

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-01-08T08:48:57.710  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 675660168830130304  
 2Mass ID (if available) : 08150451+2025393

ICRS Star Coord at Epoch: 08h 15m 04.47262s +20:25:39.40585s

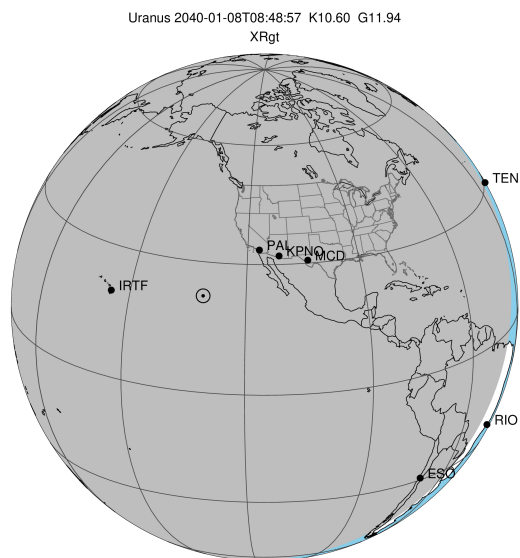
RUWE (>1.4 is poor) : 0.85  
 K magnitude : 10.602  
 G magnitude : 11.945  
 RP magnitude : 11.469  
 BP magnitude : 12.256  
 DUPflag : 0  
 Distance (au) : 17.636  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.31  
 Sun-Target sep (deg) : 165.71  
 Sun-Moon sep (deg) : 86.96  
 B (ring opening deg) : 45.60  
 PA of pole (deg) : 91.08

# a(km) ring

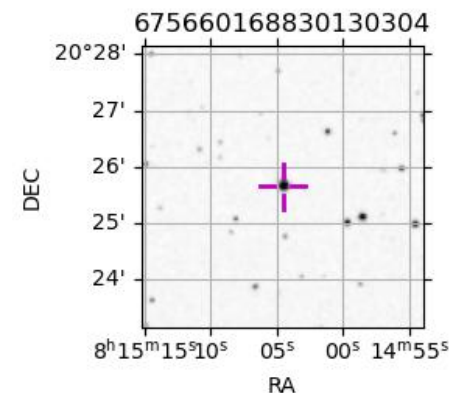
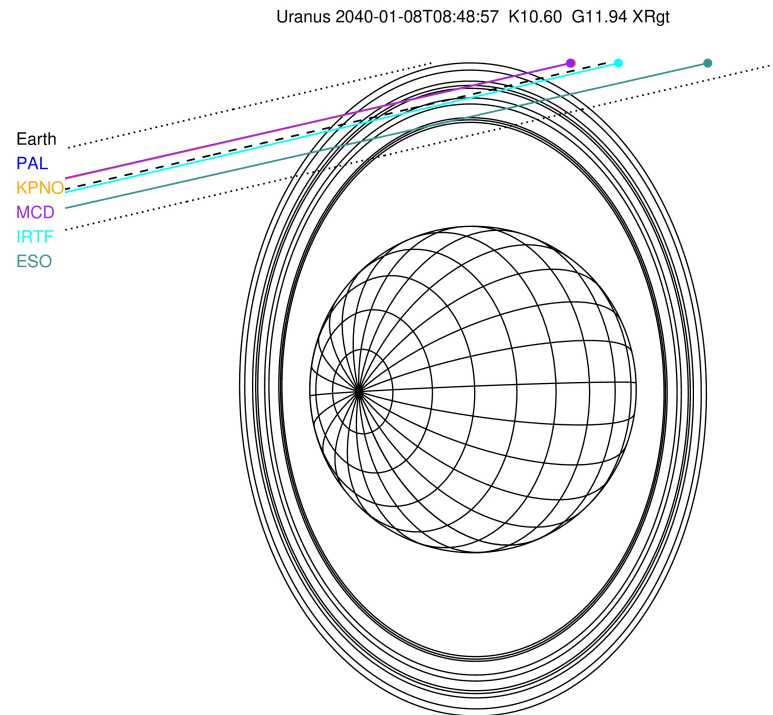
- 1 41837.2 6
- 2 42235.0 5
- 3 42571.2 4
- 4 44718.5 alpha
- 5 45661.1 beta
- 6 47176.1 eta
- 7 47626.3 gamma
- 8 48300.3 delta
- 9 50026.7 lambda
- 10 51149.4 epsilon

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

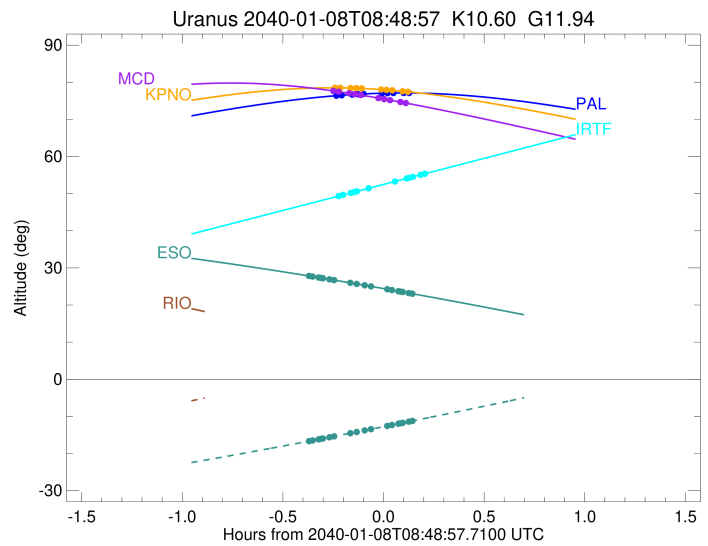
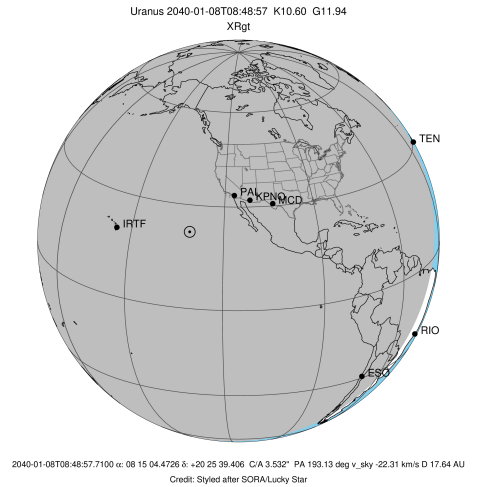
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1	+++++		+++++	JAN 08 08:34 - JAN 08 08:56	PnnRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	JAN 08 08:34 - JAN 08 08:56	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	JAN 08 08:33 - JAN 08 08:55	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	JAN 08 08:35 - JAN 08 09:01	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	+++++		+++++	JAN 08 08:26 - JAN 08 08:57	PnnRie
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



2040-01-08T08:48:57.7100 ra: 08 15 04.4726 s: +20 25 39.406 C/A 3.532° PA 193.13 deg v\_sky -22.31 km/s D 17.64 AU  
 Credit: Styled after SORA/Lucky Star



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-01-08T08:49:10.010  
 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 : 675660168830130304  
 2Mass ID (if available) : 08150451+2025393  
 ICRS Star Coord at Epoch: 08h 15m 04.47262s +20:25:39.40585s  
 RUWE (>1.4 is poor) : 0.85  
 K magnitude : 10.602  
 G magnitude : 11.945  
 RP magnitude : 11.469  
 BP magnitude : 12.256  
 DUPflag : 0  
 Distance (au) : 17.636  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.31  
 Sun-Target sep (deg) : 165.71  
 Sun-Moon sep (deg) : 87.91  
 B (ring opening deg) : 45.60  
 PA of pole (deg) : 91.08  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.628  
 C/A sky separation (km) : 46405.5  
 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



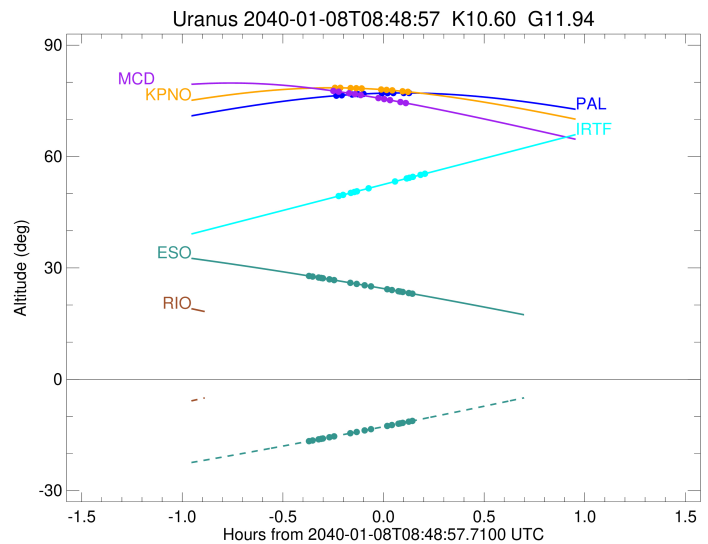
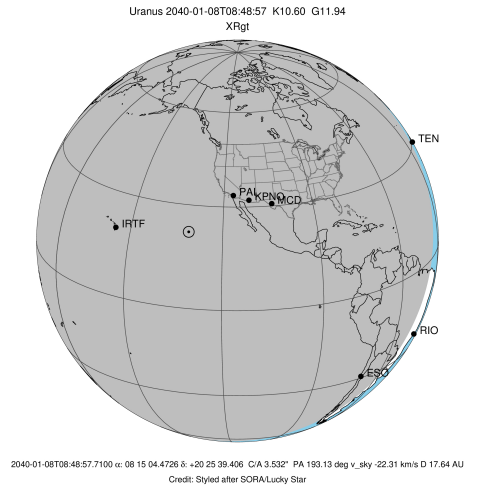
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-01-08T08:34:40.747		76.38	-75.85	51361.64	-12.60		
lambda	I	2040-01-08T08:36:33.282		76.51	-75.58	50026.71	-10.91		
delta	I	2040-01-08T08:39:40.583		76.70	-75.12	48300.35	-7.46		
gamma	I	2040-01-08T08:41:25.730		76.79	-74.86	47623.87	-5.39		
eta	I	2040-01-08T08:43:08.991		76.87	-74.59	47176.12	-3.27		

No planet occultations

eta	E	2040-01-08T08:48:21.439		77.05	-73.76	47176.12	3.28		
gamma	E	2040-01-08T08:50:05.020		77.08	-73.48	47625.61	5.39		
delta	E	2040-01-08T08:51:49.841		77.11	-73.19	48300.35	7.47		
lambda	E	2040-01-08T08:54:57.134		77.12	-72.66	50026.71	10.91		
epsilon	E	2040-01-08T08:56:24.080		77.12	-72.41	51039.69	12.60		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-01-08T08:48:46.090  
 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 : 675660168830130304  
 2Mass ID (if available) : 08150451+2025393  
 ICRS Star Coord at Epoch: 08h 15m 04.47262s +20:25:39.40585s  
 RUWE (>1.4 is poor) : 0.85  
 K magnitude : 10.602  
 G magnitude : 11.945  
 RP magnitude : 11.469  
 BP magnitude : 12.256  
 DUPflag : 0  
 Distance (au) : 17.636  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.31  
 Sun-Target sep (deg) : 165.71  
 Sun-Moon sep (deg) : 87.91  
 B (ring opening deg) : 45.60  
 PA of pole (deg) : 91.08  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.626  
 C/A sky separation (km) : 46374.4  
 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



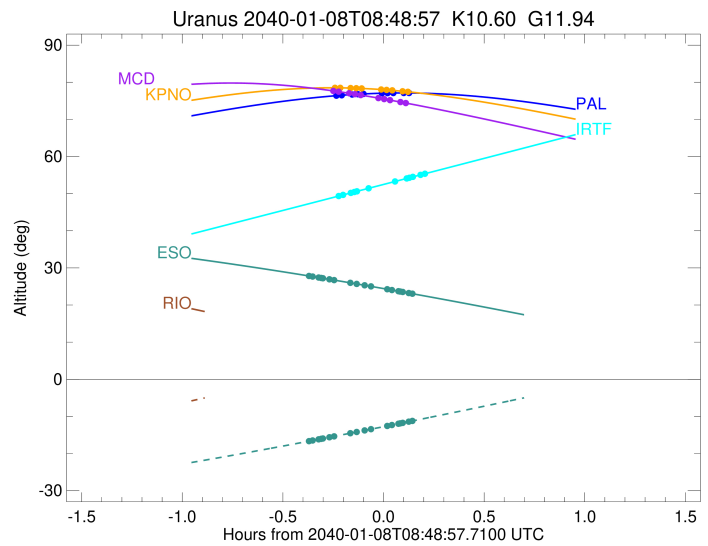
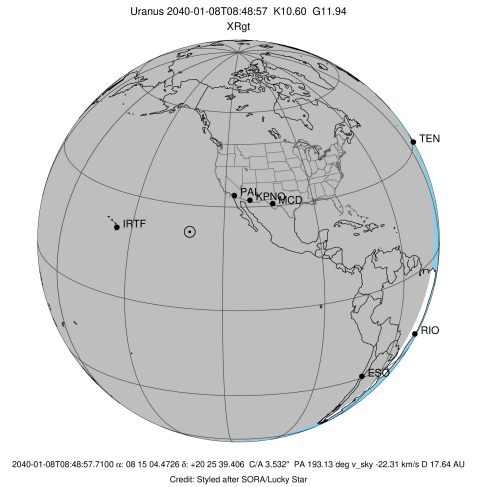
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-01-08T08:34:15.203		78.51	-73.36	51362.37	-12.65		
lambda	I	2040-01-08T08:36:07.272		78.50	-73.01	50026.71	-10.97		
delta	I	2040-01-08T08:39:13.043		78.44	-72.44	48300.35	-7.56		
gamma	I	2040-01-08T08:40:56.419		78.40	-72.12	47623.85	-5.52		
eta	I	2040-01-08T08:42:35.779		78.34	-71.81	47176.12	-3.48		

No planet occultations

eta	E	2040-01-08T08:48:08.259		78.06	-70.75	47176.12	3.49		
gamma	E	2040-01-08T08:49:47.945		77.95	-70.43	47625.63	5.52		
delta	E	2040-01-08T08:51:31.003		77.83	-70.10	48300.35	7.56		
lambda	E	2040-01-08T08:54:36.784		77.58	-69.49	50026.71	10.97		
epsilon	E	2040-01-08T08:56:03.285		77.46	-69.21	51039.20	12.65		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2040-01-08T08:48:12.360
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       : 675660168830130304
2Mass ID (if available) : 08150451+2025393
ICRS Star Coord at Epoch: 08h 15m 04.47262s +20:25:39.40585s
RUWE (>1.4 is poor) : 0.85
K magnitude          : 10.602
G magnitude          : 11.945
RP magnitude         : 11.469
BP magnitude         : 12.256
DUPflag             : 0
Distance (au)        : 17.636
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -22.31
Sun-Target sep (deg) : 165.71
Sun-Moon sep (deg)   : 87.90
B (ring opening deg) : 45.60
PA of pole (deg)     : 91.08
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.630
C/A sky separation (km) : 46433.2
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
  
```

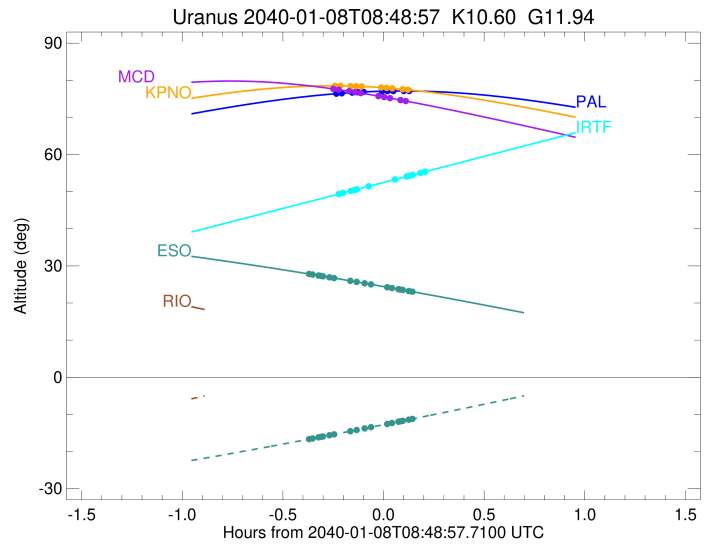
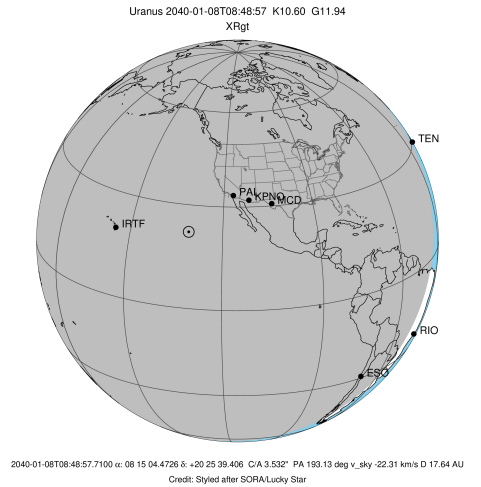


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-01-08T08:33:45.882		77.71	-68.01	51361.62	-12.57		
lambda	I	2040-01-08T08:35:38.711		77.46	-67.62	50026.71	-10.87		
delta	I	2040-01-08T08:38:46.950		77.04	-66.97	48300.35	-7.41		
gamma	I	2040-01-08T08:40:33.249		76.79	-66.60	47623.88	-5.31		
eta	I	2040-01-08T08:42:19.242		76.53	-66.24	47176.12	-3.13		

No planet occultations

eta	E	2040-01-08T08:47:18.199		75.77	-65.19	47176.12	3.13		
gamma	E	2040-01-08T08:49:04.525		75.49	-64.82	47625.59	5.31		
delta	E	2040-01-08T08:50:50.517		75.20	-64.45	48300.35	7.41		
lambda	E	2040-01-08T08:53:58.796		74.68	-63.79	50026.71	10.87		
epsilon	E	2040-01-08T08:55:26.073		74.44	-63.48	51040.47	12.57		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-01-08T08:51:49.210  
 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 : 675660168830130304  
 2Mass ID (if available) : 08150451+2025393  
 ICRS Star Coord at Epoch: 08h 15m 04.47262s +20:25:39.40585s  
 RUWE (>1.4 is poor) : 0.85  
 K magnitude : 10.602  
 G magnitude : 11.945  
 RP magnitude : 11.469  
 BP magnitude : 12.256  
 DUPflag : 0  
 Distance (au) : 17.636  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.31  
 Sun-Target sep (deg) : 165.71  
 Sun-Moon sep (deg) : 87.76  
 B (ring opening deg) : 45.60  
 PA of pole (deg) : 91.08  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.484  
 C/A sky separation (km) : 44568.5  
 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



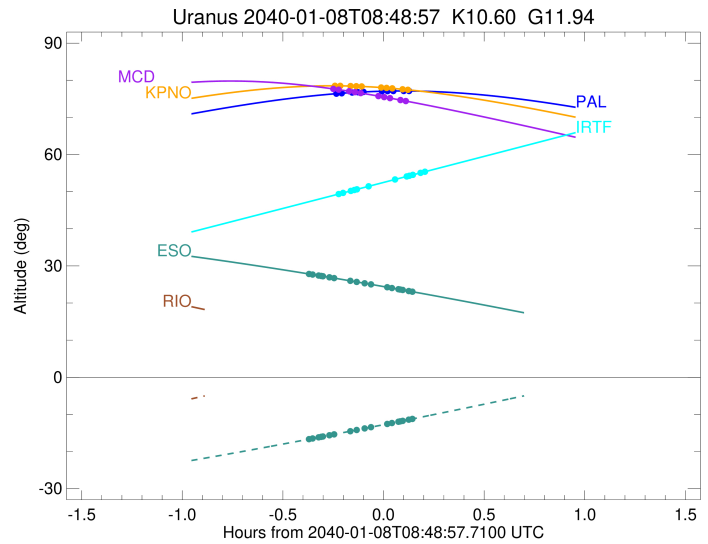
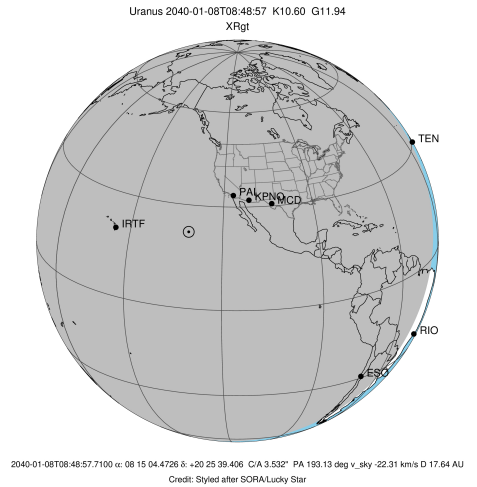
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-01-08T08:35:22.197		49.30	-63.56	51388.15	-14.87		
lambda	I	2040-01-08T08:36:57.182		49.67	-63.93	50026.71	-13.59		
delta	I	2040-01-08T08:39:15.890		50.21	-64.46	48300.35	-11.26		
gamma	I	2040-01-08T08:40:19.261		50.46	-64.71	47623.18	-10.11		
eta	I	2040-01-08T08:41:05.469		50.64	-64.88	47176.12	-9.24		
beta	I	2040-01-08T08:44:40.401		51.48	-65.71	45647.50	-4.92		

No planet occultations

beta	E	2040-01-08T08:52:16.576		53.25	-67.47	45652.74	4.93		
eta	E	2040-01-08T08:55:50.497		54.09	-68.29	47176.12	9.25		
gamma	E	2040-01-08T08:56:36.989		54.27	-68.47	47626.46	10.12		
delta	E	2040-01-08T08:57:39.976		54.51	-68.72	48300.35	11.27		
lambda	E	2040-01-08T08:59:58.525		55.05	-69.25	50026.71	13.61		
epsilon	E	2040-01-08T09:01:07.763		55.32	-69.52	51006.87	14.90		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-01-08T08:45:11.700  
 Event type : XRgt  
 : No Uranus occs  
 : 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 : 675660168830130304  
 2Mass ID (if available) : 08150451+2025393  
 ICRS Star Coord at Epoch: 08h 15m 04.47262s +20:25:39.40585s  
 RUWE (>1.4 is poor) : 0.85  
 K magnitude : 10.602  
 G magnitude : 11.945  
 RP magnitude : 11.469  
 BP magnitude : 12.256  
 DUPflag : 0  
 Distance (au) : 17.636  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.31  
 Sun-Target sep (deg) : 165.71  
 Sun-Moon sep (deg) : 87.33  
 B (ring opening deg) : 45.60  
 PA of pole (deg) : 91.08  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.264  
 C/A sky separation (km) : 41753.9  
 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	2040-01-08T08:26:31.131		27.86	-16.71	51423.92	-17.74		
lambda	I	2040-01-08T08:27:51.618		27.66	-16.48	50026.71	-16.81		
delta	I	2040-01-08T08:29:39.295		27.40	-16.17	48300.35	-15.22		
gamma	I	2040-01-08T08:30:24.888		27.29	-16.04	47622.53	-14.50		
eta	I	2040-01-08T08:30:56.221		27.21	-15.95	47176.12	-13.99		
beta	I	2040-01-08T08:32:54.279		26.91	-15.61	45644.40	-11.93		
alpha	I	2040-01-08T08:34:20.638		26.70	-15.36	44686.04	-10.28		
4	I	2040-01-08T08:39:12.127		25.96	-14.51	42569.76	-4.13		
5	I	2040-01-08T08:40:33.666		25.75	-14.27	42311.50	-2.25		

No planet occultations

5	E	2040-01-08T08:43:47.509		25.25	-13.70	42314.40	2.26		
4	E	2040-01-08T08:45:11.024		25.03	-13.45	42581.66	4.13		
alpha	E	2040-01-08T08:49:59.088		24.27	-12.59	44687.01	10.27		
beta	E	2040-01-08T08:51:25.780		24.04	-12.33	45657.07	11.92		
eta	E	2040-01-08T08:53:23.074		23.72	-11.98	47176.12	13.97		
gamma	E	2040-01-08T08:53:54.770		23.64	-11.89	47627.24	14.49		
delta	E	2040-01-08T08:54:40.097		23.52	-11.75	48300.35	15.21		
lambda	E	2040-01-08T08:56:27.928		23.23	-11.42	50026.71	16.79		
epsilon	E	2040-01-08T08:57:22.821		23.08	-11.26	50968.73	17.71		