

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2027-12-25T14:34:38.190  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 49433183791869568  
 2Mass ID (if available) : 04184227+2118429

ICRS Star Coord at Epoch: 04h 18m 42.26641s +21:18:42.96536s

RUWE (>1.4 is poor) : 0.94  
 K magnitude : 14.614  
 G magnitude : 17.623  
 RP magnitude : 16.693  
 BP magnitude : 18.536  
 DUPflag : 0  
 Distance (au) : 18.474  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.31  
 Sun-Target sep (deg) : 153.34  
 Sun-Moon sep (deg) : 175.55  
 B (ring opening deg) : 76.53  
 PA of pole (deg) : -65.01

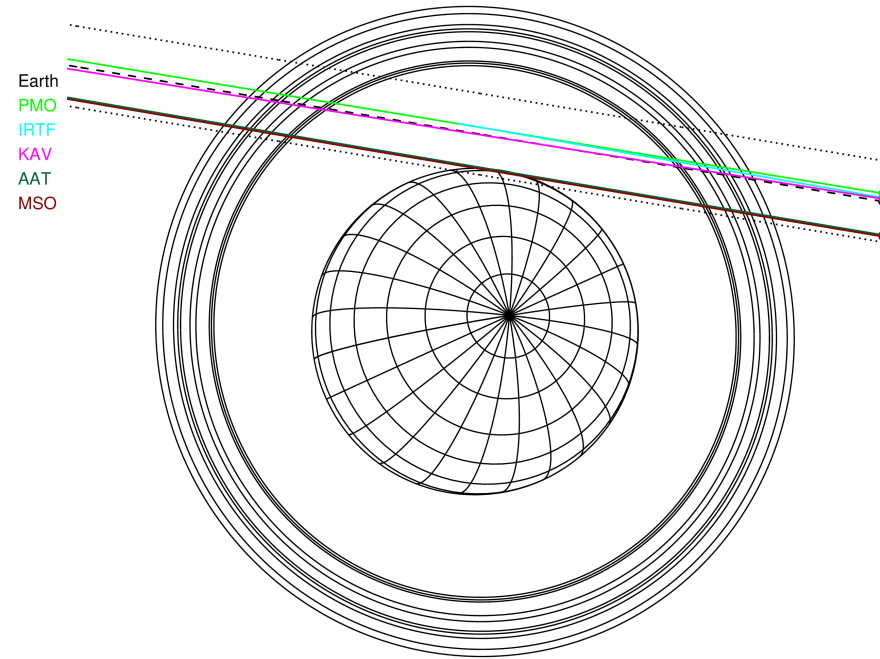
# a(km) ring

- 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



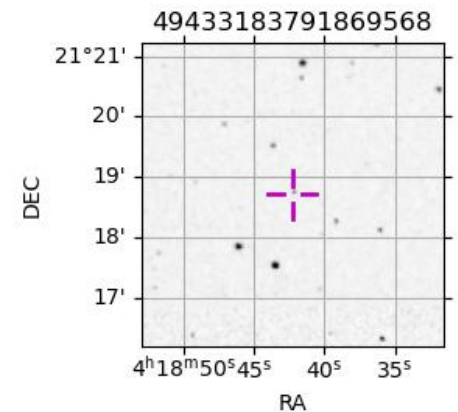
2027-12-25T14:34:38.1900 cc: 04 18 42.2664 s: +21 18 42.965 C/A 2.289° PA 170.52 deg v\_sky -20.31 km/s D 18.47 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2027-12-25T14:34:38 K14.61 G17.62 PtRgt



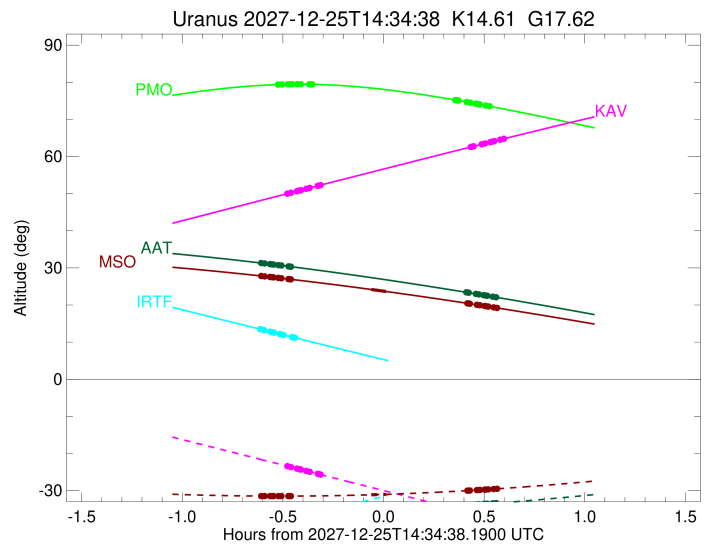
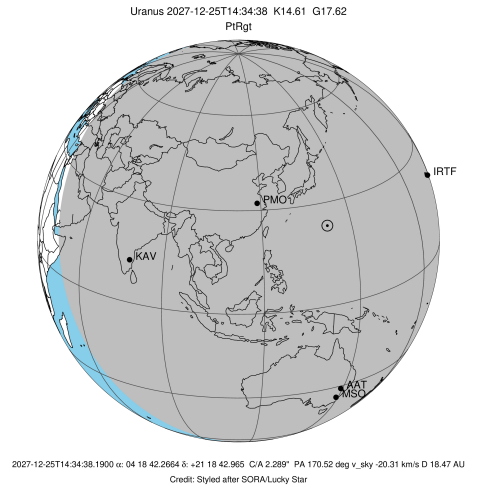
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 25 14:03 - DEC 25 15:06	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 25 13:57 - DEC 25 14:08	PnnRin
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	DEC 25 14:06 - DEC 25 15:10	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 25 13:58 - DEC 25 15:08	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+ +	+++++	DEC 25 13:58 - DEC 25 15:08	PieRie



```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2027-12-25T14:34:04.380
Event type           : PtRgt
: Uranus occs: topocentric, not geocentric
: 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       : 49433183791869568
2Mass ID (if available) : 04184227+2118429
ICRS Star Coord at Epoch: 04h 18m 42.26641s +21:18:42.96536s
RUWE (>1.4 is poor) : 0.94
K magnitude           : 14.614
G magnitude           : 17.623
RP magnitude          : 16.693
BP magnitude          : 18.536
DUPflag              : 0
Distance (au)         : 18.474
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -20.31
Sun-Target sep (deg) : 153.34
Sun-Moon sep (deg)   : 175.45
B (ring opening deg) : 76.53
PA of pole (deg)     : -65.01
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.364
C/A sky separation (km) : 31675.9
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
  
```

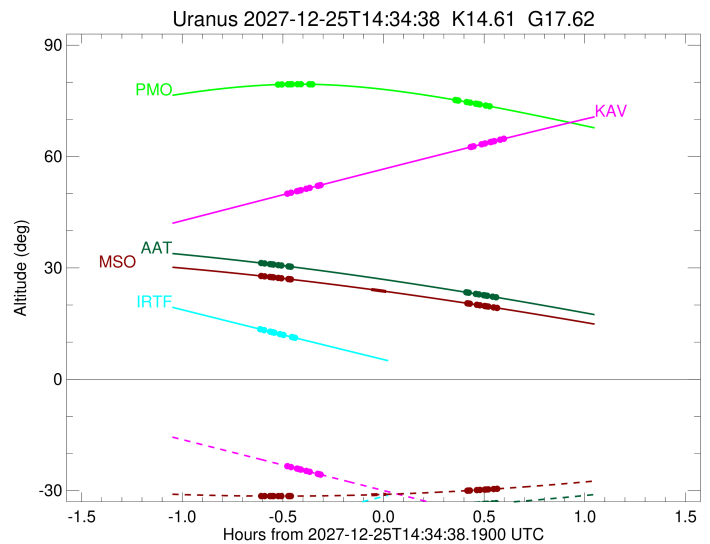
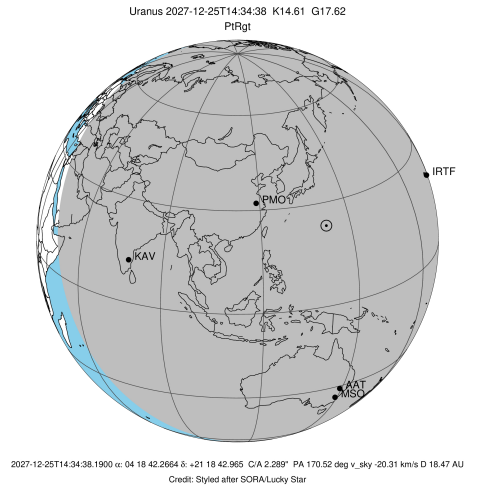


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2027-12-25T14:03:14.204		79.39	-61.90	51119.52	-16.57		
lambda	I	2027-12-25T14:04:21.028		79.42	-62.13	50026.71	-16.23		
delta	I	2027-12-25T14:06:08.714		79.46	-62.51	48300.35	-15.82		
gamma	I	2027-12-25T14:06:51.228		79.47	-62.65	47631.43	-15.65		
eta	I	2027-12-25T14:07:20.446		79.47	-62.76	47176.12	-15.52		
beta	I	2027-12-25T14:09:00.207		79.48	-63.10	45651.02	-15.06		
alpha	I	2027-12-25T14:10:00.477		79.49	-63.31	44748.67	-14.76		
4	I	2027-12-25T14:12:34.699		79.46	-63.84	42537.26	-13.91		
5	I	2027-12-25T14:13:02.955		79.46	-63.94	42155.48	-13.75		
6	I	2027-12-25T14:13:27.196		79.45	-64.03	41806.47	-13.61		

No planet occultations

6	E	2027-12-25T14:56:03.958		75.22	-72.61	41860.91	13.61		
5	E	2027-12-25T14:56:29.741		75.16	-72.70	42212.79	13.74		
4	E	2027-12-25T14:56:53.192		75.09	-72.77	42537.02	13.90		
alpha	E	2027-12-25T14:59:24.267		74.69	-73.25	44703.71	14.75		
beta	E	2027-12-25T15:00:27.350		74.52	-73.45	45643.96	15.05		
eta	E	2027-12-25T15:02:07.580		74.24	-73.77	47176.12	15.51		
gamma	E	2027-12-25T15:02:36.534		74.16	-73.86	47627.01	15.64		
delta	E	2027-12-25T15:03:19.360		74.04	-73.99	48300.35	15.81		
lambda	E	2027-12-25T15:05:07.122		73.74	-74.32	50026.71	16.22		
epsilon	E	2027-12-25T15:06:40.091		73.47	-74.61	51550.11	16.56		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2027-12-25T14:29:18.020  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : 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 : 49433183791869568  
 2Mass ID (if available) : 04184227+2118429  
 ICRS Star Coord at Epoch: 04h 18m 42.26641s +21:18:42.96536s  
 RUWE (>1.4 is poor) : 0.94  
 K magnitude : 14.614  
 G magnitude : 17.623  
 RP magnitude : 16.693  
 BP magnitude : 18.536  
 DUPflag : 0  
 Distance (au) : 18.474  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.31  
 Sun-Target sep (deg) : 153.34  
 Sun-Moon sep (deg) : 175.13  
 B (ring opening deg) : 76.53  
 PA of pole (deg) : -65.01  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.361  
 C/A sky separation (km) : 31639.0  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl1.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

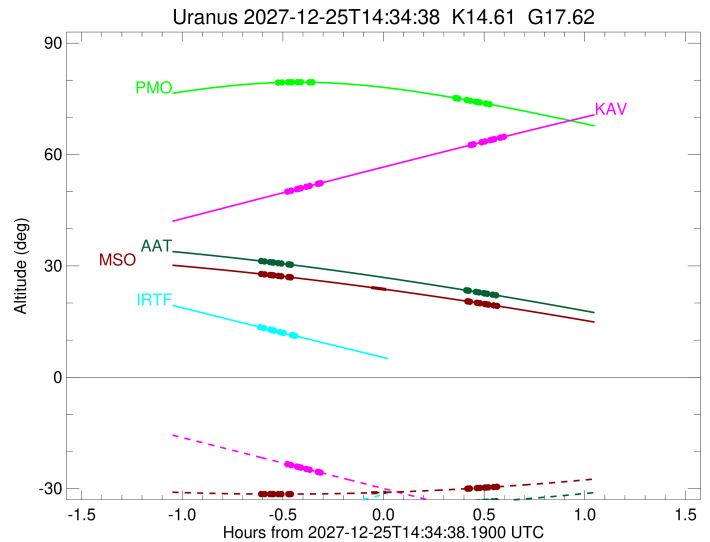
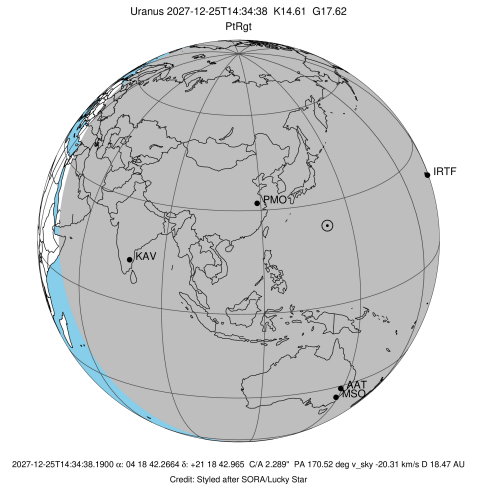


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2027-12-25T13:57:55.778		13.48	-39.91	51115.15	-16.33		
lambda	I	2027-12-25T13:59:03.331		13.23	-39.65	50026.71	-15.99		
delta	I	2027-12-25T14:00:52.634		12.82	-39.24	48300.35	-15.59		
gamma	I	2027-12-25T14:01:35.791		12.66	-39.07	47631.41	-15.41		
eta	I	2027-12-25T14:02:05.449		12.55	-38.96	47176.12	-15.29		
beta	I	2027-12-25T14:03:46.709		12.17	-38.58	45651.21	-14.83		
alpha	I	2027-12-25T14:04:47.895		11.94	-38.35	44748.84	-14.54		
4	I	2027-12-25T14:07:24.451		11.36	-37.75	42537.60	-13.70		
5	I	2027-12-25T14:07:53.160		11.25	-37.64	42155.60	-13.54		
6	I	2027-12-25T14:08:17.805		11.16	-37.55	41806.15	-13.41		

No planet occultations

6	E	2027-12-25T14:51:45.284		1.55x	-27.71	41860.60	13.35		
5	E	2027-12-25T14:52:11.531		1.46x	-27.61	42212.12	13.48		
4	E	2027-12-25T14:52:35.464		1.37x	-27.52	42536.76	13.64		
alpha	E	2027-12-25T14:55:09.542		0.81x	-26.94	44703.98	14.47		
beta	E	2027-12-25T14:56:13.859		0.58x	-26.70	45643.87	14.76		
eta	E	2027-12-25T14:57:56.112		0.21x	-26.32	47176.12	15.20		
gamma	E	2027-12-25T14:58:25.656		0.10x	-26.21	47627.06	15.32		
delta	E	2027-12-25T14:59:09.351		-0.06x	-26.04	48300.35	15.49		
lambda	E	2027-12-25T15:00:59.326		-0.46x	-25.63	50026.71	15.89		
epsilon	E	2027-12-25T15:02:34.257		-0.80x	-25.28	51550.67	16.22		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2027-12-25T14:37:38.740  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : 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 : 49433183791869568  
 2Mass ID (if available) : 04184227+2118429  
 ICRS Star Coord at Epoch: 04h 18m 42.26641s +21:18:42.96536s  
 RUWE (>1.4 is poor) : 0.94  
 K magnitude : 14.614  
 G magnitude : 17.623  
 RP magnitude : 16.693  
 BP magnitude : 18.536  
 DUPflag : 0  
 Distance (au) : 18.474  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.31  
 Sun-Target sep (deg) : 153.34  
 Sun-Moon sep (deg) : 175.69  
 B (ring opening deg) : 76.53  
 PA of pole (deg) : -65.01  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.280  
 C/A sky separation (km) : 30549.4  
 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

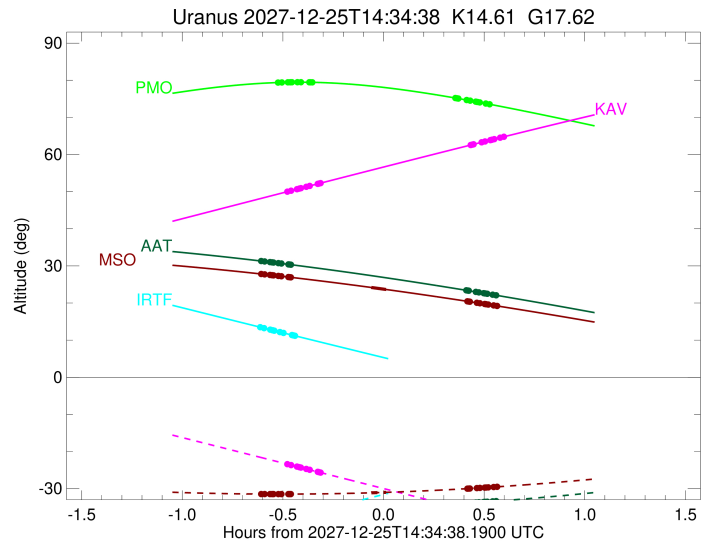
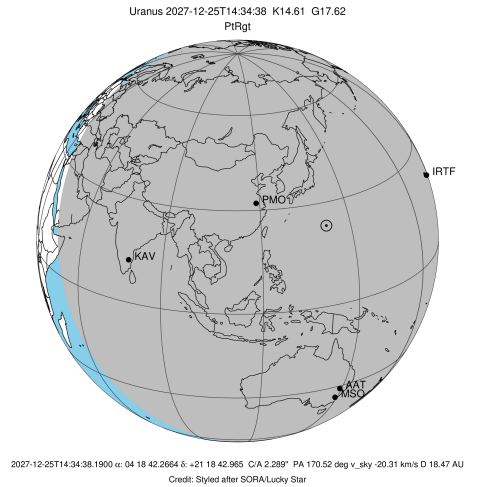


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2027-12-25T14:06:01.095		50.01	-23.42	51110.05	-16.88		
lambda	I	2027-12-25T14:07:06.063		50.26	-23.66	50026.71	-16.57		
delta	I	2027-12-25T14:08:51.419		50.67	-24.07	48300.35	-16.20		
gamma	I	2027-12-25T14:09:32.922		50.83	-24.22	47631.39	-16.04		
eta	I	2027-12-25T14:10:01.406		50.94	-24.33	47176.12	-15.93		
beta	I	2027-12-25T14:11:38.409		51.31	-24.70	45651.54	-15.51		
alpha	I	2027-12-25T14:12:36.839		51.54	-24.93	44749.14	-15.25		
4	I	2027-12-25T14:15:05.506		52.11	-25.49	42538.34	-14.49		
5	I	2027-12-25T14:15:32.670		52.22	-25.60	42155.89	-14.35		
6	I	2027-12-25T14:15:55.990		52.31	-25.69	41805.42	-14.23		

No planet occultations

6	E	2027-12-25T15:00:39.102		62.56	-35.94	41862.51	14.26		
5	E	2027-12-25T15:01:03.883		62.66	-36.03	42216.30	14.38		
4	E	2027-12-25T15:01:26.183		62.74	-36.12	42538.38	14.52		
alpha	E	2027-12-25T15:03:51.239		63.29	-36.67	44702.48	15.29		
beta	E	2027-12-25T15:04:52.302		63.52	-36.91	45644.39	15.56		
eta	E	2027-12-25T15:06:29.443		63.88	-37.28	47176.12	15.97		
gamma	E	2027-12-25T15:06:57.563		63.98	-37.39	47626.82	16.08		
delta	E	2027-12-25T15:07:39.233		64.14	-37.54	48300.35	16.24		
lambda	E	2027-12-25T15:09:24.277		64.53	-37.95	50026.71	16.62		
epsilon	E	2027-12-25T15:10:54.985		64.87	-38.29	51547.75	16.93		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2027-12-25T14:32:37.650  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : 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 : 49433183791869568  
 2Mass ID (if available) : 04184227+2118429  
 ICRS Star Coord at Epoch: 04h 18m 42.26641s +21:18:42.96536s  
 RUWE (>1.4 is poor) : 0.94  
 K magnitude : 14.614  
 G magnitude : 17.623  
 RP magnitude : 16.693  
 BP magnitude : 18.536  
 DUPflag : 0  
 Distance (au) : 18.474  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.31  
 Sun-Target sep (deg) : 153.34  
 Sun-Moon sep (deg) : 176.20  
 B (ring opening deg) : 76.53  
 PA of pole (deg) : -65.01  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.901  
 C/A sky separation (km) : 25477.3  
 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

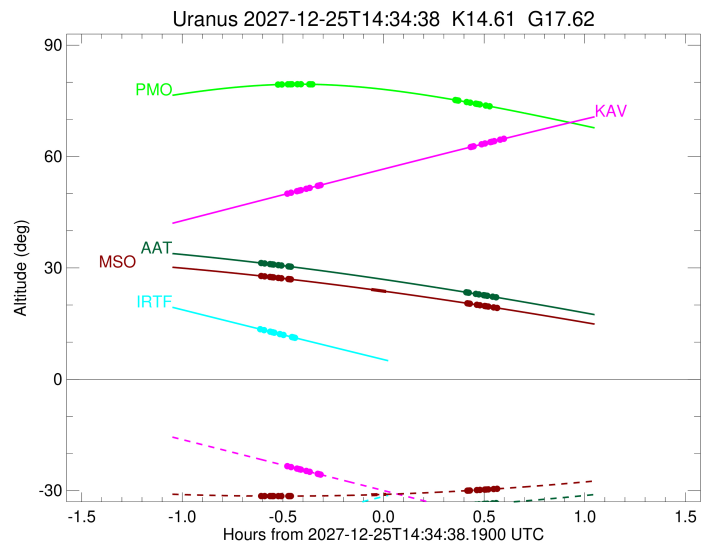
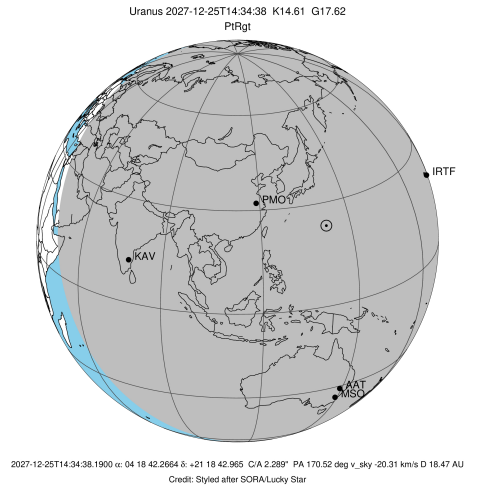


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2027-12-25T13:58:15.492		31.30	-35.49	51058.87	-18.29		
lambda	I	2027-12-25T13:59:12.389		31.20	-35.50	50026.71	-18.07		
delta	I	2027-12-25T14:00:48.525		31.02	-35.50	48300.35	-17.84		
gamma	I	2027-12-25T14:01:26.152		30.95	-35.50	47631.14	-17.74		
eta	I	2027-12-25T14:01:51.860		30.91	-35.50	47176.12	-17.66		
beta	I	2027-12-25T14:03:18.687		30.75	-35.51	45654.31	-17.40		
alpha	I	2027-12-25T14:04:10.621		30.65	-35.51	44751.03	-17.24		
4	I	2027-12-25T14:06:20.419		30.40	-35.50	42544.07	-16.77		
5	I	2027-12-25T14:06:44.025		30.36	-35.50	42159.30	-16.68		
6	I	2027-12-25T14:07:04.578		30.32	-35.50	41801.01	-16.61		

No planet occultations

6	E	2027-12-25T14:59:20.104		23.42	-33.90	41867.56	16.57		
5	E	2027-12-25T14:59:41.957		23.37	-33.88	42228.57	16.64		
4	E	2027-12-25T15:00:00.920		23.32	-33.86	42543.50	16.72		
alpha	E	2027-12-25T15:02:07.918		23.01	-33.74	44698.50	17.18		
beta	E	2027-12-25T15:03:02.757		22.87	-33.69	45646.02	17.35		
eta	E	2027-12-25T15:04:30.294		22.65	-33.60	47176.12	17.60		
gamma	E	2027-12-25T15:04:55.807		22.59	-33.57	47626.16	17.68		
delta	E	2027-12-25T15:05:33.845		22.49	-33.53	48300.35	17.77		
lambda	E	2027-12-25T15:07:10.323		22.25	-33.43	50026.71	18.01		
epsilon	E	2027-12-25T15:08:33.735		22.04	-33.34	51536.72	18.22		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2027-12-25T14:32:47.070  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : 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 : 49433183791869568  
 2Mass ID (if available) : 04184227+2118429  
 ICRS Star Coord at Epoch: 04h 18m 42.26641s +21:18:42.96536s  
 RUWE (>1.4 is poor) : 0.94  
 K magnitude : 14.614  
 G magnitude : 17.623  
 RP magnitude : 16.693  
 BP magnitude : 18.536  
 DUPflag : 0  
 Distance (au) : 18.474  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.31  
 Sun-Target sep (deg) : 153.34  
 Sun-Moon sep (deg) : 176.24  
 B (ring opening deg) : 76.53  
 PA of pole (deg) : -65.01  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.883  
 C/A sky separation (km) : 25228.2  
 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	2027-12-25T13:58:16.224		27.81	-31.46	51056.65	-18.33		
lambda	I	2027-12-25T13:59:12.852		27.72	-31.46	50026.71	-18.12		
delta	I	2027-12-25T14:00:48.714		27.56	-31.47	48300.35	-17.89		
gamma	I	2027-12-25T14:01:26.223		27.49	-31.47	47631.13	-17.79		
eta	I	2027-12-25T14:01:51.848		27.45	-31.47	47176.12	-17.72		
beta	I	2027-12-25T14:03:18.363		27.30	-31.47	45654.43	-17.47		
alpha	I	2027-12-25T14:04:10.101		27.21	-31.47	44751.10	-17.31		
4	I	2027-12-25T14:06:19.319		26.99	-31.47	42544.33	-16.85		
5	I	2027-12-25T14:06:42.816		26.95	-31.47	42159.50	-16.77		
6	I	2027-12-25T14:07:03.292		26.91	-31.47	41800.84	-16.70		
Uranus	I	2027-12-25T14:30:57.701		24.19	-31.13	25328.91		8.55	8.95
Uranus	E	2027-12-25T14:35:26.109		23.64	-31.00	25440.63		6.10	6.39
6	E	2027-12-25T14:59:39.609		20.46	-30.00	41867.79	16.65		
5	E	2027-12-25T15:00:01.374		20.41	-29.99	42229.18	16.72		
4	E	2027-12-25T15:00:20.226		20.36	-29.97	42543.77	16.80		
alpha	E	2027-12-25T15:02:26.630		20.07	-29.86	44698.31	17.25		
beta	E	2027-12-25T15:03:21.266		19.94	-29.81	45646.11	17.41		
eta	E	2027-12-25T15:04:48.482		19.74	-29.72	47176.12	17.66		
gamma	E	2027-12-25T15:05:13.908		19.68	-29.70	47626.12	17.73		
delta	E	2027-12-25T15:05:51.825		19.59	-29.66	48300.35	17.83		
lambda	E	2027-12-25T15:07:28.015		19.36	-29.57	50026.71	18.06		
epsilon	E	2027-12-25T15:08:51.166		19.16	-29.49	51536.02	18.27		