

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-08-15T01:45:15.010  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 4079192094788578176  
 2Mass ID (if available) : 18402521-2238032

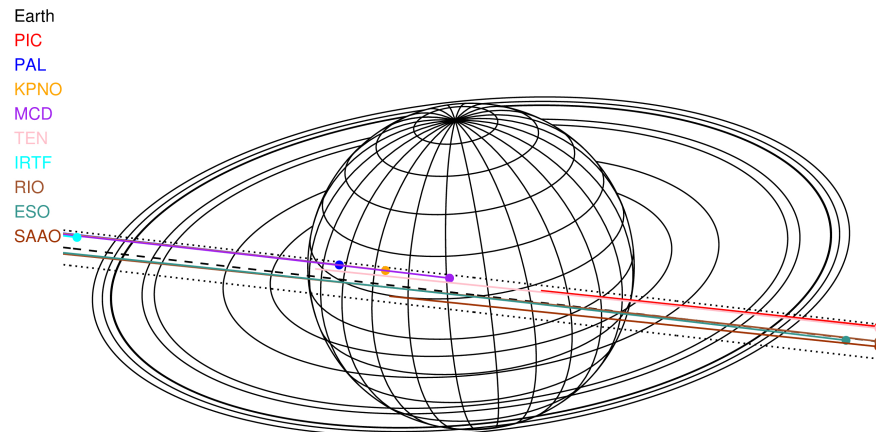
Saturn 2048-08-15T01:45:15 K9.55 G13.87 PgtRgt

ICRS Star Coord at Epoch: 18h 40m 25.18730s -22:38:03.53427s

RUWE (>1.4 is poor) : 1.11  
 K magnitude : 9.552  
 G magnitude : 13.875  
 RP magnitude : 12.684  
 BP magnitude : 15.379  
 DUPflag : 0  
 Distance (au) : 9.269  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -12.21  
 Sun-Target sep (deg) : 137.06  
 Sun-Moon sep (deg) : 72.29  
 B (ring opening deg) : 25.81  
 PA of pole (deg) : 6.22



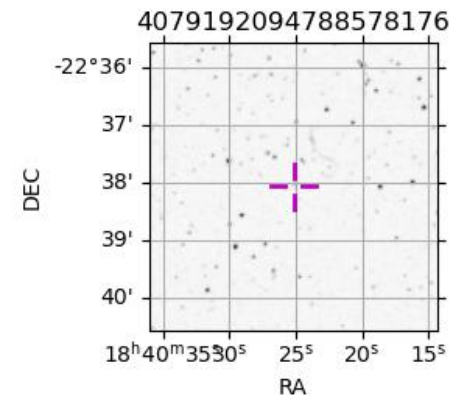
2048-08-15T01:45:15.0100 at: 18 40 25.1873 s: -22 38 03.534 C/A 1.531° PA 353.41 deg v\_sky -12.21 km/s D 09.27 AU  
 Credit: Styled after SORA/Lucky Star



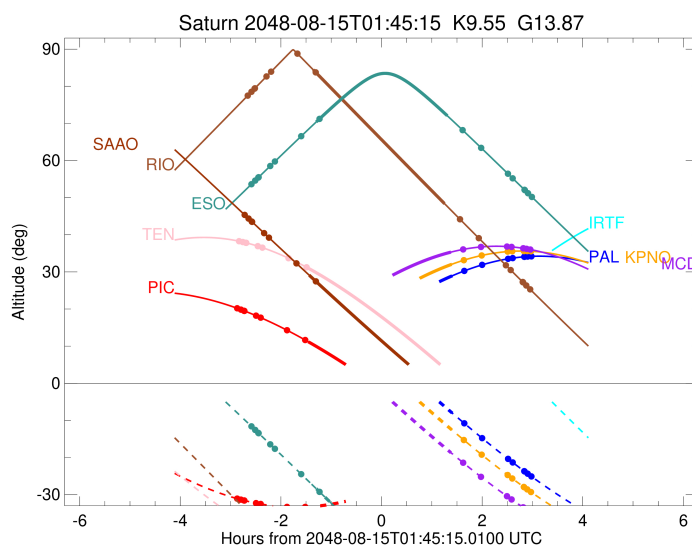
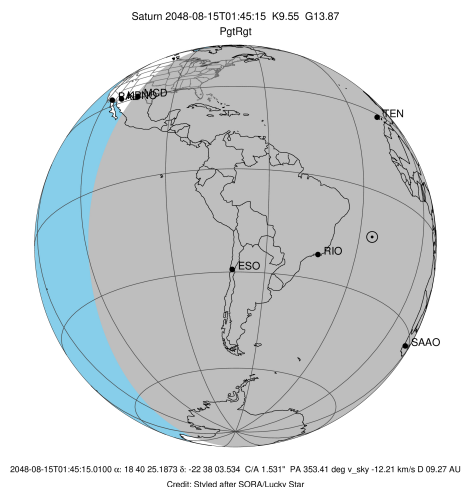
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

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	OEncode
PIC	Pic du Midi	42.9	0.1	+	+	+	AUG 14 22:53 - AUG 15 00:18	PinRin
PAL	Palomar Mt (20	33.4	243.1	+	+	+	AUG 15 03:09 - AUG 15 04:43	PneRne
PMO	Purple Mtn Obs	32.1	118.8	+	+	+		PnnRnn
KPNO	Kitt Peak Natl	32.0	248.4	+	+	+	AUG 15 03:09 - AUG 15 04:43	PneRne
MCD	McDonald Obs.	30.7	256.0	+	+	+	AUG 15 03:08 - AUG 15 04:42	PneRne
TEN	Teide Obs./Ten	28.3	343.5	+	+	+	AUG 14 22:55 - AUG 15 00:18	PinRin
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	+	+	+	AUG 14 23:05 - AUG 15 04:42	PieRie
ESO	European South	-29.3	289.3	+	+	+	AUG 14 23:10 - AUG 15 04:44	PieRie
AAT	Siding Spring	-31.3	149.1	+	+	+		PnnRnn
SAAO	So. Afr. Astro	-32.4	20.8	+	+	+	AUG 14 23:02 - AUG 15 00:18	PinRin
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+		PnnRnn



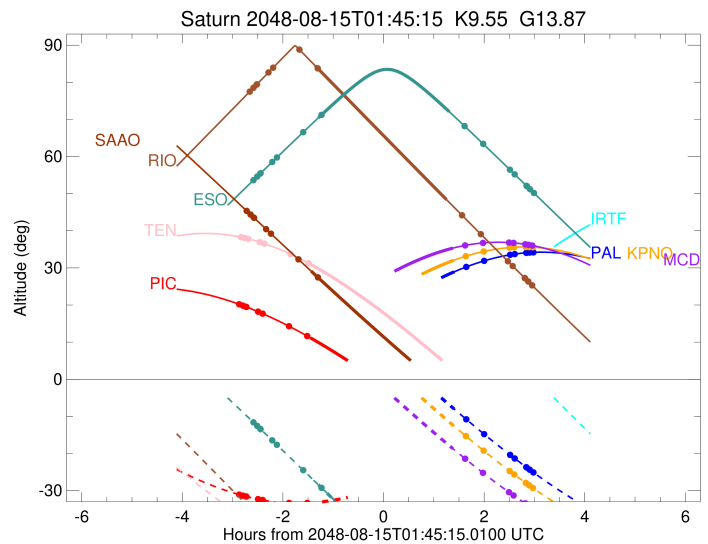
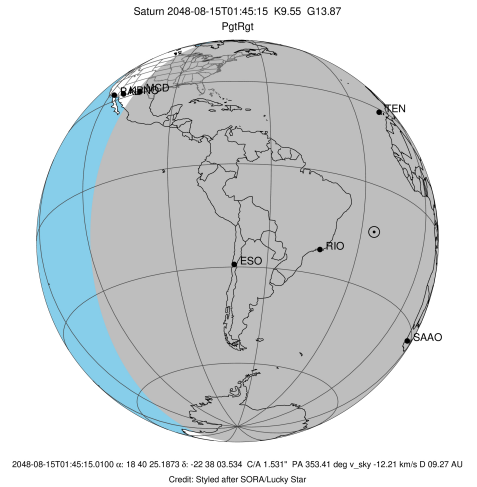
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-08-15T01:38:30.780  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 4079192094788578176  
 2Mass ID (if available) : 18402521-2238032  
 ICRS Star Coord at Epoch: 18h 40m 25.18730s -22:38:03.53427s  
 RUWE (>1.4 is poor) : 1.11  
 K magnitude : 9.552  
 G magnitude : 13.875  
 RP magnitude : 12.684  
 BP magnitude : 15.379  
 DUPflag : 0  
 Distance (au) : 9.269  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -12.21  
 Sun-Target sep (deg) : 137.06  
 Sun-Moon sep (deg) : 72.50  
 B (ring opening deg) : 25.81  
 PA of pole (deg) : 6.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.919  
 C/A sky separation (km) : 6180.3  
 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	2048-08-14T22:53:13.243		20.20	-31.08	140461.00	-13.67		
A (OER)	I	2048-08-14T22:57:43.048		19.83	-31.36	136774.40	-13.66		
Encke (OEG)	I	2048-08-14T23:01:24.910		19.51	-31.57	133744.89	-13.65		
Encke (IEG)	I	2048-08-14T23:01:48.469		19.48	-31.59	133423.31	-13.65		
A (IER)	I	2048-08-14T23:15:42.675		18.21	-32.29	122050.38	-13.62		
B (OER)	I	2048-08-14T23:21:11.821		17.67	-32.52	117571.16	-13.60		
B (IER)	I	2048-08-14T23:52:39.868		14.28	-33.31	91984.69	-13.50		
C (IER)	I	2048-08-15T00:14:21.248		11.64	-33.32	74490.58	-13.38		
Saturn	I	2048-08-15T00:18:00.752		11.17	-33.28	60162.37		-16.21	-19.63
Saturn	E	2048-08-15T03:00:00.473		-14.09x	-20.49	60254.91		5.63	6.91
C (IER)	E	2048-08-15T03:16:12.581		-16.95x	-18.29	74490.58	13.06		
B (IER)	E	2048-08-15T03:38:29.824		-20.93x	-15.07	91984.69	13.10		
B (OER)	E	2048-08-15T04:11:03.095		-26.85x	-10.05	117571.16	13.10		
A (IER)	E	2048-08-15T04:16:45.139		-27.89x	-9.14	122050.38	13.09		
Encke (IEG)	E	2048-08-15T04:31:13.984		-30.55x	-6.78	133423.31	13.08		
Encke (OEG)	E	2048-08-15T04:31:38.561		-30.62x	-6.71	133744.89	13.08		
A (OER)	E	2048-08-15T04:35:30.116		-31.33x	-6.07	136774.40	13.08		
F ring	E	2048-08-15T04:40:11.962		-32.20x	-5.29	140461.00	13.08		

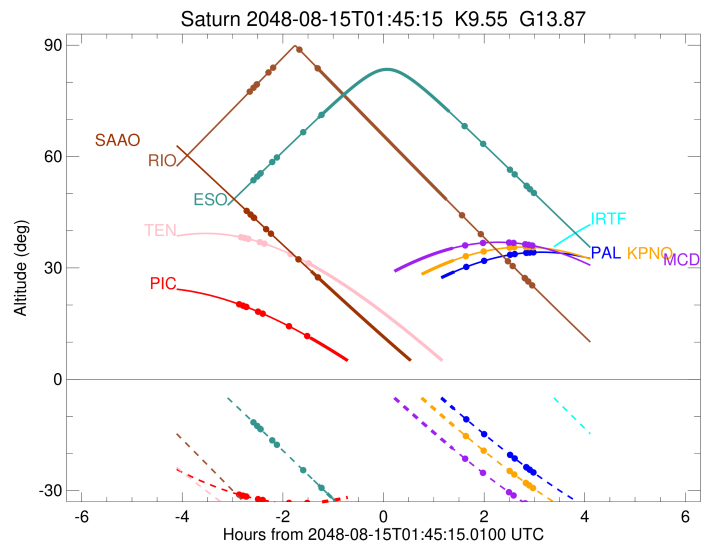
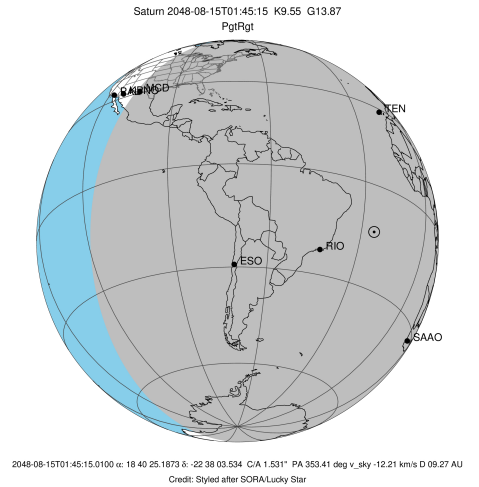
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-08-15T01:49:44.430  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4079192094788578176  
 2Mass ID (if available) : 18402521-2238032  
 ICRS Star Coord at Epoch: 18h 40m 25.18730s -22:38:03.53427s  
 RUWE (>1.4 is poor) : 1.11  
 K magnitude : 9.552  
 G magnitude : 13.875  
 RP magnitude : 12.684  
 BP magnitude : 15.379  
 DUPflag : 0  
 Distance (au) : 9.269  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -12.21  
 Sun-Target sep (deg) : 137.06  
 Sun-Moon sep (deg) : 72.44  
 B (ring opening deg) : 25.81  
 PA of pole (deg) : 6.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.777  
 C/A sky separation (km) : 5220.8  
 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

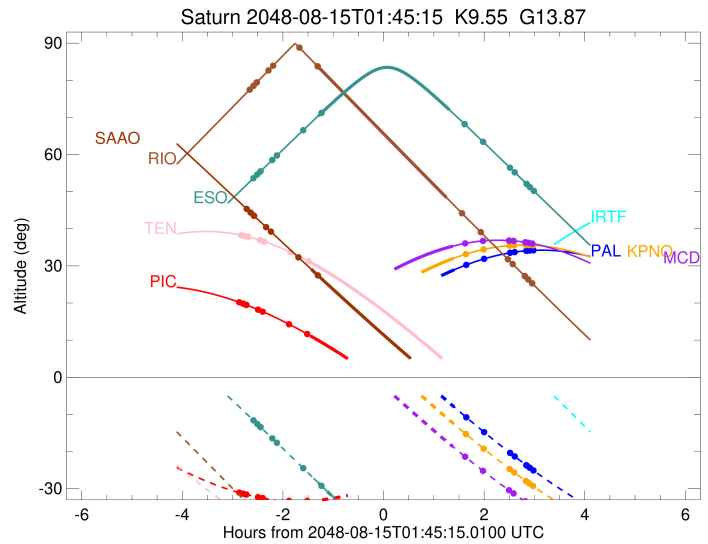
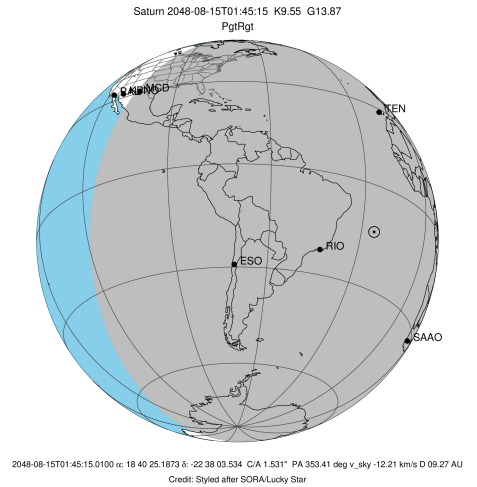
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-08-14T23:05:21.367	-10.00x	42.15x	140461.00	-13.60			
A (OER)	I	2048-08-14T23:09:52.347	-9.12x	41.23x	136774.40	-13.61			
Encke (OEG)	I	2048-08-14T23:13:34.971	-8.39x	40.46x	133744.89	-13.61			
Encke (IEG)	I	2048-08-14T23:13:58.599	-8.32x	40.38x	133423.31	-13.61			
A (IER)	I	2048-08-14T23:27:53.920	-5.62x	37.50x	122050.38	-13.62			
B (OER)	I	2048-08-14T23:33:22.768	-4.56x	36.37x	117571.16	-13.62			
B (IER)	I	2048-08-15T00:04:40.732	1.33x	29.84x	91984.69	-13.62			
C (IER)	I	2048-08-15T00:26:06.222	5.23	25.35x	74490.58	-13.59			
Saturn	I	2048-08-15T00:29:31.238	5.84	24.64x	60160.84	-16.33		-19.77	
Saturn	E	2048-08-15T03:09:36.397	28.95	-8.03	60246.50	7.23		8.86	
C (IER)	E	2048-08-15T03:23:55.027	30.26	-10.77	74490.58	13.68			
B (IER)	E	2048-08-15T03:45:11.643	31.89	-14.77	91984.69	13.72			
B (OER)	E	2048-08-15T04:16:13.941	33.53	-20.37	117571.16	13.75			
A (IER)	E	2048-08-15T04:21:39.728	33.72	-21.32	122050.38	13.75			
Encke (IEG)	E	2048-08-15T04:35:26.874	34.07	-23.67	133423.31	13.75			
Encke (OEG)	E	2048-08-15T04:35:50.263	34.07	-23.73	133744.89	13.75			
A (OER)	E	2048-08-15T04:39:30.611	34.13	-24.35	136774.40	13.75			
F ring	E	2048-08-15T04:43:58.770	34.19	-25.09	140461.00	13.75			

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-08-15T01:49:19.850  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : 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 : 4079192094788578176  
 2Mass ID (if available) : 18402521-2238032  
 ICRS Star Coord at Epoch: 18h 40m 25.18730s -22:38:03.53427s  
 RUWE (>1.4 is poor) : 1.11  
 K magnitude : 9.552  
 G magnitude : 13.875  
 RP magnitude : 12.684  
 BP magnitude : 15.379  
 DUPflag : 0  
 Distance (au) : 9.269  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -12.21  
 Sun-Target sep (deg) : 137.06  
 Sun-Moon sep (deg) : 72.51  
 B (ring opening deg) : 25.81  
 PA of pole (deg) : 6.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.777  
 C/A sky separation (km) : 5224.8  
 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



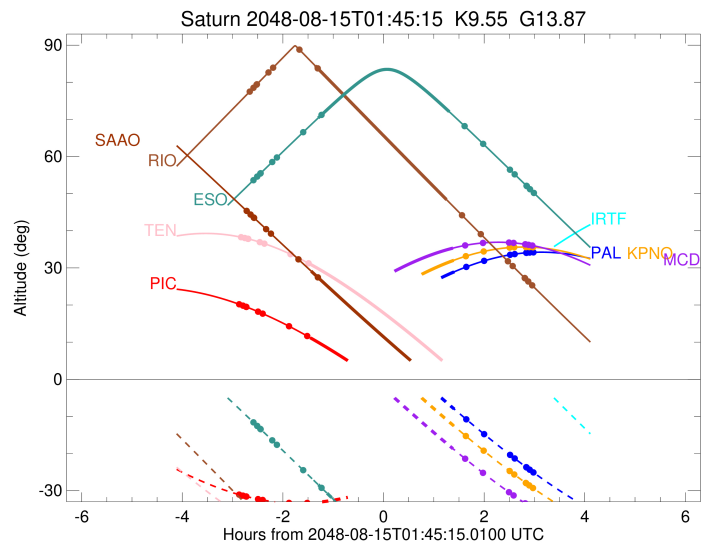
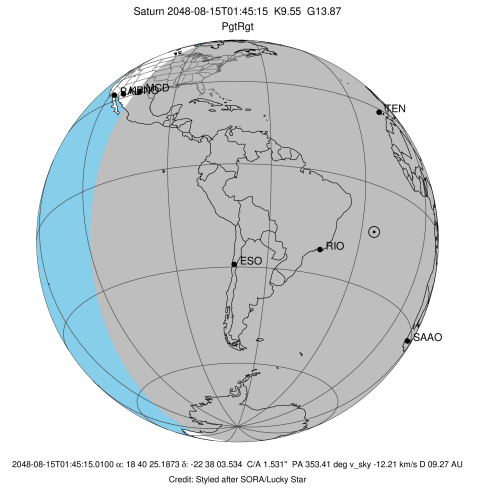
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-08-14T23:05:17.908	-5.38x	38.01x	140461.00	-13.64			
A (OER)	I	2048-08-14T23:09:48.149	-4.50x	37.06x	136774.40	-13.64			
Encke (OEG)	I	2048-08-14T23:13:30.170	-3.78x	36.28x	133744.89	-13.65			
Encke (IEG)	I	2048-08-14T23:13:53.735	-3.70x	36.20x	133423.31	-13.65			
A (IER)	I	2048-08-14T23:27:46.831	-1.03x	33.26x	122050.38	-13.66			
B (OER)	I	2048-08-14T23:33:14.820	0.02x	32.10x	117571.16	-13.66			
B (IER)	I	2048-08-15T00:04:28.087	5.84	25.46x	91984.69	-13.65			
C (IER)	I	2048-08-15T00:25:50.600	9.67	20.92x	74490.58	-13.62			
Saturn	I	2048-08-15T00:29:18.667	10.27	20.18x	60161.33			-16.29	-19.72
Saturn	E	2048-08-15T03:09:02.963	32.05	-12.54	60246.83			7.17	8.79
C (IER)	E	2048-08-15T03:23:23.875	33.15	-15.28	74490.58	13.68			
B (IER)	E	2048-08-15T03:44:40.090	34.42	-19.22	91984.69	13.73			
B (OER)	E	2048-08-15T04:15:42.362	35.47	-24.72	117571.16	13.75			
A (IER)	E	2048-08-15T04:21:08.214	35.56	-25.64	122050.38	13.75			
Encke (IEG)	E	2048-08-15T04:34:55.618	35.62	-27.92	133423.31	13.74			
Encke (OEG)	E	2048-08-15T04:35:19.016	35.62	-27.98	133744.89	13.74			
A (OER)	E	2048-08-15T04:38:59.456	35.60	-28.58	136774.40	13.74			
F ring	E	2048-08-15T04:43:27.740	35.56	-29.29	140461.00	13.74			

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-08-15T01:48:36.580  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : 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 : 4079192094788578176  
 2Mass ID (if available) : 18402521-2238032  
 ICRS Star Coord at Epoch: 18h 40m 25.18730s -22:38:03.53427s  
 RUWE (>1.4 is poor) : 1.11  
 K magnitude : 9.552  
 G magnitude : 13.875  
 RP magnitude : 12.684  
 BP magnitude : 15.379  
 DUPflag : 0  
 Distance (au) : 9.269  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -12.21  
 Sun-Target sep (deg) : 137.06  
 Sun-Moon sep (deg) : 72.61  
 B (ring opening deg) : 25.81  
 PA of pole (deg) : 6.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.776  
 C/A sky separation (km) : 5214.0  
 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	2048-08-14T23:04:58.886	0.98x	31.72x	140461.00	-13.69			
A (OER)	I	2048-08-14T23:09:28.143	1.84x	30.75x	136774.40	-13.69			
Encke (OEG)	I	2048-08-14T23:13:09.363	2.54x	29.96x	133744.89	-13.70			
Encke (IEG)	I	2048-08-14T23:13:32.843	2.62x	29.88x	133423.31	-13.70			
A (IER)	I	2048-08-14T23:27:23.006	5.23	26.89x	122050.38	-13.70			
B (OER)	I	2048-08-14T23:32:49.871	6.24	25.72x	117571.16	-13.70			
B (IER)	I	2048-08-15T00:03:57.090	11.87	19.03x	91984.69	-13.70			
C (IER)	I	2048-08-15T00:25:15.853	15.54	14.46x	74490.58	-13.66			
Saturn	I	2048-08-15T00:28:50.491	16.14	13.70x	60162.32			-16.21	-19.63
Saturn	E	2048-08-15T03:08:09.843	35.34	-18.72	60247.25			7.10	8.70
C (IER)	E	2048-08-15T03:22:34.084	36.06	-21.39	74490.58	13.68			
B (IER)	E	2048-08-15T03:43:50.540	36.73	-25.20	91984.69	13.72			
B (OER)	E	2048-08-15T04:14:54.006	36.83	-30.42	117571.16	13.73			
A (IER)	E	2048-08-15T04:20:20.168	36.73	-31.29	122050.38	13.73			
Encke (IEG)	E	2048-08-15T04:34:08.493	36.36	-33.41	133423.31	13.73			
Encke (OEG)	E	2048-08-15T04:34:31.920	36.35	-33.47	133744.89	13.73			
A (OER)	E	2048-08-15T04:38:12.639	36.21	-34.01	136774.40	13.72			
F ring	E	2048-08-15T04:42:41.281	36.03	-34.66	140461.00	13.72			

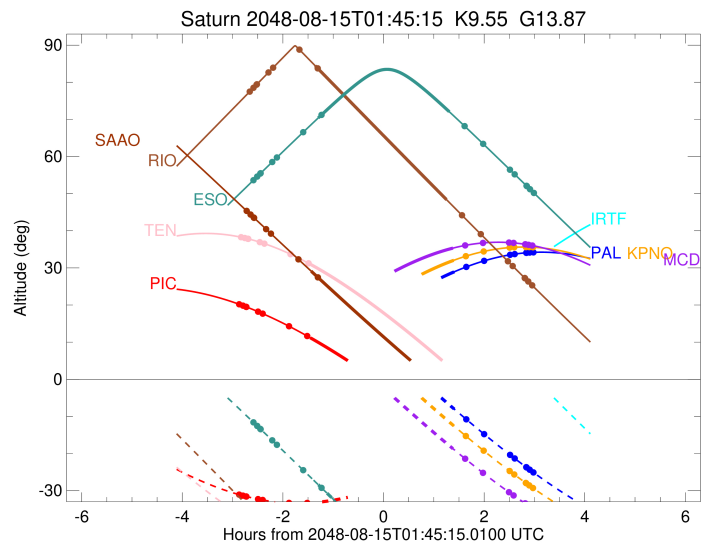
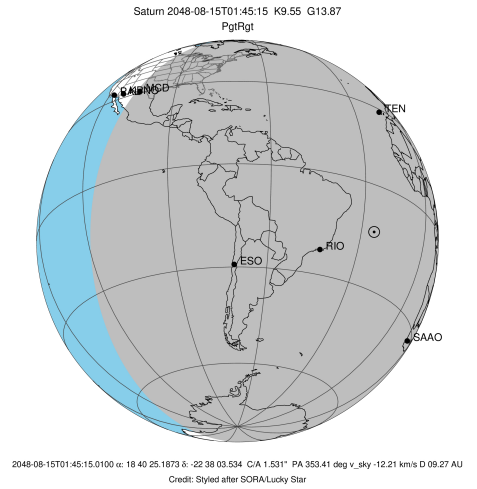
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-08-15T01:38:30.300  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 4079192094788578176  
 2Mass ID (if available) : 18402521-2238032  
 ICRS Star Coord at Epoch: 18h 40m 25.18730s -22:38:03.53427s  
 RUWE (>1.4 is poor) : 1.11  
 K magnitude : 9.552  
 G magnitude : 13.875  
 RP magnitude : 12.684  
 BP magnitude : 15.379  
 DUPflag : 0  
 Distance (au) : 9.269  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -12.21  
 Sun-Target sep (deg) : 137.06  
 Sun-Moon sep (deg) : 72.80  
 B (ring opening deg) : 25.81  
 PA of pole (deg) : 6.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.000  
 C/A sky separation (km) : 6725.3  
 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	2048-08-14T22:55:28.817		38.26	-36.78	140461.00	-13.79		
A (OER)	I	2048-08-14T22:59:56.320		38.04	-37.43	136774.40	-13.78		
Encke (OEG)	I	2048-08-14T23:03:36.287		37.84	-37.96	133744.89	-13.77		
Encke (IEG)	I	2048-08-14T23:03:59.644		37.82	-38.02	133423.31	-13.77		
A (IER)	I	2048-08-14T23:17:46.712		36.93	-39.91	122050.38	-13.73		
B (OER)	I	2048-08-14T23:23:13.047		36.53	-40.61	117571.16	-13.72		
B (IER)	I	2048-08-14T23:54:25.361		33.68	-44.13	91984.69	-13.60		
C (IER)	I	2048-08-15T00:15:56.853		31.23	-45.97	74490.58	-13.48		
Saturn	I	2048-08-15T00:18:54.308		30.87	-46.18	60156.77		-16.65	-20.14
Saturn	E	2048-08-15T02:59:06.208		4.30x	-40.45	60257.40		5.07	6.22
C (IER)	E	2048-08-15T03:15:36.184		1.06x	-38.22	74490.58	13.12		
B (IER)	E	2048-08-15T03:37:47.115		-3.38x	-34.91	91984.69	13.16		
B (OER)	E	2048-08-15T04:10:11.299		-10.02x	-29.55	117571.16	13.15		
A (IER)	E	2048-08-15T04:15:51.870		-11.20x	-28.56	122050.38	13.15		
Encke (IEG)	E	2048-08-15T04:30:17.201		-14.21x	-25.97	133423.31	13.14		
Encke (OEG)	E	2048-08-15T04:30:41.683		-14.30x	-25.89	133744.89	13.13		
A (OER)	E	2048-08-15T04:34:32.366		-15.11x	-25.19	136774.40	13.13		
F ring	E	2048-08-15T04:39:13.189		-16.09x	-24.33	140461.00	13.13		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-08-15T01:41:43.040  
 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 : 4079192094788578176  
 2Mass ID (if available) : 18402521-2238032  
 ICRS Star Coord at Epoch: 18h 40m 25.18730s -22:38:03.53427s  
 RUWE (>1.4 is poor) : 1.11  
 K magnitude : 9.552  
 G magnitude : 13.875  
 RP magnitude : 12.684  
 BP magnitude : 15.379  
 DUPflag : 0  
 Distance (au) : 9.269  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -12.21  
 Sun-Target sep (deg) : 137.06  
 Sun-Moon sep (deg) : 73.25  
 B (ring opening deg) : 25.81  
 PA of pole (deg) : 6.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.611  
 C/A sky separation (km) : 10831.3  
 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

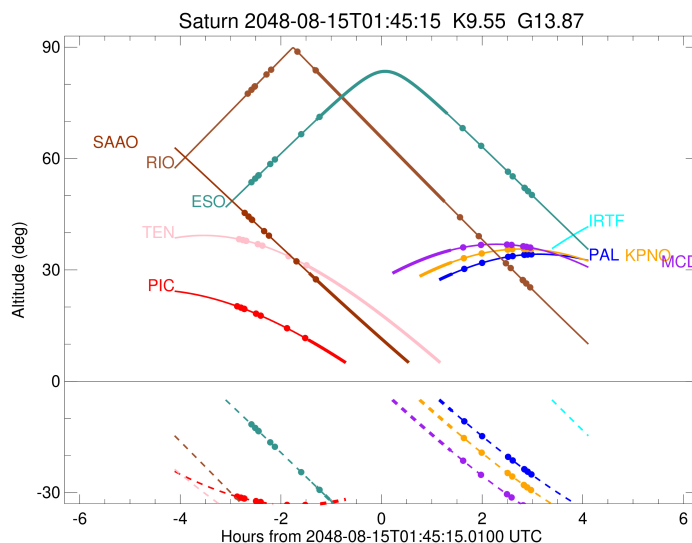
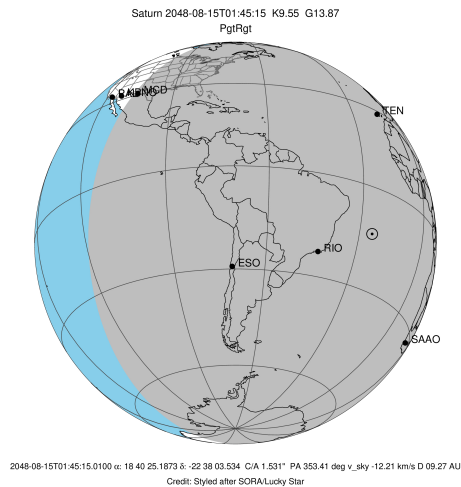


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-08-14T23:05:48.280		77.51	-34.68	140461.00	-13.76		
A (OER)	I	2048-08-14T23:10:16.371		78.54	-35.71	136774.40	-13.74		
Encke (OEG)	I	2048-08-14T23:13:56.869		79.39	-36.56	133744.89	-13.73		
Encke (IEG)	I	2048-08-14T23:14:20.285		79.48	-36.65	133423.31	-13.73		
A (IER)	I	2048-08-14T23:28:09.894		82.68	-39.84	122050.38	-13.68		
B (OER)	I	2048-08-14T23:33:37.527		83.94	-41.10	117571.16	-13.66		
B (IER)	I	2048-08-15T00:05:02.941		88.78	-48.33	91984.69	-13.46		
C (IER)	I	2048-08-15T00:26:54.227	b	83.73	-53.34	74490.58	-13.20		
Saturn	I	2048-08-15T00:23:41.888		84.47	-52.60	60104.16		-20.36	-24.45
Saturn	E	2048-08-15T03:00:30.081		48.37	-81.06	60266.91		1.62	1.99
C (IER)	E	2048-08-15T03:18:49.566		44.19	-79.73	74490.58	12.92		
B (IER)	E	2048-08-15T03:41:12.610		39.10	-76.29	91984.69	13.10		
B (OER)	E	2048-08-15T04:13:36.526		31.78	-69.83	117571.16	13.20		
A (IER)	E	2048-08-15T04:19:15.798		30.51	-68.62	122050.38	13.21		
Encke (IEG)	E	2048-08-15T04:33:36.757		27.30	-65.49	133423.31	13.21		
Encke (OEG)	E	2048-08-15T04:34:01.097		27.21	-65.40	133744.89	13.21		
A (OER)	E	2048-08-15T04:37:50.393		26.35	-64.56	136774.40	13.21		
F ring	E	2048-08-15T04:42:29.429		25.31	-63.52	140461.00	13.21		

```

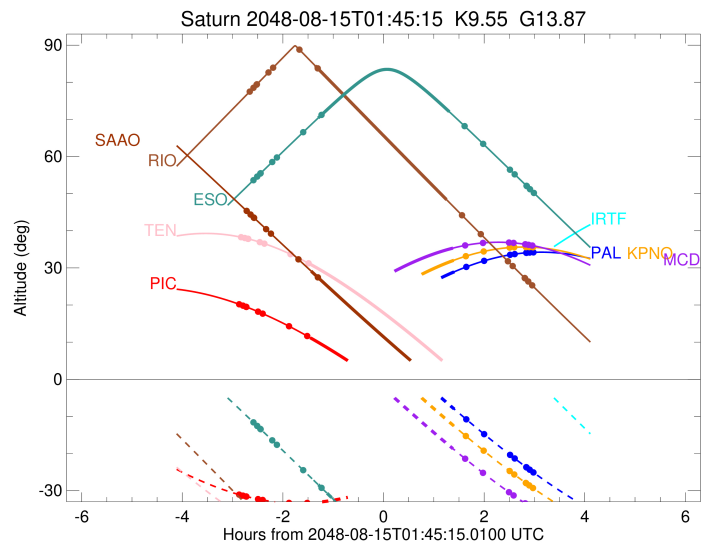
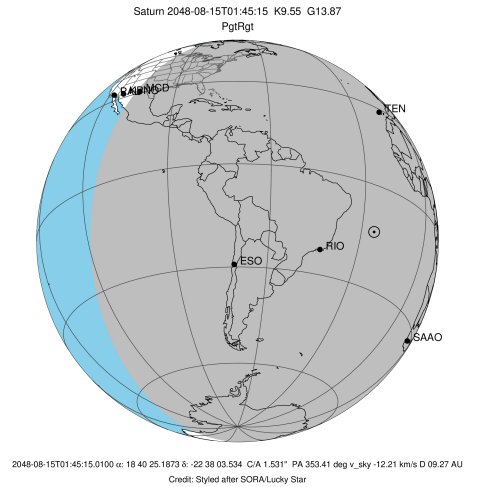
target                : Saturn
target radius (km)   : 60268.00
C/A epoch            : 2048-08-15T01:45:26.940
Event type           : PgtRgt
: Saturn occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : ESO
Location             : European Southern Obs. (3.6m)
Latitude (deg)       : -29.26097
E. Longitude (deg)   : 289.26831
Altitude (km)        : 2.400
Gaia source ID       : 4079192094788578176
2Mass ID (if available) : 18402521-2238032
ICRS Star Coord at Epoch: 18h 40m 25.18730s -22:38:03.53427s
RUWE (>1.4 is poor) : 1.11
K magnitude          : 9.552
G magnitude          : 13.875
RP magnitude         : 12.684
BP magnitude         : 15.379
DUPflag             : 0
Distance (au)        : 9.269
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -12.21
Sun-Target sep (deg) : 137.06
Sun-Moon sep (deg)   : 73.20
B (ring opening deg) : 25.81
PA of pole (deg)     : 6.22
Pole direction: RA (deg): 40.60000
Dec (deg): 83.50000
C/A sky separation (") : 1.636
C/A sky separation (km) : 10995.5
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_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
  
```



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-08-14T23:10:13.512		53.64	-11.62	140461.00	-13.71		
A (OER)	I	2048-08-14T23:14:42.530		54.62	-12.59	136774.40	-13.70		
Encke (OEG)	I	2048-08-14T23:18:23.737		55.43	-13.39	133744.89	-13.69		
Encke (IEG)	I	2048-08-14T23:18:47.226		55.52	-13.47	133423.31	-13.69		
A (IER)	I	2048-08-14T23:32:39.053		58.55	-16.47	122050.38	-13.65		
B (OER)	I	2048-08-14T23:38:07.376		59.74	-17.66	117571.16	-13.63		
B (IER)	I	2048-08-15T00:09:34.805		66.58	-24.50	91984.69	-13.46		
C (IER)	I	2048-08-15T00:31:25.713	b	71.24	-29.27	74490.58	-13.21		
Saturn	I	2048-08-15T00:27:26.868		70.40	-28.40	60097.31		-20.80	-24.96
Saturn	E	2048-08-15T03:03:49.124		72.04	-61.62	60266.74		1.75	2.15
C (IER)	E	2048-08-15T03:21:56.093		68.20	-65.04	74490.58	13.06		
B (IER)	E	2048-08-15T03:44:03.852		63.42	-68.86	91984.69	13.26		
B (OER)	E	2048-08-15T04:16:02.809		56.44	-73.11	117571.16	13.38		
A (IER)	E	2048-08-15T04:21:37.441		55.22	-73.62	122050.38	13.39		
Encke (IEG)	E	2048-08-15T04:35:46.305		52.12	-74.50	133423.31	13.40		
Encke (OEG)	E	2048-08-15T04:36:10.296		52.04	-74.52	133744.89	13.40		
A (OER)	E	2048-08-15T04:39:56.295		51.21	-74.64	136774.40	13.41		
F ring	E	2048-08-15T04:44:31.280		50.21	-74.72	140461.00	13.41		



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-08-15T01:38:12.820  
 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 : 4079192094788578176  
 2Mass ID (if available) : 18402521-2238032  
 ICRS Star Coord at Epoch: 18h 40m 25.18730s -22:38:03.53427s  
 RUWE (>1.4 is poor) : 1.11  
 K magnitude : 9.552  
 G magnitude : 13.875  
 RP magnitude : 12.684  
 BP magnitude : 15.379  
 DUPflag : 0  
 Distance (au) : 9.269  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -12.21  
 Sun-Target sep (deg) : 137.06  
 Sun-Moon sep (deg) : 72.69  
 B (ring opening deg) : 25.81  
 PA of pole (deg) : 6.22  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 2.083  
 C/A sky separation (km) : 14003.2  
 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	2048-08-14T23:02:10.299		45.33	-71.08	140461.00	-13.32		
A (OER)	I	2048-08-14T23:06:47.375		44.35	-70.78	136774.40	-13.29		
Encke (OEG)	I	2048-08-14T23:10:35.485		43.55	-70.50	133744.89	-13.27		
Encke (IEG)	I	2048-08-14T23:10:59.722		43.46	-70.47	133423.31	-13.27		
A (IER)	I	2048-08-14T23:25:19.980		40.42	-69.09	122050.38	-13.17		
B (OER)	I	2048-08-14T23:31:00.627		39.22	-68.44	117571.16	-13.13		
B (IER)	I	2048-08-15T00:03:53.752		32.29	-63.69	91984.69	-12.77		
C (IER)	I	2048-08-15T00:27:05.352	b	27.43	-59.67	74490.58	-12.33		
Saturn	I	2048-08-15T00:18:56.972		29.13	-61.12	60064.39		-22.83	-27.27
Saturn	E	2048-08-15T02:58:47.056		-2.78x	-28.84	60267.41		-1.19	-1.46
C (IER)	E	2048-08-15T03:18:46.412		-6.43x	-24.61	74490.58	12.03		
B (IER)	E	2048-08-15T03:42:37.721		-10.65x	-19.57	91984.69	12.38		
B (OER)	E	2048-08-15T04:16:43.643		-16.32x	-12.40	117571.16	12.60		
A (IER)	E	2048-08-15T04:22:38.688		-17.26x	-11.16	122050.38	12.63		
Encke (IEG)	E	2048-08-15T04:37:37.577		-19.57x	-8.04	133423.31	12.67		
Encke (OEG)	E	2048-08-15T04:38:02.948		-19.63x	-7.95	133744.89	12.68		
A (OER)	E	2048-08-15T04:42:01.857		-20.23x	-7.13	136774.40	12.69		
F ring	E	2048-08-15T04:46:52.343		-20.94x	-6.13	140461.00	12.70		