

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-10-16T15:14:30.300  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3427634041103770624  
 2Mass ID (if available) : 05454524+2332147

ICRS Star Coord at Epoch: 05h 45m 45.24510s +23:32:14.55536s

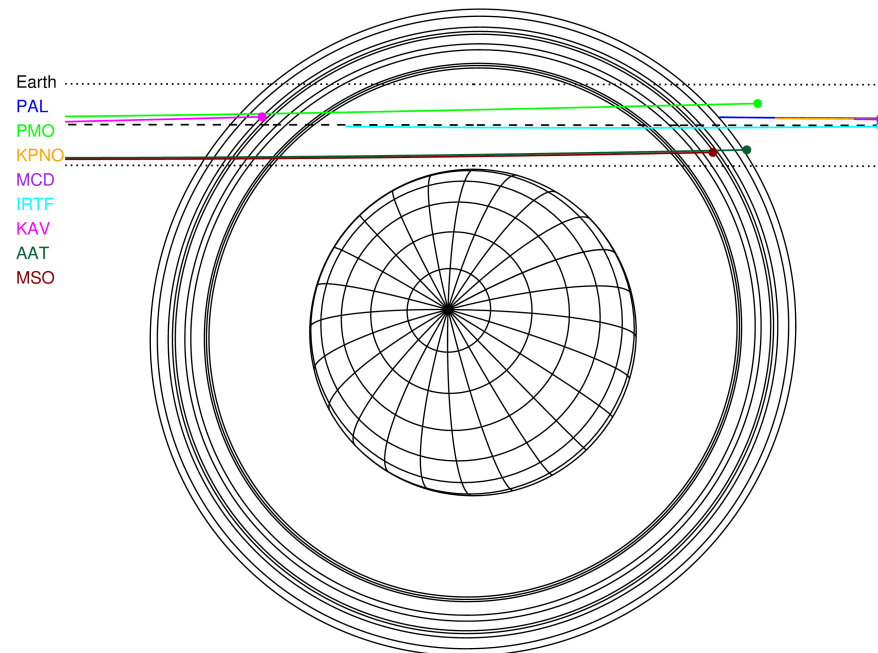
RUWE (>1.4 is poor) : 1.04  
 K magnitude : 13.942  
 G magnitude : 17.206  
 RP magnitude : 16.223  
 BP magnitude : 18.137  
 DUPflag : 0  
 Distance (au) : 18.642  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -6.67  
 Sun-Target sep (deg) : 115.88  
 Sun-Moon sep (deg) : 119.42  
 B (ring opening deg) : 78.00  
 PA of pole (deg) : 47.45

| #  | 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 |



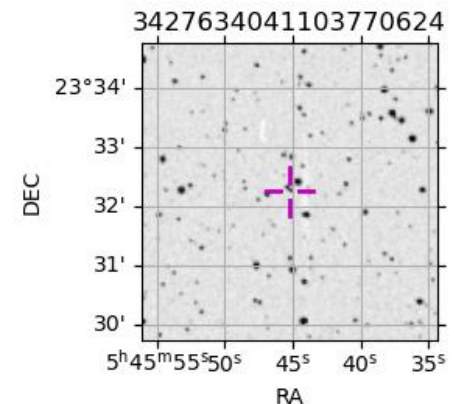
2031-10-16T15:14:30.3000 α: 05 45 45.2451 s: +23 32 14.555 C/A 2.413° PA 179.94 deg v\_sky - 6.66 km/s D 18.64 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2031-10-16T15:14:30 K13.94 G17.21 XRgt



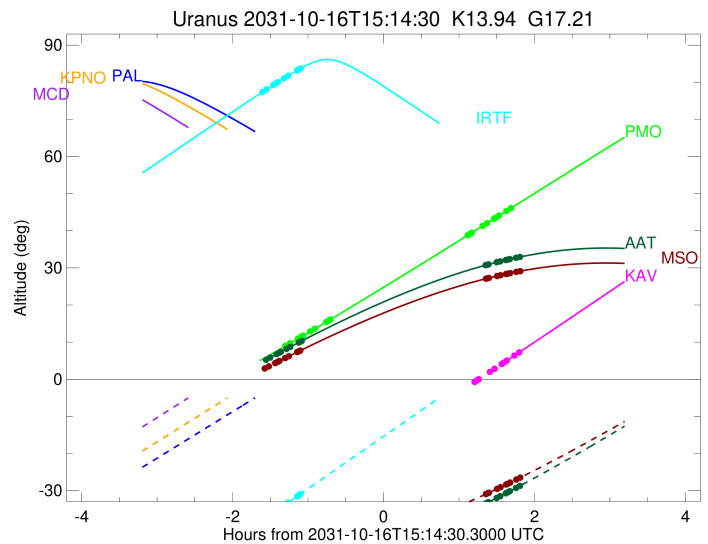
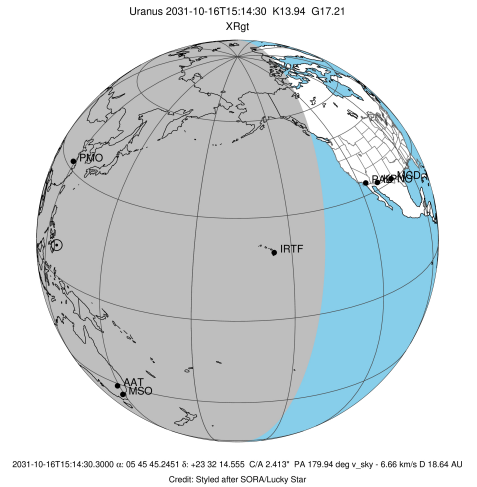
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

| Obs  | Location              | lat   | Elon  | Rings I | Planet | Rings E | Observed Events Interval    | OEcode |
|------|-----------------------|-------|-------|---------|--------|---------|-----------------------------|--------|
| PIC  | Pic du Midi           | 42.9  | 0.1   |         |        |         |                             | PnnRnn |
| PAL  | Palomar Mt (200")     | 33.4  | 243.1 |         |        |         |                             | PnnRnn |
| PMO  | Purple Mtn Obs. Nanki | 32.1  | 118.8 | +++++   |        | +++++   | OCT 16 13:57 - OCT 16 16:55 | PnnRie |
| KPNO | Kitt Peak Natl Obs    | 32.0  | 248.4 |         |        |         |                             | PnnRnn |
| MCD  | McDonald Obs. 2.7m    | 30.7  | 256.0 |         |        |         |                             | PnnRnn |
| TEN  | Teide Obs./Tenerife   | 28.3  | 343.5 |         |        |         |                             | PnnRnn |
| IRTF | Mauna Kea/IRTF        | 19.8  | 204.5 | +++++   |        |         | OCT 16 13:39 - OCT 16 14:08 | PnnRin |
| KAV  | Kavalur Observatory   | 12.6  | 78.8  |         |        | +++     | OCT 16 16:52 - OCT 16 17:02 | PnnRne |
| RIO  | Rio de Janeiro        | -22.9 | 316.8 |         |        |         |                             | PnnRnn |
| ESO  | European Southern Obs | -29.3 | 289.3 |         |        |         |                             | PnnRnn |
| AAT  | Siding Spring (AAT)   | -31.3 | 149.1 | +++++   |        | +++++   | OCT 16 13:42 - OCT 16 17:03 | PnnRie |
| SAAO | So. Afr. Astro. Obs.  | -32.4 | 20.8  |         |        |         |                             | PnnRnn |
| MSO  | Mt. Stromlo Observato | -35.3 | 149.0 | +++++   |        | +++++   | OCT 16 13:56 - OCT 16 17:03 | PnnRie |



3427634041103770624

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-10-16T15:29:11.790  
 Event type : XRgt  
 : No Uranus occs  
 : 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 : 3427634041103770624  
 2Mass ID (if available) : 05454524+2332147  
 ICRS Star Coord at Epoch: 05h 45m 45.24510s +23:32:14.55536s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 13.942  
 G magnitude : 17.206  
 RP magnitude : 16.223  
 BP magnitude : 18.137  
 DUPflag : 0  
 Distance (au) : 18.642  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -6.67  
 Sun-Target sep (deg) : 115.88  
 Sun-Moon sep (deg) : 119.38  
 B (ring opening deg) : 78.00  
 PA of pole (deg) : 47.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.579  
 C/A sky separation (km) : 34866.3  
 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

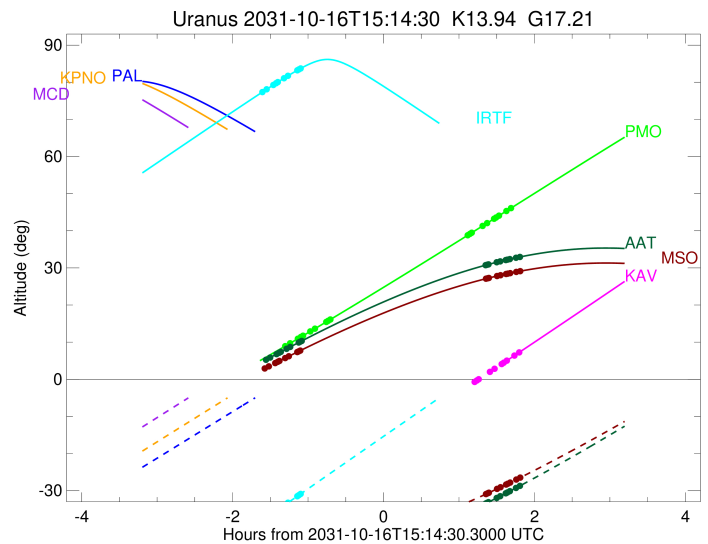
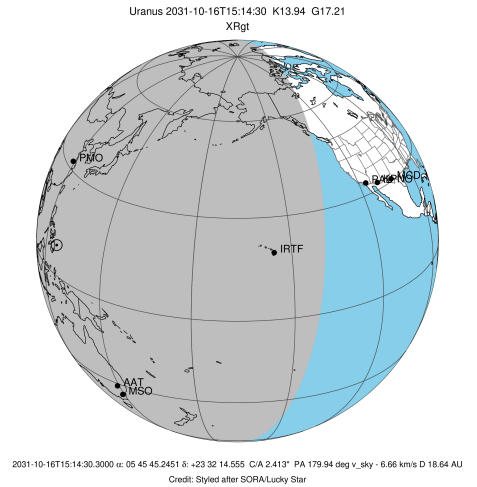


| Ring    | I/E | UTC                     | b? | alt   | alt-sun | radius   | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|-------|---------|--------------|
| epsilon | I   | 2031-10-16T13:57:47.440 |    | 9.21  | -55.27  | 50743.99 | -4.82 |         |              |
| lambda  | I   | 2031-10-16T14:00:17.256 |    | 9.70  | -55.70  | 50026.71 | -4.76 |         |              |
| delta   | I   | 2031-10-16T14:06:26.458 |    | 10.92 | -56.75  | 48300.35 | -4.59 |         |              |
| gamma   | I   | 2031-10-16T14:08:54.156 |    | 11.41 | -57.16  | 47627.37 | -4.52 |         |              |
| eta     | I   | 2031-10-16T14:10:34.540 |    | 11.75 | -57.43  | 47176.12 | -4.47 |         |              |
| beta    | I   | 2031-10-16T14:16:25.268 |    | 12.91 | -58.38  | 45641.10 | -4.28 |         |              |
| alpha   | I   | 2031-10-16T14:20:08.685 |    | 13.66 | -58.97  | 44699.60 | -4.15 |         |              |
| 4       | I   | 2031-10-16T14:29:12.389 |    | 15.48 | -60.34  | 42539.75 | -3.78 |         |              |
| 5       | I   | 2031-10-16T14:30:24.492 |    | 15.73 | -60.52  | 42267.75 | -3.73 |         |              |
| 6       | I   | 2031-10-16T14:32:10.197 |    | 16.08 | -60.77  | 41879.26 | -3.66 |         |              |

No planet occultations

|         |   |                         |  |       |        |          |      |  |  |
|---------|---|-------------------------|--|-------|--------|----------|------|--|--|
| 6       | E | 2031-10-16T16:21:30.123 |  | 38.80 | -65.97 | 41860.79 | 3.78 |  |  |
| 5       | E | 2031-10-16T16:22:56.325 |  | 39.11 | -65.87 | 42180.93 | 3.85 |  |  |
| 4       | E | 2031-10-16T16:24:22.640 |  | 39.41 | -65.76 | 42529.14 | 3.91 |  |  |
| alpha   | E | 2031-10-16T16:33:20.313 |  | 41.31 | -65.01 | 44741.08 | 4.32 |  |  |
| beta    | E | 2031-10-16T16:36:48.883 |  | 42.05 | -64.67 | 45658.43 | 4.46 |  |  |
| eta     | E | 2031-10-16T16:42:21.098 |  | 43.22 | -64.10 | 47176.12 | 4.67 |  |  |
| gamma   | E | 2031-10-16T16:43:55.740 |  | 43.56 | -63.93 | 47621.21 | 4.73 |  |  |
| delta   | E | 2031-10-16T16:46:18.043 |  | 44.06 | -63.66 | 48300.35 | 4.81 |  |  |
| lambda  | E | 2031-10-16T16:52:09.656 |  | 45.31 | -62.97 | 50026.71 | 5.00 |  |  |
| epsilon | E | 2031-10-16T16:55:49.946 |  | 46.09 | -62.51 | 51141.09 | 5.07 |  |  |

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-10-16T15:11:25.230  
 Event type : XRgt  
 : No Uranus occs  
 : 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 : 3427634041103770624  
 2Mass ID (if available) : 05454524+2332147  
 ICRS Star Coord at Epoch: 05h 45m 45.24510s +23:32:14.55536s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 13.942  
 G magnitude : 17.206  
 RP magnitude : 16.223  
 BP magnitude : 18.137  
 DUPflag : 0  
 Distance (au) : 18.642  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -6.67  
 Sun-Target sep (deg) : 115.88  
 Sun-Moon sep (deg) : 120.32  
 B (ring opening deg) : 78.00  
 PA of pole (deg) : 47.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.375  
 C/A sky separation (km) : 32107.3  
 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



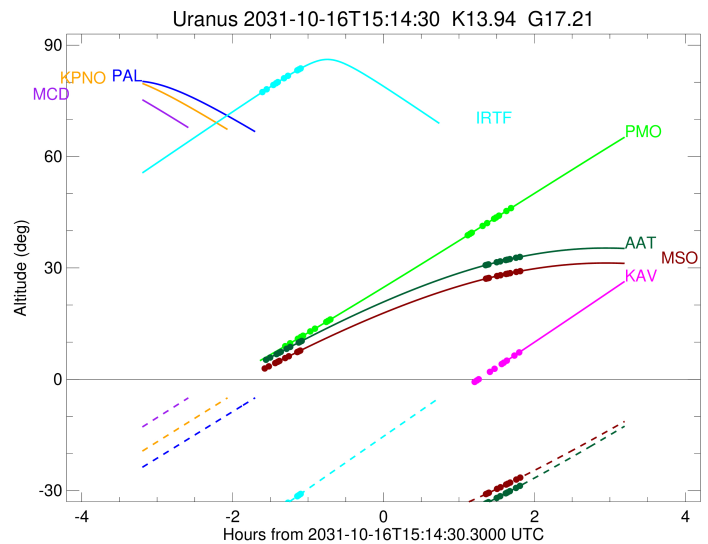
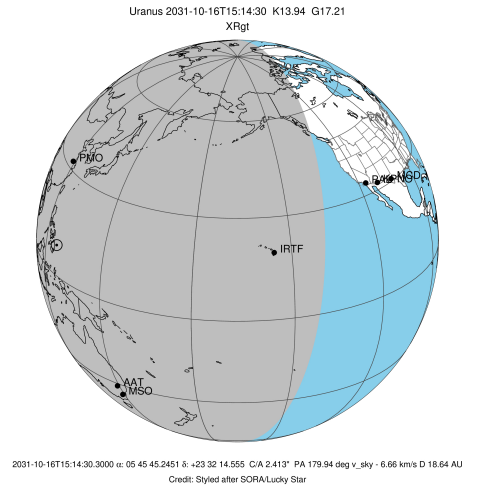
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

| Ring    | I/E | UTC                     | b? | alt   | alt-sun | radius   | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|-------|---------|--------------|
| epsilon | I   | 2031-10-16T13:39:27.291 |    | 77.64 | -37.74  | 50747.74 | -5.51 |         |              |
| lambda  | I   | 2031-10-16T13:41:38.604 |    | 78.12 | -37.23  | 50026.71 | -5.46 |         |              |
| delta   | I   | 2031-10-16T13:46:58.709 |    | 79.29 | -35.97  | 48300.35 | -5.32 |         |              |
| gamma   | I   | 2031-10-16T13:49:05.833 |    | 79.75 | -35.48  | 47627.92 | -5.26 |         |              |
| eta     | I   | 2031-10-16T13:50:32.102 |    | 80.06 | -35.14  | 47176.12 | -5.22 |         |              |
| beta    | I   | 2031-10-16T13:55:30.948 |    | 81.12 | -33.97  | 45641.08 | -5.05 |         |              |
| alpha   | I   | 2031-10-16T13:58:39.858 |    | 81.77 | -33.23  | 44696.39 | -4.95 |         |              |
| 4       | I   | 2031-10-16T14:06:07.984 |    | 83.26 | -31.47  | 42544.32 | -4.65 |         |              |
| 5       | I   | 2031-10-16T14:07:05.604 |    | 83.44 | -31.25  | 42277.29 | -4.60 |         |              |
| 6       | I   | 2031-10-16T14:08:32.887 |    | 83.71 | -30.90  | 41877.98 | -4.55 |         |              |

No planet occultations

|         |   |                         |  |       |        |          |      |  |  |
|---------|---|-------------------------|--|-------|--------|----------|------|--|--|
| 6       | E | 2031-10-16T16:10:56.540 |  | 66.17 | -2.20x | 41857.65 | 4.55 |  |  |
| 5       | E | 2031-10-16T16:12:07.857 |  | 65.90 | -1.92x | 42176.17 | 4.60 |  |  |
| 4       | E | 2031-10-16T16:13:21.604 |  | 65.62 | -1.64x | 42530.65 | 4.65 |  |  |
| alpha   | E | 2031-10-16T16:21:03.179 |  | 63.85 | 0.15x  | 44742.75 | 4.95 |  |  |
| beta    | E | 2031-10-16T16:24:06.178 |  | 63.15 | 0.85x  | 45659.70 | 5.05 |  |  |
| eta     | E | 2031-10-16T16:29:01.499 |  | 62.02 | 2.00x  | 47176.12 | 5.22 |  |  |
| gamma   | E | 2031-10-16T16:30:26.477 |  | 61.70 | 2.32x  | 47621.13 | 5.26 |  |  |
| delta   | E | 2031-10-16T16:32:34.888 |  | 61.21 | 2.82x  | 48300.35 | 5.32 |  |  |
| lambda  | E | 2031-10-16T16:37:54.980 |  | 59.98 | 4.05x  | 50026.71 | 5.46 |  |  |
| epsilon | E | 2031-10-16T16:41:20.680 |  | 59.19 | 4.84x  | 51159.39 | 5.51 |  |  |

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-10-16T15:31:22.700  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 3427634041103770624  
 2Mass ID (if available) : 05454524+2332147  
 ICRS Star Coord at Epoch: 05h 45m 45.24510s +23:32:14.55536s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 13.942  
 G magnitude : 17.206  
 RP magnitude : 16.223  
 BP magnitude : 18.137  
 DUPflag : 0  
 Distance (au) : 18.642  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -6.67  
 Sun-Target sep (deg) : 115.88  
 Sun-Moon sep (deg) : 118.77  
 B (ring opening deg) : 78.00  
 PA of pole (deg) : 47.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.560  
 C/A sky separation (km) : 34618.2  
 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

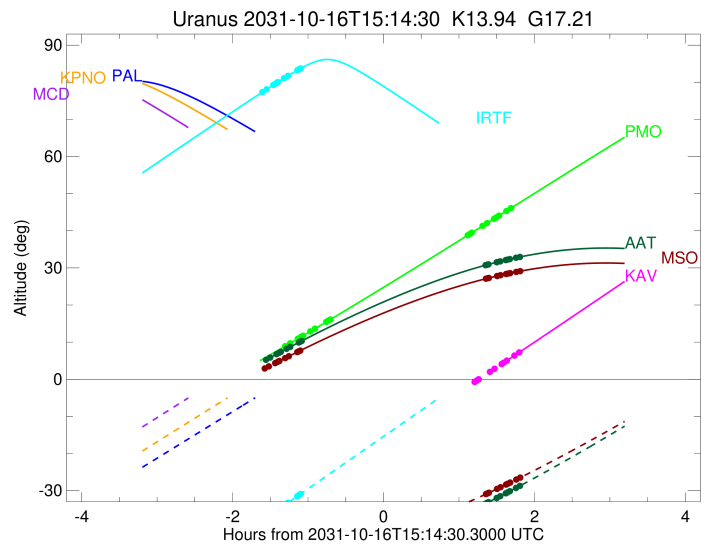
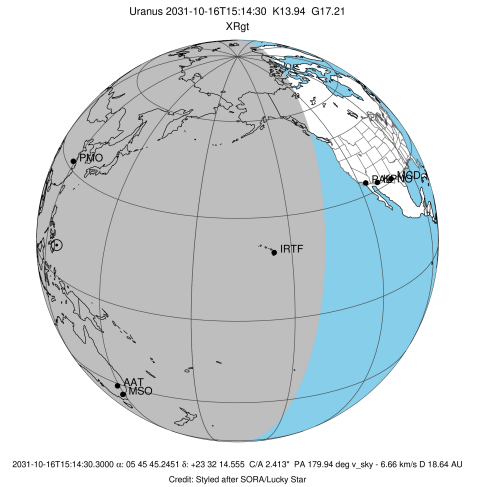


| Ring    | I/E | UTC                     | b?      | alt    | alt-sun  | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|---------|--------|----------|--------|-------|---------|--------------|
| epsilon | I   | 2031-10-16T13:54:51.130 | -32.73x | -22.44 | 50744.12 | -4.62  |       |         |              |
| lambda  | I   | 2031-10-16T13:57:27.454 | -32.24x | -23.07 | 50026.71 | -4.56  |       |         |              |
| delta   | I   | 2031-10-16T14:03:52.381 | -31.00x | -24.64 | 48300.35 | -4.41  |       |         |              |
| gamma   | I   | 2031-10-16T14:06:26.247 | -30.50x | -25.26 | 47627.41 | -4.34  |       |         |              |
| eta     | I   | 2031-10-16T14:08:10.794 | -30.16x | -25.69 | 47176.12 | -4.29  |       |         |              |
| beta    | I   | 2031-10-16T14:14:15.720 | -28.97x | -27.17 | 45641.09 | -4.12  |       |         |              |
| alpha   | I   | 2031-10-16T14:18:07.922 | -28.20x | -28.11 | 44699.39 | -4.00  |       |         |              |
| 4       | I   | 2031-10-16T14:27:31.444 | -26.32x | -30.40 | 42540.02 | -3.66  |       |         |              |
| 5       | I   | 2031-10-16T14:28:45.934 | -26.07x | -30.70 | 42268.38 | -3.60  |       |         |              |
| 6       | I   | 2031-10-16T14:30:35.329 | -25.70x | -31.15 | 41879.20 | -3.54  |       |         |              |

No planet occultations

|         |   |                         |        |        |          |      |  |  |  |
|---------|---|-------------------------|--------|--------|----------|------|--|--|--|
| 6       | E | 2031-10-16T16:26:59.114 | -0.71x | -59.55 | 41860.19 | 3.69 |  |  |  |
| 5       | E | 2031-10-16T16:28:27.336 | -0.39x | -59.91 | 42179.96 | 3.76 |  |  |  |
| 4       | E | 2031-10-16T16:29:56.180 | -0.06x | -60.27 | 42529.42 | 3.81 |  |  |  |
| alpha   | E | 2031-10-16T16:39:08.699 | 2.00x  | -62.51 | 44741.47 | 4.20 |  |  |  |
| beta    | E | 2031-10-16T16:42:43.336 | 2.81x  | -63.38 | 45658.73 | 4.33 |  |  |  |
| eta     | E | 2031-10-16T16:48:25.459 | 4.09x  | -64.77 | 47176.12 | 4.54 |  |  |  |
| gamma   | E | 2031-10-16T16:50:02.984 | 4.45x  | -65.16 | 47621.19 | 4.59 |  |  |  |
| delta   | E | 2031-10-16T16:52:29.661 | 5.00   | -65.76 | 48300.35 | 4.67 |  |  |  |
| lambda  | E | 2031-10-16T16:58:32.177 | 6.37   | -67.22 | 50026.71 | 4.85 |  |  |  |
| epsilon | E | 2031-10-16T17:02:20.476 | 7.23   | -68.15 | 51146.71 | 4.92 |  |  |  |

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-10-16T15:24:36.730  
 Event type : XRgt  
 : No Uranus occs  
 : 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 : 3427634041103770624  
 2Mass ID (if available) : 05454524+2332147  
 ICRS Star Coord at Epoch: 05h 45m 45.24510s +23:32:14.55536s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 13.942  
 G magnitude : 17.206  
 RP magnitude : 16.223  
 BP magnitude : 18.137  
 DUPflag : 0  
 Distance (au) : 18.642  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -6.67  
 Sun-Target sep (deg) : 115.88  
 Sun-Moon sep (deg) : 119.44  
 B (ring opening deg) : 78.00  
 PA of pole (deg) : 47.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.059  
 C/A sky separation (km) : 27842.2  
 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

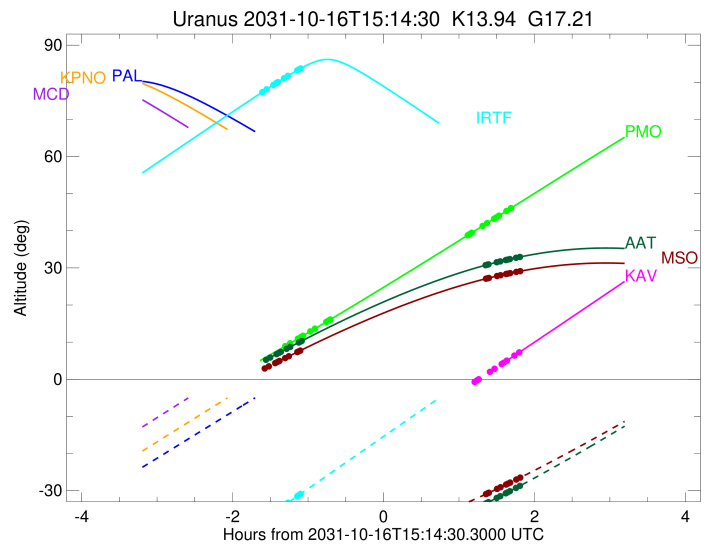
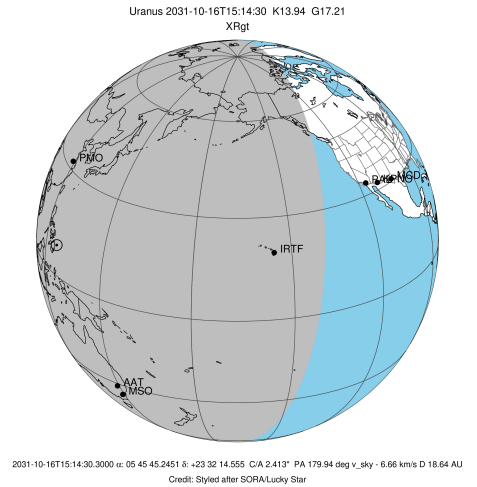


| Ring    | I/E | UTC                     | b? | alt   | alt-sun | radius   | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|-------|---------|--------------|
| epsilon | I   | 2031-10-16T13:42:17.791 |    | 5.47  | -49.92  | 50754.33 | -5.72 |         |              |
| lambda  | I   | 2031-10-16T13:44:25.210 |    | 5.86  | -49.94  | 50026.71 | -5.69 |         |              |
| delta   | I   | 2031-10-16T13:49:30.763 |    | 6.78  | -49.95  | 48300.35 | -5.60 |         |              |
| gamma   | I   | 2031-10-16T13:51:31.054 |    | 7.14  | -49.95  | 47628.41 | -5.57 |         |              |
| eta     | I   | 2031-10-16T13:52:52.496 |    | 7.38  | -49.94  | 47176.12 | -5.54 |         |              |
| beta    | I   | 2031-10-16T13:57:31.967 |    | 8.22  | -49.90  | 45641.30 | -5.44 |         |              |
| alpha   | I   | 2031-10-16T14:00:27.137 |    | 8.73  | -49.86  | 44693.65 | -5.38 |         |              |
| 4       | I   | 2031-10-16T14:07:12.737 |    | 9.93  | -49.72  | 42549.10 | -5.19 |         |              |
| 5       | I   | 2031-10-16T14:08:03.572 |    | 10.07 | -49.70  | 42285.63 | -5.17 |         |              |
| 6       | I   | 2031-10-16T14:09:22.862 |    | 10.30 | -49.66  | 41876.06 | -5.14 |         |              |

No planet occultations

|         |   |                         |  |       |        |          |      |  |  |
|---------|---|-------------------------|--|-------|--------|----------|------|--|--|
| 6       | E | 2031-10-16T16:35:40.754 |  | 30.74 | -33.49 | 41851.12 | 5.30 |  |  |
| 5       | E | 2031-10-16T16:36:41.456 |  | 30.83 | -33.32 | 42168.00 | 5.34 |  |  |
| 4       | E | 2031-10-16T16:37:47.457 |  | 30.93 | -33.13 | 42534.46 | 5.37 |  |  |
| alpha   | E | 2031-10-16T16:44:32.556 |  | 31.53 | -31.97 | 44746.03 | 5.57 |  |  |
| beta    | E | 2031-10-16T16:47:15.660 |  | 31.75 | -31.50 | 45662.62 | 5.65 |  |  |
| eta     | E | 2031-10-16T16:51:41.133 |  | 32.11 | -30.73 | 47176.12 | 5.76 |  |  |
| gamma   | E | 2031-10-16T16:52:58.177 |  | 32.21 | -30.50 | 47620.99 | 5.79 |  |  |
| delta   | E | 2031-10-16T16:54:55.065 |  | 32.36 | -30.16 | 48300.35 | 5.83 |  |  |
| lambda  | E | 2031-10-16T16:59:48.290 |  | 32.73 | -29.29 | 50026.71 | 5.94 |  |  |
| epsilon | E | 2031-10-16T17:03:06.400 |  | 32.96 | -28.69 | 51209.79 | 5.97 |  |  |

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-10-16T15:24:10.620  
 Event type : XRgt  
 : No Uranus occs  
 : 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 : 3427634041103770624  
 2Mass ID (if available) : 05454524+2332147  
 ICRS Star Coord at Epoch: 05h 45m 45.24510s +23:32:14.55536s  
 RUWE (>1.4 is poor) : 1.04  
 K magnitude : 13.942  
 G magnitude : 17.206  
 RP magnitude : 16.223  
 BP magnitude : 18.137  
 DUPflag : 0  
 Distance (au) : 18.642  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -6.67  
 Sun-Target sep (deg) : 115.88  
 Sun-Moon sep (deg) : 119.41  
 B (ring opening deg) : 78.00  
 PA of pole (deg) : 47.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.040  
 C/A sky separation (km) : 27576.4  
 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   | 2031-10-16T13:41:15.458 |    | 3.12x | -45.88  | 50754.99 | -5.74 |         |              |
| lambda  | I   | 2031-10-16T13:43:22.635 |    | 3.49x | -45.90  | 50026.71 | -5.71 |         |              |
| delta   | I   | 2031-10-16T13:48:27.245 |    | 4.36x | -45.92  | 48300.35 | -5.62 |         |              |
| gamma   | I   | 2031-10-16T13:50:27.120 |    | 4.71x | -45.92  | 47628.45 | -5.59 |         |              |
| eta     | I   | 2031-10-16T13:51:48.278 |    | 4.94x | -45.92  | 47176.12 | -5.56 |         |              |
| beta    | I   | 2031-10-16T13:56:26.659 |    | 5.73  | -45.89  | 45641.33 | -5.46 |         |              |
| alpha   | I   | 2031-10-16T13:59:21.106 |    | 6.22  | -45.86  | 44693.46 | -5.40 |         |              |
| 4       | I   | 2031-10-16T14:06:04.563 |    | 7.35  | -45.74  | 42549.46 | -5.22 |         |              |
| 5       | I   | 2031-10-16T14:06:55.069 |    | 7.49  | -45.72  | 42286.20 | -5.20 |         |              |
| 6       | I   | 2031-10-16T14:08:14.017 |    | 7.71  | -45.69  | 41875.90 | -5.17 |         |              |

No planet occultations

|         |   |                         |       |        |          |      |
|---------|---|-------------------------|-------|--------|----------|------|
| 6       | E | 2031-10-16T16:35:59.476 | 27.09 | -30.93 | 41850.79 | 5.33 |
| 5       | E | 2031-10-16T16:36:59.841 | 27.18 | -30.77 | 42167.65 | 5.36 |
| 4       | E | 2031-10-16T16:38:05.621 | 27.27 | -30.60 | 42534.67 | 5.39 |
| alpha   | E | 2031-10-16T16:44:48.983 | 27.82 | -29.53 | 44746.17 | 5.59 |
| beta    | E | 2031-10-16T16:47:31.517 | 28.03 | -29.09 | 45662.76 | 5.66 |
| eta     | E | 2031-10-16T16:51:56.173 | 28.36 | -28.37 | 47176.12 | 5.77 |
| gamma   | E | 2031-10-16T16:53:13.014 | 28.45 | -28.16 | 47620.99 | 5.80 |
| delta   | E | 2031-10-16T16:55:09.618 | 28.59 | -27.84 | 48300.35 | 5.85 |
| lambda  | E | 2031-10-16T17:00:02.236 | 28.92 | -27.02 | 50026.71 | 5.95 |
| epsilon | E | 2031-10-16T17:03:20.405 | 29.13 | -26.47 | 51212.14 | 5.98 |