

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2041-05-02T17:01:58.930  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3635760154744472960  
 2Mass ID (if available) : 13135869-0451511

Saturn 2041-05-02T17:01:58 K8.03 G10.27 PgtRgt

ICRS Star Coord at Epoch: 13h 13m 58.63924s -04:51:51.41902s

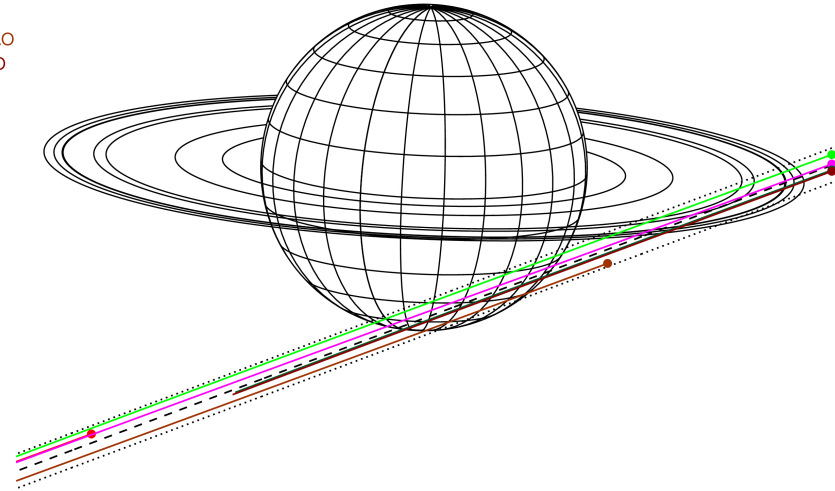
RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.025  
 G magnitude : 10.266  
 RP magnitude : 9.574  
 BP magnitude : 10.809  
 DUPflag : 0  
 Distance (au) : 8.755  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.84  
 Sun-Target sep (deg) : 156.66  
 Sun-Moon sep (deg) : 128.79  
 B (ring opening deg) : 10.88  
 PA of pole (deg) : -2.49

| # | 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      |



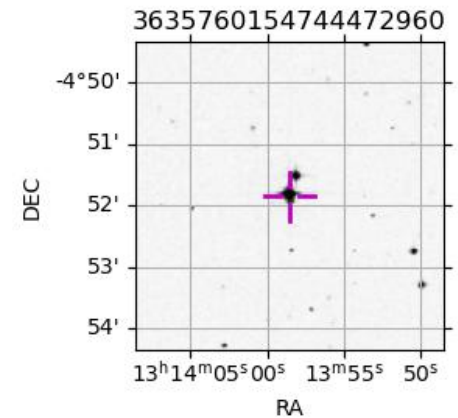
2041-05-02T17:01:58.9300 α: 13 13 58.6392 δ: -04 51 51.419 C/A 8.211° PA 20.56 deg v\_sky -17.84 km/s D 08.76 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PIC  
 PMO  
 KAV  
 AAT  
 SAAO  
 MSO

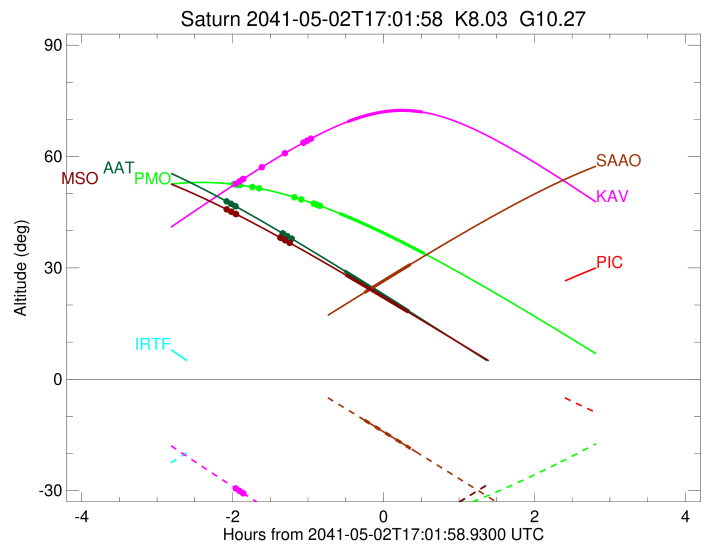
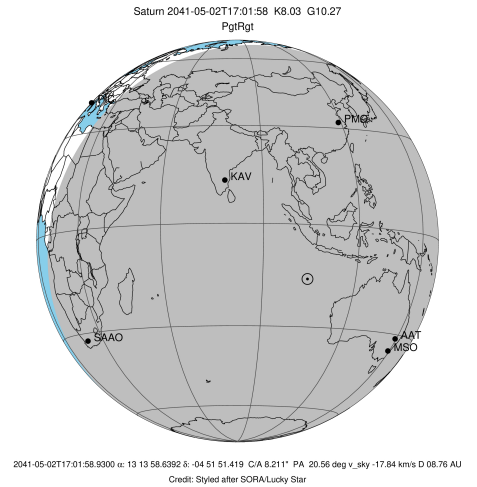


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

| 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 | +       | +      | +       | MAY 02 15:02 - MAY 02 17:34 | PieRie |
| 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  | +       | +      | +       | MAY 02 15:04 - MAY 02 17:33 | PieRie |
| RIO  | Rio de Janeiro | -22.9 | 316.8 |         |        |         |                             | PnnRnn |
| ESO  | European South | -29.3 | 289.3 |         |        |         |                             | PnnRnn |
| AAT  | Siding Spring  | -31.3 | 149.1 | +       | +      | +       | MAY 02 14:57 - MAY 02 17:22 | PieRie |
| SAAO | So. Afr. Astro | -32.4 | 20.8  |         |        |         | MAY 02 16:46 - MAY 02 17:23 | PieRnn |
| MSO  | Mt. Stromlo Ob | -35.3 | 149.0 | +       | +      | +       | MAY 02 14:57 - MAY 02 17:21 | PieRie |

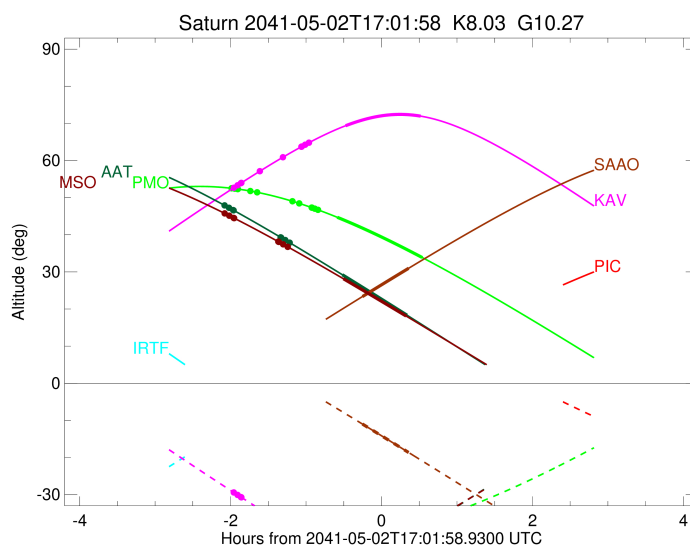
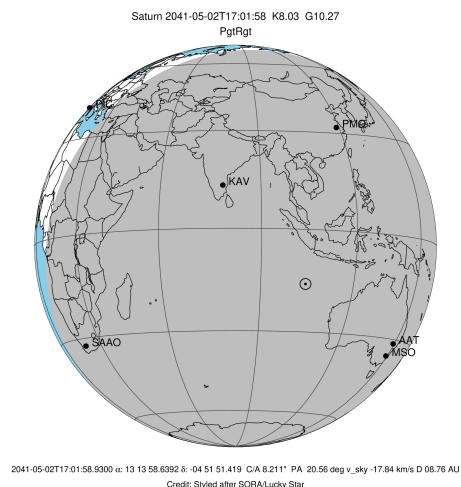


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2041-05-02T17:00:39.100  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 3635760154744472960  
 2Mass ID (if available) : 13135869-0451511  
 ICRS Star Coord at Epoch: 13h 13m 58.63924s -04:51:51.41902s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.025  
 G magnitude : 10.266  
 RP magnitude : 9.574  
 BP magnitude : 10.809  
 DUPflag : 0  
 Distance (au) : 8.755  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.84  
 Sun-Target sep (deg) : 156.66  
 Sun-Moon sep (deg) : 129.15  
 B (ring opening deg) : 10.88  
 PA of pole (deg) : -2.49  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.485  
 C/A sky separation (km) : 47524.9  
 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



| Ring        | I/E | UTC                     | b? | alt   | alt-sun | radius    | r-dot  | lat-geo | lat-geodetic |
|-------------|-----|-------------------------|----|-------|---------|-----------|--------|---------|--------------|
| F ring      | I   | 2041-05-02T15:02:47.636 |    | 52.52 | -40.45  | 140461.00 | -24.52 |         |              |
| A (OER)     | I   | 2041-05-02T15:05:21.774 |    | 52.42 | -40.62  | 136774.40 | -23.30 |         |              |
| Encke (OEG) | I   | 2041-05-02T15:07:34.968 |    | 52.32 | -40.76  | 133744.89 | -22.17 |         |              |
| Encke (IEG) | I   | 2041-05-02T15:07:49.512 |    | 52.31 | -40.78  | 133423.31 | -22.05 |         |              |
| A (IER)     | I   | 2041-05-02T15:17:42.949 |    | 51.78 | -41.34  | 122050.38 | -16.01 |         |              |
| B (OER)     | I   | 2041-05-02T15:23:00.439 |    | 51.44 | -41.60  | 117571.16 | -12.13 |         |              |
| Saturn      | I   | 2041-05-02T16:26:43.439 |    | 44.72 | -42.10  | 60219.85  |        | -28.82  | -33.92       |
| Saturn      | E   | 2041-05-02T17:34:26.237 |    | 33.86 | -37.51  | 60082.07  |        | -71.60  | -74.60       |
| B (OER)     | E   | 2041-05-02T15:51:34.116 |    | 48.99 | -42.42  | 117571.16 | 12.14  |         |              |
| A (IER)     | E   | 2041-05-02T15:56:51.455 |    | 48.43 | -42.47  | 122050.38 | 16.02  |         |              |
| Encke (IEG) | E   | 2041-05-02T16:06:44.465 |    | 47.30 | -42.47  | 133423.31 | 22.07  |         |              |
| Encke (OEG) | E   | 2041-05-02T16:06:58.996 |    | 47.27 | -42.46  | 133744.89 | 22.20  |         |              |
| A (OER)     | E   | 2041-05-02T16:09:12.063 |    | 47.00 | -42.45  | 136774.40 | 23.33  |         |              |
| F ring      | E   | 2041-05-02T16:11:46.040 |    | 46.68 | -42.42  | 140461.00 | 24.54  |         |              |

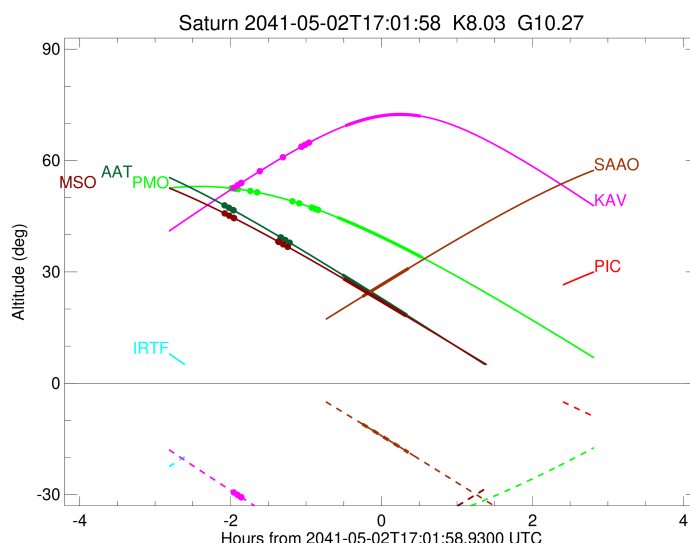
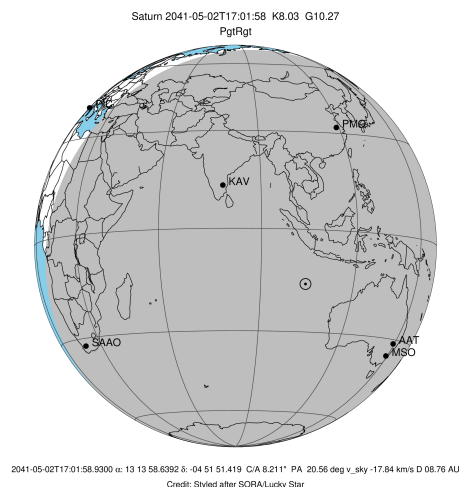
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2041-05-02T17:03:20.790  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 3635760154744472960  
 2Mass ID (if available) : 13135869-0451511  
 ICRS Star Coord at Epoch: 13h 13m 58.63924s -04:51:51.41902s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.025  
 G magnitude : 10.266  
 RP magnitude : 9.574  
 BP magnitude : 10.809  
 DUPflag : 0  
 Distance (au) : 8.755  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.84  
 Sun-Target sep (deg) : 156.66  
 Sun-Moon sep (deg) : 129.60  
 B (ring opening deg) : 10.88  
 PA of pole (deg) : -2.49  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 7.948  
 C/A sky separation (km) : 50467.6  
 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\_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   | 2041-05-02T15:04:34.276 |    | 52.67 | -29.42  | 140461.00 | -21.18 |         |              |
| A (OER)     | I   | 2041-05-02T15:07:35.069 |    | 53.33 | -30.08  | 136774.40 | -19.58 |         |              |
| Encke (OEG) | I   | 2041-05-02T15:10:16.100 |    | 53.92 | -30.67  | 133744.89 | -18.03 |         |              |
| Encke (IEG) | I   | 2041-05-02T15:10:34.021 |    | 53.98 | -30.73  | 133423.31 | -17.85 |         |              |
| A (IER)     | I   | 2041-05-02T15:25:09.253 |    | 57.11 | -33.88  | 122050.38 | -7.68  |         |              |
| Saturn      | I   | 2041-05-02T16:33:23.058 |    | 69.37 | -47.62  | 60204.12  |        | -33.74  | -39.18       |
| Saturn      | E   | 2041-05-02T17:33:05.323 |    | 71.96 | -57.16  | 60075.22  |        | -75.07  | -77.55       |
| A (IER)     | E   | 2041-05-02T15:44:02.837 |    | 60.98 | -37.87  | 122050.38 | 7.68   |         |              |
| Encke (IEG) | E   | 2041-05-02T15:58:37.066 |    | 63.77 | -40.86  | 133423.31 | 17.89  |         |              |
| Encke (OEG) | E   | 2041-05-02T15:58:54.957 |    | 63.83 | -40.92  | 133744.89 | 18.06  |         |              |
| A (OER)     | E   | 2041-05-02T16:01:35.701 |    | 64.32 | -41.46  | 136774.40 | 19.61  |         |              |
| F ring      | E   | 2041-05-02T16:04:36.132 |    | 64.86 | -42.07  | 140461.00 | 21.23  |         |              |

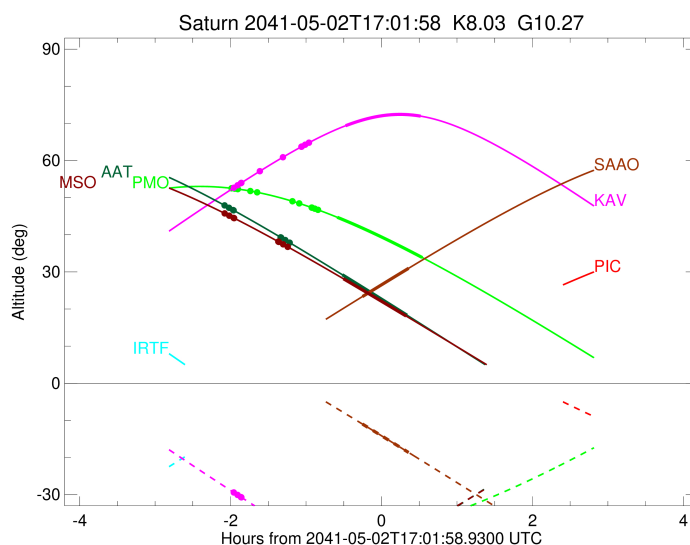
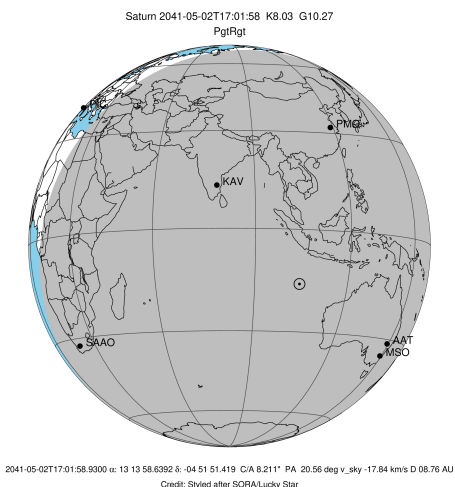
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2041-05-02T16:56:43.030  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 3635760154744472960  
 2Mass ID (if available) : 13135869-0451511  
 ICRS Star Coord at Epoch: 13h 13m 58.63924s -04:51:51.41902s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.025  
 G magnitude : 10.266  
 RP magnitude : 9.574  
 BP magnitude : 10.809  
 DUPflag : 0  
 Distance (au) : 8.755  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.84  
 Sun-Target sep (deg) : 156.66  
 Sun-Moon sep (deg) : 128.53  
 B (ring opening deg) : 10.88  
 PA of pole (deg) : -2.49  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.392  
 C/A sky separation (km) : 53289.6  
 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\_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

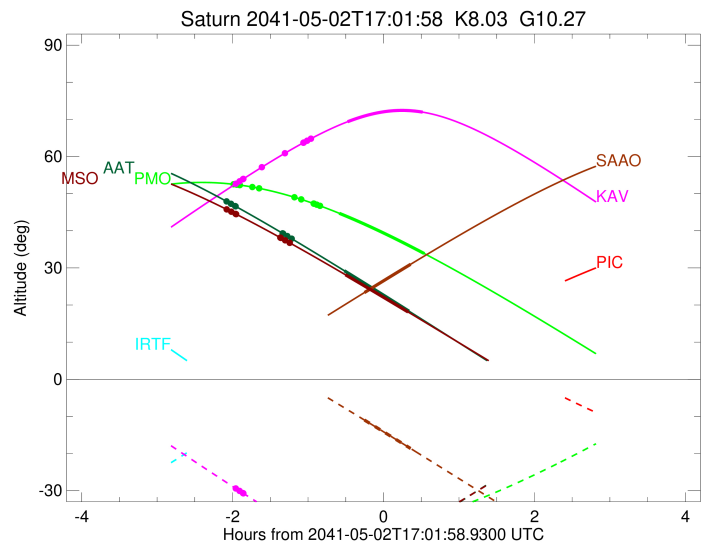
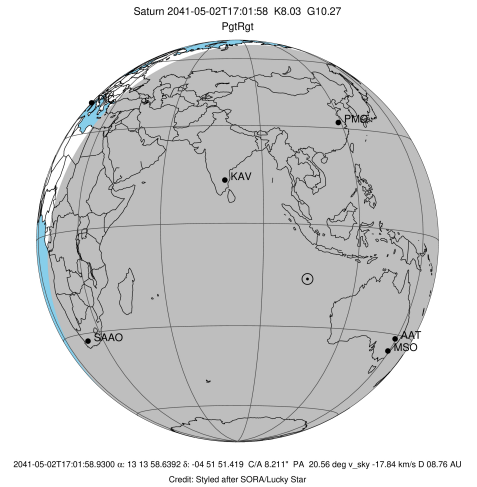
| Ring        | I/E | UTC                     | b? | alt   | alt-sun | radius    | r-dot  | lat-geo | lat-geodetic |
|-------------|-----|-------------------------|----|-------|---------|-----------|--------|---------|--------------|
| F ring      | I   | 2041-05-02T14:57:14.995 |    | 47.91 | -69.82  | 140461.00 | -18.54 |         |              |
| A (OER)     | I   | 2041-05-02T15:00:45.411 |    | 47.26 | -69.30  | 136774.40 | -16.47 |         |              |
| Encke (OEG) | I   | 2041-05-02T15:04:01.512 |    | 46.65 | -68.80  | 133744.89 | -14.40 |         |              |
| Encke (IEG) | I   | 2041-05-02T15:04:24.035 |    | 46.58 | -68.74  | 133423.31 | -14.15 |         |              |
| Saturn      | I   | 2041-05-02T16:30:52.000 |    | 29.23 | -52.45  | 60187.60  |        | -38.55  | -44.15       |
| Saturn      | E   | 2041-05-02T17:22:23.483 |    | 18.31 | -41.63  | 60070.10  |        | -78.26  | -80.23       |
| Encke (IEG) | E   | 2041-05-02T15:42:08.773 |    | 39.24 | -62.14  | 133423.31 | 14.15  |         |              |
| Encke (OEG) | E   | 2041-05-02T15:42:31.300 |    | 39.17 | -62.07  | 133744.89 | 14.40  |         |              |
| A (OER)     | E   | 2041-05-02T15:45:47.437 |    | 38.51 | -61.45  | 136774.40 | 16.47  |         |              |
| F ring      | E   | 2041-05-02T15:49:17.897 |    | 37.80 | -60.78  | 140461.00 | 18.54  |         |              |

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2041-05-02T17:05:21.420  
 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 : 3635760154744472960  
 2Mass ID (if available) : 13135869-0451511  
 ICRS Star Coord at Epoch: 13h 13m 58.63924s -04:51:51.41902s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.025  
 G magnitude : 10.266  
 RP magnitude : 9.574  
 BP magnitude : 10.809  
 DUPflag : 0  
 Distance (au) : 8.755  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.84  
 Sun-Target sep (deg) : 156.66  
 Sun-Moon sep (deg) : 129.38  
 B (ring opening deg) : 10.88  
 PA of pole (deg) : -2.49  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.936  
 C/A sky separation (km) : 56742.8  
 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   | 2041-05-02T15:06:30.855 | 2.14x | 9.14x  | 140461.00 | -12.56 |       |         |              |
| A (OER)     | I   | 2041-05-02T15:12:15.083 | 3.35x | 8.04x  | 136774.40 | -8.81  |       |         |              |
| Encke (OEG) | I   | 2041-05-02T15:21:02.802 | 5.22  | 6.33x  | 133745.16 | -2.60  |       |         |              |
| Saturn      | I   | 2041-05-02T16:46:50.026 | 23.36 | -10.99 | 60158.27  |        |       | -46.74  | -52.24       |
| Saturn      | E   | 2041-05-02T17:23:36.389 | 30.99 | -18.66 | 60069.63  |        |       | -78.59  | -80.51       |
| Encke (OEG) | E   | 2041-05-02T15:28:10.829 | 6.73  | 4.94x  | 133746.65 | 2.61   |       |         |              |
| A (OER)     | E   | 2041-05-02T15:36:58.338 | 8.59  | 3.20x  | 136774.40 | 8.82   |       |         |              |
| F ring      | E   | 2041-05-02T15:42:42.304 | 9.81  | 2.07x  | 140461.00 | 12.57  |       |         |              |

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2041-05-02T16:56:47.210  
 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 : 3635760154744472960  
 2Mass ID (if available) : 13135869-0451511  
 ICRS Star Coord at Epoch: 13h 13m 58.63924s -04:51:51.41902s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 8.025  
 G magnitude : 10.266  
 RP magnitude : 9.574  
 BP magnitude : 10.809  
 DUPflag : 0  
 Distance (au) : 8.755  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.84  
 Sun-Target sep (deg) : 156.66  
 Sun-Moon sep (deg) : 128.53  
 B (ring opening deg) : 10.88  
 PA of pole (deg) : -2.49  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 8.461  
 C/A sky separation (km) : 53726.2  
 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   | 2041-05-02T14:57:19.420 |    | 45.76 | -66.74  | 140461.00 | -17.95 |         |              |
| A (OER)     | I   | 2041-05-02T15:00:57.827 |    | 45.14 | -66.28  | 136774.40 | -15.78 |         |              |
| Encke (OEG) | I   | 2041-05-02T15:04:24.181 |    | 44.55 | -65.84  | 133744.89 | -13.56 |         |              |
| Encke (IEG) | I   | 2041-05-02T15:04:48.128 |    | 44.48 | -65.79  | 133423.31 | -13.29 |         |              |
| Saturn      | I   | 2041-05-02T16:31:42.792 |    | 28.15 | -51.08  | 60184.49  |        | -39.43  | -45.04       |
| Saturn      | E   | 2041-05-02T17:21:40.583 |    | 18.09 | -41.24  | 60069.63  |        | -78.58  | -80.50       |
| Encke (IEG) | E   | 2041-05-02T15:40:16.960 |    | 38.09 | -60.41  | 133423.31 | 13.29  |         |              |
| Encke (OEG) | E   | 2041-05-02T15:40:40.911 |    | 38.01 | -60.34  | 133744.89 | 13.56  |         |              |
| A (OER)     | E   | 2041-05-02T15:44:07.301 |    | 37.37 | -59.76  | 136774.40 | 15.77  |         |              |
| F ring      | E   | 2041-05-02T15:47:45.752 |    | 36.68 | -59.14  | 140461.00 | 17.95  |         |              |