude : 13.117  
 BP magnitude : 16.099  
 DUPflag : 0  
 Distance (au) : 10.519  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 25.54  
 Sun-Target sep (deg) : 57.63  
 Sun-Moon sep (deg) : 71.51  
 B (ring opening deg) : 26.62  
 PA of pole (deg) : 4.57  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.192  
 C/A sky separation (km) : 1465.0  
 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\_itr93\_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	2046-02-07T03:33:03.794	-10.88x	-51.43	140461.00	-25.74			
A (OER)	I	2046-02-07T03:35:27.018	-10.40x	-51.33	136774.40	-25.74			
Encke (OEG)	I	2046-02-07T03:37:24.737	-10.00x	-51.24	133744.89	-25.73			
Encke (IEG)	I	2046-02-07T03:37:37.234	-9.96x	-51.23	133423.31	-25.73			
A (IER)	I	2046-02-07T03:44:59.353	-8.46x	-50.84	122050.38	-25.71			
B (OER)	I	2046-02-07T03:47:53.566	-7.86x	-50.67	117571.16	-25.71			
B (IER)	I	2046-02-07T04:04:29.689	-4.43x	-49.44	91984.69	-25.66			
C (IER)	I	2046-02-07T04:15:51.848	-2.05x	-48.39	74490.58	-25.63			
Saturn	I	2046-02-07T04:24:58.867	-0.13x	-47.44	60266.34		1.93	2.37	
Saturn	E	2046-02-07T05:43:35.465	16.91	-36.01	60267.86		0.57	0.70	
C (IER)	E	2046-02-07T05:52:52.686	18.97	-34.37	74490.58	25.41			
B (IER)	E	2046-02-07T06:04:21.172	21.52	-32.29	91984.69	25.40			
B (OER)	E	2046-02-07T06:21:08.889	25.28	-29.14	117571.16	25.38			
A (IER)	E	2046-02-07T06:24:05.414	25.94	-28.58	122050.38	25.37			
Encke (IEG)	E	2046-02-07T06:31:33.779	27.61	-27.14	133423.31	25.36			
Encke (OEG)	E	2046-02-07T06:31:46.460	27.66	-27.10	133744.89	25.36			
A (OER)	E	2046-02-07T06:33:45.937	28.11	-26.71	136774.40	25.35			
F ring	E	2046-02-07T06:36:11.350	28.65	-26.23	140461.00	25.35			

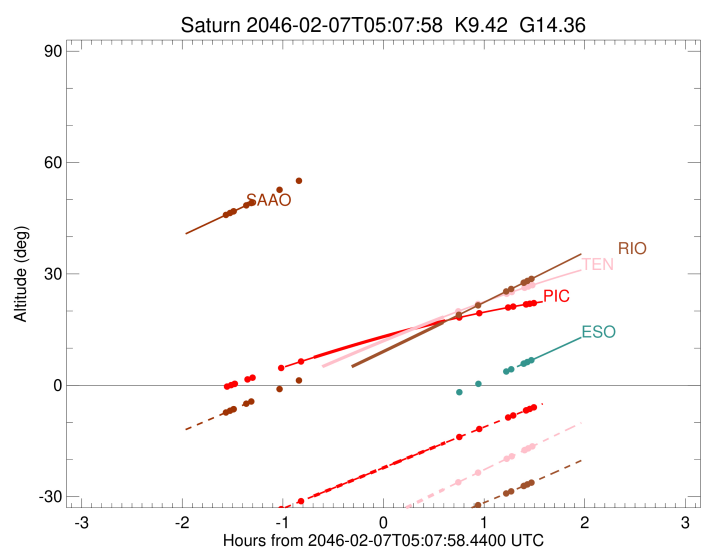
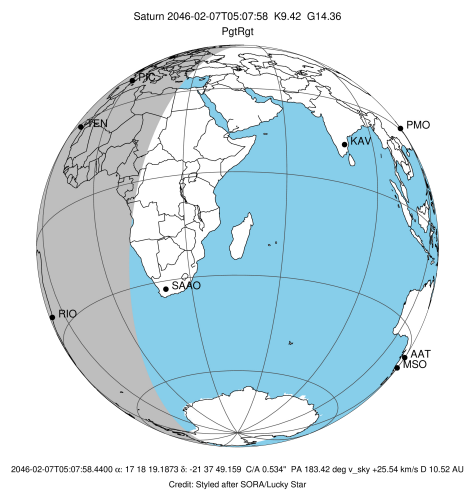
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-02-07T05:04:53.080  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 4115004833408602496  
 2Mass ID (if available) : 17181919-2137491  
 ICRS Star Coord at Epoch: 17h 18m 19.18729s -21:37:49.15865s  
 RUWE (>1.4 is poor) : 0.95  
 K magnitude : 9.420  
 G magnitude : 14.361  
 RP magnitude : 13.117  
 BP magnitude : 16.099  
 DUPflag : 0  
 Distance (au) : 10.519  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 25.54  
 Sun-Target sep (deg) : 57.63  
 Sun-Moon sep (deg) : 71.18  
 B (ring opening deg) : 26.62  
 PA of pole (deg) : 4.57  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.007  
 C/A sky separation (km) : 50.2  
 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	2046-02-07T03:34:14.597	-26.24x	-41.35	140461.00	-25.89			
A (OER)	I	2046-02-07T03:36:36.978	-25.90x	-41.58	136774.40	-25.89			
Encke (OEG)	I	2046-02-07T03:38:33.996	-25.61x	-41.77	133744.89	-25.89			
Encke (IEG)	I	2046-02-07T03:38:46.418	-25.58x	-41.79	133423.31	-25.89			
A (IER)	I	2046-02-07T03:46:05.842	-24.48x	-42.45	122050.38	-25.88			
B (OER)	I	2046-02-07T03:48:58.964	-24.03x	-42.70	117571.16	-25.87			
B (IER)	I	2046-02-07T04:05:28.526	-21.43x	-43.93	91984.69	-25.84			
C (IER)	I	2046-02-07T04:16:45.805	-19.57x	-44.59	74490.58	-25.82			
Saturn	I	2046-02-07T04:25:54.216	-18.02x	-45.01	60267.75			0.76	0.93
Saturn	E	2046-02-07T05:43:58.572	-3.67x	-44.22	60267.74			-0.75	-0.93
C (IER)	E	2046-02-07T05:53:10.299	-1.87x	-43.62	74490.58	25.64			
B (IER)	E	2046-02-07T06:04:32.927	0.37x	-42.75	91984.69	25.62			
B (OER)	E	2046-02-07T06:21:12.298	3.71x	-41.21	117571.16	25.59			
A (IER)	E	2046-02-07T06:24:07.378	4.30x	-40.91	122050.38	25.58			
Encke (IEG)	E	2046-02-07T06:31:32.088	5.81	-40.12	133423.31	25.57			
Encke (OEG)	E	2046-02-07T06:31:44.666	5.85	-40.10	133744.89	25.57			
A (OER)	E	2046-02-07T06:33:43.173	6.25	-39.88	136774.40	25.56			
F ring	E	2046-02-07T06:36:07.408	6.74	-39.61	140461.00	25.56			

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2046-02-07T05:06:30.880  
 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 : 4115004833408602496  
 2Mass ID (if available) : 17181919-2137491  
 ICRS Star Coord at Epoch: 17h 18m 19.18729s -21:37:49.15865s  
 RUWE (>1.4 is poor) : 0.95  
 K magnitude : 9.420  
 G magnitude : 14.361  
 RP magnitude : 13.117  
 BP magnitude : 16.099  
 DUPflag : 0  
 Distance (au) : 10.519  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 25.54  
 Sun-Target sep (deg) : 57.63  
 Sun-Moon sep (deg) : 72.00  
 B (ring opening deg) : 26.62  
 PA of pole (deg) : 4.57  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.340  
 C/A sky separation (km) : 2593.1  
 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\_itr93\_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	2046-02-07T03:34:01.722		45.89	-7.33	140461.00	-25.30		
A (OER)	I	2046-02-07T03:36:27.463		46.40	-6.86	136774.40	-25.29		
Encke (OEG)	I	2046-02-07T03:38:27.251		46.83	-6.47	133744.89	-25.29		
Encke (IEG)	I	2046-02-07T03:38:39.967		46.87	-6.43	133423.31	-25.29		
A (IER)	I	2046-02-07T03:46:09.854		48.46	-4.96x	122050.38	-25.27		
B (OER)	I	2046-02-07T03:49:07.127		49.09	-4.38x	117571.16	-25.26		
B (IER)	I	2046-02-07T04:06:00.805		52.66	-1.02x	91984.69	-25.22		
C (IER)	I	2046-02-07T04:17:35.175		55.09	1.30x	74490.58	-25.17		
Saturn	I	2046-02-07T04:26:42.613		57.00	3.15x	60263.96		3.02	3.70
Saturn	E	2046-02-07T05:46:23.359		72.79	19.67x	60267.19		1.35	1.66
C (IER)	E	2046-02-07T05:55:46.084		74.39	21.64x	74490.58	25.07		
B (IER)	E	2046-02-07T06:07:23.599		76.19	24.09x	91984.69	25.09		
B (OER)	E	2046-02-07T06:24:23.044		78.28	27.68x	117571.16	25.10		
A (IER)	E	2046-02-07T06:27:21.467		78.55	28.31x	122050.38	25.11		
Encke (IEG)	E	2046-02-07T06:34:54.461		79.10	29.90x	133423.31	25.11		
Encke (OEG)	E	2046-02-07T06:35:07.269		79.12	29.95x	133744.89	25.11		
A (OER)	E	2046-02-07T06:37:07.931		79.22	30.38x	136774.40	25.11		
F ring	E	2046-02-07T06:39:34.761		79.32	30.89x	140461.00	25.11		