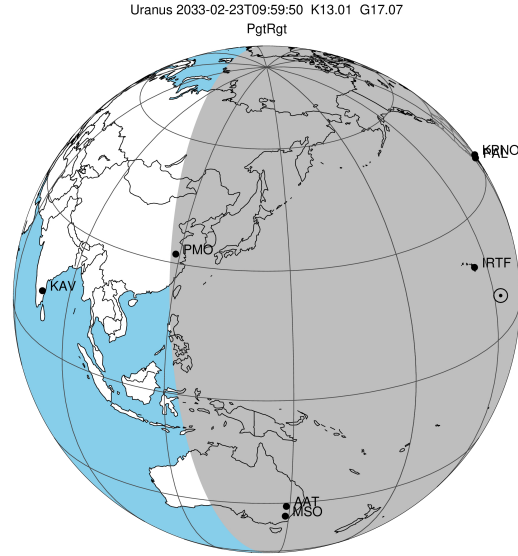


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-23T09:59:50.010
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427684000163377792
 2Mass ID (if available) : 05473953+2337319

ICRS Star Coord at Epoch: 05h 47m 39.53667s +23:37:31.85550s

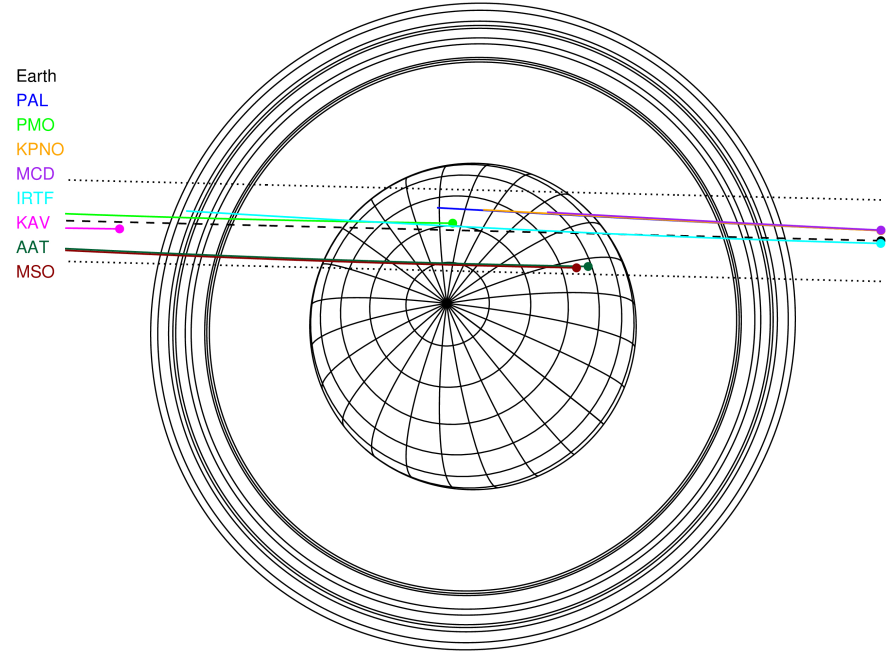
RUWE (>1.4 is poor) : 1.00
 K magnitude : 13.009
 G magnitude : 17.074
 RP magnitude : 15.967
 BP magnitude : 18.362
 DUPflag : 0
 Distance (au) : 18.607
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.08
 Sun-Target sep (deg) : 112.53
 Sun-Moon sep (deg) : 167.57
 B (ring opening deg) : 77.62
 PA of pole (deg) : 48.69

| # | 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 |



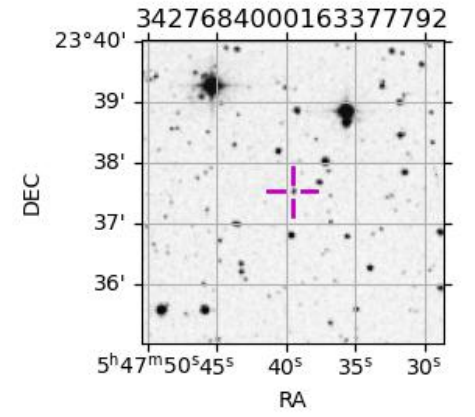
2033-02-23T09:59:50.0100 α: 05 47 39.5367 δ: +23 37 31.856 C/A 1.117° PA 178.59 deg v_sky - 5.08 km/s D 18.61 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2033-02-23T09:59:50 K13.01 G17.07 PgtRgt

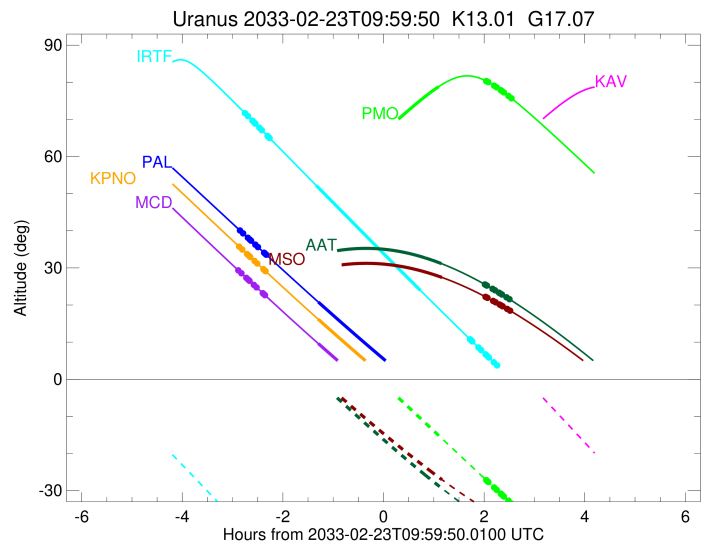
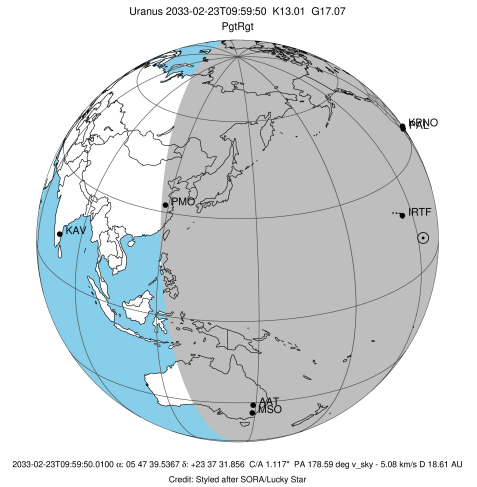


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

| 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 (200") | 33.4 | 243.1 | +++++ | + | | FEB 23 07:10 - FEB 23 08:42 | PinRin |
| PMO | Purple Mtn Obs. Nanki | 32.1 | 118.8 | | + | +++++ | FEB 23 11:05 - FEB 23 12:33 | PneRne |
| KPNO | Kitt Peak Natl Obs | 32.0 | 248.4 | +++++ | + | | FEB 23 07:09 - FEB 23 08:41 | PinRin |
| MCD | McDonald Obs. 2.7m | 30.7 | 256.0 | +++++ | + | | FEB 23 07:08 - FEB 23 08:42 | PinRin |
| TEN | Teide Obs./Tenerife | 28.3 | 343.5 | | | | | PnnRnn |
| IRTF | Mauna Kea/IRTF | 19.8 | 204.5 | +++++ | + | +++++ | FEB 23 07:15 - FEB 23 12:05 | PieRie |
| KAV | Kavalur Observatory | 12.6 | 78.8 | | | | | PnnRnn |
| 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 | | + | +++++ | FEB 23 11:08 - FEB 23 12:31 | PneRne |
| SAAO | So. Afr. Astro. Obs. | -32.4 | 20.8 | | | | | PnnRnn |
| MSO | Mt. Stromlo Observato | -35.3 | 149.0 | | + | +++++ | FEB 23 11:09 - FEB 23 12:32 | PneRne |

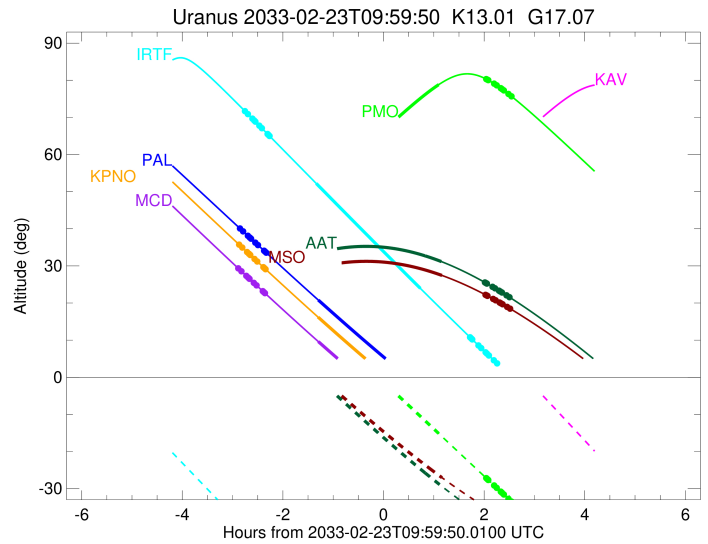
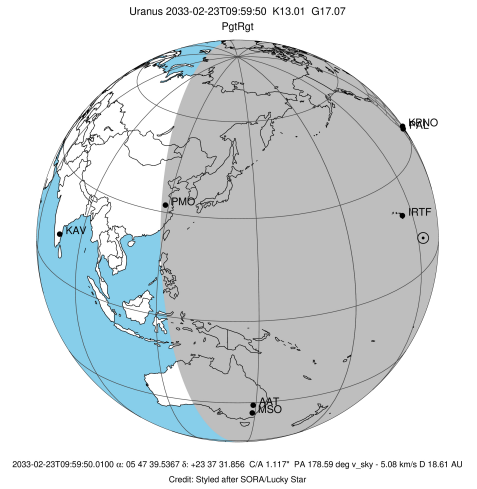


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-23T09:40:18.310
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3427684000163377792
 2Mass ID (if available) : 05473953+2337319
 ICRS Star Coord at Epoch: 05h 47m 39.53667s +23:37:31.85550s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 13.009
 G magnitude : 17.074
 RP magnitude : 15.967
 BP magnitude : 18.362
 DUPflag : 0
 Distance (au) : 18.606
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.08
 Sun-Target sep (deg) : 112.53
 Sun-Moon sep (deg) : 168.49
 B (ring opening deg) : 77.62
 PA of pole (deg) : 48.69
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.353
 C/A sky separation (km) : 18255.3
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



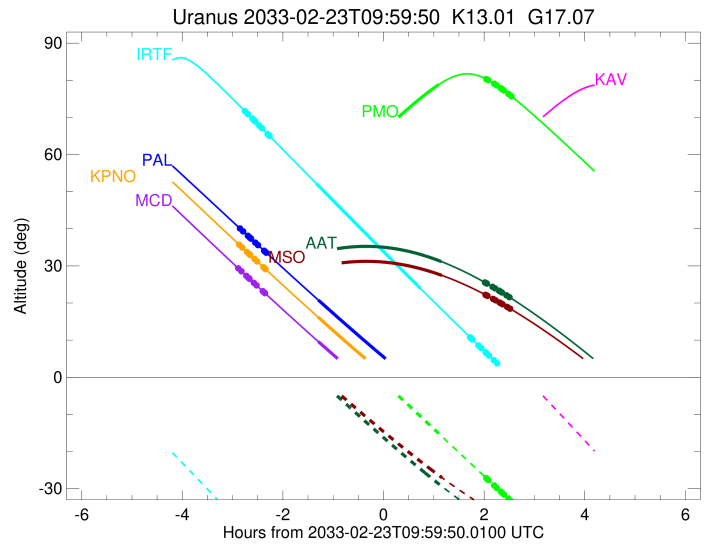
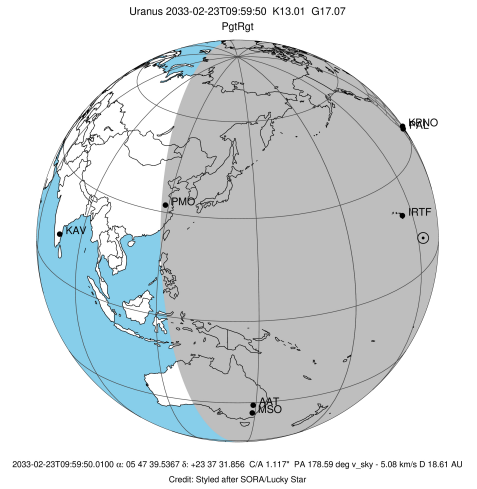
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|---------|---------|----------|-------|---------|--------------|
| epsilon | I | 2033-02-23T07:10:01.675 | | 39.80 | -63.76 | 50755.64 | -5.07 | | |
| lambda | I | 2033-02-23T07:12:25.783 | | 39.30 | -64.00 | 50026.71 | -5.05 | | |
| delta | I | 2033-02-23T07:18:08.900 | | 38.10 | -64.54 | 48300.35 | -5.01 | | |
| gamma | I | 2033-02-23T07:20:23.791 | | 37.63 | -64.73 | 47625.38 | -5.00 | | |
| eta | I | 2033-02-23T07:21:53.818 | | 37.32 | -64.86 | 47176.12 | -4.98 | | |
| beta | I | 2033-02-23T07:27:01.839 | | 36.25 | -65.25 | 45647.13 | -4.95 | | |
| alpha | I | 2033-02-23T07:30:16.220 | | 35.57 | -65.47 | 44686.79 | -4.92 | | |
| 4 | I | 2033-02-23T07:37:32.421 | | 34.06 | -65.90 | 42556.67 | -4.86 | | |
| 5 | I | 2033-02-23T07:38:51.859 | | 33.78 | -65.96 | 42168.17 | -4.84 | | |
| 6 | I | 2033-02-23T07:39:52.935 | | 33.57 | -66.01 | 41875.29 | -4.83 | | |
| Uranus | I | 2033-02-23T08:42:06.670 | | 20.80 | -64.62 | 25552.20 | | -1.33 | -1.40 |
| Uranus | E | 2033-02-23T10:37:17.767 | | -1.50x | -47.01 | 25012.70 | | 12.23 | 12.79 |
| 6 | E | 2033-02-23T11:43:42.748 | | -12.95x | -33.77 | 41799.15 | 4.38 | | |
| 5 | E | 2033-02-23T11:45:24.865 | | -13.22x | -33.42 | 42240.65 | 4.39 | | |
| 4 | E | 2033-02-23T11:46:50.637 | | -13.45x | -33.12 | 42613.96 | 4.40 | | |
| alpha | E | 2033-02-23T11:54:53.524 | | -14.72x | -31.46 | 44748.32 | 4.43 | | |
| beta | E | 2033-02-23T11:58:23.260 | | -15.27x | -30.74 | 45681.22 | 4.44 | | |
| eta | E | 2033-02-23T12:03:59.061 | | -16.13x | -29.58 | 47176.12 | 4.46 | | |
| gamma | E | 2033-02-23T12:05:40.858 | | -16.38x | -29.23 | 47630.65 | 4.47 | | |
| delta | E | 2033-02-23T12:08:10.646 | | -16.76x | -28.71 | 48300.35 | 4.47 | | |
| lambda | E | 2033-02-23T12:14:35.783 | | -17.72x | -27.38 | 50026.71 | 4.49 | | |
| epsilon | E | 2033-02-23T12:20:04.718 | | -18.52x | -26.24 | 51505.58 | 4.49 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-23T10:07:24.890
 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 : 3427684000163377792
 2Mass ID (if available) : 05473953+2337319
 ICRS Star Coord at Epoch: 05h 47m 39.53667s +23:37:31.85550s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 13.009
 G magnitude : 17.074
 RP magnitude : 15.967
 BP magnitude : 18.362
 DUPflag : 0
 Distance (au) : 18.607
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.08
 Sun-Target sep (deg) : 112.53
 Sun-Moon sep (deg) : 167.50
 B (ring opening deg) : 77.62
 PA of pole (deg) : 48.69
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.196
 C/A sky separation (km) : 16135.4
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



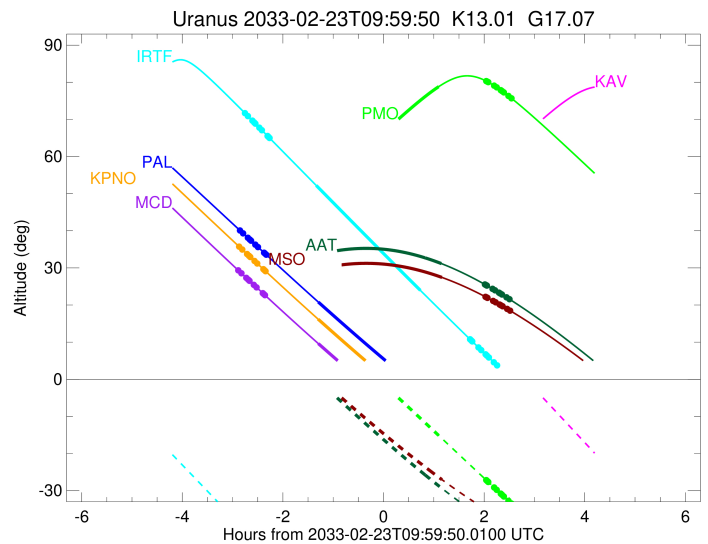
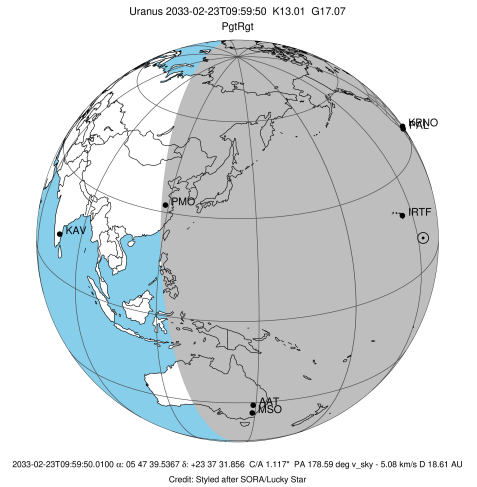
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|-------|---------|--------------|
| epsilon | I | 2033-02-23T07:39:56.900 | | 36.84 | 26.34x | 50755.95 | -5.12 | | |
| lambda | I | 2033-02-23T07:42:19.588 | | 37.35 | 25.91x | 50026.71 | -5.11 | | |
| delta | I | 2033-02-23T07:47:58.088 | | 38.54 | 24.88x | 48300.35 | -5.09 | | |
| gamma | I | 2033-02-23T07:50:10.736 | | 39.01 | 24.48x | 47625.37 | -5.09 | | |
| eta | I | 2033-02-23T07:51:39.128 | | 39.32 | 24.21x | 47176.12 | -5.08 | | |
| beta | I | 2033-02-23T07:56:40.723 | | 40.38 | 23.28x | 45647.08 | -5.06 | | |
| alpha | I | 2033-02-23T07:59:50.355 | | 41.05 | 22.69x | 44686.74 | -5.05 | | |
| 4 | I | 2033-02-23T08:06:53.939 | | 42.55 | 21.36x | 42556.34 | -5.02 | | |
| 5 | I | 2033-02-23T08:08:10.615 | | 42.82 | 21.12x | 42168.54 | -5.01 | | |
| 6 | I | 2033-02-23T08:09:09.663 | | 43.03 | 20.94x | 41875.46 | -5.00 | | |
| Uranus | I | 2033-02-23T09:06:42.183 | | 55.27 | 9.64x | 25541.65 | | -2.13 | -2.23 |
| Uranus | E | 2033-02-23T11:05:44.025 | | 78.84 | -15.16 | 25000.25 | | 12.38 | 12.95 |
| 6 | E | 2033-02-23T12:02:10.025 | | 80.35 | -27.12 | 41797.60 | 5.08 | | |
| 5 | E | 2033-02-23T12:03:39.830 | | 80.17 | -27.44 | 42247.84 | 5.09 | | |
| 4 | E | 2033-02-23T12:04:51.879 | | 80.03 | -27.69 | 42612.43 | 5.10 | | |
| alpha | E | 2033-02-23T12:11:49.249 | | 79.09 | -29.16 | 44749.60 | 5.13 | | |
| beta | E | 2033-02-23T12:14:49.990 | | 78.64 | -29.79 | 45681.21 | 5.15 | | |
| eta | E | 2033-02-23T12:19:39.836 | | 77.89 | -30.80 | 47176.12 | 5.17 | | |
| gamma | E | 2033-02-23T12:21:07.648 | | 77.65 | -31.11 | 47630.39 | 5.18 | | |
| delta | E | 2033-02-23T12:23:16.977 | | 77.29 | -31.56 | 48300.35 | 5.18 | | |
| lambda | E | 2033-02-23T12:28:49.342 | | 76.33 | -32.72 | 50026.71 | 5.20 | | |
| epsilon | E | 2033-02-23T12:33:35.814 | | 75.48 | -33.72 | 51519.50 | 5.21 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-23T09:40:11.080
 Event type : PgtRgt
 : Uranus 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 : 3427684000163377792
 2Mass ID (if available) : 05473953+2337319
 ICRS Star Coord at Epoch: 05h 47m 39.53667s +23:37:31.85550s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 13.009
 G magnitude : 17.074
 RP magnitude : 15.967
 BP magnitude : 18.362
 DUPflag : 0
 Distance (au) : 18.606
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.08
 Sun-Target sep (deg) : 112.53
 Sun-Moon sep (deg) : 168.47
 B (ring opening deg) : 77.62
 PA of pole (deg) : 48.69
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.359
 C/A sky separation (km) : 18335.6
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



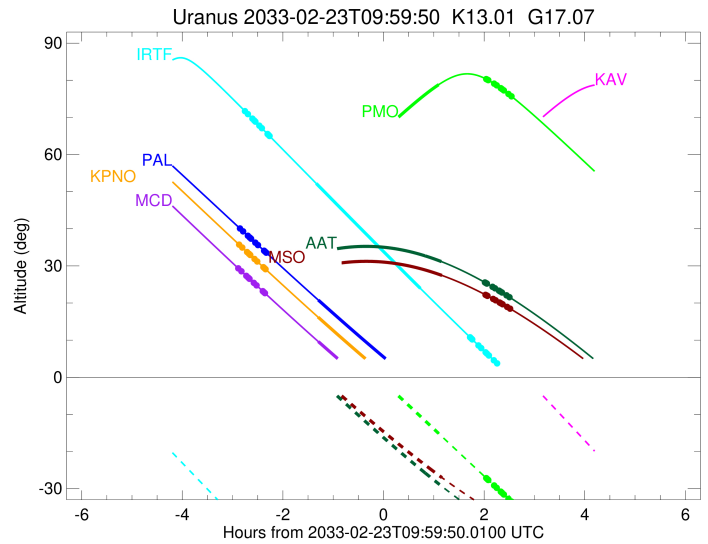
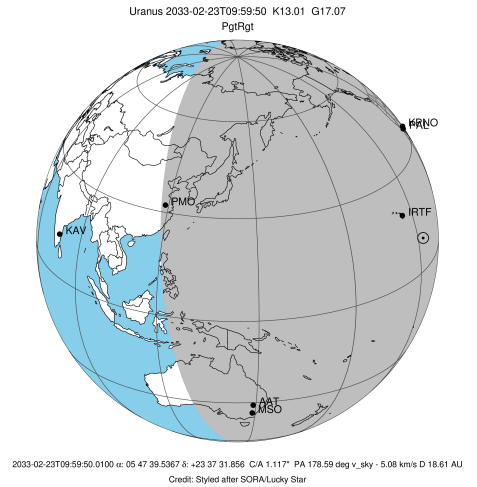
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|---------|---------|----------|-------|---------|--------------|
| epsilon | I | 2033-02-23T07:09:01.947 | | 35.44 | -66.78 | 50755.69 | -5.04 | | |
| lambda | I | 2033-02-23T07:11:26.885 | | 34.93 | -66.94 | 50026.71 | -5.02 | | |
| delta | I | 2033-02-23T07:17:12.005 | | 33.72 | -67.28 | 48300.35 | -4.98 | | |
| gamma | I | 2033-02-23T07:19:27.701 | | 33.25 | -67.40 | 47625.38 | -4.97 | | |
| eta | I | 2033-02-23T07:20:58.272 | | 32.93 | -67.47 | 47176.12 | -4.95 | | |
| beta | I | 2033-02-23T07:26:08.187 | | 31.84 | -67.67 | 45647.14 | -4.92 | | |
| alpha | I | 2033-02-23T07:29:23.795 | | 31.16 | -67.76 | 44686.80 | -4.89 | | |
| 4 | I | 2033-02-23T07:36:42.825 | | 29.63 | -67.87 | 42556.71 | -4.82 | | |
| 5 | I | 2033-02-23T07:38:02.811 | | 29.35 | -67.88 | 42168.12 | -4.81 | | |
| 6 | I | 2033-02-23T07:39:04.291 | | 29.13 | -67.88 | 41875.27 | -4.80 | | |
| Uranus | I | 2033-02-23T08:41:50.079 | | 16.20 | -63.59 | 25552.64 | | -1.29 | -1.35 |
| Uranus | E | 2033-02-23T10:37:19.759 | | -6.03x | -43.37 | 25013.49 | | 12.22 | 12.78 |
| 6 | E | 2033-02-23T11:44:24.361 | | -17.30x | -29.46 | 41799.19 | 4.35 | | |
| 5 | E | 2033-02-23T11:46:07.308 | | -17.56x | -29.10 | 42240.51 | 4.35 | | |
| 4 | E | 2033-02-23T11:47:33.854 | | -17.79x | -28.80 | 42613.99 | 4.36 | | |
| alpha | E | 2033-02-23T11:55:40.770 | | -19.01x | -27.08 | 44748.30 | 4.39 | | |
| beta | E | 2033-02-23T11:59:12.238 | | -19.54x | -26.33 | 45681.22 | 4.41 | | |
| eta | E | 2033-02-23T12:04:50.766 | | -20.36x | -25.14 | 47176.12 | 4.43 | | |
| gamma | E | 2033-02-23T12:06:33.381 | | -20.61x | -24.77 | 47630.65 | 4.43 | | |
| delta | E | 2033-02-23T12:09:04.363 | | -20.97x | -24.24 | 48300.35 | 4.44 | | |
| lambda | E | 2033-02-23T12:15:32.531 | | -21.88x | -22.87 | 50026.71 | 4.46 | | |
| epsilon | E | 2033-02-23T12:21:03.957 | | -22.64x | -21.69 | 51505.35 | 4.46 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-23T09:40:28.420
 Event type : PgtRgt
 : Uranus 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 : 3427684000163377792
 2Mass ID (if available) : 05473953+2337319
 ICRS Star Coord at Epoch: 05h 47m 39.53667s +23:37:31.85550s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 13.009
 G magnitude : 17.074
 RP magnitude : 15.967
 BP magnitude : 18.362
 DUPflag : 0
 Distance (au) : 18.606
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.08
 Sun-Target sep (deg) : 112.53
 Sun-Moon sep (deg) : 168.44
 B (ring opening deg) : 77.62
 PA of pole (deg) : 48.69
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.372
 C/A sky separation (km) : 18516.2
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



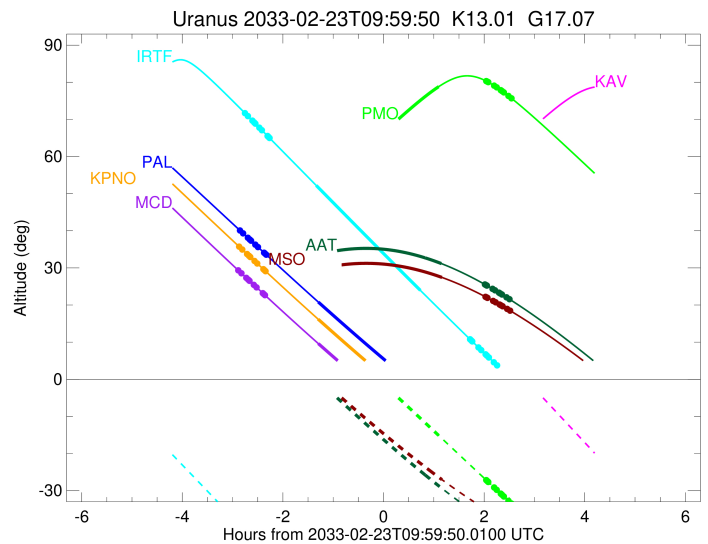
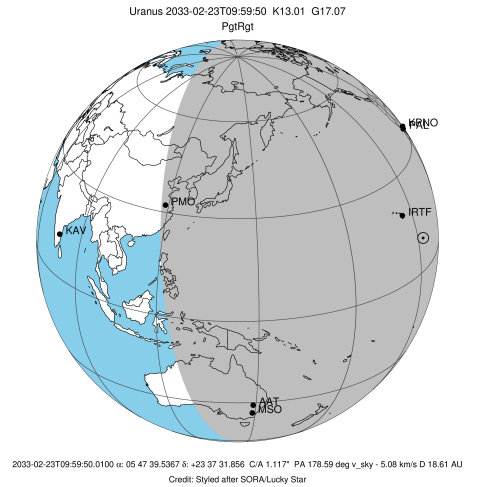
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|---------|---------|----------|-------|---------|--------------|
| epsilon | I | 2033-02-23T07:07:59.694 | | 29.05 | -69.18 | 50755.94 | -4.99 | | |
| lambda | I | 2033-02-23T07:10:26.146 | | 28.54 | -69.18 | 50026.71 | -4.97 | | |
| delta | I | 2033-02-23T07:16:14.823 | | 27.31 | -69.11 | 48300.35 | -4.93 | | |
| gamma | I | 2033-02-23T07:18:31.944 | | 26.83 | -69.07 | 47625.40 | -4.91 | | |
| eta | I | 2033-02-23T07:20:03.480 | | 26.51 | -69.03 | 47176.12 | -4.90 | | |
| beta | I | 2033-02-23T07:25:16.738 | | 25.41 | -68.85 | 45647.18 | -4.86 | | |
| alpha | I | 2033-02-23T07:28:34.514 | | 24.72 | -68.70 | 44686.84 | -4.83 | | |
| 4 | I | 2033-02-23T07:35:58.523 | | 23.17 | -68.27 | 42556.87 | -4.77 | | |
| 5 | I | 2033-02-23T07:37:19.514 | | 22.89 | -68.18 | 42167.96 | -4.75 | | |
| 6 | I | 2033-02-23T07:38:21.692 | | 22.67 | -68.10 | 41875.20 | -4.74 | | |
| Uranus | I | 2033-02-23T08:42:05.425 | | 9.62 | -59.99 | 25553.76 | | -1.17 | -1.23 |
| Uranus | E | 2033-02-23T10:37:35.730 | | -12.13x | -37.38 | 25015.23 | | 12.20 | 12.76 |
| 6 | E | 2033-02-23T11:45:43.796 | | -22.92x | -22.82 | 41799.26 | 4.29 | | |
| 5 | E | 2033-02-23T11:47:27.932 | | -23.16x | -22.45 | 42240.22 | 4.30 | | |
| 4 | E | 2033-02-23T11:48:55.630 | | -23.37x | -22.13 | 42614.04 | 4.31 | | |
| alpha | E | 2033-02-23T11:57:08.351 | | -24.50x | -20.36 | 44748.24 | 4.34 | | |
| beta | E | 2033-02-23T12:00:42.297 | | -24.98x | -19.59 | 45681.21 | 4.36 | | |
| eta | E | 2033-02-23T12:06:24.683 | | -25.72x | -18.36 | 47176.12 | 4.38 | | |
| gamma | E | 2033-02-23T12:08:08.449 | | -25.95x | -17.99 | 47630.66 | 4.38 | | |
| delta | E | 2033-02-23T12:10:41.103 | | -26.27x | -17.44 | 48300.35 | 4.39 | | |
| lambda | E | 2033-02-23T12:17:13.485 | | -27.09x | -16.03 | 50026.71 | 4.41 | | |
| epsilon | E | 2033-02-23T12:22:48.305 | | -27.76x | -14.83 | 51504.91 | 4.41 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-23T09:42:03.760
 Event type : PgtRgt
 : Uranus 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 : 3427684000163377792
 2Mass ID (if available) : 05473953+2337319
 ICRS Star Coord at Epoch: 05h 47m 39.53667s +23:37:31.85550s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 13.009
 G magnitude : 17.074
 RP magnitude : 15.967
 BP magnitude : 18.362
 DUPflag : 0
 Distance (au) : 18.606
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.08
 Sun-Target sep (deg) : 112.53
 Sun-Moon sep (deg) : 168.42
 B (ring opening deg) : 77.62
 PA of pole (deg) : 48.69
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.151
 C/A sky separation (km) : 15532.3
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



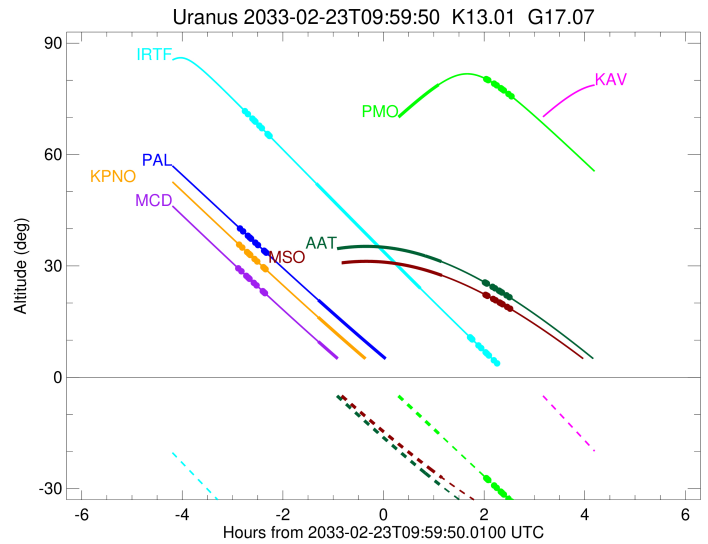
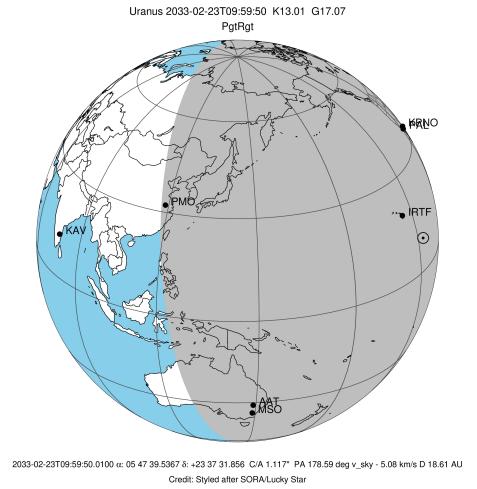
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|-------|---------|--------------|
| epsilon | I | 2033-02-23T07:15:53.114 | | 71.40 | -40.96 | 50751.43 | -5.37 | | |
| lambda | I | 2033-02-23T07:18:08.378 | | 70.89 | -41.49 | 50026.71 | -5.35 | | |
| delta | I | 2033-02-23T07:23:31.694 | | 69.66 | -42.75 | 48300.35 | -5.33 | | |
| gamma | I | 2033-02-23T07:25:38.605 | | 69.18 | -43.25 | 47625.10 | -5.32 | | |
| eta | I | 2033-02-23T07:27:03.141 | | 68.85 | -43.58 | 47176.12 | -5.31 | | |
| beta | I | 2033-02-23T07:31:52.197 | | 67.75 | -44.70 | 45646.35 | -5.28 | | |
| alpha | I | 2033-02-23T07:34:54.032 | | 67.06 | -45.41 | 44686.16 | -5.26 | | |
| 4 | I | 2033-02-23T07:41:41.296 | | 65.51 | -47.00 | 42554.06 | -5.22 | | |
| 5 | I | 2033-02-23T07:42:54.123 | | 65.23 | -47.28 | 42171.05 | -5.20 | | |
| 6 | I | 2033-02-23T07:43:51.313 | | 65.01 | -47.50 | 41876.41 | -5.20 | | |
| Uranus | I | 2033-02-23T08:39:32.589 | | 52.23 | -60.35 | 25525.56 | | -2.96 | -3.10 |
| Uranus | E | 2033-02-23T10:43:54.170 | | 23.92 | -79.70 | 25000.24 | | 12.38 | 12.95 |
| 6 | E | 2033-02-23T11:42:52.244 | | 10.81 | -70.78 | 41797.91 | 4.78 | | |
| 5 | E | 2033-02-23T11:44:27.382 | | 10.46 | -70.46 | 42246.24 | 4.78 | | |
| 4 | E | 2033-02-23T11:45:44.552 | | 10.18 | -70.19 | 42612.81 | 4.79 | | |
| alpha | E | 2033-02-23T11:53:09.577 | | 8.56 | -68.63 | 44749.31 | 4.81 | | |
| beta | E | 2033-02-23T11:56:22.900 | | 7.85 | -67.94 | 45681.23 | 4.81 | | |
| eta | E | 2033-02-23T12:01:33.367 | | 6.72 | -66.82 | 47176.12 | 4.82 | | |
| gamma | E | 2033-02-23T12:03:07.577 | | 6.38 | -66.48 | 47630.46 | 4.82 | | |
| delta | E | 2033-02-23T12:05:26.406 | | 5.88 | -65.98 | 48300.35 | 4.83 | | |
| lambda | E | 2033-02-23T12:11:23.829 | | 4.59x | -64.66 | 50026.71 | 4.83 | | |
| epsilon | E | 2033-02-23T12:16:31.779 | | 3.48x | -63.52 | 51515.62 | 4.83 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-23T09:58:37.480
 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 : 3427684000163377792
 2Mass ID (if available) : 05473953+2337319
 ICRS Star Coord at Epoch: 05h 47m 39.53667s +23:37:31.85550s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 13.009
 G magnitude : 17.074
 RP magnitude : 15.967
 BP magnitude : 18.362
 DUPflag : 0
 Distance (au) : 18.607
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.08
 Sun-Target sep (deg) : 112.53
 Sun-Moon sep (deg) : 167.45
 B (ring opening deg) : 77.62
 PA of pole (deg) : 48.69
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.726
 C/A sky separation (km) : 9795.0
 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_itr93_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 | 2033-02-23T07:28:57.447 | | 26.98 | 15.22x | 50745.83 | -5.44 | | |
| lambda | I | 2033-02-23T07:31:09.738 | | 27.24 | 14.74x | 50026.71 | -5.43 | | |
| delta | I | 2033-02-23T07:36:27.521 | | 27.85 | 13.61x | 48300.35 | -5.43 | | |
| gamma | I | 2033-02-23T07:38:31.997 | | 28.09 | 13.17x | 47624.59 | -5.43 | | |
| eta | I | 2033-02-23T07:39:54.636 | | 28.24 | 12.87x | 47176.12 | -5.43 | | |
| beta | I | 2033-02-23T07:44:37.068 | | 28.76 | 11.87x | 45644.99 | -5.42 | | |
| alpha | I | 2033-02-23T07:47:33.837 | | 29.07 | 11.24x | 44685.25 | -5.42 | | |
| 4 | I | 2033-02-23T07:54:08.913 | | 29.75 | 9.83x | 42549.30 | -5.41 | | |
| 5 | I | 2033-02-23T07:55:17.166 | | 29.86 | 9.59x | 42177.19 | -5.40 | | |
| 6 | I | 2033-02-23T07:56:13.240 | | 29.95 | 9.39x | 41878.09 | -5.40 | | |
| Uranus | I | 2033-02-23T08:47:23.916 | | 33.88 | -1.43x | 25438.81 | | -5.63 | -5.90 |
| Uranus | E | 2033-02-23T11:08:58.510 | | 31.15 | -29.30 | 25044.32 | | 11.86 | 12.40 |
| 6 | E | 2033-02-23T12:00:36.818 | | 25.56 | -37.80 | 41795.78 | 5.29 | | |
| 5 | E | 2033-02-23T12:02:05.559 | | 25.37 | -38.02 | 42259.19 | 5.29 | | |
| 4 | E | 2033-02-23T12:03:11.799 | | 25.23 | -38.19 | 42609.29 | 5.30 | | |
| alpha | E | 2033-02-23T12:09:56.012 | | 24.35 | -39.17 | 44751.15 | 5.30 | | |
| beta | E | 2033-02-23T12:12:50.977 | | 23.97 | -39.59 | 45680.92 | 5.30 | | |
| eta | E | 2033-02-23T12:17:33.108 | | 23.33 | -40.24 | 47176.12 | 5.30 | | |
| gamma | E | 2033-02-23T12:18:58.683 | | 23.13 | -40.44 | 47629.94 | 5.30 | | |
| delta | E | 2033-02-23T12:21:05.092 | | 22.84 | -40.72 | 48300.35 | 5.30 | | |
| lambda | E | 2033-02-23T12:26:30.588 | | 22.08 | -41.45 | 50026.71 | 5.30 | | |
| epsilon | E | 2033-02-23T12:31:15.219 | | 21.40 | -42.06 | 51536.23 | 5.30 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-23T09:58:43.400
 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 : 3427684000163377792
 2Mass ID (if available) : 05473953+2337319
 ICRS Star Coord at Epoch: 05h 47m 39.53667s +23:37:31.85550s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 13.009
 G magnitude : 17.074
 RP magnitude : 15.967
 BP magnitude : 18.362
 DUPflag : 0
 Distance (au) : 18.607
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.08
 Sun-Target sep (deg) : 112.53
 Sun-Moon sep (deg) : 167.42
 B (ring opening deg) : 77.62
 PA of pole (deg) : 48.69
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.708
 C/A sky separation (km) : 9550.7
 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_itr93_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 | 2033-02-23T07:28:26.328 | | 23.52 | 15.49x | 50745.61 | -5.43 | | |
| lambda | I | 2033-02-23T07:30:38.841 | | 23.77 | 15.04x | 50026.71 | -5.42 | | |
| delta | I | 2033-02-23T07:35:57.245 | | 24.34 | 13.95x | 48300.35 | -5.42 | | |
| gamma | I | 2033-02-23T07:38:01.965 | | 24.56 | 13.53x | 47624.56 | -5.42 | | |
| eta | I | 2033-02-23T07:39:24.757 | | 24.70 | 13.24x | 47176.12 | -5.42 | | |
| beta | I | 2033-02-23T07:44:07.732 | | 25.18 | 12.28x | 45644.92 | -5.41 | | |
| alpha | I | 2033-02-23T07:47:04.815 | | 25.47 | 11.68x | 44685.21 | -5.41 | | |
| 4 | I | 2033-02-23T07:53:40.623 | | 26.10 | 10.33x | 42549.06 | -5.40 | | |
| 5 | I | 2033-02-23T07:54:48.885 | | 26.21 | 10.10x | 42177.54 | -5.39 | | |
| 6 | I | 2033-02-23T07:55:45.112 | | 26.29 | 9.91x | 41878.17 | -5.39 | | |
| Uranus | I | 2033-02-23T08:46:57.976 | | 29.93 | -0.45x | 25433.95 | | -5.75 | -6.02 |
| Uranus | E | 2033-02-23T11:09:38.081 | | 27.43 | -27.05 | 25047.60 | | 11.82 | 12.36 |
| 6 | E | 2033-02-23T12:01:18.481 | | 22.23 | -34.93 | 41795.73 | 5.28 | | |
| 5 | E | 2033-02-23T12:02:47.460 | | 22.05 | -35.14 | 42259.67 | 5.28 | | |
| 4 | E | 2033-02-23T12:03:53.669 | | 21.92 | -35.29 | 42609.14 | 5.29 | | |
| alpha | E | 2033-02-23T12:10:38.595 | | 21.10 | -36.19 | 44751.20 | 5.29 | | |
| beta | E | 2033-02-23T12:13:33.842 | | 20.73 | -36.57 | 45680.90 | 5.29 | | |
| eta | E | 2033-02-23T12:18:16.469 | | 20.14 | -37.17 | 47176.12 | 5.29 | | |
| gamma | E | 2033-02-23T12:19:42.191 | | 19.95 | -37.35 | 47629.91 | 5.29 | | |
| delta | E | 2033-02-23T12:21:48.830 | | 19.68 | -37.61 | 48300.35 | 5.29 | | |
| lambda | E | 2033-02-23T12:27:14.915 | | 18.96 | -38.27 | 50026.71 | 5.29 | | |
| epsilon | E | 2033-02-23T12:32:00.191 | | 18.32 | -38.82 | 51536.88 | 5.29 | | |