

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2023-02-25T23:08:17.760  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 33481743973922304  
 2Mass ID (if available) : 02510180+1603044

ICRS Star Coord at Epoch: 02h 51m 01.83139s +16:03:04.36304s

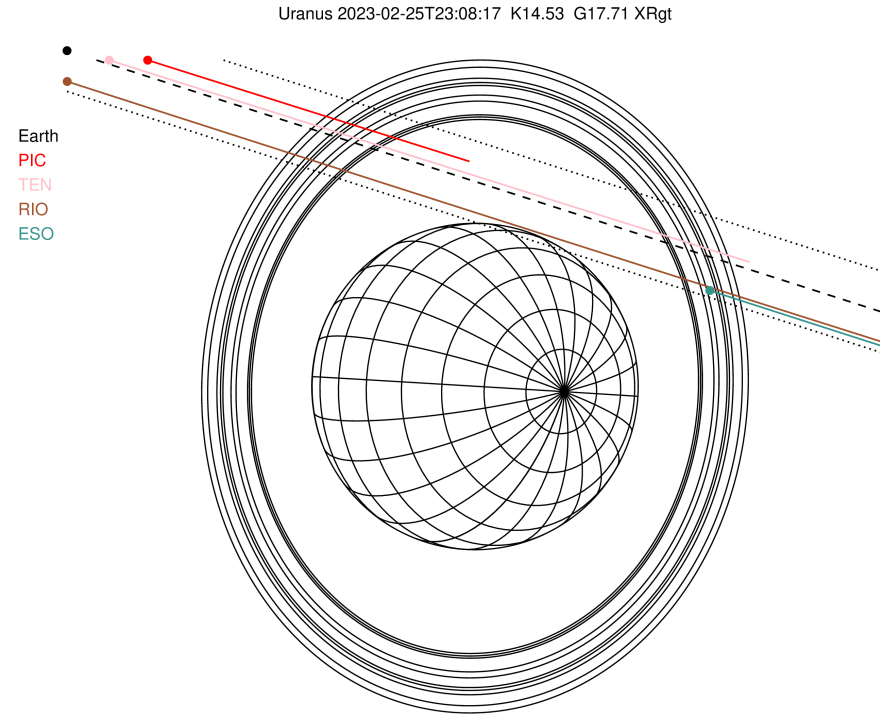
RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.528  
 G magnitude : 17.709  
 RP magnitude : 16.732  
 BP magnitude : 18.688  
 DUPflag : 0  
 Distance (au) : 20.005  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 17.36  
 Sun-Target sep (deg) : 68.36  
 Sun-Moon sep (deg) : 6.00  
 B (ring opening deg) : 56.75  
 PA of pole (deg) : -93.32

# 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

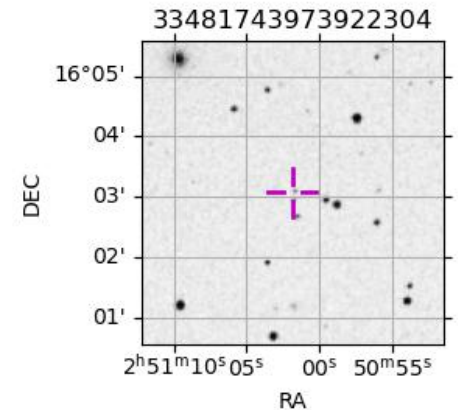


2023-02-25T23:08:17.7600 ex: 02 51 01.8314 d: +16 03 04.363 C/A 2.108° PA 162.22 deg v\_sky +17.36 km/s D 20.01 AU  
 Credit: Styled after SORA/Lucky Star

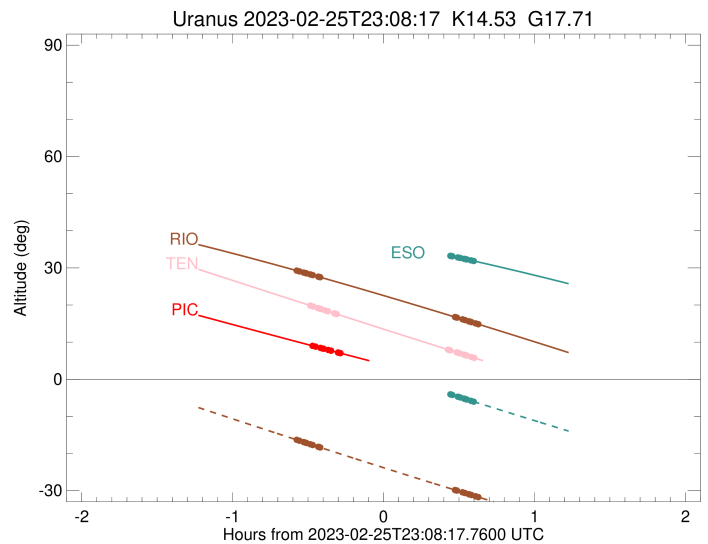
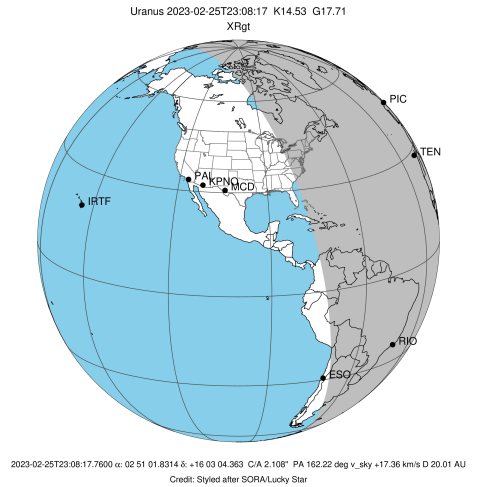


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++			FEB 25 22:40 - FEB 25 22:51	PnnRin
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 25 22:39 - FEB 25 23:44	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	+++++		+++++	FEB 25 22:33 - FEB 25 23:45	PnnRie
ESO	European Southern Obs	-29.3	289.3			+++++	FEB 25 23:40 - FEB 25 23:43	PnnRne
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2023-02-25T23:13:34.810  
 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 : 33481743973922304  
 2Mass ID (if available) : 02510180+1603044  
 ICRS Star Coord at Epoch: 02h 51m 01.83139s +16:03:04.36304s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.528  
 G magnitude : 17.709  
 RP magnitude : 16.732  
 BP magnitude : 18.688  
 DUPflag : 0  
 Distance (au) : 20.005  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 17.36  
 Sun-Target sep (deg) : 68.36  
 Sun-Moon sep (deg) : 5.09  
 B (ring opening deg) : 56.75  
 PA of pole (deg) : -93.32  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.300  
 C/A sky separation (km) : 33368.5  
 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

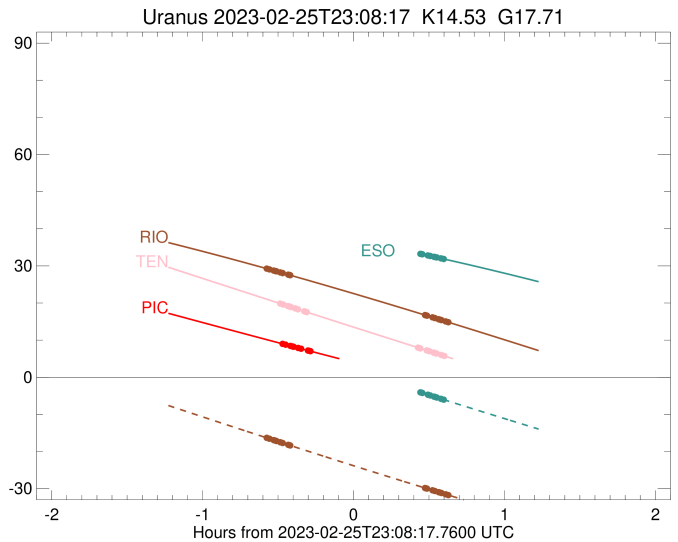
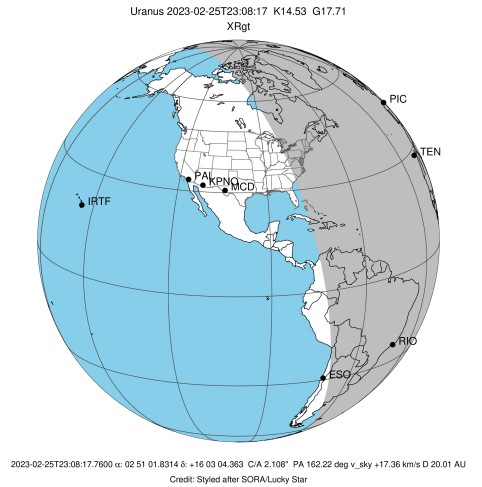


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2023-02-25T22:40:16.065		8.97	-50.61	51006.31	-15.33		
lambda	I	2023-02-25T22:41:20.033		8.78	-50.73	50026.71	-15.19		
delta	I	2023-02-25T22:43:15.376		8.44	-50.94	48300.35	-14.73		
gamma	I	2023-02-25T22:44:01.336		8.30	-51.02	47627.82	-14.53		
eta	I	2023-02-25T22:44:32.567		8.21	-51.08	47176.12	-14.39		
beta	I	2023-02-25T22:46:21.149		7.89	-51.27	45641.29	-13.87		
alpha	I	2023-02-25T22:47:25.816		7.70	-51.39	44752.25	-13.54		
4	I	2023-02-25T22:50:14.658		7.20	-51.68	42549.52	-12.58		
5	I	2023-02-25T22:50:37.931		7.13	-51.72	42250.45	-12.38		
6	I	2023-02-25T22:51:13.563		7.02	-51.78	41809.75	-12.19		

No planet occultations

6	E	2023-02-25T23:31:17.949		0.04x	-54.98	41860.05	12.24		
5	E	2023-02-25T23:31:42.507		-0.03x	-55.00	42163.57	12.43		
4	E	2023-02-25T23:32:18.272		-0.13x	-55.04	42604.29	12.64		
alpha	E	2023-02-25T23:35:00.349		-0.59x	-55.18	44726.42	13.60		
beta	E	2023-02-25T23:36:08.130		-0.78x	-55.24	45656.31	13.94		
eta	E	2023-02-25T23:37:55.203		-1.08x	-55.32	47176.12	14.47		
gamma	E	2023-02-25T23:38:25.812		-1.17x	-55.35	47621.19	14.61		
delta	E	2023-02-25T23:39:11.972		-1.30x	-55.38	48300.35	14.81		
lambda	E	2023-02-25T23:41:06.647		-1.62x	-55.47	50026.71	15.29		
epsilon	E	2023-02-25T23:41:56.160		-1.76x	-55.50	50788.28	15.43		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2023-02-25T23:14:02.660  
 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 : 33481743973922304  
 2Mass ID (if available) : 02510180+1603044  
 ICRS Star Coord at Epoch: 02h 51m 01.83139s +16:03:04.36304s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.528  
 G magnitude : 17.709  
 RP magnitude : 16.732  
 BP magnitude : 18.688  
 DUPflag : 0  
 Distance (au) : 20.005  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 17.36  
 Sun-Target sep (deg) : 68.36  
 Sun-Moon sep (deg) : 5.11  
 B (ring opening deg) : 56.75  
 PA of pole (deg) : -93.32  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.169  
 C/A sky separation (km) : 31477.2  
 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

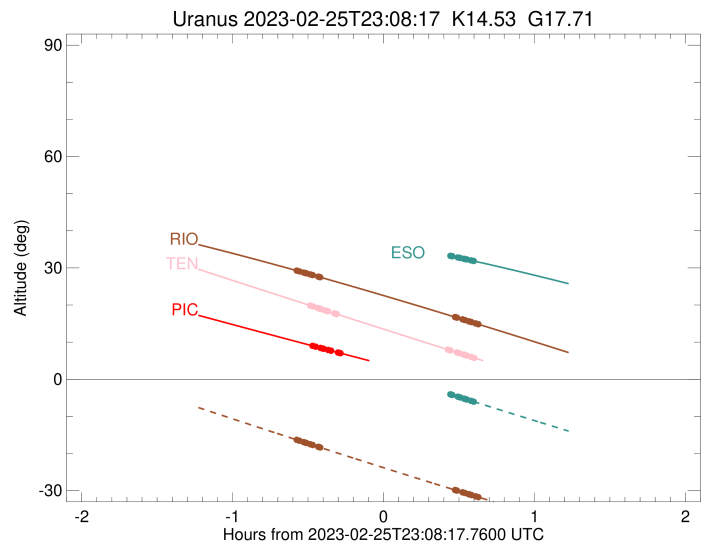
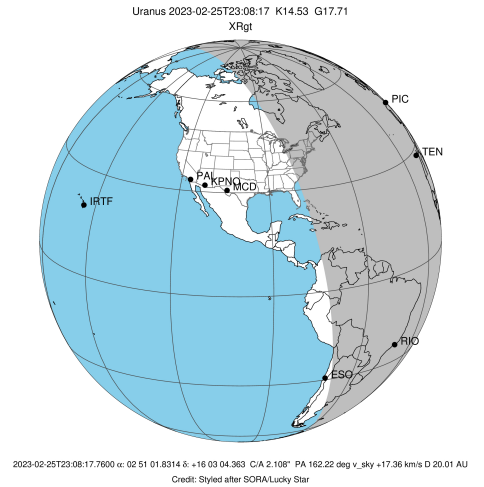


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2023-02-25T22:39:19.598		19.82	-47.84	51024.76	-15.87		
lambda	I	2023-02-25T22:40:22.489		19.59	-48.06	50026.71	-15.77		
delta	I	2023-02-25T22:42:13.329		19.19	-48.45	48300.35	-15.38		
gamma	I	2023-02-25T22:42:57.284		19.03	-48.60	47628.09	-15.21		
eta	I	2023-02-25T22:43:27.114		18.92	-48.70	47176.12	-15.09		
beta	I	2023-02-25T22:45:10.268		18.54	-49.06	45641.51	-14.66		
alpha	I	2023-02-25T22:46:11.328		18.32	-49.27	44751.98	-14.38		
4	I	2023-02-25T22:48:49.171		17.75	-49.81	42546.82	-13.60		
5	I	2023-02-25T22:49:09.975		17.67	-49.88	42255.99	-13.44		
6	I	2023-02-25T22:49:43.298		17.55	-49.99	41807.47	-13.29		

No planet occultations

6	E	2023-02-25T23:33:56.470		7.98	-58.68	41862.64	13.35		
5	E	2023-02-25T23:34:18.624		7.90	-58.75	42161.13	13.51		
4	E	2023-02-25T23:34:51.898		7.78	-58.85	42606.40	13.68		
alpha	E	2023-02-25T23:37:22.792		7.24	-59.32	44724.32	14.47		
beta	E	2023-02-25T23:38:26.905		7.01	-59.51	45657.50	14.75		
eta	E	2023-02-25T23:40:08.436		6.65	-59.82	47176.12	15.19		
gamma	E	2023-02-25T23:40:37.610		6.55	-59.91	47621.11	15.31		
delta	E	2023-02-25T23:41:21.722		6.39	-60.04	48300.35	15.48		
lambda	E	2023-02-25T23:43:11.774		6.00	-60.37	50026.71	15.88		
epsilon	E	2023-02-25T23:44:00.076		5.83	-60.51	50797.86	16.00		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2023-02-25T23:11:49.790  
 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 : 33481743973922304  
 2Mass ID (if available) : 02510180+1603044  
 ICRS Star Coord at Epoch: 02h 51m 01.83139s +16:03:04.36304s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.528  
 G magnitude : 17.709  
 RP magnitude : 16.732  
 BP magnitude : 18.688  
 DUPflag : 0  
 Distance (au) : 20.005  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 17.36  
 Sun-Target sep (deg) : 68.36  
 Sun-Moon sep (deg) : 5.75  
 B (ring opening deg) : 56.75  
 PA of pole (deg) : -93.32  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.790  
 C/A sky separation (km) : 25967.4  
 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

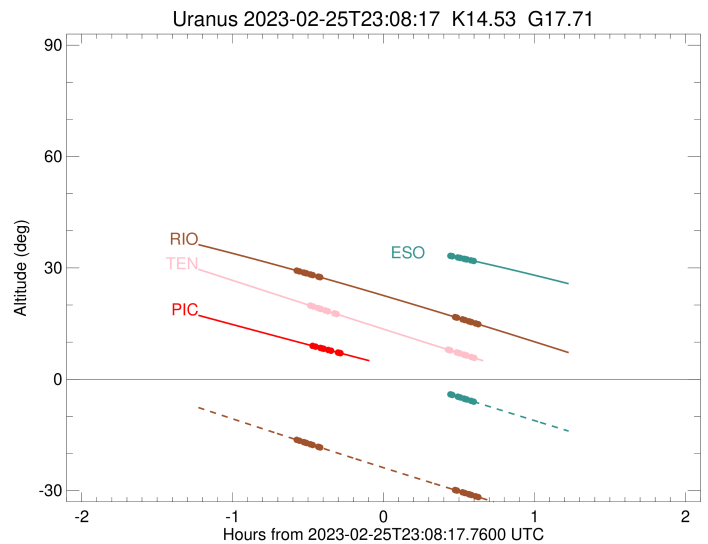
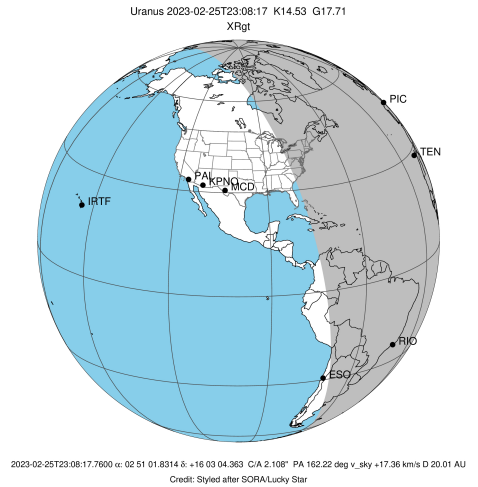


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2023-02-25T22:33:53.148		29.25	-16.34	51075.59	-17.25		
lambda	I	2023-02-25T22:34:53.888		29.06	-16.56	50026.71	-17.20		
delta	I	2023-02-25T22:36:34.927		28.74	-16.93	48300.35	-16.97		
gamma	I	2023-02-25T22:37:14.626		28.61	-17.08	47628.79	-16.86		
eta	I	2023-02-25T22:37:41.521		28.53	-17.17	47176.12	-16.80		
beta	I	2023-02-25T22:39:13.573		28.24	-17.51	45642.40	-16.54		
alpha	I	2023-02-25T22:40:07.579		28.07	-17.71	44750.66	-16.38		
4	I	2023-02-25T22:42:24.772		27.63	-18.21	42540.53	-15.93		
5	I	2023-02-25T22:42:41.129		27.58	-18.27	42269.41	-15.83		
6	I	2023-02-25T22:43:10.433		27.48	-18.38	41802.48	-15.75		

No planet occultations

6	E	2023-02-25T23:36:43.433		16.76	-29.83	41868.58	15.83		
5	E	2023-02-25T23:37:01.445		16.70	-29.89	42156.65	15.92		
4	E	2023-02-25T23:37:30.191		16.60	-29.99	42611.01	16.02		
alpha	E	2023-02-25T23:39:40.420		16.15	-30.44	44718.69	16.48		
beta	E	2023-02-25T23:40:37.489		15.95	-30.64	45660.72	16.64		
eta	E	2023-02-25T23:42:07.946		15.63	-30.95	47176.12	16.91		
gamma	E	2023-02-25T23:42:34.202		15.54	-31.04	47620.98	16.98		
delta	E	2023-02-25T23:43:14.091		15.40	-31.18	48300.35	17.08		
lambda	E	2023-02-25T23:44:54.419		15.05	-31.52	50026.71	17.33		
epsilon	E	2023-02-25T23:45:40.562		14.89	-31.68	50828.67	17.38		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2023-02-25T23:09:35.610  
 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 : 33481743973922304  
 2Mass ID (if available) : 02510180+1603044  
 ICRS Star Coord at Epoch: 02h 51m 01.83139s +16:03:04.36304s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.528  
 G magnitude : 17.709  
 RP magnitude : 16.732  
 BP magnitude : 18.688  
 DUPflag : 0  
 Distance (au) : 20.005  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 17.36  
 Sun-Target sep (deg) : 68.36  
 Sun-Moon sep (deg) : 6.12  
 B (ring opening deg) : 56.75  
 PA of pole (deg) : -93.32  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.766  
 C/A sky separation (km) : 25618.8  
 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	2023-02-25T22:31:15.417		40.98	9.68x	51077.16	-17.25		
lambda	I	2023-02-25T22:32:16.253		40.89	9.46x	50026.71	-17.20		
delta	I	2023-02-25T22:33:57.268		40.73	9.09x	48300.35	-16.97		
gamma	I	2023-02-25T22:34:36.944		40.66	8.95x	47628.81	-16.88		
eta	I	2023-02-25T22:35:03.821		40.62	8.85x	47176.12	-16.81		
beta	I	2023-02-25T22:36:35.777		40.47	8.52x	45642.44	-16.56		
alpha	I	2023-02-25T22:37:29.710		40.38	8.32x	44750.60	-16.41		
4	I	2023-02-25T22:39:46.624		40.15	7.82x	42540.32	-15.97		
5	I	2023-02-25T22:40:02.891		40.12	7.77x	42269.88	-15.88		
6	I	2023-02-25T22:40:32.145		40.07	7.66x	41802.32	-15.80		

No planet occultations

6	E	2023-02-25T23:34:52.806		33.25	-4.06x	41868.99	15.85		
5	E	2023-02-25T23:35:10.758		33.20	-4.12x	42156.41	15.93		
4	E	2023-02-25T23:35:39.509		33.13	-4.23x	42611.31	16.03		
alpha	E	2023-02-25T23:37:49.729		32.81	-4.69x	44718.23	16.47		
beta	E	2023-02-25T23:38:46.897		32.67	-4.89x	45660.98	16.62		
eta	E	2023-02-25T23:40:17.480		32.45	-5.21	47176.12	16.88		
gamma	E	2023-02-25T23:40:43.787		32.38	-5.31	47620.97	16.94		
delta	E	2023-02-25T23:41:23.763		32.28	-5.45	48300.35	17.04		
lambda	E	2023-02-25T23:43:04.349		32.03	-5.81	50026.71	17.28		
epsilon	E	2023-02-25T23:43:50.800		31.91	-5.97	50831.64	17.33		