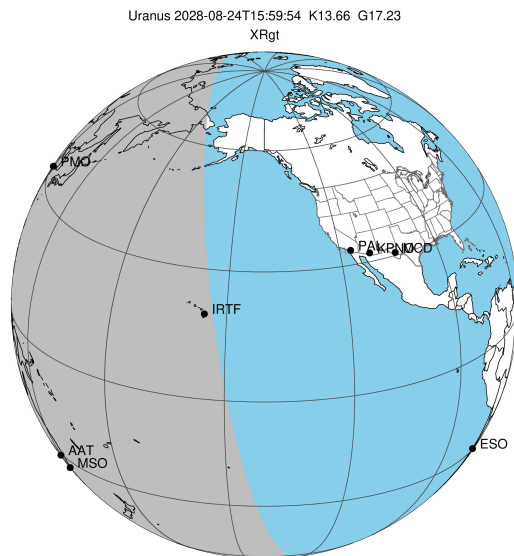


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2028-08-24T15:59:54.140  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3412872689479554432  
 2Mass ID (if available) : 04484332+2223010

ICRS Star Coord at Epoch: 04h 48m 43.33365s +22:23:00.72333s

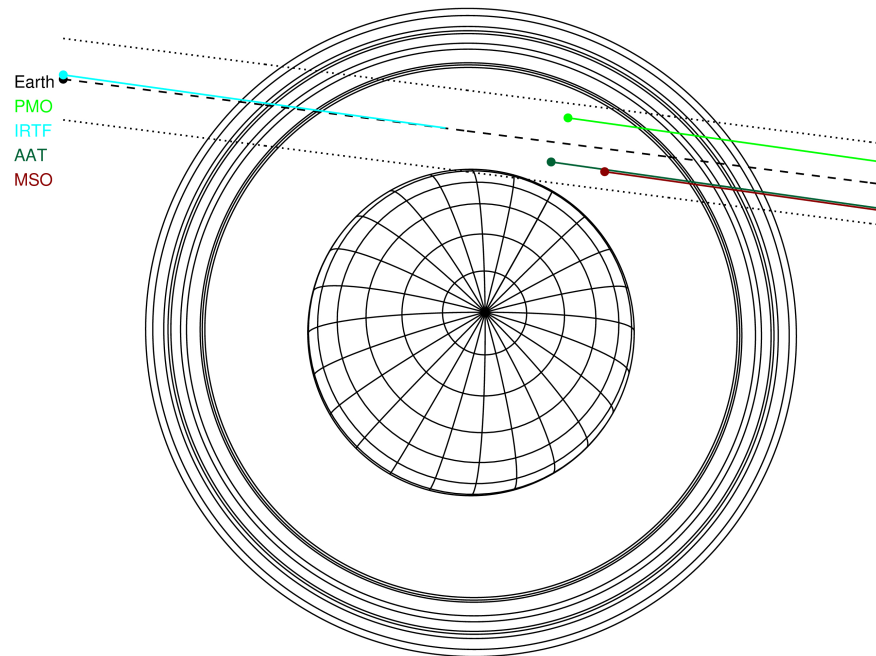
RUWE (>1.4 is poor) : 0.96  
 K magnitude : 13.658  
 G magnitude : 17.232  
 RP magnitude : 16.192  
 BP magnitude : 18.418  
 DUPflag : 0  
 Distance (au) : 19.497  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 12.49  
 Sun-Target sep (deg) : 78.05  
 Sun-Moon sep (deg) : 136.86  
 B (ring opening deg) : 81.31  
 PA of pole (deg) : -34.84

#	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



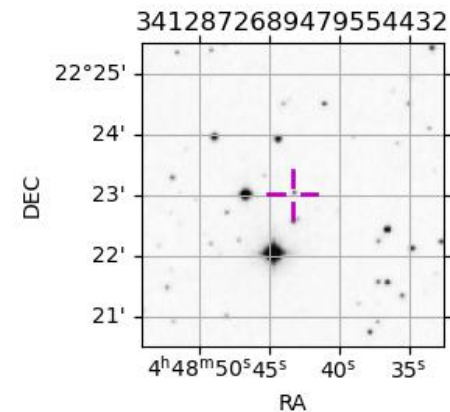
2028-08-24T15:59:54.1400 ex: 04 48 43.3336 s: +22 23 00.723 C/A 2.211" PA 172.68 deg v\_sky +12.49 km/s D 19.50 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2028-08-24T15:59:54 K13.66 G17.23 XRgt

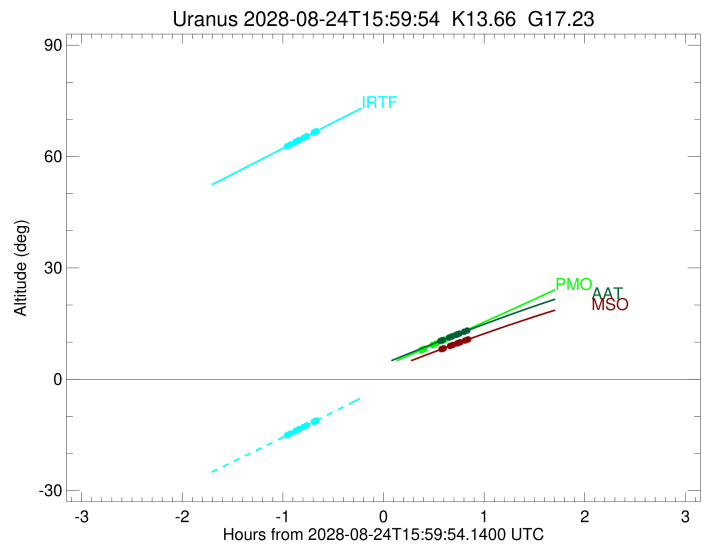
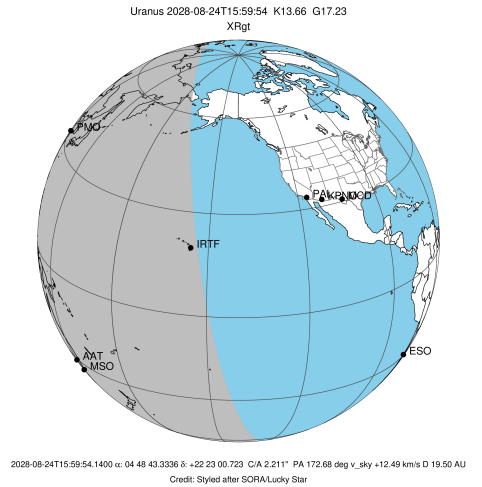


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8			+++++++	AUG 24 16:22 - AUG 24 16:42	PnnRne
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	+++++++			AUG 24 15:01 - AUG 24 15:19	PnnRin
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
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			+++++++	AUG 24 16:33 - AUG 24 16:50	PnnRne
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0			+++++++	AUG 24 16:34 - AUG 24 16:50	PnnRne



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2028-08-24T15:53:59.280  
 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 : 3412872689479554432  
 2Mass ID (if available) : 04484332+2223010  
 ICRS Star Coord at Epoch: 04h 48m 43.33365s +22:23:00.72333s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 13.658  
 G magnitude : 17.232  
 RP magnitude : 16.192  
 BP magnitude : 18.418  
 DUPflag : 0  
 Distance (au) : 19.497  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 12.49  
 Sun-Target sep (deg) : 78.05  
 Sun-Moon sep (deg) : 136.30  
 B (ring opening deg) : 81.31  
 PA of pole (deg) : -34.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.503  
 C/A sky separation (km) : 35387.7  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



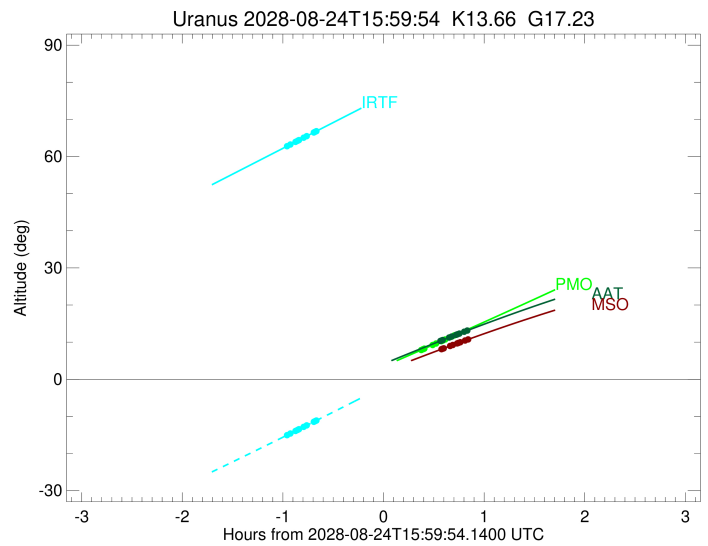
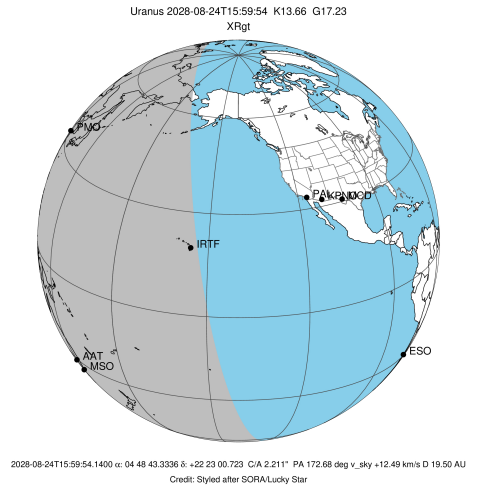
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-08-24T15:04:43.258		-6.89x	-44.82	51496.88	-9.18		
lambda	I	2028-08-24T15:07:26.272		-6.40x	-45.03	50026.71	-8.89		
delta	I	2028-08-24T15:10:44.345		-5.80x	-45.27	48300.35	-8.54		
gamma	I	2028-08-24T15:12:03.356		-5.56x	-45.37	47631.52	-8.39		
eta	I	2028-08-24T15:12:57.979		-5.39x	-45.43	47176.12	-8.28		
beta	I	2028-08-24T15:16:04.268		-4.82x	-45.64	45668.21	-7.90		
alpha	I	2028-08-24T15:18:04.679		-4.45x	-45.77	44733.44	-7.62		
4	I	2028-08-24T15:22:58.972		-3.54x	-46.07	42593.87	-6.89		
5	I	2028-08-24T15:23:43.719		-3.41x	-46.11	42291.68	-6.76		
6	I	2028-08-24T15:24:44.608		-3.22x	-46.17	41877.79	-6.60		

No planet occultations

6	E	2028-08-24T16:22:23.419		7.88	-47.20	41844.29	6.54		
5	E	2028-08-24T16:23:17.988		8.06	-47.18	42207.92	6.70		
4	E	2028-08-24T16:24:08.726		8.22	-47.16	42544.55	6.82		
alpha	E	2028-08-24T16:29:07.293		9.21	-47.03	44693.33	7.54		
beta	E	2028-08-24T16:31:16.302		9.64	-46.96	45681.04	7.81		
eta	E	2028-08-24T16:34:23.208		10.26	-46.86	47176.12	8.18		
gamma	E	2028-08-24T16:35:18.073		10.44	-46.82	47627.70	8.28		
delta	E	2028-08-24T16:36:38.590		10.71	-46.77	48300.35	8.43		
lambda	E	2028-08-24T16:39:59.426		11.38	-46.63	50026.71	8.76		
epsilon	E	2028-08-24T16:42:27.652		11.88	-46.52	51342.00	9.05		

```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch             : 2028-08-24T15:58:07.410
Event type           : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code        : IRTF
Location             : Mauna Kea/IRTF
Latitude (deg)       : 19.82622
E. Longitude (deg)   : 204.52800
Altitude (km)        : 4.168
Gaia source ID       : 3412872689479554432
2Mass ID (if available) : 04484332+2223010
ICRS Star Coord at Epoch: 04h 48m 43.33365s +22:23:00.72333s
RUWE (>1.4 is poor) : 0.96
K magnitude           : 13.658
G magnitude           : 17.232
RP magnitude          : 16.192
BP magnitude          : 18.418
DUPflag              : 0
Distance (au)        : 19.497
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : 12.49
Sun-Target sep (deg) : 78.05
Sun-Moon sep (deg)   : 137.34
B (ring opening deg) : 81.31
PA of pole (deg)     : -34.84
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.206
C/A sky separation (km) : 31191.1
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural11.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
    
```

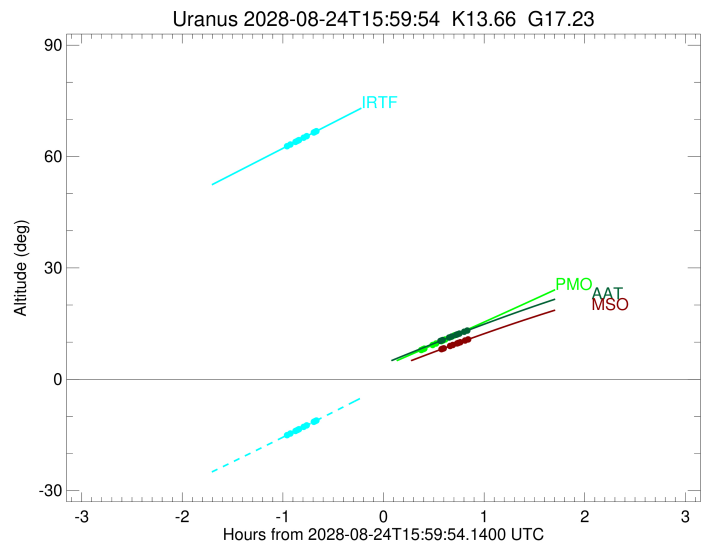
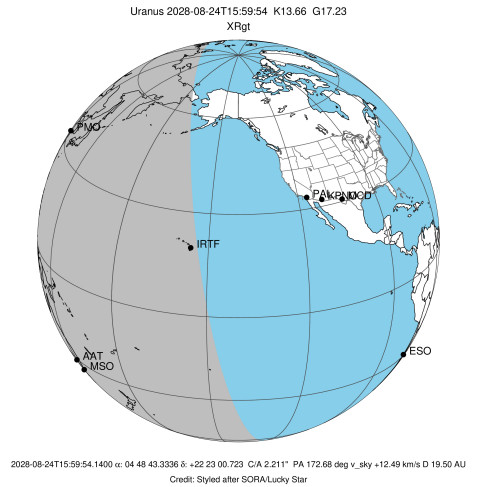


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-08-24T15:01:51.622		62.66	-15.18	51471.79	-9.67		
lambda	I	2028-08-24T15:04:23.000		63.24	-14.61	50026.71	-9.46		
delta	I	2028-08-24T15:07:27.746		63.96	-13.92	48300.35	-9.23		
gamma	I	2028-08-24T15:08:40.637		64.24	-13.64	47631.37	-9.13		
eta	I	2028-08-24T15:09:30.701		64.43	-13.46	47176.12	-9.06		
beta	I	2028-08-24T15:12:19.749		65.08	-12.82	45665.54	-8.81		
alpha	I	2028-08-24T15:14:06.107		65.49	-12.42	44737.70	-8.63		
4	I	2028-08-24T15:18:20.121		66.47	-11.47	42600.01	-8.18		
5	I	2028-08-24T15:18:57.177		66.62	-11.33	42300.40	-8.10		
6	I	2028-08-24T15:19:48.815		66.82	-11.13	41879.38	-8.01		

No planet occultations

6	E	2028-08-24T16:35:38.231		84.03	6.29x	41837.21	7.97		
5	E	2028-08-24T16:36:22.959		84.18	6.46x	42196.03	8.06		
4	E	2028-08-24T16:37:05.962		84.33	6.63x	42539.08	8.13		
alpha	E	2028-08-24T16:41:22.902		85.18	7.62x	44690.41	8.58		
beta	E	2028-08-24T16:43:17.421		85.54	8.07x	45680.50	8.75		
eta	E	2028-08-24T16:46:05.920		86.04	8.72x	47176.12	8.99		
gamma	E	2028-08-24T16:46:55.871		86.18	8.91x	47627.07	9.06		
delta	E	2028-08-24T16:48:09.775		86.38	9.20x	48300.35	9.16		
lambda	E	2028-08-24T16:51:15.945		86.81	9.92x	50026.71	9.38		
epsilon	E	2028-08-24T16:53:30.943		87.05	10.45x	51303.77	9.59		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2028-08-24T15:52:54.200  
 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 : 3412872689479554432  
 2Mass ID (if available) : 04484332+2223010  
 ICRS Star Coord at Epoch: 04h 48m 43.33365s +22:23:00.72333s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 13.658  
 G magnitude : 17.232  
 RP magnitude : 16.192  
 BP magnitude : 18.418  
 DUPflag : 0  
 Distance (au) : 19.497  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 12.49  
 Sun-Target sep (deg) : 78.05  
 Sun-Moon sep (deg) : 136.34  
 B (ring opening deg) : 81.31  
 PA of pole (deg) : -34.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.994  
 C/A sky separation (km) : 28203.1  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



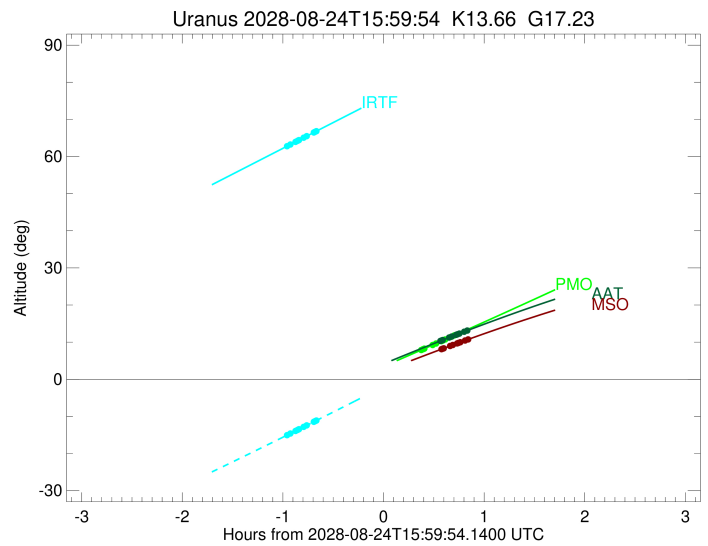
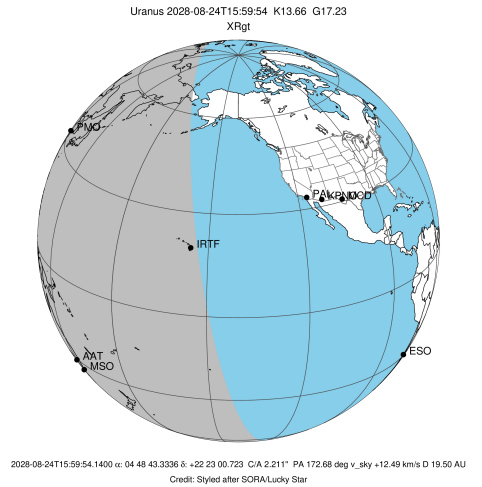
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-08-24T14:55:17.424	-8.41x	-66.67	51454.00	-10.47			
lambda	I	2028-08-24T14:57:35.117	-7.95x	-66.41	50026.71	-10.30			
delta	I	2028-08-24T15:00:24.298	-7.39x	-66.07	48300.35	-10.11			
gamma	I	2028-08-24T15:01:30.738	-7.16x	-65.93	47631.25	-10.03			
eta	I	2028-08-24T15:02:16.234	-7.01x	-65.84	47176.12	-9.98			
beta	I	2028-08-24T15:04:49.318	-6.51x	-65.51	45663.87	-9.78			
alpha	I	2028-08-24T15:06:24.438	-6.19x	-65.31	44740.07	-9.64			
4	I	2028-08-24T15:10:10.035	-5.45x	-64.80	42603.24	-9.29			
5	I	2028-08-24T15:10:42.437	-5.34x	-64.73	42304.63	-9.23			
6	I	2028-08-24T15:11:28.246	-5.19x	-64.62	41879.72	-9.16			

No planet occultations

6	E	2028-08-24T16:33:48.218	10.32	-50.21	41832.58	9.04			
5	E	2028-08-24T16:34:27.545	10.43	-50.08	42188.75	9.11			
4	E	2028-08-24T16:35:05.988	10.55	-49.96	42535.89	9.16			
alpha	E	2028-08-24T16:38:56.172	11.22	-49.19	44688.70	9.50			
beta	E	2028-08-24T16:40:39.999	11.53	-48.85	45679.92	9.63			
eta	E	2028-08-24T16:43:13.804	11.97	-48.33	47176.12	9.82			
gamma	E	2028-08-24T16:43:59.567	12.11	-48.18	47626.60	9.87			
delta	E	2028-08-24T16:45:07.575	12.30	-47.95	48300.35	9.94			
lambda	E	2028-08-24T16:47:59.655	12.80	-47.38	50026.71	10.12			
epsilon	E	2028-08-24T16:50:02.222	13.15	-46.96	51273.83	10.28			

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2028-08-24T15:53:08.010  
 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 : 3412872689479554432  
 2Mass ID (if available) : 04484332+2223010  
 ICRS Star Coord at Epoch: 04h 48m 43.33365s +22:23:00.72333s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 13.658  
 G magnitude : 17.232  
 RP magnitude : 16.192  
 BP magnitude : 18.418  
 DUPflag : 0  
 Distance (au) : 19.497  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 12.49  
 Sun-Target sep (deg) : 78.05  
 Sun-Moon sep (deg) : 136.34  
 B (ring opening deg) : 81.31  
 PA of pole (deg) : -34.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.970  
 C/A sky separation (km) : 27859.3  
 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	2028-08-24T14:55:14.146	-9.90x	-63.20	51451.66	-10.53			
lambda	I	2028-08-24T14:57:30.843	-9.46x	-62.98	50026.71	-10.36			
delta	I	2028-08-24T15:00:18.980	-8.93x	-62.70	48300.35	-10.18			
gamma	I	2028-08-24T15:01:24.981	-8.72x	-62.58	47631.23	-10.10			
eta	I	2028-08-24T15:02:10.161	-8.57x	-62.51	47176.12	-10.05			
beta	I	2028-08-24T15:04:42.138	-8.09x	-62.23	45663.67	-9.86			
alpha	I	2028-08-24T15:06:16.444	-7.79x	-62.06	44740.35	-9.72			
4	I	2028-08-24T15:09:59.993	-7.08x	-61.64	42603.61	-9.38			
5	I	2028-08-24T15:10:32.053	-6.98x	-61.57	42305.09	-9.32			
6	I	2028-08-24T15:11:17.456	-6.84x	-61.48	41879.74	-9.26			

No planet occultations

6	E	2028-08-24T16:34:26.824	8.10	-48.45	41832.12	9.14			
5	E	2028-08-24T16:35:05.718	8.21	-48.33	42188.06	9.21			
4	E	2028-08-24T16:35:43.796	8.32	-48.21	42535.60	9.26			
alpha	E	2028-08-24T16:39:31.815	8.95	-47.52	44688.55	9.58			
beta	E	2028-08-24T16:41:14.769	9.24	-47.20	45679.85	9.71			
eta	E	2028-08-24T16:43:47.374	9.66	-46.73	47176.12	9.89			
gamma	E	2028-08-24T16:44:32.795	9.78	-46.58	47626.56	9.94			
delta	E	2028-08-24T16:45:40.321	9.97	-46.37	48300.35	10.01			
lambda	E	2028-08-24T16:48:31.247	10.43	-45.84	50026.71	10.18			
epsilon	E	2028-08-24T16:50:32.769	10.76	-45.46	51270.91	10.34			