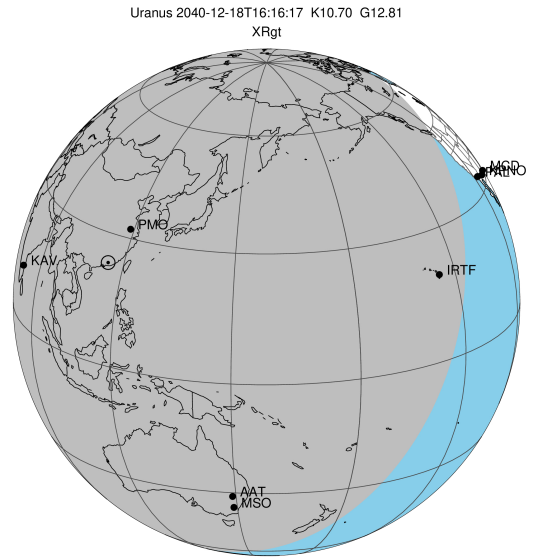


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2040-12-18T16:16:17.610
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 659756012309014656
 2Mass ID (if available) : 08375970+1908375

ICRS Star Coord at Epoch: 08h 37m 59.67931s +19:08:37.02619s

RUWE (>1.4 is poor) : 4.42
 K magnitude : 10.700
 G magnitude : 12.811
 RP magnitude : 12.119
 BP magnitude : 13.361
 DUPflag : 0
 Distance (au) : 17.777
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.17
 Sun-Target sep (deg) : 139.86
 Sun-Moon sep (deg) : 38.33
 B (ring opening deg) : 40.15
 PA of pole (deg) : 93.99

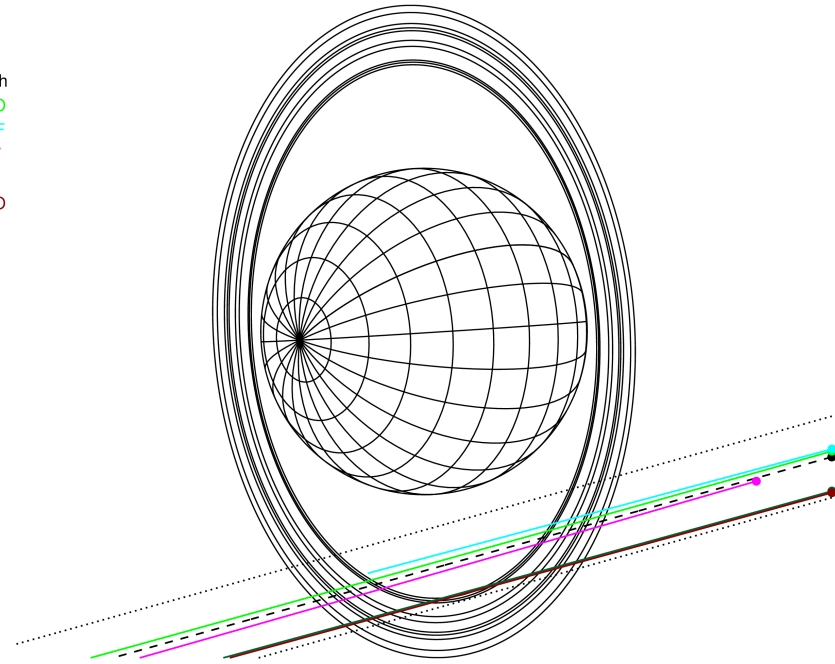
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2040-12-18T16:16:17.6100 α: 08 37 59.6793 s δ: +19 08 37.026 C/A 2.788° PA 15.61 deg v_sky -16.17 km/s D 17.78 AU
 Credit: Styled after SORA/Lucky Star

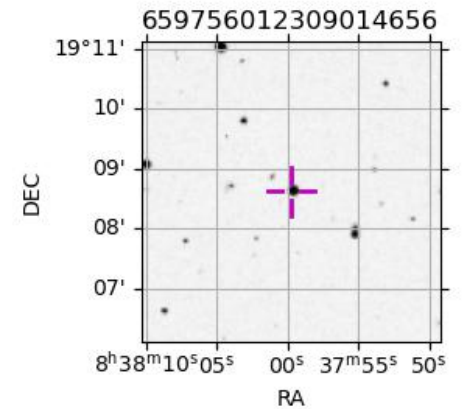
Earth
 PMO
 IRTF
 KAV
 AAT
 MSO

Uranus 2040-12-18T16:16:17 K10.70 G12.81 XRgt

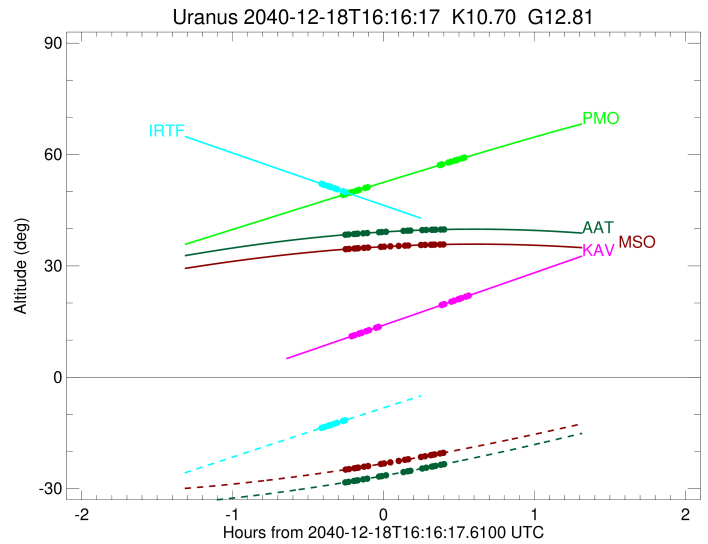
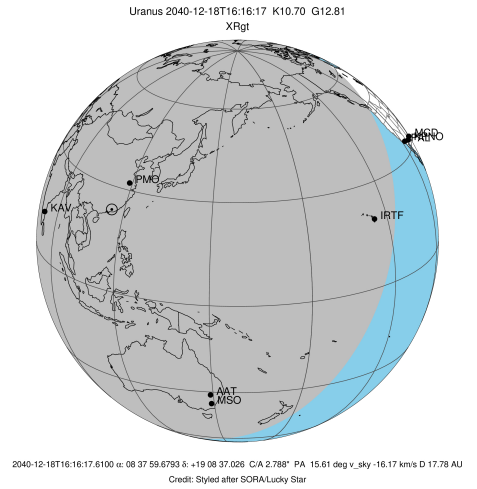


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++		+++++	DEC 18 16:00 - DEC 18 16:48	PnnRie
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald Obs. 2.7m	30.7	256.0					PnnRnn
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++			DEC 18 15:52 - DEC 18 16:01	PnnRin
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	DEC 18 16:04 - DEC 18 16:50	PnnRie
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European Southern Obs	-29.3	289.3					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1	+++++		+++++	DEC 18 16:01 - DEC 18 16:40	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++		+++++	DEC 18 16:01 - DEC 18 16:39	PnnRie



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2040-12-18T16:20:08.480
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 659756012309014656
 2Mass ID (if available) : 08375970+1908375
 ICRS Star Coord at Epoch: 08h 37m 59.67931s +19:08:37.02619s
 RUWE (>1.4 is poor) : 4.42
 K magnitude : 10.700
 G magnitude : 12.811
 RP magnitude : 12.119
 BP magnitude : 13.361
 DUPflag : 0
 Distance (au) : 17.777
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.17
 Sun-Target sep (deg) : 139.86
 Sun-Moon sep (deg) : 38.35
 B (ring opening deg) : 40.15
 PA of pole (deg) : 93.99
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.737
 C/A sky separation (km) : 35291.4
 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



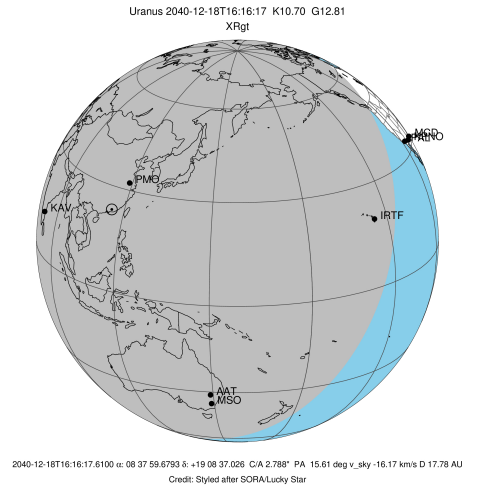
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-12-18T16:00:33.101		49.20	-81.51	50761.05	-17.89		
lambda	I	2040-12-18T16:01:14.351		49.34	-81.52	50026.71	-17.67		
delta	I	2040-12-18T16:02:53.924		49.69	-81.51	48300.35	-16.99		
gamma	I	2040-12-18T16:03:34.140		49.83	-81.50	47622.87	-16.70		
eta	I	2040-12-18T16:04:01.060		49.93	-81.50	47176.12	-16.49		
beta	I	2040-12-18T16:05:35.755		50.26	-81.47	45653.03	-15.74		
alpha	I	2040-12-18T16:06:33.170		50.46	-81.45	44752.27	-15.22		
4	I	2040-12-18T16:09:02.969		50.99	-81.36	42601.65	-13.75		
5	I	2040-12-18T16:09:22.143		51.05	-81.34	42315.11	-13.53		
6	I	2040-12-18T16:09:57.876		51.18	-81.32	41876.45	-13.19		

No planet occultations

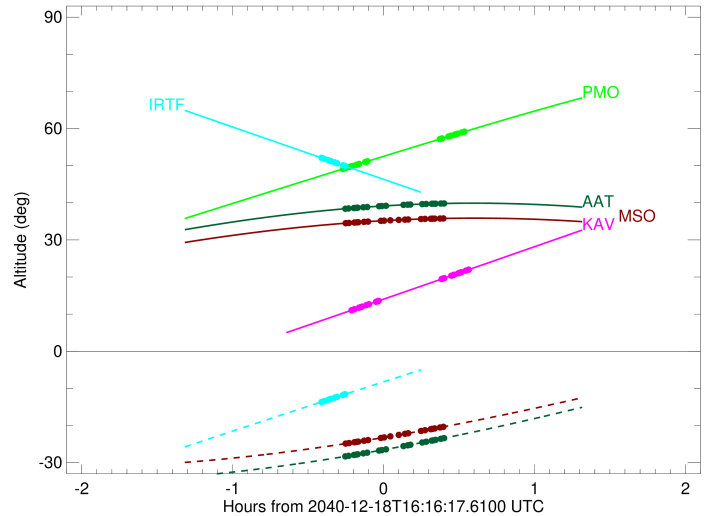
6	E	2040-12-18T16:38:42.630		57.16	-78.20	41840.43	13.22		
5	E	2040-12-18T16:39:15.635		57.28	-78.12	42264.66	13.56		
4	E	2040-12-18T16:39:36.519		57.35	-78.06	42552.87	13.78		
alpha	E	2040-12-18T16:42:05.432		57.86	-77.67	44730.86	15.26		
beta	E	2040-12-18T16:43:06.667		58.07	-77.51	45677.27	15.78		
eta	E	2040-12-18T16:44:39.419		58.38	-77.25	47176.12	16.54		
gamma	E	2040-12-18T16:45:06.194		58.47	-77.18	47621.80	16.75		
delta	E	2040-12-18T16:45:46.349		58.61	-77.07	48300.35	17.05		
lambda	E	2040-12-18T16:47:25.596		58.95	-76.79	50026.71	17.73		
epsilon	E	2040-12-18T16:48:21.842		59.14	-76.63	51034.19	17.95		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2040-12-18T16:12:37.290
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      : 659756012309014656
2Mass ID (if available) : 08375970+1908375
ICRS Star Coord at Epoch: 08h 37m 59.67931s +19:08:37.02619s
RUWE (>1.4 is poor) : 4.42
K magnitude          : 10.700
G magnitude          : 12.811
RP magnitude         : 12.119
BP magnitude         : 13.361
DUPflag             : 0
Distance (au)       : 17.777
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -16.17
Sun-Target sep (deg) : 139.86
Sun-Moon sep (deg)  : 39.18
B (ring opening deg) : 40.15
PA of pole (deg)    : 93.99
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.661
C/A sky separation (km) : 34308.8
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall11.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
    
```



Uranus 2040-12-18T16:16:17 K10.70 G12.81



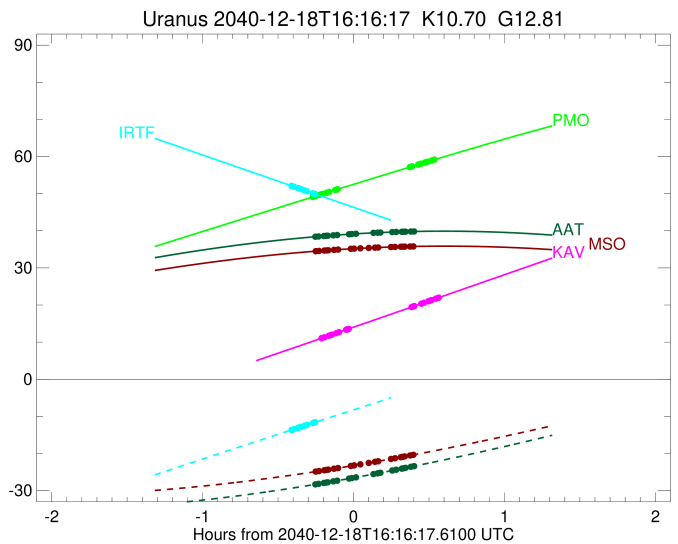
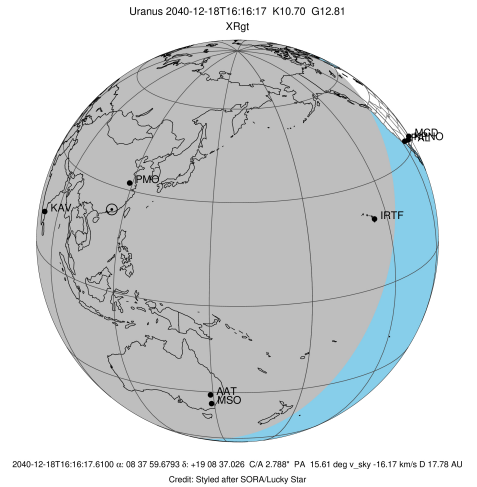
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-12-18T15:52:02.504		52.02	-13.56	50763.64	-18.41		
lambda	I	2040-12-18T15:52:42.706		51.86	-13.41	50026.71	-18.21		
delta	I	2040-12-18T15:54:19.140		51.48	-13.06	48300.35	-17.58		
gamma	I	2040-12-18T15:54:57.958		51.33	-12.92	47622.97	-17.31		
eta	I	2040-12-18T15:55:23.908		51.23	-12.82	47176.12	-17.13		
beta	I	2040-12-18T15:56:54.878		50.87	-12.49	45652.50	-16.44		
alpha	I	2040-12-18T15:57:49.679		50.66	-12.29	44752.15	-15.97		
4	I	2040-12-18T16:00:11.354		50.10	-11.77	42602.86	-14.65		
5	I	2040-12-18T16:00:29.284		50.03	-11.70	42315.23	-14.45		
6	I	2040-12-18T16:01:02.869		49.90	-11.58	41877.06	-14.16		

No planet occultations

6	E	2040-12-18T16:31:58.939	42.66	-4.83x	41838.22	14.13
5	E	2040-12-18T16:32:30.052	42.54	-4.72x	42260.85	14.42
4	E	2040-12-18T16:32:49.730	42.46	-4.65x	42550.83	14.62
alpha	E	2040-12-18T16:35:11.299	41.91	-4.14x	44729.46	15.92
beta	E	2040-12-18T16:36:10.221	41.68	-3.93x	45677.75	16.39
eta	E	2040-12-18T16:37:39.789	41.33	-3.60x	47176.12	17.07
gamma	E	2040-12-18T16:38:05.757	41.23	-3.51x	47621.92	17.26
delta	E	2040-12-18T16:38:44.759	41.08	-3.37x	48300.35	17.53
lambda	E	2040-12-18T16:40:21.513	40.70	-3.02x	50026.71	18.15
epsilon	E	2040-12-18T16:41:17.268	40.49	-2.82x	51047.73	18.34

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2040-12-18T16:22:18.540
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 659756012309014656
 2Mass ID (if available) : 08375970+1908375
 ICRS Star Coord at Epoch: 08h 37m 59.67931s +19:08:37.02619s
 RUWE (>1.4 is poor) : 4.42
 K magnitude : 10.700
 G magnitude : 12.811
 RP magnitude : 12.119
 BP magnitude : 13.361
 DUPflag : 0
 Distance (au) : 17.777
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.17
 Sun-Target sep (deg) : 139.86
 Sun-Moon sep (deg) : 37.78
 B (ring opening deg) : 40.15
 PA of pole (deg) : 93.99
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.864
 C/A sky separation (km) : 36927.3
 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

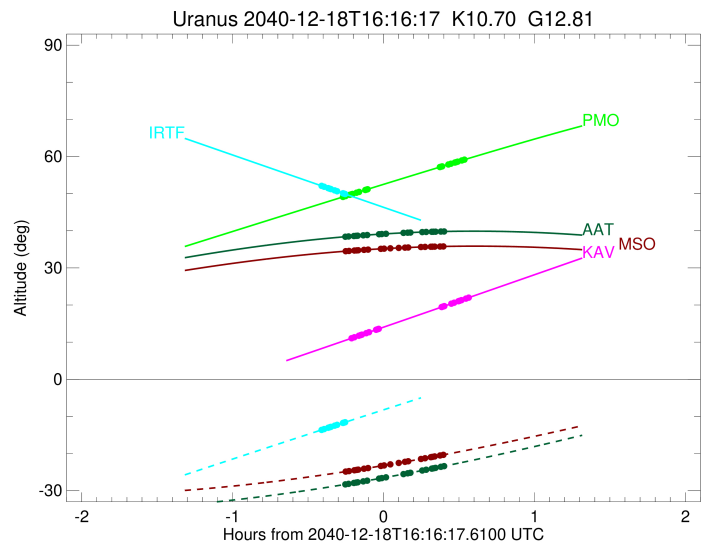
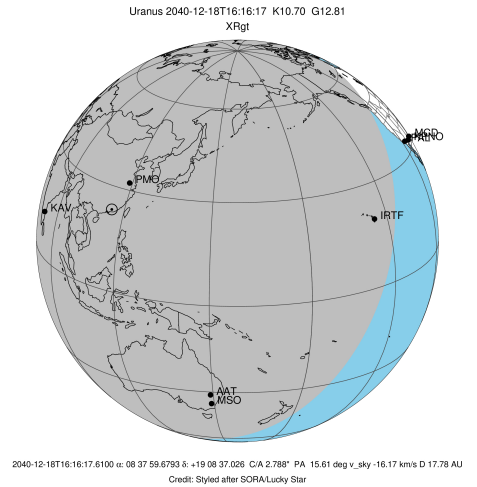


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-12-18T16:03:59.951		11.15	-51.12	50756.34	-16.80		
lambda	I	2040-12-18T16:04:43.669		11.32	-51.28	50026.71	-16.54		
delta	I	2040-12-18T16:06:30.503		11.73	-51.68	48300.35	-15.76		
gamma	I	2040-12-18T16:07:13.958		11.90	-51.85	47622.66	-15.42		
eta	I	2040-12-18T16:07:43.133		12.02	-51.96	47176.12	-15.19		
beta	I	2040-12-18T16:09:26.525		12.42	-52.35	45654.09	-14.30		
alpha	I	2040-12-18T16:10:30.120		12.67	-52.59	44752.41	-13.69		
4	I	2040-12-18T16:13:19.619		13.33	-53.22	42599.13	-11.91		
5	I	2040-12-18T16:13:41.936		13.42	-53.31	42314.53	-11.64		
6	I	2040-12-18T16:14:23.135		13.58	-53.46	41875.05	-11.22		

No planet occultations

6	E	2040-12-18T16:39:25.943		19.46	-59.06	41844.14	11.25		
5	E	2040-12-18T16:40:04.194		19.61	-59.20	42270.84	11.69		
4	E	2040-12-18T16:40:28.285		19.70	-59.29	42556.34	11.96		
alpha	E	2040-12-18T16:43:16.483		20.36	-59.91	44733.05	13.75		
beta	E	2040-12-18T16:44:23.860		20.63	-60.15	45676.43	14.37		
eta	E	2040-12-18T16:46:05.059		21.02	-60.52	47176.12	15.26		
gamma	E	2040-12-18T16:46:34.020		21.14	-60.63	47621.64	15.50		
delta	E	2040-12-18T16:47:17.315		21.31	-60.79	48300.35	15.85		
lambda	E	2040-12-18T16:49:03.557		21.73	-61.18	50026.71	16.64		
epsilon	E	2040-12-18T16:50:02.180		21.96	-61.39	51013.89	16.90		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2040-12-18T16:16:00.420
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : AAT
 Location : Siding Spring (AAT)
 Latitude (deg) : -31.27703
 E. Longitude (deg) : 149.06608
 Altitude (km) : 1.164
 Gaia source ID : 659756012309014656
 2Mass ID (if available) : 08375970+1908375
 ICRS Star Coord at Epoch: 08h 37m 59.67931s +19:08:37.02619s
 RUWE (>1.4 is poor) : 4.42
 K magnitude : 10.700
 G magnitude : 12.811
 RP magnitude : 12.119
 BP magnitude : 13.361
 DUPflag : 0
 Distance (au) : 17.777
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.17
 Sun-Target sep (deg) : 139.86
 Sun-Moon sep (deg) : 38.78
 B (ring opening deg) : 40.15
 PA of pole (deg) : 93.99
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.182
 C/A sky separation (km) : 41031.0
 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

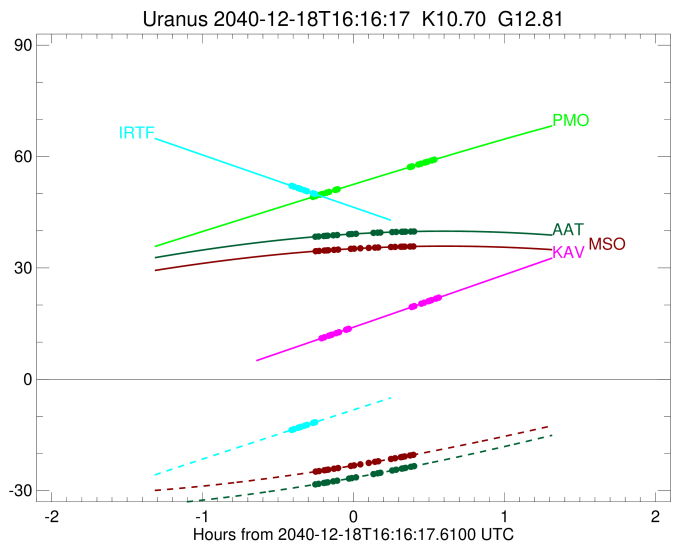
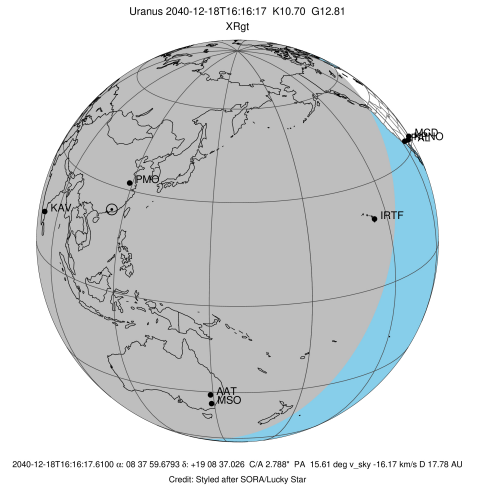


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-12-18T16:01:35.245		38.42	-28.27	50746.24	-14.59		
lambda	I	2040-12-18T16:02:25.243		38.47	-28.17	50026.71	-14.17		
delta	I	2040-12-18T16:04:32.268		38.59	-27.93	48300.35	-12.99		
gamma	I	2040-12-18T16:05:25.585		38.64	-27.83	47622.08	-12.45		
eta	I	2040-12-18T16:06:01.949		38.67	-27.76	47176.12	-12.07		
beta	I	2040-12-18T16:08:15.980		38.78	-27.50	45657.74	-10.60		
alpha	I	2040-12-18T16:09:45.192		38.85	-27.33	44751.95	-9.50		
4	I	2040-12-18T16:14:30.105		39.07	-26.76	42588.14	-5.68		
5	I	2040-12-18T16:15:21.091		39.11	-26.65	42307.84	-4.92		
6	I	2040-12-18T16:17:09.182		39.18	-26.43	41866.34	-3.34		

No planet occultations

6	E	2040-12-18T16:24:22.342		39.44	-25.53	41857.23	3.35		
5	E	2040-12-18T16:26:07.538		39.50	-25.30	42289.50	4.92		
4	E	2040-12-18T16:27:00.502		39.52	-25.19	42568.07	5.68		
alpha	E	2040-12-18T16:31:44.342		39.65	-24.57	44738.57	9.51		
beta	E	2040-12-18T16:33:17.635		39.68	-24.36	45673.96	10.61		
eta	E	2040-12-18T16:35:29.894		39.73	-24.07	47176.12	12.08		
gamma	E	2040-12-18T16:36:06.170		39.74	-23.99	47621.31	12.46		
delta	E	2040-12-18T16:36:59.509		39.76	-23.87	48300.35	13.00		
lambda	E	2040-12-18T16:39:06.428		39.79	-23.58	50026.71	14.19		
epsilon	E	2040-12-18T16:40:11.551		39.81	-23.43	50968.99	14.60		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2040-12-18T16:15:53.400
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : MSO
 Location : Mt. Stromlo Observatory
 Latitude (deg) : -35.32000
 E. Longitude (deg) : 149.00833
 Altitude (km) : 0.770
 Gaia source ID : 659756012309014656
 2Mass ID (if available) : 08375970+1908375
 ICRS Star Coord at Epoch: 08h 37m 59.67931s +19:08:37.02619s
 RUWE (>1.4 is poor) : 4.42
 K magnitude : 10.700
 G magnitude : 12.811
 RP magnitude : 12.119
 BP magnitude : 13.361
 DUPflag : 0
 Distance (au) : 17.777
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -16.17
 Sun-Target sep (deg) : 139.86
 Sun-Moon sep (deg) : 38.76
 B (ring opening deg) : 40.15
 PA of pole (deg) : 93.99
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.202
 C/A sky separation (km) : 41286.6
 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	2040-12-18T16:01:44.139		34.53	-24.82	50745.85	-14.39		
lambda	I	2040-12-18T16:02:34.838		34.57	-24.73	50026.71	-13.96		
delta	I	2040-12-18T16:04:44.034		34.68	-24.51	48300.35	-12.74		
gamma	I	2040-12-18T16:05:38.437		34.72	-24.41	47622.04	-12.19		
eta	I	2040-12-18T16:06:15.611		34.75	-24.35	47176.12	-11.80		
beta	I	2040-12-18T16:08:33.279		34.86	-24.10	45658.01	-10.27		
alpha	I	2040-12-18T16:10:05.832		34.93	-23.93	44751.85	-9.12		
4	I	2040-12-18T16:15:12.893		35.14	-23.36	42586.91	-4.95		
5	I	2040-12-18T16:16:13.123		35.17	-23.25	42306.64	-4.05		
6	I	2040-12-18T16:18:44.973		35.27	-22.96	41864.40	-1.79		

No planet occultations

6	E	2040-12-18T16:22:37.393		35.39	-22.50	41859.52	1.79		
5	E	2040-12-18T16:25:06.331		35.47	-22.21	42291.53	4.05		
4	E	2040-12-18T16:26:08.553		35.50	-22.09	42569.40	4.95		
alpha	E	2040-12-18T16:31:14.522		35.62	-21.47	44739.01	9.13		
beta	E	2040-12-18T16:32:51.169		35.66	-21.27	45673.75	10.27		
eta	E	2040-12-18T16:35:07.063		35.70	-20.99	47176.12	11.81		
gamma	E	2040-12-18T16:35:44.149		35.71	-20.91	47621.28	12.20		
delta	E	2040-12-18T16:36:38.574		35.73	-20.79	48300.35	12.75		
lambda	E	2040-12-18T16:38:47.666		35.76	-20.52	50026.71	13.97		
epsilon	E	2040-12-18T16:39:53.501		35.78	-20.38	50965.70	14.40		