

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2049-08-13T11:45:45.410  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 6772120130997809536  
 2Mass ID (if available) : 19323845-2146179

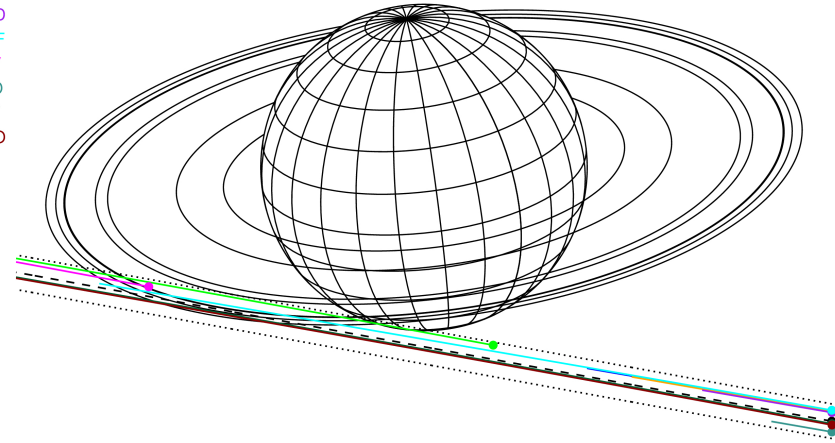
Saturn 2049-08-13T11:45:45 K9.29 G11.62 XRgt

ICRS Star Coord at Epoch: 19h 32m 38.46203s -21:46:17.95876s

RUWE (>1.4 is poor) : 0.96  
 K magnitude : 9.290  
 G magnitude : 11.619  
 RP magnitude : 10.897  
 BP magnitude : 12.202  
 DUPflag : 0  
 Distance (au) : 9.105  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.40  
 Sun-Target sep (deg) : 150.93  
 Sun-Moon sep (deg) : 30.86  
 B (ring opening deg) : 23.58  
 PA of pole (deg) : 6.77



Earth  
 PAL  
 PMO  
 KPNO  
 MCD  
 IRTF  
 KAV  
 ESO  
 AAT  
 MSO

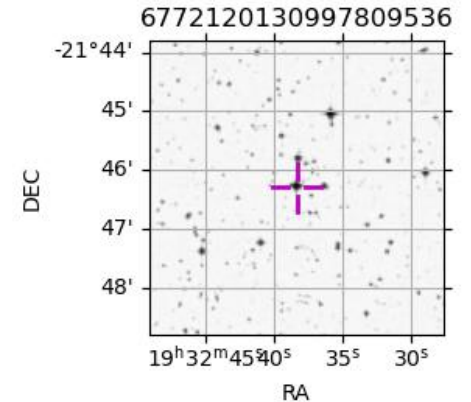


2049-08-13T11:45:45.4100 at: 19 32 38.46203 s: -21 46 17.959 C/A 9.863° PA 349.65 deg v\_sky -16.40 km/s D 09.10 AU  
 Credit: Styled after SORA/Lucky Star

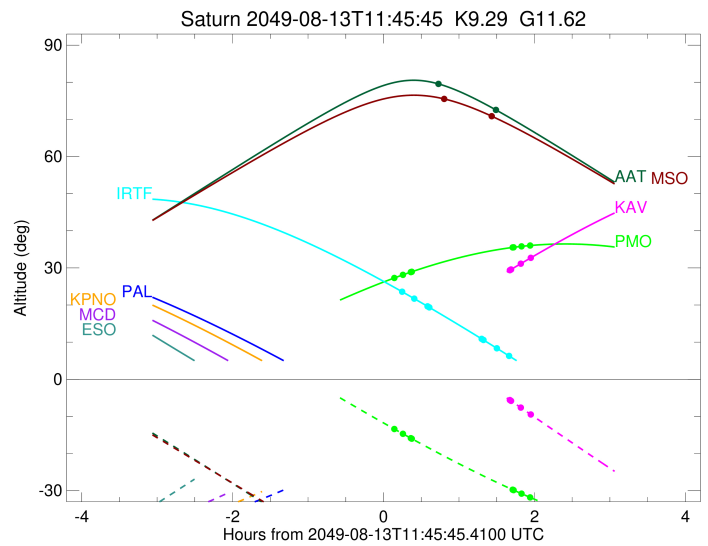
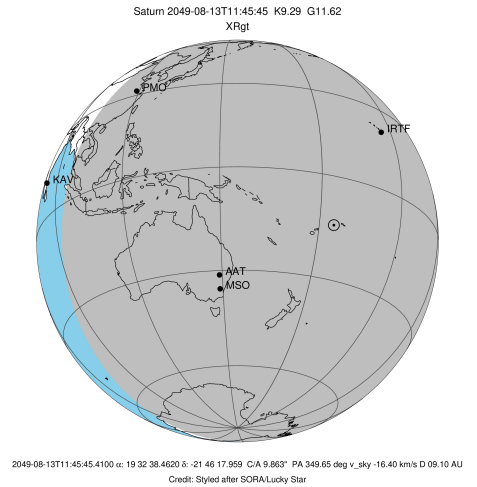
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (20	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8	+	+	+	AUG 13 11:54 - AUG 13 13:42	PnnRie
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					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+	+	+	AUG 13 12:00 - AUG 13 13:25	PnnRie
KAV	Kavalur Observ	12.6	78.8				AUG 13 13:26 - AUG 13 13:43	PnnRne
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European South	-29.3	289.3					PnnRnn
AAT	Siding Spring	-31.3	149.1	+		+	AUG 13 12:29 - AUG 13 13:15	PnnRie
SAAO	So. Afr. Astro	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Ob	-35.3	149.0	+		+	AUG 13 12:33 - AUG 13 13:12	PnnRie



target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2049-08-13T11:48:06.400  
 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 : 6772120130997809536  
 2Mass ID (if available) : 19323845-2146179  
 ICRS Star Coord at Epoch: 19h 32m 38.46203s -21:46:17.95876s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 9.290  
 G magnitude : 11.619  
 RP magnitude : 10.897  
 BP magnitude : 12.202  
 DUPflag : 0  
 Distance (au) : 9.105  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.40  
 Sun-Target sep (deg) : 150.93  
 Sun-Moon sep (deg) : 31.31  
 B (ring opening deg) : 23.58  
 PA of pole (deg) : 6.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 9.067  
 C/A sky separation (km) : 59871.4  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk



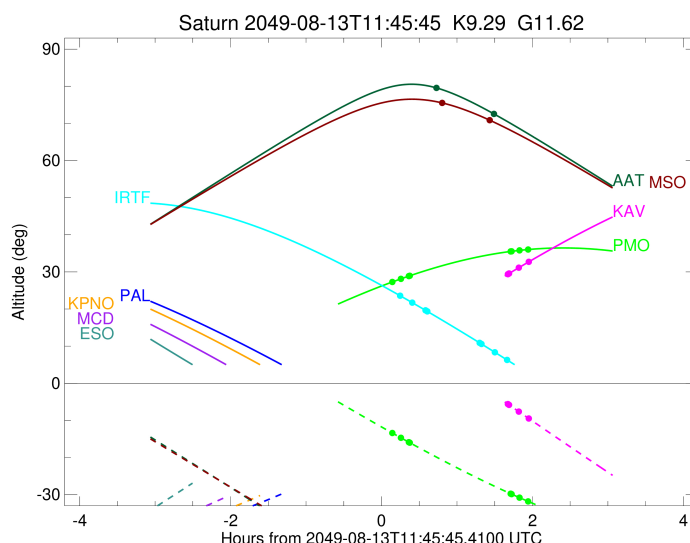
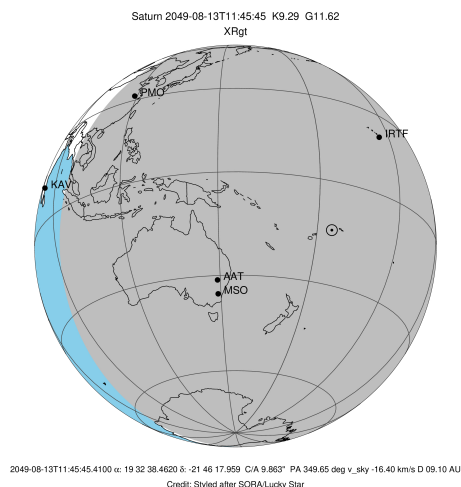
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2049-08-13T11:54:22.935		27.29	-13.41	140461.00	-9.49		
A (OER)	I	2049-08-13T12:01:11.997		28.13	-14.69	136774.40	-8.52		
Encke (OEG)	I	2049-08-13T12:07:28.647		28.87	-15.87	133744.89	-7.56		
Encke (IEG)	I	2049-08-13T12:08:11.531		28.95	-16.00	133423.31	-7.44		

No planet occultations

Encke (IEG)	E	2049-08-13T13:28:37.876		35.52	-29.78	133423.31	7.43		
Encke (OEG)	E	2049-08-13T13:29:20.850		35.55	-29.89	133744.89	7.54		
A (OER)	E	2049-08-13T13:35:38.312		35.80	-30.84	136774.40	8.50		
F ring	E	2049-08-13T13:42:28.280		36.03	-31.84	140461.00	9.47		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2049-08-13T11:39:59.300  
 Event type : XRgt  
 : No Saturn occs  
 : 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 : 6772120130997809536  
 2Mass ID (if available) : 19323845-2146179  
 ICRS Star Coord at Epoch: 19h 32m 38.46203s -21:46:17.95876s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 9.290  
 G magnitude : 11.619  
 RP magnitude : 10.897  
 BP magnitude : 12.202  
 DUPflag : 0  
 Distance (au) : 9.105  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.40  
 Sun-Target sep (deg) : 150.93  
 Sun-Moon sep (deg) : 30.35  
 B (ring opening deg) : 23.58  
 PA of pole (deg) : 6.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 9.469  
 C/A sky separation (km) : 62526.5  
 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\_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



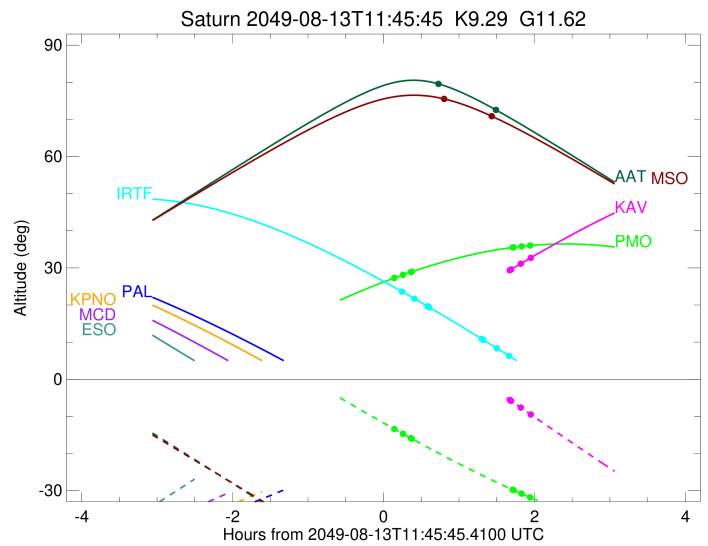
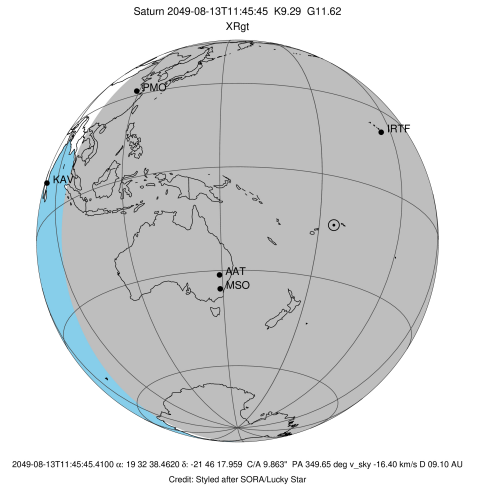
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2049-08-13T12:00:31.927		23.59	-48.79	140461.00	-7.15		
A (OER)	I	2049-08-13T12:10:05.668		21.74	-47.43	136774.40	-5.68		
Encke (OEG)	I	2049-08-13T12:20:32.875		19.69	-45.84	133744.89	-3.96		
Encke (IEG)	I	2049-08-13T12:21:56.594		19.41	-45.62	133423.31	-3.72		

No planet occultations

Encke (IEG)	E	2049-08-13T13:04:12.287		10.80	-38.37	133423.31	3.70		
Encke (OEG)	E	2049-08-13T13:05:36.505		10.50	-38.11	133744.89	3.94		
A (OER)	E	2049-08-13T13:16:08.416		8.29	-36.13	136774.40	5.63		
F ring	E	2049-08-13T13:25:47.895		6.25	-34.27	140461.00	7.07		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2049-08-13T11:51:55.550  
 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 : 6772120130997809536  
 2Mass ID (if available) : 19323845-2146179  
 ICRS Star Coord at Epoch: 19h 32m 38.46203s -21:46:17.95876s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 9.290  
 G magnitude : 11.619  
 RP magnitude : 10.897  
 BP magnitude : 12.202  
 DUPflag : 0  
 Distance (au) : 9.105  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.40  
 Sun-Target sep (deg) : 150.93  
 Sun-Moon sep (deg) : 31.64  
 B (ring opening deg) : 23.58  
 PA of pole (deg) : 6.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 9.414  
 C/A sky separation (km) : 62161.4  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 naif0012.tls  
 earth\_flat\_IAU.spk

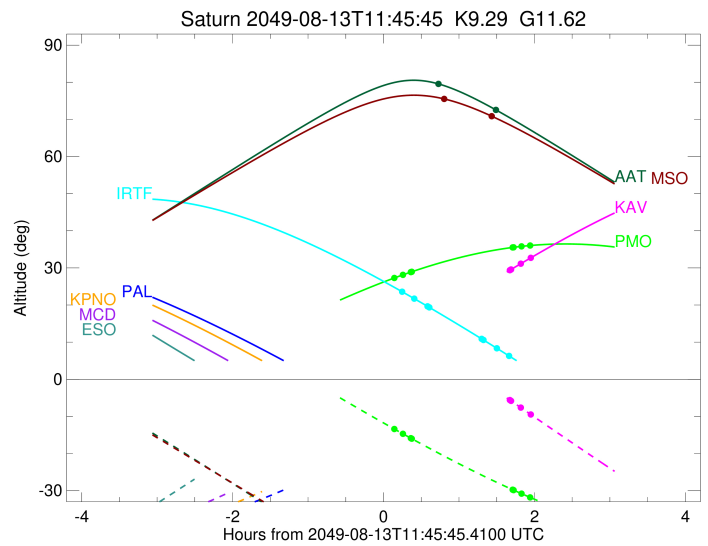
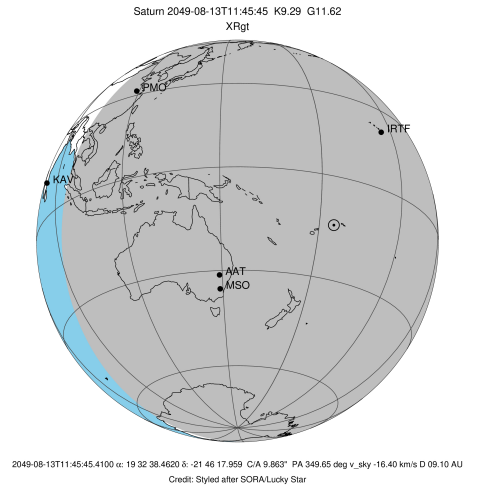


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2049-08-13T12:07:48.865		12.71	12.97x	140461.00	-8.34		
A (OER)	I	2049-08-13T12:15:44.604		14.45	11.08x	136774.40	-7.14		
Encke (OEG)	I	2049-08-13T12:23:28.983		16.14	9.24x	133744.89	-5.89		
Encke (IEG)	I	2049-08-13T12:24:24.327		16.34	9.02x	133423.31	-5.73		

No planet occultations

Encke (IEG)	E	2049-08-13T13:26:28.741		29.43	-5.66	133423.31	5.75		
Encke (OEG)	E	2049-08-13T13:27:23.931		29.62	-5.87	133744.89	5.90		
A (OER)	E	2049-08-13T13:35:06.808		31.17	-7.68	136774.40	7.17		
F ring	E	2049-08-13T13:43:00.574		32.74	-9.52	140461.00	8.38		

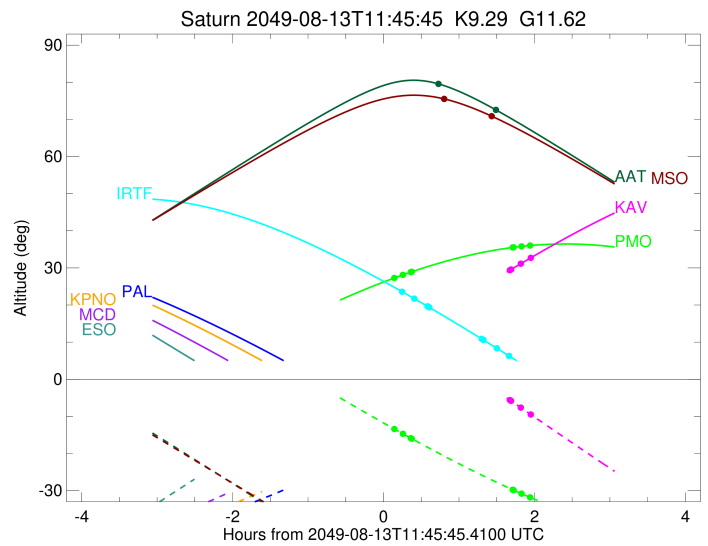
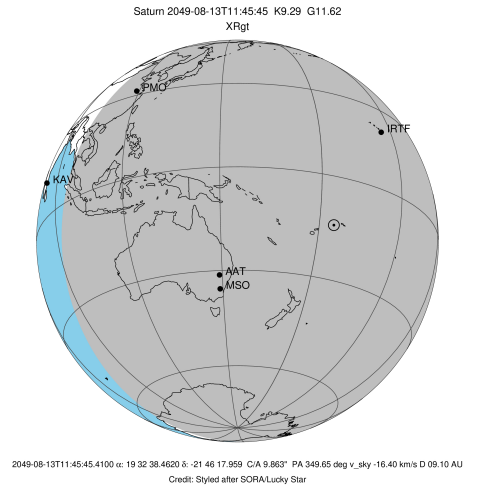
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2049-08-13T11:46:16.810  
 Event type : XRgt  
 : No Saturn occs  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 6772120130997809536  
 2Mass ID (if available) : 19323845-2146179  
 ICRS Star Coord at Epoch: 19h 32m 38.46203s -21:46:17.95876s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 9.290  
 G magnitude : 11.619  
 RP magnitude : 10.897  
 BP magnitude : 12.202  
 DUPflag : 0  
 Distance (au) : 9.105  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.40  
 Sun-Target sep (deg) : 150.93  
 Sun-Moon sep (deg) : 31.51  
 B (ring opening deg) : 23.58  
 PA of pole (deg) : 6.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 10.004  
 C/A sky separation (km) : 66059.0  
 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



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	2049-08-13T12:29:10.844		79.59	-61.80	140461.00	-4.04		
No planet occultations									
F ring	E	2049-08-13T13:15:33.350		72.48	-69.37	140461.00	4.03		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2049-08-13T11:46:21.000  
 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 : 6772120130997809536  
 2Mass ID (if available) : 19323845-2146179  
 ICRS Star Coord at Epoch: 19h 32m 38.46203s -21:46:17.95876s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 9.290  
 G magnitude : 11.619  
 RP magnitude : 10.897  
 BP magnitude : 12.202  
 DUPflag : 0  
 Distance (au) : 9.105  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.40  
 Sun-Target sep (deg) : 150.93  
 Sun-Moon sep (deg) : 31.52  
 B (ring opening deg) : 23.58  
 PA of pole (deg) : 6.77  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 10.070  
 C/A sky separation (km) : 66494.2  
 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	2049-08-13T12:33:38.667		75.55	-60.25	140461.00	-3.36		
No planet occultations									
F ring	E	2049-08-13T13:12:16.598		70.79	-65.70	140461.00	3.35		