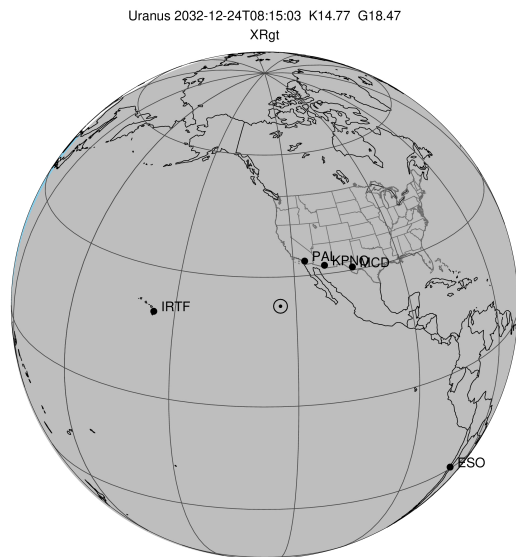


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2032-12-24T08:15:03.570
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427814051773830144
 2Mass ID (if available) : 05554199+2338597

ICRS Star Coord at Epoch: 05h 55m 41.99231s +23:38:59.38356s

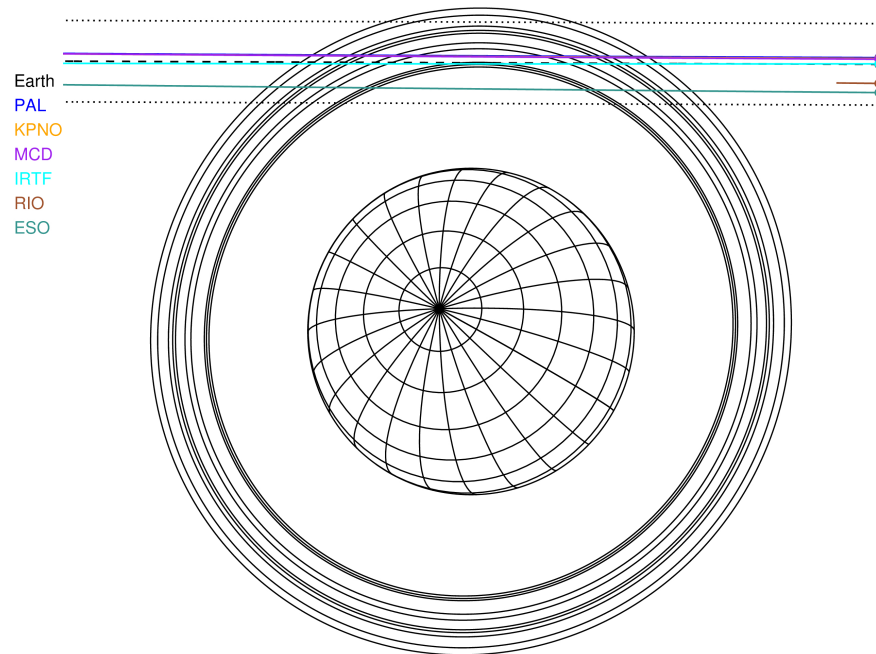
RUWE (>1.4 is poor) : 1.05
 K magnitude : 14.774
 G magnitude : 18.475
 RP magnitude : 17.463
 BP magnitude : 19.563
 DUPflag : 0
 Distance (au) : 18.037
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.36
 Sun-Target sep (deg) : 176.40
 Sun-Moon sep (deg) : 88.01
 B (ring opening deg) : 76.16
 PA of pole (deg) : 54.33

#	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



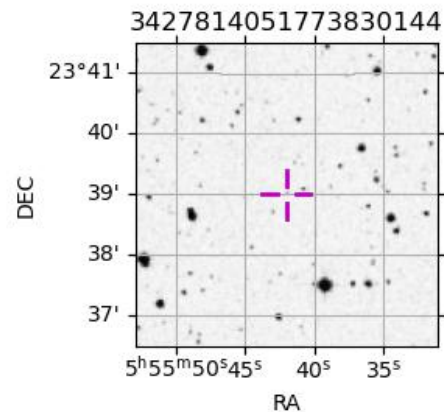
2032-12-24T08:15:03.5700 ra: 05 55 41.9923 s: +23 38 59.384 C/A 3.224 PA 179.77 deg v_sky -23.36 km/s D 18.04 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2032-12-24T08:15:03 K14.77 G18.47 XRgt



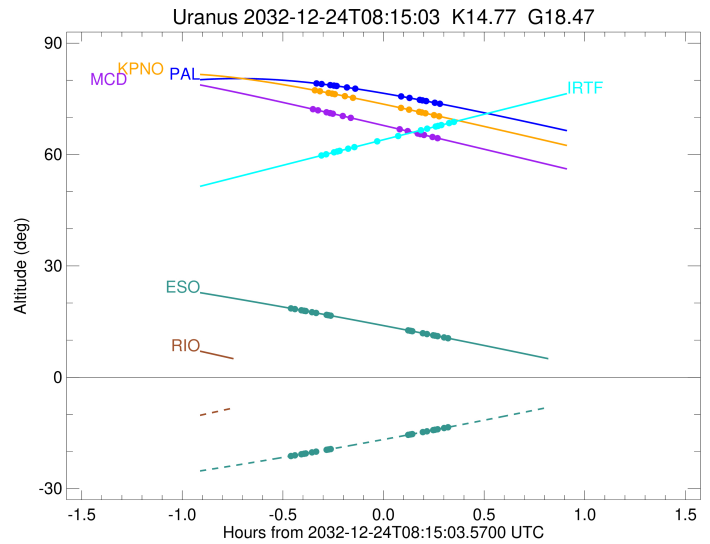
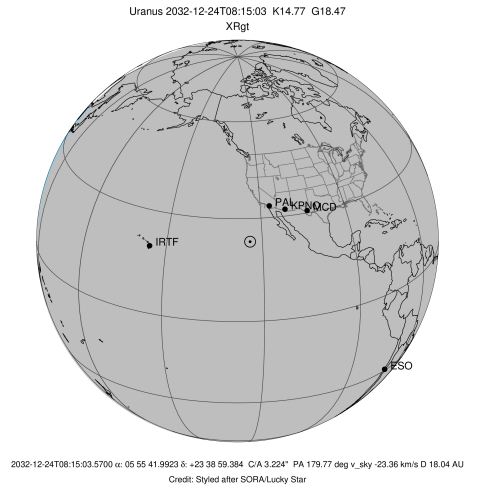
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEncode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1	+++++		+++++	DEC 24 07:54 - DEC 24 08:32	PnnRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	DEC 24 07:54 - DEC 24 08:32	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	DEC 24 07:53 - DEC 24 08:31	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	DEC 24 07:56 - DEC 24 08:36	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	+++++		+++++	DEC 24 07:47 - DEC 24 08:34	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            : 2032-12-24T08:14:18.890
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       : 3427814051773830144
2Mass ID (if available) : 05554199+2338597
ICRS Star Coord at Epoch: 05h 55m 41.99231s +23:38:59.38356s
RUWE (>1.4 is poor) : 1.05
K magnitude          : 14.774
G magnitude          : 18.475
RP magnitude         : 17.463
BP magnitude         : 19.563
DUPflag             : 0
Distance (au)        : 18.037
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -23.36
Sun-Target sep (deg) : 176.40
Sun-Moon sep (deg)   : 88.89
B (ring opening deg) : 76.16
PA of pole (deg)     : 54.33
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.301
C/A sky separation (km) : 43178.4
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
  
```



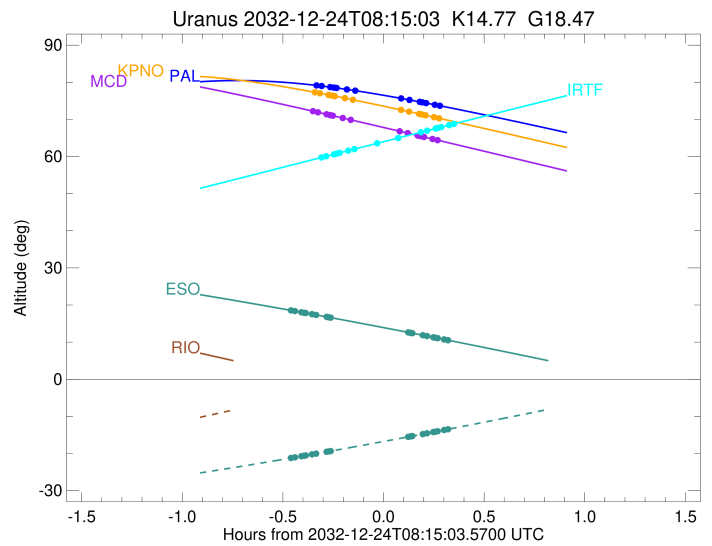
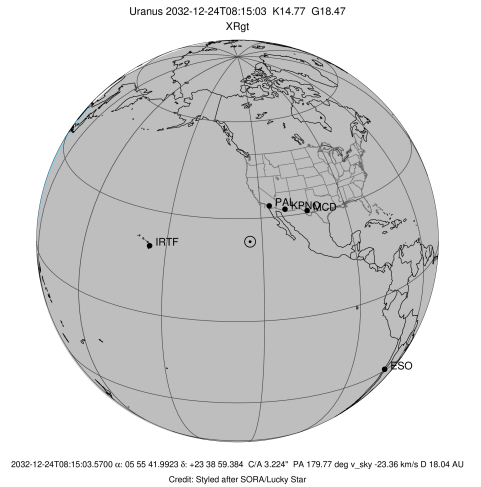
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-24T07:54:43.516		79.20	-80.08	51439.24	-12.96		
lambda	I	2032-12-24T07:56:37.728		78.99	-80.00	50026.71	-11.87		
delta	I	2032-12-24T07:59:12.485		78.70	-79.87	48300.35	-10.41		
gamma	I	2032-12-24T08:00:19.046		78.57	-79.80	47629.49	-9.74		
eta	I	2032-12-24T08:01:06.821		78.47	-79.75	47176.12	-9.24		
beta	I	2032-12-24T08:04:08.911		78.08	-79.53	45676.43	-7.19		
alpha	I	2032-12-24T08:06:35.809		77.75	-79.33	44748.30	-5.41		

No planet occultations

alpha	E	2032-12-24T08:20:19.893		75.66	-77.80	44738.28	5.41		
beta	E	2032-12-24T08:22:47.530		75.25	-77.47	45666.36	7.19		
eta	E	2032-12-24T08:25:51.001		74.73	-77.04	47176.12	9.24		
gamma	E	2032-12-24T08:26:38.368		74.59	-76.93	47625.35	9.73		
delta	E	2032-12-24T08:27:45.381		74.40	-76.77	48300.35	10.41		
lambda	E	2032-12-24T08:30:20.206		73.95	-76.38	50026.71	11.87		
epsilon	E	2032-12-24T08:32:21.553		73.59	-76.07	51530.35	12.96		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2032-12-24T08:13:56.760
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      : 3427814051773830144
2Mass ID (if available) : 05554199+2338597
ICRS Star Coord at Epoch: 05h 55m 41.99231s +23:38:59.38356s
RUWE (>1.4 is poor) : 1.05
K magnitude          : 14.774
G magnitude          : 18.475
RP magnitude         : 17.463
BP magnitude         : 19.563
DUPflag             : 0
Distance (au)       : 18.037
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -23.36
Sun-Target sep (deg) : 176.40
Sun-Moon sep (deg)  : 88.87
B (ring opening deg) : 76.16
PA of pole (deg)    : 54.33
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.292
C/A sky separation (km) : 43071.4
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
    
```

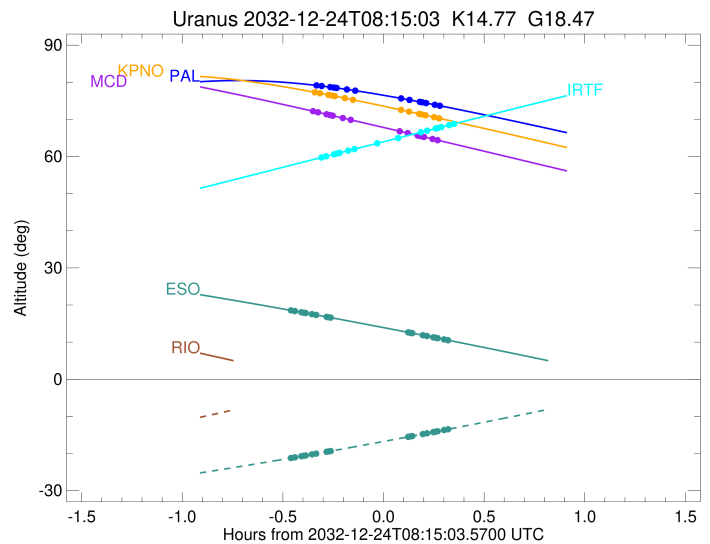
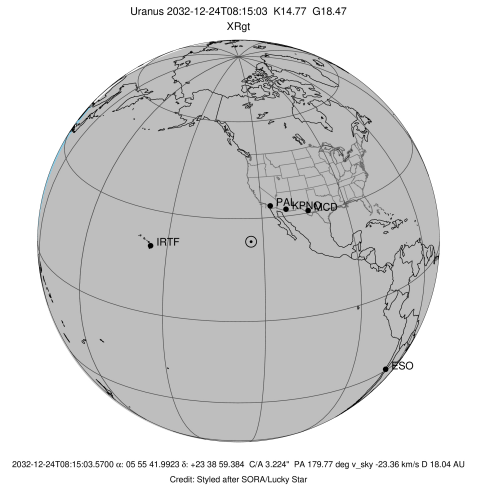


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-24T07:54:14.467		77.36	-79.55	51437.95	-13.05		
lambda	I	2032-12-24T07:56:07.773		77.04	-79.30	50026.71	-11.96		
delta	I	2032-12-24T07:58:41.103		76.59	-78.94	48300.35	-10.53		
gamma	I	2032-12-24T07:59:46.880		76.40	-78.78	47629.52	-9.86		
eta	I	2032-12-24T08:00:34.013		76.26	-78.66	47176.12	-9.37		
beta	I	2032-12-24T08:03:32.654		75.73	-78.21	45676.54	-7.38		
alpha	I	2032-12-24T08:05:54.671		75.29	-77.84	44748.48	-5.66		

No planet occultations

alpha	E	2032-12-24T08:20:17.068		72.56	-75.37	44738.01	5.66		
beta	E	2032-12-24T08:22:39.838		72.09	-74.94	45666.22	7.37		
eta	E	2032-12-24T08:25:39.887		71.50	-74.39	47176.12	9.37		
gamma	E	2032-12-24T08:26:26.620		71.34	-74.24	47625.32	9.86		
delta	E	2032-12-24T08:27:32.861		71.12	-74.03	48300.35	10.52		
lambda	E	2032-12-24T08:30:06.291		70.61	-73.55	50026.71	11.96		
epsilon	E	2032-12-24T08:32:06.780		70.21	-73.17	51529.88	13.04		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2032-12-24T08:13:25.550
 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 : 3427814051773830144
 2Mass ID (if available) : 05554199+2338597
 ICRS Star Coord at Epoch: 05h 55m 41.99231s +23:38:59.38356s
 RUWE (>1.4 is poor) : 1.05
 K magnitude : 14.774
 G magnitude : 18.475
 RP magnitude : 17.463
 BP magnitude : 19.563
 DUPflag : 0
 Distance (au) : 18.037
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.36
 Sun-Target sep (deg) : 176.40
 Sun-Moon sep (deg) : 88.84
 B (ring opening deg) : 76.16
 PA of pole (deg) : 54.33
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.289
 C/A sky separation (km) : 43026.4
 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



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

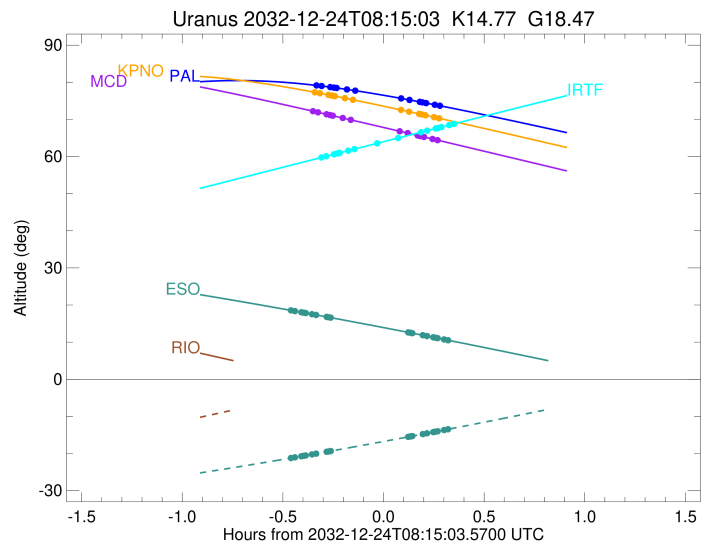
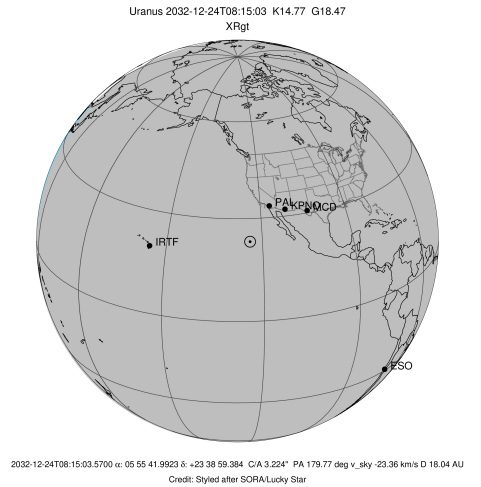
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-24T07:53:39.881		72.29	-75.29	51437.22	-13.08		
lambda	I	2032-12-24T07:55:32.831		71.91	-74.93	50026.71	-12.00		
delta	I	2032-12-24T07:58:05.618		71.38	-74.42	48300.35	-10.57		
gamma	I	2032-12-24T07:59:11.093		71.15	-74.21	47629.53	-9.91		
eta	I	2032-12-24T07:59:57.978		70.99	-74.05	47176.12	-9.43		
beta	I	2032-12-24T08:02:55.276		70.38	-73.46	45676.60	-7.45		
alpha	I	2032-12-24T08:05:15.413		69.89	-72.99	44748.56	-5.76		

No planet occultations

alpha	E	2032-12-24T08:19:54.060		66.81	-70.00	44737.91	5.76		
beta	E	2032-12-24T08:22:14.973		66.31	-69.51	45666.17	7.45		
eta	E	2032-12-24T08:25:13.716		65.68	-68.89	47176.12	9.42		
gamma	E	2032-12-24T08:26:00.211		65.51	-68.73	47625.32	9.90		
delta	E	2032-12-24T08:27:06.168		65.28	-68.50	48300.35	10.56		
lambda	E	2032-12-24T08:29:39.102		64.73	-67.96	50026.71	11.99		
epsilon	E	2032-12-24T08:31:39.306		64.31	-67.54	51529.76	13.06		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2032-12-24T08:17:07.150
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       : 3427814051773830144
2Mass ID (if available) : 05554199+2338597
ICRS Star Coord at Epoch: 05h 55m 41.99231s +23:38:59.38356s
RUWE (>1.4 is poor) : 1.05
K magnitude           : 14.774
G magnitude           : 18.475
RP magnitude          : 17.463
BP magnitude          : 19.563
DUPflag              : 0
Distance (au)         : 18.037
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -23.36
Sun-Target sep (deg) : 176.40
Sun-Moon sep (deg)   : 88.83
B (ring opening deg) : 76.16
PA of pole (deg)     : 54.33
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.204
C/A sky separation (km) : 41915.1
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
    
```

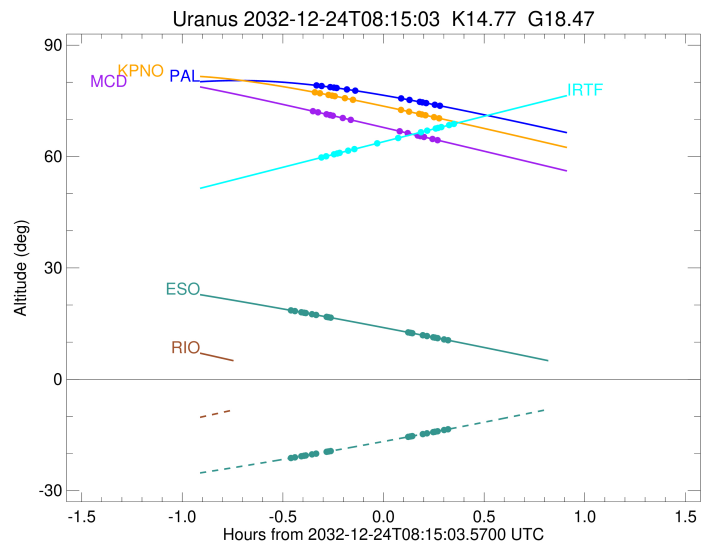
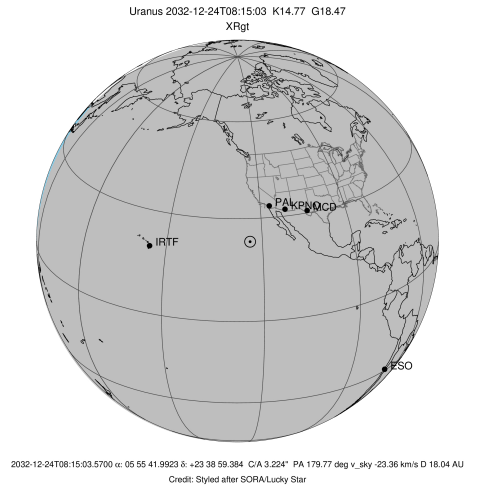


Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-24T07:56:13.743	59.67	-56.09	51427.55	-13.86		
lambda	I	2032-12-24T07:57:58.875	60.07	-56.49	50026.71	-12.90		
delta	I	2032-12-24T08:00:19.411	60.61	-57.03	48300.35	-11.65		
gamma	I	2032-12-24T08:01:18.382	60.83	-57.25	47629.73	-11.09		
eta	I	2032-12-24T08:02:00.057	60.99	-57.41	47176.12	-10.68		
beta	I	2032-12-24T08:04:31.532	61.57	-57.99	45677.40	-9.08		
alpha	I	2032-12-24T08:06:21.109	61.99	-58.41	44749.76	-7.83		
4	I	2032-12-24T08:13:25.138	63.61	-60.03	42555.26	-2.36		

No planet occultations

4	E	2032-12-24T08:19:07.964	64.92	-61.34	42547.34	2.37		
alpha	E	2032-12-24T08:26:13.460	66.55	-62.97	44735.19	7.83		
beta	E	2032-12-24T08:28:03.655	66.97	-63.39	45664.65	9.09		
eta	E	2032-12-24T08:30:36.315	67.55	-63.97	47176.12	10.69		
gamma	E	2032-12-24T08:31:17.520	67.70	-64.13	47625.00	11.10		
delta	E	2032-12-24T08:32:16.849	67.93	-64.35	48300.35	11.67		
lambda	E	2032-12-24T08:34:37.209	68.47	-64.89	50026.71	12.91		
epsilon	E	2032-12-24T08:36:29.113	68.89	-65.32	51522.98	13.88		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2032-12-24T08:11:36.280
 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 : 3427814051773830144
 2Mass ID (if available) : 05554199+2338597
 ICRS Star Coord at Epoch: 05h 55m 41.99231s +23:38:59.38356s
 RUWE (>1.4 is poor) : 1.05
 K magnitude : 14.774
 G magnitude : 18.475
 RP magnitude : 17.463
 BP magnitude : 19.563
 DUPflag : 0
 Distance (au) : 18.037
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.36
 Sun-Target sep (deg) : 176.40
 Sun-Moon sep (deg) : 88.21
 B (ring opening deg) : 76.16
 PA of pole (deg) : 54.33
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.905
 C/A sky separation (km) : 38000.7
 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	2032-12-24T07:47:13.922		18.60	-21.25	51385.72	-16.14		
lambda	I	2032-12-24T07:48:40.222		18.36	-21.03	50026.71	-15.46		
delta	I	2032-12-24T07:50:34.912		18.05	-20.73	48300.35	-14.63		
gamma	I	2032-12-24T07:51:21.272		17.92	-20.61	47630.35	-14.27		
eta	I	2032-12-24T07:51:53.392		17.83	-20.52	47176.12	-14.01		
beta	I	2032-12-24T07:53:43.883		17.53	-20.23	45679.40	-13.06		
alpha	I	2032-12-24T07:54:56.738		17.33	-20.04	44751.88	-12.39		
4	I	2032-12-24T07:58:07.639		16.80	-19.53	42571.08	-10.39		
5	I	2032-12-24T07:58:32.407		16.73	-19.47	42314.08	-10.15		
6	I	2032-12-24T07:59:23.132		16.59	-19.33	41814.12	-9.58		

No planet occultations

6	E	2032-12-24T08:22:25.745		12.63	-15.52	41847.43	9.57		
5	E	2032-12-24T08:23:10.766		12.50	-15.39	42296.49	10.14		
4	E	2032-12-24T08:23:33.422		12.43	-15.32	42535.89	10.38		
alpha	E	2032-12-24T08:26:46.380		11.86	-14.77	44728.93	12.36		
beta	E	2032-12-24T08:28:00.064		11.64	-14.56	45661.06	13.03		
eta	E	2032-12-24T08:29:52.154		11.31	-14.24	47176.12	13.98		
gamma	E	2032-12-24T08:30:23.925		11.22	-14.15	47624.25	14.23		
delta	E	2032-12-24T08:31:10.833		11.08	-14.01	48300.35	14.59		
lambda	E	2032-12-24T08:33:05.837		10.73	-13.68	50026.71	15.42		
epsilon	E	2032-12-24T08:34:39.668		10.45	-13.41	51502.17	16.10		