

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2037-02-13T15:06:29.970  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3368248563392174336  
 2Mass ID (if available) : 07075783+2258016

ICRS Star Coord at Epoch: 07h 07m 57.83522s +22:58:01.47066s

RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.246  
 G magnitude : 16.080  
 RP magnitude : 15.471  
 BP magnitude : 16.527  
 DUPflag : 0  
 Distance (au) : 17.982  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.66  
 Sun-Target sep (deg) : 140.87  
 Sun-Moon sep (deg) : 157.91  
 B (ring opening deg) : 60.95  
 PA of pole (deg) : 79.78

# 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

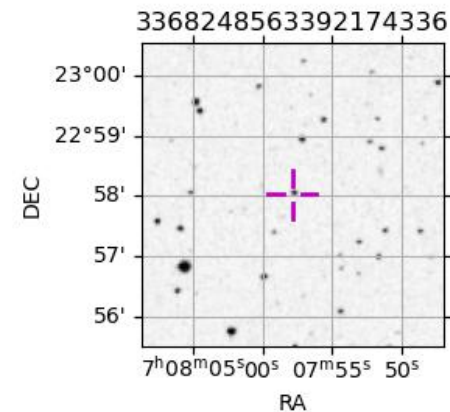
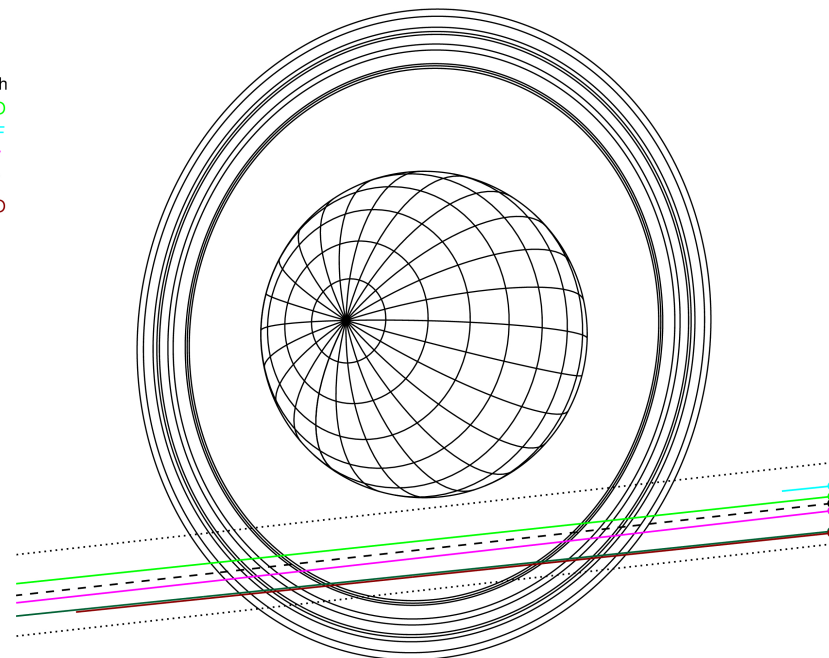
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++		+++++	FEB 13 14:32 - FEB 13 15:40	PnnRie
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald 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					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	FEB 13 14:38 - FEB 13 15:42	PnnRie
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	+++++		+++++	FEB 13 14:34 - FEB 13 15:34	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++		+++++	FEB 13 14:34 - FEB 13 15:34	PnnRie



2037-02-13T15:06:29.9700 a: 07 07 57.8352 s: +22 58 01.471 C/A 2.557" PA 6.44 deg v\_sky -16.66 km/s D 17.98 AU  
 Credit: Styled after SORA/Lucky Star

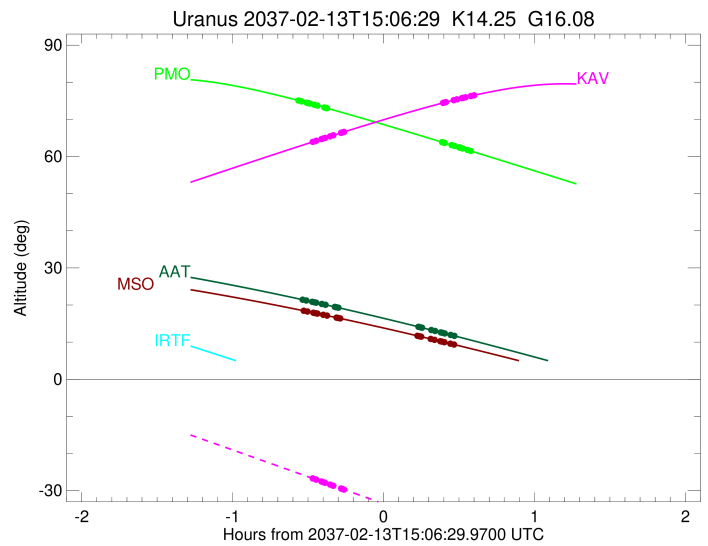
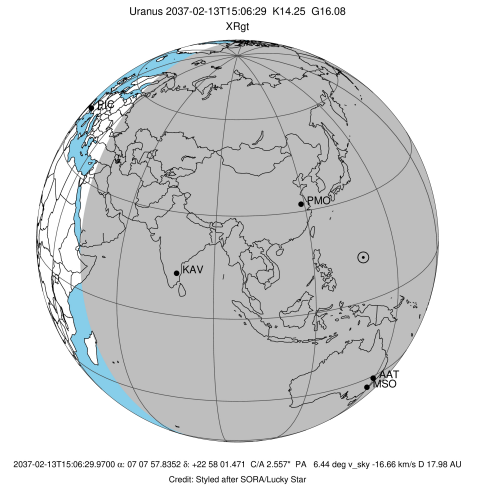
Uranus 2037-02-13T15:06:29 K14.25 G16.08 XRgt

Earth  
 PMO  
 IRTF  
 KAV  
 AAT  
 MSO



```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2037-02-13T15:04:50.870
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       : 3368248563392174336
2Mass ID (if available) : 07075783+2258016
ICRS Star Coord at Epoch: 07h 07m 57.83522s +22:58:01.47066s
RUWE (>1.4 is poor) : 0.97
K magnitude           : 14.246
G magnitude           : 16.080
RP magnitude          : 15.471
BP magnitude          : 16.527
DUPflag              : 0
Distance (au)        : 17.982
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -16.66
Sun-Target sep (deg) : 140.87
Sun-Moon sep (deg)   : 157.98
B (ring opening deg) : 60.95
PA of pole (deg)     : 79.78
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.460
C/A sky separation (km) : 32077.9
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_itrfr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```

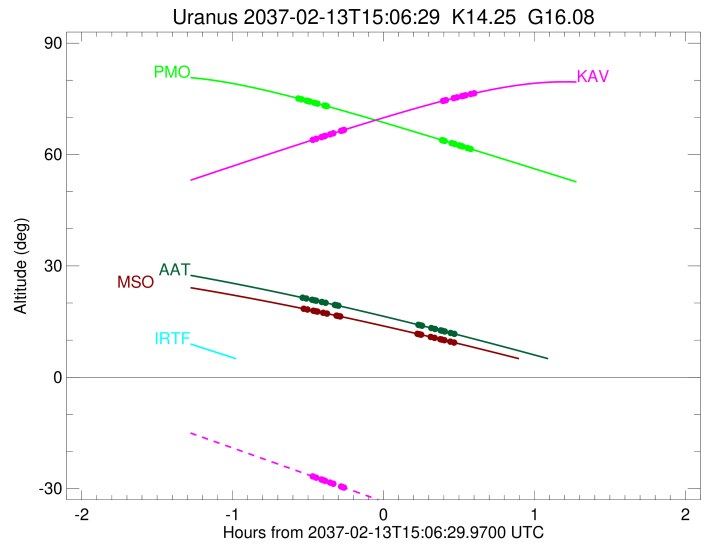
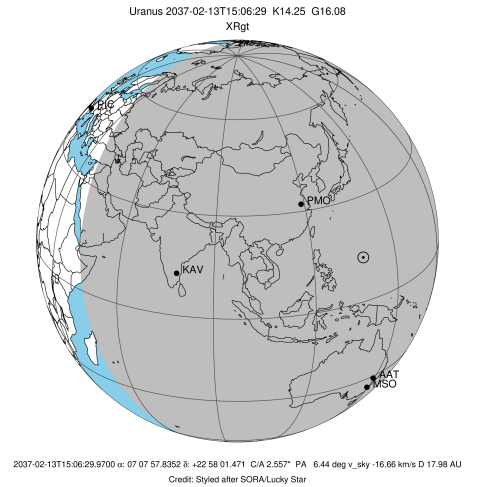


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2037-02-13T14:32:22.413		75.15	-59.22	51440.88	-14.93		
lambda	I	2037-02-13T14:33:57.625		74.87	-59.51	50026.71	-14.71		
delta	I	2037-02-13T14:35:56.565		74.51	-59.86	48300.35	-14.31		
gamma	I	2037-02-13T14:36:44.306		74.37	-60.01	47620.99	-14.14		
eta	I	2037-02-13T14:37:15.886		74.27	-60.10	47176.12	-14.03		
beta	I	2037-02-13T14:39:05.687		73.94	-60.42	45660.92	-13.60		
alpha	I	2037-02-13T14:40:18.403		73.71	-60.64	44686.55	-13.29		
4	I	2037-02-13T14:42:59.082		73.21	-61.10	42616.26	-12.54		
5	I	2037-02-13T14:43:36.030		73.10	-61.21	42162.80	-12.36		
6	I	2037-02-13T14:44:02.458		73.02	-61.29	41831.48	-12.18		

No planet occultations

6	E	2037-02-13T15:29:44.325		63.88	-68.09	41794.84	12.16		
5	E	2037-02-13T15:30:20.957		63.76	-68.16	42256.57	12.34		
4	E	2037-02-13T15:30:47.616		63.66	-68.21	42583.39	12.51		
alpha	E	2037-02-13T15:33:32.299		63.09	-68.52	44705.66	13.25		
beta	E	2037-02-13T15:34:44.918		62.84	-68.66	45681.23	13.57		
eta	E	2037-02-13T15:36:33.394		62.46	-68.85	47176.12	13.99		
gamma	E	2037-02-13T15:37:05.513		62.35	-68.91	47627.22	14.10		
delta	E	2037-02-13T15:37:52.961		62.19	-68.99	48300.35	14.27		
lambda	E	2037-02-13T15:39:52.292		61.77	-69.19	50026.71	14.66		
epsilon	E	2037-02-13T15:40:45.757		61.59	-69.27	50814.74	14.87		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2037-02-13T15:08:14.910  
 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 : 3368248563392174336  
 2Mass ID (if available) : 07075783+2258016  
 ICRS Star Coord at Epoch: 07h 07m 57.83522s +22:58:01.47066s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.246  
 G magnitude : 16.080  
 RP magnitude : 15.471  
 BP magnitude : 16.527  
 DUPflag : 0  
 Distance (au) : 17.982  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.66  
 Sun-Target sep (deg) : 140.87  
 Sun-Moon sep (deg) : 158.45  
 B (ring opening deg) : 60.95  
 PA of pole (deg) : 79.78  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.660  
 C/A sky separation (km) : 34691.4  
 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

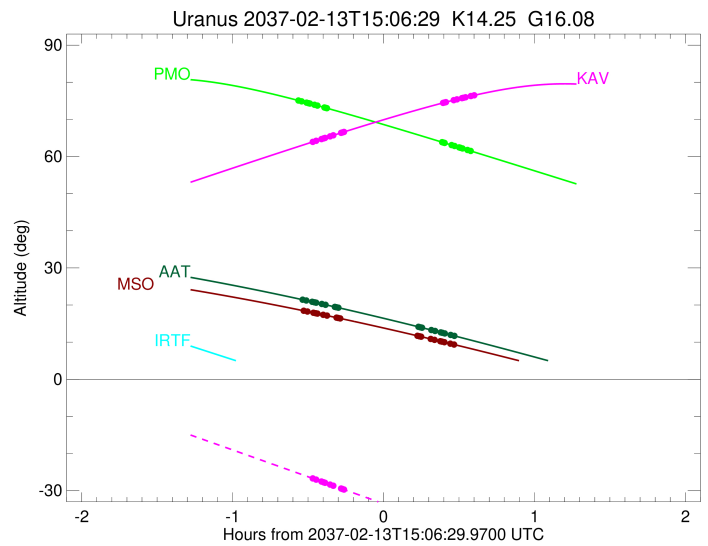
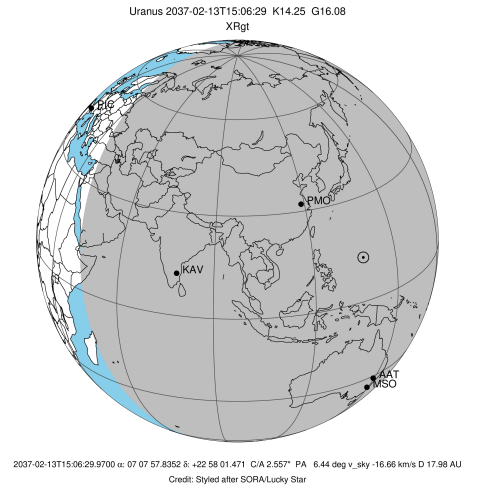


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2037-02-13T14:38:04.659		63.88	-26.64	51422.31	-14.07		
lambda	I	2037-02-13T14:39:44.524		64.24	-27.04	50026.71	-13.80		
delta	I	2037-02-13T14:41:51.880		64.70	-27.55	48300.35	-13.30		
gamma	I	2037-02-13T14:42:43.347		64.89	-27.76	47621.04	-13.09		
eta	I	2037-02-13T14:43:17.525		65.01	-27.90	47176.12	-12.94		
beta	I	2037-02-13T14:45:17.093		65.44	-28.38	45662.55	-12.40		
alpha	I	2037-02-13T14:46:37.450		65.73	-28.70	44685.70	-11.99		
4	I	2037-02-13T14:49:37.683		66.38	-29.43	42616.56	-11.00		
5	I	2037-02-13T14:50:19.493		66.52	-29.60	42166.63	-10.77		
6	I	2037-02-13T14:50:50.987		66.64	-29.72	41827.20	-10.53		

No planet occultations

6	E	2037-02-13T15:30:05.869		74.44	-39.22	41795.42	10.54		
5	E	2037-02-13T15:30:47.417		74.56	-39.39	42247.96	10.78		
4	E	2037-02-13T15:31:18.883		74.65	-39.52	42587.99	11.01		
alpha	E	2037-02-13T15:34:22.448		75.18	-40.26	44702.72	12.01		
beta	E	2037-02-13T15:35:42.425		75.40	-40.58	45681.12	12.41		
eta	E	2037-02-13T15:37:40.211		75.73	-41.06	47176.12	12.96		
gamma	E	2037-02-13T15:38:14.790		75.82	-41.20	47626.78	13.11		
delta	E	2037-02-13T15:39:05.762		75.96	-41.40	48300.35	13.32		
lambda	E	2037-02-13T15:41:12.971		76.29	-41.92	50026.71	13.81		
epsilon	E	2037-02-13T15:42:10.876		76.44	-42.15	50832.66	14.09		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2037-02-13T15:02:06.250  
 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 : 3368248563392174336  
 2Mass ID (if available) : 07075783+2258016  
 ICRS Star Coord at Epoch: 07h 07m 57.83522s +22:58:01.47066s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.246  
 G magnitude : 16.080  
 RP magnitude : 15.471  
 BP magnitude : 16.527  
 DUPflag : 0  
 Distance (au) : 17.982  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.66  
 Sun-Target sep (deg) : 140.87  
 Sun-Moon sep (deg) : 157.36  
 B (ring opening deg) : 60.95  
 PA of pole (deg) : 79.78  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.859  
 C/A sky separation (km) : 37290.2  
 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\_itrfr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

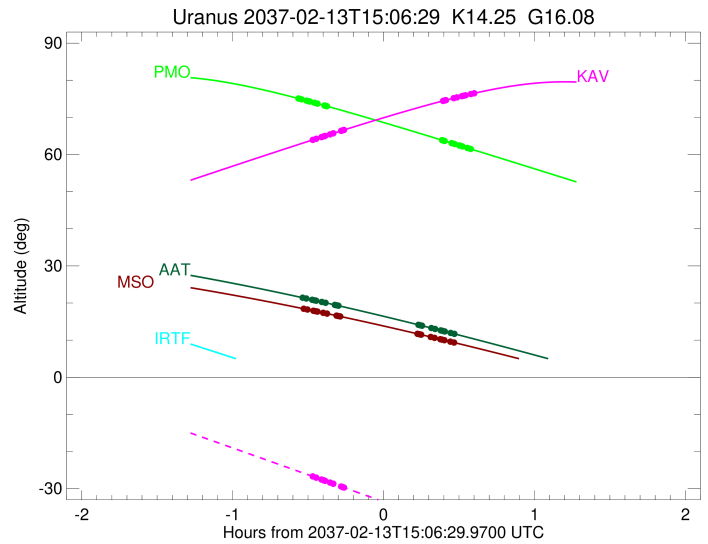
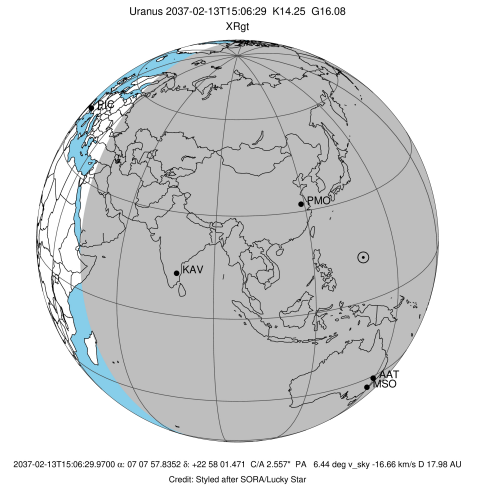


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2037-02-13T14:34:03.160		21.48	-45.62	51397.15	-12.98		
lambda	I	2037-02-13T14:35:49.789		21.21	-45.58	50026.71	-12.63		
delta	I	2037-02-13T14:38:09.787		20.86	-45.52	48300.35	-12.02		
gamma	I	2037-02-13T14:39:06.948		20.72	-45.49	47621.15	-11.75		
eta	I	2037-02-13T14:39:45.142		20.63	-45.48	47176.12	-11.56		
beta	I	2037-02-13T14:42:00.128		20.29	-45.41	45664.59	-10.86		
alpha	I	2037-02-13T14:43:32.923		20.05	-45.36	44684.97	-10.32		
4	I	2037-02-13T14:47:07.390		19.50	-45.23	42616.31	-8.98		
5	I	2037-02-13T14:47:58.131		19.37	-45.20	42172.65	-8.66		
6	I	2037-02-13T14:48:39.413		19.27	-45.18	41821.73	-8.32		

No planet occultations

6	E	2037-02-13T15:20:17.136		14.15	-43.32	41796.61	8.30		
5	E	2037-02-13T15:21:08.665		14.00	-43.26	42238.81	8.63		
4	E	2037-02-13T15:21:49.076		13.89	-43.20	42592.53	8.95		
alpha	E	2037-02-13T15:25:27.865		13.27	-42.91	44700.01	10.28		
beta	E	2037-02-13T15:27:00.663		13.01	-42.78	45680.86	10.81		
eta	E	2037-02-13T15:29:14.561		12.63	-42.59	47176.12	11.51		
gamma	E	2037-02-13T15:29:53.379		12.51	-42.53	47626.37	11.69		
delta	E	2037-02-13T15:30:50.369		12.35	-42.45	48300.35	11.96		
lambda	E	2037-02-13T15:33:11.084		11.95	-42.24	50026.71	12.57		
epsilon	E	2037-02-13T15:34:15.906		11.76	-42.14	50849.87	12.90		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2037-02-13T15:02:15.050  
 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 : 3368248563392174336  
 2Mass ID (if available) : 07075783+2258016  
 ICRS Star Coord at Epoch: 07h 07m 57.83522s +22:58:01.47066s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.246  
 G magnitude : 16.080  
 RP magnitude : 15.471  
 BP magnitude : 16.527  
 DUPflag : 0  
 Distance (au) : 17.982  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.66  
 Sun-Target sep (deg) : 140.87  
 Sun-Moon sep (deg) : 157.37  
 B (ring opening deg) : 60.95  
 PA of pole (deg) : 79.78  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.883  
 C/A sky separation (km) : 37595.8  
 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	2037-02-13T14:34:29.852		18.49	-41.60	51394.36	-12.84		
lambda	I	2037-02-13T14:36:17.445		18.25	-41.56	50026.71	-12.49		
delta	I	2037-02-13T14:38:39.222		17.91	-41.51	48300.35	-11.85		
gamma	I	2037-02-13T14:39:37.199		17.78	-41.49	47621.16	-11.57		
eta	I	2037-02-13T14:40:15.973		17.69	-41.47	47176.12	-11.38		
beta	I	2037-02-13T14:42:33.241		17.36	-41.41	45664.82	-10.66		
alpha	I	2037-02-13T14:44:07.928		17.14	-41.36	44684.91	-10.11		
4	I	2037-02-13T14:47:47.977		16.61	-41.25	42616.23	-8.70		
5	I	2037-02-13T14:48:40.269		16.48	-41.22	42173.47	-8.37		
6	I	2037-02-13T14:49:23.281		16.38	-41.19	41821.06	-8.01		

No planet occultations

6	E	2037-02-13T15:19:53.579		11.72	-39.59	41796.84	7.99		
5	E	2037-02-13T15:20:46.837		11.58	-39.53	42237.46	8.34		
4	E	2037-02-13T15:21:28.788		11.47	-39.48	42593.18	8.68		
alpha	E	2037-02-13T15:25:13.124		10.87	-39.21	44699.63	10.07		
beta	E	2037-02-13T15:26:47.799		10.62	-39.09	45680.81	10.62		
eta	E	2037-02-13T15:29:03.953		10.25	-38.92	47176.12	11.33		
gamma	E	2037-02-13T15:29:43.345		10.14	-38.87	47626.31	11.52		
delta	E	2037-02-13T15:30:41.140		9.99	-38.79	48300.35	11.80		
lambda	E	2037-02-13T15:33:03.607		9.60	-38.60	50026.71	12.43		
epsilon	E	2037-02-13T15:34:09.349		9.42	-38.51	50852.44	12.77		