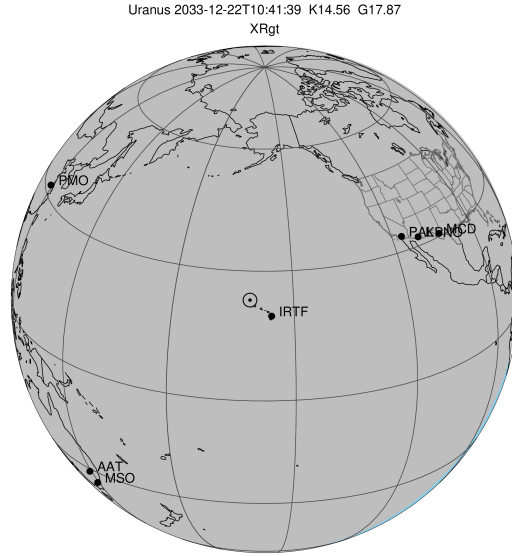


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-22T10:41:39.690
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3425574690184589440
 2Mass ID (if available) : 06161379+2339293

ICRS Star Coord at Epoch: 06h 16m 13.81886s +23:39:29.26016s

RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.557
 G magnitude : 17.867
 RP magnitude : 16.942
 BP magnitude : 18.782
 DUPflag : 0
 Distance (au) : 17.972
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.36
 Sun-Target sep (deg) : 176.69
 Sun-Moon sep (deg) : 173.03
 B (ring opening deg) : 72.09
 PA of pole (deg) : 64.76

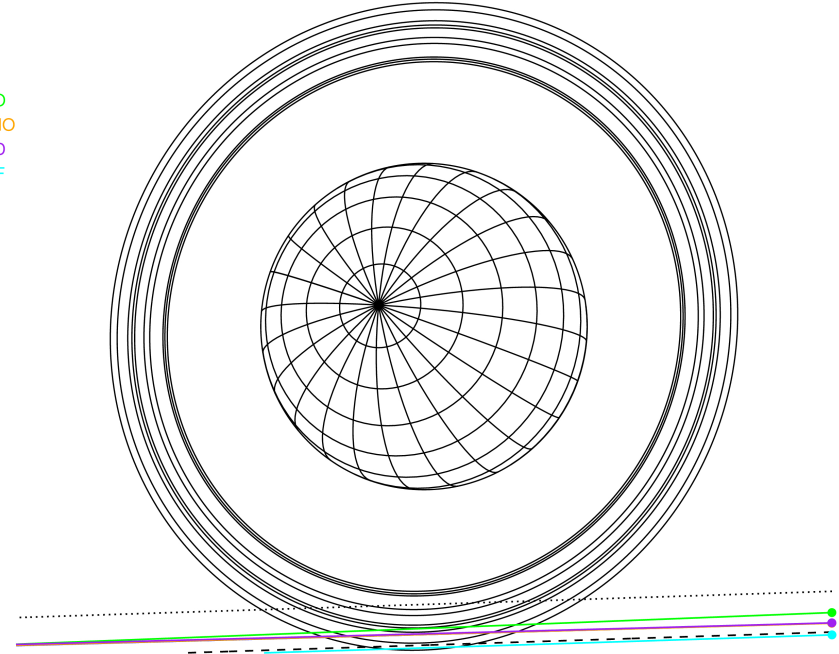
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2033-12-22T10:41:39.6900 α: 06 16 13.81886 s +23 39 29.260 C/A 3.820" PA 1.84 deg v_sky -23.36 km/s D 17.97 AU
 Credit: Styled after SORA/Lucky Star

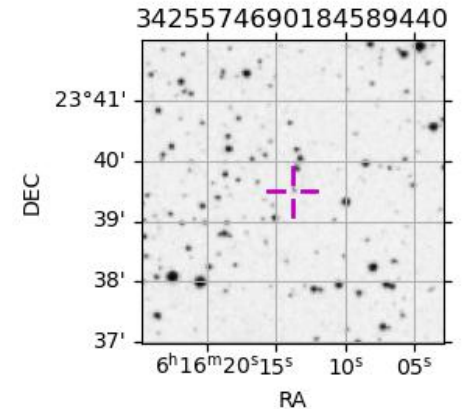
Uranus 2033-12-22T10:41:39 K14.56 G17.87 XRgt

PAL
 PMO
 KPNO
 MCD
 IRTF



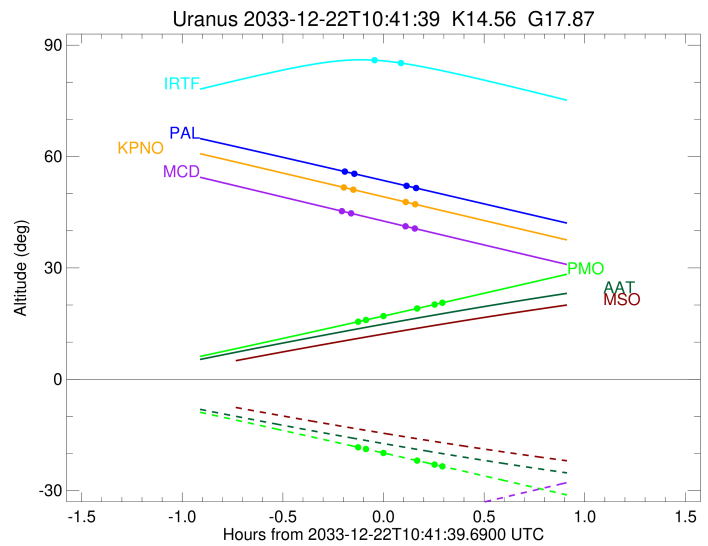
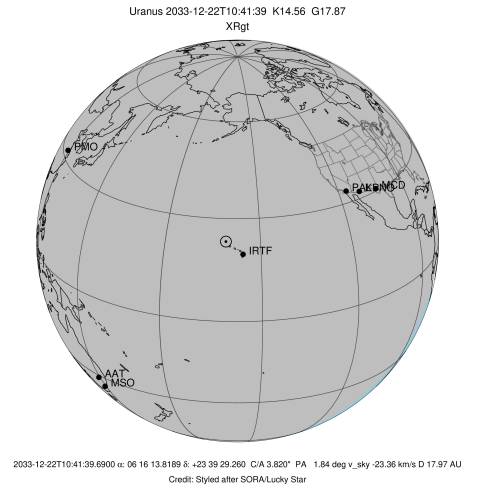
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	++		++	DEC 22 10:29 - DEC 22 10:52	PnnRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++		+++	DEC 22 10:33 - DEC 22 10:59	PnnRie
KPNO	Kitt Peak Natl Obs	32.0	248.4	++		++	DEC 22 10:29 - DEC 22 10:51	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	++		++	DEC 22 10:28 - DEC 22 10:51	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+		+	DEC 22 10:37 - DEC 22 10:48	PnnRie
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
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					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            : 2033-12-22T10:39:25.840
Event type          : XRgt
: No Uranus occs
: 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      : 3425574690184589440
2Mass ID (if available) : 06161379+2339293
ICRS Star Coord at Epoch: 06h 16m 13.81886s +23:39:29.26017s
RUWE (>1.4 is poor) : 0.98
K magnitude         : 14.557
G magnitude         : 17.867
RP magnitude        : 16.942
BP magnitude        : 18.782
DUPflag            : 0
Distance (au)       : 17.972
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -23.36
Sun-Target sep (deg) : 176.69
Sun-Moon sep (deg)  : 172.96
B (ring opening deg) : 72.09
PA of pole (deg)    : 64.76
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.699
C/A sky separation (km) : 48215.2
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```

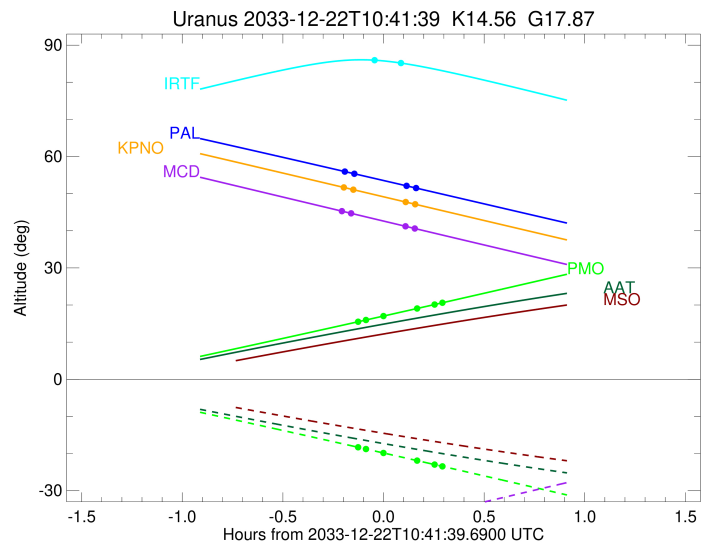
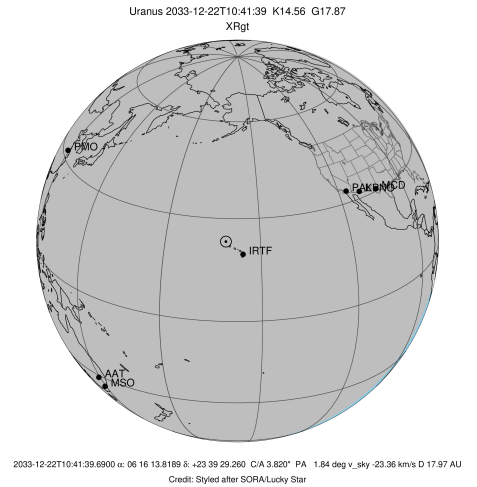


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-22T10:29:37.100		56.06	-52.96	51401.26	-8.02		
lambda	I	2033-12-22T10:33:00.140		55.35	-52.26	50026.71	-5.63		

No planet occultations

lambda	E	2033-12-22T10:48:30.062		52.11	-49.02	50026.71	5.63		
epsilon	E	2033-12-22T10:52:11.186		51.34	-48.25	51543.97	8.02		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-22T10:45:20.370
 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 : 3425574690184589440
 2Mass ID (if available) : 06161379+2339293
 ICRS Star Coord at Epoch: 06h 16m 13.81886s +23:39:29.26016s
 RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.557
 G magnitude : 17.867
 RP magnitude : 16.942
 BP magnitude : 18.782
 DUPflag : 0
 Distance (au) : 17.972
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.36
 Sun-Target sep (deg) : 176.69
 Sun-Moon sep (deg) : 173.87
 B (ring opening deg) : 72.09
 PA of pole (deg) : 64.76
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.626
 C/A sky separation (km) : 47257.1
 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

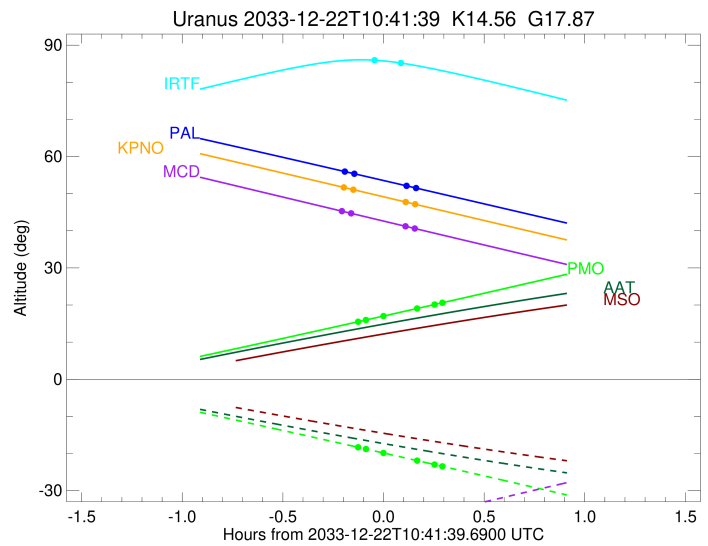
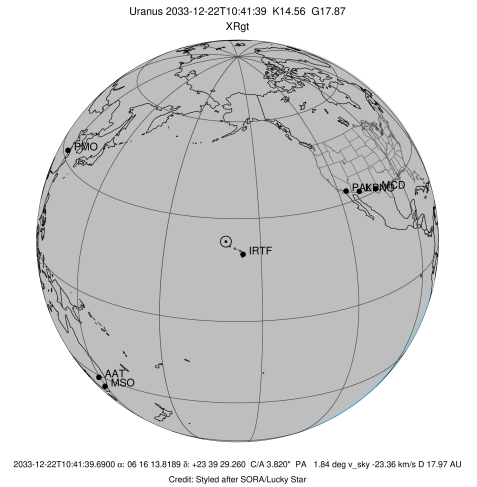


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-22T10:33:41.350		15.41	-18.24	51380.55	-9.13		
lambda	I	2033-12-22T10:36:27.907		15.98	-18.80	50026.71	-7.25		
delta	I	2033-12-22T10:41:42.689		17.04	-19.87	48300.35	-3.65		

No planet occultations

delta	E	2033-12-22T10:51:37.387		19.05	-21.90	48300.35	3.65		
lambda	E	2033-12-22T10:56:51.816		20.13	-22.98	50026.71	7.26		
epsilon	E	2033-12-22T10:59:56.466		20.76	-23.61	51547.59	9.15		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-22T10:39:09.010
 Event type : XRgt
 : No Uranus occs
 : 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 : 3425574690184589440
 2Mass ID (if available) : 06161379+2339293
 ICRS Star Coord at Epoch: 06h 16m 13.81886s +23:39:29.26017s
 RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.557
 G magnitude : 17.867
 RP magnitude : 16.942
 BP magnitude : 18.782
 DUPflag : 0
 Distance (au) : 17.972
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.36
 Sun-Target sep (deg) : 176.69
 Sun-Moon sep (deg) : 172.91
 B (ring opening deg) : 72.09
 PA of pole (deg) : 64.76
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.699
 C/A sky separation (km) : 48212.6
 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

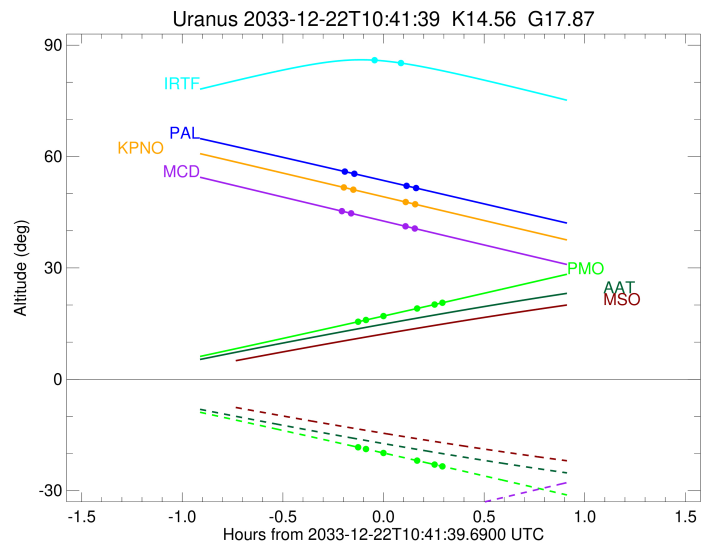
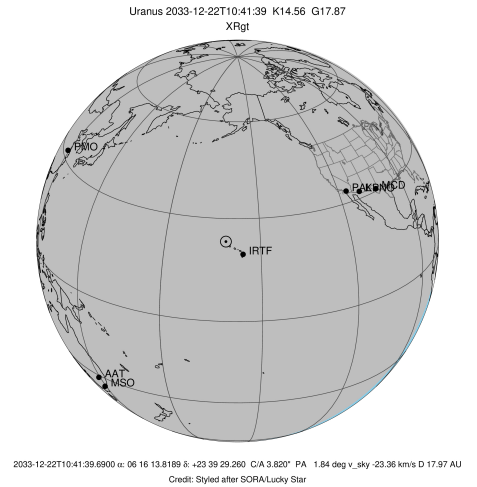


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-22T10:29:19.324		51.79	-48.64	51401.34	-8.02		
lambda	I	2033-12-22T10:32:42.341		51.06	-47.92	50026.71	-5.63		

No planet occultations

lambda	E	2033-12-22T10:48:14.227		47.76	-44.62	50026.71	5.63		
epsilon	E	2033-12-22T10:51:55.351		46.97	-43.84	51544.04	8.01		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-22T10:38:47.850
 Event type : XRgt
 : No Uranus occs
 : 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 : 3425574690184589440
 2Mass ID (if available) : 06161379+2339293
 ICRS Star Coord at Epoch: 06h 16m 13.81886s +23:39:29.26017s
 RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.557
 G magnitude : 17.867
 RP magnitude : 16.942
 BP magnitude : 18.782
 DUPflag : 0
 Distance (au) : 17.972
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.36
 Sun-Target sep (deg) : 176.69
 Sun-Moon sep (deg) : 172.86
 B (ring opening deg) : 72.09
 PA of pole (deg) : 64.76
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.691
 C/A sky separation (km) : 48111.2
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



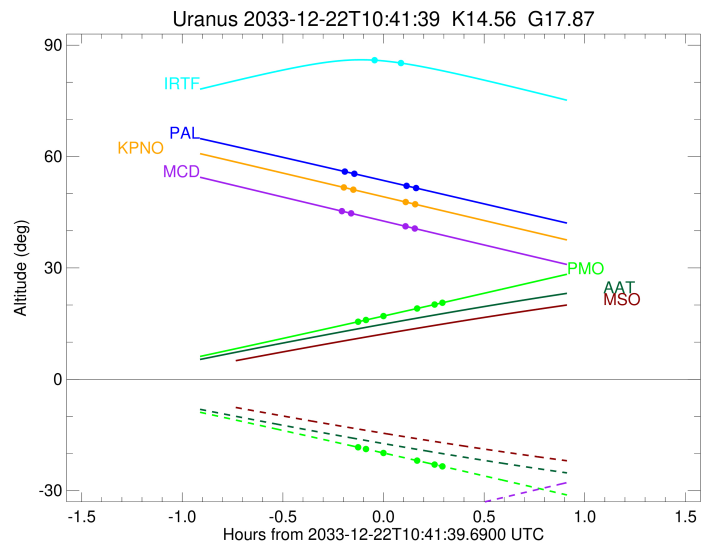
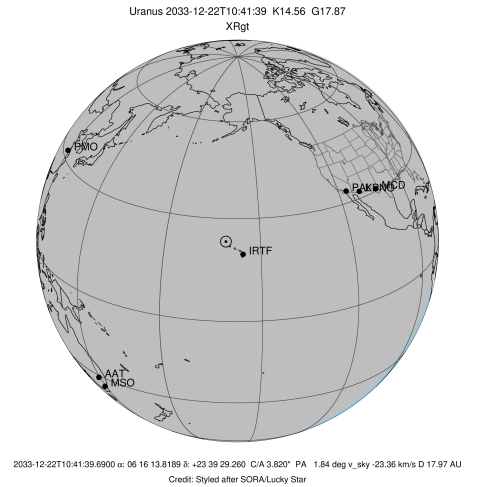
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-22T10:28:44.963		45.40	-42.22	51399.56	-8.15		
lambda	I	2033-12-22T10:32:02.826		44.69	-41.52	50026.71	-5.84		

No planet occultations

lambda	E	2033-12-22T10:48:11.197		41.21	-38.06	50026.71	5.83		
epsilon	E	2033-12-22T10:51:47.205		40.44	-37.29	51544.66	8.14		

```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch             : 2033-12-22T10:41:33.470
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        : 3425574690184589440
2Mass ID (if available) : 06161379+2339293
ICRS Star Coord at Epoch: 06h 16m 13.81886s +23:39:29.26016s
RUWE (>1.4 is poor)  : 0.98
K magnitude           : 14.557
G magnitude           : 17.867
RP magnitude          : 16.942
BP magnitude          : 18.782
DUPflag              : 0
Distance (au)         : 17.972
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -23.36
Sun-Target sep (deg)  : 176.69
Sun-Moon sep (deg)    : 173.07
B (ring opening deg) : 72.09
PA of pole (deg)     : 64.76
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.860
C/A sky separation (km) : 50316.4
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_itrf93_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 2033-12-22T10:37:33.905  86.01 -84.56 51451.98 -3.97
    
```

No planet occultations

```

epsilon   E 2033-12-22T10:48:36.262  84.94 -82.49 51524.48 3.98
    
```