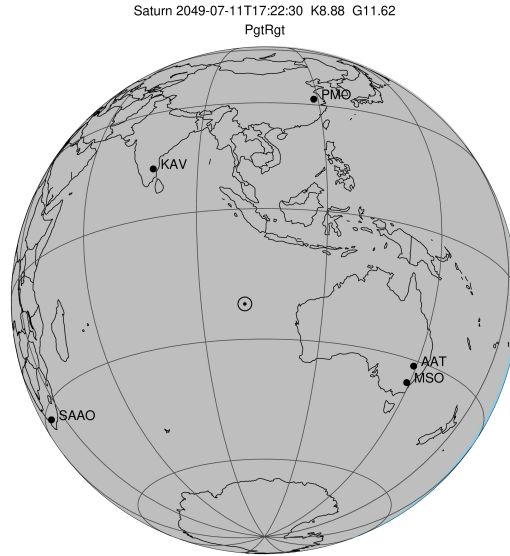


target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-07-11T17:22:30.110
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 6868046262751649024
 2Mass ID (if available) : 19421898-2120388

ICRS Star Coord at Epoch: 19h 42m 18.94180s -21:20:39.07040s

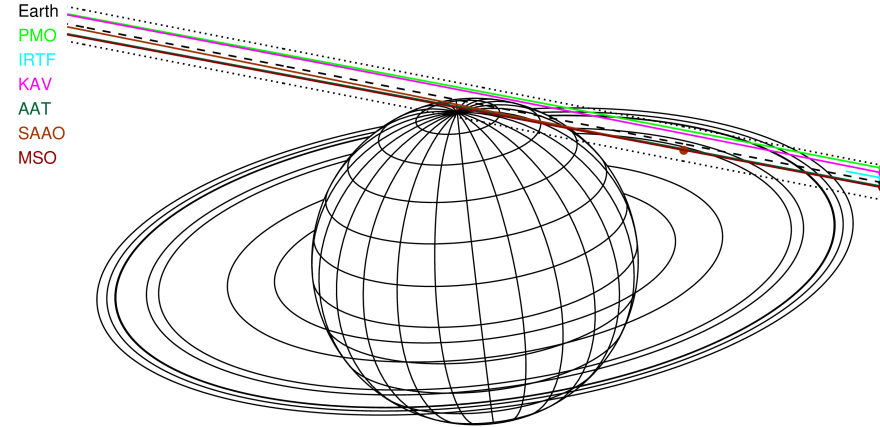
RUWE (>1.4 is poor) : 0.91
 K magnitude : 8.884
 G magnitude : 11.622
 RP magnitude : 10.813
 BP magnitude : 12.325
 DUPflag : 0
 Distance (au) : 8.992
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.04
 Sun-Target sep (deg) : 175.45
 Sun-Moon sep (deg) : 51.61
 B (ring opening deg) : 22.89
 PA of pole (deg) : 6.82

| # | 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 |



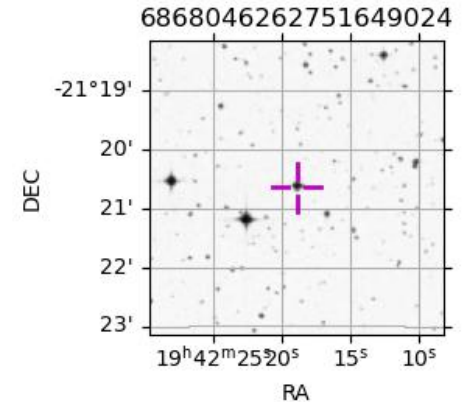
2049-07-11T17:22:30.1100 at: 19 42 18.9418 s: -21 20 39.070 C/A 8.792° PA 168.98 deg v_sky -20.04 km/s D 08.99 AU
 Credit: Styled after SORA/Lucky Star

Saturn 2049-07-11T17:22:30 K8.88 G11.62 PgtRgt

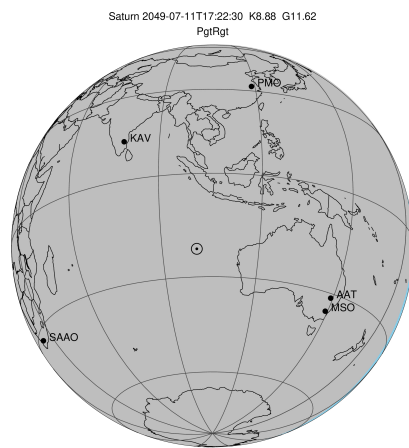


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

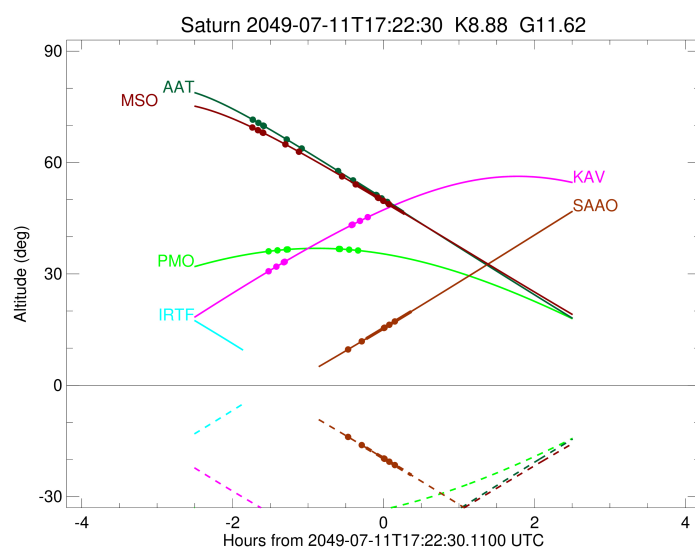
| Obs | Location | lat | Elon | Rings I | Planet | Rings E | Observed Events Interval | OEcode |
|------|----------------|-------|-------|---------|--------|---------|-----------------------------|--------|
| PIC | Pic du Midi | 42.9 | 0.1 | | | | | PnnRnn |
| PAL | Palomar Mt (20 | 33.4 | 243.1 | | | | | PnnRnn |
| PMO | Purple Mtn Obs | 32.1 | 118.8 | + | | + | JUL 11 15:51 - JUL 11 17:02 | 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 | | | | | PnnRnn |
| KAV | Kavalur Observ | 12.6 | 78.8 | + | | + | JUL 11 15:51 - JUL 11 17:10 | PnnRie |
| RIO | Rio de Janeiro | -22.9 | 316.8 | | | | | PnnRnn |
| ESO | European South | -29.3 | 289.3 | | | | | PnnRnn |
| AAT | Siding Spring | -31.3 | 149.1 | + | + | + | JUL 11 15:38 - JUL 11 17:38 | PieRie |
| SAAO | So. Afr. Astro | -32.4 | 20.8 | | + | + | JUL 11 16:54 - JUL 11 17:44 | PieRne |
| MSO | Mt. Stromlo Ob | -35.3 | 149.0 | + | + | + | JUL 11 15:38 - JUL 11 17:39 | PieRie |



target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-07-11T17:20:58.120
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : 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 : 6868046262751649024
 2Mass ID (if available) : 19421898-2120388
 ICRS Star Coord at Epoch: 19h 42m 18.94180s -21:20:39.07040s
 RUWE (>1.4 is poor) : 0.91
 K magnitude : 8.884
 G magnitude : 11.622
 RP magnitude : 10.813
 BP magnitude : 12.325
 DUPflag : 0
 Distance (au) : 8.992
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.04
 Sun-Target sep (deg) : 175.45
 Sun-Moon sep (deg) : 52.27
 B (ring opening deg) : 22.89
 PA of pole (deg) : 6.82
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 9.515
 C/A sky separation (km) : 62058.0
 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



2049-07-11T17:22:30.1100 cc: 19 42 18.9418 s: -21 20 39.070 C/A 8.792° PA 166.98 deg v_sky -20.04 km/s D 08.99 AU
 Credit: Styled after SORA/Lucky Star



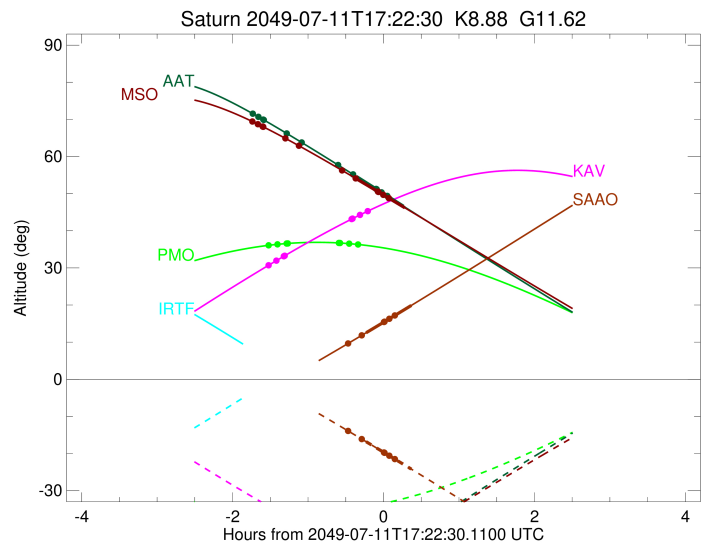
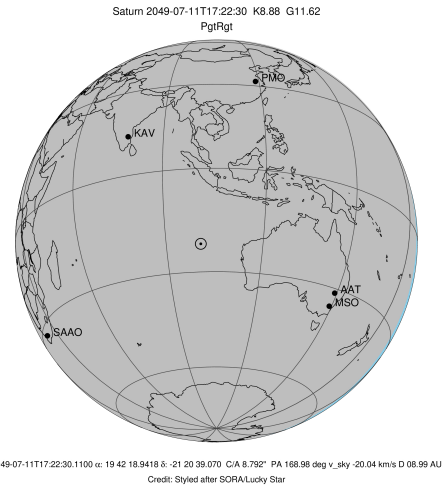
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|-------------|-----|-------------------------|----|-------|---------|-----------|-------|---------|--------------|
| F ring | I | 2049-07-11T15:51:00.394 | | 36.07 | -35.94 | 140461.00 | -9.61 | | |
| A (OER) | I | 2049-07-11T15:58:00.256 | | 36.34 | -36.06 | 136774.40 | -7.93 | | |
| Encke (OEG) | I | 2049-07-11T16:05:12.352 | | 36.56 | -36.12 | 133744.89 | -6.07 | | |
| Encke (IEG) | I | 2049-07-11T16:06:06.387 | | 36.58 | -36.13 | 133423.31 | -5.83 | | |

No planet occultations

| | | | | | | | | | |
|-------------|---|-------------------------|--|-------|--------|-----------|------|--|--|
| Encke (IEG) | E | 2049-07-11T16:47:14.896 | | 36.72 | -35.42 | 133423.31 | 5.83 | | |
| Encke (OEG) | E | 2049-07-11T16:48:08.983 | | 36.70 | -35.39 | 133744.89 | 6.07 | | |
| A (OER) | E | 2049-07-11T16:55:21.599 | | 36.53 | -35.07 | 136774.40 | 7.92 | | |
| F ring | E | 2049-07-11T17:02:22.184 | | 36.31 | -34.72 | 140461.00 | 9.59 | | |

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-07-11T17:24:14.180
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : 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 : 6868046262751649024
 2Mass ID (if available) : 19421898-2120388
 ICRS Star Coord at Epoch: 19h 42m 18.94180s -21:20:39.07040s
 RUWE (>1.4 is poor) : 0.91
 K magnitude : 8.884
 G magnitude : 11.622
 RP magnitude : 10.813
 BP magnitude : 12.325
 DUPflag : 0
 Distance (au) : 8.992
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.04
 Sun-Target sep (deg) : 175.45
 Sun-Moon sep (deg) : 51.98
 B (ring opening deg) : 22.89
 PA of pole (deg) : 6.82
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 9.372
 C/A sky separation (km) : 61124.9
 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



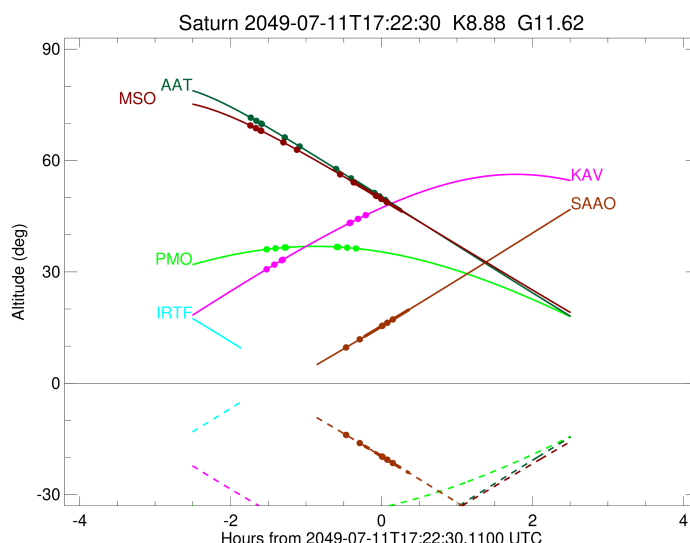
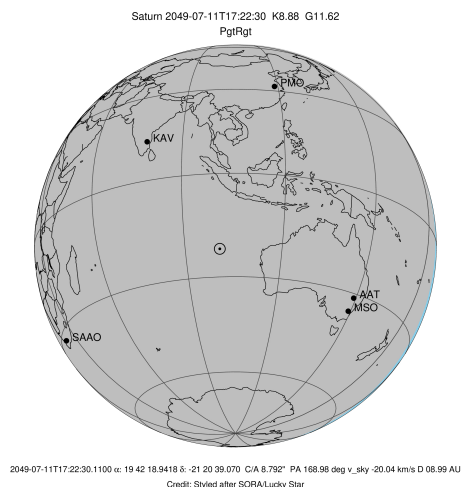
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|-------------|-----|-------------------------|----|-------|---------|-----------|--------|---------|--------------|
| F ring | I | 2049-07-11T15:51:01.320 | | 30.69 | -34.16 | 140461.00 | -10.71 | | |
| A (OER) | I | 2049-07-11T15:57:09.743 | | 31.92 | -35.33 | 136774.40 | -9.29 | | |
| Encke (OEG) | I | 2049-07-11T16:03:03.473 | | 33.10 | -36.45 | 133744.89 | -7.82 | | |
| Encke (IEG) | I | 2049-07-11T16:03:45.050 | | 33.23 | -36.58 | 133423.31 | -7.64 | | |

No planet occultations

| | | | | | | | | | |
|-------------|---|-------------------------|--|-------|--------|-----------|-------|--|--|
| Encke (IEG) | E | 2049-07-11T16:57:19.444 | | 43.18 | -45.79 | 133423.31 | 7.65 | | |
| Encke (OEG) | E | 2049-07-11T16:58:00.971 | | 43.30 | -45.90 | 133744.89 | 7.83 | | |
| A (OER) | E | 2049-07-11T17:03:54.255 | | 44.29 | -46.79 | 136774.40 | 9.30 | | |
| F ring | E | 2049-07-11T17:10:02.198 | | 45.29 | -47.68 | 140461.00 | 10.72 | | |

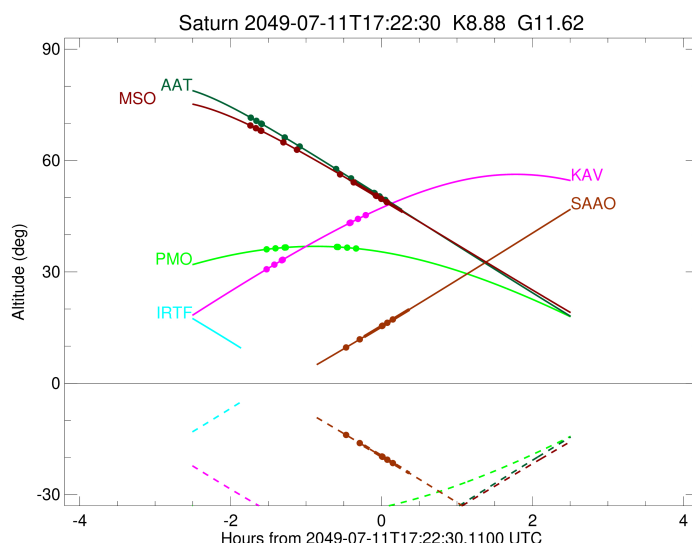
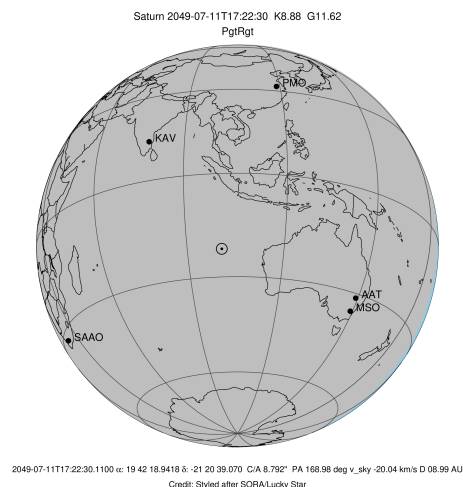
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-07-11T17:20:05.010
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : AAT
 Location : Siding Spring (AAT)
 Latitude (deg) : -31.27703
 E. Longitude (deg) : 149.06608
 Altitude (km) : 1.164
 Gaia source ID : 6868046262751649024
 2Mass ID (if available) : 19421898-2120388
 ICRS Star Coord at Epoch: 19h 42m 18.94180s -21:20:39.07040s
 RUWE (>1.4 is poor) : 0.91
 K magnitude : 8.884
 G magnitude : 11.622
 RP magnitude : 10.813
 BP magnitude : 12.325
 DUPflag : 0
 Distance (au) : 8.992
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.04
 Sun-Target sep (deg) : 175.45
 Sun-Moon sep (deg) : 52.53
 B (ring opening deg) : 22.89
 PA of pole (deg) : 6.82
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 8.437
 C/A sky separation (km) : 55026.8
 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 | 2049-07-11T15:38:31.039 | | 71.56 | -68.11 | 140461.00 | -14.26 | | |
| A (OER) | I | 2049-07-11T15:42:57.229 | | 70.71 | -67.21 | 136774.40 | -13.43 | | |
| Encke (OEG) | I | 2049-07-11T15:46:49.606 | | 69.96 | -66.42 | 133744.89 | -12.64 | | |
| Encke (IEG) | I | 2049-07-11T15:47:15.138 | | 69.88 | -66.33 | 133423.31 | -12.55 | | |
| A (IER) | I | 2049-07-11T16:05:24.854 | | 66.25 | -62.57 | 122050.38 | -8.13 | | |
| B (OER) | I | 2049-07-11T16:16:56.578 | | 63.89 | -60.15 | 117571.16 | -4.76 | | |
| Saturn | I | 2049-07-11T17:00:56.756 | | 54.63 | -50.79 | 59766.95 | | 44.60 | 50.17 |
| Saturn | E | 2049-07-11T17:38:29.843 | | 46.59 | -42.76 | 59418.97 | | 66.65 | 70.35 |
| B (OER) | E | 2049-07-11T16:46:51.256 | | 57.62 | -53.80 | 117571.16 | 4.75 | | |
| A (IER) | E | 2049-07-11T16:58:24.356 | | 55.17 | -51.33 | 122050.38 | 8.11 | | |
| Encke (IEG) | E | 2049-07-11T17:16:38.600 | b | 51.27 | -47.43 | 133423.31 | 12.48 | | |
| Encke (OEG) | E | 2049-07-11T17:17:04.281 | b | 51.18 | -47.34 | 133744.89 | 12.57 | | |
| A (OER) | E | 2049-07-11T17:20:58.106 | b | 50.35 | -46.51 | 136774.40 | 13.34 | | |
| F ring | E | 2049-07-11T17:25:26.160 | b | 49.39 | -45.55 | 140461.00 | 14.16 | | |

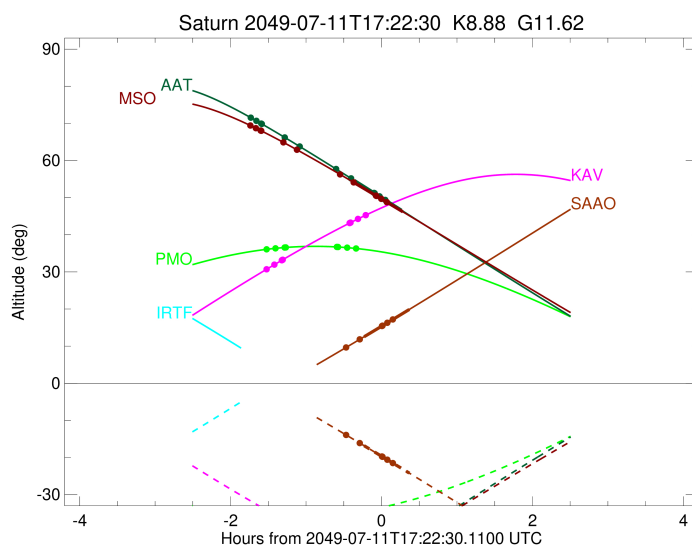
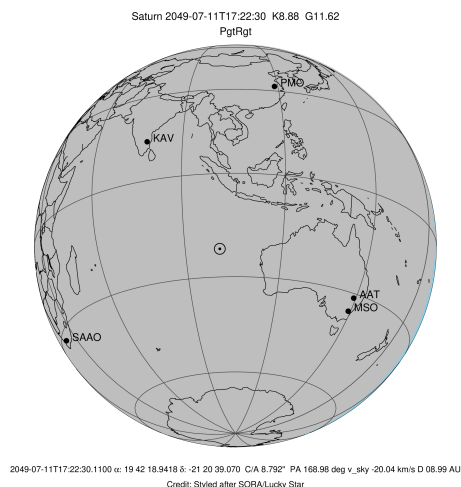
target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-07-11T17:27:03.260
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : SAAO
 Location : So. Afr. Astro. Obs. (Sutherland)
 Latitude (deg) : -32.37953
 E. Longitude (deg) : 20.81070
 Altitude (km) : 1.768
 Gaia source ID : 6868046262751649024
 2Mass ID (if available) : 19421898-2120388
 ICRS Star Coord at Epoch: 19h 42m 18.94180s -21:20:39.07040s
 RUWE (>1.4 is poor) : 0.91
 K magnitude : 8.884
 G magnitude : 11.622
 RP magnitude : 10.813
 BP magnitude : 12.325
 DUPflag : 0
 Distance (au) : 8.992
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.04
 Sun-Target sep (deg) : 175.45
 Sun-Moon sep (deg) : 51.24
 B (ring opening deg) : 22.89
 PA of pole (deg) : 6.82
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 8.510
 C/A sky separation (km) : 55498.7
 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 | 2049-07-11T15:43:00.671 | | -4.21x | 0.08x | 140461.00 | -14.35 | | |
| A (OER) | I | 2049-07-11T15:47:24.936 | | -3.38x | -0.76x | 136774.40 | -13.54 | | |
| Encke (OEG) | I | 2049-07-11T15:51:14.904 | | -2.66x | -1.49x | 133744.89 | -12.79 | | |
| Encke (IEG) | I | 2049-07-11T15:51:40.123 | | -2.58x | -1.57x | 133423.31 | -12.71 | | |
| A (IER) | I | 2049-07-11T16:09:21.607 | | 0.79x | -4.99x | 122050.38 | -8.53 | | |
| B (OER) | I | 2049-07-11T16:19:56.909 | | 2.84x | -7.06 | 117571.16 | -5.51 | | |
| Saturn | I | 2049-07-11T17:08:39.861 | | 12.53 | -16.82 | 59761.14 | | 44.93 | 50.49 |
| Saturn | E | 2049-07-11T17:44:37.768 | | 19.89 | -24.21 | 59415.04 | | 66.96 | 70.62 |
| B (OER) | E | 2049-07-11T16:54:44.089 | | 9.72 | -13.99 | 117571.16 | 5.53 | | |
| A (IER) | E | 2049-07-11T17:05:17.197 | | 11.85 | -16.13 | 122050.38 | 8.57 | | |
| Encke (IEG) | E | 2049-07-11T17:22:53.466 | b | 15.43 | -19.73 | 133423.31 | 12.78 | | |
| Encke (OEG) | E | 2049-07-11T17:23:18.544 | b | 15.51 | -19.81 | 133744.89 | 12.87 | | |
| A (OER) | E | 2049-07-11T17:27:07.202 | b | 16.29 | -20.59 | 136774.40 | 13.62 | | |
| F ring | E | 2049-07-11T17:31:29.894 | b | 17.19 | -21.49 | 140461.00 | 14.43 | | |

target : Saturn
 target radius (km) : 60268.00
 C/A epoch : 2049-07-11T17:20:16.240
 Event type : PgtRgt
 : Saturn occs: geocentric, topocentric
 : 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 : 6868046262751649024
 2Mass ID (if available) : 19421898-2120388
 ICRS Star Coord at Epoch: 19h 42m 18.94180s -21:20:39.07040s
 RUWE (>1.4 is poor) : 0.91
 K magnitude : 8.884
 G magnitude : 11.622
 RP magnitude : 10.813
 BP magnitude : 12.325
 DUPflag : 0
 Distance (au) : 8.992
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.04
 Sun-Target sep (deg) : 175.45
 Sun-Moon sep (deg) : 52.50
 B (ring opening deg) : 22.89
 PA of pole (deg) : 6.82
 Pole direction: RA (deg): 40.60000
 Dec (deg): 83.50000
 C/A sky separation (") : 8.380
 C/A sky separation (km) : 54653.4
 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 | 2049-07-11T15:38:11.326 | | 69.44 | -66.59 | 140461.00 | -14.46 | | |
| A (OER) | I | 2049-07-11T15:42:33.446 | | 68.73 | -65.80 | 136774.40 | -13.65 | | |
| Encke (OEG) | I | 2049-07-11T15:46:21.612 | | 68.09 | -65.10 | 133744.89 | -12.89 | | |
| Encke (IEG) | I | 2049-07-11T15:46:46.637 | | 68.02 | -65.02 | 133423.31 | -12.81 | | |
| A (IER) | I | 2049-07-11T16:04:20.085 | | 64.92 | -61.71 | 122050.38 | -8.60 | | |
| B (OER) | I | 2049-07-11T16:14:49.222 | | 62.99 | -59.68 | 117571.16 | -5.58 | | |
| Saturn | I | 2049-07-11T17:00:23.148 | | 54.11 | -50.58 | 59780.94 | | 43.80 | 49.39 |
| Saturn | E | 2049-07-11T17:39:26.179 | | 46.20 | -42.63 | 59421.42 | | 66.45 | 70.18 |
| B (OER) | E | 2049-07-11T16:49:55.689 | | 56.19 | -52.70 | 117571.16 | 5.58 | | |
| A (IER) | E | 2049-07-11T17:00:26.151 | b | 54.10 | -50.57 | 122050.38 | 8.58 | | |
| Encke (IEG) | E | 2049-07-11T17:18:04.005 | b | 50.55 | -46.99 | 133423.31 | 12.73 | | |
| Encke (OEG) | E | 2049-07-11T17:18:29.174 | b | 50.46 | -46.91 | 133744.89 | 12.82 | | |
| A (OER) | E | 2049-07-11T17:22:18.748 | b | 49.69 | -46.13 | 136774.40 | 13.57 | | |
| F ring | E | 2049-07-11T17:26:42.678 | b | 48.79 | -45.23 | 140461.00 | 14.36 | | |