

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-07T23:04:48.870  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3424870281189642752  
 2Mass ID (if available) : 05584450+2339004

ICRS Star Coord at Epoch: 05h 58m 44.50864s +23:39:00.32295s

RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.309  
 G magnitude : 17.142  
 RP magnitude : 16.230  
 BP magnitude : 18.009  
 DUPflag : 0  
 Distance (au) : 18.064  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.57  
 Sun-Target sep (deg) : 166.23  
 Sun-Moon sep (deg) : 127.74  
 B (ring opening deg) : 75.59  
 PA of pole (deg) : 56.22

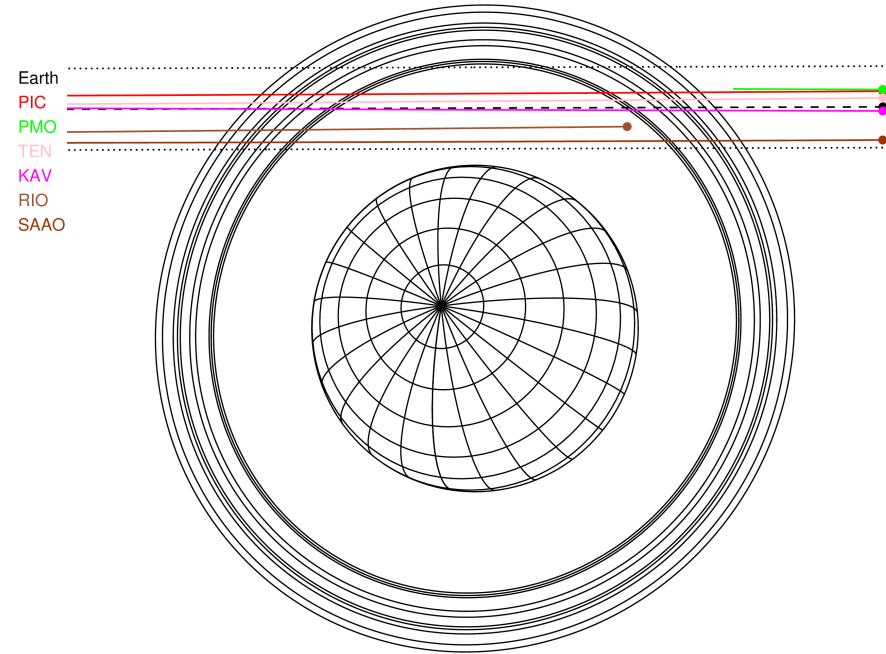
# a(km) ring

- 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



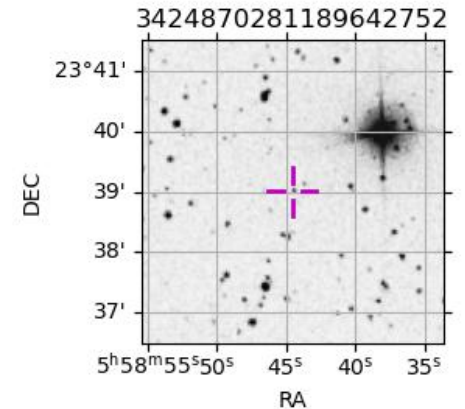
2032-12-07T23:04:48.8700 ex: 05 58 44.5086 s: +23 39 00.323 C/A 2.642° PA 180.17 deg v\_sky -22.57 km/s D 18.06 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2032-12-07T23:04:48 K14.31 G17.14 XRgt

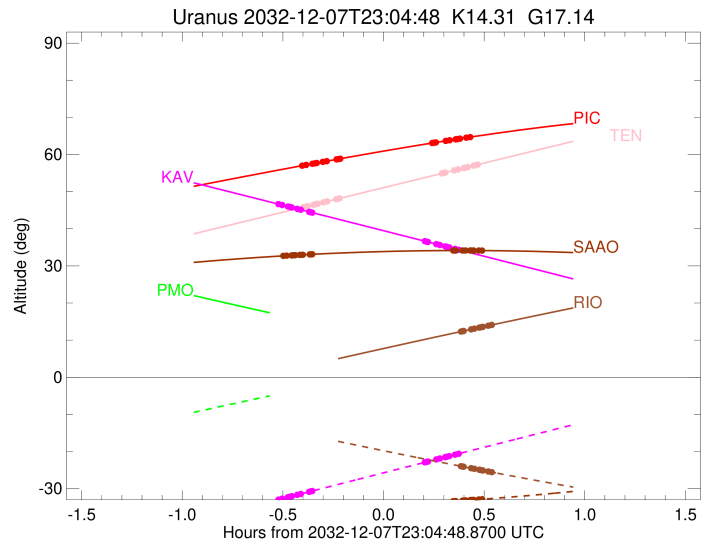
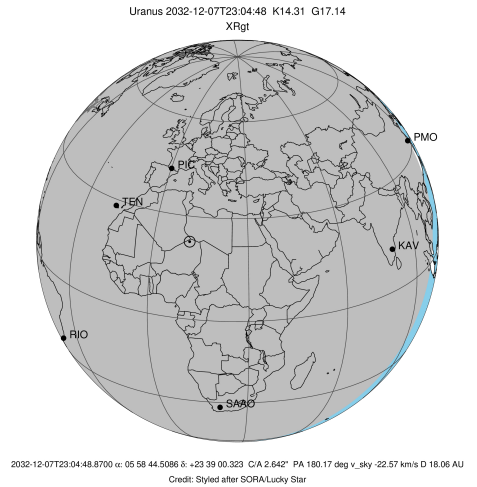


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	DEC 07 22:40 - DEC 07 23:30	PnnRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
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	+++++		+++++	DEC 07 22:40 - DEC 07 23:33	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	DEC 07 22:33 - DEC 07 23:27	PnnRie
RIO	Rio de Janeiro	-22.9	316.8			+++++	DEC 07 23:27 - DEC 07 23:37	PnnRne
ESO	European Southern Obs	-29.3	289.3					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++		+++++	DEC 07 22:34 - DEC 07 23:34	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-07T23:06:25.070  
 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 : 3424870281189642752  
 2Mass ID (if available) : 05584450+2339004  
 ICRS Star Coord at Epoch: 05h 58m 44.50864s +23:39:00.32295s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.309  
 G magnitude : 17.142  
 RP magnitude : 16.230  
 BP magnitude : 18.009  
 DUPflag : 0  
 Distance (au) : 18.064  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.57  
 Sun-Target sep (deg) : 166.23  
 Sun-Moon sep (deg) : 128.63  
 B (ring opening deg) : 75.59  
 PA of pole (deg) : 56.22  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.808  
 C/A sky separation (km) : 36783.2  
 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

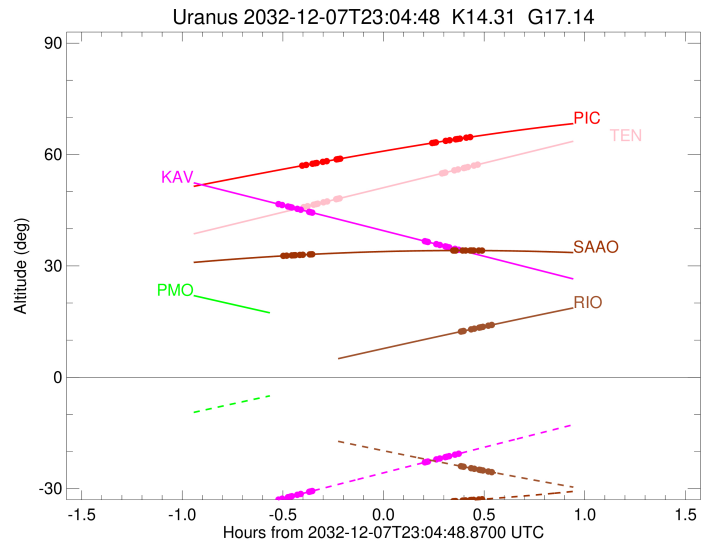
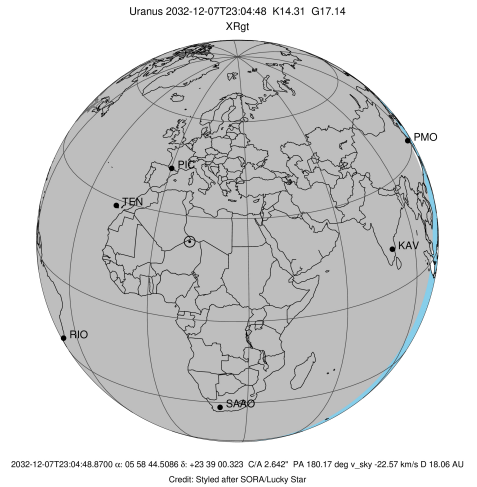


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-07T22:40:14.478		56.95	-65.15	51487.85	-16.25		
lambda	I	2032-12-07T22:41:46.265		57.20	-65.33	50026.71	-15.65		
delta	I	2032-12-07T22:43:39.113		57.52	-65.56	48300.35	-14.93		
gamma	I	2032-12-07T22:44:24.580		57.64	-65.65	47628.38	-14.62		
eta	I	2032-12-07T22:44:55.742		57.73	-65.71	47176.12	-14.40		
beta	I	2032-12-07T22:46:43.119		58.02	-65.92	45672.44	-13.58		
alpha	I	2032-12-07T22:47:52.956		58.21	-66.05	44743.00	-13.01		
4	I	2032-12-07T22:50:53.038		58.70	-66.39	42542.23	-11.36		
5	I	2032-12-07T22:51:14.095		58.76	-66.43	42303.84	-11.16		
6	I	2032-12-07T22:51:56.112		58.87	-66.50	41843.79	-10.77		

No planet occultations

6	E	2032-12-07T23:19:23.132		63.11	-68.93	41875.33	10.78		
5	E	2032-12-07T23:19:56.117		63.19	-68.96	42238.02	11.17		
4	E	2032-12-07T23:20:20.544		63.25	-68.99	42526.36	11.37		
alpha	E	2032-12-07T23:23:19.413		63.68	-69.17	44706.18	13.03		
beta	E	2032-12-07T23:24:30.372		63.84	-69.24	45649.12	13.60		
eta	E	2032-12-07T23:26:19.273		64.10	-69.33	47176.12	14.42		
gamma	E	2032-12-07T23:26:49.955		64.17	-69.36	47621.97	14.64		
delta	E	2032-12-07T23:27:35.795		64.28	-69.40	48300.35	14.96		
lambda	E	2032-12-07T23:29:28.473		64.53	-69.49	50026.71	15.68		
epsilon	E	2032-12-07T23:30:53.755		64.73	-69.55	51384.94	16.28		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-07T23:07:44.880  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 3424870281189642752  
 2Mass ID (if available) : 05584450+2339004  
 ICRS Star Coord at Epoch: 05h 58m 44.50864s +23:39:00.32295s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.309  
 G magnitude : 17.142  
 RP magnitude : 16.230  
 BP magnitude : 18.009  
 DUPflag : 0  
 Distance (au) : 18.064  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.57  
 Sun-Target sep (deg) : 166.23  
 Sun-Moon sep (deg) : 128.72  
 B (ring opening deg) : 75.59  
 PA of pole (deg) : 56.22  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.716  
 C/A sky separation (km) : 35585.8  
 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



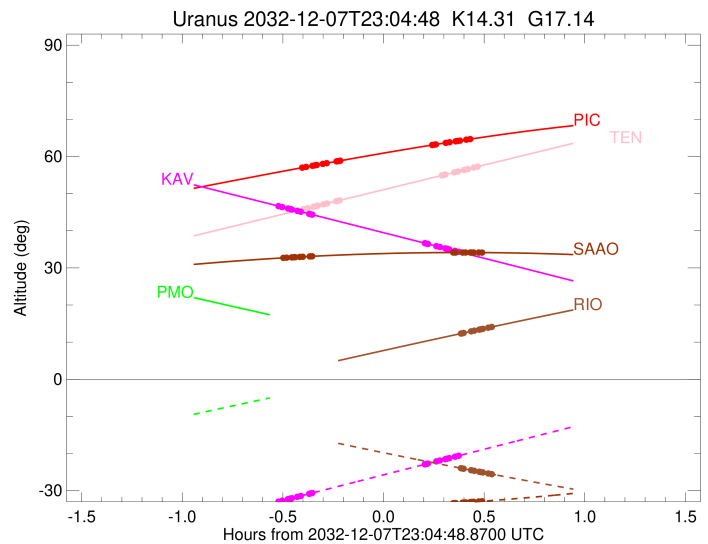
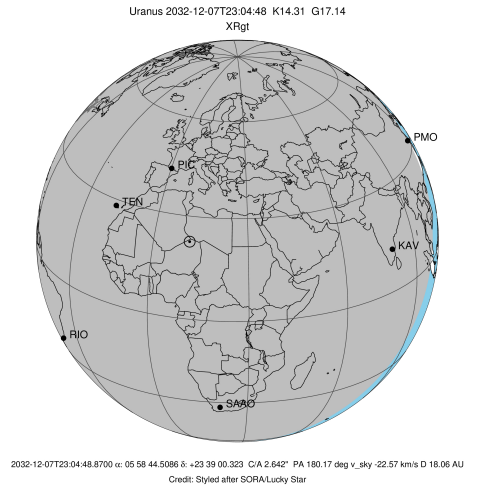
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-07T22:40:43.302	45.76	-58.69	51480.71	-16.79		
lambda	I	2032-12-07T22:42:11.529	46.09	-59.01	50026.71	-16.24		
delta	I	2032-12-07T22:43:59.945	46.48	-59.41	48300.35	-15.60		
gamma	I	2032-12-07T22:44:43.402	46.64	-59.57	47628.56	-15.32		
eta	I	2032-12-07T22:45:13.126	46.75	-59.68	47176.12	-15.12		
beta	I	2032-12-07T22:46:54.882	47.13	-60.05	45673.13	-14.40		
alpha	I	2032-12-07T22:48:00.519	47.37	-60.29	44744.03	-13.90		
4	I	2032-12-07T22:50:46.981	47.98	-60.90	42544.13	-12.47		
5	I	2032-12-07T22:51:06.162	48.05	-60.97	42305.99	-12.30		
6	I	2032-12-07T22:51:44.472	48.19	-61.11	41841.38	-11.97		

No planet occultations

6	E	2032-12-07T23:22:16.856	54.93	-67.80	41876.41	11.99		
5	E	2032-12-07T23:22:46.105	55.04	-67.91	42233.29	12.32		
4	E	2032-12-07T23:23:08.693	55.12	-67.99	42526.79	12.49		
alpha	E	2032-12-07T23:25:53.776	55.73	-68.59	44704.65	13.93		
beta	E	2032-12-07T23:27:00.473	55.97	-68.83	45648.39	14.43		
eta	E	2032-12-07T23:28:43.650	56.35	-69.21	47176.12	15.16		
gamma	E	2032-12-07T23:29:12.862	56.46	-69.31	47621.85	15.36		
delta	E	2032-12-07T23:29:56.643	56.62	-69.47	48300.35	15.64		
lambda	E	2032-12-07T23:31:44.763	57.02	-69.86	50026.71	16.29		
epsilon	E	2032-12-07T23:33:06.306	57.32	-70.16	51373.07	16.84		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-07T23:01:04.330  
 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 : 3424870281189642752  
 2Mass ID (if available) : 05584450+2339004  
 ICRS Star Coord at Epoch: 05h 58m 44.50864s +23:39:00.32295s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.309  
 G magnitude : 17.142  
 RP magnitude : 16.230  
 BP magnitude : 18.009  
 DUPflag : 0  
 Distance (au) : 18.064  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.57  
 Sun-Target sep (deg) : 166.23  
 Sun-Moon sep (deg) : 127.77  
 B (ring opening deg) : 75.59  
 PA of pole (deg) : 56.22  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.614  
 C/A sky separation (km) : 34249.6  
 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



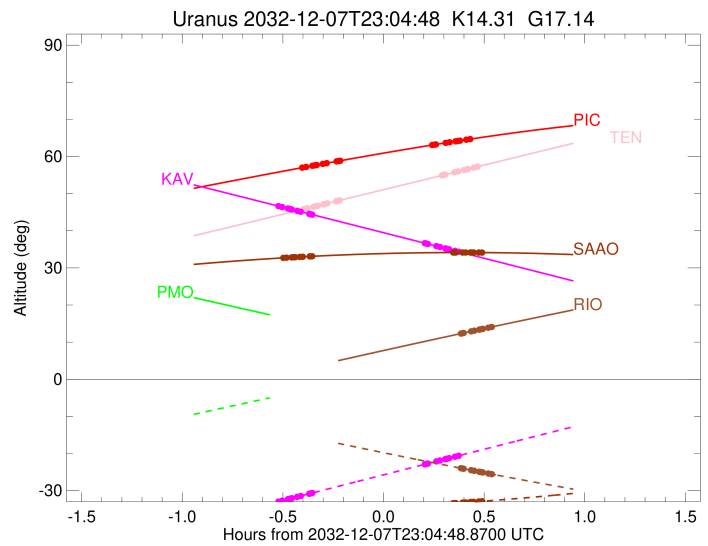
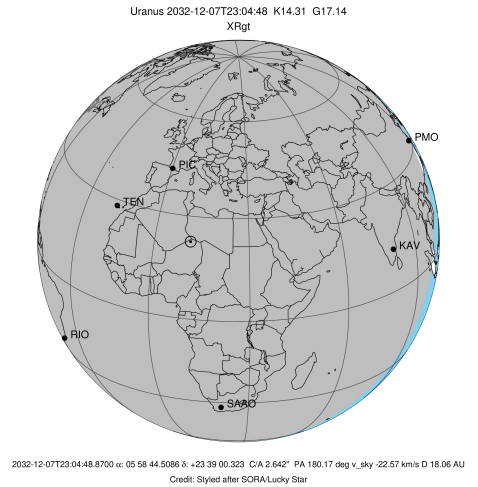
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-07T22:33:12.544	46.71	-33.03	51469.27	-17.42		
lambda	I	2032-12-07T22:34:36.752	46.39	-32.71	50026.71	-16.92		
delta	I	2032-12-07T22:36:20.546	46.00	-32.31	48300.35	-16.34		
gamma	I	2032-12-07T22:37:01.955	45.84	-32.15	47628.81	-16.09		
eta	I	2032-12-07T22:37:30.238	45.73	-32.04	47176.12	-15.92		
beta	I	2032-12-07T22:39:06.480	45.37	-31.67	45674.04	-15.28		
alpha	I	2032-12-07T22:40:08.142	45.13	-31.43	44745.33	-14.84		
4	I	2032-12-07T22:42:42.406	44.55	-30.84	42546.66	-13.61		
5	I	2032-12-07T22:43:00.026	44.48	-30.77	42308.41	-13.46		
6	I	2032-12-07T22:43:35.296	44.35	-30.64	41838.36	-13.18		

No planet occultations

6	E	2032-12-07T23:17:10.966	36.65	-22.91	41877.18	13.15		
5	E	2032-12-07T23:17:37.334	36.55	-22.80	42229.46	13.43		
4	E	2032-12-07T23:17:58.402	36.47	-22.72	42527.25	13.57		
alpha	E	2032-12-07T23:20:32.031	35.88	-22.14	44703.46	14.80		
beta	E	2032-12-07T23:21:35.052	35.64	-21.89	45647.84	15.24		
eta	E	2032-12-07T23:23:13.241	35.26	-21.52	47176.12	15.87		
gamma	E	2032-12-07T23:23:41.169	35.15	-21.41	47621.76	16.04		
delta	E	2032-12-07T23:24:23.145	34.99	-21.25	48300.35	16.29		
lambda	E	2032-12-07T23:26:07.273	34.59	-20.85	50026.71	16.86		
epsilon	E	2032-12-07T23:27:25.690	34.29	-20.55	51364.31	17.36		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-07T23:09:00.660  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 3424870281189642752  
 2Mass ID (if available) : 05584450+2339004  
 ICRS Star Coord at Epoch: 05h 58m 44.50864s +23:39:00.32295s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.309  
 G magnitude : 17.142  
 RP magnitude : 16.230  
 BP magnitude : 18.009  
 DUPflag : 0  
 Distance (au) : 18.064  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.57  
 Sun-Target sep (deg) : 166.23  
 Sun-Moon sep (deg) : 128.33  
 B (ring opening deg) : 75.59  
 PA of pole (deg) : 56.22  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.395  
 C/A sky separation (km) : 31376.7  
 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\_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	2032-12-07T22:39:14.334		2.54x	-14.95	51453.53	-18.33		
lambda	I	2032-12-07T22:40:33.183		2.81x	-15.20	50026.71	-17.93		
delta	I	2032-12-07T22:42:10.638		3.14x	-15.52	48300.35	-17.49		
gamma	I	2032-12-07T22:42:49.222		3.27x	-15.64	47629.14	-17.30		
eta	I	2032-12-07T22:43:15.506		3.36x	-15.72	47176.12	-17.17		
beta	I	2032-12-07T22:44:44.131		3.67x	-16.01	45675.22	-16.69		
alpha	I	2032-12-07T22:45:40.330		3.86x	-16.19	44746.97	-16.36		
4	I	2032-12-07T22:47:58.194		4.33x	-16.63	42550.42	-15.47		
5	I	2032-12-07T22:48:13.798		4.38x	-16.67	42311.22	-15.35		
6	I	2032-12-07T22:48:45.021		4.49x	-16.77	41834.10	-15.15		

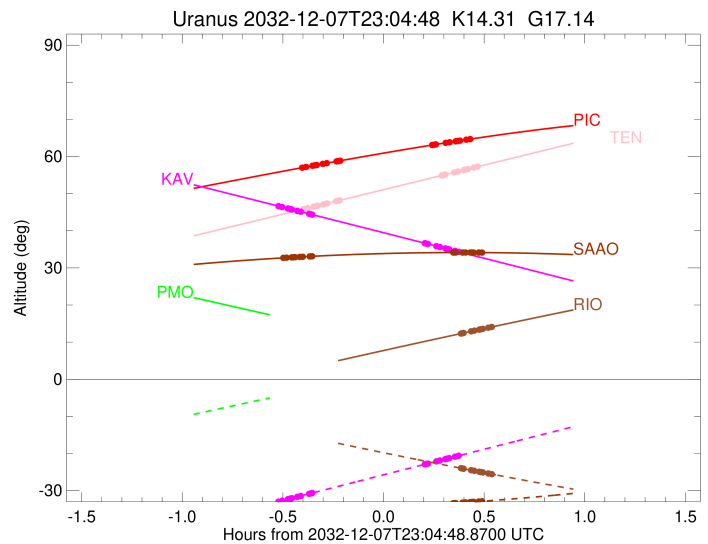
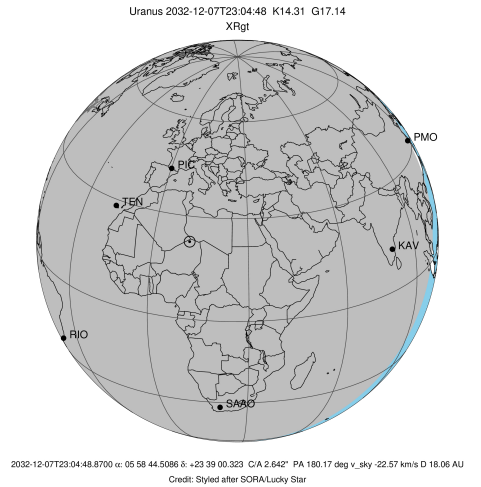
No planet occultations

6	E	2032-12-07T23:27:56.762	12.32	-23.97	41878.70	15.20
5	E	2032-12-07T23:28:18.851	12.39	-24.03	42219.66	15.40
4	E	2032-12-07T23:28:38.012	12.45	-24.09	42528.89	15.50
alpha	E	2032-12-07T23:30:54.288	12.90	-24.49	44700.24	16.42
beta	E	2032-12-07T23:31:51.482	13.08	-24.65	45646.33	16.75
eta	E	2032-12-07T23:33:21.437	13.37	-24.91	47176.12	17.24
gamma	E	2032-12-07T23:33:47.174	13.46	-24.99	47621.51	17.37
delta	E	2032-12-07T23:34:26.035	13.58	-25.10	48300.35	17.56
lambda	E	2032-12-07T23:36:03.065	13.89	-25.38	50026.71	18.01
epsilon	E	2032-12-07T23:37:15.014	14.12	-25.59	51333.73	18.42



```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch              : 2032-12-07T23:05:12.290
Event type             : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code         : SAAO
Location              : So. Afr. Astro. Obs. (Sutherland)
Latitude (deg)        : -32.37953
E. Longitude (deg)    : 20.81070
Altitude (km)         : 1.768
Gaia source ID        : 3424870281189642752
2Mass ID (if available) : 05584450+2339004
ICRS Star Coord at Epoch: 05h 58m 44.50864s +23:39:00.32295s
RUWE (>1.4 is poor)  : 0.98
K magnitude           : 14.309
G magnitude           : 17.142
RP magnitude          : 16.230
BP magnitude          : 18.009
DUPflag              : 0
Distance (au)         : 18.064
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -22.57
Sun-Target sep (deg)  : 166.23
Sun-Moon sep (deg)    : 128.16
B (ring opening deg)  : 75.59
PA of pole (deg)      : 56.22
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.233
C/A sky separation (km) : 29252.3
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_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	2032-12-07T22:34:42.525		32.69	-35.04	51437.39	-19.29		
lambda	I	2032-12-07T22:35:56.471		32.75	-35.03	50026.71	-18.94		
delta	I	2032-12-07T22:37:28.514		32.83	-35.02	48300.35	-18.57		
gamma	I	2032-12-07T22:38:04.804		32.86	-35.01	47629.42	-18.41		
eta	I	2032-12-07T22:38:29.504		32.88	-35.01	47176.12	-18.30		
beta	I	2032-12-07T22:39:52.361		32.95	-34.99	45676.18	-17.89		
alpha	I	2032-12-07T22:40:44.656		33.00	-34.98	44748.22	-17.62		
4	I	2032-12-07T22:42:51.697		33.09	-34.95	42553.66	-16.87		
5	I	2032-12-07T22:43:06.093		33.11	-34.95	42312.98	-16.79		
6	I	2032-12-07T22:43:34.856		33.13	-34.94	41830.66	-16.63		

No planet occultations

6	E	2032-12-07T23:25:38.394		34.14	-33.39	41879.24	16.64		
5	E	2032-12-07T23:25:58.219		34.14	-33.37	42214.38	16.80		
4	E	2032-12-07T23:26:16.198		34.14	-33.35	42530.06	16.88		
alpha	E	2032-12-07T23:28:22.079		34.15	-33.23	44698.57	17.63		
beta	E	2032-12-07T23:29:15.526		34.15	-33.18	45645.58	17.90		
eta	E	2032-12-07T23:30:40.003		34.14	-33.09	47176.12	18.31		
gamma	E	2032-12-07T23:31:04.251		34.14	-33.06	47621.39	18.42		
delta	E	2032-12-07T23:31:40.955		34.14	-33.03	48300.35	18.58		
lambda	E	2032-12-07T23:33:12.938		34.13	-32.93	50026.71	18.95		
epsilon	E	2032-12-07T23:34:20.569		34.13	-32.85	51317.04	19.30		