

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2048-03-23T02:26:14.140  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3869939531411235840  
 2Mass ID (if available) : 10374464+0931453

ICRS Star Coord at Epoch: 10h 37m 44.59401s +09:31:45.04763s

RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.874  
 G magnitude : 18.311  
 RP magnitude : 17.175  
 BP magnitude : 19.629  
 DUPflag : 0  
 Distance (au) : 17.390  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.16  
 Sun-Target sep (deg) : 154.96  
 Sun-Moon sep (deg) : 60.25  
 B (ring opening deg) : 10.01  
 PA of pole (deg) : 103.88

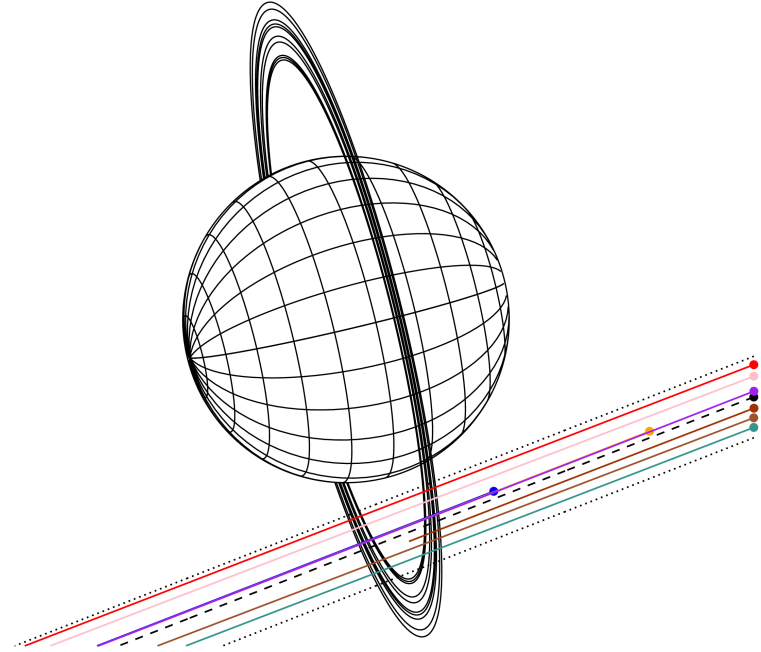
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2048-03-23T02:26:14.1400 α: 10 37 44.5940 s δ: +09 31 45.048 C/A 2.742° PA 21.40 deg v\_sky -20.16 km/s D 17.39 AU  
 Credit: Styled after SORA/Lucky Star

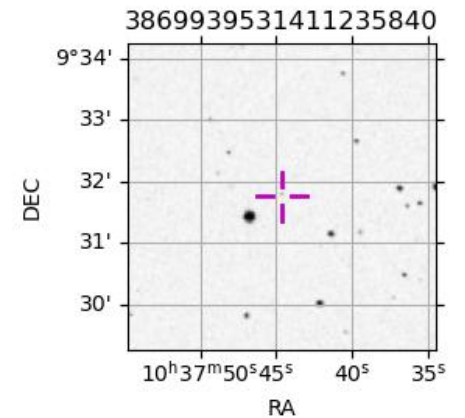
Uranus 2048-03-23T02:26:14 K14.87 G18.31 XRgt

Earth  
 PIC  
 PAL  
 KPNO  
 MCD  
 TEN  
 RIO  
 ESO  
 SAAO

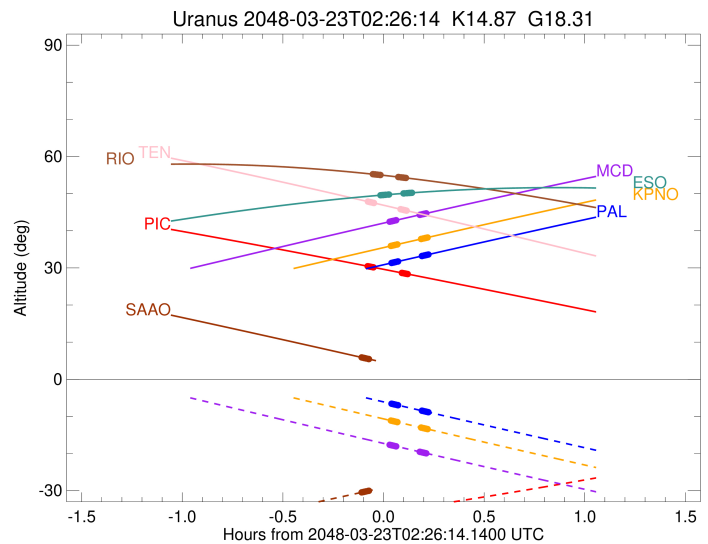
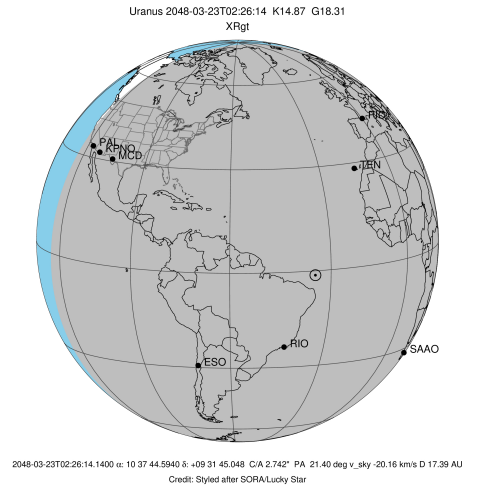


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	MAR 23 02:21 - MAR 23 02:33	PnnRie
PAL	Palomar Mt (200")	33.4	243.1	+++++		+++++	MAR 23 02:28 - MAR 23 02:39	PnnRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	MAR 23 02:28 - MAR 23 02:39	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	MAR 23 02:28 - MAR 23 02:39	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++		+++++	MAR 23 02:21 - MAR 23 02:33	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+++++		+++++	MAR 23 02:23 - MAR 23 02:32	PnnRie
ESO	European Southern Obs	-29.3	289.3	+++++		+++++	MAR 23 02:25 - MAR 23 02:34	PnnRie
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++			MAR 23 02:19 - MAR 23 02:21	PnnRin
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2048-03-23T02:24:30.170  
 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 : 3869939531411235840  
 2Mass ID (if available) : 10374464+0931453  
 ICRS Star Coord at Epoch: 10h 37m 44.59401s +09:31:45.04763s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.874  
 G magnitude : 18.311  
 RP magnitude : 17.175  
 BP magnitude : 19.629  
 DUPflag : 0  
 Distance (au) : 17.390  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.16  
 Sun-Target sep (deg) : 154.96  
 Sun-Moon sep (deg) : 60.81  
 B (ring opening deg) : 10.01  
 PA of pole (deg) : 103.88  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.344  
 C/A sky separation (km) : 29564.1  
 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\_itrfr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

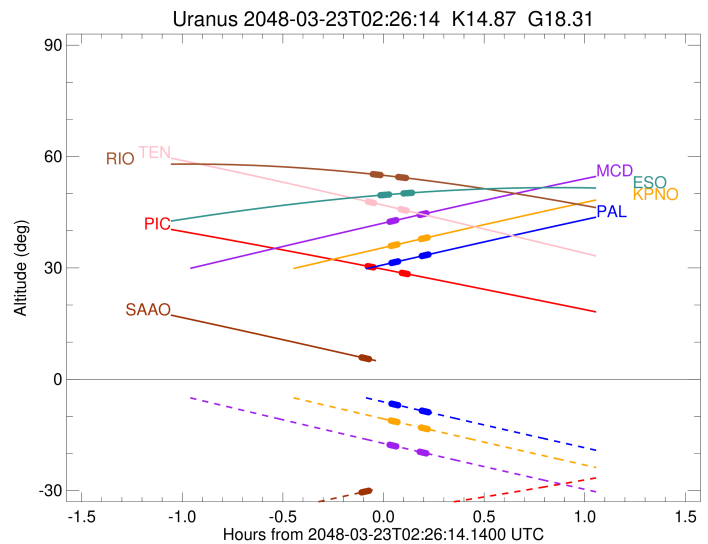
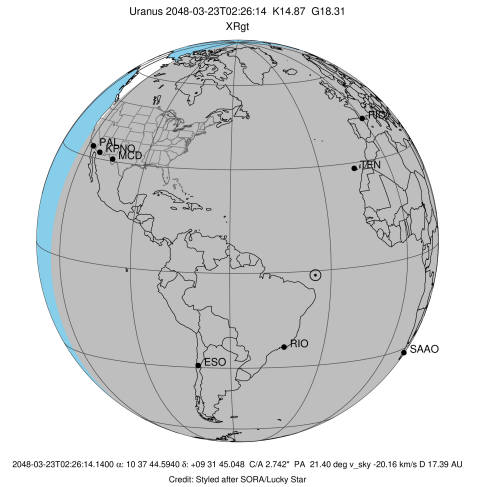


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2048-03-23T02:21:34.816		30.45	-36.46	50749.15	-93.87		
lambda	I	2048-03-23T02:21:42.534		30.42	-36.45	50026.71	-93.23		
delta	I	2048-03-23T02:22:01.236		30.37	-36.41	48300.34	-91.34		
gamma	I	2048-03-23T02:22:08.643		30.35	-36.39	47626.76	-90.53		
eta	I	2048-03-23T02:22:13.635		30.33	-36.38	47176.12	-89.98		
beta	I	2048-03-23T02:22:30.971		30.28	-36.34	45646.01	-87.98		
alpha	I	2048-03-23T02:22:40.759		30.25	-36.32	44750.68	-86.58		
4	I	2048-03-23T02:23:06.758		30.18	-36.27	42575.12	-82.60		
5	I	2048-03-23T02:23:13.454		30.16	-36.25	42189.36	-82.62		
6	I	2048-03-23T02:23:16.265		30.15	-36.25	41807.73	-80.99		

No planet occultations

6	E	2048-03-23T02:31:43.229		28.65	-35.14	41806.13	80.95		
5	E	2048-03-23T02:31:46.894		28.64	-35.13	42301.18	82.58		
4	E	2048-03-23T02:31:50.995		28.63	-35.12	42526.03	82.56		
alpha	E	2048-03-23T02:32:15.168		28.55	-35.07	44704.21	86.52		
beta	E	2048-03-23T02:32:26.607		28.52	-35.04	45676.44	87.92		
eta	E	2048-03-23T02:32:43.630		28.47	-35.00	47176.12	89.91		
gamma	E	2048-03-23T02:32:48.563		28.46	-34.99	47621.01	90.46		
delta	E	2048-03-23T02:32:56.040		28.43	-34.97	48300.35	91.27		
lambda	E	2048-03-23T02:33:14.759		28.38	-34.93	50026.72	93.15		
epsilon	E	2048-03-23T02:33:27.364		28.34	-34.90	51208.26	93.78		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2048-03-23T02:30:39.340  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3869939531411235840  
 2Mass ID (if available) : 10374464+0931453  
 ICRS Star Coord at Epoch: 10h 37m 44.59401s +09:31:45.04763s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.874  
 G magnitude : 18.311  
 RP magnitude : 17.175  
 BP magnitude : 19.629  
 DUPflag : 0  
 Distance (au) : 17.390  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.16  
 Sun-Target sep (deg) : 154.96  
 Sun-Moon sep (deg) : 60.27  
 B (ring opening deg) : 10.01  
 PA of pole (deg) : 103.88  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.655  
 C/A sky separation (km) : 33481.3  
 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



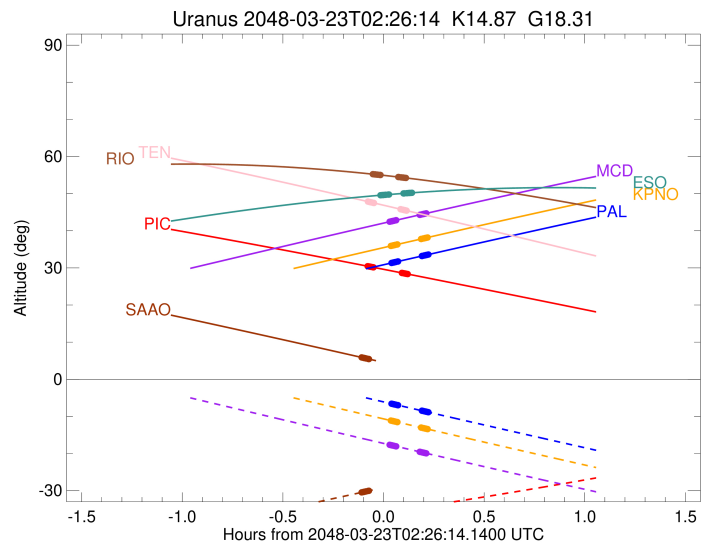
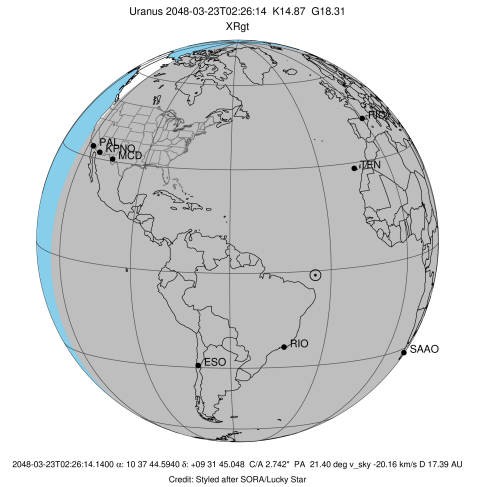
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2048-03-23T02:28:41.985		31.35	-6.60	50744.45	-86.76		
lambda	I	2048-03-23T02:28:50.301		31.38	-6.63	50026.71	-85.80		
delta	I	2048-03-23T02:29:10.731		31.45	-6.70	48300.35	-83.14		
gamma	I	2048-03-23T02:29:18.895		31.48	-6.73	47626.16	-81.99		
eta	I	2048-03-23T02:29:24.409		31.49	-6.75	47176.12	-81.20		
beta	I	2048-03-23T02:29:43.692		31.56	-6.82	45647.70	-78.31		
alpha	I	2048-03-23T02:29:54.803		31.60	-6.85	44749.07	-76.29		
4	I	2048-03-23T02:30:24.980		31.70	-6.96	42568.77	-70.53		
5	I	2048-03-23T02:30:32.052		31.73	-6.98	42199.20	-70.18		
6	I	2048-03-23T02:30:36.286		31.74	-7.00	41803.59	-68.19		

No planet occultations

6	E	2048-03-23T02:37:41.235		33.20	-8.47	41802.22	68.24		
5	E	2048-03-23T02:37:46.257		33.22	-8.49	42294.01	70.23		
4	E	2048-03-23T02:37:50.641		33.23	-8.50	42526.92	70.58		
alpha	E	2048-03-23T02:38:18.717		33.33	-8.60	44708.22	76.34		
beta	E	2048-03-23T02:38:31.561		33.37	-8.64	45674.74	78.36		
eta	E	2048-03-23T02:38:50.512		33.44	-8.71	47176.11	81.26		
gamma	E	2048-03-23T02:38:55.960		33.46	-8.73	47620.96	82.05		
delta	E	2048-03-23T02:39:04.183		33.49	-8.76	48300.35	83.20		
lambda	E	2048-03-23T02:39:24.602		33.56	-8.83	50026.71	85.86		
epsilon	E	2048-03-23T02:39:37.772		33.60	-8.87	51167.80	86.82		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2048-03-23T02:30:27.220
Event type          : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code       : KPNO
Location            : Kitt Peak Natl Obs
Latitude (deg)      : 31.96333
E. Longitude (deg)  : 248.40000
Altitude (km)       : 2.120
Gaia source ID      : 3869939531411235840
2Mass ID (if available) : 10374464+0931453
ICRS Star Coord at Epoch: 10h 37m 44.59401s +09:31:45.04763s
RUWE (>1.4 is poor) : 1.01
K magnitude          : 14.874
G magnitude          : 18.311
RP magnitude         : 17.175
BP magnitude         : 19.629
DUPflag             : 0
Distance (au)       : 17.390
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -20.16
Sun-Target sep (deg) : 154.96
Sun-Moon sep (deg)  : 60.35
B (ring opening deg) : 10.01
PA of pole (deg)    : 103.88
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.663
C/A sky separation (km) : 33591.5
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
    
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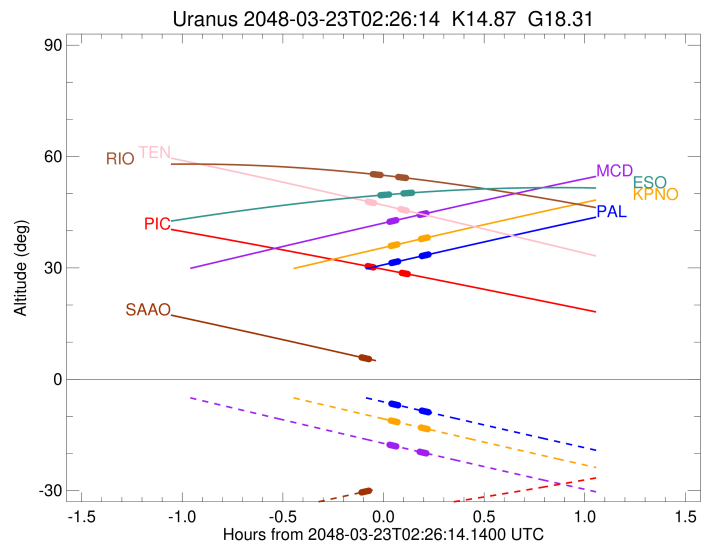
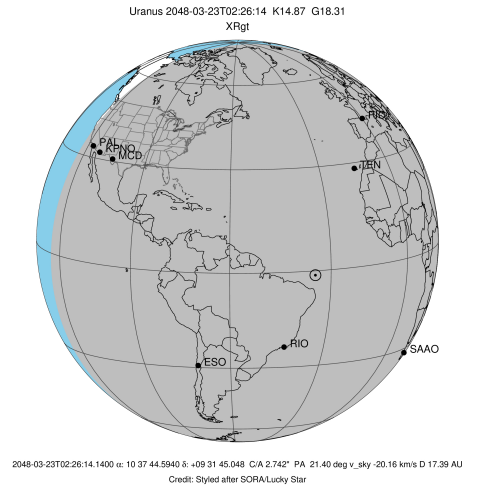


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2048-03-23T02:28:30.436		35.93	-11.14	50744.37	-86.67		
lambda	I	2048-03-23T02:28:38.760		35.96	-11.17	50026.71	-85.70		
delta	I	2048-03-23T02:28:59.217		36.03	-11.24	48300.35	-83.02		
gamma	I	2048-03-23T02:29:07.394		36.06	-11.27	47626.15	-81.85		
eta	I	2048-03-23T02:29:12.918		36.08	-11.29	47176.12	-81.05		
beta	I	2048-03-23T02:29:32.240		36.15	-11.36	45647.75	-78.13		
alpha	I	2048-03-23T02:29:43.381		36.19	-11.40	44749.01	-76.08		
4	I	2048-03-23T02:30:13.663		36.29	-11.50	42568.58	-70.26		
5	I	2048-03-23T02:30:20.739		36.32	-11.53	42199.51	-69.89		
6	I	2048-03-23T02:30:25.019		36.33	-11.54	41803.47	-67.88		

No planet occultations

6	E	2048-03-23T02:37:26.751		37.79	-13.02	41802.12	67.93		
5	E	2048-03-23T02:37:31.814		37.81	-13.03	42293.78	69.93		
4	E	2048-03-23T02:37:36.205		37.82	-13.05	42526.96	70.30		
alpha	E	2048-03-23T02:38:04.384		37.92	-13.15	44708.33	76.13		
beta	E	2048-03-23T02:38:17.259		37.96	-13.19	45674.69	78.17		
eta	E	2048-03-23T02:38:36.249		38.03	-13.26	47176.11	81.10		
gamma	E	2048-03-23T02:38:41.707		38.05	-13.28	47620.95	81.90		
delta	E	2048-03-23T02:38:49.944		38.08	-13.31	48300.35	83.07		
lambda	E	2048-03-23T02:39:10.391		38.15	-13.38	50026.71	85.76		
epsilon	E	2048-03-23T02:39:23.562		38.19	-13.42	51166.69	86.73		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2048-03-23T02:30:05.960  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 3869939531411235840  
 2Mass ID (if available) : 10374464+0931453  
 ICRS Star Coord at Epoch: 10h 37m 44.59401s +09:31:45.04763s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.874  
 G magnitude : 18.311  
 RP magnitude : 17.175  
 BP magnitude : 19.629  
 DUPflag : 0  
 Distance (au) : 17.390  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.16  
 Sun-Target sep (deg) : 154.96  
 Sun-Moon sep (deg) : 60.45  
 B (ring opening deg) : 10.01  
 PA of pole (deg) : 103.88  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.667  
 C/A sky separation (km) : 33641.3  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
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 IAU\_URANUS\_for\_RINGFIT.tpc  
 vgr2.ura111.bsp  
 ura161.bsp  
 vgr2.ura161.bsp  
 peph.ura160.bsp  
 earthstns\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
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 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

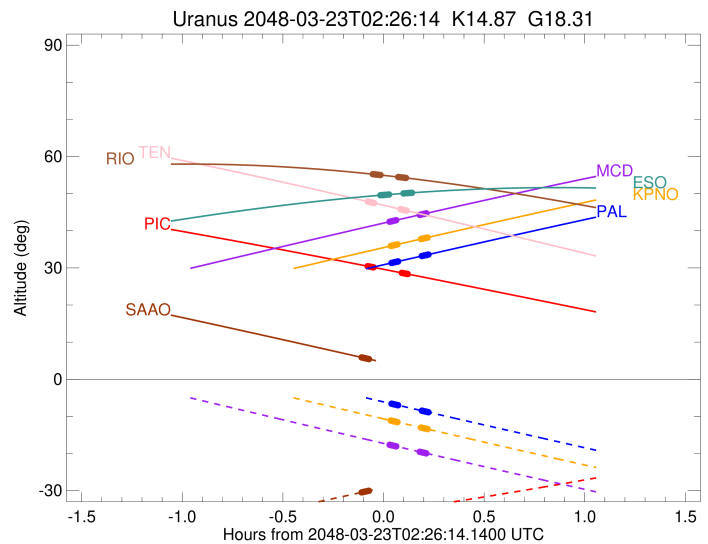
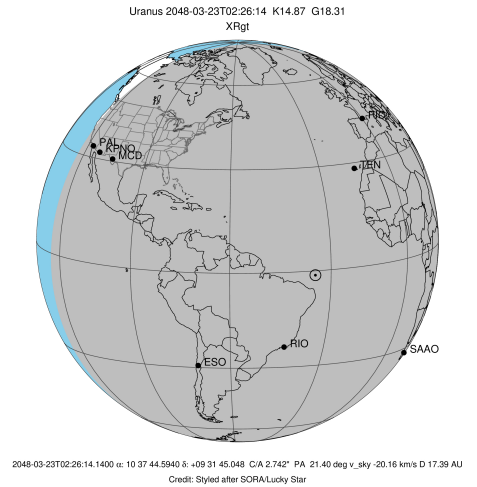


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2048-03-23T02:28:08.505		42.46	-17.67	50744.33	-86.75		
lambda	I	2048-03-23T02:28:16.821		42.49	-17.70	50026.71	-85.77		
delta	I	2048-03-23T02:28:37.262		42.56	-17.78	48300.35	-83.07		
gamma	I	2048-03-23T02:28:45.434		42.59	-17.80	47626.14	-81.90		
eta	I	2048-03-23T02:28:50.955		42.60	-17.82	47176.12	-81.10		
beta	I	2048-03-23T02:29:10.267		42.67	-17.89	45647.78	-78.15		
alpha	I	2048-03-23T02:29:21.407		42.71	-17.93	44748.99	-76.09		
4	I	2048-03-23T02:29:51.694		42.81	-18.04	42568.49	-70.23		
5	I	2048-03-23T02:29:58.762		42.84	-18.06	42199.65	-69.86		
6	I	2048-03-23T02:30:03.057		42.85	-18.08	41803.42	-67.84		

No planet occultations

6	E	2048-03-23T02:37:02.862		44.29	-19.54	41802.08	67.88		
5	E	2048-03-23T02:37:07.936		44.31	-19.56	42293.69	69.90		
4	E	2048-03-23T02:37:12.325		44.33	-19.58	42526.97	70.27		
alpha	E	2048-03-23T02:37:40.510		44.42	-19.67	44708.38	76.14		
beta	E	2048-03-23T02:37:53.382		44.47	-19.72	45674.68	78.20		
eta	E	2048-03-23T02:38:12.365		44.53	-19.78	47176.11	81.14		
gamma	E	2048-03-23T02:38:17.820		44.55	-19.80	47620.96	81.95		
delta	E	2048-03-23T02:38:26.052		44.58	-19.83	48300.35	83.12		
lambda	E	2048-03-23T02:38:46.485		44.65	-19.90	50026.71	85.82		
epsilon	E	2048-03-23T02:38:59.641		44.69	-19.95	51166.28	86.80		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2048-03-23T02:24:17.640  
 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 : 3869939531411235840  
 2Mass ID (if available) : 10374464+0931453  
 ICRS Star Coord at Epoch: 10h 37m 44.59401s +09:31:45.04763s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.874  
 G magnitude : 18.311  
 RP magnitude : 17.175  
 BP magnitude : 19.629  
 DUPflag : 0  
 Distance (au) : 17.390  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.16  
 Sun-Target sep (deg) : 154.96  
 Sun-Moon sep (deg) : 61.01  
 B (ring opening deg) : 10.01  
 PA of pole (deg) : 103.88  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.469  
 C/A sky separation (km) : 31135.8  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

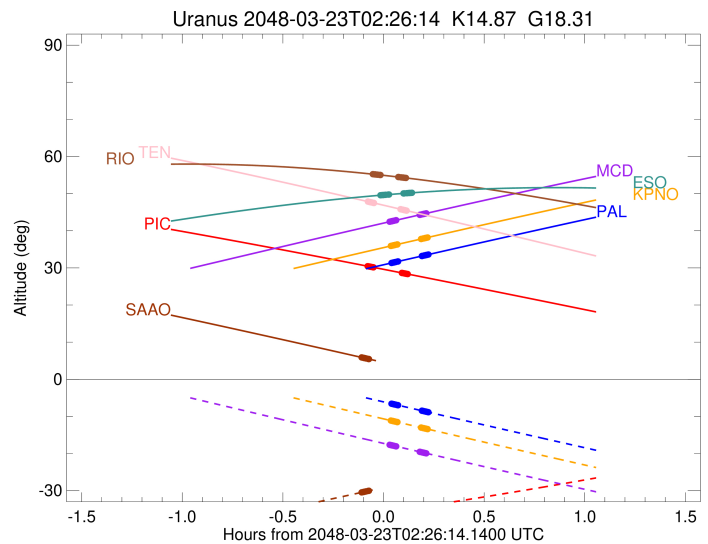
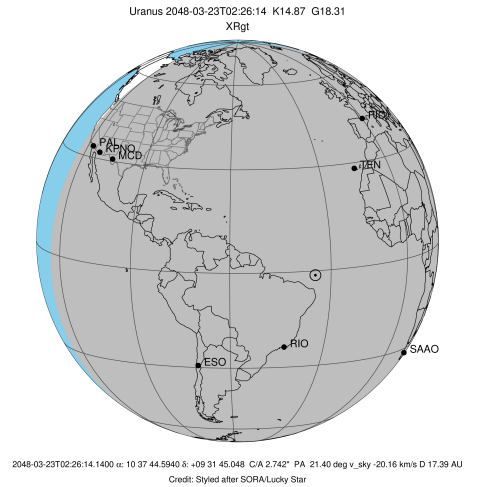


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2048-03-23T02:21:39.944		47.85	-56.24	50746.83	-91.71		
lambda	I	2048-03-23T02:21:47.825		47.82	-56.22	50026.71	-90.95		
delta	I	2048-03-23T02:22:07.030		47.75	-56.19	48300.35	-88.78		
gamma	I	2048-03-23T02:22:14.660		47.73	-56.17	47626.52	-87.84		
eta	I	2048-03-23T02:22:19.805		47.71	-56.16	47176.12	-87.20		
beta	I	2048-03-23T02:22:37.714		47.64	-56.13	45646.64	-84.87		
alpha	I	2048-03-23T02:22:47.895		47.61	-56.10	44750.11	-83.24		
4	I	2048-03-23T02:23:15.154		47.51	-56.05	42572.69	-78.63		
5	I	2048-03-23T02:23:21.926		47.49	-56.04	42193.02	-78.52		
6	I	2048-03-23T02:23:25.203		47.48	-56.03	41806.06	-76.76		

No planet occultations

6	E	2048-03-23T02:31:19.939		45.81	-55.04	41804.59	76.73		
5	E	2048-03-23T02:31:24.034		45.80	-55.03	42298.65	78.49		
4	E	2048-03-23T02:31:28.194		45.78	-55.02	42526.27	78.60		
alpha	E	2048-03-23T02:31:53.536		45.69	-54.96	44705.71	83.20		
beta	E	2048-03-23T02:32:05.397		45.65	-54.94	45675.82	84.82		
eta	E	2048-03-23T02:32:22.995		45.59	-54.90	47176.12	87.14		
gamma	E	2048-03-23T02:32:28.082		45.57	-54.89	47620.97	87.78		
delta	E	2048-03-23T02:32:35.781		45.54	-54.87	48300.35	88.72		
lambda	E	2048-03-23T02:32:55.002		45.47	-54.83	50026.71	90.89		
epsilon	E	2048-03-23T02:33:07.740		45.43	-54.80	51192.85	91.64		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2048-03-23T02:24:22.230  
 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 : 3869939531411235840  
 2Mass ID (if available) : 10374464+0931453  
 ICRS Star Coord at Epoch: 10h 37m 44.59401s +09:31:45.04763s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.874  
 G magnitude : 18.311  
 RP magnitude : 17.175  
 BP magnitude : 19.629  
 DUPflag : 0  
 Distance (au) : 17.390  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.16  
 Sun-Target sep (deg) : 154.96  
 Sun-Moon sep (deg) : 61.08  
 B (ring opening deg) : 10.01  
 PA of pole (deg) : 103.88  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.949  
 C/A sky separation (km) : 37199.6  
 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

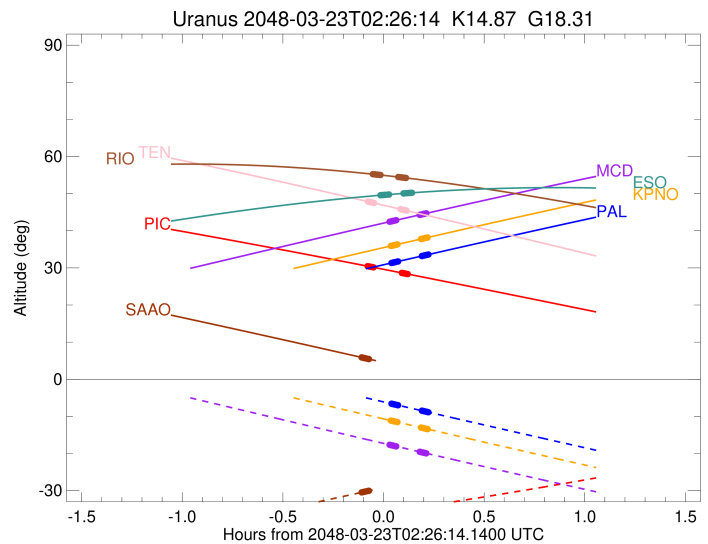
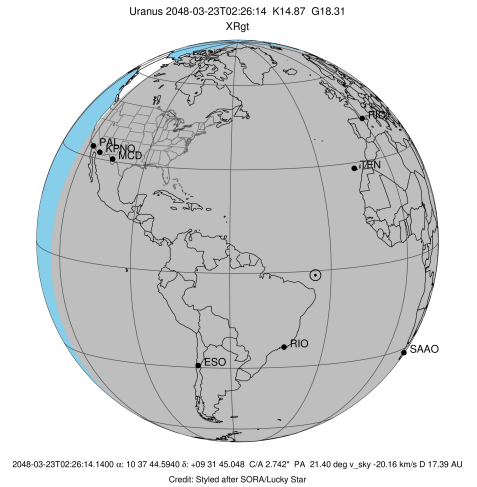


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2048-03-23T02:23:08.020		55.24	-66.77	50743.77	-79.13		
lambda	I	2048-03-23T02:23:17.163		55.22	-66.79	50026.71	-77.72		
delta	I	2048-03-23T02:23:39.906		55.19	-66.82	48300.35	-74.01		
gamma	I	2048-03-23T02:23:49.123		55.17	-66.84	47625.53	-72.38		
eta	I	2048-03-23T02:23:55.380		55.16	-66.84	47176.11	-71.25		
beta	I	2048-03-23T02:24:17.549		55.13	-66.88	45649.78	-67.04		
alpha	I	2048-03-23T02:24:30.774		55.11	-66.90	44746.74	-64.05		
4	I	2048-03-23T02:25:08.044		55.05	-66.95	42561.49	-55.32		
5	I	2048-03-23T02:25:15.946		55.03	-66.96	42211.57	-54.34		
6	I	2048-03-23T02:25:22.729		55.02	-66.97	41799.62	-51.62		

No planet occultations

6	E	2048-03-23T02:30:38.720		54.48	-67.40	41798.63	51.63		
5	E	2048-03-23T02:30:46.209		54.47	-67.41	42284.32	54.35		
4	E	2048-03-23T02:30:51.381		54.46	-67.42	42529.00	55.33		
alpha	E	2048-03-23T02:31:26.351		54.40	-67.46	44712.73	64.05		
beta	E	2048-03-23T02:31:41.397		54.37	-67.48	45672.72	67.04		
eta	E	2048-03-23T02:32:03.254		54.33	-67.50	47176.11	71.25		
gamma	E	2048-03-23T02:32:09.450		54.32	-67.51	47620.98	72.37		
delta	E	2048-03-23T02:32:18.733		54.30	-67.52	48300.35	74.00		
lambda	E	2048-03-23T02:32:41.485		54.26	-67.55	50026.71	77.71		
epsilon	E	2048-03-23T02:32:55.452		54.24	-67.57	51126.75	79.12		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2048-03-23T02:26:12.580  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 3869939531411235840  
 2Mass ID (if available) : 10374464+0931453  
 ICRS Star Coord at Epoch: 10h 37m 44.59401s +09:31:45.04763s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.874  
 G magnitude : 18.311  
 RP magnitude : 17.175  
 BP magnitude : 19.629  
 DUPflag : 0  
 Distance (au) : 17.390  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.16  
 Sun-Target sep (deg) : 154.96  
 Sun-Moon sep (deg) : 60.87  
 B (ring opening deg) : 10.01  
 PA of pole (deg) : 103.88  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.070  
 C/A sky separation (km) : 38722.8  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



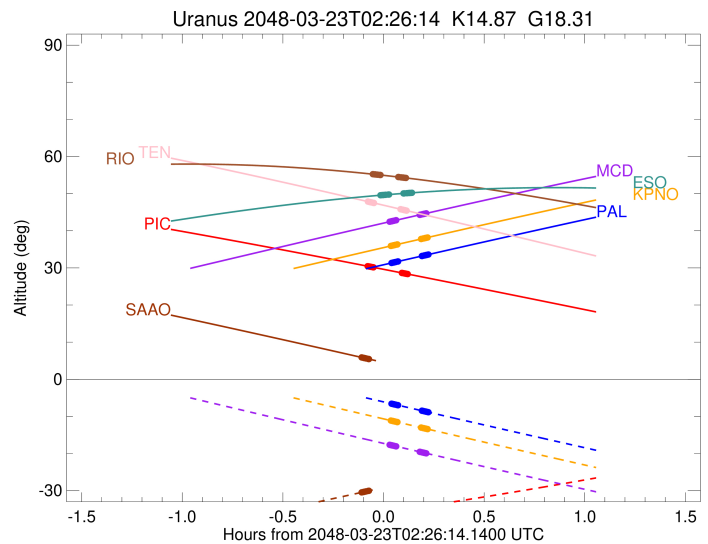
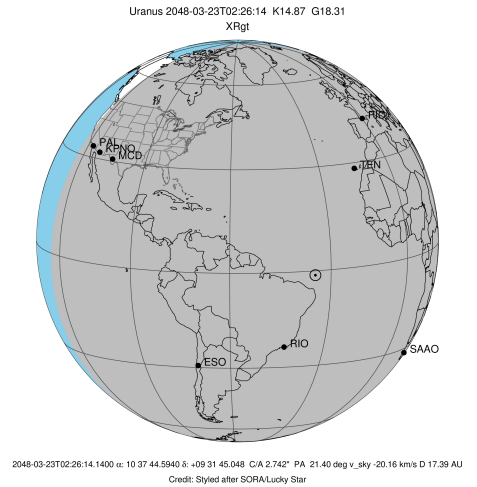
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2048-03-23T02:25:25.548		49.58	-45.86	50744.85	-75.02		
lambda	I	2048-03-23T02:25:35.228		49.60	-45.89	50026.72	-73.37		
delta	I	2048-03-23T02:25:59.448		49.63	-45.97	48300.35	-69.09		
gamma	I	2048-03-23T02:26:09.351		49.64	-46.00	47625.26	-67.20		
eta	I	2048-03-23T02:26:16.099		49.65	-46.02	47176.12	-65.88		
beta	I	2048-03-23T02:26:40.242		49.68	-46.09	45650.82	-60.90		
alpha	I	2048-03-23T02:26:54.987		49.70	-46.14	44745.42	-57.32		
4	I	2048-03-23T02:27:37.839		49.75	-46.27	42557.85	-46.51		
5	I	2048-03-23T02:27:46.619		49.76	-46.30	42218.27	-45.07		
6	I	2048-03-23T02:27:55.580		49.77	-46.32	41797.96	-41.71		

No planet occultations

6	E	2048-03-23T02:32:11.194		50.07	-47.10	41797.16	41.73		
5	E	2048-03-23T02:32:20.837		50.08	-47.13	42278.65	45.09		
4	E	2048-03-23T02:32:26.848		50.08	-47.15	42530.51	46.54		
alpha	E	2048-03-23T02:33:07.292		50.13	-47.27	44714.98	57.34		
beta	E	2048-03-23T02:33:23.894		50.15	-47.32	45671.67	60.92		
eta	E	2048-03-23T02:33:47.719		50.17	-47.39	47176.11	65.90		
gamma	E	2048-03-23T02:33:54.404		50.18	-47.41	47621.03	67.22		
delta	E	2048-03-23T02:34:04.370		50.19	-47.44	48300.35	69.11		
lambda	E	2048-03-23T02:34:28.589		50.22	-47.51	50026.71	73.39		
epsilon	E	2048-03-23T02:34:43.091		50.23	-47.56	51108.08	75.04		



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2048-03-23T02:21:14.680  
 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 : 3869939531411235840  
 2Mass ID (if available) : 10374464+0931453  
 ICRS Star Coord at Epoch: 10h 37m 44.59401s +09:31:45.04763s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.874  
 G magnitude : 18.311  
 RP magnitude : 17.175  
 BP magnitude : 19.629  
 DUPflag : 0  
 Distance (au) : 17.390  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.16  
 Sun-Target sep (deg) : 154.96  
 Sun-Moon sep (deg) : 60.74  
 B (ring opening deg) : 10.01  
 PA of pole (deg) : 103.88  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.852  
 C/A sky separation (km) : 35972.3  
 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\_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	2048-03-23T02:19:47.333		5.87	-30.45	50743.51	-80.78		
lambda	I	2048-03-23T02:19:56.274		5.84	-30.43	50026.71	-79.55		
delta	I	2048-03-23T02:20:18.423		5.76	-30.35	48300.34	-76.27		
gamma	I	2048-03-23T02:20:27.350		5.73	-30.32	47625.76	-74.84		
eta	I	2048-03-23T02:20:33.396		5.71	-30.30	47176.12	-73.85		
beta	I	2048-03-23T02:20:54.706		5.64	-30.23	45649.03	-70.19		
alpha	I	2048-03-23T02:21:07.241		5.60	-30.19	44747.62	-67.61		
4	I	2048-03-23T02:21:42.025		5.48	-30.07	42564.09	-60.18		
5	I	2048-03-23T02:21:49.647		5.45	-30.05	42207.01	-59.46		
6	I	2048-03-23T02:21:55.426		5.43	-30.03	41800.94	-57.09		

No planet occultations

6	E	2048-03-23T02:27:56.567		4.19x	-28.83	41799.80	57.08		
5	E	2048-03-23T02:28:03.094		4.17x	-28.81	42287.93	59.45		
4	E	2048-03-23T02:28:07.964		4.15x	-28.79	42528.13	60.16		
alpha	E	2048-03-23T02:28:40.502		4.04x	-28.68	44711.16	67.58		
beta	E	2048-03-23T02:28:54.864		3.99x	-28.63	45673.44	70.15		
eta	E	2048-03-23T02:29:15.866		3.92x	-28.56	47176.11	73.80		
gamma	E	2048-03-23T02:29:21.854		3.90x	-28.54	47620.97	74.79		
delta	E	2048-03-23T02:29:30.852		3.87x	-28.51	48300.35	76.22		
lambda	E	2048-03-23T02:29:53.022		3.79x	-28.44	50026.72	79.48		
epsilon	E	2048-03-23T02:30:06.871		3.75x	-28.39	51140.53	80.71		