

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-18T16:46:58.490
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3412545172454436736
 2Mass ID (if available) : 04574144+2241571

ICRS Star Coord at Epoch: 04h 57m 41.42543s +22:41:57.34017s

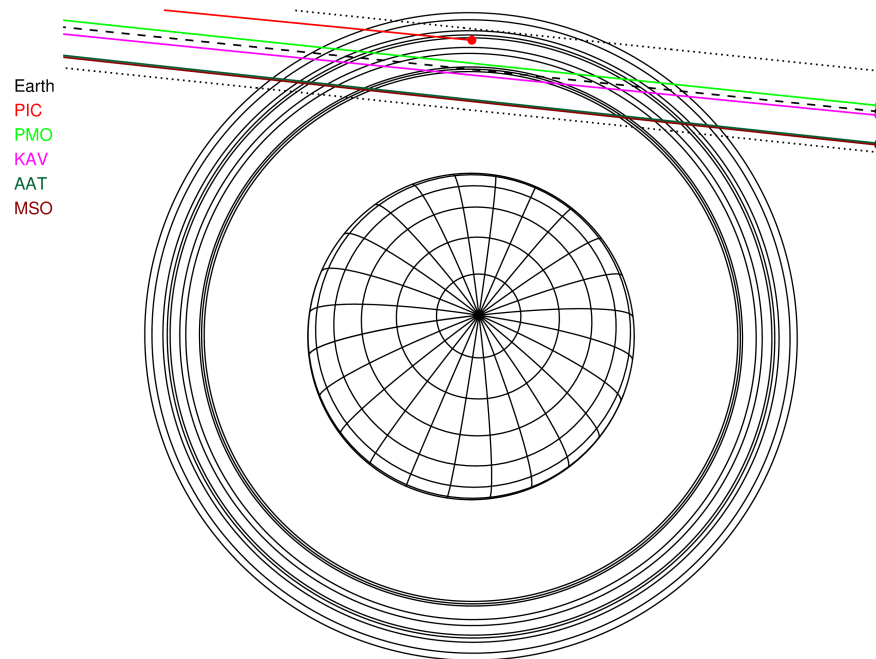
RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.794
 G magnitude : 17.033
 RP magnitude : 16.358
 BP magnitude : 17.539
 DUPflag : 0
 Distance (au) : 18.256
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.90
 Sun-Target sep (deg) : 169.02
 Sun-Moon sep (deg) : 14.13
 B (ring opening deg) : 82.00
 PA of pole (deg) : -20.44

#	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



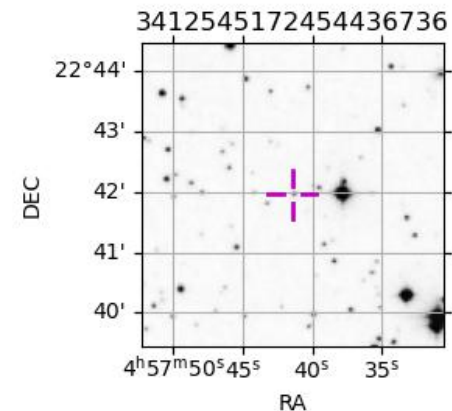
Uranus 2029-12-18T16:46:58 K14.79 G17.03 XRgt
 Credit: Styled after SORA/Lucky Star

Uranus 2029-12-18T16:46:58 K14.79 G17.03 XRgt



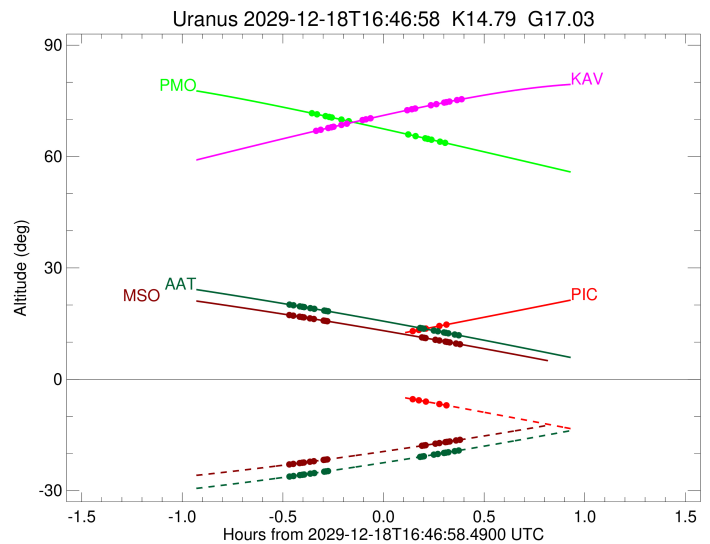
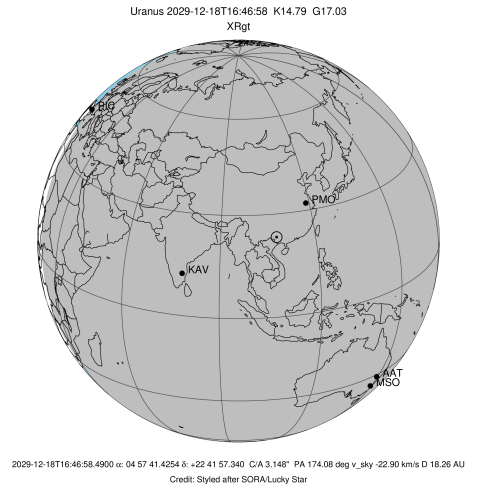
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1			+++++	DEC 18 16:55 - DEC 18 17:05	PnnRne
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++++		+++++++	DEC 18 16:25 - DEC 18 17:05	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					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++++		+++++++	DEC 18 16:26 - DEC 18 17:10	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 18 16:18 - DEC 18 17:09	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++++		+++++++	DEC 18 16:18 - DEC 18 17:09	PnnRie



```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2029-12-18T16:50:14.380
Event type          : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code       : PIC
Location            : Pic du Midi
Latitude (deg)      : 42.93656
E. Longitude (deg)  : 0.14231
Altitude (km)       : 2.890
Gaia source ID      : 3412545172454436736
2Mass ID (if available) : 04574144+2241571
ICRS Star Coord at Epoch: 04h 57m 41.42543s +22:41:57.34017s
RUWE (>1.4 is poor) : 0.99
K magnitude         : 14.794
G magnitude         : 17.033
RP magnitude        : 16.358
BP magnitude        : 17.539
DUPflag            : 0
Distance (au)       : 18.256
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -22.90
Sun-Target sep (deg) : 169.02
Sun-Moon sep (deg)  : 13.51
B (ring opening deg) : 82.00
PA of pole (deg)    : -20.44
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.489
C/A sky separation (km) : 46190.3
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_itrfr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```

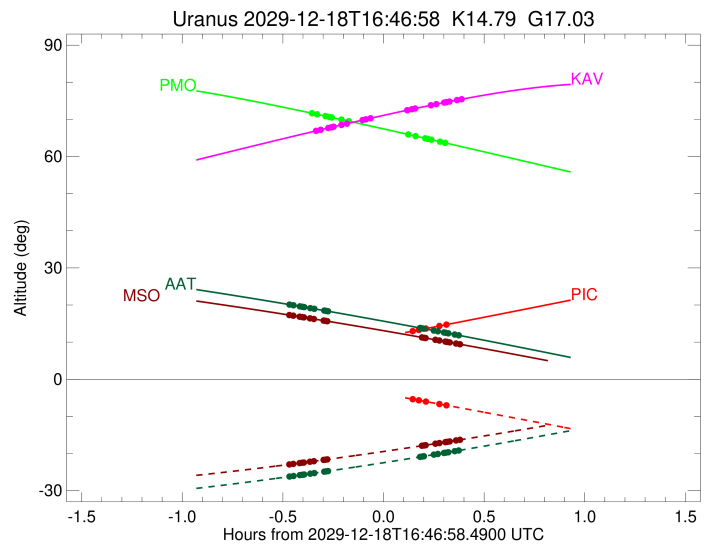
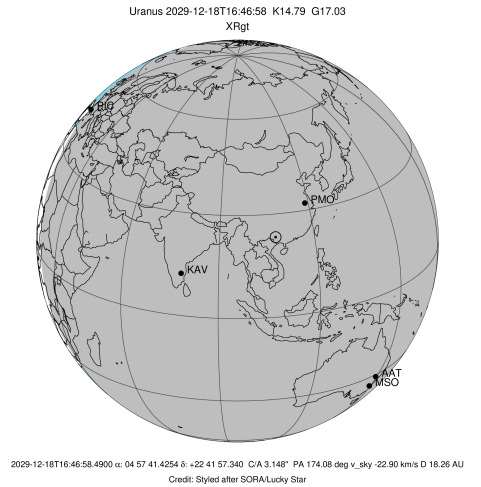


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-18T16:34:26.389		9.31	-1.95x	51516.11	-9.64		
lambda	I	2029-12-18T16:37:11.760		9.78	-2.39x	50026.71	-8.28		
delta	I	2029-12-18T16:41:13.561		10.47	-3.03x	48300.35	-5.96		
gamma	I	2029-12-18T16:43:21.592		10.83	-3.37x	47621.12	-4.64		
eta	I	2029-12-18T16:45:11.255		11.15	-3.67x	47176.12	-3.47		

No planet occultations

eta	E	2029-12-18T16:55:37.175		12.95	-5.36	47176.12	3.47		
gamma	E	2029-12-18T16:57:26.957		13.27	-5.66	47622.07	4.65		
delta	E	2029-12-18T16:59:34.653		13.64	-6.01	48300.35	5.97		
lambda	E	2029-12-18T17:03:36.114		14.35	-6.67	50026.71	8.29		
epsilon	E	2029-12-18T17:05:53.765		14.75	-7.05	51252.41	9.66		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-18T16:45:20.210
 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 : 3412545172454436736
 2Mass ID (if available) : 04574144+2241571
 ICRS Star Coord at Epoch: 04h 57m 41.42543s +22:41:57.34017s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.794
 G magnitude : 17.033
 RP magnitude : 16.358
 BP magnitude : 17.539
 DUPflag : 0
 Distance (au) : 18.256
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.90
 Sun-Target sep (deg) : 169.02
 Sun-Moon sep (deg) : 14.63
 B (ring opening deg) : 82.00
 PA of pole (deg) : -20.44
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.215
 C/A sky separation (km) : 42573.0
 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



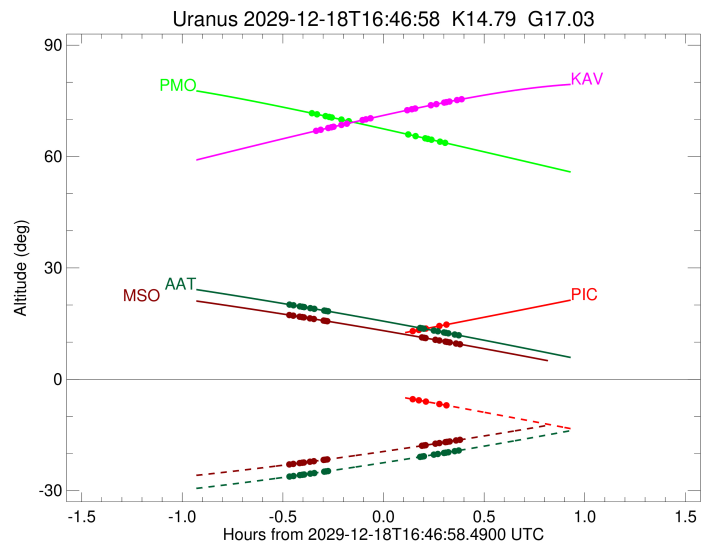
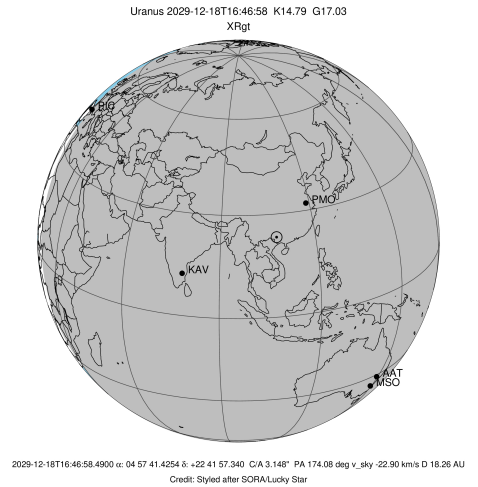
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-18T16:25:08.453		71.77	-80.03	51538.31	-12.82		
lambda	I	2029-12-18T16:27:10.359		71.37	-79.79	50026.71	-11.92		
delta	I	2029-12-18T16:29:43.281		70.88	-79.47	48300.35	-10.63		
gamma	I	2029-12-18T16:30:49.026		70.67	-79.32	47620.96	-10.03		
eta	I	2029-12-18T16:31:34.325		70.52	-79.22	47176.12	-9.60		
beta	I	2029-12-18T16:34:28.630		69.95	-78.81	45652.55	-7.84		
alpha	I	2029-12-18T16:36:39.210		69.52	-78.50	44720.24	-6.45		

No planet occultations

alpha	E	2029-12-18T16:54:21.692		65.95	-75.57	44737.97	6.45		
beta	E	2029-12-18T16:56:28.307		65.51	-75.19	45642.99	7.84		
eta	E	2029-12-18T16:59:23.912		64.91	-74.65	47176.12	9.60		
gamma	E	2029-12-18T17:00:09.447		64.76	-74.51	47622.94	10.02		
delta	E	2029-12-18T17:01:15.053		64.53	-74.31	48300.35	10.62		
lambda	E	2029-12-18T17:03:48.127		64.01	-73.84	50026.71	11.91		
epsilon	E	2029-12-18T17:05:23.375		63.68	-73.54	51196.75	12.80		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-18T16:48:26.240
 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 : 3412545172454436736
 2Mass ID (if available) : 04574144+2241571
 ICRS Star Coord at Epoch: 04h 57m 41.42543s +22:41:57.34017s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.794
 G magnitude : 17.033
 RP magnitude : 16.358
 BP magnitude : 17.539
 DUPflag : 0
 Distance (au) : 18.256
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.90
 Sun-Target sep (deg) : 169.02
 Sun-Moon sep (deg) : 14.10
 B (ring opening deg) : 82.00
 PA of pole (deg) : -20.44
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.078
 C/A sky separation (km) : 40754.6
 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_itrff93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

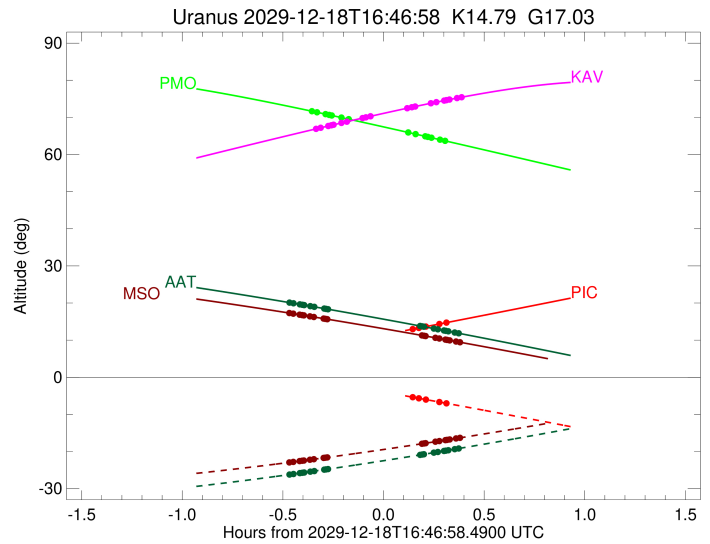
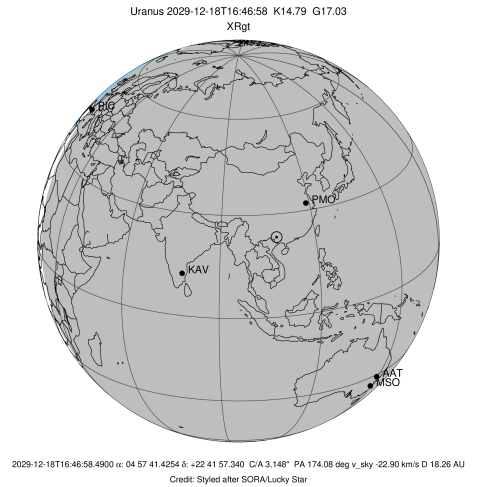


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-18T16:26:25.104		66.82	-56.18	51544.33	-14.02		
lambda	I	2029-12-18T16:28:16.096		67.21	-56.59	50026.71	-13.28		
delta	I	2029-12-18T16:30:31.387		67.69	-57.10	48300.35	-12.23		
gamma	I	2029-12-18T16:31:28.046		67.89	-57.31	47620.97	-11.75		
eta	I	2029-12-18T16:32:06.439		68.03	-57.45	47176.12	-11.42		
beta	I	2029-12-18T16:34:27.666		68.52	-57.97	45654.39	-10.11		
alpha	I	2029-12-18T16:36:05.184		68.86	-58.33	44716.26	-9.16		
4	I	2029-12-18T16:40:46.777		69.83	-59.37	42576.20	-5.97		
5	I	2029-12-18T16:41:39.611		70.01	-59.57	42268.06	-5.32		
6	I	2029-12-18T16:43:06.045		70.30	-59.88	41862.65	-4.26		

No planet occultations

6	E	2029-12-18T16:54:00.401		72.47	-62.27	41848.74	4.27		
5	E	2029-12-18T16:55:23.041		72.74	-62.57	42232.26	5.32		
4	E	2029-12-18T16:56:18.960		72.91	-62.77	42553.30	5.97		
alpha	E	2029-12-18T17:01:06.898		73.82	-63.81	44741.34	9.16		
beta	E	2029-12-18T17:02:40.336		74.10	-64.15	45642.16	10.11		
eta	E	2029-12-18T17:05:02.624		74.53	-64.65	47176.12	11.43		
gamma	E	2029-12-18T17:05:41.185		74.64	-64.79	47623.32	11.76		
delta	E	2029-12-18T17:06:37.596		74.81	-64.99	48300.35	12.24		
lambda	E	2029-12-18T17:08:52.759		75.20	-65.47	50026.71	13.29		
epsilon	E	2029-12-18T17:10:16.834		75.44	-65.77	51169.58	14.04		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-18T16:44:01.720
 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 : 3412545172454436736
 2Mass ID (if available) : 04574144+2241571
 ICRS Star Coord at Epoch: 04h 57m 41.42543s +22:41:57.34017s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.794
 G magnitude : 17.033
 RP magnitude : 16.358
 BP magnitude : 17.539
 DUPflag : 0
 Distance (au) : 18.256
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.90
 Sun-Target sep (deg) : 169.02
 Sun-Moon sep (deg) : 14.83
 B (ring opening deg) : 82.00
 PA of pole (deg) : -20.44
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.786
 C/A sky separation (km) : 36885.9
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ural11.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ural11.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

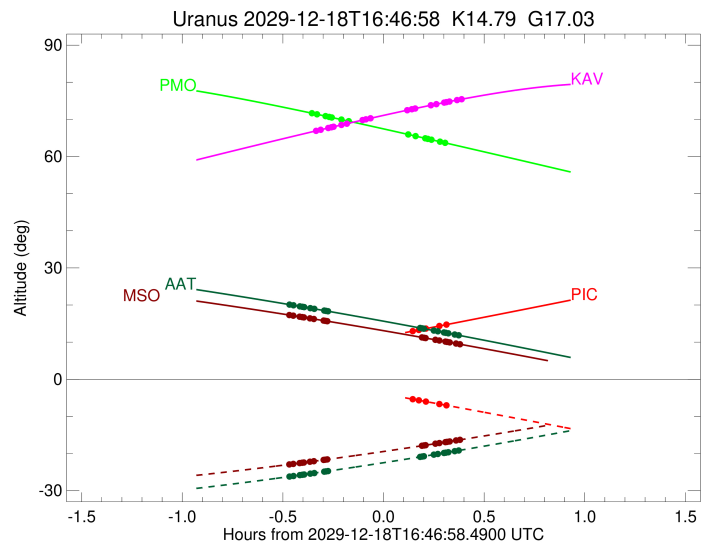
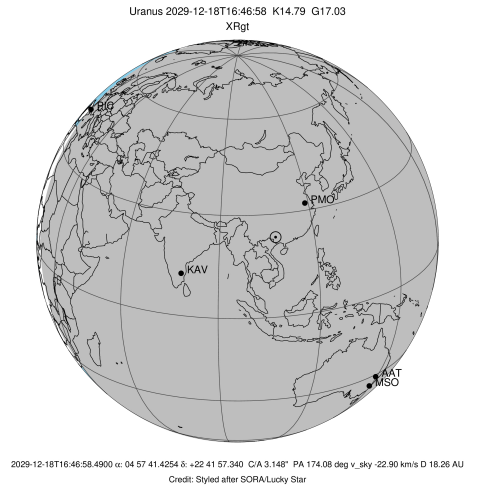


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-18T16:18:32.393		20.18	-26.26	51552.99	-16.03		
lambda	I	2029-12-18T16:20:09.148		19.93	-26.06	50026.71	-15.49		
delta	I	2029-12-18T16:22:03.171		19.64	-25.82	48300.35	-14.77		
gamma	I	2029-12-18T16:22:49.639		19.52	-25.72	47621.09	-14.46		
eta	I	2029-12-18T16:23:20.646		19.44	-25.66	47176.12	-14.24		
beta	I	2029-12-18T16:25:10.407		19.15	-25.42	45657.82	-13.41		
alpha	I	2029-12-18T16:26:22.698		18.96	-25.27	44709.84	-12.85		
4	I	2029-12-18T16:29:18.851		18.50	-24.89	42587.38	-11.22		
5	I	2029-12-18T16:29:45.274		18.43	-24.83	42286.38	-10.96		
6	I	2029-12-18T16:30:24.663		18.33	-24.74	41871.53	-10.58		

No planet occultations

6	E	2029-12-18T16:57:51.484		13.83	-20.92	41836.91	10.56		
5	E	2029-12-18T16:58:27.181		13.73	-20.83	42212.20	10.94		
4	E	2029-12-18T16:58:56.738		13.64	-20.76	42543.99	11.21		
alpha	E	2029-12-18T17:01:59.811		13.12	-20.30	44745.38	12.82		
beta	E	2029-12-18T17:03:08.202		12.93	-20.13	45641.35	13.38		
eta	E	2029-12-18T17:04:59.423		12.61	-19.85	47176.12	14.21		
gamma	E	2029-12-18T17:05:30.708		12.52	-19.78	47623.95	14.42		
delta	E	2029-12-18T17:06:17.102		12.38	-19.66	48300.35	14.73		
lambda	E	2029-12-18T17:08:11.449		12.06	-19.37	50026.71	15.45		
epsilon	E	2029-12-18T17:09:21.622		11.85	-19.19	51125.01	15.98		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-18T16:44:11.890
 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 : 3412545172454436736
 2Mass ID (if available) : 04574144+2241571
 ICRS Star Coord at Epoch: 04h 57m 41.42543s +22:41:57.34017s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.794
 G magnitude : 17.033
 RP magnitude : 16.358
 BP magnitude : 17.539
 DUPflag : 0
 Distance (au) : 18.256
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.90
 Sun-Target sep (deg) : 169.02
 Sun-Moon sep (deg) : 14.80
 B (ring opening deg) : 82.00
 PA of pole (deg) : -20.44
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.766
 C/A sky separation (km) : 36618.9
 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_itrf93_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	2029-12-18T16:18:29.633		17.36	-22.98	51553.30	-16.15		
lambda	I	2029-12-18T16:20:05.657		17.13	-22.80	50026.71	-15.62		
delta	I	2029-12-18T16:21:58.649		16.85	-22.58	48300.35	-14.92		
gamma	I	2029-12-18T16:22:44.640		16.74	-22.49	47621.10	-14.61		
eta	I	2029-12-18T16:23:15.310		16.67	-22.43	47176.12	-14.40		
beta	I	2029-12-18T16:25:03.707		16.41	-22.21	45658.02	-13.59		
alpha	I	2029-12-18T16:26:14.995		16.23	-22.07	44709.50	-13.05		
4	I	2029-12-18T16:29:07.814		15.81	-21.72	42587.92	-11.48		
5	I	2029-12-18T16:29:33.615		15.74	-21.67	42287.19	-11.22		
6	I	2029-12-18T16:30:12.066		15.65	-21.59	41871.87	-10.86		

No planet occultations

6	E	2029-12-18T16:58:24.347		11.28	-17.92	41836.32	10.84		
5	E	2029-12-18T16:58:59.101		11.19	-17.84	42211.17	11.20		
4	E	2029-12-18T16:59:28.036		11.11	-17.77	42543.51	11.46		
alpha	E	2029-12-18T17:02:27.763		10.63	-17.35	44745.60	13.02		
beta	E	2029-12-18T17:03:35.143		10.44	-17.19	45641.32	13.56		
eta	E	2029-12-18T17:05:24.990		10.15	-16.94	47176.12	14.37		
gamma	E	2029-12-18T17:05:55.935		10.06	-16.86	47623.99	14.58		
delta	E	2029-12-18T17:06:41.847		9.94	-16.75	48300.35	14.88		
lambda	E	2029-12-18T17:08:35.148		9.63	-16.49	50026.71	15.58		
epsilon	E	2029-12-18T17:09:44.563		9.44	-16.32	51121.85	16.10		