

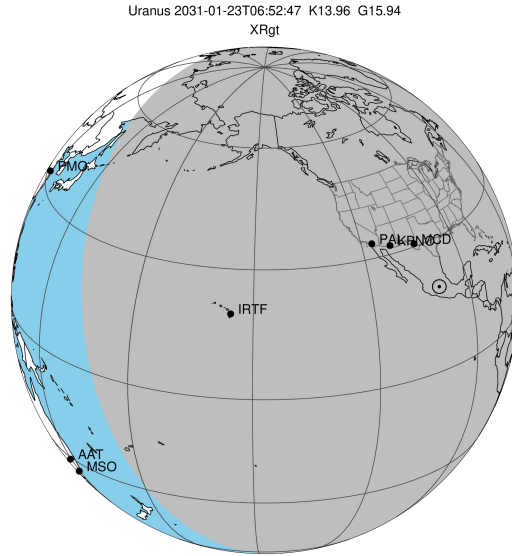
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-23T06:52:47.340
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3415723929290214144
 2Mass ID (if available) : 05113260+2304109

ICRS Star Coord at Epoch: 05h 11m 32.61374s +23:04:10.98164s

RUWE (>1.4 is poor) : 1.02
 K magnitude : 13.959
 G magnitude : 15.944
 RP magnitude : 15.290
 BP magnitude : 16.424
 DUPflag : 0
 Distance (au) : 18.424
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -15.20
 Sun-Target sep (deg) : 136.24
 Sun-Moon sep (deg) : 134.69
 B (ring opening deg) : 82.09
 PA of pole (deg) : 4.03

a(km) ring

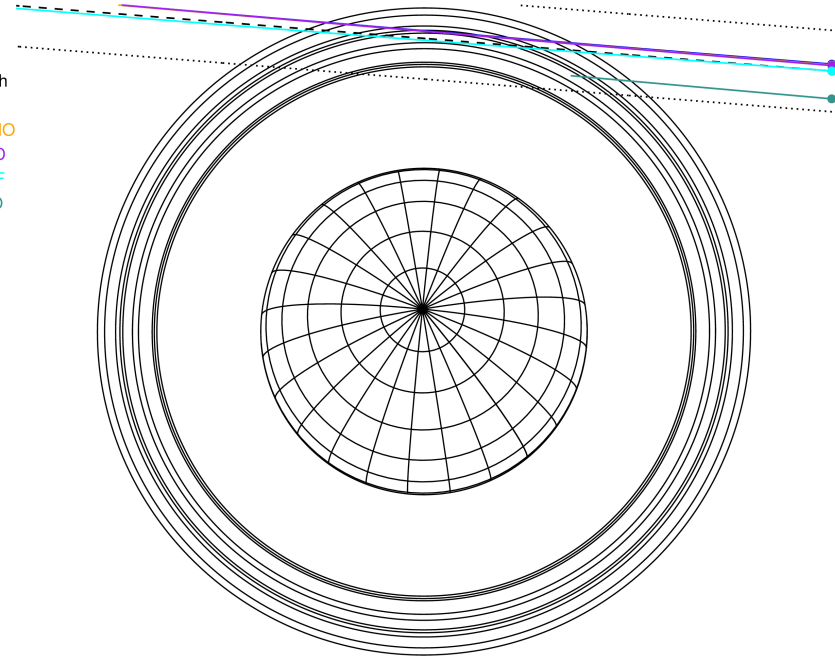
- 1 41837.2 6
- 2 42235.0 5
- 3 42571.2 4
- 4 44718.5 alpha
- 5 45661.1 beta
- 6 47176.1 eta
- 7 47626.3 gamma
- 8 48300.3 delta
- 9 50026.7 lambda
- 10 51149.4 epsilon



2031-01-23T06:52:47.3400 ra: 05 11 32.6137 s: +23 04 10.982 C/A 3.431" PA 175.42 deg v_sky -15.20 km/s D 18.42 AU
 Credit: Styled after SORA/Lucky Star

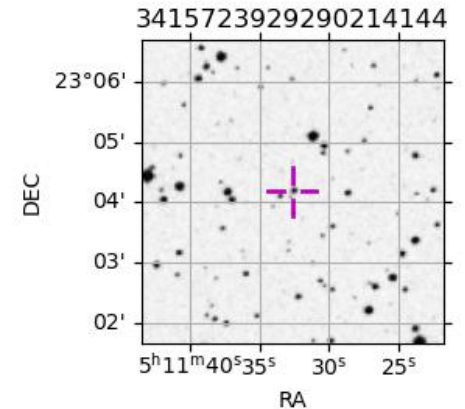
Uranus 2031-01-23T06:52:47 K13.96 G15.94 XRgt

Earth
 PAL
 KPNO
 MCD
 IRTF
 ESO



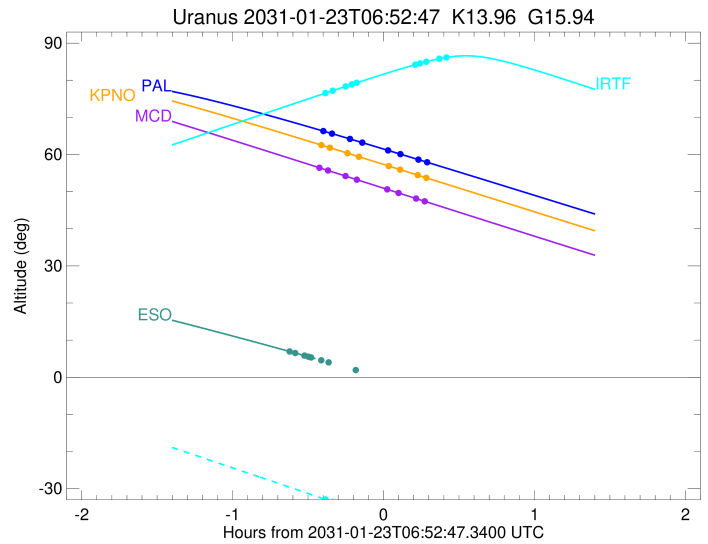
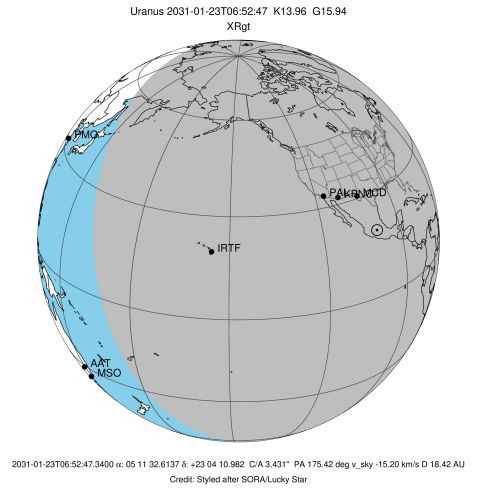
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 23 06:30 - JAN 23 07:09	PnnRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	++++		++++	JAN 23 06:29 - JAN 23 07:09	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	++++		++++	JAN 23 06:28 - JAN 23 07:08	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	JAN 23 06:30 - JAN 23 07:17	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 23 06:16 - JAN 23 06:24	PnnRin
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



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target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-01-23T06:49:37.640
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      : 3415723929290214144
2Mass ID (if available) : 05113260+2304109
ICRS Star Coord at Epoch: 05h 11m 32.61374s +23:04:10.98164s
RUWE (>1.4 is poor) : 1.02
K magnitude         : 13.959
G magnitude         : 15.944
RP magnitude        : 15.290
BP magnitude        : 16.424
DUPflag            : 0
Distance (au)       : 18.424
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -15.20
Sun-Target sep (deg) : 136.24
Sun-Moon sep (deg)  : 135.02
B (ring opening deg) : 82.09
PA of pole (deg)    : 4.03
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.513
C/A sky separation (km) : 46943.6
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
  
```



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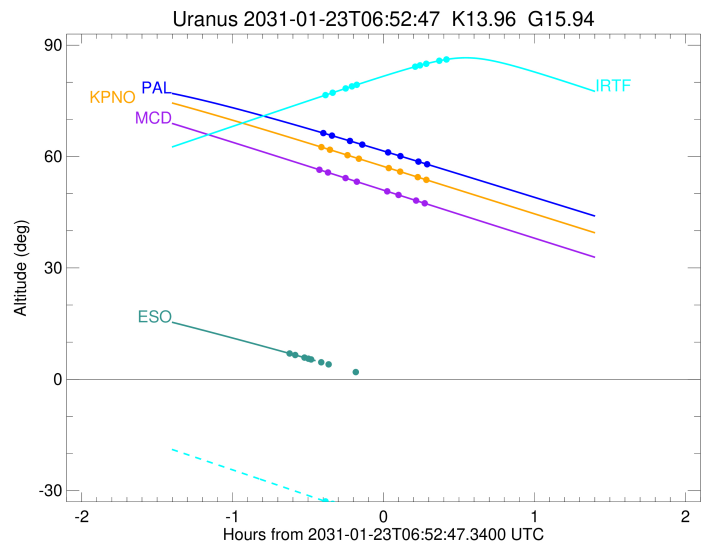
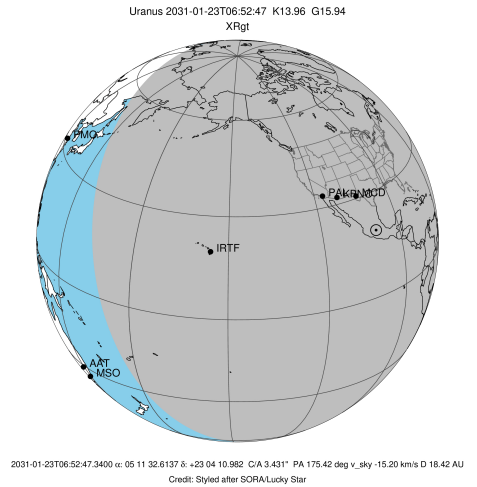
b: ring blocked by planet  x: target alt < 5.0 deg or sun > -5.0 deg
Ring      I/E      UTC      b? alt  alt-sun  radius  r-dot  lat-geo lat-geodetic
-----
epsilon   I  2031-01-23T06:29:59.730  66.09 -65.86  50774.45 -5.63
lambda    I  2031-01-23T06:32:21.197  65.62 -66.29  50026.71 -4.98
delta     I  2031-01-23T06:39:32.295  64.18 -67.57  48300.35 -2.99
gamma     I  2031-01-23T06:44:33.295  63.17 -68.45  47622.11 -1.50
  
```

No planet occultations

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gamma     E  2031-01-23T06:54:24.914  61.16 -70.09  47622.82  1.50
delta     E  2031-01-23T06:59:25.745  60.13 -70.88  48300.35  2.99
lambda    E  2031-01-23T07:06:37.639  58.64 -71.96  50026.71  4.97
epsilon   E  2031-01-23T07:09:35.277  58.03 -72.38  50976.60  5.61
  
```

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-23T06:49:05.460
 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 : 3415723929290214144
 2Mass ID (if available) : 05113260+2304109
 ICRS Star Coord at Epoch: 05h 11m 32.61374s +23:04:10.98164s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 13.959
 G magnitude : 15.944
 RP magnitude : 15.290
 BP magnitude : 16.424
 DUPflag : 0
 Distance (au) : 18.424
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -15.20
 Sun-Target sep (deg) : 136.24
 Sun-Moon sep (deg) : 134.95
 B (ring opening deg) : 82.09
 PA of pole (deg) : 4.03
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.507
 C/A sky separation (km) : 46862.6
 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



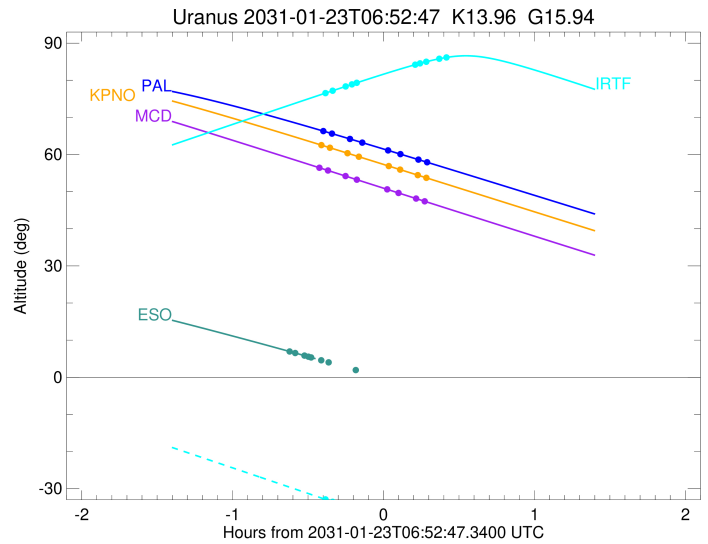
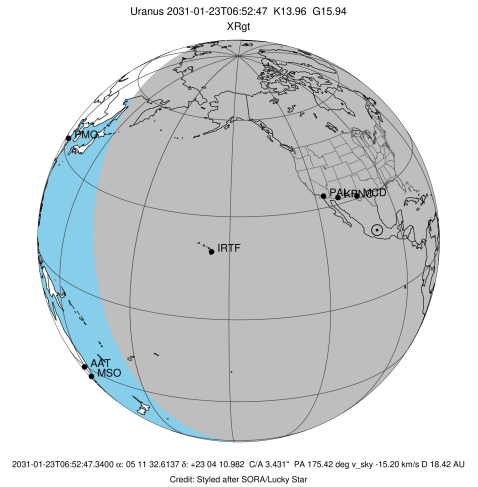
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-23T06:29:13.236		62.31	-70.23	50773.63	-5.69		
lambda	I	2031-01-23T06:31:32.797		61.82	-70.64	50026.71	-5.05		
delta	I	2031-01-23T06:38:33.376		60.35	-71.82	48300.35	-3.12		
gamma	I	2031-01-23T06:43:10.911		59.37	-72.57	47622.05	-1.76		

No planet occultations

gamma	E	2031-01-23T06:54:42.939		56.93	-74.29	47622.89	1.76		
delta	E	2031-01-23T06:59:20.349		55.95	-74.91	48300.35	3.12		
lambda	E	2031-01-23T07:06:21.840		54.46	-75.76	50026.71	5.04		
epsilon	E	2031-01-23T07:09:17.625		53.84	-76.08	50977.89	5.67		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-01-23T06:48:22.250
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      : 3415723929290214144
2Mass ID (if available) : 05113260+2304109
ICRS Star Coord at Epoch: 05h 11m 32.61374s +23:04:10.98164s
RUWE (>1.4 is poor) : 1.02
K magnitude          : 13.959
G magnitude          : 15.944
RP magnitude         : 15.290
BP magnitude         : 16.424
DUPflag             : 0
Distance (au)        : 18.424
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -15.20
Sun-Target sep (deg) : 136.24
Sun-Moon sep (deg)  : 134.83
B (ring opening deg) : 82.09
PA of pole (deg)    : 4.03
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.506
C/A sky separation (km) : 46853.3
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_itrff93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



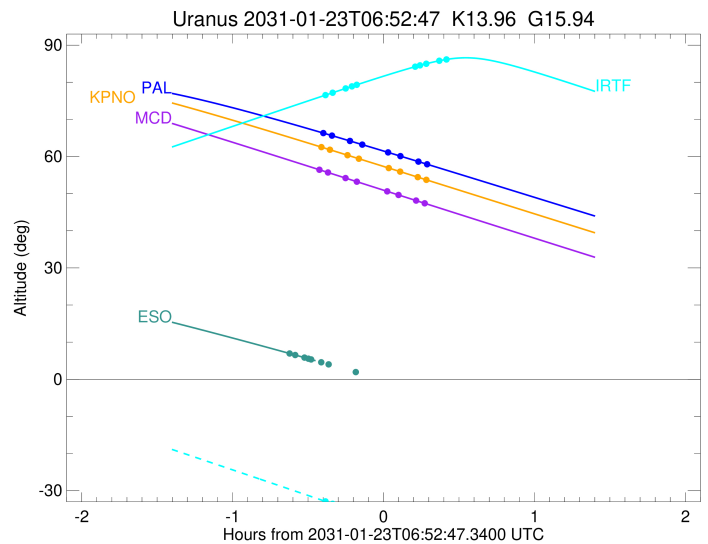
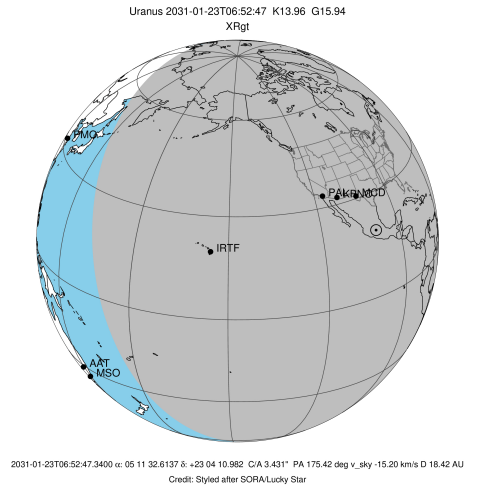
Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-23T06:28:26.523	56.19	-75.83	50773.36	-5.69		
lambda	I	2031-01-23T06:30:46.030	55.69	-76.16	50026.71	-5.05		
delta	I	2031-01-23T06:37:46.045	54.18	-77.05	48300.35	-3.13		
gamma	I	2031-01-23T06:42:21.646	53.19	-77.56	47622.05	-1.78		

No planet occultations

gamma	E	2031-01-23T06:54:05.638	50.66	-78.54	47622.89	1.78		
delta	E	2031-01-23T06:58:41.174	49.66	-78.77	48300.35	3.13		
lambda	E	2031-01-23T07:05:42.255	48.15	-78.95	50026.71	5.04		
epsilon	E	2031-01-23T07:08:38.081	47.52	-78.96	50977.62	5.67		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch             : 2031-01-23T06:53:54.380
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        : 3415723929290214144
2Mass ID (if available) : 05113260+2304109
ICRS Star Coord at Epoch: 05h 11m 32.61374s +23:04:10.98164s
RUWE (>1.4 is poor)  : 1.02
K magnitude           : 13.959
G magnitude           : 15.944
RP magnitude          : 15.290
BP magnitude          : 16.424
DUPflag              : 0
Distance (au)         : 18.424
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -15.20
Sun-Target sep (deg)  : 136.24
Sun-Moon sep (deg)    : 135.49
B (ring opening deg)  : 82.09
PA of pole (deg)      : 4.03
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.403
C/A sky separation (km) : 45470.0
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLvl.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
    
```

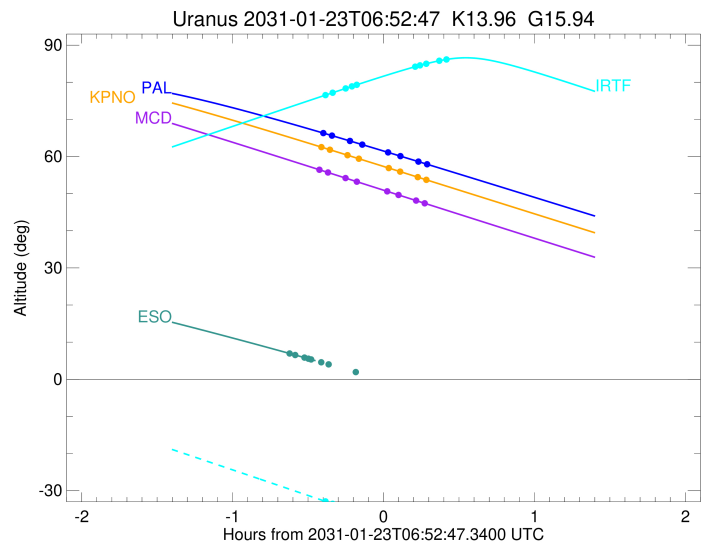
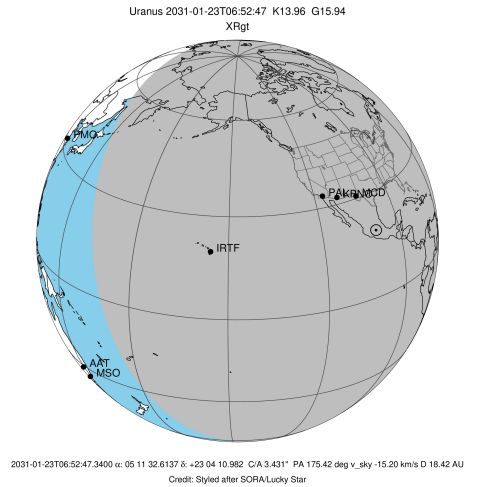


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-23T06:30:42.026		76.77	-33.13	50764.93	-6.71		
lambda	I	2031-01-23T06:32:36.574		77.20	-33.57	50026.71	-6.21		
delta	I	2031-01-23T06:37:47.816		78.36	-34.77	48300.35	-4.86		
gamma	I	2031-01-23T06:40:18.388		78.92	-35.35	47621.63	-4.15		
eta	I	2031-01-23T06:42:13.340		79.34	-35.79	47176.12	-3.60		

No planet occultations

eta	E	2031-01-23T07:05:19.136		84.19	-41.15	47176.12	3.60		
gamma	E	2031-01-23T07:07:14.547		84.54	-41.60	47623.60	4.15		
delta	E	2031-01-23T07:09:44.622		84.99	-42.18	48300.35	4.86		
lambda	E	2031-01-23T07:14:55.804		85.80	-43.38	50026.71	6.21		
epsilon	E	2031-01-23T07:17:26.151		86.11	-43.97	51006.59	6.71		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-23T06:46:45.250
 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 : 3415723929290214144
 2Mass ID (if available) : 05113260+2304109
 ICRS Star Coord at Epoch: 05h 11m 32.61374s +23:04:10.98164s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 13.959
 G magnitude : 15.944
 RP magnitude : 15.290
 BP magnitude : 16.424
 DUPflag : 0
 Distance (au) : 18.424
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -15.20
 Sun-Target sep (deg) : 136.24
 Sun-Moon sep (deg) : 134.08
 B (ring opening deg) : 82.09
 PA of pole (deg) : 4.03
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.139
 C/A sky separation (km) : 41944.1
 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	2031-01-23T06:16:16.295		6.80	-37.59	50749.47	-8.49		
lambda	I	2031-01-23T06:17:43.038		6.52	-37.46	50026.71	-8.19		
delta	I	2031-01-23T06:21:24.492		5.83	-37.11	48300.35	-7.39		
gamma	I	2031-01-23T06:22:58.684		5.53	-36.96	47621.18	-7.03		
eta	I	2031-01-23T06:24:03.193		5.33	-36.86	47176.12	-6.77		
beta	I	2031-01-23T06:28:01.718		4.57x	-36.46	45680.14	-5.75		
alpha	I	2031-01-23T06:31:04.218		3.99x	-36.15	44704.48	-4.91		
4	I	2031-01-23T06:42:19.114		1.83x	-34.92	42541.10	-1.41		

No planet occultations

4	E	2031-01-23T06:50:50.732		0.17x	-33.93	42535.42	1.41		
alpha	E	2031-01-23T07:02:08.299		-2.05x	-32.52	44688.68	4.89		
beta	E	2031-01-23T07:05:13.174		-2.66x	-32.12	45670.28	5.73		
eta	E	2031-01-23T07:09:14.663		-3.46x	-31.58	47176.12	6.73		
gamma	E	2031-01-23T07:10:20.040		-3.68x	-31.44	47624.52	6.98		
delta	E	2031-01-23T07:11:54.353		-3.99x	-31.23	48300.35	7.34		
lambda	E	2031-01-23T07:15:37.370		-4.74x	-30.72	50026.71	8.13		
epsilon	E	2031-01-23T07:17:41.044		-5.15x	-30.43	51056.47	8.43		