

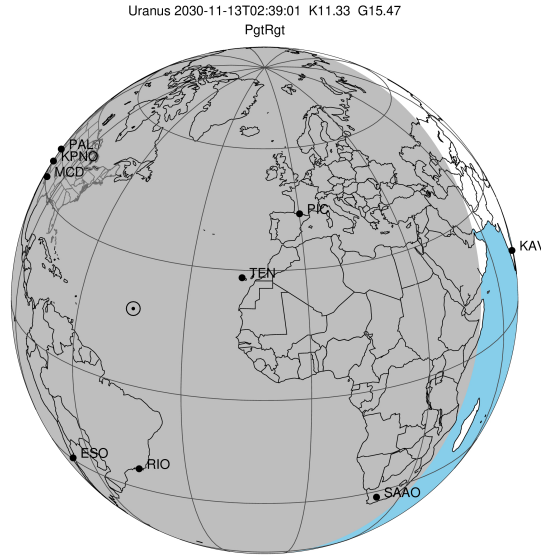
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-11-13T02:39:01.860
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3416296499969956480
 2Mass ID (if available) : 05232572+2315317

Uranus 2030-11-13T02:39:01 K11.33 G15.47 PgtRgt

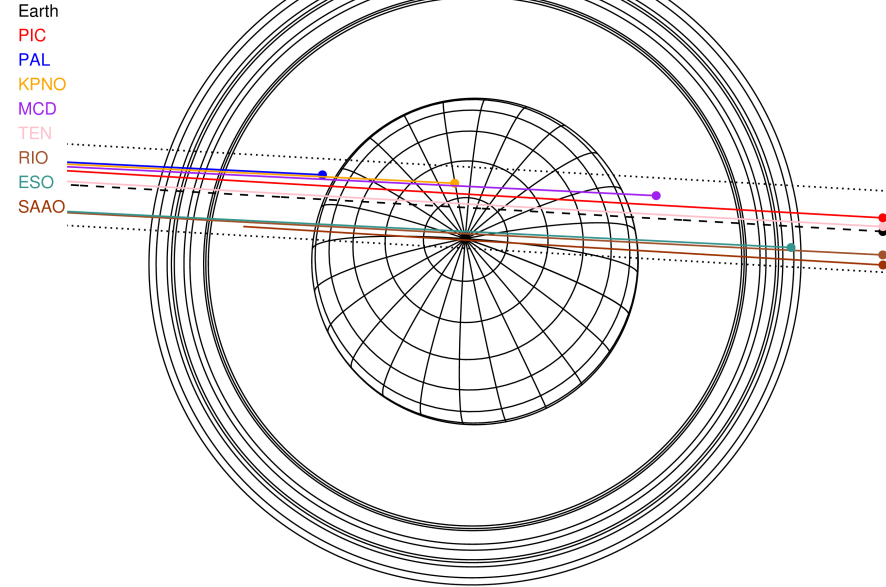
ICRS Star Coord at Epoch: 05h 23m 25.72792s +23:15:31.77346s

RUWE (>1.4 is poor) : 1.01
 K magnitude : 11.330
 G magnitude : 15.472
 RP magnitude : 14.351
 BP magnitude : 16.793
 DUPflag : 0
 Distance (au) : 18.308
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.11
 Sun-Target sep (deg) : 148.72
 Sun-Moon sep (deg) : 1.78
 B (ring opening deg) : 81.25
 PA of pole (deg) : 23.11

| # | 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 |

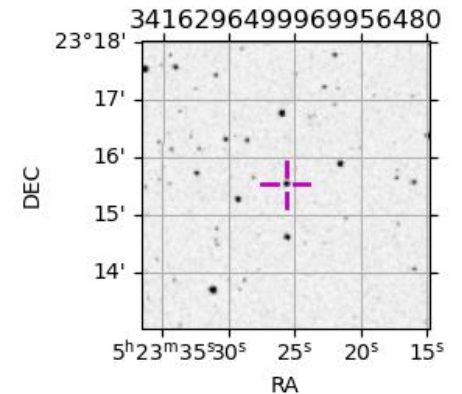


2030-11-13T02:39:01.8600 ra: 05 23 25.7279 s: +23 15 31.773 C/A 0.635° PA 176.72 deg v_sky -19.11 km/s D 18.31 AU
 Credit: Styled after SORA/Lucky Star

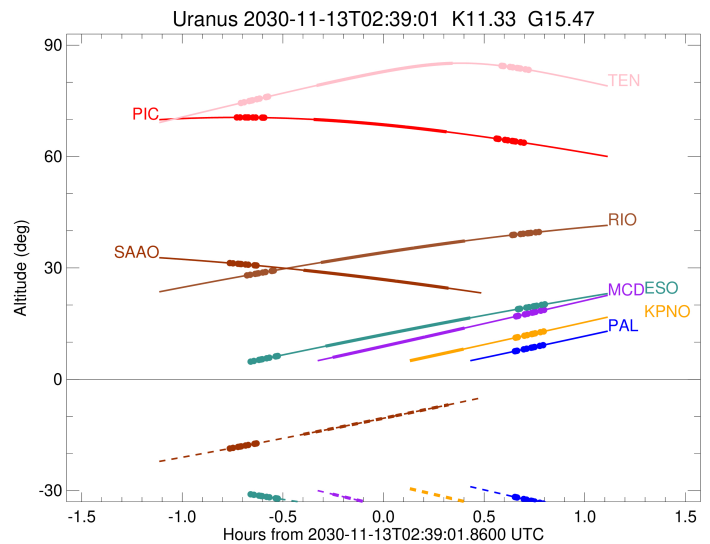
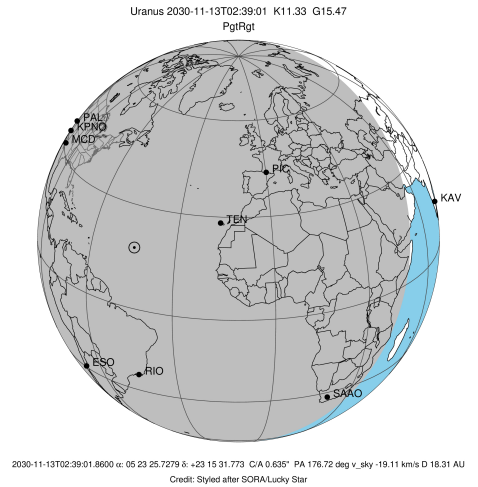


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

| Obs | Location | lat | Elon | Rings I | Planet | Rings E | Observed Events Interval | OEcode |
|------|-----------------------|-------|-------|---------|--------|---------|-----------------------------|--------|
| PIC | Pic du Midi | 42.9 | 0.1 | +++++ | + + | +++++ | NOV 13 01:55 - NOV 13 03:21 | PieRie |
| PAL | Palomar Mt (200") | 33.4 | 243.1 | | | +++++ | NOV 13 03:18 - NOV 13 03:26 | PnnRne |
| PMO | Purple Mtn Obs. Nanki | 32.1 | 118.8 | | | | | PnnRnn |
| KPNO | Kitt Peak Natl Obs | 32.0 | 248.4 | | + | +++++ | NOV 13 03:02 - NOV 13 03:27 | PneRne |
| MCD | McDonald Obs. 2.7m | 30.7 | 256.0 | | + + | +++++ | NOV 13 02:23 - NOV 13 03:27 | PieRne |
| TEN | Teide Obs./Tenerife | 28.3 | 343.5 | +++++ | + + | +++++ | NOV 13 01:56 - NOV 13 03:22 | PieRie |
| IRTF | Mauna Kea/IRTF | 19.8 | 204.5 | | | | | PnnRnn |
| KAV | Kavalur Observatory | 12.6 | 78.8 | | | | | PnnRnn |
| RIO | Rio de Janeiro | -22.9 | 316.8 | +++++ | + + | +++++ | NOV 13 01:58 - NOV 13 03:25 | PieRie |
| ESO | European Southern Obs | -29.3 | 289.3 | +++++ | + + | +++++ | NOV 13 02:01 - NOV 13 03:27 | PieRie |
| AAT | Siding Spring (AAT) | -31.3 | 149.1 | | | | | PnnRnn |
| SAAO | So. Afr. Astro. Obs. | -32.4 | 20.8 | +++++ | + + | | NOV 13 01:53 - NOV 13 02:58 | PieRin |
| MSO | Mt. Stromlo Observato | -35.3 | 149.0 | | | | | PnnRnn |

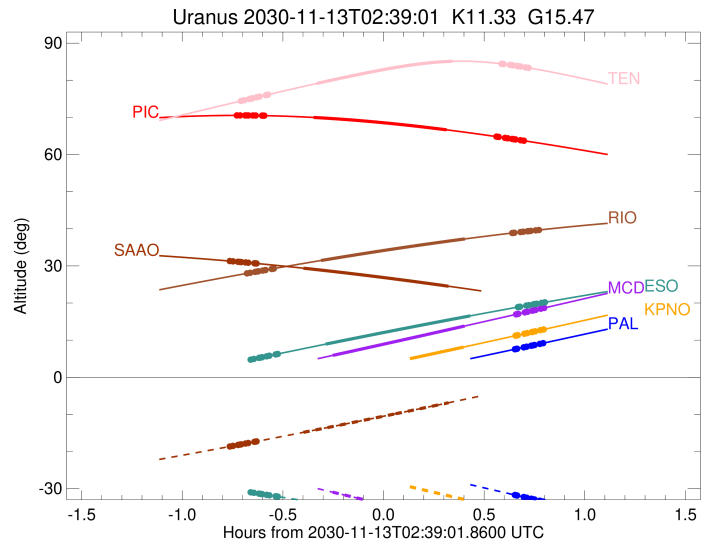
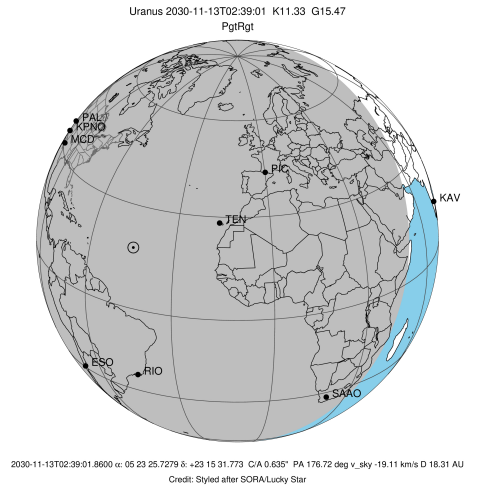


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-11-13T02:38:10.490
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3416296499969956480
 2Mass ID (if available) : 05232572+2315317
 ICRS Star Coord at Epoch: 05h 23m 25.72792s +23:15:31.77346s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 11.330
 G magnitude : 15.472
 RP magnitude : 14.351
 BP magnitude : 16.793
 DUPflag : 0
 Distance (au) : 18.308
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.11
 Sun-Target sep (deg) : 148.72
 Sun-Moon sep (deg) : 2.01
 B (ring opening deg) : 81.25
 PA of pole (deg) : 23.11
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.787
 C/A sky separation (km) : 10451.3
 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_itrfr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



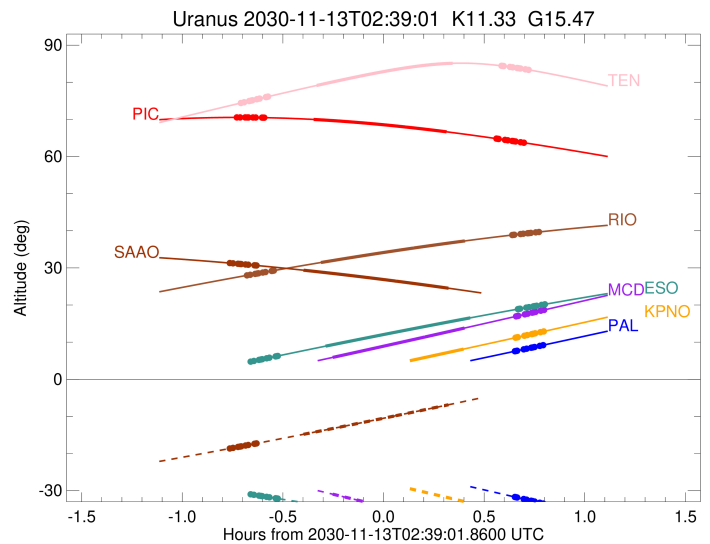
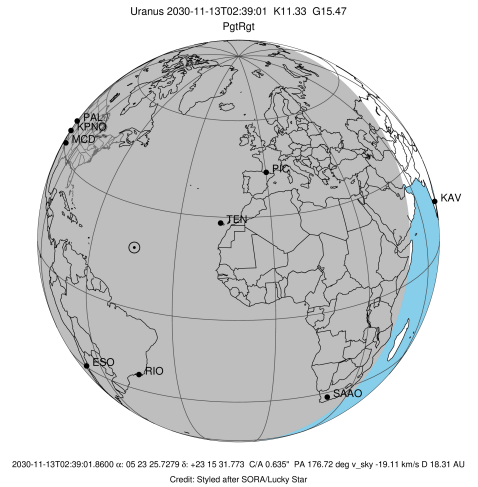
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I | 2030-11-13T01:55:28.256 | | 70.54 | -52.68 | 50962.72 | -19.09 | | |
| lambda | I | 2030-11-13T01:56:17.381 | | 70.54 | -52.55 | 50026.71 | -19.05 | | |
| delta | I | 2030-11-13T01:57:48.102 | | 70.54 | -52.31 | 48300.35 | -19.01 | | |
| gamma | I | 2030-11-13T01:58:23.559 | | 70.53 | -52.22 | 47626.44 | -19.00 | | |
| eta | I | 2030-11-13T01:58:47.267 | | 70.53 | -52.16 | 47176.12 | -18.99 | | |
| beta | I | 2030-11-13T02:00:07.468 | | 70.52 | -51.94 | 45654.39 | -18.95 | | |
| alpha | I | 2030-11-13T02:00:58.356 | | 70.51 | -51.81 | 44690.08 | -18.93 | | |
| 4 | I | 2030-11-13T02:02:51.395 | | 70.48 | -51.51 | 42553.51 | -18.88 | | |
| 5 | I | 2030-11-13T02:03:12.207 | | 70.48 | -51.45 | 42161.31 | -18.87 | | |
| 6 | I | 2030-11-13T02:03:31.514 | | 70.47 | -51.40 | 41797.68 | -18.85 | | |
| Uranus | I | 2030-11-13T02:18:11.180 | | 69.99 | -49.01 | 25558.08 | | -0.34 | -0.36 |
| Uranus | E | 2030-11-13T02:57:50.187 | | 66.66 | -42.19 | 25209.48 | | 6.78 | 7.10 |
| 6 | E | 2030-11-13T03:12:43.056 | | 64.82 | -39.55 | 41864.05 | 18.85 | | |
| 5 | E | 2030-11-13T03:13:06.839 | | 64.77 | -39.48 | 42314.83 | 18.86 | | |
| 4 | E | 2030-11-13T03:13:22.549 | | 64.74 | -39.43 | 42606.88 | 18.88 | | |
| alpha | E | 2030-11-13T03:15:16.015 | | 64.49 | -39.09 | 44752.27 | 18.93 | | |
| beta | E | 2030-11-13T03:16:03.836 | | 64.38 | -38.95 | 45658.59 | 18.95 | | |
| eta | E | 2030-11-13T03:17:23.834 | | 64.20 | -38.71 | 47176.12 | 18.99 | | |
| gamma | E | 2030-11-13T03:17:47.651 | | 64.14 | -38.64 | 47628.42 | 19.00 | | |
| delta | E | 2030-11-13T03:18:23.011 | | 64.06 | -38.53 | 48300.35 | 19.01 | | |
| lambda | E | 2030-11-13T03:19:53.750 | | 63.86 | -38.26 | 50026.71 | 19.04 | | |
| epsilon | E | 2030-11-13T03:21:09.141 | | 63.68 | -38.03 | 51463.19 | 19.09 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-11-13T02:43:25.280
 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 : 3416296499969956480
 2Mass ID (if available) : 05232572+2315317
 ICRS Star Coord at Epoch: 05h 23m 25.72792s +23:15:31.77346s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 11.330
 G magnitude : 15.472
 RP magnitude : 14.351
 BP magnitude : 16.793
 DUPflag : 0
 Distance (au) : 18.308
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.11
 Sun-Target sep (deg) : 148.72
 Sun-Moon sep (deg) : 2.65
 B (ring opening deg) : 81.25
 PA of pole (deg) : 23.11
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.932
 C/A sky separation (km) : 12371.7
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



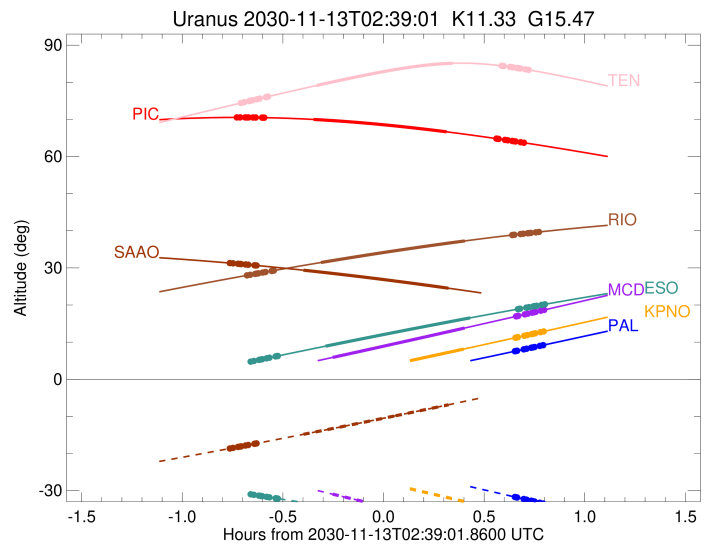
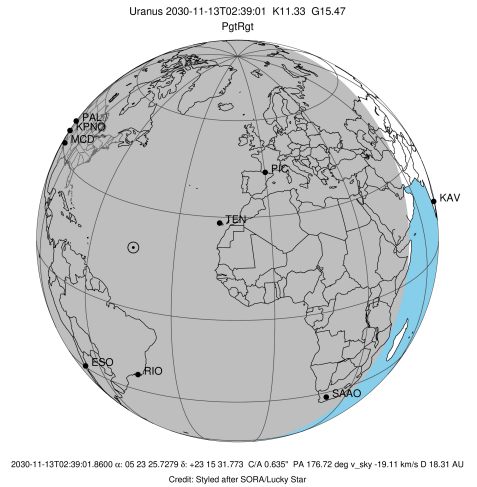
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|--------|--------|----------|--------|-------|---------|--------------|
| epsilon | I | 2030-11-13T01:59:59.126 | -6.90x | -15.47 | 50979.37 | -18.42 | | | |
| lambda | I | 2030-11-13T02:00:50.981 | -6.75x | -15.65 | 50026.71 | -18.36 | | | |
| delta | I | 2030-11-13T02:02:25.111 | -6.47x | -15.97 | 48300.35 | -18.32 | | | |
| gamma | I | 2030-11-13T02:03:01.902 | -6.36x | -16.09 | 47626.70 | -18.30 | | | |
| eta | I | 2030-11-13T02:03:26.532 | -6.29x | -16.18 | 47176.12 | -18.29 | | | |
| beta | I | 2030-11-13T02:04:49.889 | -6.05x | -16.46 | 45653.43 | -18.24 | | | |
| alpha | I | 2030-11-13T02:05:42.673 | -5.89x | -16.64 | 44691.07 | -18.21 | | | |
| 4 | I | 2030-11-13T02:07:40.173 | -5.55x | -17.05 | 42555.80 | -18.14 | | | |
| 5 | I | 2030-11-13T02:08:01.850 | -5.48x | -17.12 | 42163.15 | -18.13 | | | |
| 6 | I | 2030-11-13T02:08:22.095 | -5.42x | -17.19 | 41796.89 | -18.10 | | | |
| Uranus | I | 2030-11-13T02:23:47.139 | -2.66x | -20.37 | 25557.40 | | | 0.45 | 0.47 |
| Uranus | E | 2030-11-13T03:02:37.710 | 4.56x | -28.45 | 25167.03 | | | 7.19 | 7.53 |
| 6 | E | 2030-11-13T03:18:12.960 | 7.55 | -31.71 | 41862.71 | 18.23 | | | |
| 5 | E | 2030-11-13T03:18:37.579 | 7.63 | -31.80 | 42314.44 | 18.25 | | | |
| 4 | E | 2030-11-13T03:18:53.917 | 7.69 | -31.85 | 42607.94 | 18.27 | | | |
| alpha | E | 2030-11-13T03:20:51.023 | 8.06 | -32.26 | 44752.37 | 18.35 | | | |
| beta | E | 2030-11-13T03:21:40.309 | 8.22 | -32.43 | 45657.89 | 18.38 | | | |
| eta | E | 2030-11-13T03:23:02.806 | 8.49 | -32.72 | 47176.12 | 18.43 | | | |
| gamma | E | 2030-11-13T03:23:27.349 | 8.57 | -32.81 | 47628.58 | 18.44 | | | |
| delta | E | 2030-11-13T03:24:03.754 | 8.69 | -32.94 | 48300.35 | 18.46 | | | |
| lambda | E | 2030-11-13T03:25:37.137 | 8.99 | -33.26 | 50026.71 | 18.51 | | | |
| epsilon | E | 2030-11-13T03:26:55.073 | 9.24 | -33.53 | 51470.80 | 18.57 | | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-11-13T02:43:36.120
 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 : 3416296499969956480
 2Mass ID (if available) : 05232572+2315317
 ICRS Star Coord at Epoch: 05h 23m 25.72792s +23:15:31.77346s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 11.330
 G magnitude : 15.472
 RP magnitude : 14.351
 BP magnitude : 16.793
 DUPflag : 0
 Distance (au) : 18.308
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.11
 Sun-Target sep (deg) : 148.72
 Sun-Moon sep (deg) : 2.64
 B (ring opening deg) : 81.25
 PA of pole (deg) : 23.11
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.910
 C/A sky separation (km) : 12077.9
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



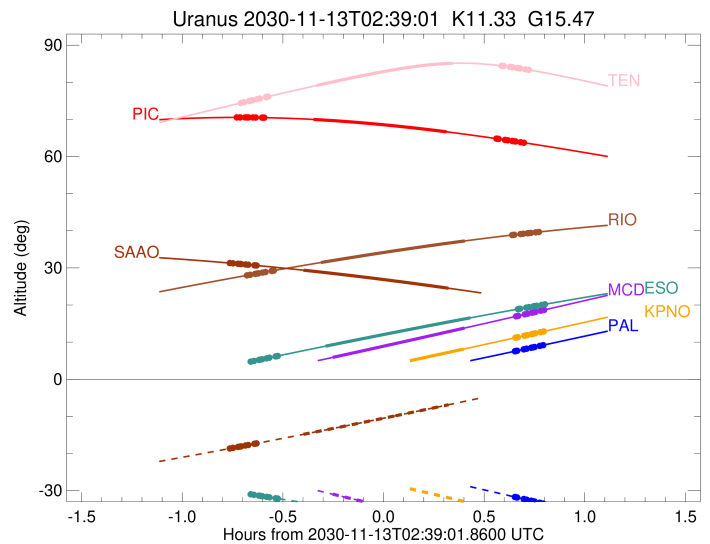
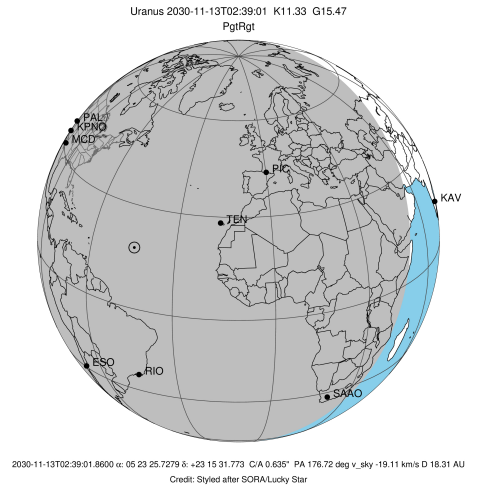
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|--------|--------|----------|--------|-------|---------|--------------|
| epsilon | I | 2030-11-13T02:00:10.808 | -3.84x | -19.62 | 50977.34 | -18.47 | | | |
| lambda | I | 2030-11-13T02:01:02.389 | -3.68x | -19.80 | 50026.71 | -18.42 | | | |
| delta | I | 2030-11-13T02:02:36.213 | -3.39x | -20.13 | 48300.35 | -18.38 | | | |
| gamma | I | 2030-11-13T02:03:12.884 | -3.28x | -20.26 | 47626.67 | -18.36 | | | |
| eta | I | 2030-11-13T02:03:37.428 | -3.20x | -20.34 | 47176.12 | -18.35 | | | |
| beta | I | 2030-11-13T02:05:00.489 | -2.95x | -20.64 | 45653.55 | -18.31 | | | |
| alpha | I | 2030-11-13T02:05:53.097 | -2.79x | -20.82 | 44690.94 | -18.28 | | | |
| 4 | I | 2030-11-13T02:07:50.167 | -2.43x | -21.23 | 42555.51 | -18.21 | | | |
| 5 | I | 2030-11-13T02:08:11.758 | -2.36x | -21.31 | 42162.91 | -18.20 | | | |
| 6 | I | 2030-11-13T02:08:31.906 | -2.30x | -21.38 | 41796.98 | -18.18 | | | |
| Uranus | I | 2030-11-13T02:23:51.594 | 0.58x | -24.61 | 25558.09 | | | 0.34 | 0.36 |
| Uranus | E | 2030-11-13T03:02:55.445 | 8.13 | -32.88 | 25174.39 | | | 7.12 | 7.46 |
| 6 | E | 2030-11-13T03:18:24.896 | 11.20 | -36.18 | 41862.97 | 18.30 | | | |
| 5 | E | 2030-11-13T03:18:49.408 | 11.28 | -36.26 | 42314.53 | 18.32 | | | |
| 4 | E | 2030-11-13T03:19:05.658 | 11.34 | -36.32 | 42607.74 | 18.34 | | | |
| alpha | E | 2030-11-13T03:21:02.312 | 11.73 | -36.73 | 44752.35 | 18.42 | | | |
| beta | E | 2030-11-13T03:21:51.417 | 11.89 | -36.91 | 45658.03 | 18.45 | | | |
| eta | E | 2030-11-13T03:23:13.600 | 12.16 | -37.20 | 47176.12 | 18.50 | | | |
| gamma | E | 2030-11-13T03:23:38.052 | 12.25 | -37.29 | 47628.55 | 18.51 | | | |
| delta | E | 2030-11-13T03:24:14.328 | 12.37 | -37.41 | 48300.35 | 18.53 | | | |
| lambda | E | 2030-11-13T03:25:47.384 | 12.68 | -37.74 | 50026.71 | 18.57 | | | |
| epsilon | E | 2030-11-13T03:27:04.970 | 12.94 | -38.02 | 51469.24 | 18.63 | | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-11-13T02:43:45.070
 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 : 3416296499969956480
 2Mass ID (if available) : 05232572+2315317
 ICRS Star Coord at Epoch: 05h 23m 25.72792s +23:15:31.77346s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 11.330
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 DUPflag : 0
 Distance (au) : 18.308
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.11
 Sun-Target sep (deg) : 148.72
 Sun-Moon sep (deg) : 2.62
 B (ring opening deg) : 81.25
 PA of pole (deg) : 23.11
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.881
 C/A sky separation (km) : 11692.2
 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



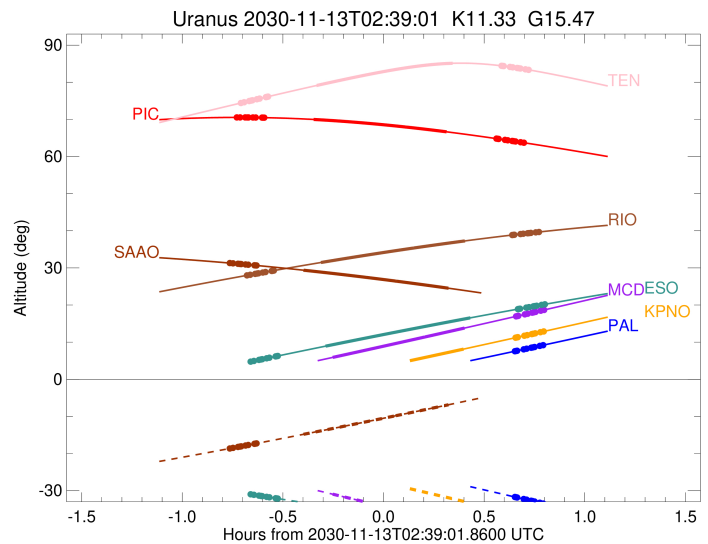
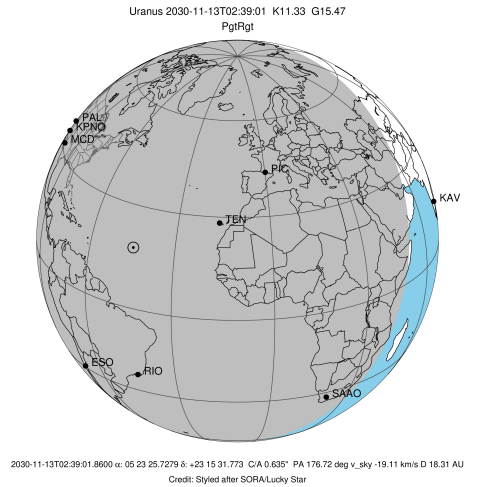
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I | 2030-11-13T02:00:22.104 | | 1.29x | -25.91 | 50974.63 | -18.55 | | |
| lambda | I | 2030-11-13T02:01:13.305 | | 1.45x | -26.09 | 50026.71 | -18.50 | | |
| delta | I | 2030-11-13T02:02:46.695 | | 1.75x | -26.43 | 48300.35 | -18.47 | | |
| gamma | I | 2030-11-13T02:03:23.193 | | 1.87x | -26.56 | 47626.62 | -18.45 | | |
| eta | I | 2030-11-13T02:03:47.617 | | 1.95x | -26.64 | 47176.12 | -18.44 | | |
| beta | I | 2030-11-13T02:05:10.262 | | 2.22x | -26.94 | 45653.71 | -18.40 | | |
| alpha | I | 2030-11-13T02:06:02.621 | | 2.39x | -27.13 | 44690.77 | -18.37 | | |
| 4 | I | 2030-11-13T02:07:59.087 | | 2.76x | -27.54 | 42555.12 | -18.31 | | |
| 5 | I | 2030-11-13T02:08:20.559 | | 2.83x | -27.62 | 42162.59 | -18.30 | | |
| 6 | I | 2030-11-13T02:08:40.572 | | 2.90x | -27.69 | 41797.11 | -18.28 | | |
| Uranus | I | 2030-11-13T02:23:53.088 | | 5.89 | -30.96 | 25558.69 | | 0.20 | 0.21 |
| Uranus | E | 2030-11-13T03:03:12.571 | | 13.80 | -39.42 | 25184.01 | | 7.03 | 7.36 |
| 6 | E | 2030-11-13T03:18:34.353 | | 16.95 | -42.73 | 41863.31 | 18.41 | | |
| 5 | E | 2030-11-13T03:18:58.719 | | 17.03 | -42.82 | 42314.63 | 18.43 | | |
| 4 | E | 2030-11-13T03:19:14.853 | | 17.09 | -42.88 | 42607.47 | 18.44 | | |
| alpha | E | 2030-11-13T03:21:10.888 | | 17.49 | -43.29 | 44752.33 | 18.52 | | |
| beta | E | 2030-11-13T03:21:59.747 | | 17.65 | -43.47 | 45658.21 | 18.54 | | |
| eta | E | 2030-11-13T03:23:21.500 | | 17.94 | -43.76 | 47176.12 | 18.59 | | |
| gamma | E | 2030-11-13T03:23:45.828 | | 18.02 | -43.85 | 47628.51 | 18.60 | | |
| delta | E | 2030-11-13T03:24:21.927 | | 18.14 | -43.98 | 48300.35 | 18.62 | | |
| lambda | E | 2030-11-13T03:25:54.532 | | 18.46 | -44.31 | 50026.71 | 18.66 | | |
| epsilon | E | 2030-11-13T03:27:11.645 | | 18.73 | -44.58 | 51467.21 | 18.72 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-11-13T02:39:30.280
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : TEN
 Location : Teide Obs./Tenerife
 Latitude (deg) : 28.30050
 E. Longitude (deg) : 343.48909
 Altitude (km) : 2.395
 Gaia source ID : 3416296499969956480
 2Mass ID (if available) : 05232572+2315317
 ICRS Star Coord at Epoch: 05h 23m 25.72792s +23:15:31.77346s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 11.330
 G magnitude : 15.472
 RP magnitude : 14.351
 BP magnitude : 16.793
 DUPflag : 0
 Distance (au) : 18.308
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.11
 Sun-Target sep (deg) : 148.72
 Sun-Moon sep (deg) : 1.92
 B (ring opening deg) : 81.25
 PA of pole (deg) : 23.11
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.672
 C/A sky separation (km) : 8925.6
 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



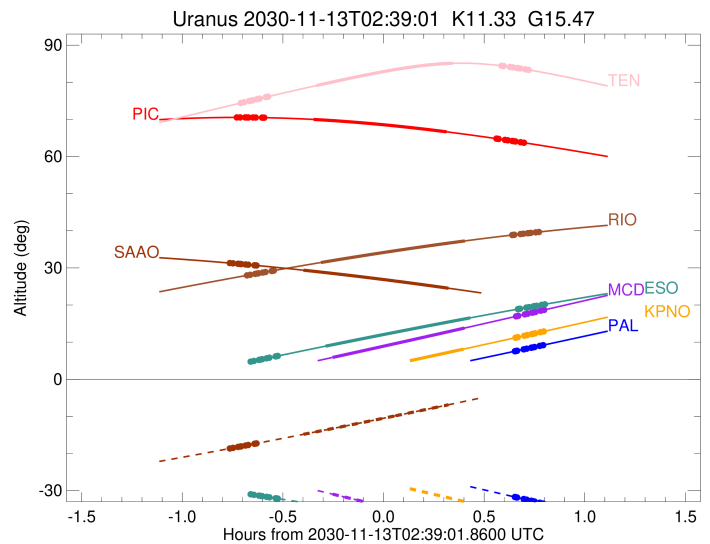
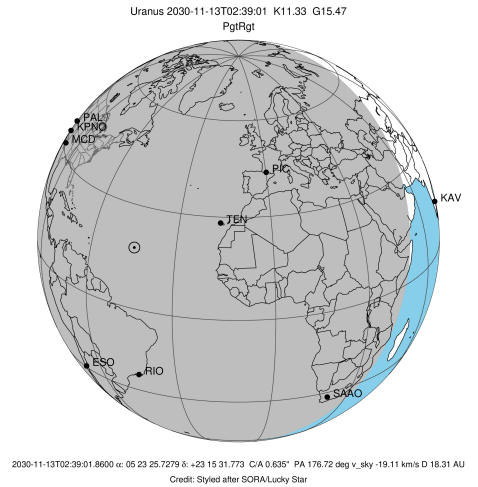
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I | 2030-11-13T01:56:41.866 | | 74.46 | -71.64 | 50952.62 | -19.25 | | |
| lambda | I | 2030-11-13T01:57:30.041 | | 74.63 | -71.49 | 50026.71 | -19.21 | | |
| delta | I | 2030-11-13T01:58:59.943 | | 74.95 | -71.20 | 48300.35 | -19.19 | | |
| gamma | I | 2030-11-13T01:59:35.076 | | 75.07 | -71.09 | 47626.28 | -19.18 | | |
| eta | I | 2030-11-13T01:59:58.548 | | 75.16 | -71.02 | 47176.12 | -19.17 | | |
| beta | I | 2030-11-13T02:01:17.923 | | 75.44 | -70.76 | 45655.00 | -19.15 | | |
| alpha | I | 2030-11-13T02:02:08.345 | | 75.62 | -70.60 | 44689.48 | -19.14 | | |
| 4 | I | 2030-11-13T02:04:00.187 | | 76.01 | -70.23 | 42552.07 | -19.10 | | |
| 5 | I | 2030-11-13T02:04:20.748 | | 76.09 | -70.16 | 42160.25 | -19.09 | | |
| 6 | I | 2030-11-13T02:04:39.743 | | 76.15 | -70.10 | 41798.26 | -19.08 | | |
| Uranus | I | 2030-11-13T02:19:03.253 | | 79.13 | -67.21 | 25552.92 | | -0.88 | -0.92 |
| Uranus | E | 2030-11-13T02:59:40.108 | | 85.12 | -58.64 | 25248.02 | | 6.39 | 6.69 |
| 6 | E | 2030-11-13T03:14:14.368 | | 84.44 | -55.48 | 41865.34 | 19.10 | | |
| 5 | E | 2030-11-13T03:14:37.801 | | 84.39 | -55.40 | 42315.09 | 19.12 | | |
| 4 | E | 2030-11-13T03:14:53.212 | | 84.36 | -55.34 | 42605.75 | 19.13 | | |
| alpha | E | 2030-11-13T03:16:45.302 | | 84.14 | -54.93 | 44752.13 | 19.17 | | |
| beta | E | 2030-11-13T03:17:32.590 | | 84.04 | -54.76 | 45659.32 | 19.18 | | |
| eta | E | 2030-11-13T03:18:51.613 | | 83.86 | -54.48 | 47176.12 | 19.21 | | |
| gamma | E | 2030-11-13T03:19:15.149 | | 83.80 | -54.39 | 47628.25 | 19.21 | | |
| delta | E | 2030-11-13T03:19:50.120 | | 83.72 | -54.26 | 48300.35 | 19.22 | | |
| lambda | E | 2030-11-13T03:21:19.866 | | 83.50 | -53.94 | 50026.71 | 19.25 | | |
| epsilon | E | 2030-11-13T03:22:34.014 | | 83.31 | -53.67 | 51454.58 | 19.28 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-11-13T02:41:56.930
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : RIO
 Location : Rio de Janeiro
 Latitude (deg) : -22.89506
 E. Longitude (deg) : 316.77708
 Altitude (km) : 0.033
 Gaia source ID : 3416296499969956480
 2Mass ID (if available) : 05232572+2315317
 ICRS Star Coord at Epoch: 05h 23m 25.72792s +23:15:31.77346s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 11.330
 G magnitude : 15.472
 RP magnitude : 14.351
 BP magnitude : 16.793
 DUPflag : 0
 Distance (au) : 18.308
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.11
 Sun-Target sep (deg) : 148.72
 Sun-Moon sep (deg) : 1.72
 B (ring opening deg) : 81.25
 PA of pole (deg) : 23.11
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.322
 C/A sky separation (km) : 4279.9
 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_itrfr93_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 | 2030-11-13T01:58:31.713 | | 28.02 | -48.23 | 50921.84 | -19.39 | | |
| lambda | I | 2030-11-13T01:59:17.904 | | 28.15 | -48.28 | 50026.71 | -19.38 | | |
| delta | I | 2030-11-13T02:00:47.001 | | 28.39 | -48.35 | 48300.35 | -19.37 | | |
| gamma | I | 2030-11-13T02:01:21.820 | | 28.48 | -48.38 | 47625.77 | -19.37 | | |
| eta | I | 2030-11-13T02:01:45.031 | | 28.55 | -48.40 | 47176.12 | -19.37 | | |
| beta | I | 2030-11-13T02:03:03.457 | | 28.76 | -48.47 | 45656.95 | -19.37 | | |
| alpha | I | 2030-11-13T02:03:53.477 | | 28.89 | -48.51 | 44687.84 | -19.37 | | |
| 4 | I | 2030-11-13T02:05:44.025 | | 29.18 | -48.59 | 42547.76 | -19.36 | | |
| 5 | I | 2030-11-13T02:06:04.251 | | 29.24 | -48.61 | 42157.54 | -19.36 | | |
| 6 | I | 2030-11-13T02:06:22.715 | | 29.29 | -48.62 | 41800.36 | -19.35 | | |
| Uranus | I | 2030-11-13T02:20:24.250 | | 31.46 | -49.10 | 25511.95 | | -2.46 | -2.58 |
| Uranus | E | 2030-11-13T03:03:19.901 | | 37.27 | -48.80 | 25358.70 | | 5.11 | 5.35 |
| 6 | E | 2030-11-13T03:17:25.859 | | 38.86 | -48.12 | 41868.88 | 19.44 | | |
| 5 | E | 2030-11-13T03:17:48.763 | | 38.90 | -48.10 | 42315.14 | 19.44 | | |
| 4 | E | 2030-11-13T03:18:03.673 | | 38.93 | -48.08 | 42602.14 | 19.45 | | |
| alpha | E | 2030-11-13T03:19:54.164 | | 39.12 | -47.97 | 44751.43 | 19.46 | | |
| beta | E | 2030-11-13T03:20:40.906 | | 39.20 | -47.93 | 45661.48 | 19.46 | | |
| eta | E | 2030-11-13T03:21:58.716 | | 39.33 | -47.84 | 47176.12 | 19.47 | | |
| gamma | E | 2030-11-13T03:22:21.912 | | 39.37 | -47.82 | 47627.73 | 19.47 | | |
| delta | E | 2030-11-13T03:22:56.455 | | 39.43 | -47.78 | 48300.35 | 19.47 | | |
| lambda | E | 2030-11-13T03:24:25.090 | | 39.58 | -47.69 | 50026.71 | 19.48 | | |
| epsilon | E | 2030-11-13T03:25:36.984 | | 39.70 | -47.60 | 51427.46 | 19.50 | | |

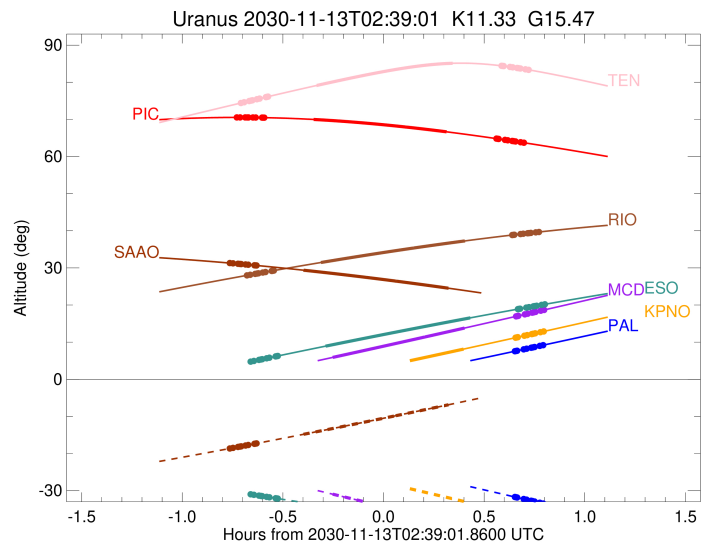
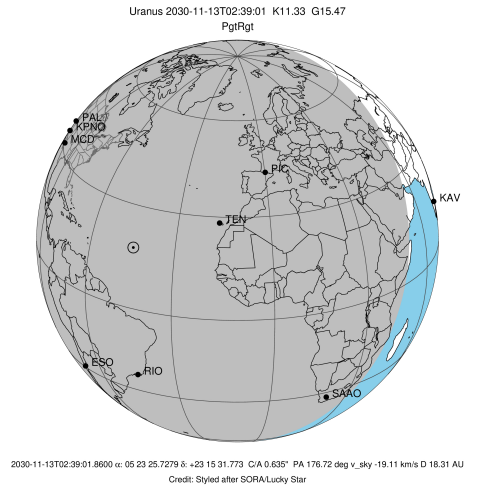
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-11-13T02:43:24.330
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : ESO
 Location : European Southern Obs. (3.6m)
 Latitude (deg) : -29.26097
 E. Longitude (deg) : 289.26831
 Altitude (km) : 2.400
 Gaia source ID : 3416296499969956480
 2Mass ID (if available) : 05232572+2315317
 ICRS Star Coord at Epoch: 05h 23m 25.72792s +23:15:31.77346s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 11.330
 G magnitude : 15.472
 RP magnitude : 14.351
 BP magnitude : 16.793
 DUPflag : 0
 Distance (au) : 18.308
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.11
 Sun-Target sep (deg) : 148.72
 Sun-Moon sep (deg) : 1.93
 B (ring opening deg) : 81.25
 PA of pole (deg) : 23.11
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.348
 C/A sky separation (km) : 4626.2
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl1.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itrfr93_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 | 2030-11-13T01:59:37.694 | | 4.79x | -31.02 | 50924.75 | -19.20 | | |
| lambda | I | 2030-11-13T02:00:24.492 | | 4.94x | -31.13 | 50026.71 | -19.19 | | |
| delta | I | 2030-11-13T02:01:54.468 | | 5.22 | -31.35 | 48300.35 | -19.19 | | |
| gamma | I | 2030-11-13T02:02:29.629 | | 5.33 | -31.43 | 47625.82 | -19.18 | | |
| eta | I | 2030-11-13T02:02:53.071 | | 5.40 | -31.49 | 47176.12 | -19.18 | | |
| beta | I | 2030-11-13T02:04:12.283 | | 5.65 | -31.68 | 45656.76 | -19.18 | | |
| alpha | I | 2030-11-13T02:05:02.783 | | 5.81 | -31.80 | 44687.98 | -19.18 | | |
| 4 | I | 2030-11-13T02:06:54.417 | | 6.16 | -32.06 | 42548.14 | -19.17 | | |
| 5 | I | 2030-11-13T02:07:14.851 | | 6.23 | -32.11 | 42157.75 | -19.17 | | |
| 6 | I | 2030-11-13T02:07:33.523 | | 6.28 | -32.15 | 41800.14 | -19.16 | | |
| Uranus | I | 2030-11-13T02:21:43.688 | | 8.92 | -34.07 | 25516.83 | -19.16 | -2.33 | -2.44 |
| Uranus | E | 2030-11-13T03:04:53.806 | | 16.54 | -38.94 | 25352.28 | -19.16 | 5.19 | 5.43 |
| 6 | E | 2030-11-13T03:19:07.376 | | 18.90 | -40.17 | 41868.71 | 19.29 | | |
| 5 | E | 2030-11-13T03:19:30.471 | | 18.96 | -40.20 | 42315.16 | 19.29 | | |
| 4 | E | 2030-11-13T03:19:45.511 | | 19.00 | -40.22 | 42602.34 | 19.29 | | |
| alpha | E | 2030-11-13T03:21:36.861 | | 19.30 | -40.37 | 44751.47 | 19.31 | | |
| beta | E | 2030-11-13T03:22:23.957 | | 19.43 | -40.43 | 45661.38 | 19.31 | | |
| eta | E | 2030-11-13T03:23:42.371 | | 19.64 | -40.53 | 47176.12 | 19.32 | | |
| gamma | E | 2030-11-13T03:24:05.744 | | 19.70 | -40.56 | 47627.75 | 19.32 | | |
| delta | E | 2030-11-13T03:24:40.548 | | 19.80 | -40.60 | 48300.35 | 19.33 | | |
| lambda | E | 2030-11-13T03:26:09.849 | | 20.04 | -40.71 | 50026.71 | 19.34 | | |
| epsilon | E | 2030-11-13T03:27:22.345 | | 20.23 | -40.79 | 51428.77 | 19.35 | | |


```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2030-11-13T02:36:50.310
Event type           : PgtRgt
: Uranus 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       : 3416296499969956480
2Mass ID (if available) : 05232572+2315317
ICRS Star Coord at Epoch: 05h 23m 25.72792s +23:15:31.77346s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 11.330
G magnitude           : 15.472
RP magnitude          : 14.351
BP magnitude          : 16.793
DUPflag              : 0
Distance (au)        : 18.308
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -19.11
Sun-Target sep (deg) : 148.72
Sun-Moon sep (deg)   : 0.99
B (ring opening deg) : 81.25
PA of pole (deg)     : 23.11
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.245
C/A sky separation (km) : 3255.7
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural11.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_itrfr93_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 | 2030-11-13T01:53:25.152 | | 31.29 | -18.61 | 50912.24 | -19.48 | | |
| lambda | I | 2030-11-13T01:54:10.630 | | 31.23 | -18.48 | 50026.71 | -19.47 | | |
| delta | I | 2030-11-13T01:55:39.304 | | 31.11 | -18.23 | 48300.35 | -19.47 | | |
| gamma | I | 2030-11-13T01:56:13.967 | | 31.06 | -18.13 | 47625.61 | -19.47 | | |
| eta | I | 2030-11-13T01:56:37.060 | | 31.03 | -18.07 | 47176.12 | -19.46 | | |
| beta | I | 2030-11-13T01:57:55.085 | | 30.93 | -17.84 | 45657.56 | -19.46 | | |
| alpha | I | 2030-11-13T01:58:44.922 | | 30.86 | -17.70 | 44687.40 | -19.46 | | |
| 4 | I | 2030-11-13T02:00:34.987 | | 30.70 | -17.38 | 42546.49 | -19.45 | | |
| 5 | I | 2030-11-13T02:00:55.097 | | 30.68 | -17.33 | 42156.89 | -19.45 | | |
| 6 | I | 2030-11-13T02:01:13.396 | | 30.65 | -17.27 | 41801.08 | -19.45 | | |
| Uranus | I | 2030-11-13T02:15:10.707 | | 29.38 | -14.83 | 25495.09 | | -2.87 | -3.01 |
| Uranus | E | 2030-11-13T02:58:24.704 | | 24.53 | -6.87 | 25376.17 | | 4.87 | 5.10 |
| 6 | E | 2030-11-13T03:12:30.148 | | 22.68 | -4.17x | 41869.34 | 19.40 | | |
| 5 | E | 2030-11-13T03:12:53.079 | | 22.63 | -4.10x | 42315.06 | 19.40 | | |
| 4 | E | 2030-11-13T03:13:07.991 | | 22.59 | -4.05x | 42601.62 | 19.40 | | |
| alpha | E | 2030-11-13T03:14:58.767 | | 22.34 | -3.69x | 44751.31 | 19.41 | | |
| beta | E | 2030-11-13T03:15:45.653 | | 22.23 | -3.54x | 45661.77 | 19.41 | | |
| eta | E | 2030-11-13T03:17:03.669 | | 22.05 | -3.29x | 47176.12 | 19.41 | | |
| gamma | E | 2030-11-13T03:17:26.931 | | 22.00 | -3.21x | 47627.66 | 19.41 | | |
| delta | E | 2030-11-13T03:18:01.583 | | 21.92 | -3.10x | 48300.35 | 19.41 | | |
| lambda | E | 2030-11-13T03:19:30.507 | | 21.71 | -2.81x | 50026.71 | 19.41 | | |
| epsilon | E | 2030-11-13T03:20:42.477 | | 21.55 | -2.58x | 51424.05 | 19.42 | | |