

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-01-13T06:22:20.480
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3413208826504255872
 2Mass ID (if available) : 04533633+2235552

ICRS Star Coord at Epoch: 04h 53m 36.33651s +22:35:55.19959s

RUWE (>1.4 is poor) : 1.02
 K magnitude : 11.752
 G magnitude : 15.104
 RP magnitude : 14.145
 BP magnitude : 16.041
 DUPflag : 0
 Distance (au) : 18.433
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.15
 Sun-Target sep (deg) : 142.02
 Sun-Moon sep (deg) : 33.99
 B (ring opening deg) : 81.71
 PA of pole (deg) : -27.15

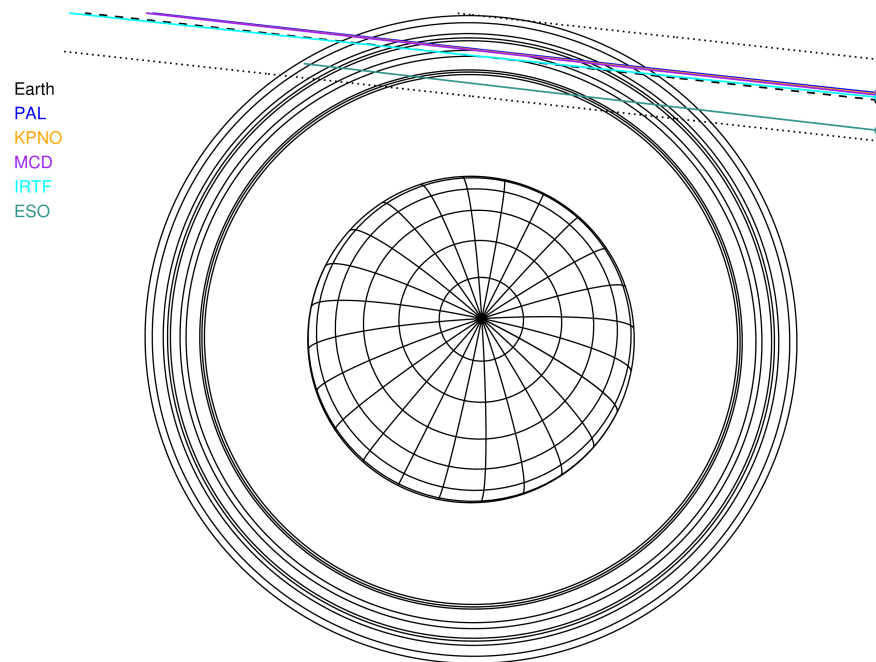
a(km) ring

- 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



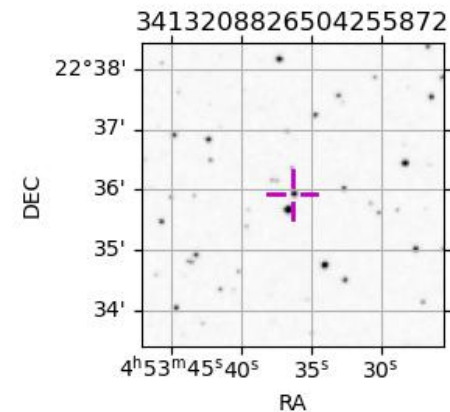
2030-01-13T06:22:20.4800 α: 04 53 36.3365 δ: +22 35 55.200 C/A 3.313° PA 173.74 deg v_sky -17.15 km/s D 18.43 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2030-01-13T06:22:20 K11.75 G15.10 XRgt



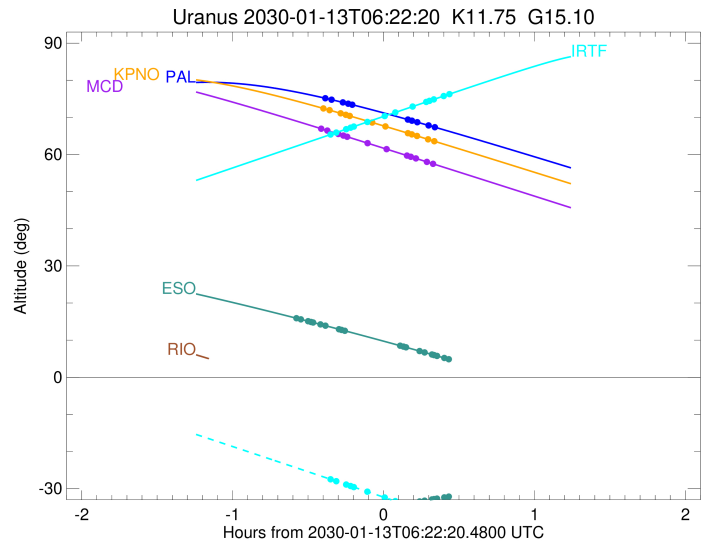
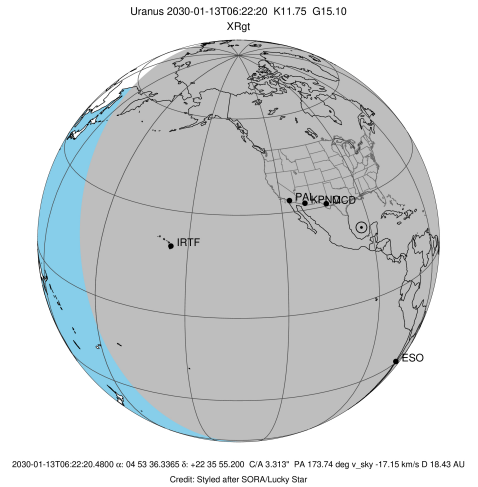
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	+++++		+++++	JAN 13 05:58 - JAN 13 06:43	PnnRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	JAN 13 05:57 - JAN 13 06:43	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	JAN 13 05:56 - JAN 13 06:42	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	JAN 13 06:00 - JAN 13 06:49	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 13 05:47 - JAN 13 06:46	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



```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2030-01-13T06:20:40.340
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       : 3413208826504255872
2Mass ID (if available) : 04533633+2235552
ICRS Star Coord at Epoch: 04h 53m 36.33651s +22:35:55.19959s
RUWE (>1.4 is poor) : 1.02
K magnitude          : 11.752
G magnitude          : 15.104
RP magnitude         : 14.145
BP magnitude         : 16.041
DUPflag             : 0
Distance (au)        : 18.433
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -17.15
Sun-Target sep (deg) : 142.02
Sun-Moon sep (deg)   : 34.67
B (ring opening deg) : 81.71
PA of pole (deg)     : -27.15
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.388
C/A sky separation (km) : 45299.1
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_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



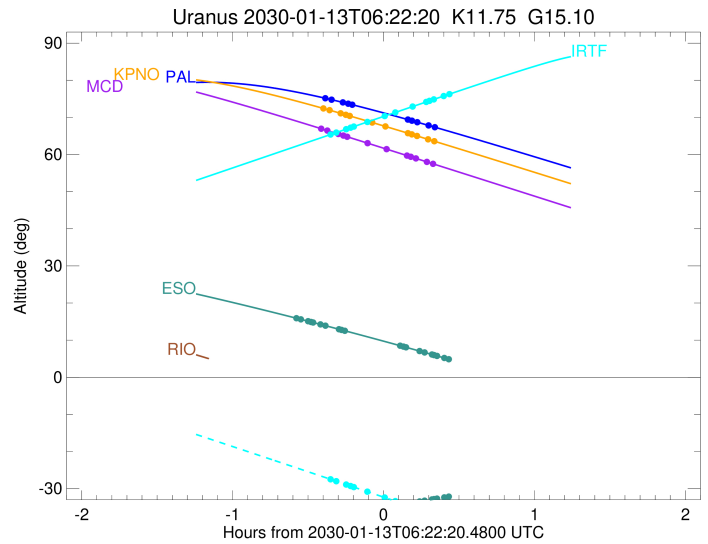
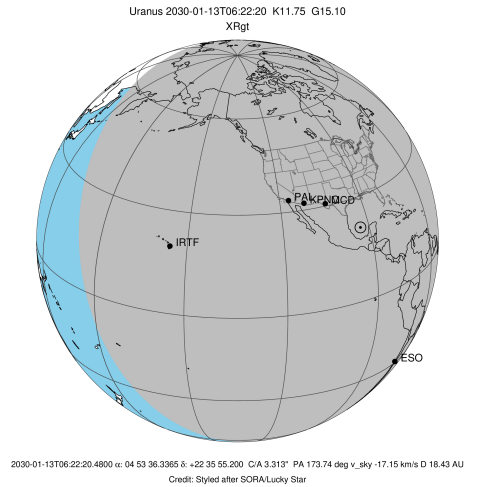
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-13T05:58:24.708		75.29	-61.49	51545.92	-8.13		
lambda	I	2030-01-13T06:01:44.018		74.77	-62.16	50026.71	-7.12		
delta	I	2030-01-13T06:06:13.743		74.04	-63.05	48300.35	-5.65		
gamma	I	2030-01-13T06:08:22.261		73.68	-63.47	47621.92	-4.90		
eta	I	2030-01-13T06:09:59.011		73.41	-63.79	47176.12	-4.31		

No planet occultations

eta	E	2030-01-13T06:31:58.357		69.43	-68.01	47176.12	4.31		
gamma	E	2030-01-13T06:33:34.998		69.13	-68.31	47620.96	4.89		
delta	E	2030-01-13T06:35:43.846		68.72	-68.71	48300.35	5.65		
lambda	E	2030-01-13T06:40:13.920		67.85	-69.53	50026.71	7.11		
epsilon	E	2030-01-13T06:43:21.351		67.24	-70.09	51447.56	8.12		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2030-01-13T06:20:10.820
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       : 3413208826504255872
2Mass ID (if available) : 04533633+2235552
ICRS Star Coord at Epoch: 04h 53m 36.33651s +22:35:55.19959s
RUWE (>1.4 is poor) : 1.02
K magnitude          : 11.752
G magnitude          : 15.104
RP magnitude         : 14.145
BP magnitude         : 16.041
DUPflag             : 0
Distance (au)        : 18.433
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -17.15
Sun-Target sep (deg) : 142.02
Sun-Moon sep (deg)   : 34.72
B (ring opening deg) : 81.71
PA of pole (deg)     : -27.15
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.378
C/A sky separation (km) : 45161.3
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_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```

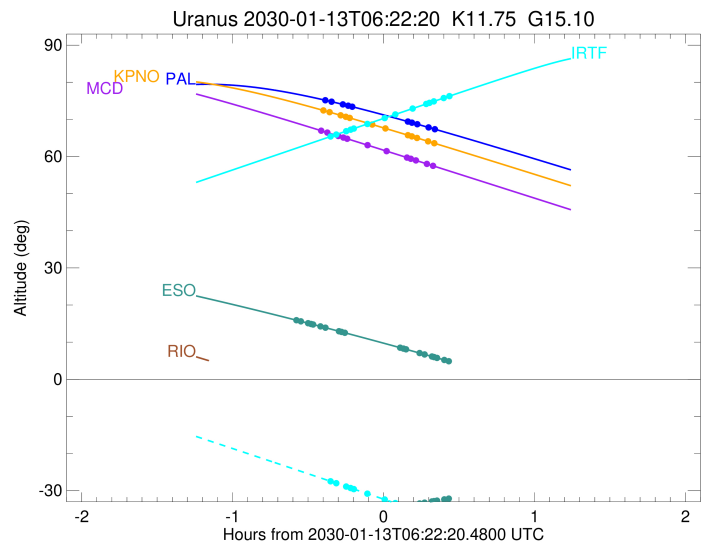
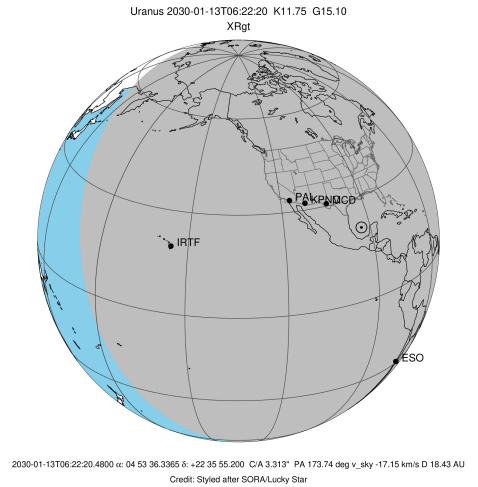


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-13T05:57:39.860		72.57	-65.99	51545.34	-8.22		
lambda	I	2030-01-13T06:00:56.542		71.95	-66.65	50026.71	-7.23		
delta	I	2030-01-13T06:05:21.030		71.10	-67.52	48300.35	-5.80		
gamma	I	2030-01-13T06:07:25.784		70.69	-67.93	47621.96	-5.07		
eta	I	2030-01-13T06:08:58.800		70.39	-68.23	47176.12	-4.51		
beta	I	2030-01-13T06:18:03.240		68.59	-69.98	45664.66	-0.98		

No planet occultations

beta	E	2030-01-13T06:22:52.415		67.62	-70.89	45662.44	0.98		
eta	E	2030-01-13T06:31:59.434		65.76	-72.56	47176.12	4.51		
gamma	E	2030-01-13T06:33:32.360		65.44	-72.84	47620.96	5.07		
delta	E	2030-01-13T06:35:37.477		65.01	-73.21	48300.35	5.79		
lambda	E	2030-01-13T06:40:02.396		64.10	-73.97	50026.71	7.22		
epsilon	E	2030-01-13T06:43:07.306		63.46	-74.49	51446.18	8.21		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-01-13T06:19:29.270
 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 : 3413208826504255872
 2Mass ID (if available) : 04533633+2235552
 ICRS Star Coord at Epoch: 04h 53m 36.33651s +22:35:55.19959s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 11.752
 G magnitude : 15.104
 RP magnitude : 14.145
 BP magnitude : 16.041
 DUPflag : 0
 Distance (au) : 18.433
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.15
 Sun-Target sep (deg) : 142.02
 Sun-Moon sep (deg) : 34.77
 B (ring opening deg) : 81.71
 PA of pole (deg) : -27.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.371
 C/A sky separation (km) : 45071.5
 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

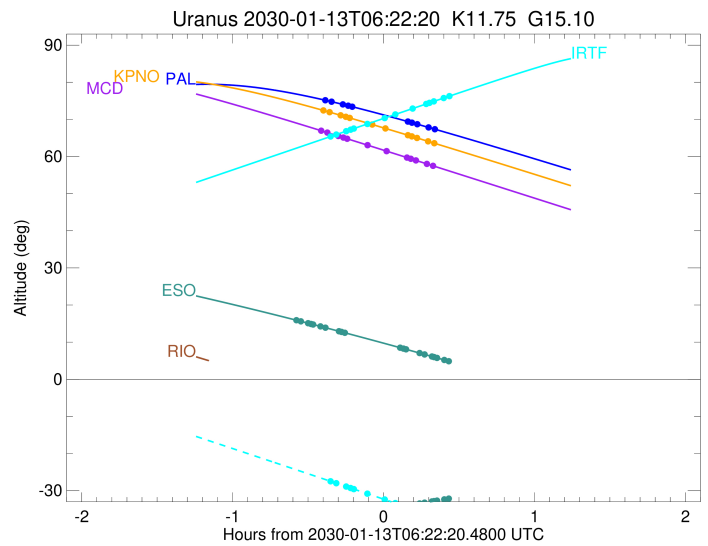
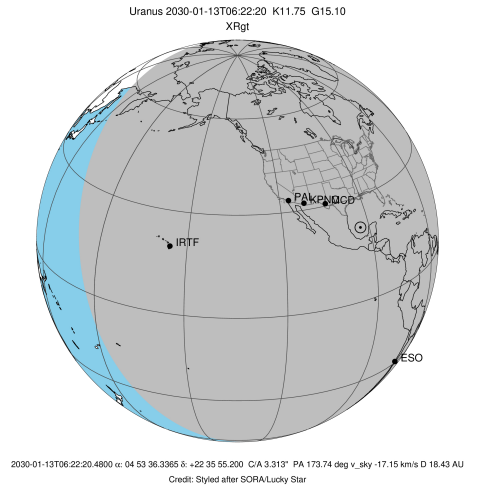
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-13T05:56:47.572		67.12	-72.29	51544.89	-8.28		
lambda	I	2030-01-13T06:00:02.710		66.44	-72.92	50026.71	-7.30		
delta	I	2030-01-13T06:04:24.123		65.53	-73.73	48300.35	-5.89		
gamma	I	2030-01-13T06:06:26.686		65.09	-74.11	47621.98	-5.18		
eta	I	2030-01-13T06:07:57.561		64.77	-74.39	47176.12	-4.63		
beta	I	2030-01-13T06:16:07.906		63.04	-75.84	45665.24	-1.47		

No planet occultations

beta	E	2030-01-13T06:23:24.563		61.49	-77.05	45661.90	1.47		
eta	E	2030-01-13T06:31:37.585		59.73	-78.30	47176.12	4.63		
gamma	E	2030-01-13T06:33:08.399		59.41	-78.51	47620.96	5.17		
delta	E	2030-01-13T06:35:11.369		58.97	-78.79	48300.35	5.88		
lambda	E	2030-01-13T06:39:33.330		58.03	-79.34	50026.71	7.28		
epsilon	E	2030-01-13T06:42:36.838		57.37	-79.68	51445.46	8.26		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2030-01-13T06:24:37.920
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      : 3413208826504255872
2Mass ID (if available) : 04533633+2235552
ICRS Star Coord at Epoch: 04h 53m 36.33651s +22:35:55.19959s
RUWE (>1.4 is poor) : 1.02
K magnitude         : 11.752
G magnitude         : 15.104
RP magnitude        : 14.145
BP magnitude        : 16.041
DUPflag            : 0
Distance (au)       : 18.433
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -17.15
Sun-Target sep (deg) : 142.02
Sun-Moon sep (deg)  : 34.22
B (ring opening deg) : 81.71
PA of pole (deg)    : -27.15
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.310
C/A sky separation (km) : 44257.4
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural11.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
    
```

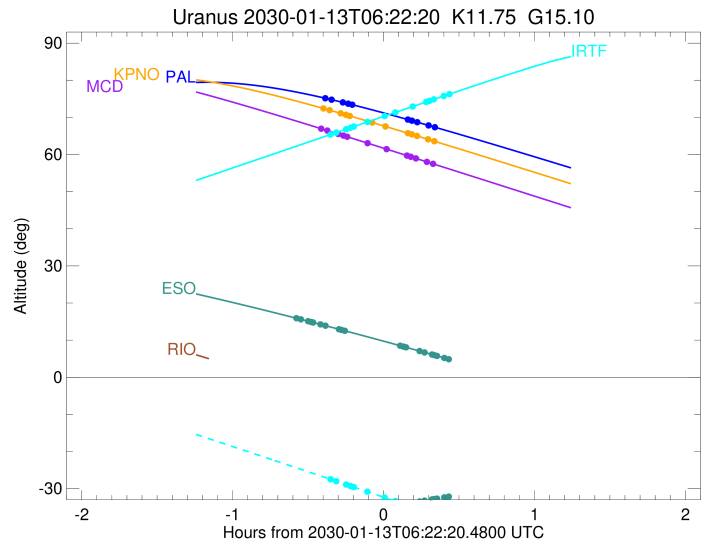
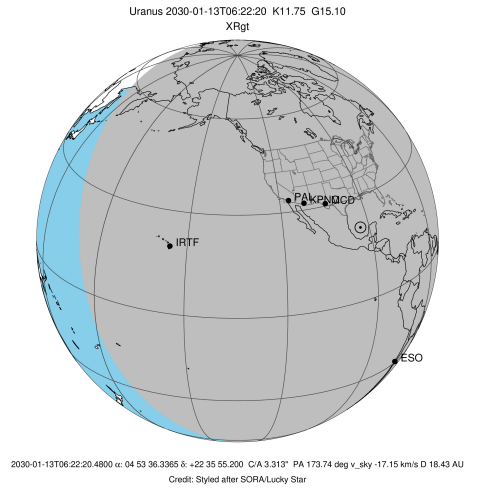


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-13T06:00:34.030		65.23	-27.32	51542.48	-8.79		
lambda	I	2030-01-13T06:03:35.792		65.93	-28.01	50026.71	-7.90		
delta	I	2030-01-13T06:07:32.218		66.84	-28.90	48300.35	-6.68		
gamma	I	2030-01-13T06:09:18.485		67.25	-29.31	47622.13	-6.08		
eta	I	2030-01-13T06:10:34.544		67.54	-29.60	47176.12	-5.64		
beta	I	2030-01-13T06:15:58.474		68.79	-30.83	45667.48	-3.63		
alpha	I	2030-01-13T06:23:42.707		70.57	-32.60	44697.93	-0.52		

No planet occultations

alpha	E	2030-01-13T06:26:12.396		71.15	-33.17	44699.49	0.52		
beta	E	2030-01-13T06:33:50.993		72.91	-34.92	45659.25	3.63		
eta	E	2030-01-13T06:39:16.917		74.15	-36.17	47176.12	5.65		
gamma	E	2030-01-13T06:40:32.715		74.44	-36.46	47620.96	6.09		
delta	E	2030-01-13T06:42:19.069		74.85	-36.87	48300.35	6.68		
lambda	E	2030-01-13T06:46:15.220		75.75	-37.77	50026.71	7.92		
epsilon	E	2030-01-13T06:49:04.304		76.39	-38.42	51433.79	8.80		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2030-01-13T06:17:41.560
 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 : 3413208826504255872
 2Mass ID (if available) : 04533633+2235552
 ICRS Star Coord at Epoch: 04h 53m 36.33651s +22:35:55.19959s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 11.752
 G magnitude : 15.104
 RP magnitude : 14.145
 BP magnitude : 16.041
 DUPflag : 0
 Distance (au) : 18.433
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.15
 Sun-Target sep (deg) : 142.02
 Sun-Moon sep (deg) : 34.67
 B (ring opening deg) : 81.71
 PA of pole (deg) : -27.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.982
 C/A sky separation (km) : 39866.6
 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	2030-01-13T05:47:10.221		16.00	-37.70	51520.37	-10.92		
lambda	I	2030-01-13T05:49:30.883		15.60	-37.55	50026.71	-10.35		
delta	I	2030-01-13T05:52:23.593		15.10	-37.36	48300.35	-9.63		
gamma	I	2030-01-13T05:53:35.113		14.89	-37.28	47622.97	-9.31		
eta	I	2030-01-13T05:54:23.695		14.75	-37.23	47176.12	-9.08		
beta	I	2030-01-13T05:57:17.222		14.24	-37.02	45672.77	-8.22		
alpha	I	2030-01-13T05:59:21.925		13.88	-36.87	44688.33	-7.57		
4	I	2030-01-13T06:04:33.216		12.95	-36.47	42615.51	-5.71		
5	I	2030-01-13T06:05:26.523		12.80	-36.40	42314.47	-5.37		
6	I	2030-01-13T06:06:54.073		12.53	-36.28	41876.26	-4.80		

No planet occultations

6	E	2030-01-13T06:29:03.030		8.49	-34.26	41879.26	4.79		
5	E	2030-01-13T06:30:27.250		8.23	-34.11	42305.92	5.36		
4	E	2030-01-13T06:31:20.528		8.06	-34.02	42599.97	5.70		
alpha	E	2030-01-13T06:36:38.521		7.07	-33.46	44711.78	7.54		
beta	E	2030-01-13T06:38:38.201		6.69	-33.25	45653.97	8.19		
eta	E	2030-01-13T06:41:34.776		6.14	-32.92	47176.12	9.04		
gamma	E	2030-01-13T06:42:23.396		5.98	-32.83	47621.09	9.26		
delta	E	2030-01-13T06:43:35.488		5.76	-32.69	48300.35	9.58		
lambda	E	2030-01-13T06:46:29.162		5.21	-32.36	50026.71	10.29		
epsilon	E	2030-01-13T06:48:38.638		4.79x	-32.11	51390.37	10.86		