

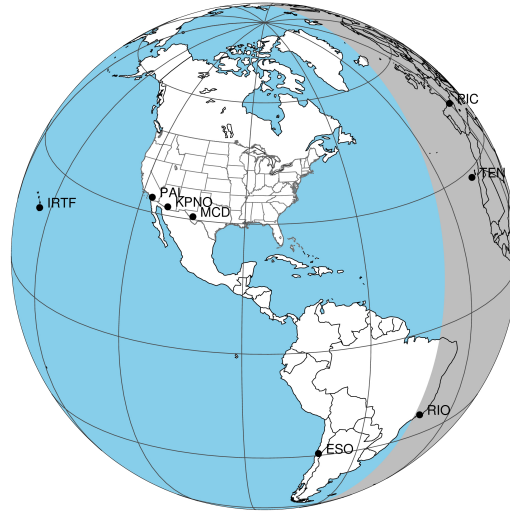
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-04-20T20:42:16.060
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3412547234038768000
 2Mass ID (if available) : 04570769+2241595

Uranus 2030-04-20T20:42:16 K14.97 G17.44 PgtRgt

ICRS Star Coord at Epoch: 04h 57m 07.70185s +22:41:59.47493s

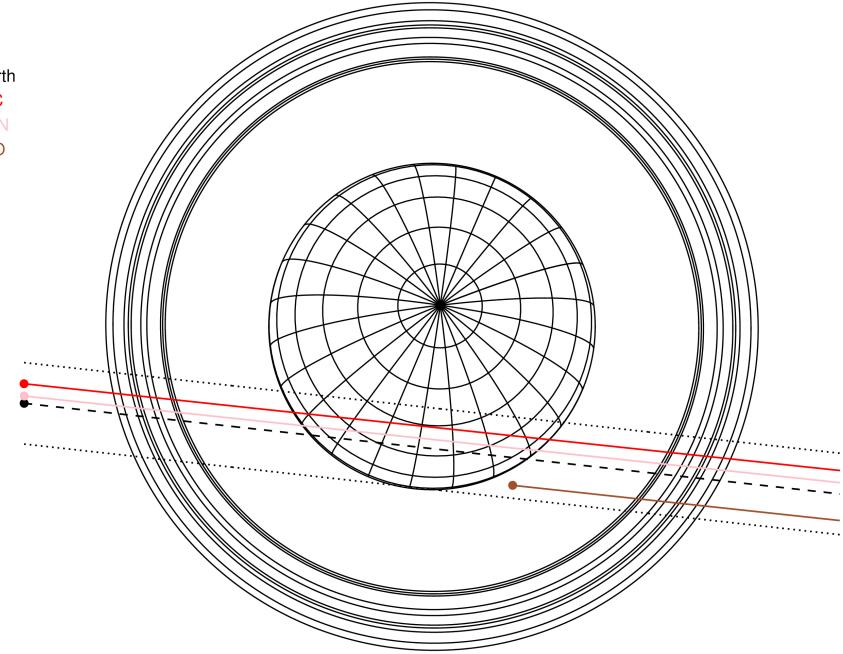
RUWE (>1.4 is poor) : 1.18
 K magnitude : 14.969
 G magnitude : 17.441
 RP magnitude : 16.606
 BP magnitude : 18.112
 DUPflag : 0
 Distance (au) : 19.895
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 27.33
 Sun-Target sep (deg) : 45.14
 Sun-Moon sep (deg) : 173.15
 B (ring opening deg) : 81.95
 PA of pole (deg) : -21.36

Uranus 2030-04-20T20:42:16 K14.97 G17.44
 PgtRgt



2030-04-20T20:42:16.0600 ex: 04 57 07.7018 s: +22 41 59.475 C/A 1.313° PA 353.66 deg v_sky +27.33 km/s D 19.90 AU
 Credit: Styled after SORA/Lucky Star

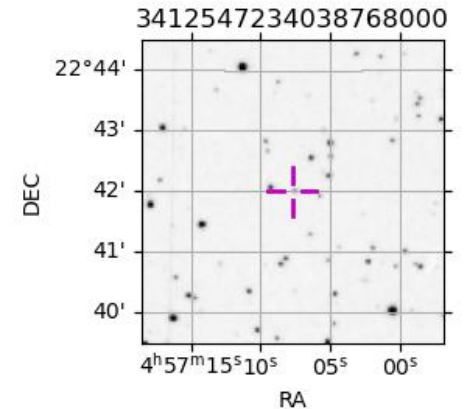
Earth
 PIC
 TEN
 RIO



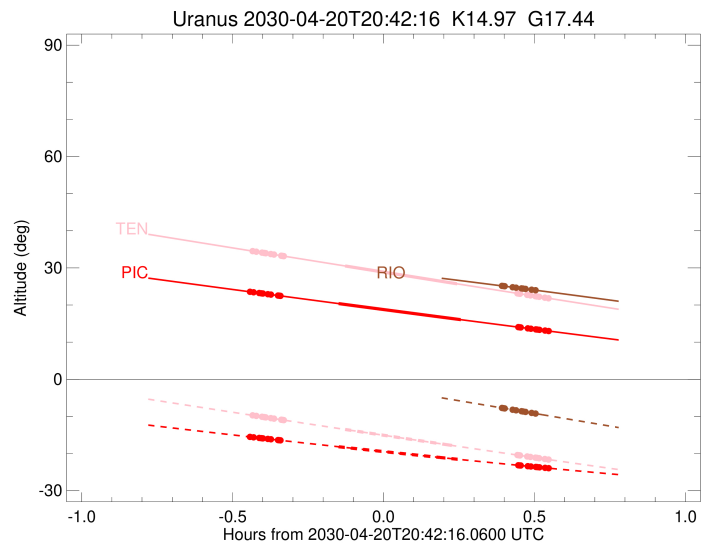
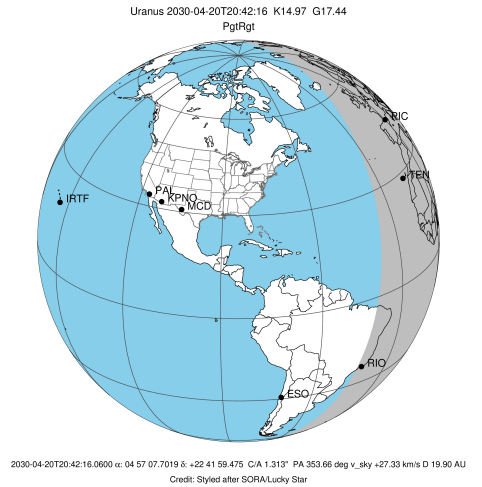
| # | a(km) | ring |
|----|---------|---------|
| 1 | 41837.2 | 6 |
| 2 | 42235.0 | 5 |
| 3 | 42571.2 | 4 |
| 4 | 44718.5 | alpha |
| 5 | 45661.1 | beta |
| 6 | 47176.1 | eta |
| 7 | 47626.3 | gamma |
| 8 | 48300.3 | delta |
| 9 | 50026.7 | lambda |
| 10 | 51149.4 | epsilon |

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 | +++++ | + + | +++++ | APR 20 20:15 - APR 20 21:14 | PieRie |
| PAL | Palomar Mt (200") | 33.4 | 243.1 | | | | | PnnRnn |
| PMO | Purple Mtn Obs. Nanki | 32.1 | 118.8 | | | | | PnnRnn |
| 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 | +++++ | + + | +++++ | APR 20 20:16 - APR 20 21:14 | 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 | | | +++++ | APR 20 21:05 - APR 20 21:12 | PnnRne |
| ESO | European Southern Obs | -29.3 | 289.3 | | | | | PnnRnn |
| AAT | Siding Spring (AAT) | -31.3 | 149.1 | | | | | PnnRnn |
| SAAO | So. Afr. Astro. Obs. | -32.4 | 20.8 | | | | | PnnRnn |
| MSO | Mt. Stromlo Observato | -35.3 | 149.0 | | | | | PnnRnn |

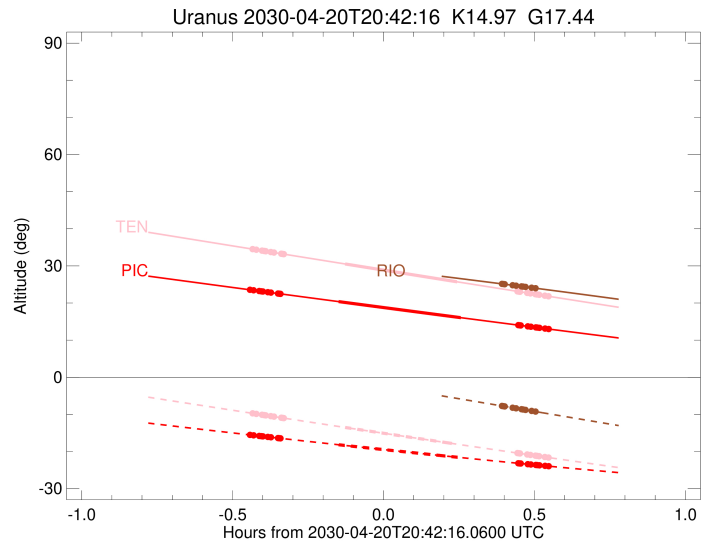
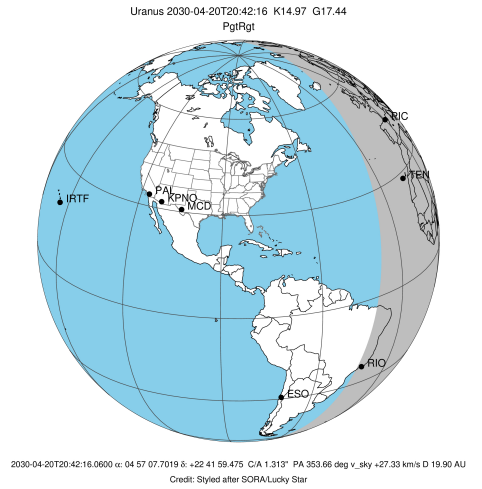


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-04-20T20:45:23.650
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3412547234038768000
 2Mass ID (if available) : 04570769+2241595
 ICRS Star Coord at Epoch: 04h 57m 07.70185s +22:41:59.47493s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 14.969
 G magnitude : 17.441
 RP magnitude : 16.606
 BP magnitude : 18.112
 DUPflag : 0
 Distance (au) : 19.895
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 27.33
 Sun-Target sep (deg) : 45.14
 Sun-Moon sep (deg) : 173.90
 B (ring opening deg) : 81.95
 PA of pole (deg) : -21.36
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.087
 C/A sky separation (km) : 15681.4
 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



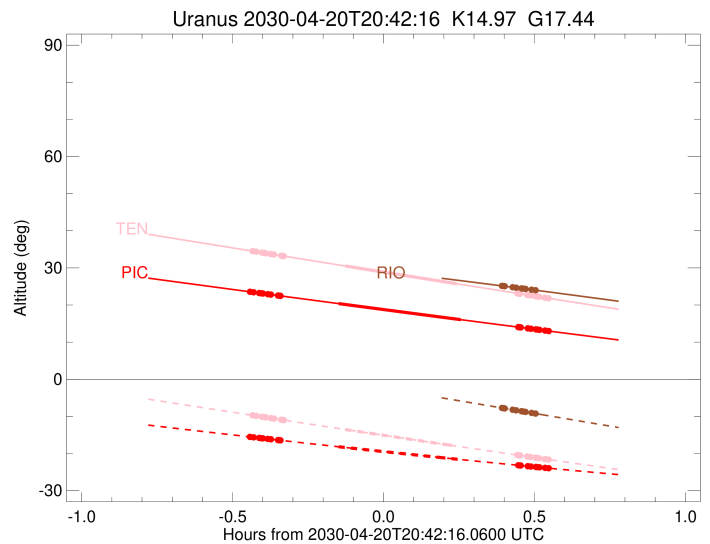
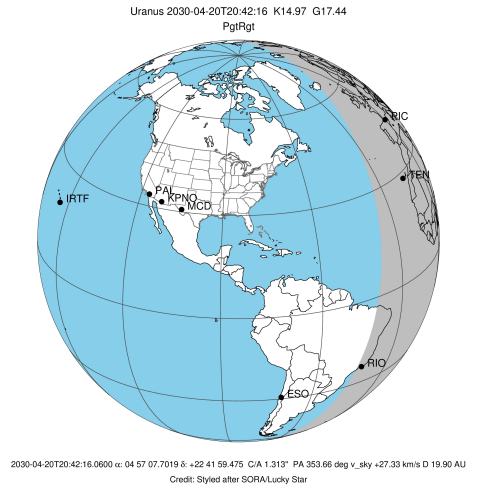
| Ring | I/E | UTC | b? | alt | alt-sun | radius | r-dot | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I | 2030-04-20T20:15:28.803 | | 23.61 | -15.49 | 51548.92 | -25.94 | | |
| lambda | I | 2030-04-20T20:16:27.600 | | 23.43 | -15.64 | 50026.71 | -25.85 | | |
| delta | I | 2030-04-20T20:17:34.522 | | 23.23 | -15.81 | 48300.35 | -25.74 | | |
| gamma | I | 2030-04-20T20:18:00.763 | | 23.15 | -15.88 | 47625.39 | -25.70 | | |
| eta | I | 2030-04-20T20:18:18.255 | | 23.10 | -15.92 | 47176.12 | -25.67 | | |
| beta | I | 2030-04-20T20:19:16.608 | | 22.92 | -16.07 | 45681.16 | -25.56 | | |
| alpha | I | 2030-04-20T20:19:55.173 | | 22.80 | -16.17 | 44696.46 | -25.48 | | |
| 4 | I | 2030-04-20T20:21:19.513 | | 22.55 | -16.38 | 42555.79 | -25.31 | | |
| 5 | I | 2030-04-20T20:21:34.619 | | 22.50 | -16.42 | 42174.96 | -25.27 | | |
| 6 | I | 2030-04-20T20:21:49.614 | | 22.46 | -16.46 | 41796.31 | -25.22 | | |
| Uranus | I | 2030-04-20T20:33:21.364 | | 20.38 | -18.18 | 25180.57 | | -6.49 | -6.79 |
| Uranus | E | 2030-04-20T20:57:38.924 | | 16.05 | -21.64 | 25470.84 | | -3.10 | -3.25 |
| 6 | E | 2030-04-20T21:09:04.533 | | 14.04 | -23.17 | 41874.43 | 25.30 | | |
| 5 | E | 2030-04-20T21:09:21.970 | | 13.99 | -23.21 | 42315.17 | 25.35 | | |
| 4 | E | 2030-04-20T21:09:33.635 | | 13.96 | -23.23 | 42611.84 | 25.38 | | |
| alpha | E | 2030-04-20T21:10:56.304 | | 13.72 | -23.41 | 44717.91 | 25.56 | | |
| beta | E | 2030-04-20T21:11:32.593 | | 13.61 | -23.49 | 45647.06 | 25.65 | | |
| eta | E | 2030-04-20T21:12:32.086 | | 13.44 | -23.62 | 47176.12 | 25.76 | | |
| gamma | E | 2030-04-20T21:12:49.450 | | 13.39 | -23.66 | 47623.66 | 25.79 | | |
| delta | E | 2030-04-20T21:13:15.666 | | 13.31 | -23.72 | 48300.35 | 25.83 | | |
| lambda | E | 2030-04-20T21:14:22.348 | | 13.12 | -23.86 | 50026.71 | 25.94 | | |
| epsilon | E | 2030-04-20T21:14:54.690 | | 13.03 | -23.93 | 50866.55 | 26.04 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-04-20T20:45:38.210
 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 : 3412547234038768000
 2Mass ID (if available) : 04570769+2241595
 ICRS Star Coord at Epoch: 04h 57m 07.70185s +22:41:59.47493s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 14.969
 G magnitude : 17.441
 RP magnitude : 16.606
 BP magnitude : 18.112
 DUPflag : 0
 Distance (au) : 19.895
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 27.33
 Sun-Target sep (deg) : 45.14
 Sun-Moon sep (deg) : 174.02
 B (ring opening deg) : 81.95
 PA of pole (deg) : -21.36
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.219
 C/A sky separation (km) : 17588.6
 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 | 2030-04-20T20:15:59.756 | | 34.58 | -9.66 | 51551.46 | -25.47 | | |
| lambda | I | 2030-04-20T20:16:59.764 | | 34.36 | -9.87 | 50026.71 | -25.36 | | |
| delta | I | 2030-04-20T20:18:08.025 | | 34.11 | -10.11 | 48300.35 | -25.22 | | |
| gamma | I | 2030-04-20T20:18:34.822 | | 34.01 | -10.20 | 47625.17 | -25.17 | | |
| eta | I | 2030-04-20T20:18:52.678 | | 33.95 | -10.26 | 47176.12 | -25.13 | | |
| beta | I | 2030-04-20T20:19:52.322 | | 33.73 | -10.47 | 45681.22 | -24.99 | | |
| alpha | I | 2030-04-20T20:20:31.834 | | 33.59 | -10.61 | 44695.29 | -24.89 | | |
| 4 | I | 2030-04-20T20:21:58.146 | | 33.28 | -10.91 | 42557.90 | -24.66 | | |
| 5 | I | 2030-04-20T20:22:13.617 | | 33.22 | -10.96 | 42177.68 | -24.62 | | |
| 6 | I | 2030-04-20T20:22:29.115 | | 33.16 | -11.01 | 41796.94 | -24.56 | | |
| Uranus | I | 2030-04-20T20:34:37.360 | | 30.53 | -13.52 | 25127.05 | | -6.95 | -7.27 |
| Uranus | E | 2030-04-20T20:56:53.814 | | 25.71 | -18.03 | 25424.97 | | -3.83 | -4.01 |
| 6 | E | 2030-04-20T21:08:54.712 | | 23.14 | -20.42 | 41873.35 | 24.64 | | |
| 5 | E | 2030-04-20T21:09:12.662 | | 23.07 | -20.48 | 42314.90 | 24.70 | | |
| 4 | E | 2030-04-20T21:09:24.662 | | 23.03 | -20.52 | 42612.78 | 24.75 | | |
| alpha | E | 2030-04-20T21:10:49.264 | | 22.73 | -20.80 | 44716.34 | 24.97 | | |
| beta | E | 2030-04-20T21:11:26.479 | | 22.59 | -20.92 | 45647.72 | 25.08 | | |
| eta | E | 2030-04-20T21:12:27.248 | | 22.38 | -21.12 | 47176.12 | 25.22 | | |
| gamma | E | 2030-04-20T21:12:44.969 | | 22.31 | -21.17 | 47623.46 | 25.26 | | |
| delta | E | 2030-04-20T21:13:11.732 | | 22.22 | -21.26 | 48300.35 | 25.32 | | |
| lambda | E | 2030-04-20T21:14:19.725 | | 21.98 | -21.48 | 50026.71 | 25.46 | | |
| epsilon | E | 2030-04-20T21:14:53.134 | | 21.86 | -21.59 | 50878.27 | 25.58 | | |

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-04-20T20:44:26.410
 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 : 3412547234038768000
 2Mass ID (if available) : 04570769+2241595
 ICRS Star Coord at Epoch: 04h 57m 07.70185s +22:41:59.47493s
 RUWE (>1.4 is poor) : 1.18
 K magnitude : 14.969
 G magnitude : 17.441
 RP magnitude : 16.606
 BP magnitude : 18.112
 DUPflag : 0
 Distance (au) : 19.895
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 27.33
 Sun-Target sep (deg) : 45.14
 Sun-Moon sep (deg) : 173.79
 B (ring opening deg) : 81.95
 PA of pole (deg) : -21.36
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.620
 C/A sky separation (km) : 23372.1
 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_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 | 2030-04-20T20:16:13.093 | | 33.13 | 3.47x | 51555.25 | -23.98 | | |
| lambda | I | 2030-04-20T20:17:17.105 | | 32.98 | 3.23x | 50026.71 | -23.78 | | |
| delta | I | 2030-04-20T20:18:30.080 | | 32.80 | 2.96x | 48300.35 | -23.53 | | |
| gamma | I | 2030-04-20T20:18:58.867 | | 32.73 | 2.85x | 47624.48 | -23.42 | | |
| eta | I | 2030-04-20T20:19:18.036 | | 32.68 | 2.78x | 47176.12 | -23.35 | | |
| beta | I | 2030-04-20T20:20:22.403 | | 32.52 | 2.54x | 45681.13 | -23.09 | | |
| alpha | I | 2030-04-20T20:21:05.398 | | 32.41 | 2.38x | 44691.96 | -22.90 | | |
| 4 | I | 2030-04-20T20:22:39.252 | | 32.18 | 2.03x | 42564.75 | -22.46 | | |
| 5 | I | 2030-04-20T20:22:56.106 | | 32.14 | 1.96x | 42187.13 | -22.38 | | |
| 6 | I | 2030-04-20T20:23:13.549 | | 32.09 | 1.90x | 41799.58 | -22.27 | | |
| Uranus | I | 2030-04-20T20:38:58.690 | | 29.64 | -1.64x | 24989.84 | | -8.01 | -8.39 |
| Uranus | E | 2030-04-20T20:50:14.315 | | 27.80 | -4.19x | 25188.87 | | -6.42 | -6.72 |
| 6 | E | 2030-04-20T21:05:49.733 | | 25.15 | -7.73 | 41869.24 | 22.32 | | |
| 5 | E | 2030-04-20T21:06:09.679 | | 25.10 | -7.80 | 42312.68 | 22.43 | | |
| 4 | E | 2030-04-20T21:06:23.024 | | 25.06 | -7.85 | 42615.13 | 22.51 | | |
| alpha | E | 2030-04-20T21:07:55.201 | | 24.79 | -8.20 | 44711.33 | 22.95 | | |
| beta | E | 2030-04-20T21:08:35.927 | | 24.67 | -8.36 | 45650.02 | 23.15 | | |
| eta | E | 2030-04-20T21:09:41.477 | | 24.48 | -8.61 | 47176.12 | 23.42 | | |
| gamma | E | 2030-04-20T21:10:00.526 | | 24.43 | -8.68 | 47622.87 | 23.49 | | |
| delta | E | 2030-04-20T21:10:29.302 | | 24.34 | -8.79 | 48300.35 | 23.60 | | |
| lambda | E | 2030-04-20T21:11:42.067 | | 24.13 | -9.06 | 50026.71 | 23.85 | | |
| epsilon | E | 2030-04-20T21:12:19.370 | | 24.02 | -9.20 | 50918.57 | 24.05 | | |