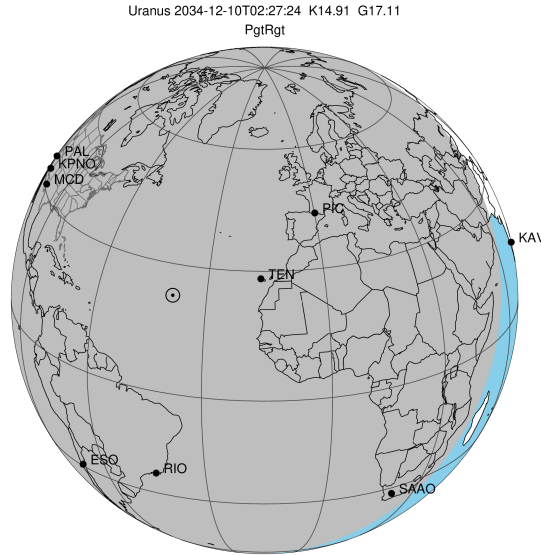


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2034-12-10T02:27:24.800  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3382772046843847296  
 2Mass ID (if available) : 06384518+2328067

Uranus 2034-12-10T02:27:24 K14.91 G17.11 PgtRgt

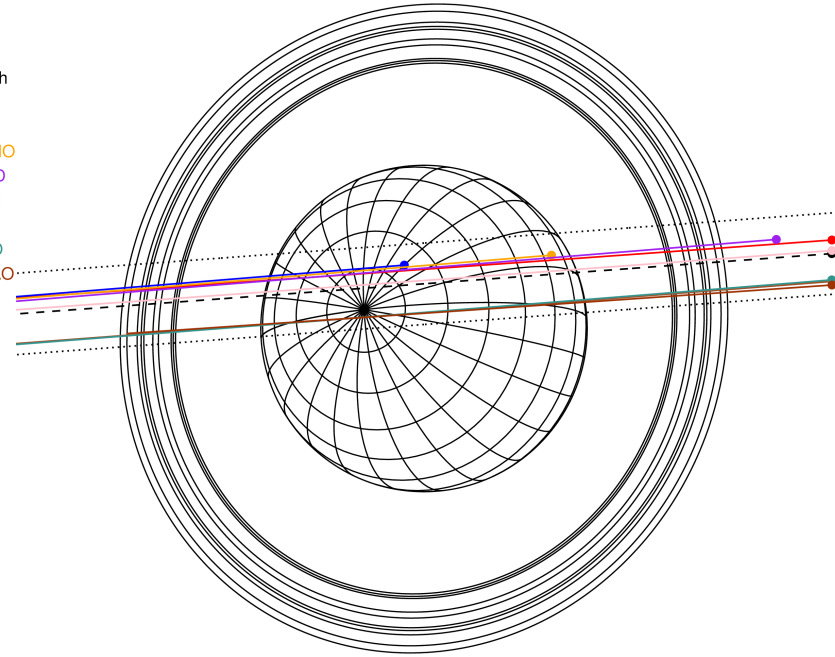
ICRS Star Coord at Epoch: 06h 38m 45.18277s +23:28:06.81435s

RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.912  
 G magnitude : 17.114  
 RP magnitude : 16.427  
 BP magnitude : 17.635  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.35  
 Sun-Target sep (deg) : 158.72  
 Sun-Moon sep (deg) : 150.23  
 B (ring opening deg) : 67.35  
 PA of pole (deg) : 72.58



2034-12-10T02:27:24.8000 ra: 06 38 45.1828 s: +23 28 06.814 C/A 0.544° PA 184.23 deg v\_sky -21.35 km/s D 17.97 AU  
 Credit: Styled after SORA/Lucky Star

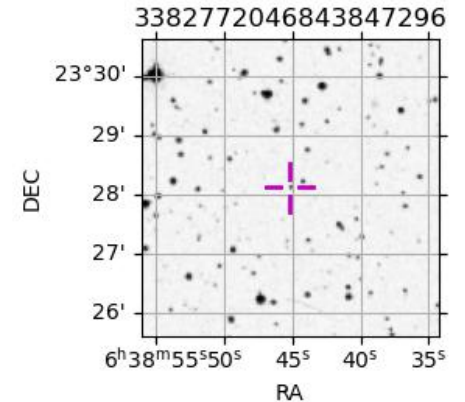
Earth  
 PIC  
 PAL  
 KPNO  
 MCD  
 TEN  
 RIO  
 ESO  
 SAAO



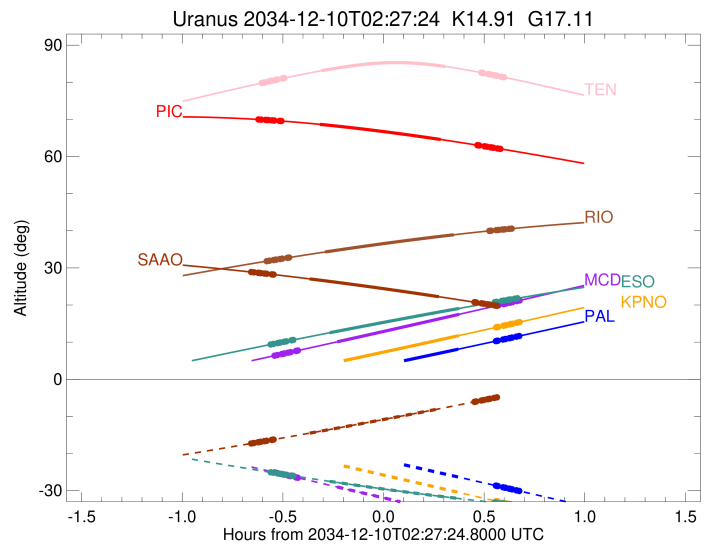
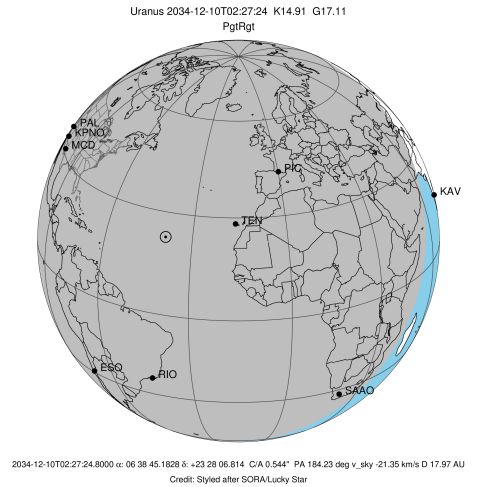
| #  | a(km)   | ring    |
|----|---------|---------|
| 1  | 41837.2 | 6       |
| 2  | 42235.0 | 5       |
| 3  | 42571.2 | 4       |
| 4  | 44718.5 | alpha   |
| 5  | 45661.1 | beta    |
| 6  | 47176.1 | eta     |
| 7  | 47626.3 | gamma   |
| 8  | 48300.3 | delta   |
| 9  | 50026.7 | lambda  |
| 10 | 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   | +++++   | + +    | +++++   | DEC 10 01:49 - DEC 10 03:01 | PieRie |
| PAL  | Palomar Mt (200")     | 33.4  | 243.1 |         | +      | +++++   | DEC 10 02:49 - DEC 10 03:07 | PneRne |
| PMO  | Purple Mtn Obs. Nanki | 32.1  | 118.8 |         |        |         |                             | PnnRnn |
| KPNO | Kitt Peak Natl Obs    | 32.0  | 248.4 |         | +      | +++++   | DEC 10 02:49 - DEC 10 03:07 | PneRne |
| MCD  | McDonald Obs. 2.7m    | 30.7  | 256.0 | +++++   | + +    | +++++   | DEC 10 01:54 - DEC 10 03:07 | PieRie |
| TEN  | Teide Obs./Tenerife   | 28.3  | 343.5 | +++++   | + +    | +++++   | DEC 10 01:50 - DEC 10 03:03 | 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 | +++++   | + +    | +++++   | DEC 10 01:52 - DEC 10 03:05 | PieRie |
| ESO  | European Southern Obs | -29.3 | 289.3 | +++++   | + +    | +++++   | DEC 10 01:53 - DEC 10 03:07 | PieRie |
| AAT  | Siding Spring (AAT)   | -31.3 | 149.1 |         |        |         |                             | PnnRnn |
| SAAO | So. Afr. Astro. Obs.  | -32.4 | 20.8  | +++++   | + +    | +++++   | DEC 10 01:47 - DEC 10 03:00 | PieRie |
| MSO  | Mt. Stromlo Observato | -35.3 | 149.0 |         |        |         |                             | PnnRnn |

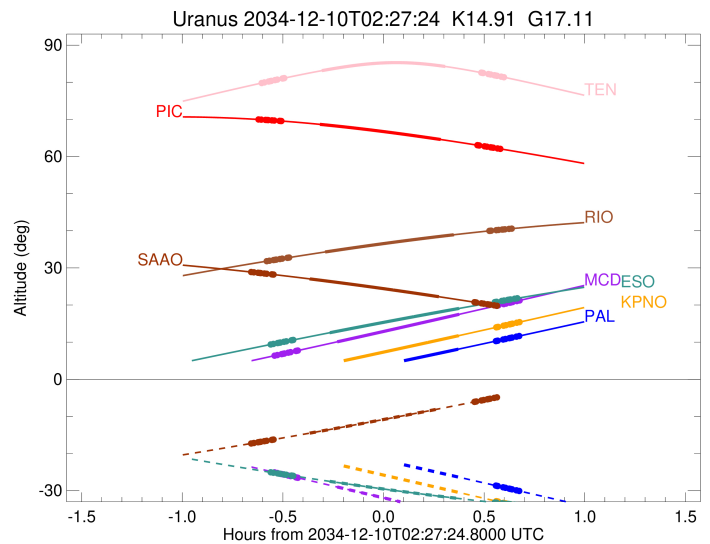
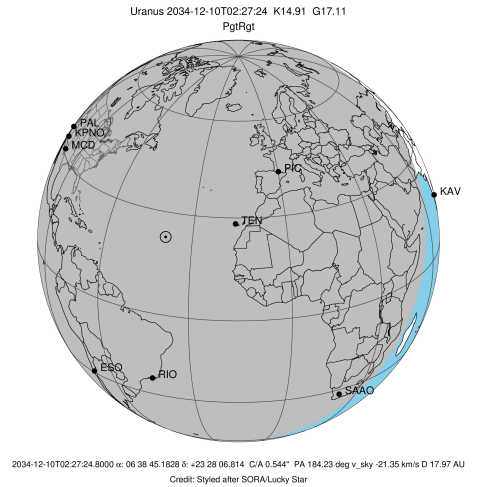


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2034-12-10T02:26:33.180  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 3382772046843847296  
 2Mass ID (if available) : 06384518+2328067  
 ICRS Star Coord at Epoch: 06h 38m 45.18277s +23:28:06.81435s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.912  
 G magnitude : 17.114  
 RP magnitude : 16.427  
 BP magnitude : 17.635  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.35  
 Sun-Target sep (deg) : 158.72  
 Sun-Moon sep (deg) : 150.82  
 B (ring opening deg) : 67.35  
 PA of pole (deg) : 72.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.709  
 C/A sky separation (km) : 9247.1  
 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   | 2034-12-10T01:49:52.466 |    | 70.00 | -58.55  | 51545.52 | -22.86 |         |              |
| lambda  | I   | 2034-12-10T01:50:58.910 |    | 69.94 | -58.37  | 50026.71 | -22.85 |         |              |
| delta   | I   | 2034-12-10T01:52:14.525 |    | 69.87 | -58.17  | 48300.35 | -22.82 |         |              |
| gamma   | I   | 2034-12-10T01:52:44.310 |    | 69.84 | -58.09  | 47620.97 | -22.80 |         |              |
| eta     | I   | 2034-12-10T01:53:03.823 |    | 69.82 | -58.04  | 47176.12 | -22.79 |         |              |
| beta    | I   | 2034-12-10T01:54:09.581 |    | 69.75 | -57.86  | 45677.80 | -22.76 |         |              |
| alpha   | I   | 2034-12-10T01:54:53.015 |    | 69.70 | -57.74  | 44686.55 | -22.74 |         |              |
| 4       | I   | 2034-12-10T01:56:24.085 |    | 69.60 | -57.50  | 42613.59 | -22.68 |         |              |
| 5       | I   | 2034-12-10T01:56:44.819 |    | 69.58 | -57.44  | 42155.27 | -22.68 |         |              |
| 6       | I   | 2034-12-10T01:56:56.809 |    | 69.57 | -57.41  | 41879.45 | -22.67 |         |              |
| Uranus  | I   | 2034-12-10T02:08:27.603 |    | 68.67 | -55.51  | 25288.44 |        | -16.37  | -17.10       |
| Uranus  | E   | 2034-12-10T02:44:27.742 |    | 64.59 | -49.29  | 25060.77 |        | 22.65   | 23.61        |
| 6       | E   | 2034-12-10T02:55:22.178 |    | 63.07 | -47.34  | 41797.11 | 22.65  |         |              |
| 5       | E   | 2034-12-10T02:55:44.698 |    | 63.01 | -47.28  | 42310.54 | 22.66  |         |              |
| 4       | E   | 2034-12-10T02:55:55.648 |    | 62.99 | -47.24  | 42539.95 | 22.67  |         |              |
| alpha   | E   | 2034-12-10T02:57:32.918 |    | 62.75 | -46.95  | 44752.31 | 22.72  |         |              |
| beta    | E   | 2034-12-10T02:58:12.358 |    | 62.66 | -46.84  | 45650.41 | 22.74  |         |              |
| eta     | E   | 2034-12-10T02:59:19.348 |    | 62.49 | -46.64  | 47176.12 | 22.77  |         |              |
| gamma   | E   | 2034-12-10T02:59:39.331 |    | 62.44 | -46.58  | 47631.30 | 22.78  |         |              |
| delta   | E   | 2034-12-10T03:00:08.690 |    | 62.37 | -46.49  | 48300.35 | 22.80  |         |              |
| lambda  | E   | 2034-12-10T03:01:24.374 |    | 62.19 | -46.26  | 50026.71 | 22.82  |         |              |
| epsilon | E   | 2034-12-10T03:01:55.970 |    | 62.11 | -46.17  | 50748.07 | 22.84  |         |              |

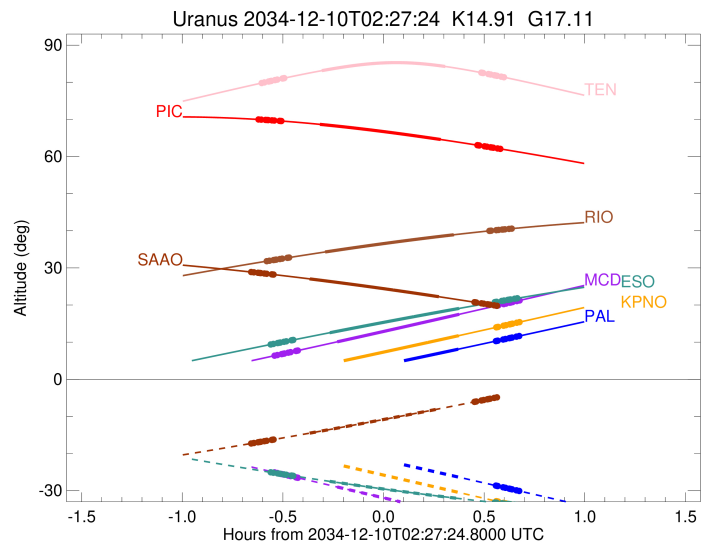
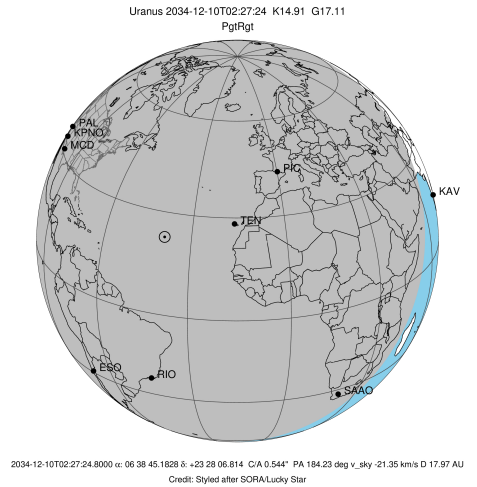
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2034-12-10T02:31:46.390  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3382772046843847296  
 2Mass ID (if available) : 06384518+2328067  
 ICRS Star Coord at Epoch: 06h 38m 45.18277s +23:28:06.81435s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.912  
 G magnitude : 17.114  
 RP magnitude : 16.427  
 BP magnitude : 17.635  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.35  
 Sun-Target sep (deg) : 158.72  
 Sun-Moon sep (deg) : 149.67  
 B (ring opening deg) : 67.35  
 PA of pole (deg) : 72.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.778  
 C/A sky separation (km) : 10142.6  
 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\_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   | 2034-12-10T01:54:26.133 | -2.28x | -15.15 | 51542.95 | -22.29 |       |         |              |
| lambda  | I   | 2034-12-10T01:55:34.164 | -2.08x | -15.38 | 50026.71 | -22.27 |       |         |              |
| delta   | I   | 2034-12-10T01:56:51.728 | -1.84x | -15.64 | 48300.35 | -22.24 |       |         |              |
| gamma   | I   | 2034-12-10T01:57:22.285 | -1.75x | -15.74 | 47620.99 | -22.23 |       |         |              |
| eta     | I   | 2034-12-10T01:57:42.305 | -1.69x | -15.81 | 47176.12 | -22.22 |       |         |              |
| beta    | I   | 2034-12-10T01:58:49.766 | -1.48x | -16.03 | 45678.12 | -22.18 |       |         |              |
| alpha   | I   | 2034-12-10T01:59:34.339 | -1.35x | -16.18 | 44686.90 | -22.16 |       |         |              |
| 4       | I   | 2034-12-10T02:01:07.823 | -1.06x | -16.49 | 42614.07 | -22.09 |       |         |              |
| 5       | I   | 2034-12-10T02:01:29.092 | -1.00x | -16.56 | 42155.57 | -22.09 |       |         |              |
| 6       | I   | 2034-12-10T02:01:41.426 | -0.96x | -16.60 | 41879.27 | -22.07 |       |         |              |
| Uranus  | I   | 2034-12-10T02:13:36.567 | 1.24x  | -19.00 | 25312.28 |        |       | -15.60  | -16.30       |
| Uranus  | E   | 2034-12-10T02:49:41.658 | 8.10   | -26.34 | 25061.25 |        |       | 22.64   | 23.59        |
| 6       | E   | 2034-12-10T03:00:52.461 | 10.28  | -28.64 | 41797.29 | 22.18  |       |         |              |
| 5       | E   | 2034-12-10T03:01:15.430 | 10.35  | -28.72 | 42310.20 | 22.20  |       |         |              |
| 4       | E   | 2034-12-10T03:01:26.646 | 10.39  | -28.76 | 42540.35 | 22.21  |       |         |              |
| alpha   | E   | 2034-12-10T03:03:05.874 | 10.71  | -29.10 | 44752.28 | 22.27  |       |         |              |
| beta    | E   | 2034-12-10T03:03:46.109 | 10.84  | -29.24 | 45650.59 | 22.30  |       |         |              |
| eta     | E   | 2034-12-10T03:04:54.396 | 11.06  | -29.47 | 47176.12 | 22.34  |       |         |              |
| gamma   | E   | 2034-12-10T03:05:14.763 | 11.13  | -29.54 | 47631.28 | 22.35  |       |         |              |
| delta   | E   | 2034-12-10T03:05:44.682 | 11.23  | -29.65 | 48300.35 | 22.37  |       |         |              |
| lambda  | E   | 2034-12-10T03:07:01.786 | 11.48  | -29.91 | 50026.71 | 22.41  |       |         |              |
| epsilon | E   | 2034-12-10T03:07:33.988 | 11.59  | -30.02 | 50748.59 | 22.43  |       |         |              |

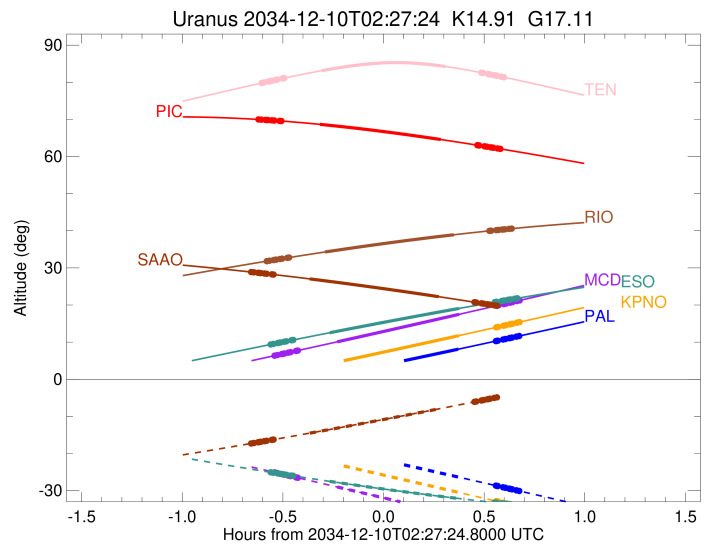
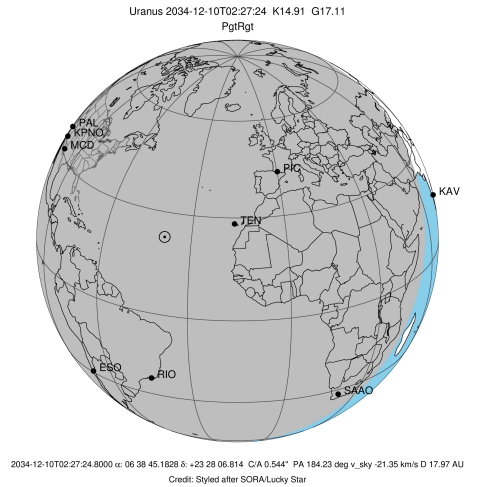
```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch              : 2034-12-10T02:31:52.110
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        : 3382772046843847296
2Mass ID (if available) : 06384518+2328067
ICRS Star Coord at Epoch: 06h 38m 45.18277s +23:28:06.81435s
RUWE (>1.4 is poor)  : 1.06
K magnitude           : 14.912
G magnitude           : 17.114
RP magnitude          : 16.427
BP magnitude          : 17.635
DUPflag              : 0
Distance (au)         : 17.971
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -21.35
Sun-Target sep (deg)  : 158.72
Sun-Moon sep (deg)    : 149.68
B (ring opening deg)  : 67.35
PA of pole (deg)      : 72.58
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.754
C/A sky separation (km) : 9821.8
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
    
```



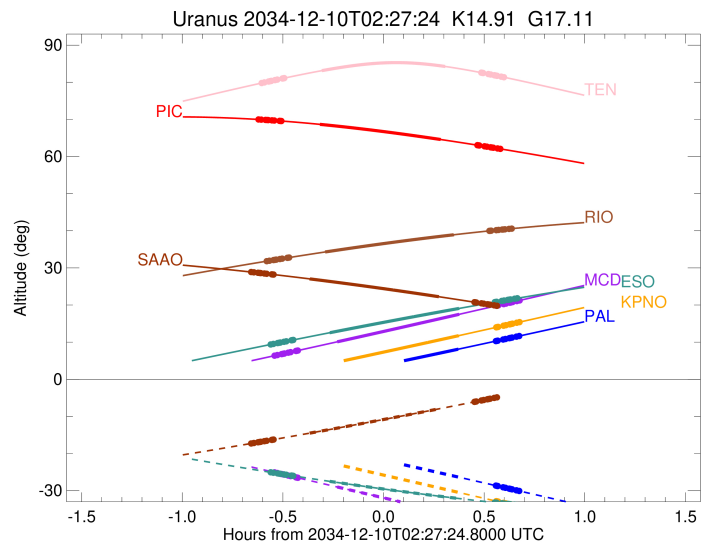
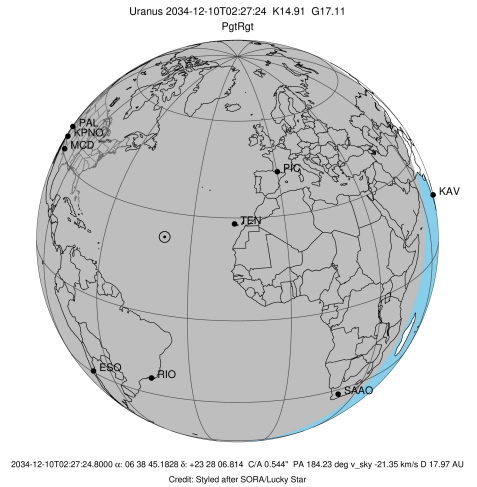
| Ring    | I/E | UTC                     | b? | alt   | alt-sun | radius   | r-dot  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I   | 2034-12-10T01:54:33.409 |    | 0.97x | -19.03  | 51543.57 | -22.36 |         |              |
| lambda  | I   | 2034-12-10T01:55:41.272 |    | 1.19x | -19.26  | 50026.71 | -22.34 |         |              |
| delta   | I   | 2034-12-10T01:56:58.604 |    | 1.43x | -19.53  | 48300.35 | -22.31 |         |              |
| gamma   | I   | 2034-12-10T01:57:29.068 |    | 1.53x | -19.63  | 47620.98 | -22.29 |         |              |
| eta     | I   | 2034-12-10T01:57:49.025 |    | 1.59x | -19.70  | 47176.12 | -22.29 |         |              |
| beta    | I   | 2034-12-10T01:58:56.276 |    | 1.80x | -19.93  | 45678.04 | -22.25 |         |              |
| alpha   | I   | 2034-12-10T01:59:40.704 |    | 1.95x | -20.08  | 44686.81 | -22.23 |         |              |
| 4       | I   | 2034-12-10T02:01:13.870 |    | 2.24x | -20.40  | 42613.96 | -22.17 |         |              |
| 5       | I   | 2034-12-10T02:01:35.071 |    | 2.31x | -20.47  | 42155.48 | -22.17 |         |              |
| 6       | I   | 2034-12-10T02:01:47.355 |    | 2.35x | -20.52  | 41879.32 | -22.15 |         |              |
| Uranus  | I   | 2034-12-10T02:13:37.965 |    | 4.63x | -22.95  | 25305.51 |        | -15.82  | -16.53       |
| Uranus  | E   | 2034-12-10T02:49:52.076 |    | 11.75 | -30.49  | 25060.92 |        | 22.65   | 23.60        |
| 6       | E   | 2034-12-10T03:00:59.550 |    | 13.98 | -32.83  | 41797.18 | 22.27  |         |              |
| 5       | E   | 2034-12-10T03:01:22.449 |    | 14.06 | -32.91  | 42310.42 | 22.28  |         |              |
| 4       | E   | 2034-12-10T03:01:33.599 |    | 14.10 | -32.95  | 42540.10 | 22.29  |         |              |
| alpha   | E   | 2034-12-10T03:03:12.490 |    | 14.43 | -33.30  | 44752.30 | 22.35  |         |              |
| beta    | E   | 2034-12-10T03:03:52.580 |    | 14.57 | -33.44  | 45650.47 | 22.38  |         |              |
| eta     | E   | 2034-12-10T03:05:00.648 |    | 14.79 | -33.67  | 47176.12 | 22.42  |         |              |
| gamma   | E   | 2034-12-10T03:05:20.949 |    | 14.86 | -33.75  | 47631.29 | 22.43  |         |              |
| delta   | E   | 2034-12-10T03:05:50.773 |    | 14.96 | -33.85  | 48300.35 | 22.44  |         |              |
| lambda  | E   | 2034-12-10T03:07:07.636 |    | 15.22 | -34.12  | 50026.71 | 22.48  |         |              |
| epsilon | E   | 2034-12-10T03:07:39.722 |    | 15.33 | -34.23  | 50748.19 | 22.50  |         |              |

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2034-12-10T02:31:54.620  
 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 : 3382772046843847296  
 2Mass ID (if available) : 06384518+2328067  
 ICRS Star Coord at Epoch: 06h 38m 45.18277s +23:28:06.81435s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.912  
 G magnitude : 17.114  
 RP magnitude : 16.427  
 BP magnitude : 17.635  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.35  
 Sun-Target sep (deg) : 158.72  
 Sun-Moon sep (deg) : 149.70  
 B (ring opening deg) : 67.35  
 PA of pole (deg) : 72.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.723  
 C/A sky separation (km) : 9417.3  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



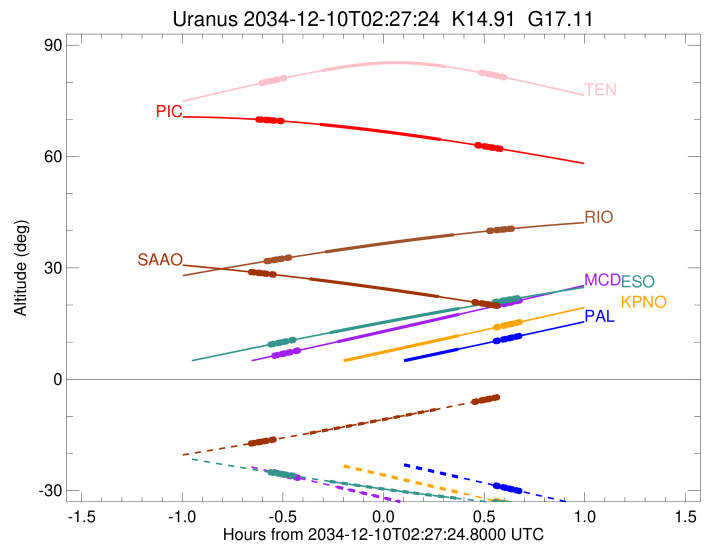
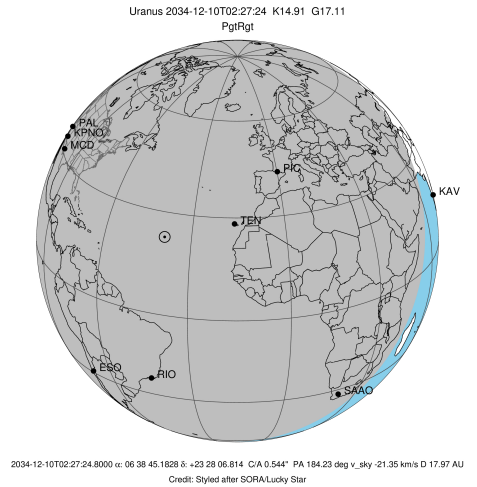
| Ring    | I/E | UTC                     | b? | alt   | alt-sun | radius   | r-dot  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I   | 2034-12-10T01:54:38.948 |    | 6.30  | -25.02  | 51544.35 | -22.45 |         |              |
| lambda  | I   | 2034-12-10T01:55:46.573 |    | 6.52  | -25.26  | 50026.71 | -22.43 |         |              |
| delta   | I   | 2034-12-10T01:57:03.587 |    | 6.78  | -25.53  | 48300.35 | -22.40 |         |              |
| gamma   | I   | 2034-12-10T01:57:33.922 |    | 6.88  | -25.63  | 47620.98 | -22.39 |         |              |
| eta     | I   | 2034-12-10T01:57:53.794 |    | 6.94  | -25.70  | 47176.12 | -22.38 |         |              |
| beta    | I   | 2034-12-10T01:59:00.757 |    | 7.17  | -25.94  | 45677.94 | -22.35 |         |              |
| alpha   | I   | 2034-12-10T01:59:44.987 |    | 7.31  | -26.09  | 44686.70 | -22.33 |         |              |
| 4       | I   | 2034-12-10T02:01:17.724 |    | 7.62  | -26.42  | 42613.80 | -22.28 |         |              |
| 5       | I   | 2034-12-10T02:01:38.830 |    | 7.69  | -26.49  | 42155.38 | -22.27 |         |              |
| 6       | I   | 2034-12-10T02:01:51.048 |    | 7.73  | -26.53  | 41879.38 | -22.26 |         |              |
| Uranus  | I   | 2034-12-10T02:13:35.824 |    | 10.08 | -29.01  | 25296.95 |        | -16.10  | -16.82       |
| Uranus  | E   | 2034-12-10T02:49:59.761 |    | 17.50 | -36.75  | 25060.77 |        | 22.65   | 23.61        |
| 6       | E   | 2034-12-10T03:01:02.989 |    | 19.79 | -39.12  | 41797.04 | 22.38  |         |              |
| 5       | E   | 2034-12-10T03:01:25.793 |    | 19.87 | -39.20  | 42310.69 | 22.39  |         |              |
| 4       | E   | 2034-12-10T03:01:36.860 |    | 19.90 | -39.24  | 42539.77 | 22.39  |         |              |
| alpha   | E   | 2034-12-10T03:03:15.303 |    | 20.25 | -39.59  | 44752.33 | 22.45  |         |              |
| beta    | E   | 2034-12-10T03:03:55.202 |    | 20.38 | -39.73  | 45650.32 | 22.48  |         |              |
| eta     | E   | 2034-12-10T03:05:02.977 |    | 20.62 | -39.97  | 47176.12 | 22.51  |         |              |
| gamma   | E   | 2034-12-10T03:05:23.191 |    | 20.69 | -40.05  | 47631.31 | 22.52  |         |              |
| delta   | E   | 2034-12-10T03:05:52.886 |    | 20.79 | -40.15  | 48300.35 | 22.54  |         |              |
| lambda  | E   | 2034-12-10T03:07:09.428 |    | 21.06 | -40.43  | 50026.71 | 22.57  |         |              |
| epsilon | E   | 2034-12-10T03:07:41.361 |    | 21.17 | -40.54  | 50747.71 | 22.59  |         |              |

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2034-12-10T02:27:30.480  
 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 : 3382772046843847296  
 2Mass ID (if available) : 063884518+2328067  
 ICRS Star Coord at Epoch: 06h 38m 45.18277s +23:28:06.81435s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.912  
 G magnitude : 17.114  
 RP magnitude : 16.427  
 BP magnitude : 17.635  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.35  
 Sun-Target sep (deg) : 158.72  
 Sun-Moon sep (deg) : 150.66  
 B (ring opening deg) : 67.35  
 PA of pole (deg) : 72.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.575  
 C/A sky separation (km) : 7496.5  
 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



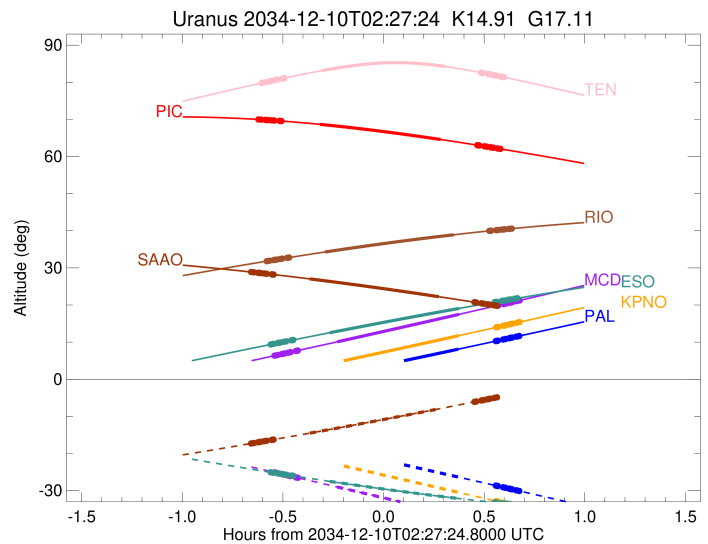
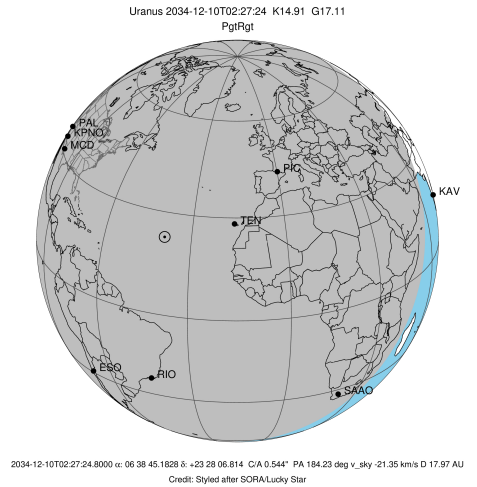
| Ring    | I/E | UTC                     | b? | alt   | alt-sun | radius   | r-dot  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I   | 2034-12-10T01:50:48.719 |    | 79.75 | -77.11  | 51548.26 | -23.07 |         |              |
| lambda  | I   | 2034-12-10T01:51:54.686 |    | 79.97 | -76.88  | 50026.71 | -23.06 |         |              |
| delta   | I   | 2034-12-10T01:53:09.591 |    | 80.21 | -76.63  | 48300.35 | -23.04 |         |              |
| gamma   | I   | 2034-12-10T01:53:39.087 |    | 80.31 | -76.52  | 47620.96 | -23.03 |         |              |
| eta     | I   | 2034-12-10T01:53:58.405 |    | 80.37 | -76.46  | 47176.12 | -23.02 |         |              |
| beta    | I   | 2034-12-10T01:55:03.507 |    | 80.59 | -76.23  | 45677.36 | -23.00 |         |              |
| alpha   | I   | 2034-12-10T01:55:46.481 |    | 80.73 | -76.08  | 44686.14 | -22.99 |         |              |
| 4       | I   | 2034-12-10T01:57:16.533 |    | 81.02 | -75.77  | 42612.90 | -22.95 |         |              |
| 5       | I   | 2034-12-10T01:57:37.040 |    | 81.08 | -75.70  | 42154.99 | -22.95 |         |              |
| 6       | I   | 2034-12-10T01:57:48.866 |    | 81.12 | -75.66  | 41879.62 | -22.94 |         |              |
| Uranus  | I   | 2034-12-10T02:09:02.347 |    | 83.14 | -73.28  | 25253.42 |        | -17.45  | -18.22       |
| Uranus  | E   | 2034-12-10T02:45:49.368 |    | 84.26 | -65.30  | 25063.31 |        | 22.59   | 23.54        |
| 6       | E   | 2034-12-10T02:56:32.289 |    | 82.60 | -62.95  | 41796.53 | 22.95  |         |              |
| 5       | E   | 2034-12-10T02:56:54.583 |    | 82.54 | -62.86  | 42311.66 | 22.96  |         |              |
| 4       | E   | 2034-12-10T02:57:05.263 |    | 82.50 | -62.83  | 42538.55 | 22.96  |         |              |
| alpha   | E   | 2034-12-10T02:58:41.385 |    | 82.22 | -62.47  | 44752.40 | 23.00  |         |              |
| beta    | E   | 2034-12-10T02:59:20.314 |    | 82.10 | -62.33  | 45649.73 | 23.01  |         |              |
| eta     | E   | 2034-12-10T03:00:26.566 |    | 81.90 | -62.09  | 47176.12 | 23.03  |         |              |
| gamma   | E   | 2034-12-10T03:00:46.328 |    | 81.84 | -62.02  | 47631.36 | 23.04  |         |              |
| delta   | E   | 2034-12-10T03:01:15.359 |    | 81.75 | -61.91  | 48300.35 | 23.05  |         |              |
| lambda  | E   | 2034-12-10T03:02:30.230 |    | 81.52 | -61.63  | 50026.71 | 23.07  |         |              |
| epsilon | E   | 2034-12-10T03:03:01.412 |    | 81.42 | -61.52  | 50746.14 | 23.08  |         |              |

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2034-12-10T02:29:14.870  
 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 : 3382772046843847296  
 2Mass ID (if available) : 06384518+2328067  
 ICRS Star Coord at Epoch: 06h 38m 45.18277s +23:28:06.81435s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.912  
 G magnitude : 17.114  
 RP magnitude : 16.427  
 BP magnitude : 17.635  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.35  
 Sun-Target sep (deg) : 158.72  
 Sun-Moon sep (deg) : 150.10  
 B (ring opening deg) : 67.35  
 PA of pole (deg) : 72.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.188  
 C/A sky separation (km) : 2445.9  
 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\_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   | 2034-12-10T01:52:18.969 |    | 31.77 | -42.55  | 51553.67 | -23.24 |         |              |
| lambda  | I   | 2034-12-10T01:53:24.683 |    | 31.93 | -42.63  | 50026.71 | -23.24 |         |              |
| delta   | I   | 2034-12-10T01:54:38.980 |    | 32.11 | -42.71  | 48300.35 | -23.24 |         |              |
| gamma   | I   | 2034-12-10T01:55:08.219 |    | 32.19 | -42.74  | 47620.97 | -23.23 |         |              |
| eta     | I   | 2034-12-10T01:55:27.365 |    | 32.23 | -42.76  | 47176.12 | -23.23 |         |              |
| beta    | I   | 2034-12-10T01:56:31.901 |    | 32.39 | -42.82  | 45675.97 | -23.23 |         |              |
| alpha   | I   | 2034-12-10T01:57:14.429 |    | 32.49 | -42.87  | 44685.22 | -23.23 |         |              |
| 4       | I   | 2034-12-10T01:58:43.528 |    | 32.71 | -42.95  | 42610.51 | -23.23 |         |              |
| 5       | I   | 2034-12-10T01:59:03.781 |    | 32.76 | -42.97  | 42154.94 | -23.23 |         |              |
| 6       | I   | 2034-12-10T01:59:15.459 |    | 32.78 | -42.99  | 41879.71 | -23.23 |         |              |
| Uranus  | I   | 2034-12-10T02:10:02.329 |    | 34.29 | -43.54  | 25163.69 |        | -20.00  | -20.86       |
| Uranus  | E   | 2034-12-10T02:48:23.435 |    | 38.93 | -44.34  | 25098.37 |        | 21.71   | 22.63        |
| 6       | E   | 2034-12-10T02:58:56.411 |    | 39.97 | -44.23  | 41795.32 | 23.29  |         |              |
| 5       | E   | 2034-12-10T02:59:18.517 |    | 40.00 | -44.22  | 42314.02 | 23.30  |         |              |
| 4       | E   | 2034-12-10T02:59:28.721 |    | 40.02 | -44.22  | 42534.92 | 23.29  |         |              |
| alpha   | E   | 2034-12-10T03:01:03.694 |    | 40.17 | -44.19  | 44752.33 | 23.30  |         |              |
| beta    | E   | 2034-12-10T03:01:42.032 |    | 40.22 | -44.17  | 45647.90 | 23.30  |         |              |
| eta     | E   | 2034-12-10T03:02:47.574 |    | 40.32 | -44.15  | 47176.12 | 23.30  |         |              |
| gamma   | E   | 2034-12-10T03:03:07.114 |    | 40.35 | -44.14  | 47631.50 | 23.31  |         |              |
| delta   | E   | 2034-12-10T03:03:35.813 |    | 40.39 | -44.13  | 48300.35 | 23.31  |         |              |
| lambda  | E   | 2034-12-10T03:04:49.877 |    | 40.50 | -44.10  | 50026.71 | 23.31  |         |              |
| epsilon | E   | 2034-12-10T03:05:20.628 |    | 40.55 | -44.09  | 50743.53 | 23.31  |         |              |

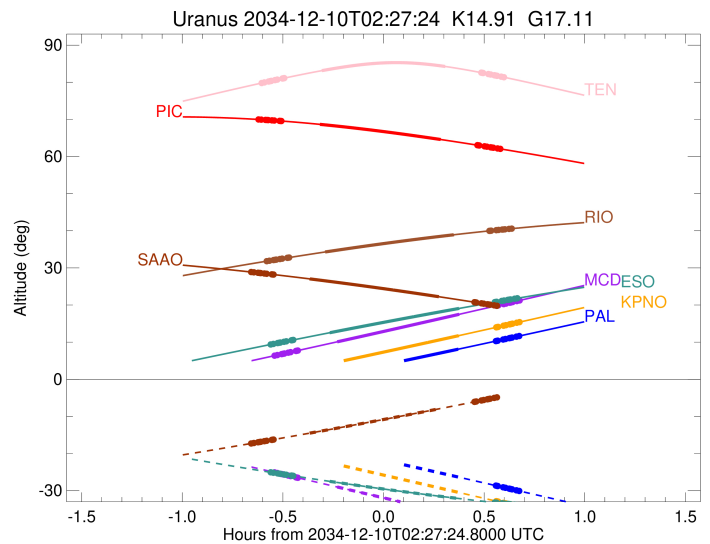
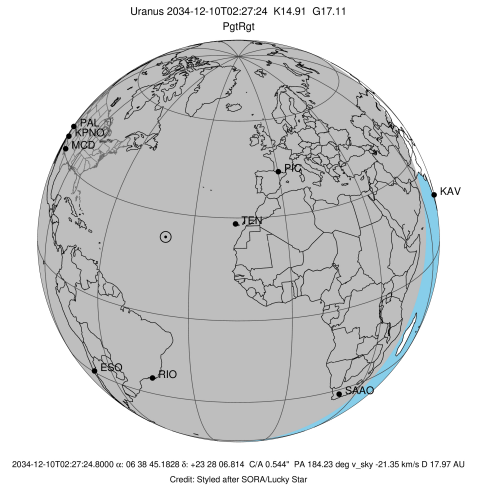
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2034-12-10T02:30:41.830  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 3382772046843847296  
 2Mass ID (if available) : 06384518+2328067  
 ICRS Star Coord at Epoch: 06h 38m 45.18277s +23:28:06.81435s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.912  
 G magnitude : 17.114  
 RP magnitude : 16.427  
 BP magnitude : 17.635  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.35  
 Sun-Target sep (deg) : 158.72  
 Sun-Moon sep (deg) : 149.74  
 B (ring opening deg) : 67.35  
 PA of pole (deg) : 72.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.193  
 C/A sky separation (km) : 2509.2  
 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   | 2034-12-10T01:53:30.098 |    | 9.32  | -25.02  | 51553.52 | -23.06 |         |              |
| lambda  | I   | 2034-12-10T01:54:36.307 |    | 9.52  | -25.18  | 50026.71 | -23.06 |         |              |
| delta   | I   | 2034-12-10T01:55:51.171 |    | 9.75  | -25.36  | 48300.35 | -23.06 |         |              |
| gamma   | I   | 2034-12-10T01:56:20.632 |    | 9.84  | -25.43  | 47620.97 | -23.06 |         |              |
| eta     | I   | 2034-12-10T01:56:39.924 |    | 9.90  | -25.47  | 47176.12 | -23.06 |         |              |
| beta    | I   | 2034-12-10T01:57:44.946 |    | 10.10 | -25.63  | 45676.03 | -23.06 |         |              |
| alpha   | I   | 2034-12-10T01:58:27.797 |    | 10.22 | -25.73  | 44685.24 | -23.06 |         |              |
| 4       | I   | 2034-12-10T01:59:57.565 |    | 10.50 | -25.94  | 42610.61 | -23.05 |         |              |
| 5       | I   | 2034-12-10T02:00:17.971 |    | 10.56 | -25.99  | 42154.93 | -23.06 |         |              |
| 6       | I   | 2034-12-10T02:00:29.736 |    | 10.59 | -26.02  | 41879.71 | -23.06 |         |              |
| Uranus  | I   | 2034-12-10T02:11:21.714 |    | 12.53 | -27.50  | 25165.87 |        | -19.94  | -20.80       |
| Uranus  | E   | 2034-12-10T02:49:57.218 |    | 19.08 | -32.13  | 25098.51 |        | 21.70   | 22.63        |
| 6       | E   | 2034-12-10T03:00:34.037 |    | 20.77 | -33.21  | 41795.31 | 23.16  |         |              |
| 5       | E   | 2034-12-10T03:00:56.273 |    | 20.83 | -33.24  | 42314.04 | 23.16  |         |              |
| 4       | E   | 2034-12-10T03:01:06.532 |    | 20.86 | -33.26  | 42534.88 | 23.15  |         |              |
| alpha   | E   | 2034-12-10T03:02:42.056 |    | 21.11 | -33.41  | 44752.33 | 23.16  |         |              |
| beta    | E   | 2034-12-10T03:03:20.612 |    | 21.21 | -33.47  | 45647.87 | 23.17  |         |              |
| eta     | E   | 2034-12-10T03:04:26.530 |    | 21.38 | -33.57  | 47176.12 | 23.17  |         |              |
| gamma   | E   | 2034-12-10T03:04:46.181 |    | 21.43 | -33.60  | 47631.50 | 23.17  |         |              |
| delta   | E   | 2034-12-10T03:05:15.041 |    | 21.50 | -33.65  | 48300.35 | 23.18  |         |              |
| lambda  | E   | 2034-12-10T03:06:29.523 |    | 21.70 | -33.76  | 50026.71 | 23.18  |         |              |
| epsilon | E   | 2034-12-10T03:07:00.445 |    | 21.77 | -33.81  | 50743.53 | 23.18  |         |              |



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2034-12-10T02:24:39.770  
 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 : 3382772046843847296  
 2Mass ID (if available) : 06384518+2328067  
 ICRS Star Coord at Epoch: 06h 38m 45.18277s +23:28:06.81435s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.912  
 G magnitude : 17.114  
 RP magnitude : 16.427  
 BP magnitude : 17.635  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.35  
 Sun-Target sep (deg) : 158.72  
 Sun-Moon sep (deg) : 150.73  
 B (ring opening deg) : 67.35  
 PA of pole (deg) : 72.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.183  
 C/A sky separation (km) : 2381.4  
 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\_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   | 2034-12-10T01:47:40.683 |    | 28.91 | -17.34  | 51553.97 | -23.24 |         |              |
| lambda  | I   | 2034-12-10T01:48:46.401 |    | 28.80 | -17.17  | 50026.71 | -23.24 |         |              |
| delta   | I   | 2034-12-10T01:50:00.695 |    | 28.68 | -16.97  | 48300.35 | -23.23 |         |              |
| gamma   | I   | 2034-12-10T01:50:29.936 |    | 28.63 | -16.90  | 47620.97 | -23.23 |         |              |
| eta     | I   | 2034-12-10T01:50:49.083 |    | 28.60 | -16.85  | 47176.12 | -23.23 |         |              |
| beta    | I   | 2034-12-10T01:51:53.632 |    | 28.49 | -16.68  | 45675.85 | -23.23 |         |              |
| alpha   | I   | 2034-12-10T01:52:36.167 |    | 28.42 | -16.57  | 44685.16 | -23.23 |         |              |
| 4       | I   | 2034-12-10T01:54:05.297 |    | 28.26 | -16.33  | 42610.32 | -23.22 |         |              |
| 5       | I   | 2034-12-10T01:54:25.554 |    | 28.23 | -16.28  | 42154.99 | -23.22 |         |              |
| 6       | I   | 2034-12-10T01:54:37.239 |    | 28.21 | -16.25  | 41879.69 | -23.22 |         |              |
| Uranus  | I   | 2034-12-10T02:05:24.076 |    | 27.04 | -14.51  | 25159.63 |        | -20.11  | -20.98       |
| Uranus  | E   | 2034-12-10T02:43:53.486 |    | 22.24 | -7.98   | 25097.11 |        | 21.74   | 22.67        |
| 6       | E   | 2034-12-10T02:54:29.466 |    | 20.76 | -6.09   | 41795.36 | 23.16  |         |              |
| 5       | E   | 2034-12-10T02:54:51.691 |    | 20.71 | -6.02   | 42313.95 | 23.17  |         |              |
| 4       | E   | 2034-12-10T02:55:01.963 |    | 20.69 | -5.99   | 42535.06 | 23.16  |         |              |
| alpha   | E   | 2034-12-10T02:56:37.466 |    | 20.46 | -5.71   | 44752.35 | 23.16  |         |              |
| beta    | E   | 2034-12-10T02:57:16.027 |    | 20.37 | -5.59   | 45647.98 | 23.17  |         |              |
| eta     | E   | 2034-12-10T02:58:21.947 |    | 20.21 | -5.39   | 47176.12 | 23.17  |         |              |
| gamma   | E   | 2034-12-10T02:58:41.601 |    | 20.16 | -5.33   | 47631.49 | 23.17  |         |              |
| delta   | E   | 2034-12-10T02:59:10.469 |    | 20.09 | -5.25   | 48300.35 | 23.17  |         |              |
| lambda  | E   | 2034-12-10T03:00:24.977 |    | 19.91 | -5.02   | 50026.71 | 23.17  |         |              |
| epsilon | E   | 2034-12-10T03:00:55.914 |    | 19.84 | -4.93x  | 50743.56 | 23.17  |         |              |