

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-11-21T16:53:20.010  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3404367481707638656  
 2Mass ID (if available) : 05414565+2331101

ICRS Star Coord at Epoch: 05h 41m 45.65340s +23:31:10.14334s

RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.841  
 G magnitude : 18.285  
 RP magnitude : 17.226  
 BP magnitude : 19.410  
 DUPflag : 0  
 Distance (au) : 18.207  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.18  
 Sun-Target sep (deg) : 152.91  
 Sun-Moon sep (deg) : 115.80  
 B (ring opening deg) : 78.67  
 PA of pole (deg) : 44.01

# 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

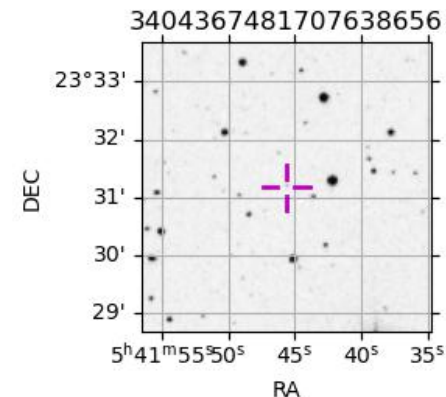
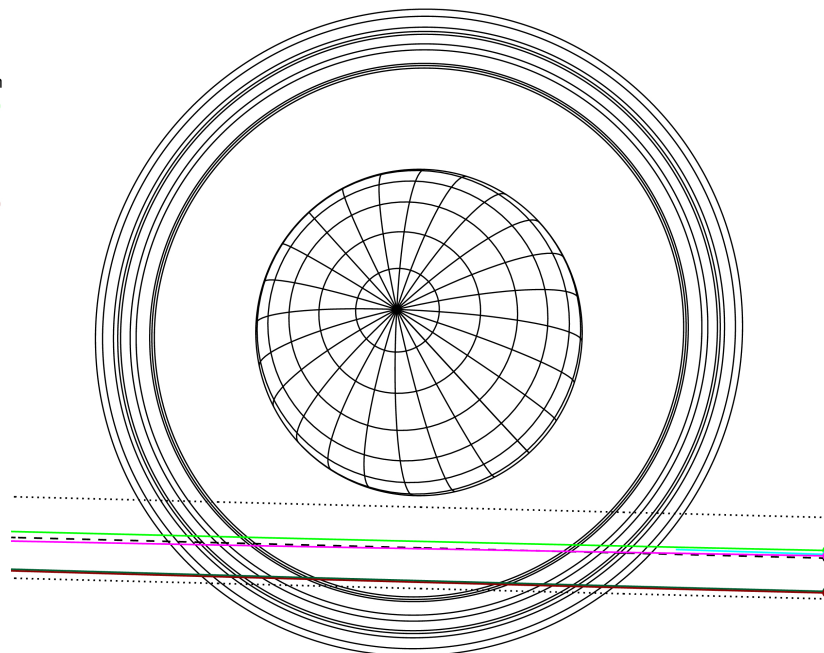
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++		+++++	NOV 21 16:23 - NOV 21 17:26	PnnRie
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald 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					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	NOV 21 16:26 - NOV 21 17:28	PnnRie
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	+++++		+++++	NOV 21 16:26 - NOV 21 17:19	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++		+++++	NOV 21 16:26 - NOV 21 17:19	PnnRie



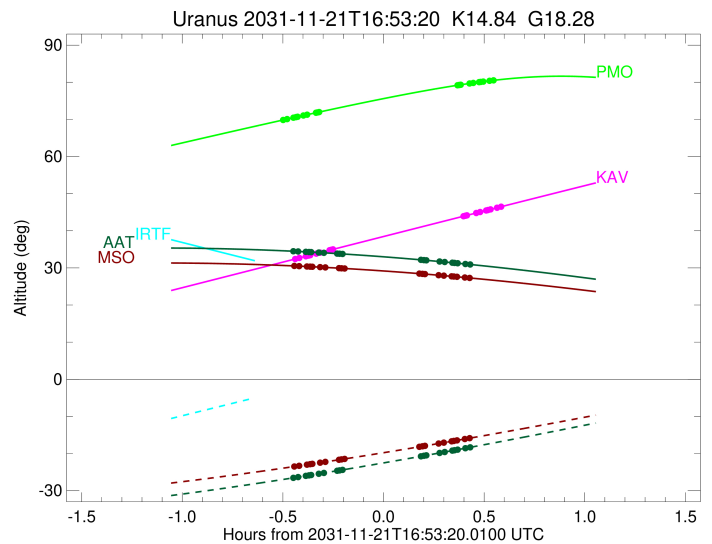
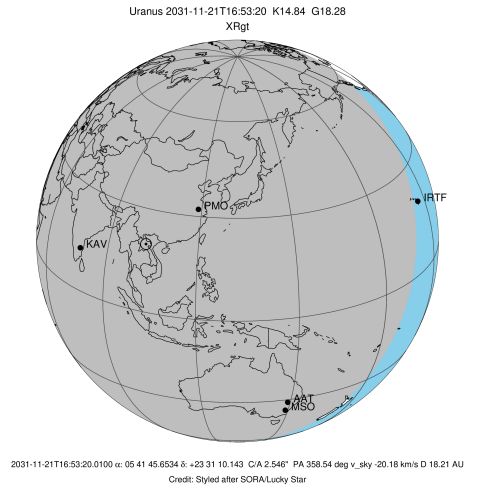
2031-11-21T16:53:20.0100 ex: 05 41 45.6534 s: +23 31 10.143 C/A 2.546" PA 358.54 deg v\_sky -20.18 km/s D 18.21 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2031-11-21T16:53:20 K14.84 G18.28 XRgt

Earth  
 PMO  
 IRTF  
 KAV  
 AAT  
 MSO



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-11-21T16:54:15.950  
 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 : 3404367481707638656  
 2Mass ID (if available) : 05414565+2331101  
 ICRS Star Coord at Epoch: 05h 41m 45.65340s +23:31:10.14334s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.841  
 G magnitude : 18.285  
 RP magnitude : 17.226  
 BP magnitude : 19.410  
 DUPflag : 0  
 Distance (au) : 18.207  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.18  
 Sun-Target sep (deg) : 152.91  
 Sun-Moon sep (deg) : 116.74  
 B (ring opening deg) : 78.67  
 PA of pole (deg) : 44.01  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.476  
 C/A sky separation (km) : 32701.1  
 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\_itrff93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



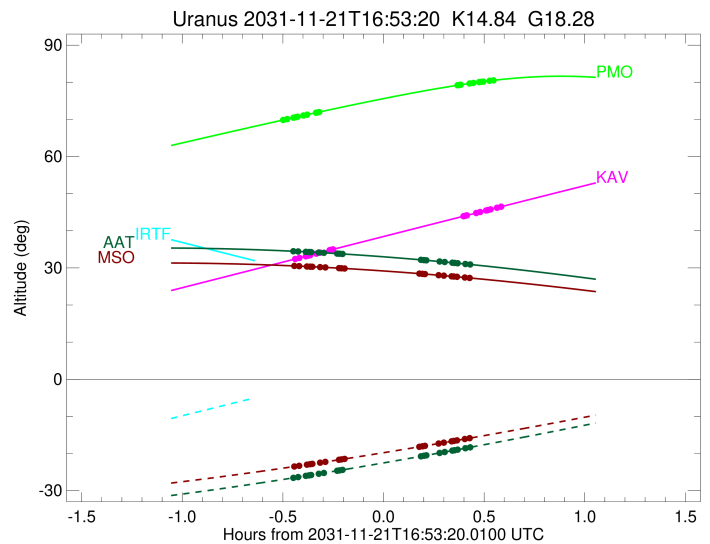
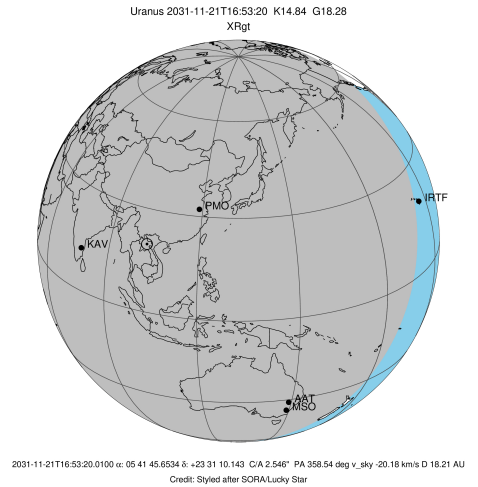
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-21T16:23:06.480		69.79	-76.02	51450.14	-15.97		
lambda	I	2031-11-21T16:24:36.930		70.09	-75.84	50026.71	-15.57		
delta	I	2031-11-21T16:26:29.361		70.46	-75.61	48300.35	-15.13		
gamma	I	2031-11-21T16:27:14.128		70.61	-75.51	47627.28	-14.94		
eta	I	2031-11-21T16:27:44.463		70.71	-75.45	47176.12	-14.81		
beta	I	2031-11-21T16:29:27.095		71.05	-75.23	45680.84	-14.33		
alpha	I	2031-11-21T16:30:33.542		71.27	-75.08	44737.74	-14.00		
4	I	2031-11-21T16:33:12.380		71.79	-74.72	42587.64	-13.07		
5	I	2031-11-21T16:33:44.423		71.90	-74.64	42172.82	-12.88		
6	I	2031-11-21T16:34:12.408		71.99	-74.58	41804.68	-12.72		

No planet occultations

6	E	2031-11-21T17:15:24.815		79.20	-67.57	41855.75	12.74		
5	E	2031-11-21T17:15:49.454		79.26	-67.50	42171.60	12.89		
4	E	2031-11-21T17:16:17.194		79.32	-67.41	42533.21	13.09		
alpha	E	2031-11-21T17:19:00.596		79.69	-66.89	44748.02	14.02		
beta	E	2031-11-21T17:20:05.347		79.82	-66.68	45665.96	14.35		
eta	E	2031-11-21T17:21:48.869		80.04	-66.35	47176.12	14.83		
gamma	E	2031-11-21T17:22:18.739		80.10	-66.26	47621.02	14.96		
delta	E	2031-11-21T17:23:03.855		80.18	-66.11	48300.35	15.15		
lambda	E	2031-11-21T17:24:56.102		80.40	-65.75	50026.71	15.60		
epsilon	E	2031-11-21T17:26:20.760		80.55	-65.47	51360.46	16.00		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-11-21T16:57:12.110
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       : 3404367481707638656
2Mass ID (if available) : 05414565+2331101
ICRS Star Coord at Epoch: 05h 41m 45.65340s +23:31:10.14334s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 14.841
G magnitude           : 18.285
RP magnitude          : 17.226
BP magnitude          : 19.410
DUPflag              : 0
Distance (au)         : 18.207
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -20.18
Sun-Target sep (deg) : 152.91
Sun-Moon sep (deg)   : 116.69
B (ring opening deg) : 78.67
PA of pole (deg)     : 44.01
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.564
C/A sky separation (km) : 33858.1
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_itrfr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



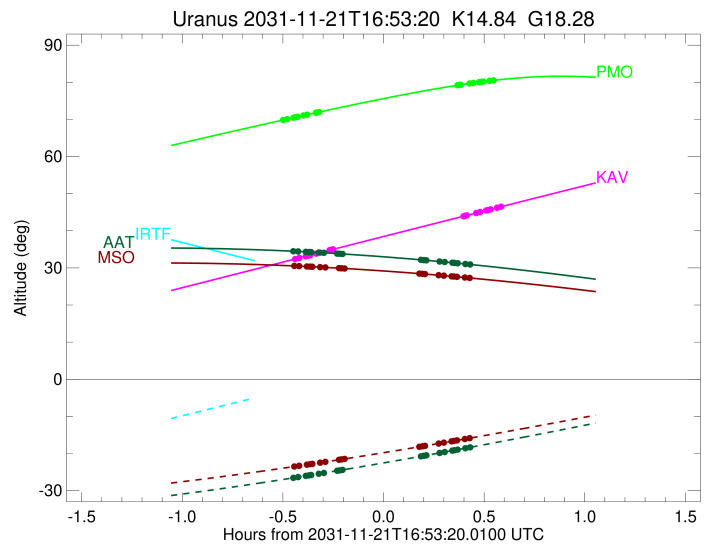
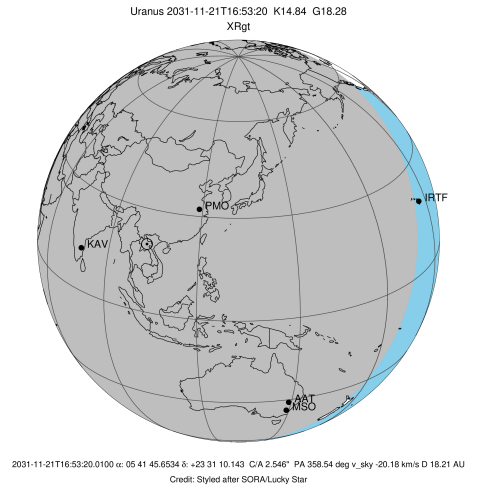
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-21T16:26:40.932		32.33	-59.41	51456.91	-15.46		
lambda	I	2031-11-21T16:28:14.967		32.69	-59.77	50026.71	-15.03		
delta	I	2031-11-21T16:30:11.686		33.13	-60.22	48300.35	-14.54		
gamma	I	2031-11-21T16:30:58.310		33.31	-60.40	47627.12	-14.33		
eta	I	2031-11-21T16:31:29.933		33.43	-60.52	47176.12	-14.19		
beta	I	2031-11-21T16:33:17.293		33.84	-60.94	45680.96	-13.66		
alpha	I	2031-11-21T16:34:27.061		34.11	-61.20	44738.70	-13.29		
4	I	2031-11-21T16:37:15.526		34.76	-61.85	42585.94	-12.26		
5	I	2031-11-21T16:37:49.728		34.89	-61.98	42170.79	-12.04		
6	I	2031-11-21T16:38:19.458		35.00	-62.10	41805.86	-11.86		

No planet occultations

6	E	2031-11-21T17:17:11.442		43.92	-70.90	41853.72	11.90		
5	E	2031-11-21T17:17:37.745		44.02	-70.99	42169.17	12.08		
4	E	2031-11-21T17:18:07.563		44.14	-71.10	42534.49	12.30		
alpha	E	2031-11-21T17:21:00.215		44.79	-71.73	44748.74	13.34		
beta	E	2031-11-21T17:22:08.090		45.05	-71.98	45666.79	13.71		
eta	E	2031-11-21T17:23:56.027		45.46	-72.37	47176.12	14.25		
gamma	E	2031-11-21T17:24:27.088		45.58	-72.48	47621.05	14.40		
delta	E	2031-11-21T17:25:13.919		45.76	-72.65	48300.35	14.61		
lambda	E	2031-11-21T17:27:10.078		46.20	-73.07	50026.71	15.10		
epsilon	E	2031-11-21T17:28:38.178		46.54	-73.38	51372.59	15.54		

```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch             : 2031-11-21T16:52:11.430
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        : 3404367481707638656
2Mass ID (if available) : 05414565+2331101
ICRS Star Coord at Epoch: 05h 41m 45.65340s +23:31:10.14334s
RUWE (>1.4 is poor)  : 1.01
K magnitude           : 14.841
G magnitude           : 18.285
RP magnitude          : 17.226
BP magnitude          : 19.410
DUPflag               : 0
Distance (au)         : 18.207
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -20.18
Sun-Target sep (deg)  : 152.91
Sun-Moon sep (deg)    : 116.15
B (ring opening deg)  : 78.67
PA of pole (deg)      : 44.01
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.942
C/A sky separation (km) : 38849.5
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_itrfr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```

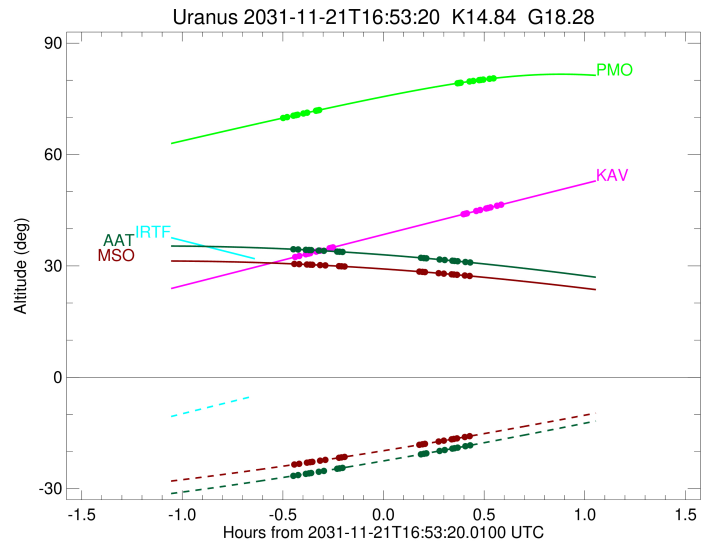
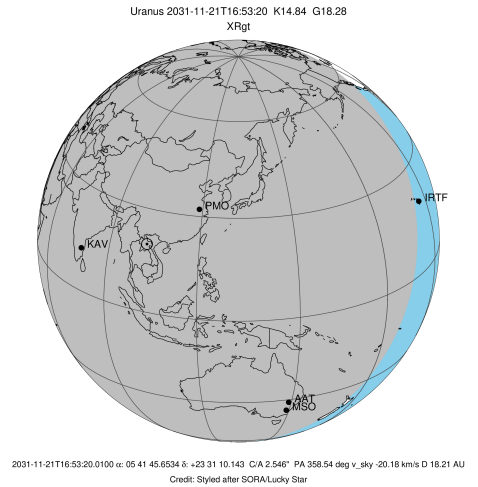


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-21T16:26:02.581		34.51	-26.62	51492.89	-13.51		
lambda	I	2031-11-21T16:27:53.947		34.43	-26.35	50026.71	-12.88		
delta	I	2031-11-21T16:30:12.068		34.32	-26.02	48300.35	-12.11		
gamma	I	2031-11-21T16:31:08.544		34.28	-25.88	47626.19	-11.76		
eta	I	2031-11-21T16:31:47.190		34.25	-25.79	47176.12	-11.52		
beta	I	2031-11-21T16:34:02.067		34.14	-25.46	45681.22	-10.63		
alpha	I	2031-11-21T16:35:32.783		34.06	-25.24	44743.90	-9.99		
4	I	2031-11-21T16:39:33.086		33.85	-24.64	42574.92	-8.03		
5	I	2031-11-21T16:40:25.766		33.80	-24.51	42160.63	-7.58		
6	I	2031-11-21T16:41:11.664		33.75	-24.40	41814.59	-7.19		

No planet occultations

6	E	2031-11-21T17:04:29.004		32.17	-20.76	41843.48	7.19		
5	E	2031-11-21T17:05:11.774		32.12	-20.64	42160.15	7.58		
4	E	2031-11-21T17:06:00.149		32.05	-20.51	42541.54	8.03		
alpha	E	2031-11-21T17:10:05.286		31.72	-19.84	44751.11	9.98		
beta	E	2031-11-21T17:11:34.482		31.59	-19.60	45670.12	10.62		
eta	E	2031-11-21T17:13:50.484		31.40	-19.23	47176.12	11.52		
gamma	E	2031-11-21T17:14:28.735		31.34	-19.12	47621.28	11.76		
delta	E	2031-11-21T17:15:25.665		31.26	-18.96	48300.35	12.10		
lambda	E	2031-11-21T17:17:43.879		31.05	-18.58	50026.71	12.87		
epsilon	E	2031-11-21T17:19:29.526		30.89	-18.28	51415.03	13.50		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-11-21T16:52:15.250  
 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 : 3404367481707638656  
 2Mass ID (if available) : 05414565+2331101  
 ICRS Star Coord at Epoch: 05h 41m 45.65340s +23:31:10.14334s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.841  
 G magnitude : 18.285  
 RP magnitude : 17.226  
 BP magnitude : 19.410  
 DUPflag : 0  
 Distance (au) : 18.207  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.18  
 Sun-Target sep (deg) : 152.91  
 Sun-Moon sep (deg) : 116.10  
 B (ring opening deg) : 78.67  
 PA of pole (deg) : 44.01  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.961  
 C/A sky separation (km) : 39097.4  
 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\_itrff93\_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	2031-11-21T16:26:19.513		30.55	-23.56	51494.50	-13.38		
lambda	I	2031-11-21T16:28:12.170		30.47	-23.31	50026.71	-12.74		
delta	I	2031-11-21T16:30:31.992		30.38	-23.00	48300.35	-11.94		
gamma	I	2031-11-21T16:31:29.266		30.34	-22.87	47626.14	-11.59		
eta	I	2031-11-21T16:32:08.491		30.31	-22.78	47176.12	-11.35		
beta	I	2031-11-21T16:34:25.707		30.20	-22.47	45681.22	-10.43		
alpha	I	2031-11-21T16:35:58.305		30.13	-22.26	44744.16	-9.76		
4	I	2031-11-21T16:40:05.899		29.93	-21.69	42574.23	-7.73		
5	I	2031-11-21T16:41:00.742		29.88	-21.56	42160.15	-7.25		
6	I	2031-11-21T16:41:48.719		29.84	-21.44	41815.23	-6.84		

No planet occultations

6	E	2031-11-21T17:04:00.096		28.46	-18.20	41842.73	6.84		
5	E	2031-11-21T17:04:44.946		28.41	-18.08	42159.68	7.25		
4	E	2031-11-21T17:05:35.479		28.34	-17.95	42542.08	7.73		
alpha	E	2031-11-21T17:09:47.903		28.03	-17.31	44751.22	9.76		
beta	E	2031-11-21T17:11:18.976		27.91	-17.07	45670.32	10.42		
eta	E	2031-11-21T17:13:37.313		27.73	-16.72	47176.12	11.34		
gamma	E	2031-11-21T17:14:16.141		27.68	-16.61	47621.30	11.59		
delta	E	2031-11-21T17:15:13.866		27.60	-16.46	48300.35	11.94		
lambda	E	2031-11-21T17:17:33.775		27.41	-16.10	50026.71	12.73		
epsilon	E	2031-11-21T17:19:20.706		27.26	-15.82	51417.37	13.37		