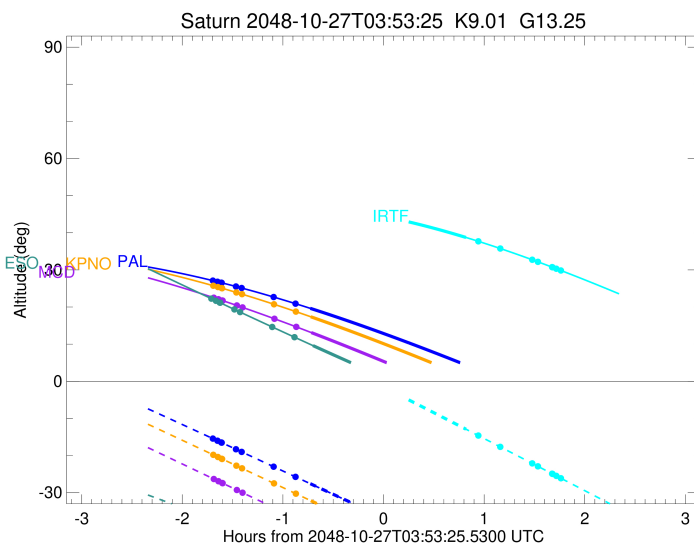
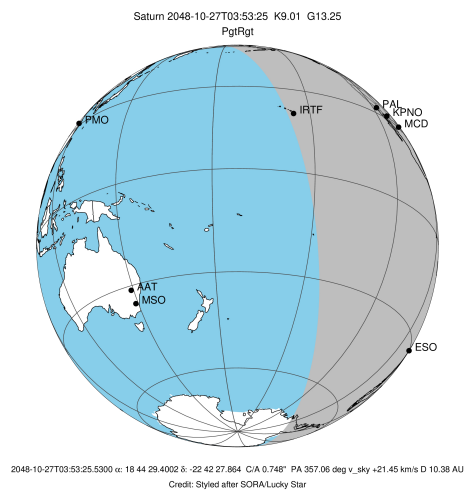




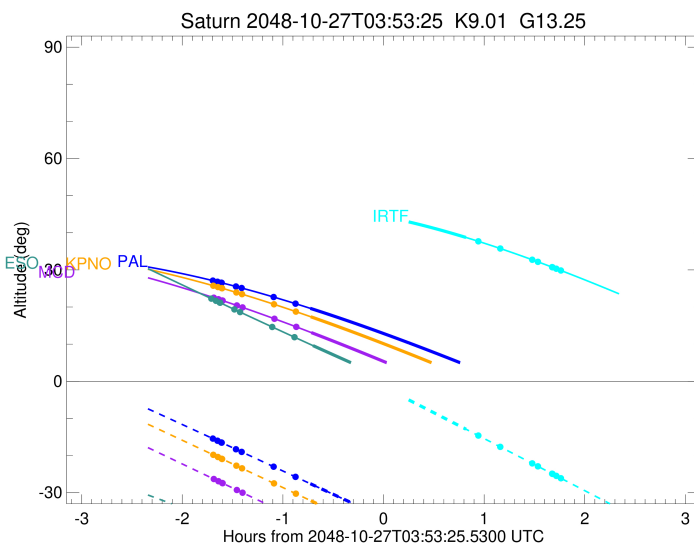
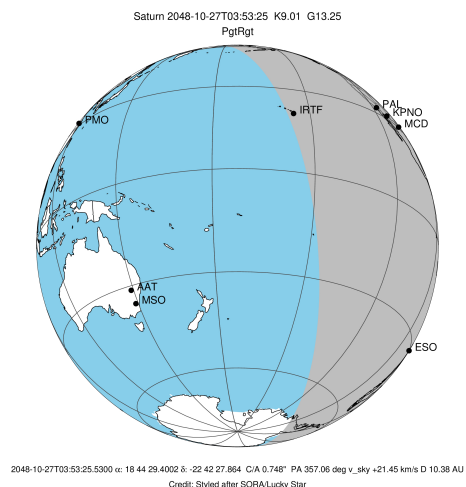
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-10-27T03:57:04.140  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 4078513386847518464  
 2Mass ID (if available) : 18442941-2242276  
 ICRS Star Coord at Epoch: 18h 44m 29.40023s -22:42:27.86429s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 9.014  
 G magnitude : 13.249  
 RP magnitude : 12.085  
 BP magnitude : 14.677  
 DUPflag : 0  
 Distance (au) : 10.384  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 21.45  
 Sun-Target sep (deg) : 66.52  
 Sun-Moon sep (deg) : 173.88  
 B (ring opening deg) : 25.78  
 PA of pole (deg) : 6.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.206  
 C/A sky separation (km) : 1547.9  
 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	2048-10-27T02:11:42.961		27.11	-15.45	140461.00	-22.27		
A (OER)	I	2048-10-27T02:14:28.486		26.80	-16.03	136774.40	-22.27		
Encke (OEG)	I	2048-10-27T02:16:44.486		26.55	-16.50	133744.89	-22.28		
Encke (IEG)	I	2048-10-27T02:16:58.921		26.52	-16.55	133423.31	-22.28		
A (IER)	I	2048-10-27T02:25:29.286		25.53	-18.32	122050.38	-22.29		
B (OER)	I	2048-10-27T02:28:50.217		25.12	-19.02	117571.17	-22.29		
B (IER)	I	2048-10-27T02:47:57.198		22.68	-23.02	91984.69	-22.32		
C (IER)	I	2048-10-27T03:01:00.759		20.90	-25.76	74490.58	-22.33		
Saturn	I	2048-10-27T03:09:44.110		19.65	-27.58	60246.37		7.26	8.89
Saturn	E	2048-10-27T04:44:12.169		4.09x	-47.03	60227.69		-9.94	-12.14
C (IER)	E	2048-10-27T04:51:18.804		2.79x	-48.44	74490.58	22.55		
B (IER)	E	2048-10-27T05:04:13.718		0.42x	-50.97	91984.69	22.60		
B (OER)	E	2048-10-27T05:23:04.844		-3.12x	-54.55	117571.16	22.64		
A (IER)	E	2048-10-27T05:26:22.614		-3.75x	-55.17	122050.38	22.65		
Encke (IEG)	E	2048-10-27T05:34:44.450		-5.35x	-56.70	133423.31	22.67		
Encke (OEG)	E	2048-10-27T05:34:58.633		-5.40x	-56.74	133744.89	22.67		
A (OER)	E	2048-10-27T05:37:12.234		-5.83x	-57.14	136774.40	22.68		
F ring	E	2048-10-27T05:39:54.771		-6.35x	-57.62	140461.00	22.68		

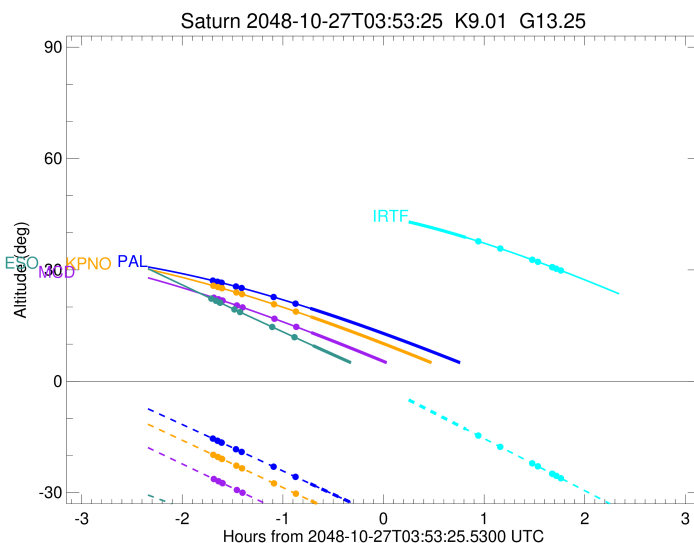
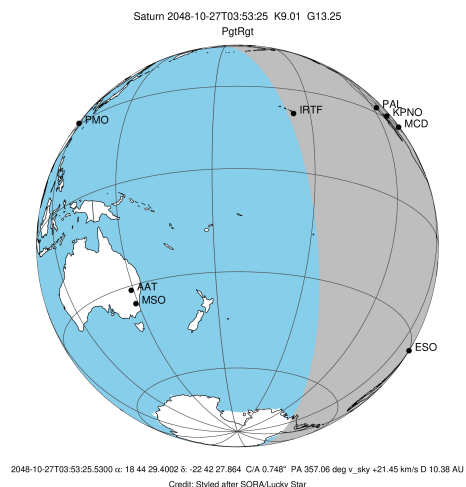
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-10-27T03:57:18.490  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 4078513386847518464  
 2Mass ID (if available) : 18442941-2242276  
 ICRS Star Coord at Epoch: 18h 44m 29.40023s -22:42:27.86429s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 9.014  
 G magnitude : 13.249  
 RP magnitude : 12.085  
 BP magnitude : 14.677  
 DUPflag : 0  
 Distance (au) : 10.384  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 21.45  
 Sun-Target sep (deg) : 66.52  
 Sun-Moon sep (deg) : 173.93  
 B (ring opening deg) : 25.78  
 PA of pole (deg) : 6.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.244  
 C/A sky separation (km) : 1834.6  
 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\_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

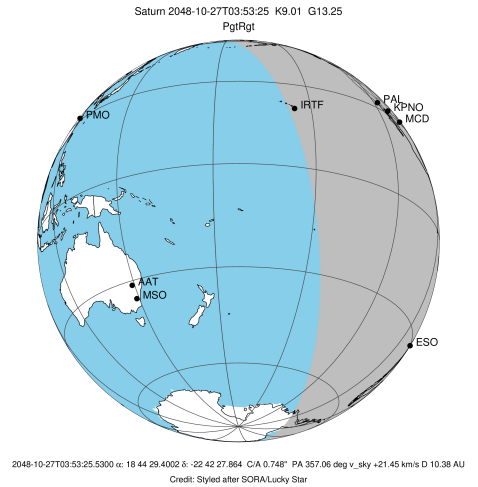
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-10-27T02:11:58.025		25.73	-19.82	140461.00	-22.29		
A (OER)	I	2048-10-27T02:14:43.386		25.38	-20.41	136774.40	-22.30		
Encke (OEG)	I	2048-10-27T02:16:59.250		25.08	-20.89	133744.89	-22.30		
Encke (IEG)	I	2048-10-27T02:17:13.671		25.05	-20.94	133423.31	-22.30		
A (IER)	I	2048-10-27T02:25:43.518		23.92	-22.75	122050.38	-22.31		
B (OER)	I	2048-10-27T02:29:04.241		23.46	-23.46	117571.17	-22.32		
B (IER)	I	2048-10-27T02:48:10.034		20.73	-27.52	91984.69	-22.34		
C (IER)	I	2048-10-27T03:01:12.815		18.76	-30.29	74490.58	-22.35		
Saturn	I	2048-10-27T03:10:02.298		17.38	-32.16	60247.68		7.04	8.62
Saturn	E	2048-10-27T04:44:21.939	0.85x	-51.71	60225.58			-10.20	-12.45
C (IER)	E	2048-10-27T04:51:17.925	-0.47x	-53.08	74490.58		22.58		
B (IER)	E	2048-10-27T05:04:11.811	-2.94x	-55.58	91984.69		22.63		
B (OER)	E	2048-10-27T05:23:01.283	-6.61x	-59.10	117571.16		22.68		
A (IER)	E	2048-10-27T05:26:18.752	-7.26x	-59.69	122050.38		22.69		
Encke (IEG)	E	2048-10-27T05:34:39.816	-8.91x	-61.17	133423.31		22.71		
Encke (OEG)	E	2048-10-27T05:34:53.978	-8.96x	-61.21	133744.89		22.71		
A (OER)	E	2048-10-27T05:37:07.372	-9.40x	-61.59	136774.40		22.71		
F ring	E	2048-10-27T05:39:49.656	-9.94x	-62.05	140461.00		22.72		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-10-27T03:57:34.370  
 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 : 4078513386847518464  
 2Mass ID (if available) : 18442941-2242276  
 ICRS Star Coord at Epoch: 18h 44m 29.40023s -22:42:27.86429s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 9.014  
 G magnitude : 13.249  
 RP magnitude : 12.085  
 BP magnitude : 14.677  
 DUPflag : 0  
 Distance (au) : 10.384  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 21.45  
 Sun-Target sep (deg) : 66.52  
 Sun-Moon sep (deg) : 173.98  
 B (ring opening deg) : 25.78  
 PA of pole (deg) : 6.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.294  
 C/A sky separation (km) : 2211.1  
 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

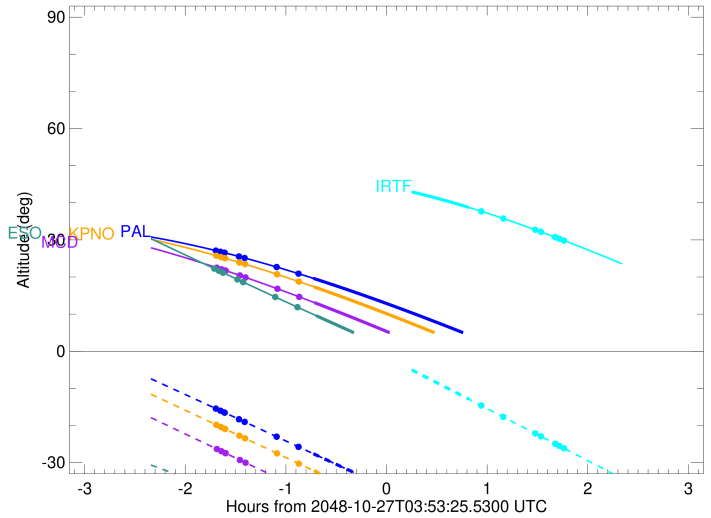


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-10-27T02:12:17.610		22.50	-26.34	140461.00	-22.33		
A (OER)	I	2048-10-27T02:15:02.685		22.09	-26.93	136774.40	-22.34		
Encke (OEG)	I	2048-10-27T02:17:18.313		21.75	-27.42	133744.89	-22.34		
Encke (IEG)	I	2048-10-27T02:17:32.708		21.71	-27.47	133423.31	-22.34		
A (IER)	I	2048-10-27T02:26:01.663		20.42	-29.30	122050.38	-22.35		
B (OER)	I	2048-10-27T02:29:22.033		19.90	-30.02	117571.16	-22.36		
B (IER)	I	2048-10-27T02:48:25.828		16.83	-34.12	91984.69	-22.38		
C (IER)	I	2048-10-27T03:01:27.326		14.65	-36.91	74490.58	-22.39		
Saturn	I	2048-10-27T03:10:24.553		13.11	-38.83	60249.37		6.74	8.26
Saturn	E	2048-10-27T04:44:30.624		-4.47x	-58.19	60222.78		-10.53	-12.86
C (IER)	E	2048-10-27T04:51:12.544		-5.80x	-59.46	74490.58	22.62		
B (IER)	E	2048-10-27T05:04:04.963		-8.38x	-61.84	91984.69	22.67		
B (OER)	E	2048-10-27T05:22:52.089		-12.18x	-65.08	117571.17	22.73		
A (IER)	E	2048-10-27T05:26:09.136		-12.85x	-65.62	122050.38	22.74		
Encke (IEG)	E	2048-10-27T05:34:29.117		-14.56x	-66.92	133423.31	22.76		
Encke (OEG)	E	2048-10-27T05:34:43.247		-14.61x	-66.95	133744.89	22.76		
A (OER)	E	2048-10-27T05:36:56.351		-15.06x	-67.28	136774.40	22.76		
F ring	E	2048-10-27T05:39:38.282		-15.62x	-67.67	140461.00	22.77		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-10-27T03:55:01.020  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : IRTF  
 Location : Mauna Kea/IRTF  
 Latitude (deg) : 19.82622  
 E. Longitude (deg) : 204.52800  
 Altitude (km) : 4.168  
 Gaia source ID : 4078513386847518464  
 2Mass ID (if available) : 18442941-2242276  
 ICRS Star Coord at Epoch: 18h 44m 29.40023s -22:42:27.86429s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 9.014  
 G magnitude : 13.249  
 RP magnitude : 12.085  
 BP magnitude : 14.677  
 DUPflag : 0  
 Distance (au) : 10.384  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 21.45  
 Sun-Target sep (deg) : 66.52  
 Sun-Moon sep (deg) : 173.57  
 B (ring opening deg) : 25.78  
 PA of pole (deg) : 6.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 0.206  
 C/A sky separation (km) : 1553.6  
 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\_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



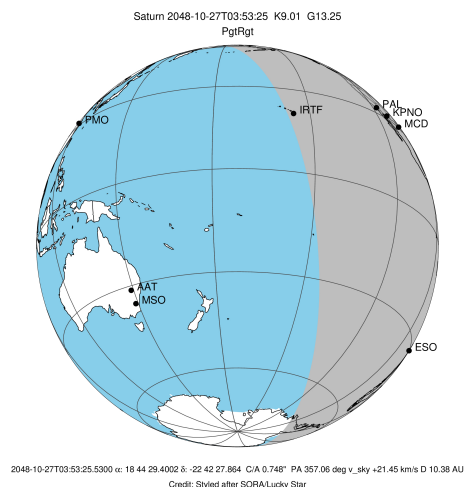
Saturn 2048-10-27T03:53:25 K9.01 G13.25



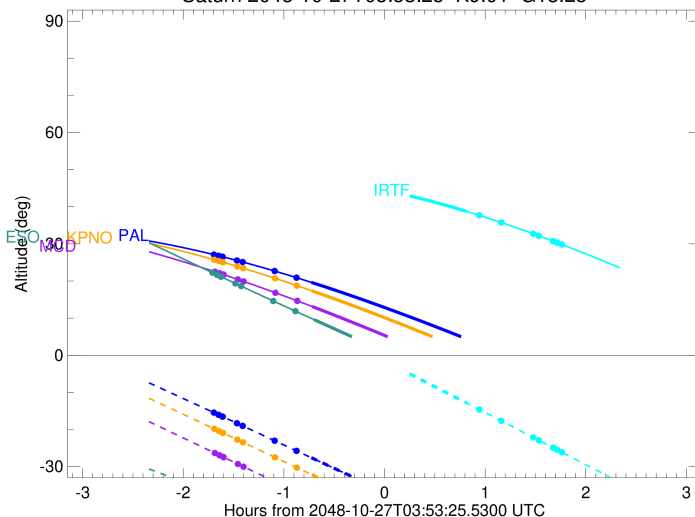
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2048-10-27T02:08:37.558		46.74	21.87x	140461.00	-22.10		
A (OER)	I	2048-10-27T02:11:24.379		46.87	21.27x	136774.40	-22.10		
Encke (OEG)	I	2048-10-27T02:13:41.459		46.97	20.77x	133744.89	-22.10		
Encke (IEG)	I	2048-10-27T02:13:56.010		46.98	20.72x	133423.31	-22.10		
A (IER)	I	2048-10-27T02:22:30.565		47.30	18.85x	122050.38	-22.10		
B (OER)	I	2048-10-27T02:25:53.199		47.40	18.12x	117571.17	-22.11		
B (IER)	I	2048-10-27T02:45:10.478		47.64	13.86x	91984.69	-22.11		
C (IER)	I	2048-10-27T02:58:21.602		47.51	10.92x	74490.58	-22.11		
Saturn	I	2048-10-27T03:07:15.524		47.28	8.93x	60247.41		7.08	8.68
Saturn	E	2048-10-27T04:42:39.462		38.73	-12.92	60228.64		-9.82	-12.00
C (IER)	E	2048-10-27T04:49:56.204		37.71	-14.62	74490.58	22.27		
B (IER)	E	2048-10-27T05:03:01.066		35.77	-17.66	91984.69	22.31		
B (OER)	E	2048-10-27T05:22:06.857		32.74	-22.12	117571.16	22.35		
A (IER)	E	2048-10-27T05:25:27.202		32.18	-22.91	122050.38	22.36		
Encke (IEG)	E	2048-10-27T05:33:55.578		30.75	-24.89	133423.31	22.38		
Encke (OEG)	E	2048-10-27T05:34:09.947		30.71	-24.95	133744.89	22.38		
A (OER)	E	2048-10-27T05:36:25.290		30.33	-25.47	136774.40	22.39		
F ring	E	2048-10-27T05:39:09.947		29.85	-26.12	140461.00	22.39		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2048-10-27T03:57:26.440  
 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 : 4078513386847518464  
 2Mass ID (if available) : 18442941-2242276  
 ICRS Star Coord at Epoch: 18h 44m 29.40023s -22:42:27.86429s  
 RUWE (>1.4 is poor) : 1.05  
 K magnitude : 9.014  
 G magnitude : 13.249  
 RP magnitude : 12.085  
 BP magnitude : 14.677  
 DUPflag : 0  
 Distance (au) : 10.384  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 21.45  
 Sun-Target sep (deg) : 66.52  
 Sun-Moon sep (deg) : 174.10  
 B (ring opening deg) : 25.78  
 PA of pole (deg) : 6.29  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 1.232  
 C/A sky separation (km) : 9277.9  
 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\_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



Saturn 2048-10-27T03:53:25 K9.01 G13.25



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	2048-10-27T02:10:48.028		22.25	-36.67	140461.00	-22.34		
A (OER)	I	2048-10-27T02:13:33.084		21.67	-37.08	136774.40	-22.33		
Encke (OEG)	I	2048-10-27T02:15:48.763		21.19	-37.41	133744.89	-22.33		
Encke (IEG)	I	2048-10-27T02:16:03.167		21.14	-37.44	133423.31	-22.32		
A (IER)	I	2048-10-27T02:24:32.958		19.35	-38.64	122050.38	-22.29		
B (OER)	I	2048-10-27T02:27:53.975		18.64	-39.10	117571.17	-22.27		
B (IER)	I	2048-10-27T02:47:06.585		14.62	-41.56	91984.69	-22.10		
C (IER)	I	2048-10-27T03:00:22.605		11.87	-43.06	74490.58	-21.83		
Saturn	I	2048-10-27T03:11:17.169		9.62	-44.16	60267.82		0.66	0.82
Saturn	E	2048-10-27T04:43:18.572	-8.45x	-47.71	60158.38			-16.55	-20.02
C (IER)	E	2048-10-27T04:45:11.749	-8.80x	-47.67	74490.58	22.01			
B (IER)	E	2048-10-27T04:58:19.960	-11.21x	-47.21	91984.69	22.34			
B (OER)	E	2048-10-27T05:17:17.966	-14.60x	-46.15	117571.16	22.60			
A (IER)	E	2048-10-27T05:20:36.056	-15.17x	-45.92	122050.38	22.63			
Encke (IEG)	E	2048-10-27T05:28:57.932	-16.62x	-45.28	133423.31	22.69			
Encke (OEG)	E	2048-10-27T05:29:12.102	-16.66x	-45.26	133744.89	22.69			
A (OER)	E	2048-10-27T05:31:25.551	-17.03x	-45.08	136774.40	22.71			
F ring	E	2048-10-27T05:34:07.829	-17.49x	-44.85	140461.00	22.73			