

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-21T12:46:01.460
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3415723753195695744
 2Mass ID (if available) : 05114534+2304244

ICRS Star Coord at Epoch: 05h 11m 45.34410s +23:04:24.69461s

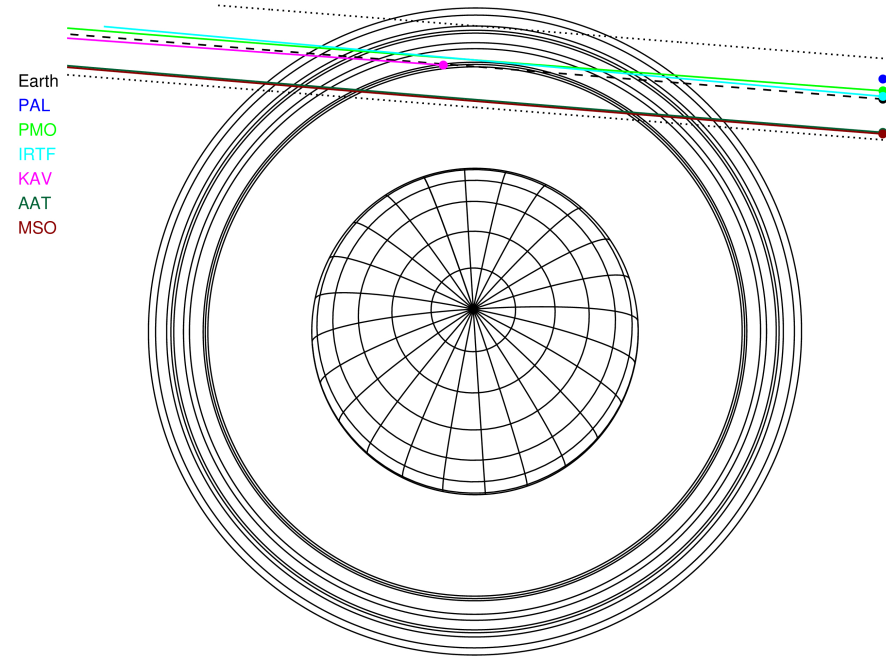
RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.961
 G magnitude : 17.475
 RP magnitude : 16.662
 BP magnitude : 18.213
 DUPflag : 0
 Distance (au) : 18.404
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -15.85
 Sun-Target sep (deg) : 138.08
 Sun-Moon sep (deg) : 161.10
 B (ring opening deg) : 82.08
 PA of pole (deg) : 4.40

#	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



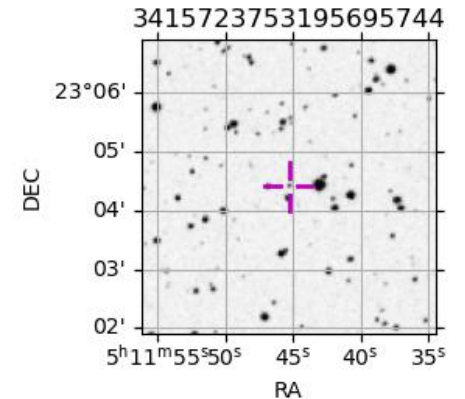
2031-01-21T12:46:01.4600 ex: 05 11 45.3441 s: +23 04 24.695 C/A 3.104° PA 175.44 deg v_sky -15.85 km/s D 18.40 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2031-01-21T12:46:01 K14.96 G17.48 XRgt

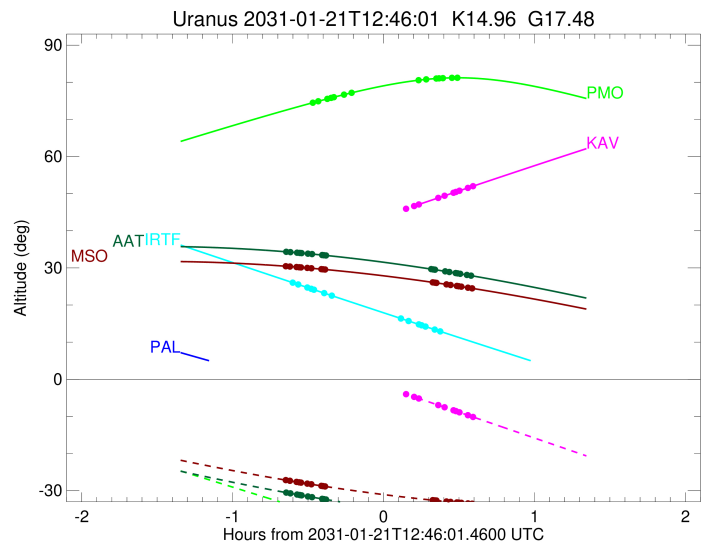
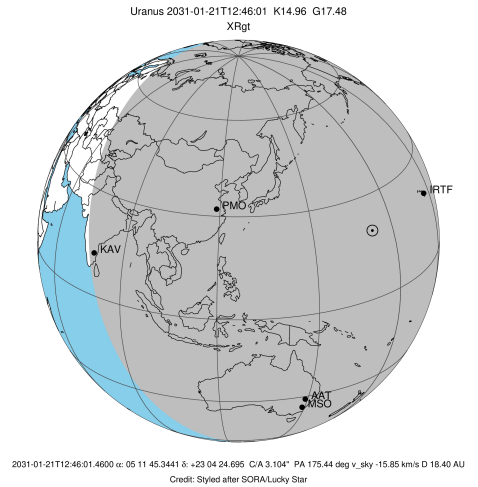


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	++++++		++++++	JAN 21 12:18 - JAN 21 13:15	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	++++++		++++++	JAN 21 12:10 - JAN 21 13:08	PnnRie
KAV	Kavalur Observatory	12.6	78.8			++++++	JAN 21 12:59 - JAN 21 13:21	PnnRne
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	++++++		++++++	JAN 21 12:07 - JAN 21 13:20	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	++++++		++++++	JAN 21 12:07 - JAN 21 13:21	PnnRie



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-21T12:46:47.450
 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 : 3415723753195695744
 2Mass ID (if available) : 05114534+2304244
 ICRS Star Coord at Epoch: 05h 11m 45.34410s +23:04:24.69461s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.961
 G magnitude : 17.475
 RP magnitude : 16.662
 BP magnitude : 18.213
 DUPflag : 0
 Distance (au) : 18.404
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -15.85
 Sun-Target sep (deg) : 138.08
 Sun-Moon sep (deg) : 161.53
 B (ring opening deg) : 82.08
 PA of pole (deg) : 4.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.176
 C/A sky separation (km) : 42392.4
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

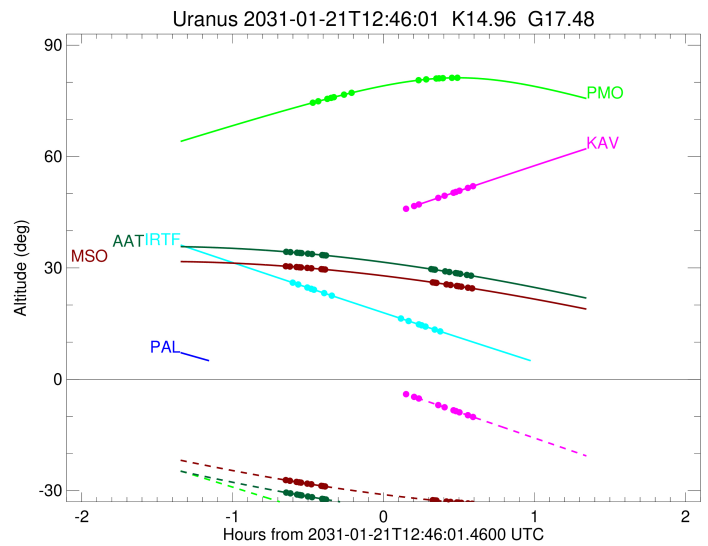
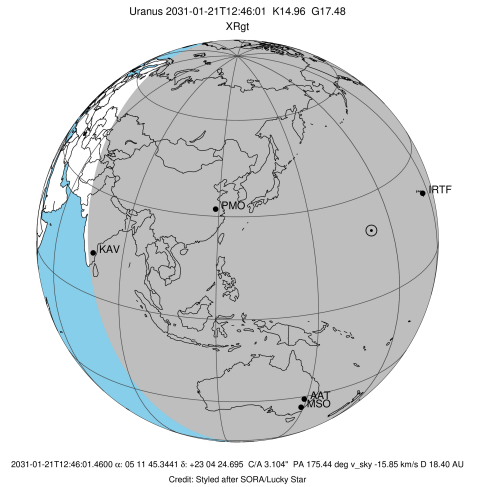


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-21T12:18:41.966		74.64	-35.96	50755.31	-8.76		
lambda	I	2031-01-21T12:20:06.975		74.90	-36.26	50026.71	-8.41		
delta	I	2031-01-21T12:23:43.435		75.54	-37.02	48300.35	-7.53		
gamma	I	2031-01-21T12:25:16.141		75.81	-37.35	47621.33	-7.12		
eta	I	2031-01-21T12:26:19.966		75.99	-37.57	47176.12	-6.83		
beta	I	2031-01-21T12:30:19.014		76.67	-38.42	45679.37	-5.67		
alpha	I	2031-01-21T12:33:27.574		77.19	-39.09	44701.09	-4.67		

No planet occultations

alpha	E	2031-01-21T12:59:49.225		80.55	-44.68	44687.97	4.67		
beta	E	2031-01-21T13:02:58.869		80.79	-45.35	45669.43	5.67		
eta	E	2031-01-21T13:06:59.614		81.01	-46.20	47176.12	6.83		
gamma	E	2031-01-21T13:08:03.915		81.06	-46.42	47624.75	7.12		
delta	E	2031-01-21T13:09:36.131		81.12	-46.75	48300.35	7.53		
lambda	E	2031-01-21T13:13:12.569		81.20	-47.51	50026.71	8.41		
epsilon	E	2031-01-21T13:15:13.529		81.21	-47.94	51071.67	8.76		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-21T12:39:20.260
 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 : 3415723753195695744
 2Mass ID (if available) : 05114534+2304244
 ICRS Star Coord at Epoch: 05h 11m 45.34410s +23:04:24.69461s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.961
 G magnitude : 17.475
 RP magnitude : 16.662
 BP magnitude : 18.213
 DUPflag : 0
 Distance (au) : 18.404
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -15.85
 Sun-Target sep (deg) : 138.08
 Sun-Moon sep (deg) : 160.33
 B (ring opening deg) : 82.08
 PA of pole (deg) : 4.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.172
 C/A sky separation (km) : 42339.4
 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



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

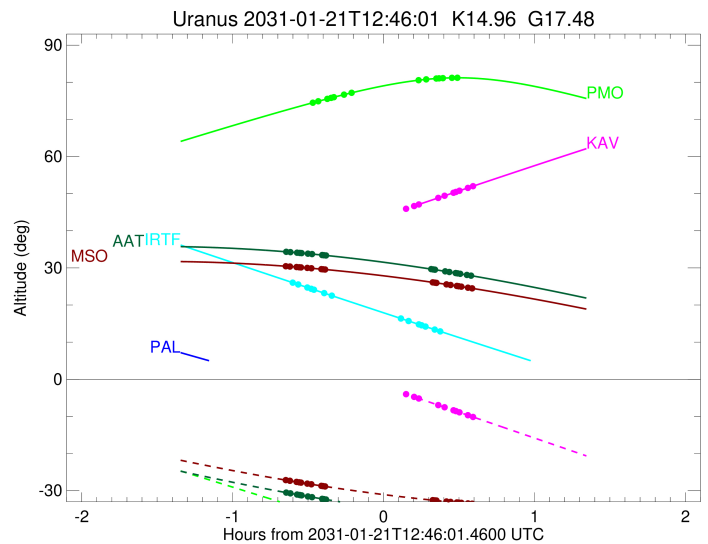
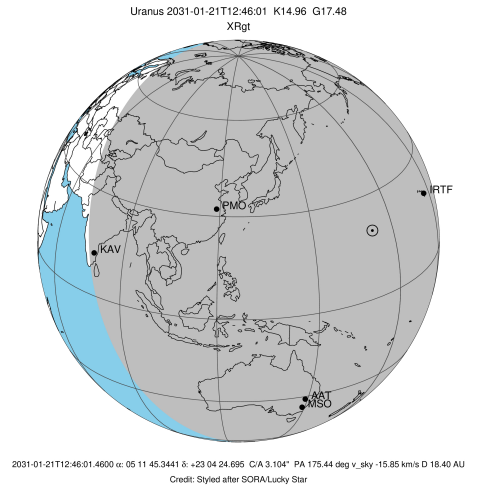
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-21T12:10:42.878		25.85	-67.06	50753.89	-8.67		
lambda	I	2031-01-21T12:12:08.585		25.53	-66.73	50026.71	-8.32		
delta	I	2031-01-21T12:15:47.161		24.71	-65.87	48300.35	-7.46		
gamma	I	2031-01-21T12:17:20.720		24.35	-65.51	47621.30	-7.06		
eta	I	2031-01-21T12:18:25.097		24.11	-65.25	47176.12	-6.77		
beta	I	2031-01-21T12:22:25.869		23.21	-64.31	45679.50	-5.64		
alpha	I	2031-01-21T12:25:35.071		22.50	-63.57	44701.60	-4.67		

No planet occultations

alpha	E	2031-01-21T12:52:47.264		16.41	-57.21	44688.10	4.65		
beta	E	2031-01-21T12:55:58.411		15.70	-56.46	45669.60	5.61		
eta	E	2031-01-21T13:00:02.119		14.79	-55.51	47176.12	6.73		
gamma	E	2031-01-21T13:01:07.349		14.55	-55.26	47624.70	7.02		
delta	E	2031-01-21T13:02:40.991		14.21	-54.89	48300.35	7.41		
lambda	E	2031-01-21T13:06:21.044		13.39	-54.04	50026.71	8.27		
epsilon	E	2031-01-21T13:08:23.672		12.94	-53.56	51067.36	8.60		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-01-21T12:51:10.280
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      : 3415723753195695744
2Mass ID (if available) : 05114534+2304244
ICRS Star Coord at Epoch: 05h 11m 45.34410s +23:04:24.69461s
RUWE (>1.4 is poor) : 1.06
K magnitude         : 14.961
G magnitude         : 17.475
RP magnitude        : 16.662
BP magnitude        : 18.213
DUPflag            : 0
Distance (au)       : 18.404
f0 (km)            : 0.000
g0 (km)            : 0.000
skyplane vel. (km/s) : -15.85
Sun-Target sep (deg) : 138.08
Sun-Moon sep (deg)  : 162.00
B (ring opening deg) : 82.08
PA of pole (deg)    : 4.40
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.092
C/A sky separation (km) : 41272.7
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_itrfr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```

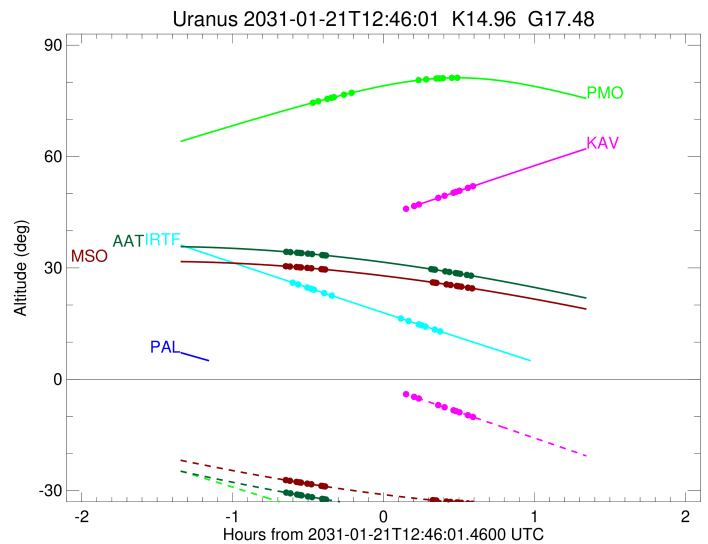
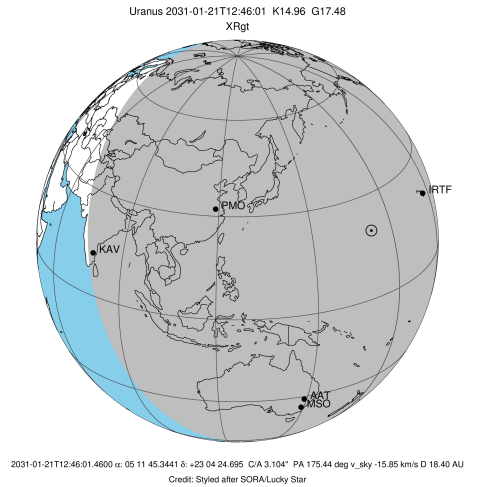


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-21T12:21:09.230		38.14	3.73x	50752.27	-9.22		
lambda	I	2031-01-21T12:22:29.312		38.45	3.43x	50026.71	-8.92		
delta	I	2031-01-21T12:25:51.426		39.23	2.66x	48300.35	-8.15		
gamma	I	2031-01-21T12:27:16.542		39.55	2.34x	47621.24	-7.80		
eta	I	2031-01-21T12:28:14.492		39.78	2.12x	47176.12	-7.56		
beta	I	2031-01-21T12:31:45.515		40.59	1.32x	45679.83	-6.60		
alpha	I	2031-01-21T12:34:22.210		41.19	0.72x	44703.22	-5.83		
4	I	2031-01-21T12:42:16.483		43.01	-1.09x	42541.43	-3.22		
5	I	2031-01-21T12:43:55.765		43.39	-1.47x	42242.96	-2.61		
6	I	2031-01-21T12:46:58.491		44.09	-2.17x	41871.12	-1.52		

No planet occultations

6	E	2031-01-21T12:55:04.487		45.95	-4.03x	41865.74	1.52		
5	E	2031-01-21T12:58:00.776		46.62	-4.70x	42217.11	2.62		
4	E	2031-01-21T12:59:45.835		47.02	-5.11	42530.49	3.22		
alpha	E	2031-01-21T13:07:39.911		48.83	-6.93	44686.85	5.84		
beta	E	2031-01-21T13:10:17.238		49.43	-7.54	45668.10	6.62		
eta	E	2031-01-21T13:13:49.309		50.24	-8.35	47176.12	7.59		
gamma	E	2031-01-21T13:14:47.534		50.46	-8.58	47625.05	7.83		
delta	E	2031-01-21T13:16:11.842		50.78	-8.90	48300.35	8.18		
lambda	E	2031-01-21T13:19:33.113		51.54	-9.68	50026.71	8.96		
epsilon	E	2031-01-21T13:21:29.146		51.98	-10.13	51090.19	9.27		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-21T12:44:10.360
 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 : 3415723753195695744
 2Mass ID (if available) : 05114534+2304244
 ICRS Star Coord at Epoch: 05h 11m 45.34410s +23:04:24.69461s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.961
 G magnitude : 17.475
 RP magnitude : 16.662
 BP magnitude : 18.213
 DUPflag : 0
 Distance (au) : 18.404
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -15.85
 Sun-Target sep (deg) : 138.08
 Sun-Moon sep (deg) : 160.88
 B (ring opening deg) : 82.08
 PA of pole (deg) : 4.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.712
 C/A sky separation (km) : 36200.6
 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



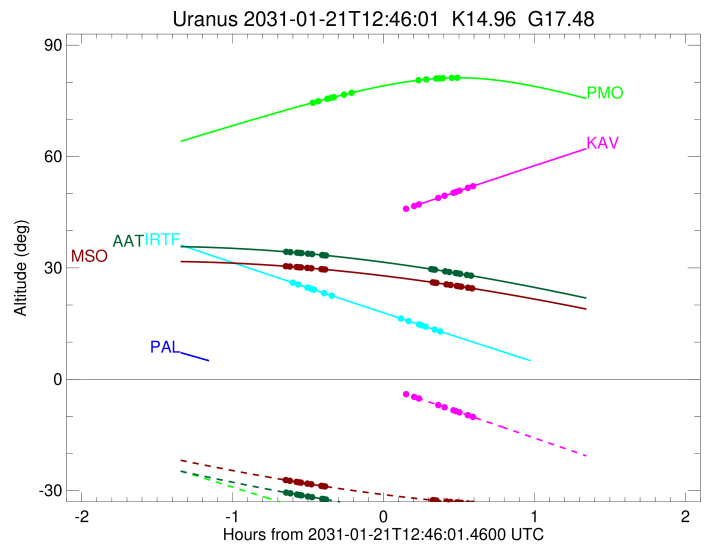
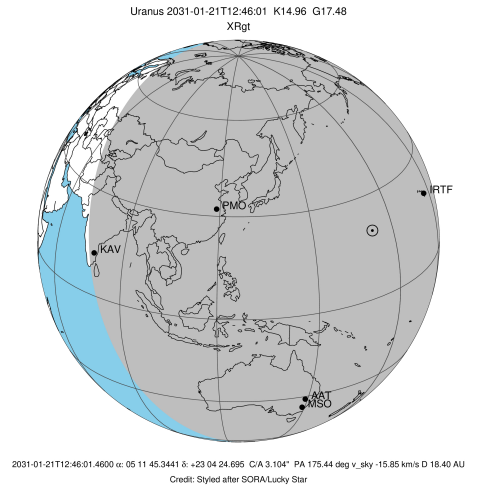
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-21T12:07:58.085		34.30	-30.60	50743.83	-11.28		
lambda	I	2031-01-21T12:09:02.176		34.24	-30.74	50026.71	-11.10		
delta	I	2031-01-21T12:11:41.043		34.09	-31.06	48300.35	-10.63		
gamma	I	2031-01-21T12:12:45.604		34.03	-31.19	47621.00	-10.42		
eta	I	2031-01-21T12:13:28.599		33.99	-31.27	47176.12	-10.28		
beta	I	2031-01-21T12:15:57.863		33.83	-31.57	45681.03	-9.75		
alpha	I	2031-01-21T12:17:39.258		33.73	-31.76	44711.31	-9.35		
4	I	2031-01-21T12:21:43.250		33.46	-32.23	42554.78	-8.30		
5	I	2031-01-21T12:22:17.171		33.42	-32.29	42271.47	-8.14		
6	I	2031-01-21T12:23:06.879		33.36	-32.39	41878.69	-7.92		

No planet occultations

6	E	2031-01-21T13:04:58.612		29.68	-36.33	41851.09	7.90		
5	E	2031-01-21T13:05:42.140		29.60	-36.38	42191.38	8.12		
4	E	2031-01-21T13:06:22.035		29.53	-36.43	42526.30	8.28		
alpha	E	2031-01-21T13:10:27.405		29.09	-36.73	44684.91	9.32		
beta	E	2031-01-21T13:12:10.209		28.90	-36.85	45664.02	9.72		
eta	E	2031-01-21T13:14:41.656		28.62	-37.02	47176.12	10.24		
gamma	E	2031-01-21T13:15:25.273		28.53	-37.06	47625.99	10.38		
delta	E	2031-01-21T13:16:29.572		28.41	-37.13	48300.35	10.59		
lambda	E	2031-01-21T13:19:09.009		28.11	-37.30	50026.71	11.06		
epsilon	E	2031-01-21T13:20:49.278		27.91	-37.40	51149.25	11.24		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-21T12:44:17.870
 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 : 3415723753195695744
 2Mass ID (if available) : 05114534+2304244
 ICRS Star Coord at Epoch: 05h 11m 45.34410s +23:04:24.69461s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.961
 G magnitude : 17.475
 RP magnitude : 16.662
 BP magnitude : 18.213
 DUPflag : 0
 Distance (au) : 18.404
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -15.85
 Sun-Target sep (deg) : 138.08
 Sun-Moon sep (deg) : 160.87
 B (ring opening deg) : 82.08
 PA of pole (deg) : 4.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.694
 C/A sky separation (km) : 35953.3
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ural11.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ural11.bsp
 ural61.bsp
 vgr2.ural61.bsp
 peph.ural60.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	2031-01-21T12:07:47.419		30.42	-27.23	50743.73	-11.35		
lambda	I	2031-01-21T12:08:51.092		30.37	-27.35	50026.71	-11.17		
delta	I	2031-01-21T12:11:28.810		30.23	-27.65	48300.35	-10.71		
gamma	I	2031-01-21T12:12:32.841		30.17	-27.77	47621.00	-10.51		
eta	I	2031-01-21T12:13:15.460		30.13	-27.85	47176.12	-10.37		
beta	I	2031-01-21T12:15:43.249		30.00	-28.12	45681.05	-9.85		
alpha	I	2031-01-21T12:17:23.441		29.90	-28.30	44711.63	-9.47		
4	I	2031-01-21T12:21:23.804		29.66	-28.72	42555.25	-8.45		
5	I	2031-01-21T12:21:57.081		29.62	-28.78	42272.30	-8.29		
6	I	2031-01-21T12:22:45.904		29.57	-28.86	41878.80	-8.08		

No planet occultations

6	E	2031-01-21T13:05:34.702		26.11	-32.57	41850.59	8.07		
5	E	2031-01-21T13:06:17.334		26.04	-32.62	42190.60	8.27		
4	E	2031-01-21T13:06:56.594		25.97	-32.66	42526.24	8.43		
alpha	E	2031-01-21T13:10:58.315		25.57	-32.92	44684.87	9.44		
beta	E	2031-01-21T13:12:39.908		25.40	-33.03	45663.84	9.82		
eta	E	2031-01-21T13:15:09.869		25.14	-33.18	47176.12	10.34		
gamma	E	2031-01-21T13:15:53.106		25.06	-33.22	47626.03	10.47		
delta	E	2031-01-21T13:16:56.868		24.95	-33.29	48300.35	10.67		
lambda	E	2031-01-21T13:19:35.139		24.67	-33.44	50026.71	11.13		
epsilon	E	2031-01-21T13:21:15.025		24.49	-33.53	51152.14	11.31		