

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-02-18T23:23:44.080  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 630707258699340800  
 2Mass ID (if available) : 09265565+1548403

Uranus 2044-02-18T23:23:44 K13.78 G16.86 XRgt

ICRS Star Coord at Epoch: 09h 26m 55.67252s +15:48:39.79921s

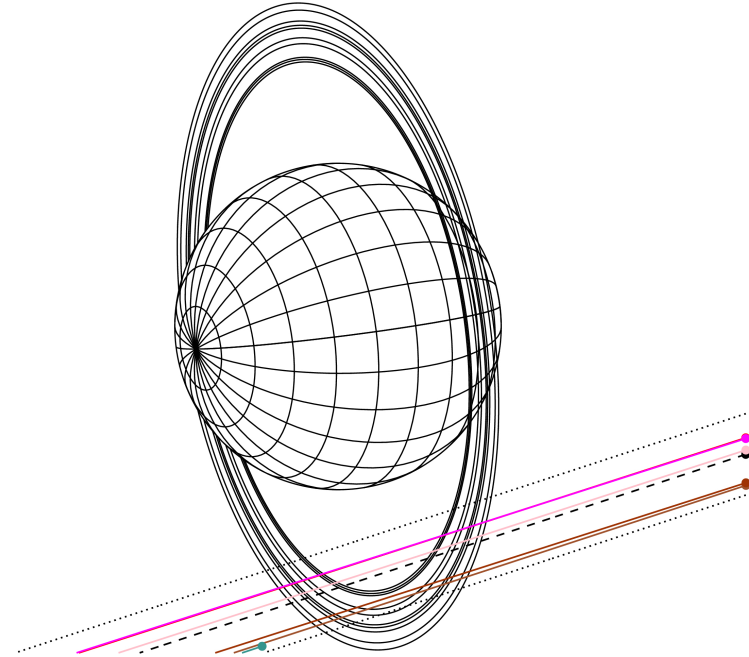
RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.778  
 G magnitude : 16.864  
 RP magnitude : 15.891  
 BP magnitude : 17.852  
 DUPflag : 0  
 Distance (au) : 17.425  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.64  
 Sun-Target sep (deg) : 169.70  
 Sun-Moon sep (deg) : 79.66  
 B (ring opening deg) : 28.18  
 PA of pole (deg) : 99.03

Uranus 2044-02-18T23:23:44 K13.78 G16.86 XRgt



2044-02-18T23:23:44.0800 α: 09 26 55.6725 δ: +15 48 39.799 C/A 3.072° PA 18.13 deg v\_sky -22.64 km/s D 17.43 AU  
 Credit: Styled after SORA/Lucky Star

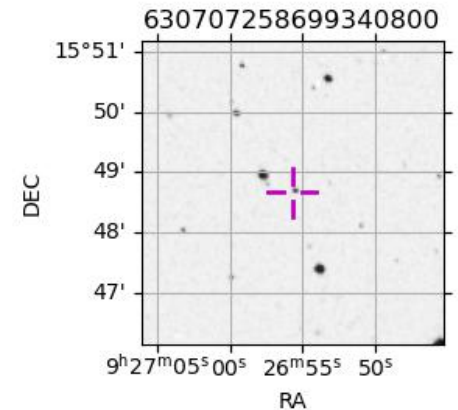
Earth  
 PIC  
 TEN  
 KAV  
 RIO  
 ESO  
 SAAO



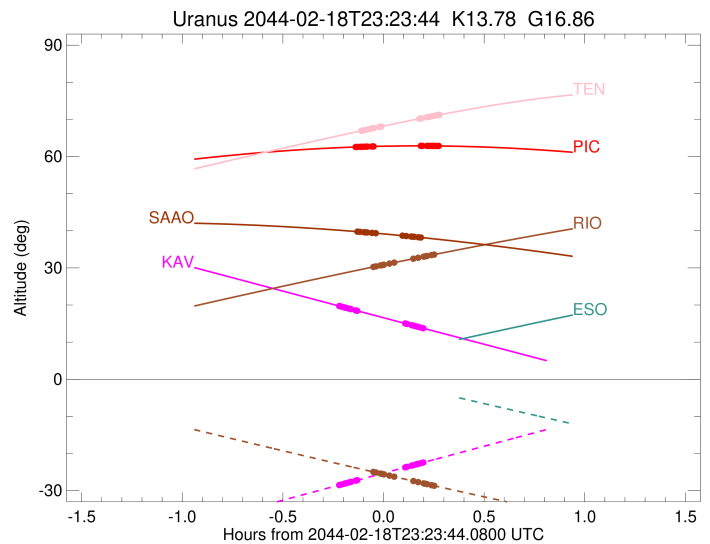
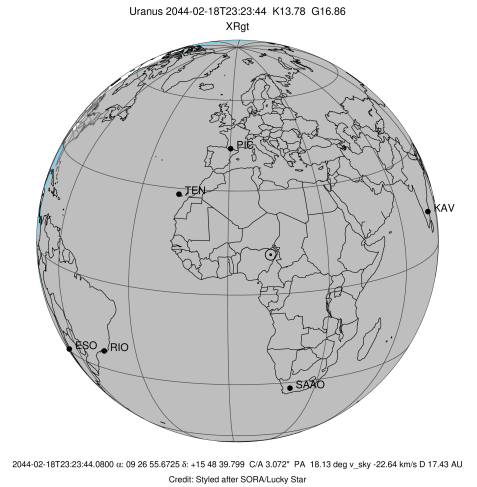
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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	+++++		+++++	FEB 18 23:15 - FEB 18 23:40	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	+++++		+++++	FEB 18 23:17 - FEB 18 23:40	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	FEB 18 23:10 - FEB 18 23:35	PnnRie
RIO	Rio de Janeiro	-22.9	316.8	+++++		+++++	FEB 18 23:20 - FEB 18 23:39	PnnRie
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	+++++		+++++	FEB 18 23:15 - FEB 18 23:35	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-02-18T23:24:39.880  
 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 : 630707258699340800  
 2Mass ID (if available) : 09265565+1548403  
 ICRS Star Coord at Epoch: 09h 26m 55.67252s +15:48:39.79921s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.778  
 G magnitude : 16.864  
 RP magnitude : 15.891  
 BP magnitude : 17.852  
 DUPflag : 0  
 Distance (au) : 17.425  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.64  
 Sun-Target sep (deg) : 169.70  
 Sun-Moon sep (deg) : 80.49  
 B (ring opening deg) : 28.18  
 PA of pole (deg) : 99.03  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.865  
 C/A sky separation (km) : 36207.6  
 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

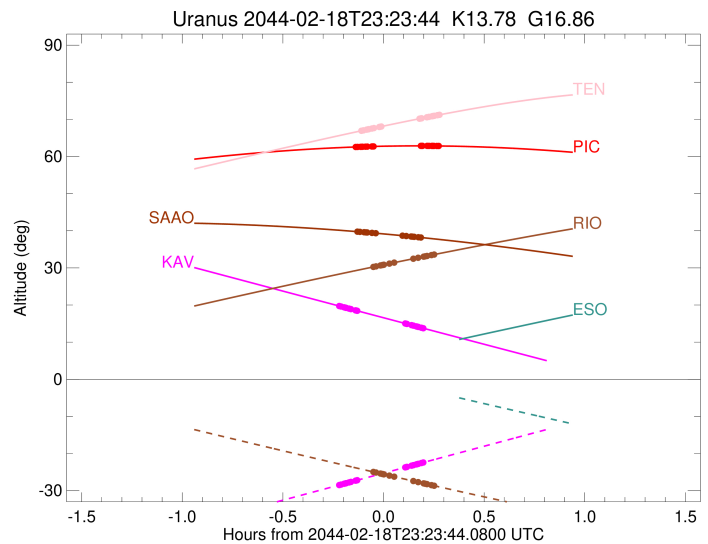
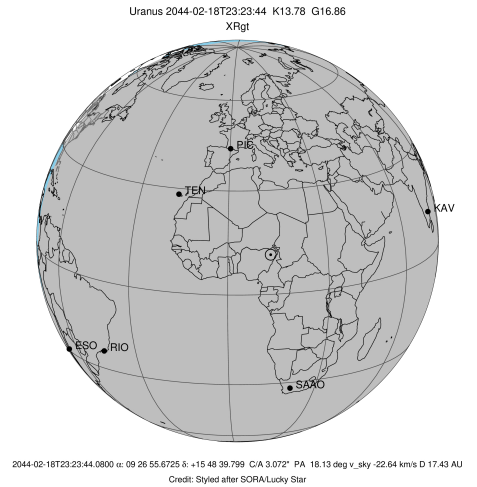


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2044-02-18T23:15:20.898		62.57	-56.31	51365.18	-34.07		
lambda	I	2044-02-18T23:16:01.005		62.59	-56.36	50026.71	-32.89		
delta	I	2044-02-18T23:16:54.619		62.62	-56.44	48300.35	-31.49		
gamma	I	2044-02-18T23:17:16.062		62.63	-56.46	47631.58	-30.88		
eta	I	2044-02-18T23:17:30.913		62.63	-56.48	47176.12	-30.45		
beta	I	2044-02-18T23:18:21.690		62.66	-56.55	45664.93	-28.85		
alpha	I	2044-02-18T23:18:53.579		62.67	-56.59	44752.23	-27.78		
4	I	2044-02-18T23:20:17.936		62.71	-56.70	42525.96	-24.59		
5	I	2044-02-18T23:20:34.671		62.71	-56.72	42172.40	-24.10		
6	I	2044-02-18T23:20:45.906		62.72	-56.73	41877.75	-23.55		

No planet occultations

6	E	2044-02-18T23:34:51.596		62.87	-57.65	41869.41	23.56		
5	E	2044-02-18T23:35:08.323		62.87	-57.66	42247.03	24.10		
4	E	2044-02-18T23:35:20.923		62.87	-57.68	42548.13	24.59		
alpha	E	2044-02-18T23:36:43.784		62.87	-57.75	44726.29	27.78		
beta	E	2044-02-18T23:37:16.500		62.87	-57.78	45643.28	28.85		
eta	E	2044-02-18T23:38:08.156		62.86	-57.82	47176.12	30.45		
gamma	E	2044-02-18T23:38:22.870		62.86	-57.84	47627.28	30.88		
delta	E	2044-02-18T23:38:44.455		62.86	-57.85	48300.35	31.48		
lambda	E	2044-02-18T23:39:38.076		62.85	-57.90	50026.71	32.89		
epsilon	E	2044-02-18T23:40:21.962		62.84	-57.93	51493.03	34.07		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-02-18T23:25:27.060  
 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 : 630707258699340800  
 2Mass ID (if available) : 09265565+1548403  
 ICRS Star Coord at Epoch: 09h 26m 55.67252s +15:48:39.79921s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.778  
 G magnitude : 16.864  
 RP magnitude : 15.891  
 BP magnitude : 17.852  
 DUPflag : 0  
 Distance (au) : 17.425  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.64  
 Sun-Target sep (deg) : 169.70  
 Sun-Moon sep (deg) : 80.55  
 B (ring opening deg) : 28.18  
 PA of pole (deg) : 99.03  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.014  
 C/A sky separation (km) : 38086.4  
 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

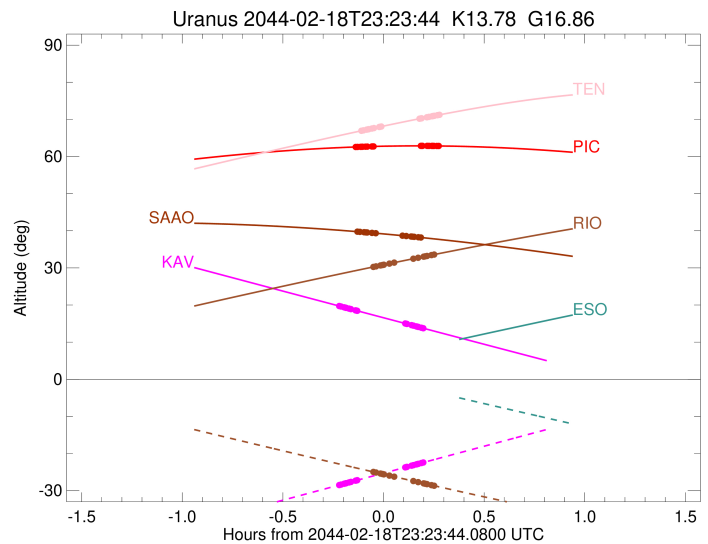
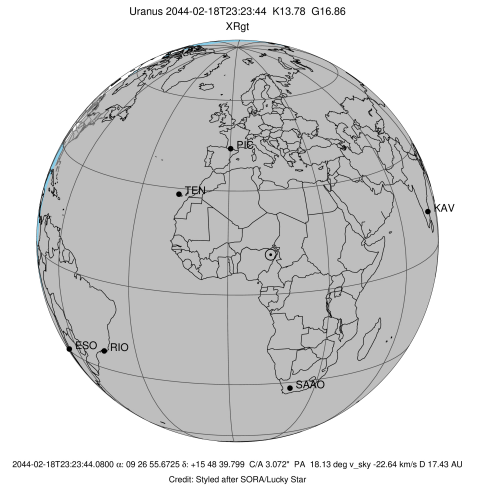


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2044-02-18T23:17:01.489		66.92	-56.84	51383.31	-32.25		
lambda	I	2044-02-18T23:17:44.614		67.06	-56.98	50026.71	-30.88		
delta	I	2044-02-18T23:18:42.044		67.24	-57.18	48300.35	-29.21		
gamma	I	2044-02-18T23:19:05.223		67.32	-57.25	47631.57	-28.49		
eta	I	2044-02-18T23:19:21.358		67.37	-57.31	47176.12	-27.96		
beta	I	2044-02-18T23:20:17.206		67.55	-57.49	45663.48	-26.01		
alpha	I	2044-02-18T23:20:52.792		67.66	-57.61	44751.84	-24.68		
4	I	2044-02-18T23:22:30.387		67.97	-57.94	42526.01	-20.60		
5	I	2044-02-18T23:22:49.701		68.03	-58.00	42177.62	-19.91		
6	I	2044-02-18T23:23:03.775		68.08	-58.05	41878.85	-19.16		

No planet occultations

6	E	2044-02-18T23:34:28.596		70.19	-60.29	41872.09	19.17		
5	E	2044-02-18T23:34:48.249		70.25	-60.35	42239.14	19.92		
4	E	2044-02-18T23:35:03.331		70.29	-60.40	42544.53	20.60		
alpha	E	2044-02-18T23:36:39.422		70.58	-60.71	44728.85	24.69		
beta	E	2044-02-18T23:37:15.853		70.69	-60.82	45644.01	26.02		
eta	E	2044-02-18T23:38:12.563		70.85	-61.00	47176.12	27.97		
gamma	E	2044-02-18T23:38:28.554		70.90	-61.05	47627.62	28.50		
delta	E	2044-02-18T23:38:51.866		70.97	-61.13	48300.35	29.22		
lambda	E	2044-02-18T23:39:49.277		71.13	-61.31	50026.71	30.89		
epsilon	E	2044-02-18T23:40:36.157		71.27	-61.46	51504.24	32.27		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-02-18T23:19:54.640  
 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 : 630707258699340800  
 2Mass ID (if available) : 09265565+1548403  
 ICRS Star Coord at Epoch: 09h 26m 55.67252s +15:48:39.79921s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.778  
 G magnitude : 16.864  
 RP magnitude : 15.891  
 BP magnitude : 17.852  
 DUPflag : 0  
 Distance (au) : 17.425  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.64  
 Sun-Target sep (deg) : 169.70  
 Sun-Moon sep (deg) : 79.78  
 B (ring opening deg) : 28.18  
 PA of pole (deg) : 99.03  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.862  
 C/A sky separation (km) : 36165.6  
 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\_itrf93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

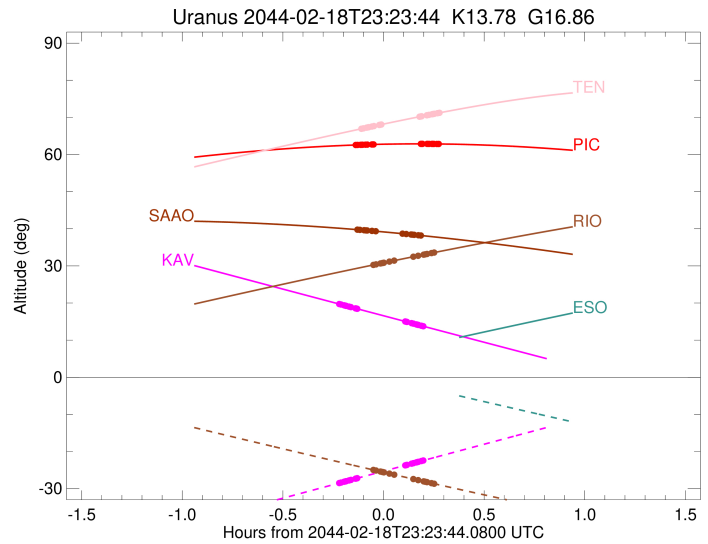
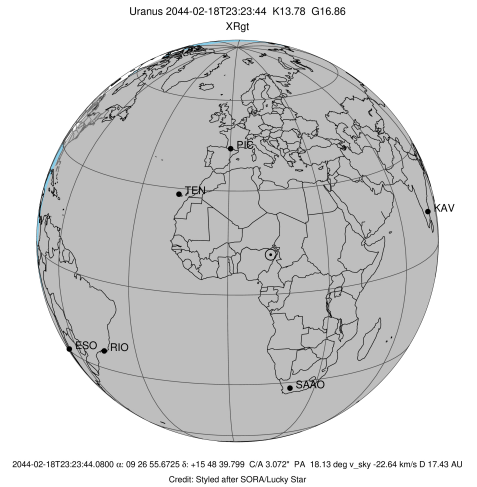


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2044-02-18T23:10:26.087		19.75	-28.52	51365.03	-33.79		
lambda	I	2044-02-18T23:11:06.524		19.59	-28.36	50026.71	-32.62		
delta	I	2044-02-18T23:12:00.576		19.38	-28.14	48300.35	-31.23		
gamma	I	2044-02-18T23:12:22.192		19.29	-28.05	47631.58	-30.64		
eta	I	2044-02-18T23:12:37.161		19.23	-27.99	47176.12	-30.21		
beta	I	2044-02-18T23:13:28.332		19.03	-27.79	45664.95	-28.63		
alpha	I	2044-02-18T23:14:00.460		18.90	-27.66	44752.23	-27.58		
4	I	2044-02-18T23:15:25.394		18.56	-27.31	42525.97	-24.44		
5	I	2044-02-18T23:15:42.242		18.49	-27.24	42172.31	-23.96		
6	I	2044-02-18T23:15:53.540		18.45	-27.20	41877.73	-23.42		

No planet occultations

6	E	2044-02-18T23:30:12.282		15.03	-23.73	41869.32	23.39		
5	E	2044-02-18T23:30:29.148		14.96	-23.66	42247.28	23.93		
4	E	2044-02-18T23:30:41.846		14.91	-23.61	42548.25	24.41		
alpha	E	2044-02-18T23:32:05.381		14.58	-23.27	44726.20	27.54		
beta	E	2044-02-18T23:32:38.395		14.45	-23.14	45643.26	28.58		
eta	E	2044-02-18T23:33:30.540		14.24	-22.93	47176.12	30.16		
gamma	E	2044-02-18T23:33:45.396		14.18	-22.87	47627.27	30.58		
delta	E	2044-02-18T23:34:07.195		14.10	-22.78	48300.35	31.17		
lambda	E	2044-02-18T23:35:01.359		13.88	-22.56	50026.71	32.55		
epsilon	E	2044-02-18T23:35:45.688		13.71	-22.38	51492.56	33.72		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-02-18T23:25:52.970  
 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 : 630707258699340800  
 2Mass ID (if available) : 09265565+1548403  
 ICRS Star Coord at Epoch: 09h 26m 55.67252s +15:48:39.79921s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.778  
 G magnitude : 16.864  
 RP magnitude : 15.891  
 BP magnitude : 17.852  
 DUPflag : 0  
 Distance (au) : 17.425  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.64  
 Sun-Target sep (deg) : 169.70  
 Sun-Moon sep (deg) : 80.19  
 B (ring opening deg) : 28.18  
 PA of pole (deg) : 99.03  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.444  
 C/A sky separation (km) : 43528.4  
 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\_itrf93\_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

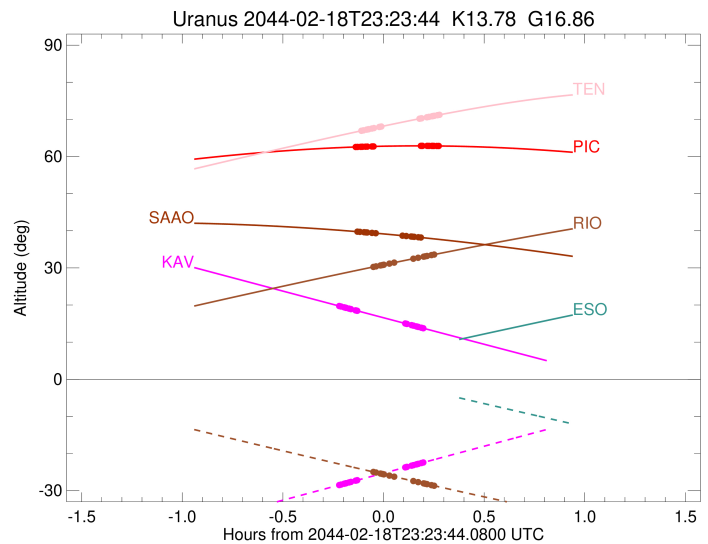
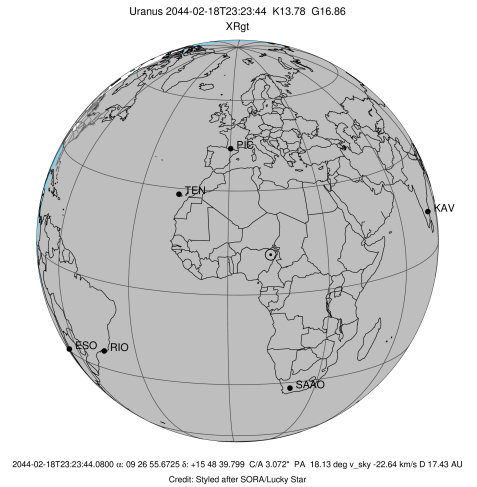
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2044-02-18T23:20:32.049		30.23	-24.92	51438.59	-25.20		
lambda	I	2044-02-18T23:21:30.935		30.41	-25.12	50026.71	-22.95		
delta	I	2044-02-18T23:22:51.371		30.66	-25.40	48300.35	-19.92		
gamma	I	2044-02-18T23:23:26.182		30.77	-25.52	47631.36	-18.50		
eta	I	2044-02-18T23:23:51.505		30.85	-25.61	47176.12	-17.44		
beta	I	2044-02-18T23:25:31.002		31.16	-25.95	45657.58	-12.95		
alpha	I	2044-02-18T23:26:53.377		31.42	-26.24	44747.67	-8.93		

No planet occultations

alpha	E	2044-02-18T23:32:38.162		32.47	-27.42	44739.34	8.94		
beta	E	2044-02-18T23:34:01.458		32.73	-27.70	45647.84	12.96		
eta	E	2044-02-18T23:35:41.805		33.03	-28.04	47176.12	17.45		
gamma	E	2044-02-18T23:36:06.975		33.11	-28.13	47628.79	18.52		
delta	E	2044-02-18T23:36:41.902		33.21	-28.25	48300.35	19.93		
lambda	E	2044-02-18T23:38:02.279		33.45	-28.52	50026.71	22.97		
epsilon	E	2044-02-18T23:39:04.922		33.64	-28.73	51534.02	25.23		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2044-02-18T23:21:43.680
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      : 630707258699340800
2Mass ID (if available) : 09265565+1548403
ICRS Star Coord at Epoch: 09h 26m 55.67252s +15:48:39.79921s
RUWE (>1.4 is poor) : 1.03
K magnitude          : 13.778
G magnitude          : 16.864
RP magnitude         : 15.891
BP magnitude         : 17.852
DUPflag             : 0
Distance (au)       : 17.425
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -22.64
Sun-Target sep (deg) : 169.70
Sun-Moon sep (deg)  : 80.15
B (ring opening deg) : 28.18
PA of pole (deg)    : 99.03
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.388
C/A sky separation (km) : 42817.4
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_itrf93_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	2044-02-18T23:15:47.082		39.77	-45.89	51431.49	-26.38		
lambda	I	2044-02-18T23:16:42.745		39.71	-45.86	50026.71	-24.29		
delta	I	2044-02-18T23:17:57.997		39.61	-45.82	48300.35	-21.54		
gamma	I	2044-02-18T23:18:29.987		39.57	-45.80	47631.41	-20.27		
eta	I	2044-02-18T23:18:52.972		39.54	-45.79	47176.12	-19.34		
beta	I	2044-02-18T23:20:19.676		39.43	-45.73	45658.62	-15.53		
alpha	I	2044-02-18T23:21:24.011		39.35	-45.69	44748.85	-12.48		

No planet occultations

alpha	E	2044-02-18T23:29:23.948		38.68	-45.33	44737.20	12.49		
beta	E	2044-02-18T23:30:29.242		38.59	-45.28	45646.99	15.53		
eta	E	2044-02-18T23:31:56.871		38.46	-45.20	47176.12	19.33		
gamma	E	2044-02-18T23:32:19.727		38.42	-45.18	47628.60	20.27		
delta	E	2044-02-18T23:32:51.870		38.37	-45.15	48300.35	21.53		
lambda	E	2044-02-18T23:34:07.161		38.26	-45.09	50026.71	24.26		
epsilon	E	2044-02-18T23:35:06.615		38.17	-45.03	51529.97	26.37		