

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-01-07T07:02:36.830  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3413211167262512000  
 2Mass ID (if available) : 04542665+2237050

ICRS Star Coord at Epoch: 04h 54m 26.64041s +22:37:05.00813s

RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.549  
 G magnitude : 17.179  
 RP magnitude : 16.354  
 BP magnitude : 17.863  
 DUPflag : 0  
 Distance (au) : 18.375  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.02  
 Sun-Target sep (deg) : 148.30  
 Sun-Moon sep (deg) : 107.58  
 B (ring opening deg) : 81.78  
 PA of pole (deg) : -25.81

# a(km) ring

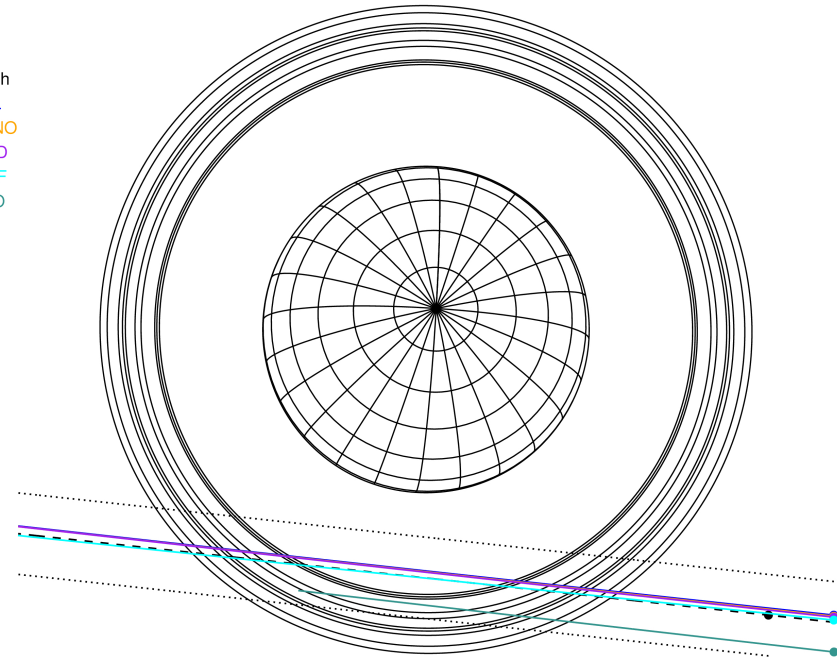
- 1 41837.2 6
- 2 42235.0 5
- 3 42571.2 4
- 4 44718.5 alpha
- 5 45661.1 beta
- 6 47176.1 eta
- 7 47626.3 gamma
- 8 48300.3 delta
- 9 50026.7 lambda
- 10 51149.4 epsilon



2030-01-07T07:02:36.8300 α: 04 54 26.6404 s: +22 37 05.008 C/A 2.897 PA 353.80 deg v\_sky -19.02 km/s D 18.38 AU  
 Credit: Styled after SORA/Lucky Star

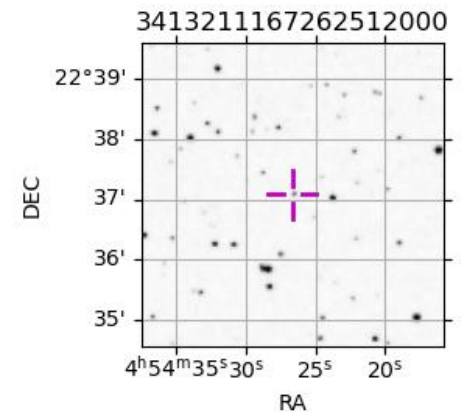
Uranus 2030-01-07T07:02:36 K14.55 G17.18 XRgt

Earth  
 PAL  
 KPNO  
 MCD  
 IRTF  
 ESO

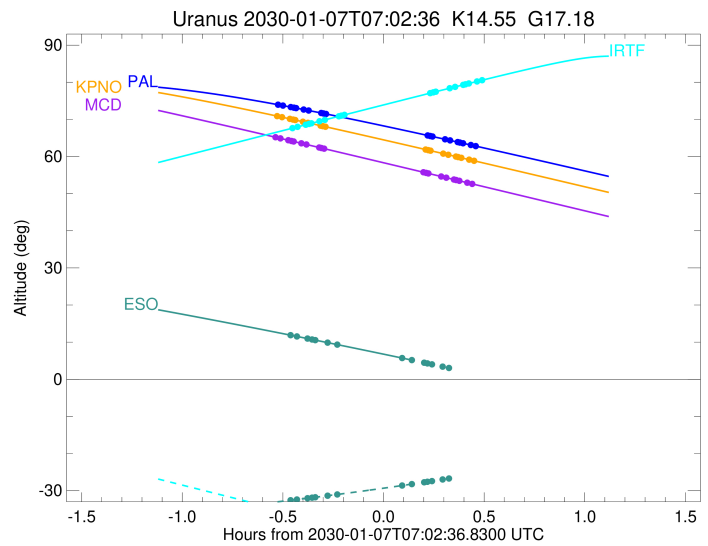
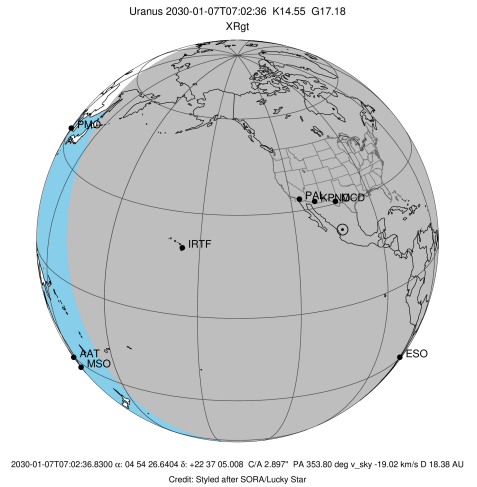


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 07 06:31 - JAN 07 07:29	PnnRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	JAN 07 06:31 - JAN 07 07:29	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	JAN 07 06:30 - JAN 07 07:28	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	JAN 07 06:35 - JAN 07 07:31	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 07 06:35 - JAN 07 07:11	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 : 2030-01-07T07:00:50.520  
 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 : 3413211167262512000  
 2Mass ID (if available) : 04542665+2237050  
 ICRS Star Coord at Epoch: 04h 54m 26.64041s +22:37:05.00813s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.549  
 G magnitude : 17.179  
 RP magnitude : 16.354  
 BP magnitude : 17.863  
 DUPflag : 0  
 Distance (au) : 18.375  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.02  
 Sun-Target sep (deg) : 148.30  
 Sun-Moon sep (deg) : 108.33  
 B (ring opening deg) : 81.78  
 PA of pole (deg) : -25.81  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.821  
 C/A sky separation (km) : 37592.2  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

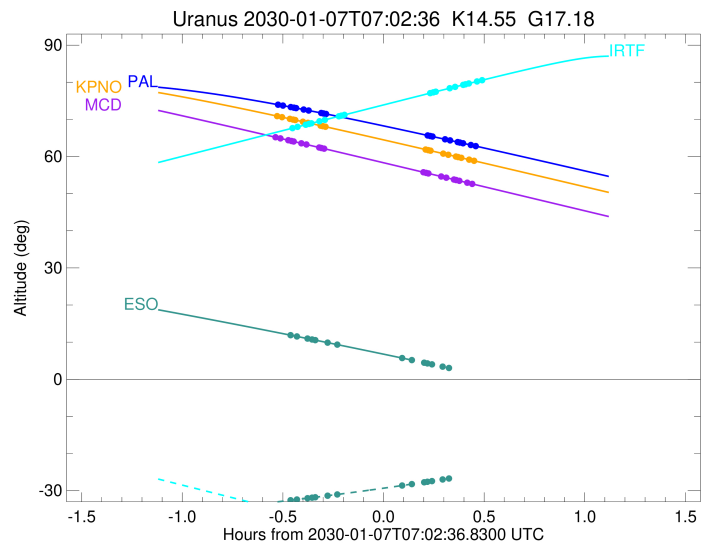
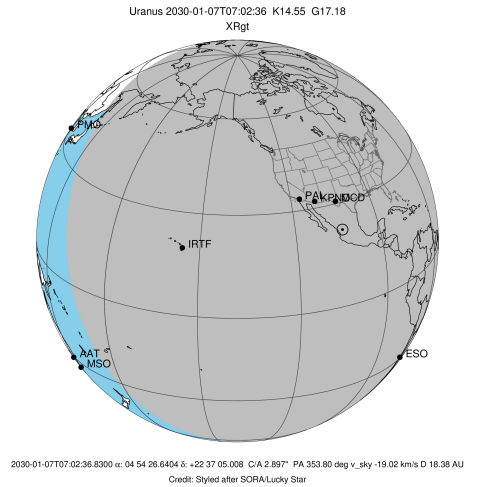


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-07T06:31:24.778		73.93	-68.89	50976.76	-12.86		
lambda	I	2030-01-07T06:32:38.954		73.72	-69.12	50026.71	-12.65		
delta	I	2030-01-07T06:34:58.914		73.32	-69.56	48300.35	-12.01		
gamma	I	2030-01-07T06:35:55.309		73.16	-69.74	47630.92	-11.73		
eta	I	2030-01-07T06:36:34.412		73.05	-69.86	47176.12	-11.53		
beta	I	2030-01-07T06:38:48.875		72.66	-70.27	45673.81	-10.79		
alpha	I	2030-01-07T06:40:20.004		72.39	-70.55	44713.69	-10.27		
4	I	2030-01-07T06:44:05.844		71.72	-71.23	42558.97	-8.76		
5	I	2030-01-07T06:44:48.977		71.59	-71.36	42185.76	-8.45		
6	I	2030-01-07T06:45:35.338		71.45	-71.50	41802.11	-8.12		

No planet occultations

6	E	2030-01-07T07:15:39.351		65.71	-76.30	41796.26	8.11		
5	E	2030-01-07T07:16:23.894		65.56	-76.40	42154.83	8.44		
4	E	2030-01-07T07:17:06.529		65.42	-76.50	42528.80	8.75		
alpha	E	2030-01-07T07:20:59.498		64.64	-76.99	44746.58	10.26		
beta	E	2030-01-07T07:22:25.609		64.36	-77.16	45651.53	10.78		
eta	E	2030-01-07T07:24:42.418		63.90	-77.43	47176.12	11.51		
gamma	E	2030-01-07T07:25:21.513		63.77	-77.50	47629.97	11.71		
delta	E	2030-01-07T07:26:18.098		63.58	-77.60	48300.35	11.98		
lambda	E	2030-01-07T07:28:38.347		63.11	-77.84	50026.71	12.62		
epsilon	E	2030-01-07T07:29:36.187		62.91	-77.94	50763.91	12.83		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-01-07T07:00:27.430  
 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 : 3413211167262512000  
 2Mass ID (if available) : 04542665+2237050  
 ICRS Star Coord at Epoch: 04h 54m 26.64041s +22:37:05.00813s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.549  
 G magnitude : 17.179  
 RP magnitude : 16.354  
 BP magnitude : 17.863  
 DUPflag : 0  
 Distance (au) : 18.375  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.02  
 Sun-Target sep (deg) : 148.30  
 Sun-Moon sep (deg) : 108.28  
 B (ring opening deg) : 81.78  
 PA of pole (deg) : -25.81  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.830  
 C/A sky separation (km) : 37716.0  
 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

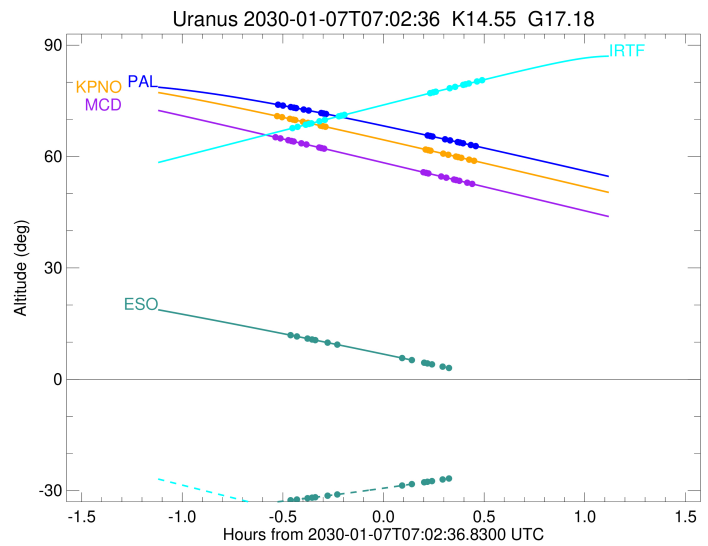
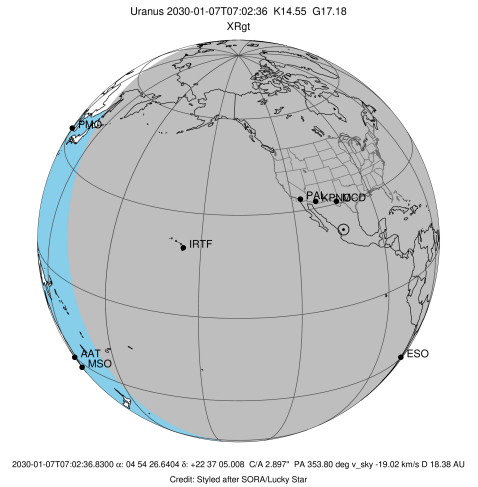


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-07T06:31:08.551		70.84	-73.41	50975.13	-12.80		
lambda	I	2030-01-07T06:32:22.932		70.60	-73.64	50026.71	-12.59		
delta	I	2030-01-07T06:34:43.605		70.14	-74.06	48300.35	-11.94		
gamma	I	2030-01-07T06:35:40.324		69.95	-74.23	47630.94	-11.66		
eta	I	2030-01-07T06:36:19.668		69.82	-74.34	47176.12	-11.46		
beta	I	2030-01-07T06:38:35.073		69.38	-74.74	45673.72	-10.71		
alpha	I	2030-01-07T06:40:06.925		69.07	-75.00	44713.89	-10.18		
4	I	2030-01-07T06:43:55.274		68.31	-75.65	42558.65	-8.65		
5	I	2030-01-07T06:44:39.023		68.16	-75.77	42185.29	-8.33		
6	I	2030-01-07T06:45:26.071		68.00	-75.90	41801.92	-7.99		

No planet occultations

6	E	2030-01-07T07:15:02.494		61.91	-79.78	41796.19	7.98		
5	E	2030-01-07T07:15:47.739		61.75	-79.85	42154.83	8.31		
4	E	2030-01-07T07:16:30.996		61.60	-79.90	42528.89	8.63		
alpha	E	2030-01-07T07:20:26.540		60.78	-80.18	44746.49	10.17		
beta	E	2030-01-07T07:21:53.401		60.48	-80.26	45651.60	10.69		
eta	E	2030-01-07T07:24:11.202		60.00	-80.37	47176.12	11.43		
gamma	E	2030-01-07T07:24:50.553		59.86	-80.40	47629.98	11.64		
delta	E	2030-01-07T07:25:47.484		59.66	-80.44	48300.35	11.91		
lambda	E	2030-01-07T07:28:08.504		59.16	-80.51	50026.71	12.56		
epsilon	E	2030-01-07T07:29:06.601		58.96	-80.53	50763.54	12.77		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-01-07T06:59:55.550  
 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 : 3413211167262512000  
 2Mass ID (if available) : 04542665+2237050  
 ICRS Star Coord at Epoch: 04h 54m 26.64041s +22:37:05.00813s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.549  
 G magnitude : 17.179  
 RP magnitude : 16.354  
 BP magnitude : 17.863  
 DUPflag : 0  
 Distance (au) : 18.375  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.02  
 Sun-Target sep (deg) : 148.30  
 Sun-Moon sep (deg) : 108.20  
 B (ring opening deg) : 81.78  
 PA of pole (deg) : -25.81  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.835  
 C/A sky separation (km) : 37785.2  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



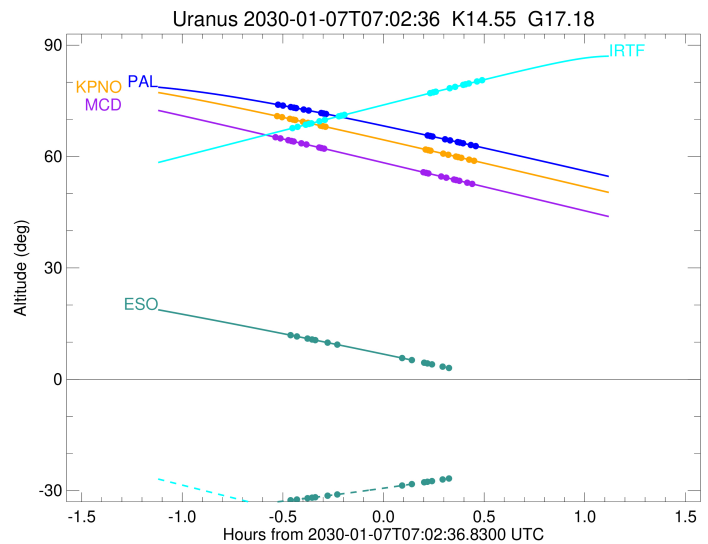
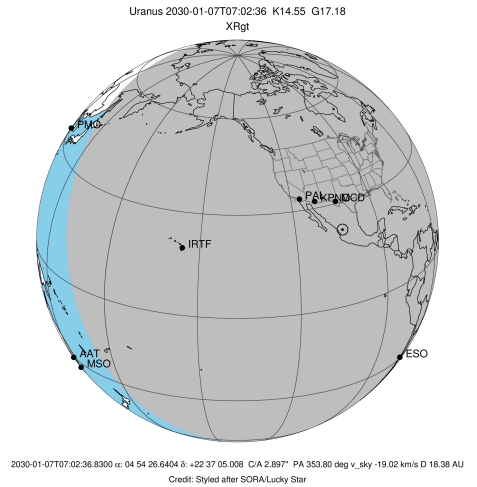
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-07T06:30:39.387		65.15	-79.21	50973.98	-12.76		
lambda	I	2030-01-07T06:31:53.911		64.89	-79.39	50026.71	-12.55		
delta	I	2030-01-07T06:34:15.073		64.39	-79.72	48300.35	-11.90		
gamma	I	2030-01-07T06:35:12.010		64.19	-79.85	47630.95	-11.61		
eta	I	2030-01-07T06:35:51.516		64.05	-79.93	47176.12	-11.41		
beta	I	2030-01-07T06:38:07.545		63.57	-80.22	45673.66	-10.66		
alpha	I	2030-01-07T06:39:39.866		63.24	-80.41	44714.03	-10.13		
4	I	2030-01-07T06:43:29.817		62.42	-80.83	42558.44	-8.57		
5	I	2030-01-07T06:44:13.954		62.27	-80.91	42184.97	-8.25		
6	I	2030-01-07T06:45:01.432		62.10	-80.98	41801.80	-7.91		

No planet occultations

6	E	2030-01-07T07:14:23.484		55.80	-81.41	41796.15	7.90		
5	E	2030-01-07T07:15:09.177		55.63	-81.36	42154.83	8.24		
4	E	2030-01-07T07:15:52.830		55.47	-81.30	42528.94	8.56		
alpha	E	2030-01-07T07:19:50.069		54.62	-80.95	44746.45	10.10		
beta	E	2030-01-07T07:21:17.436		54.31	-80.81	45651.64	10.63		
eta	E	2030-01-07T07:23:35.930		53.81	-80.56	47176.12	11.38		
gamma	E	2030-01-07T07:24:15.462		53.67	-80.48	47629.99	11.58		
delta	E	2030-01-07T07:25:12.644		53.46	-80.37	48300.35	11.86		
lambda	E	2030-01-07T07:27:34.234		52.95	-80.08	50026.71	12.51		
epsilon	E	2030-01-07T07:28:32.537		52.74	-79.96	50763.40	12.72		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2030-01-07T07:03:58.400
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       : 3413211167262512000
2Mass ID (if available) : 04542665+2237050
ICRS Star Coord at Epoch: 04h 54m 26.64041s +22:37:05.00813s
RUWE (>1.4 is poor) : 1.06
K magnitude           : 14.549
G magnitude           : 17.179
RP magnitude          : 16.354
BP magnitude          : 17.863
DUPflag              : 0
Distance (au)         : 18.375
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -19.02
Sun-Target sep (deg) : 148.30
Sun-Moon sep (deg)   : 108.53
B (ring opening deg) : 81.78
PA of pole (deg)     : -25.81
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.907
C/A sky separation (km) : 38736.1
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
    
```

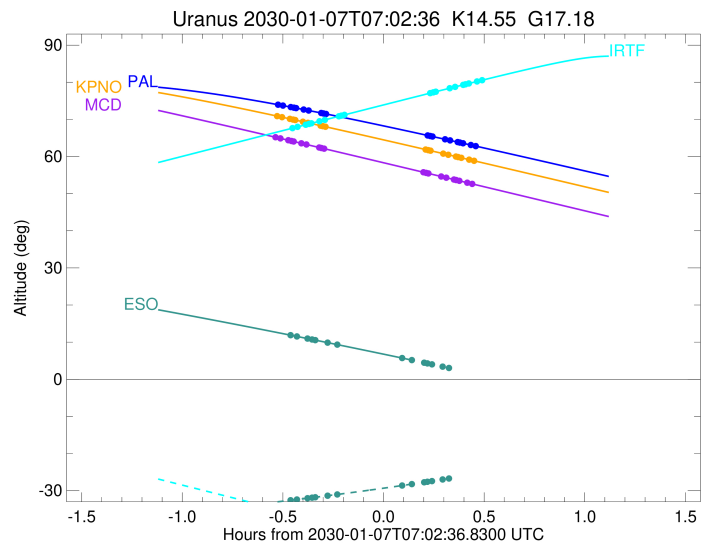
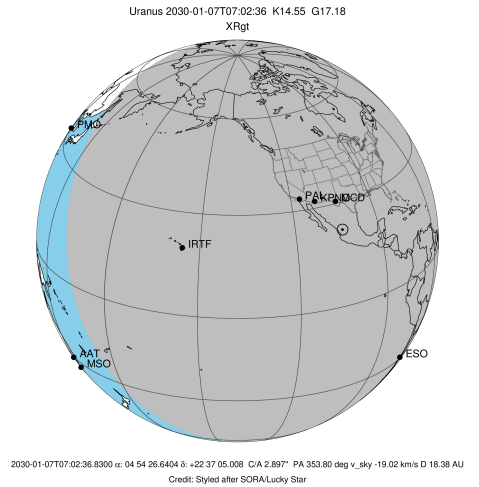


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-01-07T06:35:44.124		67.71	-36.05	50966.09	-12.35		
lambda	I	2030-01-07T06:37:00.552		68.00	-36.34	50026.71	-12.12		
delta	I	2030-01-07T06:39:27.252		68.57	-36.90	48300.35	-11.40		
gamma	I	2030-01-07T06:40:26.745		68.80	-37.13	47631.01	-11.09		
eta	I	2030-01-07T06:41:08.166		68.96	-37.29	47176.12	-10.87		
beta	I	2030-01-07T06:43:31.813		69.51	-37.83	45673.15	-10.03		
alpha	I	2030-01-07T06:45:10.198		69.89	-38.21	44715.22	-9.44		
4	I	2030-01-07T06:49:22.188		70.85	-39.17	42556.43	-7.65		
5	I	2030-01-07T06:50:12.074		71.05	-39.36	42181.93	-7.26		
6	I	2030-01-07T06:51:06.242		71.25	-39.57	41800.61	-6.85		

No planet occultations

6	E	2030-01-07T07:16:22.395	77.04	-45.37	41795.52	6.86
5	E	2030-01-07T07:17:14.685	77.24	-45.57	42155.08	7.27
4	E	2030-01-07T07:18:03.992	77.43	-45.76	42530.01	7.65
alpha	E	2030-01-07T07:22:22.628	78.40	-46.75	44745.46	9.44
beta	E	2030-01-07T07:23:55.783	78.75	-47.11	45652.47	10.04
eta	E	2030-01-07T07:26:21.406	79.30	-47.66	47176.12	10.88
gamma	E	2030-01-07T07:27:02.710	79.46	-47.82	47630.15	11.11
delta	E	2030-01-07T07:28:02.224	79.68	-48.05	48300.35	11.42
lambda	E	2030-01-07T07:30:28.771	80.22	-48.61	50026.71	12.13
epsilon	E	2030-01-07T07:31:28.473	80.44	-48.84	50759.10	12.37

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-01-07T06:58:44.470  
 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 : 3413211167262512000  
 2Mass ID (if available) : 04542665+2237050  
 ICRS Star Coord at Epoch: 04h 54m 26.64041s +22:37:05.00813s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.549  
 G magnitude : 17.179  
 RP magnitude : 16.354  
 BP magnitude : 17.863  
 DUPflag : 0  
 Distance (au) : 18.375  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -19.02  
 Sun-Target sep (deg) : 148.30  
 Sun-Moon sep (deg) : 107.46  
 B (ring opening deg) : 81.78  
 PA of pole (deg) : -25.81  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.220  
 C/A sky separation (km) : 42909.4  
 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	2030-01-07T06:35:19.371		11.80	-32.55	50912.71	-10.01		
lambda	I	2030-01-07T06:36:49.124		11.53	-32.39	50026.71	-9.63		
delta	I	2030-01-07T06:39:59.317		10.96	-32.04	48300.35	-8.51		
gamma	I	2030-01-07T06:41:20.359		10.71	-31.89	47631.38	-8.00		
eta	I	2030-01-07T06:42:18.670		10.53	-31.78	47176.12	-7.62		
beta	I	2030-01-07T06:45:58.210		9.86	-31.36	45669.11	-6.08		
alpha	I	2030-01-07T06:48:51.983		9.33	-31.03	44724.24	-4.79		

No planet occultations

alpha	E	2030-01-07T07:08:11.498		5.71	-28.62	44739.68	4.78		
beta	E	2030-01-07T07:11:00.431		5.18	-28.25	45656.44	6.06		
eta	E	2030-01-07T07:14:42.689		4.47x	-27.75	47176.12	7.59		
gamma	E	2030-01-07T07:15:41.094		4.28x	-27.62	47630.70	7.97		
delta	E	2030-01-07T07:17:02.488		4.02x	-27.44	48300.35	8.48		
lambda	E	2030-01-07T07:20:13.384		3.41x	-27.00	50026.71	9.59		
epsilon	E	2030-01-07T07:21:27.068		3.17x	-26.83	50747.87	9.97		