

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2047-03-12T13:30:08.470  
 Event type : PRgt  
 : Uranus occs: not geocentric or topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3877308011664274176  
 2Mass ID (if available) : 10204261+11110257

Uranus 2047-03-12T13:30:08 K14.14 G17.41 PRgt

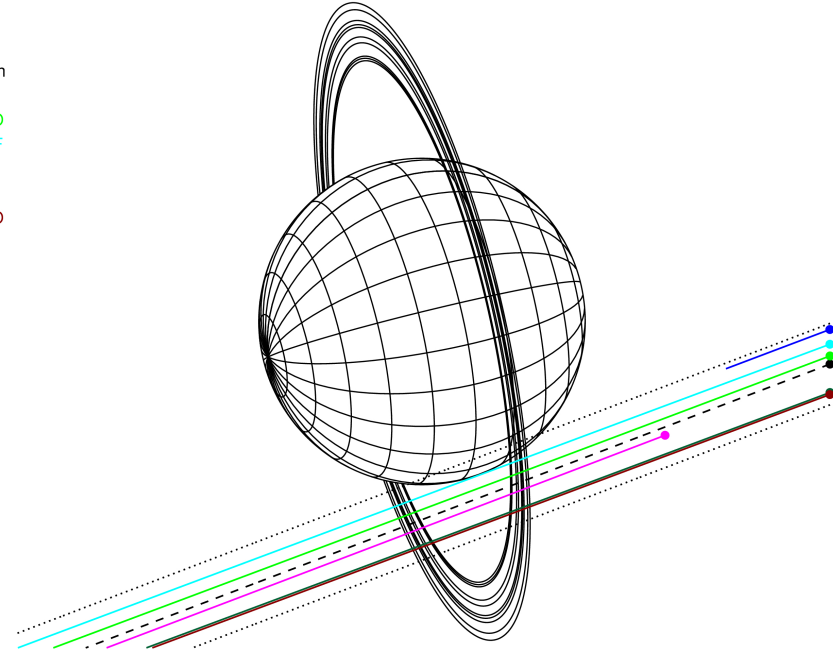
ICRS Star Coord at Epoch: 10h 20m 42.57413s +11:10:25.61682s

RUWE (>1.4 is poor) : 1.00  
 K magnitude : 14.137  
 G magnitude : 17.411  
 RP magnitude : 16.362  
 BP magnitude : 18.583  
 DUPflag : 0  
 Distance (au) : 17.368  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.48  
 Sun-Target sep (deg) : 161.68  
 Sun-Moon sep (deg) : 25.82  
 B (ring opening deg) : 14.46  
 PA of pole (deg) : 102.98



2047-03-12T13:30:08.4700 α: 10 20 42.5741 s; +11 10 25.617 C/A 2.299° PA 20.87 deg v\_sky -21.48 km/s D 17.37 AU  
 Credit: Styled after SORA/Lucky Star

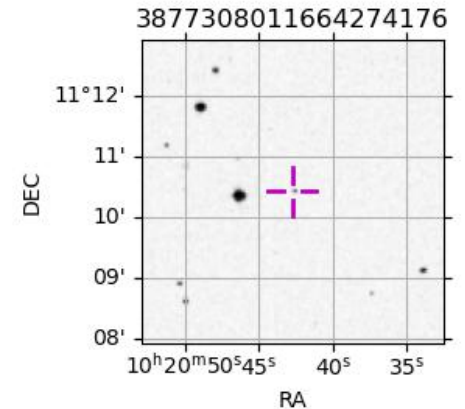
Earth  
 PAL  
 PMO  
 IRTF  
 KAV  
 AAT  
 MSO



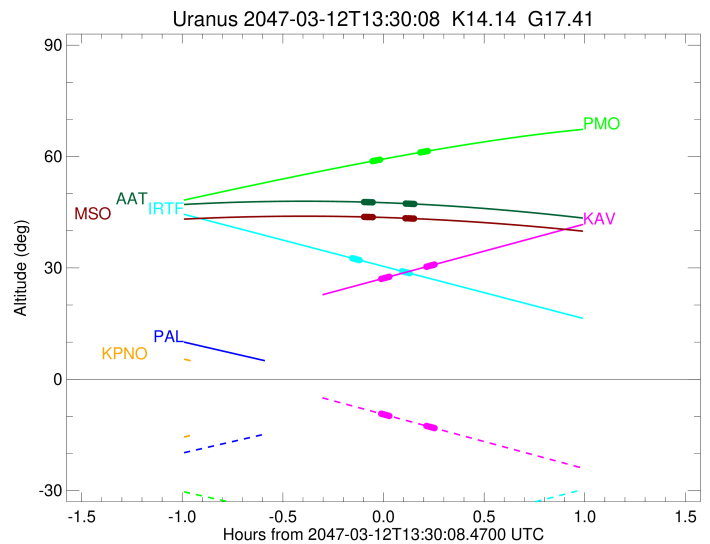
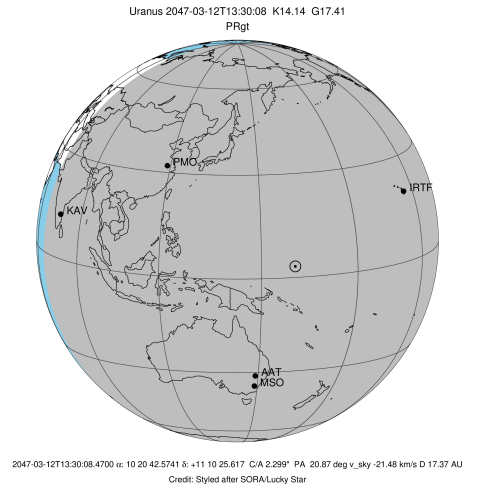
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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	+++++		+++++	MAR 12 13:26 - MAR 12 13:43	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	+++++		+++++	MAR 12 13:20 - MAR 12 13:37	PnnRie
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	MAR 12 13:29 - MAR 12 13:45	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	+++++		+++++	MAR 12 13:24 - MAR 12 13:39	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++		+++++	MAR 12 13:24 - MAR 12 13:39	PnnRie



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2047-03-12T13:32:28.410  
 Event type : PRgt  
 : Uranus occs: not geocentric or topocentric  
 : 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 : 3877308011664274176  
 2Mass ID (if available) : 10204261+1110257  
 ICRS Star Coord at Epoch: 10h 20m 42.57413s +11:10:25.61682s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 14.137  
 G magnitude : 17.411  
 RP magnitude : 16.362  
 BP magnitude : 18.583  
 DUPflag : 0  
 Distance (au) : 17.368  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.48  
 Sun-Target sep (deg) : 161.68  
 Sun-Moon sep (deg) : 26.66  
 B (ring opening deg) : 14.46  
 PA of pole (deg) : 102.98  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.189  
 C/A sky separation (km) : 27568.2  
 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



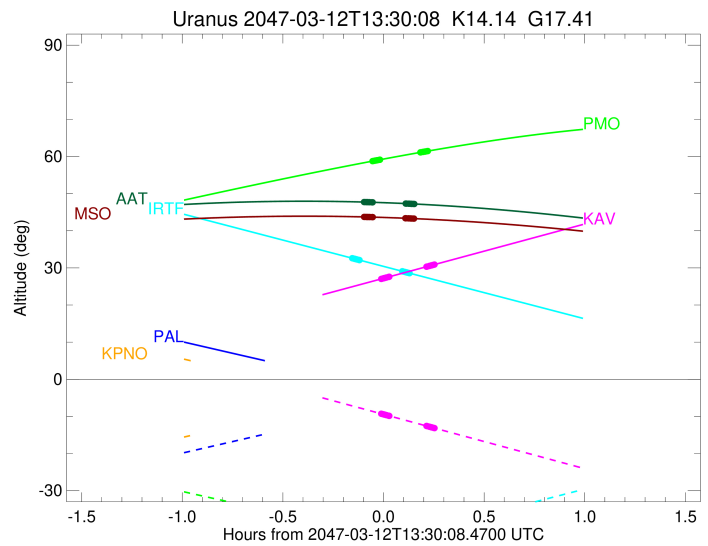
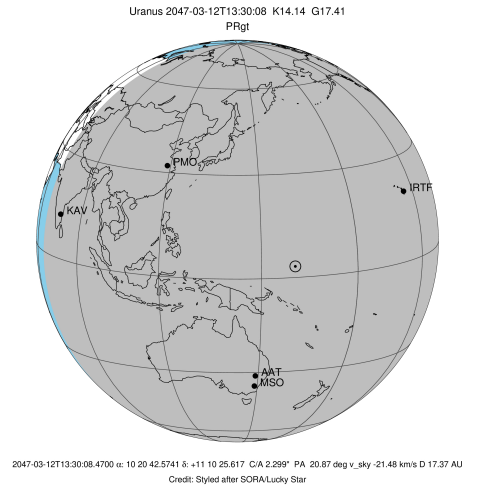
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2047-03-12T13:26:46.649		58.75	-41.36	51543.66	-72.93		
lambda	I	2047-03-12T13:27:07.555		58.81	-41.42	50026.71	-72.09		
delta	I	2047-03-12T13:27:31.698		58.88	-41.50	48300.34	-70.90		
gamma	I	2047-03-12T13:27:41.298		58.90	-41.53	47622.07	-70.39		
eta	I	2047-03-12T13:27:47.648		58.92	-41.55	47176.12	-70.05		
beta	I	2047-03-12T13:28:09.770		58.98	-41.62	45641.19	-68.78		
alpha	I	2047-03-12T13:28:22.826		59.02	-41.66	44719.88	-67.88		
4	I	2047-03-12T13:28:55.056		59.11	-41.76	42526.00	-65.54		
5	I	2047-03-12T13:29:00.384		59.13	-41.78	42281.62	-65.30		
6	I	2047-03-12T13:29:05.933		59.14	-41.79	41795.37	-64.46		

No planet occultations

6	E	2047-03-12T13:41:08.403		61.12	-44.02	41834.82	64.47		
5	E	2047-03-12T13:41:15.470		61.14	-44.04	42293.32	65.32		
4	E	2047-03-12T13:41:18.086		61.15	-44.05	42580.25	65.55		
alpha	E	2047-03-12T13:41:51.150		61.23	-44.15	44751.21	67.90		
beta	E	2047-03-12T13:42:03.897		61.27	-44.19	45663.97	68.79		
eta	E	2047-03-12T13:42:25.844		61.33	-44.26	47176.11	70.07		
gamma	E	2047-03-12T13:42:32.228		61.34	-44.28	47624.51	70.41		
delta	E	2047-03-12T13:42:41.791		61.37	-44.31	48300.35	70.92		
lambda	E	2047-03-12T13:43:05.930		61.43	-44.38	50026.71	72.10		
epsilon	E	2047-03-12T13:43:17.971		61.46	-44.42	50898.24	72.94		

```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch              : 2047-03-12T13:26:54.910
Event type             : PRgt
: Uranus occs: not geocentric or topocentric
: 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        : 3877308011664274176
2Mass ID (if available) : 10204261+1110257
ICRS Star Coord at Epoch: 10h 20m 42.57413s +11:10:25.61682s
RUWE (>1.4 is poor)  : 1.00
K magnitude           : 14.137
G magnitude           : 17.411
RP magnitude          : 16.362
BP magnitude          : 18.583
DUPflag              : 0
Distance (au)         : 17.368
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -21.48
Sun-Target sep (deg)  : 161.68
Sun-Moon sep (deg)    : 25.54
B (ring opening deg)  : 14.46
PA of pole (deg)     : 102.98
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.038
C/A sky separation (km) : 25674.9
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
    
```

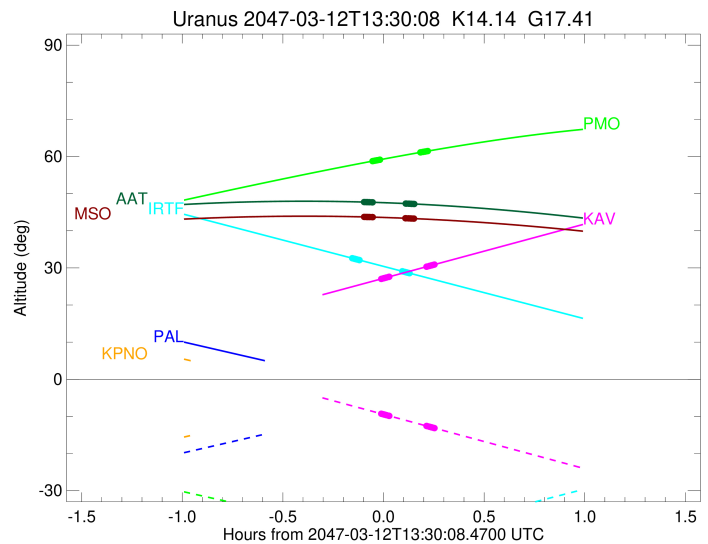
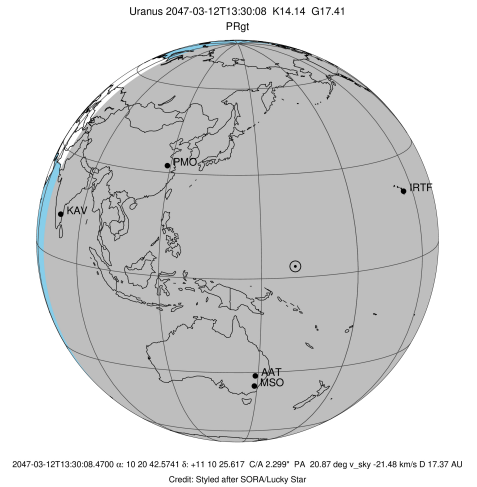


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2047-03-12T13:20:43.838		32.63	-45.56	51547.48	-74.39		
lambda	I	2047-03-12T13:21:04.367		32.55	-45.49	50026.71	-73.68		
delta	I	2047-03-12T13:21:27.952		32.46	-45.40	48300.35	-72.69		
gamma	I	2047-03-12T13:21:37.307		32.42	-45.36	47622.23	-72.27		
eta	I	2047-03-12T13:21:43.493		32.40	-45.34	47176.12	-71.98		
beta	I	2047-03-12T13:22:04.992		32.31	-45.26	45641.35	-70.92		
alpha	I	2047-03-12T13:22:17.622		32.26	-45.21	44718.08	-70.16		
4	I	2047-03-12T13:22:48.686		32.14	-45.09	42525.93	-68.22		
5	I	2047-03-12T13:22:53.801		32.12	-45.07	42277.73	-68.04		
6	I	2047-03-12T13:22:58.988		32.10	-45.05	41795.87	-67.29		

No planet occultations

6	E	2047-03-12T13:35:44.623		29.09	-42.15	41837.37	67.22		
5	E	2047-03-12T13:35:51.210		29.06	-42.13	42289.98	67.96		
4	E	2047-03-12T13:35:53.830		29.05	-42.12	42582.83	68.14		
alpha	E	2047-03-12T13:36:25.696		28.93	-41.99	44750.67	70.08		
beta	E	2047-03-12T13:36:38.046		28.88	-41.95	45665.01	70.83		
eta	E	2047-03-12T13:36:59.391		28.80	-41.87	47176.12	71.88		
gamma	E	2047-03-12T13:37:05.620		28.77	-41.84	47624.76	72.16		
delta	E	2047-03-12T13:37:14.955		28.73	-41.81	48300.34	72.59		
lambda	E	2047-03-12T13:37:38.576		28.64	-41.72	50026.72	73.57		
epsilon	E	2047-03-12T13:37:50.198		28.60	-41.67	50884.38	74.28		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2047-03-12T13:34:23.870  
 Event type : PRgt  
 : Uranus occs: not geocentric or topocentric  
 : 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 : 3877308011664274176  
 2Mass ID (if available) : 10204261+1110257  
 ICRS Star Coord at Epoch: 10h 20m 42.57413s +11:10:25.61682s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 14.137  
 G magnitude : 17.411  
 RP magnitude : 16.362  
 BP magnitude : 18.583  
 DUPflag : 0  
 Distance (au) : 17.368  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.48  
 Sun-Target sep (deg) : 161.68  
 Sun-Moon sep (deg) : 26.76  
 B (ring opening deg) : 14.46  
 PA of pole (deg) : 102.98  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.399  
 C/A sky separation (km) : 30220.8  
 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

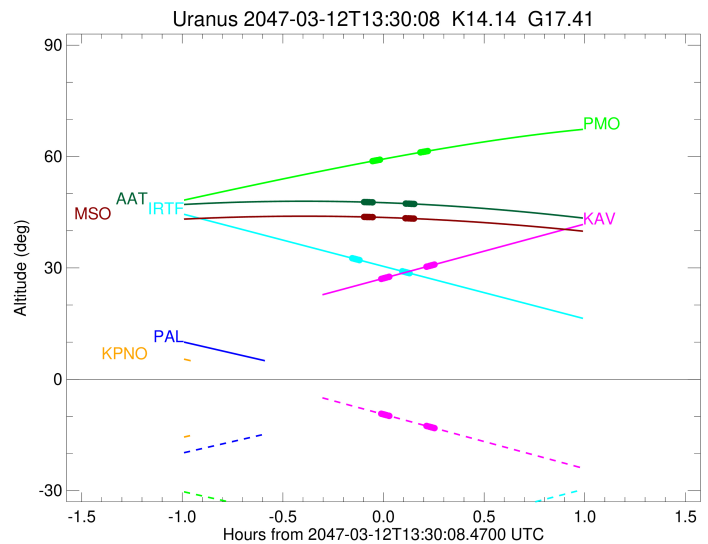
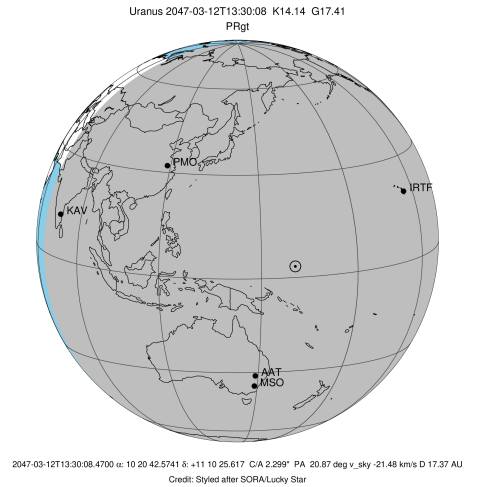


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2047-03-12T13:29:22.592		27.01	-9.26	51536.82	-69.30		
lambda	I	2047-03-12T13:29:44.524		27.10	-9.35	50026.71	-68.27		
delta	I	2047-03-12T13:30:10.084		27.20	-9.45	48300.35	-66.78		
gamma	I	2047-03-12T13:30:20.292		27.24	-9.50	47621.85	-66.14		
eta	I	2047-03-12T13:30:27.053		27.27	-9.52	47176.11	-65.70		
beta	I	2047-03-12T13:30:50.701		27.37	-9.62	45641.08	-64.08		
alpha	I	2047-03-12T13:31:04.772		27.42	-9.68	44722.53	-62.97		
4	I	2047-03-12T13:31:39.777		27.57	-9.82	42526.38	-59.96		
5	I	2047-03-12T13:31:45.571		27.59	-9.84	42287.11	-59.64		
6	I	2047-03-12T13:31:51.909		27.62	-9.87	41794.89	-58.63		

No planet occultations

6	E	2047-03-12T13:42:57.893		30.32	-12.58	41830.98	58.68		
5	E	2047-03-12T13:43:05.952		30.35	-12.61	42298.00	59.70		
4	E	2047-03-12T13:43:08.685		30.36	-12.62	42576.31	60.01		
alpha	E	2047-03-12T13:43:44.625		30.51	-12.77	44751.82	63.02		
beta	E	2047-03-12T13:43:58.360		30.56	-12.82	45662.42	64.14		
eta	E	2047-03-12T13:44:21.831		30.66	-12.92	47176.12	65.77		
gamma	E	2047-03-12T13:44:28.620		30.69	-12.95	47624.16	66.20		
delta	E	2047-03-12T13:44:38.784		30.73	-12.99	48300.35	66.85		
lambda	E	2047-03-12T13:45:04.321		30.83	-13.09	50026.72	68.34		
epsilon	E	2047-03-12T13:45:17.318		30.88	-13.14	50919.50	69.38		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2047-03-12T13:28:44.650  
 Event type : PRgt  
 : Uranus occs: not geocentric or topocentric  
 : 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 : 3877308011664274176  
 2Mass ID (if available) : 10204261+1110257  
 ICRS Star Coord at Epoch: 10h 20m 42.57413s +11:10:25.61682s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 14.137  
 G magnitude : 17.411  
 RP magnitude : 16.362  
 BP magnitude : 18.583  
 DUPflag : 0  
 Distance (au) : 17.368  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.48  
 Sun-Target sep (deg) : 161.68  
 Sun-Moon sep (deg) : 25.74  
 B (ring opening deg) : 14.46  
 PA of pole (deg) : 102.98  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.603  
 C/A sky separation (km) : 32788.5  
 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

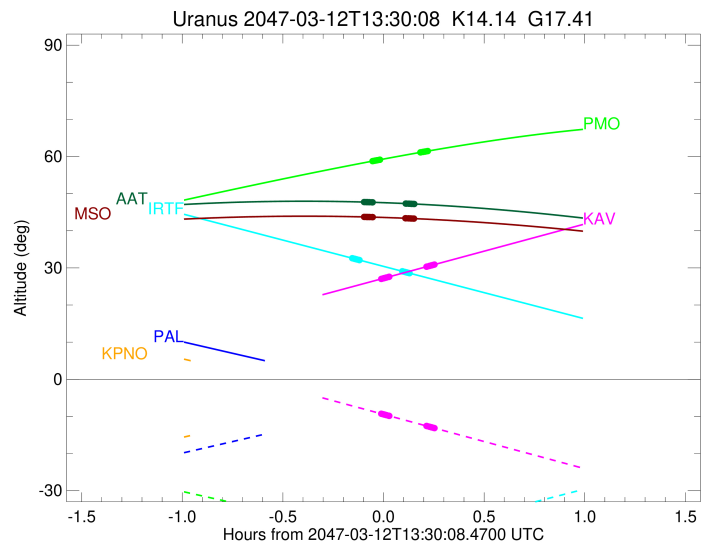
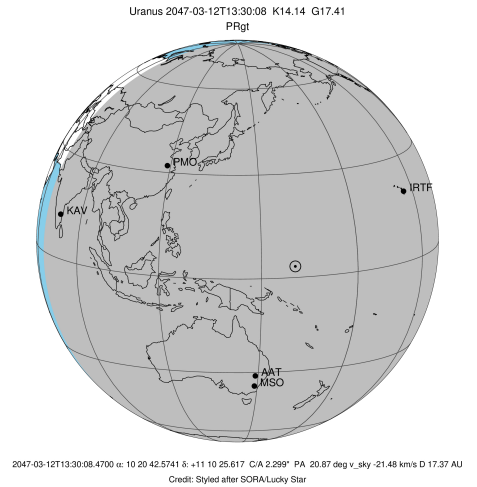


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2047-03-12T13:24:14.754		47.74	-53.74	51528.07	-66.43		
lambda	I	2047-03-12T13:24:37.540		47.73	-53.77	50026.71	-65.16		
delta	I	2047-03-12T13:25:04.413		47.72	-53.81	48300.35	-63.29		
gamma	I	2047-03-12T13:25:15.204		47.71	-53.82	47621.64	-62.48		
eta	I	2047-03-12T13:25:22.366		47.71	-53.83	47176.11	-61.93		
beta	I	2047-03-12T13:25:47.551		47.70	-53.86	45641.07	-59.86		
alpha	I	2047-03-12T13:26:02.696		47.69	-53.88	44725.31	-58.45		
4	I	2047-03-12T13:26:40.817		47.68	-53.93	42527.16	-54.55		
5	I	2047-03-12T13:26:47.100		47.67	-53.93	42292.58	-54.12		
6	I	2047-03-12T13:26:54.430		47.67	-53.94	41794.75	-52.87		

No planet occultations

6	E	2047-03-12T13:36:45.918		47.33	-54.60	41827.10	52.87		
5	E	2047-03-12T13:36:55.132		47.32	-54.60	42302.23	54.12		
4	E	2047-03-12T13:36:58.074		47.32	-54.61	42572.28	54.55		
alpha	E	2047-03-12T13:37:37.270		47.29	-54.64	44752.23	58.44		
beta	E	2047-03-12T13:37:52.078		47.28	-54.66	45660.88	59.85		
eta	E	2047-03-12T13:38:17.130		47.26	-54.68	47176.12	61.92		
gamma	E	2047-03-12T13:38:24.329		47.26	-54.69	47623.82	62.47		
delta	E	2047-03-12T13:38:35.089		47.25	-54.70	48300.35	63.28		
lambda	E	2047-03-12T13:39:01.971		47.23	-54.72	50026.71	65.14		
epsilon	E	2047-03-12T13:39:15.907		47.22	-54.74	50940.75	66.42		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2047-03-12T13:28:40.260  
 Event type : PRgt  
 : Uranus occs: not geocentric or topocentric  
 : 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 : 3877308011664274176  
 2Mass ID (if available) : 10204261+1110257  
 ICRS Star Coord at Epoch: 10h 20m 42.57413s +11:10:25.61682s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 14.137  
 G magnitude : 17.411  
 RP magnitude : 16.362  
 BP magnitude : 18.583  
 DUPflag : 0  
 Distance (au) : 17.368  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -21.48  
 Sun-Target sep (deg) : 161.68  
 Sun-Moon sep (deg) : 25.70  
 B (ring opening deg) : 14.46  
 PA of pole (deg) : 102.98  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.628  
 C/A sky separation (km) : 33099.6  
 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\_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	2047-03-12T13:24:15.419		43.74	-49.94	51526.90	-65.93		
lambda	I	2047-03-12T13:24:38.368		43.73	-49.97	50026.71	-64.62		
delta	I	2047-03-12T13:25:05.477		43.72	-50.00	48300.34	-62.70		
gamma	I	2047-03-12T13:25:16.372		43.71	-50.01	47621.62	-61.87		
eta	I	2047-03-12T13:25:23.605		43.71	-50.02	47176.11	-61.30		
beta	I	2047-03-12T13:25:49.062		43.70	-50.05	45641.08	-59.18		
alpha	I	2047-03-12T13:26:04.393		43.70	-50.06	44725.65	-57.72		
4	I	2047-03-12T13:26:43.057		43.68	-50.11	42527.29	-53.70		
5	I	2047-03-12T13:26:49.425		43.68	-50.11	42293.25	-53.26		
6	I	2047-03-12T13:26:56.919		43.68	-50.12	41794.77	-51.98		

No planet occultations

6	E	2047-03-12T13:36:39.336		43.38	-50.69	41826.58	51.98		
5	E	2047-03-12T13:36:48.739		43.37	-50.69	42302.75	53.26		
4	E	2047-03-12T13:36:51.724		43.37	-50.70	42571.74	53.70		
alpha	E	2047-03-12T13:37:31.477		43.35	-50.73	44752.27	57.72		
beta	E	2047-03-12T13:37:46.470		43.34	-50.74	45660.68	59.17		
eta	E	2047-03-12T13:38:11.794		43.32	-50.76	47176.11	61.29		
gamma	E	2047-03-12T13:38:19.064		43.32	-50.77	47623.78	61.86		
delta	E	2047-03-12T13:38:29.928		43.31	-50.78	48300.35	62.69		
lambda	E	2047-03-12T13:38:57.047		43.29	-50.80	50026.71	64.60		
epsilon	E	2047-03-12T13:39:11.139		43.28	-50.81	50943.59	65.91		