

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-10-31T18:04:04.530
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427624592175693056
 2Mass ID (if available) : 05443411+2332002

Uranus 2031-10-31T18:04:04 K14.71 G18.36 PgtRgt

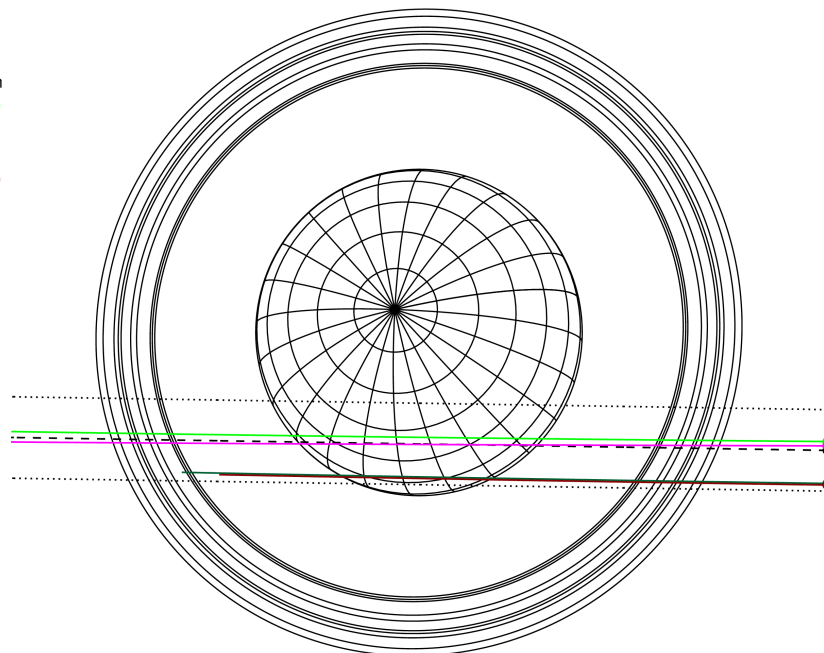
ICRS Star Coord at Epoch: 05h 44m 34.11381s +23:32:00.39343s

RUWE (>1.4 is poor) : 1.07
 K magnitude : 14.708
 G magnitude : 18.362
 RP magnitude : 17.319
 BP magnitude : 19.461
 DUPflag : 0
 Distance (au) : 18.427
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -13.27
 Sun-Target sep (deg) : 131.21
 Sun-Moon sep (deg) : 31.60
 B (ring opening deg) : 78.21
 PA of pole (deg) : 46.46
 # a(km) ring



2031-10-31T18:04:04.5300 ex: 05 44 34.1138 s: +23 32 00.393 C/A 1.298° PA 359.09 deg v_sky -13.27 km/s D 18.43 AU
 Credit: Styled after SORA/Lucky Star

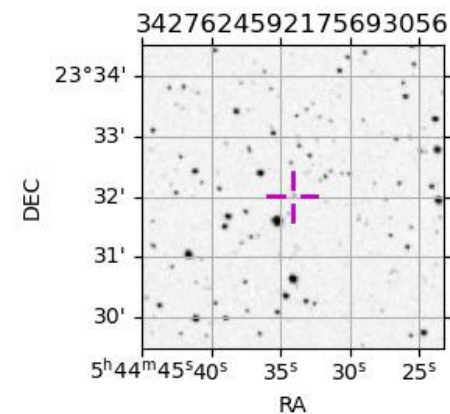
Earth
 PMO
 KAV
 AAT
 MSO



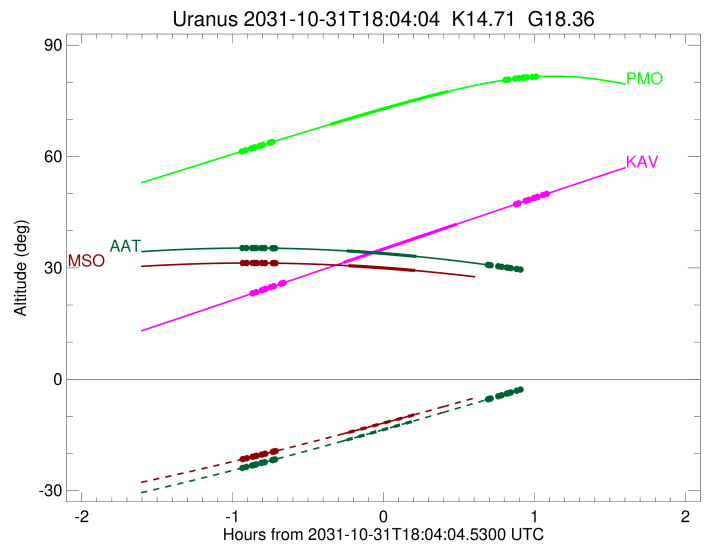
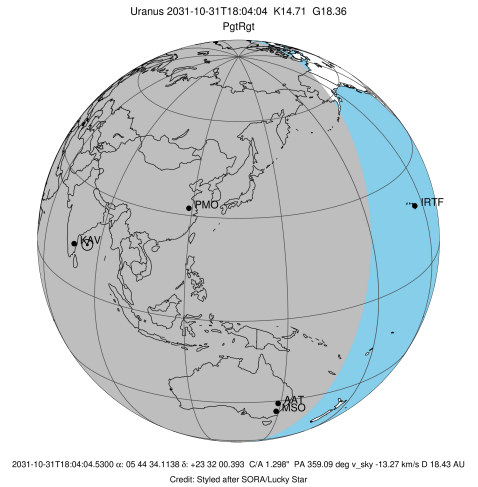
| # | a(km) | ring |
|----|---------|---------|
| 1 | 41837.2 | 6 |
| 2 | 42235.0 | 5 |
| 3 | 42571.2 | 4 |
| 4 | 44718.5 | alpha |
| 5 | 45661.1 | beta |
| 6 | 47176.1 | eta |
| 7 | 47626.3 | gamma |
| 8 | 48300.3 | delta |
| 9 | 50026.7 | lambda |
| 10 | 51149.4 | epsilon |

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 (200") | 33.4 | 243.1 | | | | | PnnRnn |
| PMO | Purple Mtn Obs. Nanki | 32.1 | 118.8 | +++++ | + + | +++++ | OCT 31 17:07 - OCT 31 19:05 | PieRie |
| KPNO | Kitt Peak Natl Obs | 32.0 | 248.4 | | | | | PnnRnn |
| MCD | McDonald Obs. 2.7m | 30.7 | 256.0 | | | | | PnnRnn |
| TEN | Teide Obs./Tenerife | 28.3 | 343.5 | | | | | PnnRnn |
| IRTF | Mauna Kea/IRTF | 19.8 | 204.5 | | | | | PnnRnn |
| KAV | Kavalur Observatory | 12.6 | 78.8 | +++++ | + + | +++++ | OCT 31 17:12 - OCT 31 19:09 | PieRie |
| RIO | Rio de Janeiro | -22.9 | 316.8 | | | | | PnnRnn |
| ESO | European Southern Obs | -29.3 | 289.3 | | | | | PnnRnn |
| AAT | Siding Spring (AAT) | -31.3 | 149.1 | +++++ | + + | +++ | OCT 31 17:07 - OCT 31 18:46 | PieRie |
| SAAO | So. Afr. Astro. Obs. | -32.4 | 20.8 | | | | | PnnRnn |
| MSO | Mt. Stromlo Observato | -35.3 | 149.0 | +++++ | + + | | OCT 31 17:08 - OCT 31 18:16 | PieRin |

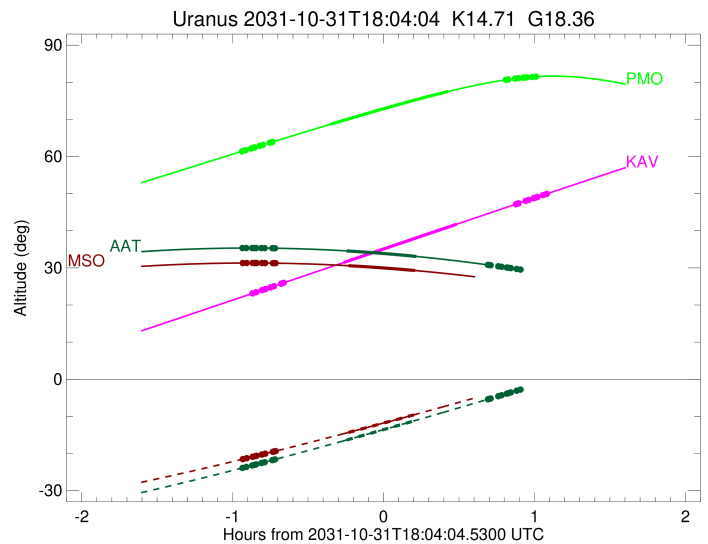
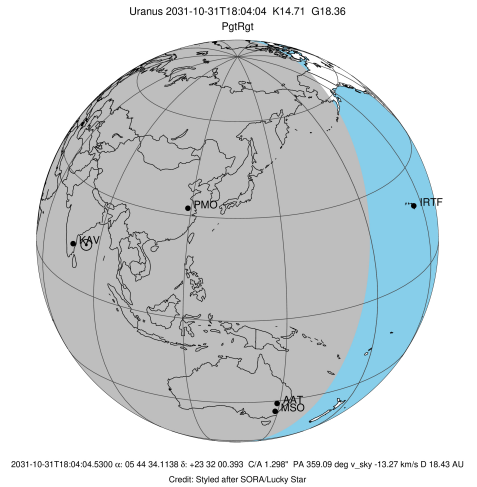


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-10-31T18:05:54.760
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 3427624592175693056
 2Mass ID (if available) : 05443411+2332002
 ICRS Star Coord at Epoch: 05h 44m 34.11381s +23:32:00.39343s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 14.708
 G magnitude : 18.362
 RP magnitude : 17.319
 BP magnitude : 19.461
 DUPflag : 0
 Distance (au) : 18.427
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -13.27
 Sun-Target sep (deg) : 131.21
 Sun-Moon sep (deg) : 31.88
 B (ring opening deg) : 78.21
 PA of pole (deg) : 46.46
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.228
 C/A sky separation (km) : 16416.9
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



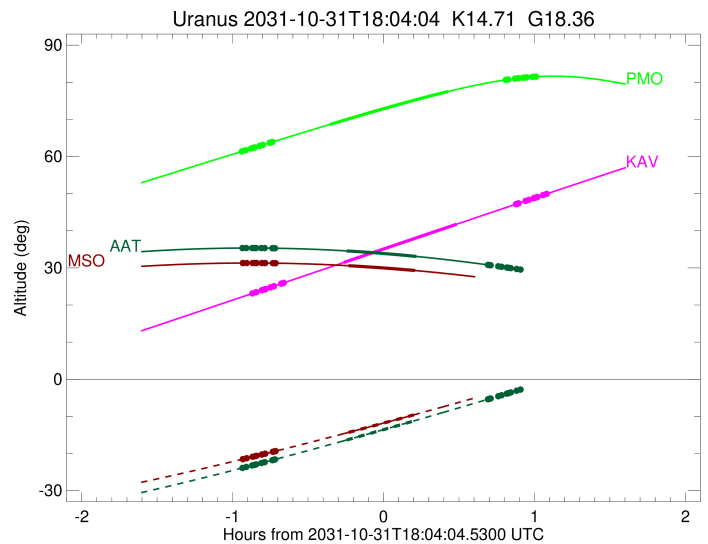
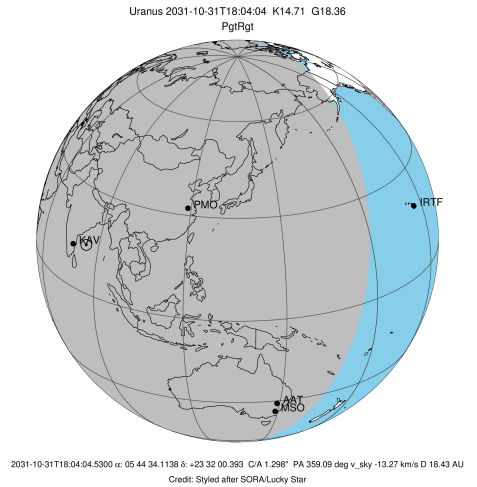
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I | 2031-10-31T17:07:48.939 | | 61.40 | -64.64 | 51132.79 | -13.03 | | |
| lambda | I | 2031-10-31T17:09:14.168 | | 61.69 | -64.41 | 50026.71 | -12.96 | | |
| delta | I | 2031-10-31T17:11:27.647 | | 62.16 | -64.04 | 48300.35 | -12.90 | | |
| gamma | I | 2031-10-31T17:12:19.538 | | 62.34 | -63.90 | 47631.31 | -12.88 | | |
| eta | I | 2031-10-31T17:12:54.898 | | 62.47 | -63.80 | 47176.12 | -12.86 | | |
| beta | I | 2031-10-31T17:14:52.655 | | 62.88 | -63.47 | 45664.84 | -12.81 | | |
| alpha | I | 2031-10-31T17:16:08.106 | | 63.14 | -63.25 | 44697.87 | -12.77 | | |
| 4 | I | 2031-10-31T17:18:52.216 | | 63.71 | -62.78 | 42615.20 | -12.66 | | |
| 5 | I | 2031-10-31T17:19:18.370 | | 63.80 | -62.71 | 42279.90 | -12.64 | | |
| 6 | I | 2031-10-31T17:19:55.226 | | 63.93 | -62.60 | 41808.30 | -12.61 | | |
| Uranus | I | 2031-10-31T17:42:51.541 | | 68.66 | -58.43 | 24998.31 | | -11.79 | -12.33 |
| Uranus | E | 2031-10-31T18:29:49.333 | | 77.53 | -49.18 | 25549.87 | | 1.47 | 1.54 |
| 6 | E | 2031-10-31T18:52:39.874 | | 80.65 | -44.47 | 41834.58 | 12.68 | | |
| 5 | E | 2031-10-31T18:53:04.801 | | 80.69 | -44.39 | 42156.03 | 12.71 | | |
| 4 | E | 2031-10-31T18:53:35.842 | | 80.74 | -44.28 | 42548.31 | 12.73 | | |
| alpha | E | 2031-10-31T18:56:28.227 | | 81.00 | -43.68 | 44751.99 | 12.84 | | |
| beta | E | 2031-10-31T18:57:39.678 | | 81.09 | -43.44 | 45671.69 | 12.88 | | |
| eta | E | 2031-10-31T18:59:36.181 | | 81.23 | -43.03 | 47176.12 | 12.94 | | |
| gamma | E | 2031-10-31T19:00:10.559 | | 81.27 | -42.91 | 47621.35 | 12.96 | | |
| delta | E | 2031-10-31T19:01:02.901 | | 81.33 | -42.73 | 48300.35 | 12.99 | | |
| lambda | E | 2031-10-31T19:03:15.541 | | 81.45 | -42.27 | 50026.71 | 13.04 | | |
| epsilon | E | 2031-10-31T19:05:01.013 | | 81.52 | -41.90 | 51404.89 | 13.12 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-10-31T18:10:15.950
 Event type : PgtRgt
 : Uranus 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 : 3427624592175693056
 2Mass ID (if available) : 05443411+2332002
 ICRS Star Coord at Epoch: 05h 44m 34.11381s +23:32:00.39343s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 14.708
 G magnitude : 18.362
 RP magnitude : 17.319
 BP magnitude : 19.461
 DUPflag : 0
 Distance (au) : 18.427
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -13.27
 Sun-Target sep (deg) : 131.21
 Sun-Moon sep (deg) : 31.22
 B (ring opening deg) : 78.21
 PA of pole (deg) : 46.46
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.312
 C/A sky separation (km) : 17535.8
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



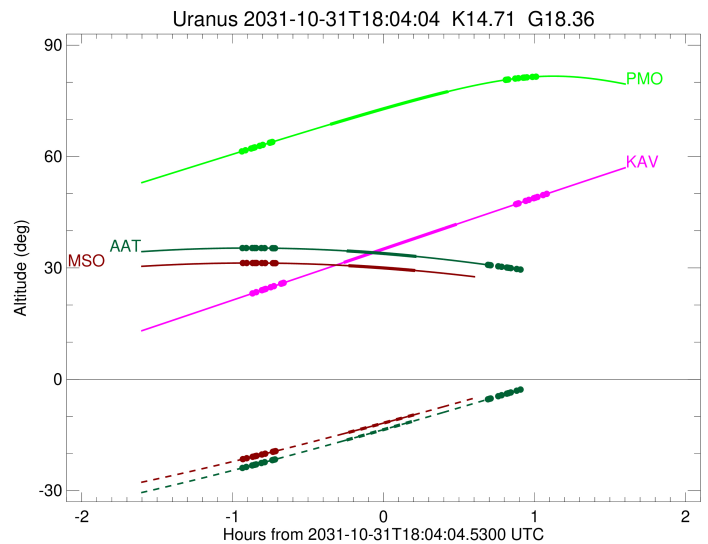
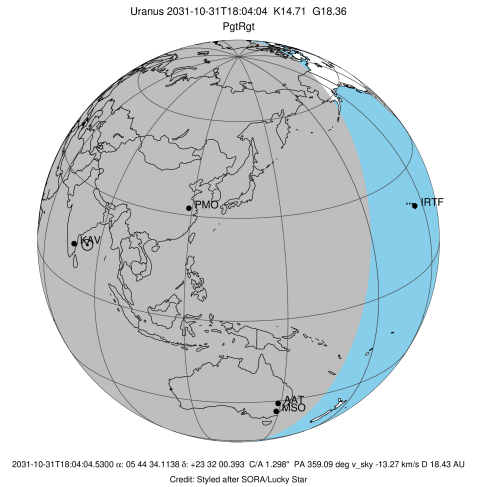
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I | 2031-10-31T17:12:01.807 | | 23.14 | -71.39 | 51139.45 | -12.75 | | |
| lambda | I | 2031-10-31T17:13:29.451 | | 23.47 | -71.74 | 50026.71 | -12.68 | | |
| delta | I | 2031-10-31T17:15:45.952 | | 23.99 | -72.29 | 48300.35 | -12.62 | | |
| gamma | I | 2031-10-31T17:16:39.041 | | 24.20 | -72.50 | 47631.27 | -12.59 | | |
| eta | I | 2031-10-31T17:17:15.222 | | 24.34 | -72.65 | 47176.12 | -12.57 | | |
| beta | I | 2031-10-31T17:19:15.738 | | 24.80 | -73.13 | 45665.23 | -12.51 | | |
| alpha | I | 2031-10-31T17:20:33.003 | | 25.09 | -73.45 | 44698.43 | -12.46 | | |
| 4 | I | 2031-10-31T17:23:21.258 | | 25.74 | -74.12 | 42615.43 | -12.35 | | |
| 5 | I | 2031-10-31T17:23:48.201 | | 25.84 | -74.23 | 42278.41 | -12.32 | | |
| 6 | I | 2031-10-31T17:24:25.967 | | 25.98 | -74.38 | 41807.61 | -12.29 | | |
| Uranus | I | 2031-10-31T17:48:16.217 | | 31.46 | -80.12 | 24998.02 | | -11.79 | -12.33 |
| Uranus | E | 2031-10-31T18:33:08.865 | | 41.77 | -87.91 | 25556.94 | | 0.70 | 0.73 |
| 6 | E | 2031-10-31T18:56:44.902 | | 47.16 | -82.86 | 41832.99 | 12.45 | | |
| 5 | E | 2031-10-31T18:57:10.404 | | 47.26 | -82.76 | 42155.57 | 12.48 | | |
| 4 | E | 2031-10-31T18:57:42.152 | | 47.38 | -82.63 | 42549.77 | 12.51 | | |
| alpha | E | 2031-10-31T19:00:37.331 | | 48.05 | -81.94 | 44752.16 | 12.64 | | |
| beta | E | 2031-10-31T19:01:49.942 | | 48.32 | -81.65 | 45672.27 | 12.69 | | |
| eta | E | 2031-10-31T19:03:48.130 | | 48.77 | -81.18 | 47176.12 | 12.76 | | |
| gamma | E | 2031-10-31T19:04:23.002 | | 48.90 | -81.05 | 47621.42 | 12.78 | | |
| delta | E | 2031-10-31T19:05:16.067 | | 49.10 | -80.83 | 48300.35 | 12.81 | | |
| lambda | E | 2031-10-31T19:07:30.461 | | 49.61 | -80.30 | 50026.71 | 12.88 | | |
| epsilon | E | 2031-10-31T19:09:17.998 | | 50.02 | -79.87 | 51414.66 | 12.96 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-10-31T18:02:40.960
 Event type : PgtRgt
 : Uranus 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 : 3427624592175693056
 2Mass ID (if available) : 05443411+2332002
 ICRS Star Coord at Epoch: 05h 44m 34.11381s +23:32:00.39343s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 14.708
 G magnitude : 18.362
 RP magnitude : 17.319
 BP magnitude : 19.461
 DUPflag : 0
 Distance (au) : 18.427
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -13.27
 Sun-Target sep (deg) : 131.21
 Sun-Moon sep (deg) : 32.01
 B (ring opening deg) : 78.21
 PA of pole (deg) : 46.46
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.692
 C/A sky separation (km) : 22607.8
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I | 2031-10-31T17:07:58.361 | | 35.35 | -23.89 | 51188.72 | -12.40 | | |
| lambda | I | 2031-10-31T17:09:32.743 | | 35.35 | -23.62 | 50026.71 | -12.28 | | |
| delta | I | 2031-10-31T17:11:54.045 | | 35.35 | -23.21 | 48300.35 | -12.16 | | |
| gamma | I | 2031-10-31T17:12:49.213 | | 35.35 | -23.04 | 47631.00 | -12.11 | | |
| eta | I | 2031-10-31T17:13:26.836 | | 35.35 | -22.93 | 47176.12 | -12.07 | | |
| beta | I | 2031-10-31T17:15:32.424 | | 35.34 | -22.56 | 45667.90 | -11.95 | | |
| alpha | I | 2031-10-31T17:16:53.313 | | 35.33 | -22.32 | 44702.48 | -11.87 | | |
| 4 | I | 2031-10-31T17:19:51.129 | | 35.31 | -21.80 | 42616.44 | -11.65 | | |
| 5 | I | 2031-10-31T17:20:20.545 | | 35.30 | -21.71 | 42267.73 | -11.60 | | |
| 6 | I | 2031-10-31T17:21:00.259 | | 35.30 | -21.59 | 41803.30 | -11.55 | | |
| Uranus | I | 2031-10-31T17:49:26.386 | | 34.57 | -16.35 | 25073.34 | | -10.94 | -11.44 |
| Uranus | E | 2031-10-31T18:17:08.794 | | 33.09 | -11.03 | 25521.02 | | -3.00 | -3.14 |
| 6 | E | 2031-10-31T18:45:34.337 | | 30.82 | -5.40 | 41827.68 | 11.54 | | |
| 5 | E | 2031-10-31T18:46:02.332 | | 30.77 | -5.30 | 42154.83 | 11.59 | | |
| 4 | E | 2031-10-31T18:46:36.955 | | 30.72 | -5.19 | 42554.85 | 11.64 | | |
| alpha | E | 2031-10-31T18:49:43.974 | | 30.43 | -4.56x | 44752.43 | 11.86 | | |
| beta | E | 2031-10-31T18:51:01.375 | | 30.30 | -4.30x | 45674.07 | 11.94 | | |
| eta | E | 2031-10-31T18:53:06.486 | | 30.10 | -3.88x | 47176.12 | 12.07 | | |
| gamma | E | 2031-10-31T18:53:43.362 | | 30.04 | -3.75x | 47621.67 | 12.10 | | |
| delta | E | 2031-10-31T18:54:39.338 | | 29.95 | -3.56x | 48300.35 | 12.15 | | |
| lambda | E | 2031-10-31T18:57:00.737 | | 29.71 | -3.09x | 50026.71 | 12.27 | | |
| epsilon | E | 2031-10-31T18:58:55.750 | | 29.51 | -2.70x | 51442.62 | 12.39 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-10-31T18:02:45.470
 Event type : PgtRgt
 : Uranus 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 : 3427624592175693056
 2Mass ID (if available) : 05443411+2332002
 ICRS Star Coord at Epoch: 05h 44m 34.11381s +23:32:00.39343s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 14.708
 G magnitude : 18.362
 RP magnitude : 17.319
 BP magnitude : 19.461
 DUPflag : 0
 Distance (au) : 18.427
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -13.27
 Sun-Target sep (deg) : 131.21
 Sun-Moon sep (deg) : 31.97
 B (ring opening deg) : 78.21
 PA of pole (deg) : 46.46
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.710
 C/A sky separation (km) : 22854.8
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I | 2031-10-31T17:08:07.952 | | 31.31 | -21.53 | 51190.90 | -12.35 | | |
| lambda | I | 2031-10-31T17:09:42.899 | | 31.32 | -21.27 | 50026.71 | -12.22 | | |
| delta | I | 2031-10-31T17:12:04.814 | | 31.32 | -20.88 | 48300.35 | -12.10 | | |
| gamma | I | 2031-10-31T17:13:00.233 | | 31.32 | -20.72 | 47630.98 | -12.05 | | |
| eta | I | 2031-10-31T17:13:38.029 | | 31.31 | -20.62 | 47176.12 | -12.02 | | |
| beta | I | 2031-10-31T17:15:44.214 | | 31.31 | -20.27 | 45668.02 | -11.89 | | |
| alpha | I | 2031-10-31T17:17:05.508 | | 31.30 | -20.04 | 44702.67 | -11.80 | | |
| 4 | I | 2031-10-31T17:20:04.312 | | 31.28 | -19.54 | 42616.46 | -11.58 | | |
| 5 | I | 2031-10-31T17:20:33.937 | | 31.28 | -19.46 | 42267.21 | -11.53 | | |
| 6 | I | 2031-10-31T17:21:13.865 | | 31.27 | -19.35 | 41803.12 | -11.48 | | |
| Uranus | I | 2031-10-31T17:50:07.289 | | 30.59 | -14.33 | 25082.06 | | -10.83 | -11.33 |
| Uranus | E | 2031-10-31T18:16:37.796 | | 29.29 | -9.50 | 25514.52 | | -3.25 | -3.40 |
| 6 | E | 2031-10-31T18:45:30.477 | | 27.19 | -4.05x | 41827.38 | 11.48 | | |
| 5 | E | 2031-10-31T18:45:58.668 | | 27.15 | -3.96x | 42154.82 | 11.53 | | |
| 4 | E | 2031-10-31T18:46:33.512 | | 27.10 | -3.85x | 42555.15 | 11.58 | | |
| alpha | E | 2031-10-31T18:49:41.506 | | 26.82 | -3.25x | 44752.43 | 11.80 | | |
| beta | E | 2031-10-31T18:50:59.300 | | 26.71 | -3.00x | 45674.16 | 11.89 | | |
| eta | E | 2031-10-31T18:53:04.991 | | 26.52 | -2.59x | 47176.12 | 12.01 | | |
| gamma | E | 2031-10-31T18:53:42.034 | | 26.47 | -2.47x | 47621.69 | 12.05 | | |
| delta | E | 2031-10-31T18:54:38.255 | | 26.38 | -2.29x | 48300.35 | 12.10 | | |
| lambda | E | 2031-10-31T18:57:00.247 | | 26.16 | -1.84x | 50026.71 | 12.22 | | |
| epsilon | E | 2031-10-31T18:58:55.844 | | 25.98 | -1.46x | 51444.18 | 12.34 | | |