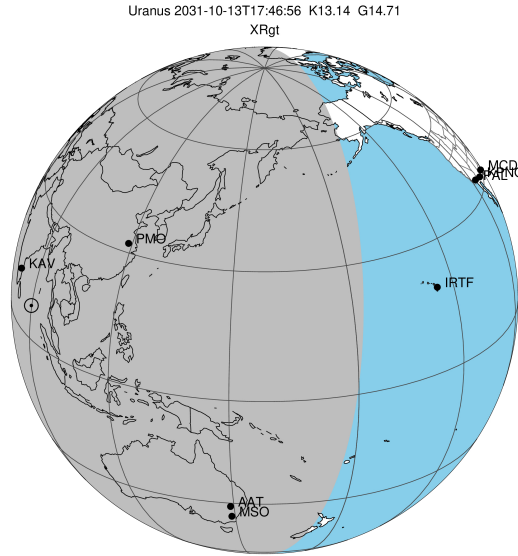


target : Uranus
target radius (km) : 25559.00
C/A epoch : 2031-10-13T17:46:56.180
Event type : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Gaia source ID : 3427633426926872064
2Mass ID (if available) : 05455327+2332151

ICRS Star Coord at Epoch: 05h 45m 53.27689s +23:32:14.98321s

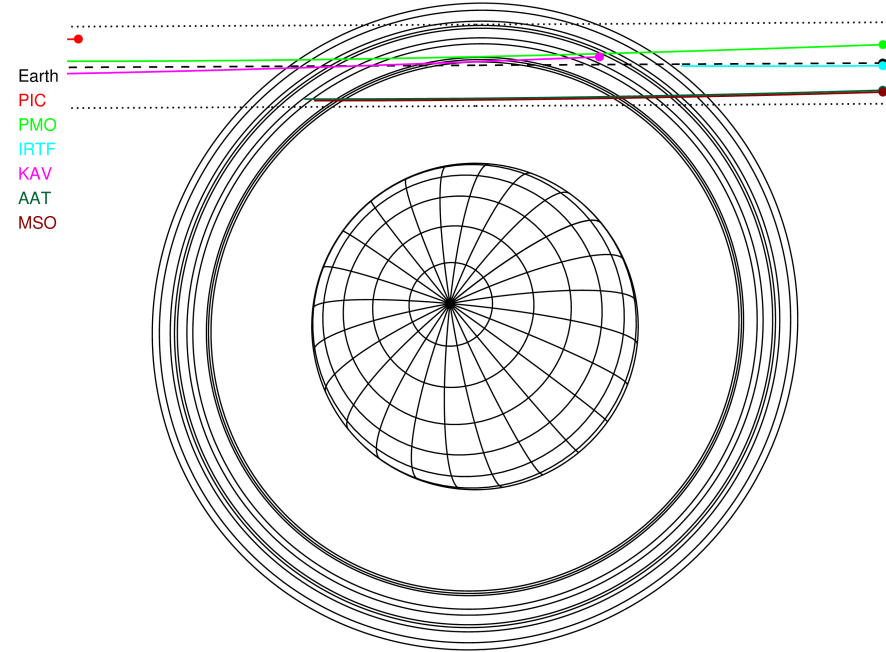
RUWE (>1.4 is poor) : 0.99
K magnitude : 13.140
G magnitude : 14.711
RP magnitude : 14.172
BP magnitude : 15.074
DUPflag : 0
Distance (au) : 18.687
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -5.29
Sun-Target sep (deg) : 112.99
Sun-Moon sep (deg) : 81.80
B (ring opening deg) : 77.98
PA of pole (deg) : 47.56

#	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



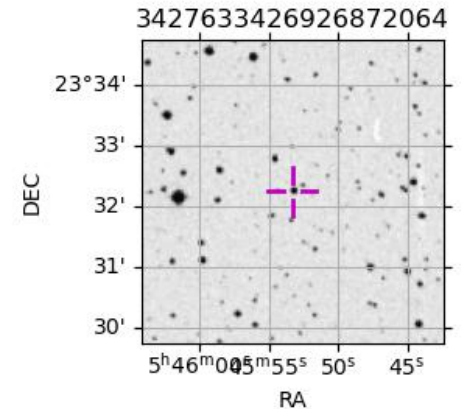
2031-10-13T17:46:56.1800 α: 05 45 53.2769 β: +23 32 14.983 C/A 3.028° PA 180.31 deg v_sky - 5.28 km/s D 18.69 AU
Credit: Styled after SORA/Lucky Star

Uranus 2031-10-13T17:46:56 K13.14 G14.71 XRgt

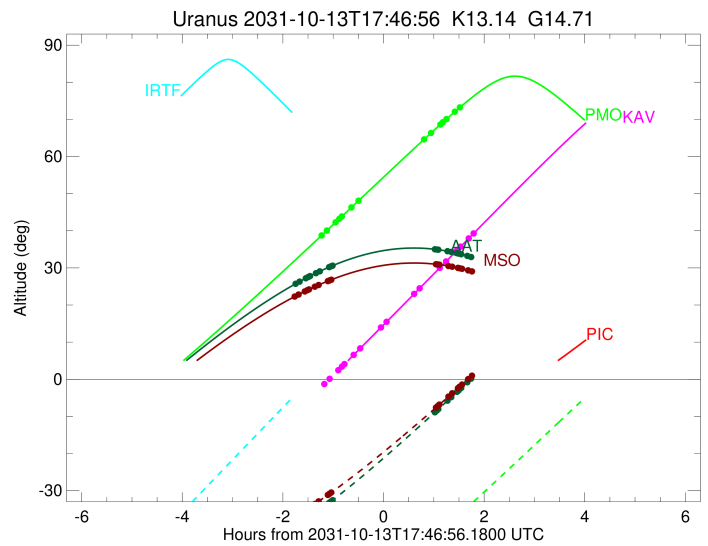
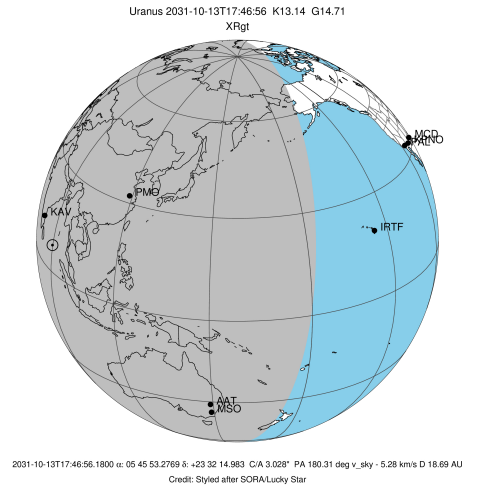


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	++++++		++++++	OCT 13 16:35 - OCT 13 19:17	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	++++		++++++	OCT 13 17:11 - OCT 13 19:34	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	++++++		++++	OCT 13 16:03 - OCT 13 19:03	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	++++++		+++	OCT 13 16:02 - OCT 13 18:53	PnnRie



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-10-13T17:59:11.480
 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 : 3427633426926872064
 2Mass ID (if available) : 05455327+2332151
 ICRS Star Coord at Epoch: 05h 45m 53.27689s +23:32:14.98321s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 13.140
 G magnitude : 14.711
 RP magnitude : 14.172
 BP magnitude : 15.074
 DUPflag : 0
 Distance (au) : 18.687
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.29
 Sun-Target sep (deg) : 112.99
 Sun-Moon sep (deg) : 82.61
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.56
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.116
 C/A sky separation (km) : 42227.1
 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

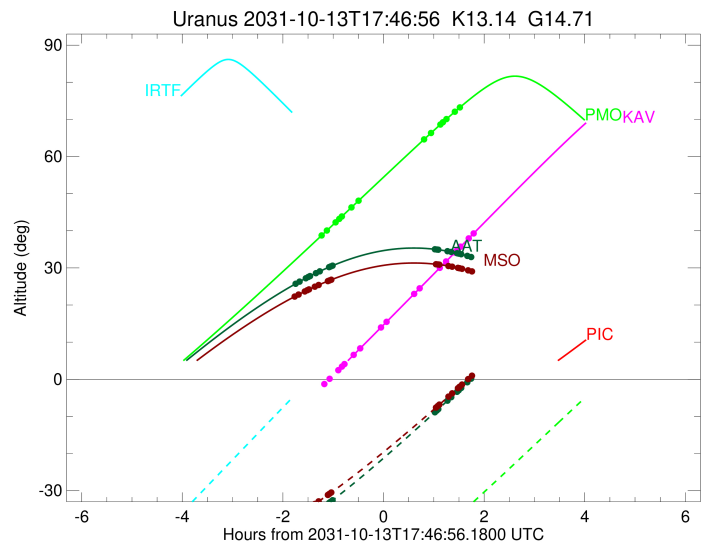
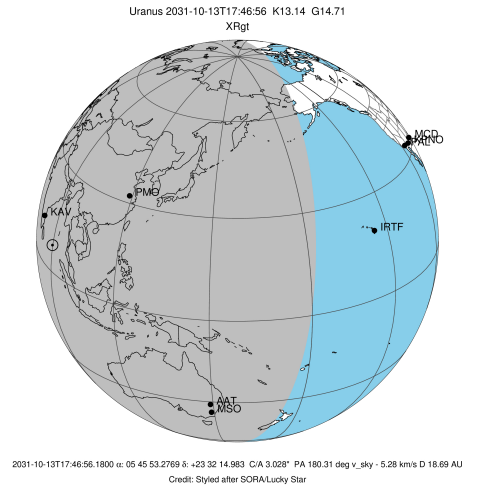


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-10-13T16:35:23.105		39.22	-63.85	50756.39	-3.02		
lambda	I	2031-10-13T16:39:29.325		40.08	-63.46	50026.71	-2.91		
delta	I	2031-10-13T16:49:52.900		42.29	-62.35	48300.35	-2.62		
gamma	I	2031-10-13T16:54:17.122		43.22	-61.83	47625.42	-2.49		
eta	I	2031-10-13T16:57:21.347		43.88	-61.45	47176.12	-2.39		
beta	I	2031-10-13T17:08:59.314		46.35	-59.90	45643.47	-2.00		
alpha	I	2031-10-13T17:17:24.667		48.14	-58.68	44714.44	-1.69		

No planet occultations

alpha	E	2031-10-13T18:35:18.136		64.62	-44.94	44734.16	1.72		
beta	E	2031-10-13T18:43:26.053		66.30	-43.35	45654.09	2.04		
eta	E	2031-10-13T18:54:40.742		68.60	-41.11	47176.12	2.46		
gamma	E	2031-10-13T18:57:37.988		69.20	-40.52	47621.61	2.56		
delta	E	2031-10-13T19:01:55.351		70.07	-39.65	48300.35	2.71		
lambda	E	2031-10-13T19:11:57.050		72.05	-37.62	50026.71	3.02		
epsilon	E	2031-10-13T19:17:34.817		73.15	-36.47	51075.96	3.15		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-10-13T18:09:54.880
 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 : 3427633426926872064
 2Mass ID (if available) : 05455327+2332151
 ICRS Star Coord at Epoch: 05h 45m 53.27689s +23:32:14.98321s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 13.140
 G magnitude : 14.711
 RP magnitude : 14.172
 BP magnitude : 15.074
 DUPflag : 0
 Distance (au) : 18.687
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.29
 Sun-Target sep (deg) : 112.99
 Sun-Moon sep (deg) : 82.15
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.56
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.057
 C/A sky separation (km) : 41435.1
 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

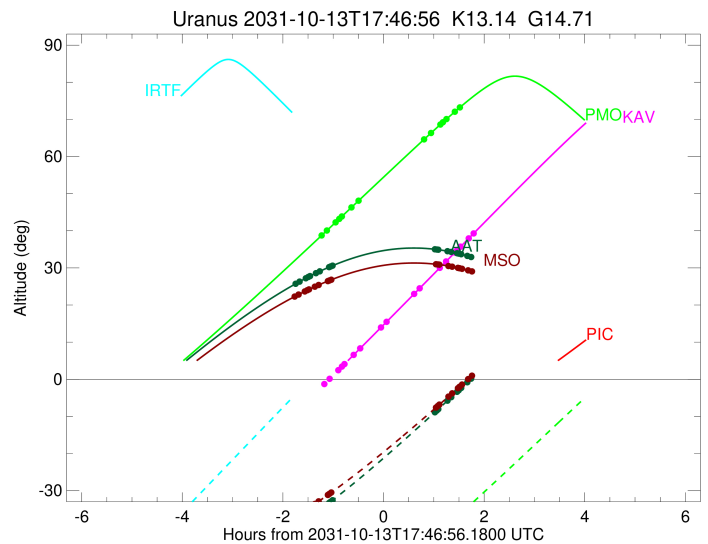
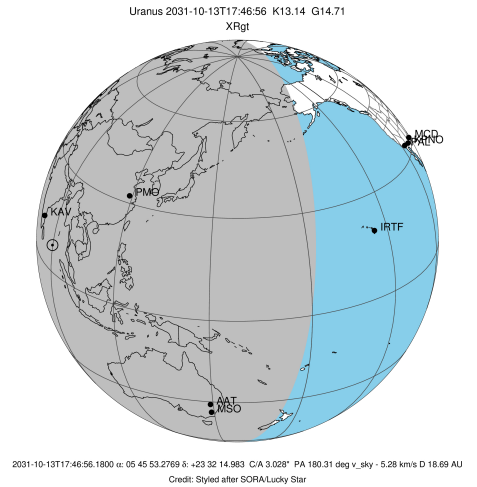


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-10-13T16:38:37.940	-0.78x	-62.01	50754.96	-2.99			
lambda	I	2031-10-13T16:42:45.815	0.14x	-63.01	50026.71	-2.89			
delta	I	2031-10-13T16:53:08.526	2.47x	-65.52	48300.35	-2.65			
gamma	I	2031-10-13T16:57:28.976	3.44x	-66.57	47625.54	-2.53			
eta	I	2031-10-13T17:00:29.181	4.12x	-67.30	47176.12	-2.45			
beta	I	2031-10-13T17:11:37.566	6.63	-69.97	45643.17	-2.13			
alpha	I	2031-10-13T17:19:21.730	8.38	-71.82	44713.11	-1.88			
4	I	2031-10-13T17:45:02.328	14.21	-77.82	42527.17	-0.93			
5	I	2031-10-13T17:51:19.188	15.64	-79.24	42219.86	-0.66			

No planet occultations

5	E	2031-10-13T18:22:23.649	22.74	-84.96	42201.45	0.67			
4	E	2031-10-13T18:28:55.821	24.24	-85.38	42526.18	0.95			
alpha	E	2031-10-13T18:54:05.524	30.02	-82.67	44736.22	1.96			
beta	E	2031-10-13T19:01:22.913	31.69	-81.21	45655.26	2.23			
eta	E	2031-10-13T19:11:52.254	34.11	-78.92	47176.12	2.60			
gamma	E	2031-10-13T19:14:40.814	34.75	-78.29	47621.48	2.69			
delta	E	2031-10-13T19:18:47.382	35.70	-77.35	48300.35	2.82			
lambda	E	2031-10-13T19:28:29.795	37.93	-75.10	50026.71	3.11			
epsilon	E	2031-10-13T19:34:04.968	39.21	-73.79	51093.80	3.22			

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-10-13T17:49:41.250
 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 : 3427633426926872064
 2Mass ID (if available) : 05455327+2332151
 ICRS Star Coord at Epoch: 05h 45m 53.27689s +23:32:14.98321s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 13.140
 G magnitude : 14.711
 RP magnitude : 14.172
 BP magnitude : 15.074
 DUPflag : 0
 Distance (au) : 18.687
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.29
 Sun-Target sep (deg) : 112.99
 Sun-Moon sep (deg) : 82.33
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.56
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.636
 C/A sky separation (km) : 35724.5
 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

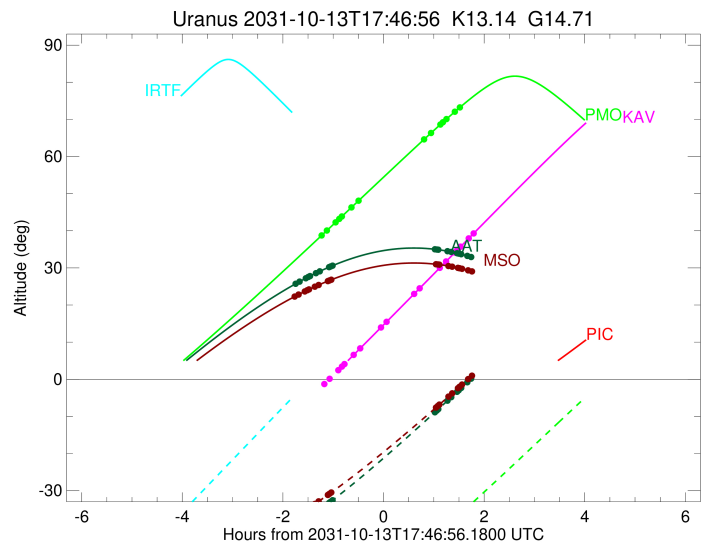
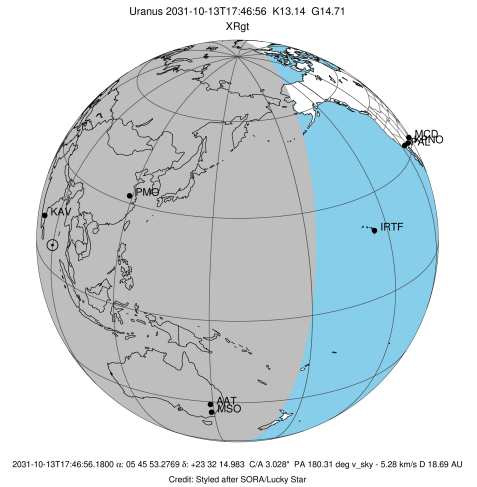


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-10-13T16:03:52.797		25.94	-39.55	50743.79	-3.99		
lambda	I	2031-10-13T16:06:53.744		26.31	-39.09	50026.71	-3.93		
delta	I	2031-10-13T16:14:21.023		27.21	-37.92	48300.35	-3.78		
gamma	I	2031-10-13T16:17:20.676		27.56	-37.45	47626.80	-3.72		
eta	I	2031-10-13T16:19:22.732		27.80	-37.12	47176.12	-3.67		
beta	I	2031-10-13T16:26:31.163		28.60	-35.95	45641.42	-3.49		
alpha	I	2031-10-13T16:31:04.544		29.09	-35.19	44703.54	-3.37		
4	I	2031-10-13T16:42:21.554		30.24	-33.26	42534.96	-3.02		
5	I	2031-10-13T16:43:54.492		30.39	-32.99	42255.28	-2.97		
6	I	2031-10-13T16:46:03.039		30.59	-32.62	41879.74	-2.90		

No planet occultations

6	E	2031-10-13T18:48:13.604		35.01	-8.89	41857.67	2.94		
5	E	2031-10-13T18:50:04.117		34.96	-8.51	42176.25	3.01		
4	E	2031-10-13T18:51:56.613		34.91	-8.12	42530.61	3.07		
alpha	E	2031-10-13T19:03:17.743		34.50	-5.76	44742.65	3.43		
beta	E	2031-10-13T19:07:39.994		34.31	-4.84x	45659.58	3.55		
eta	E	2031-10-13T19:14:35.846		33.96	-3.39x	47176.12	3.74		
gamma	E	2031-10-13T19:16:34.099		33.86	-2.97x	47621.14	3.79		
delta	E	2031-10-13T19:19:31.752		33.69	-2.35x	48300.35	3.86		
lambda	E	2031-10-13T19:26:49.844		33.24	-0.81x	50026.71	4.02		
epsilon	E	2031-10-13T19:31:26.777		32.93	0.16x	51153.10	4.08		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-10-13T17:49:34.610
 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 : 3427633426926872064
 2Mass ID (if available) : 05455327+2332151
 ICRS Star Coord at Epoch: 05h 45m 53.27689s +23:32:14.98321s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 13.140
 G magnitude : 14.711
 RP magnitude : 14.172
 BP magnitude : 15.074
 DUPflag : 0
 Distance (au) : 18.687
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.29
 Sun-Target sep (deg) : 112.99
 Sun-Moon sep (deg) : 82.28
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.56
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.618
 C/A sky separation (km) : 35479.3
 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	2031-10-13T16:02:42.120		22.48	-36.84	50743.69	-4.01		
lambda	I	2031-10-13T16:05:42.335		22.83	-36.43	50026.71	-3.95		
delta	I	2031-10-13T16:13:07.530		23.67	-35.36	48300.35	-3.80		
gamma	I	2031-10-13T16:16:06.177		23.99	-34.93	47626.85	-3.74		
eta	I	2031-10-13T16:18:07.512		24.21	-34.63	47176.12	-3.69		
beta	I	2031-10-13T16:25:12.946		24.95	-33.56	45641.38	-3.52		
alpha	I	2031-10-13T16:29:44.065		25.41	-32.87	44703.25	-3.40		
4	I	2031-10-13T16:40:53.238		26.47	-31.11	42535.26	-3.07		
5	I	2031-10-13T16:42:24.689		26.61	-30.87	42256.16	-3.01		
6	I	2031-10-13T16:44:31.528		26.80	-30.52	41879.74	-2.95		

No planet occultations

6	E	2031-10-13T18:49:31.935		30.99	-7.62	41857.24	2.99		
5	E	2031-10-13T18:51:20.668		30.94	-7.26	42175.65	3.05		
4	E	2031-10-13T18:53:11.793		30.89	-6.90	42530.83	3.11		
alpha	E	2031-10-13T19:04:25.200		30.51	-4.67x	44742.87	3.46		
beta	E	2031-10-13T19:08:45.196		30.33	-3.80x	45659.75	3.58		
eta	E	2031-10-13T19:15:38.084		30.01	-2.43x	47176.12	3.76		
gamma	E	2031-10-13T19:17:35.626		29.91	-2.03x	47621.13	3.81		
delta	E	2031-10-13T19:20:32.303		29.76	-1.44x	48300.35	3.88		
lambda	E	2031-10-13T19:27:48.374		29.35	0.02x	50026.71	4.04		
epsilon	E	2031-10-13T19:32:24.958		29.06	0.95x	51155.92	4.10		