

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-04T18:05:26.470
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3404422526007683072
 2Mass ID (if available) : 05393173+2330236

ICRS Star Coord at Epoch: 05h 39m 31.73912s +23:30:23.61365s

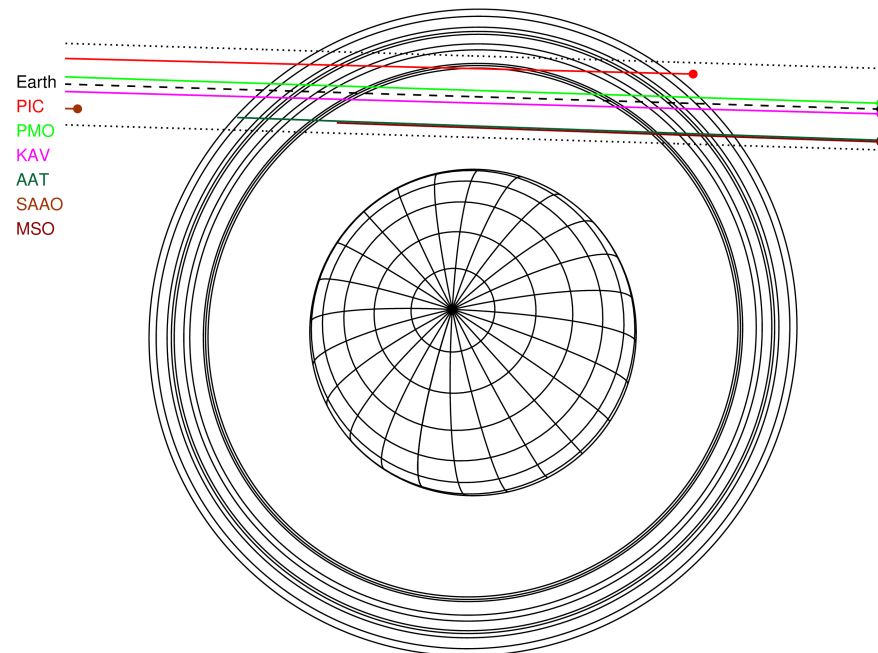
RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.987
 G magnitude : 18.879
 RP magnitude : 17.790
 BP magnitude : 20.118
 DUPflag : 0
 Distance (au) : 18.129
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.62
 Sun-Target sep (deg) : 166.63
 Sun-Moon sep (deg) : 50.70
 B (ring opening deg) : 79.03
 PA of pole (deg) : 41.94

#	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



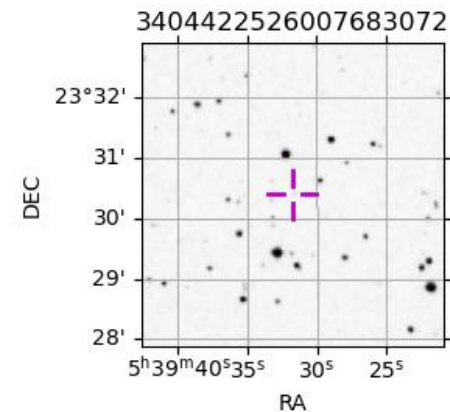
2031-12-04T18:05:26.4700 ra: 05 39 31.73912 s: +23 30 23.614 C/A 2.815° PA 178.24 deg v_sky -22.62 km/s D 18.13 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2031-12-04T18:05:26 K14.99 G18.88 XRgt

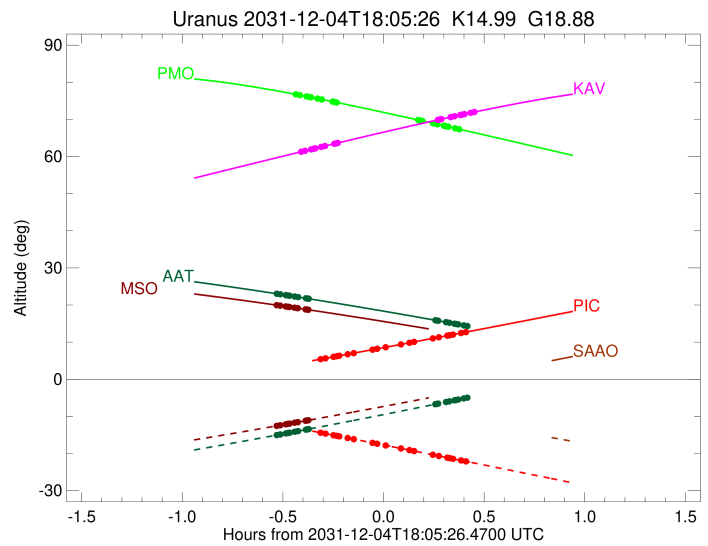
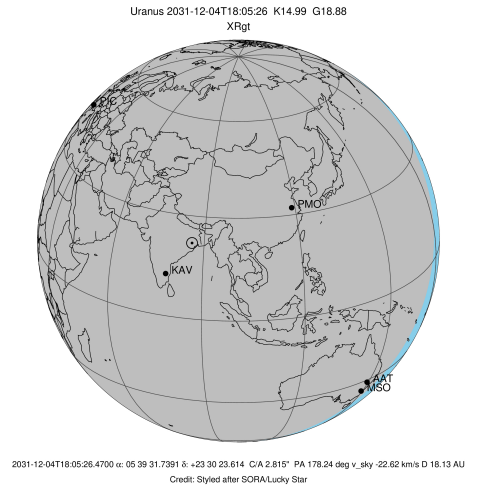


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	DEC 04 17:46 - DEC 04 18:29	PnnRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++		+++++	DEC 04 17:39 - DEC 04 18:27	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	+++++		+++++	DEC 04 17:41 - DEC 04 18:32	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	+++++		+++++	DEC 04 17:33 - DEC 04 18:30	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++			DEC 04 17:33 - DEC 04 17:43	PnnRin



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-04T18:08:55.860
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3404422526007683072
 2Mass ID (if available) : 05393173+2330236
 ICRS Star Coord at Epoch: 05h 39m 31.73912s +23:30:23.61365s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.987
 G magnitude : 18.879
 RP magnitude : 17.790
 BP magnitude : 20.118
 DUPflag : 0
 Distance (au) : 18.129
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.62
 Sun-Target sep (deg) : 166.63
 Sun-Moon sep (deg) : 51.24
 B (ring opening deg) : 79.03
 PA of pole (deg) : 41.94
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.143
 C/A sky separation (km) : 41320.2
 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

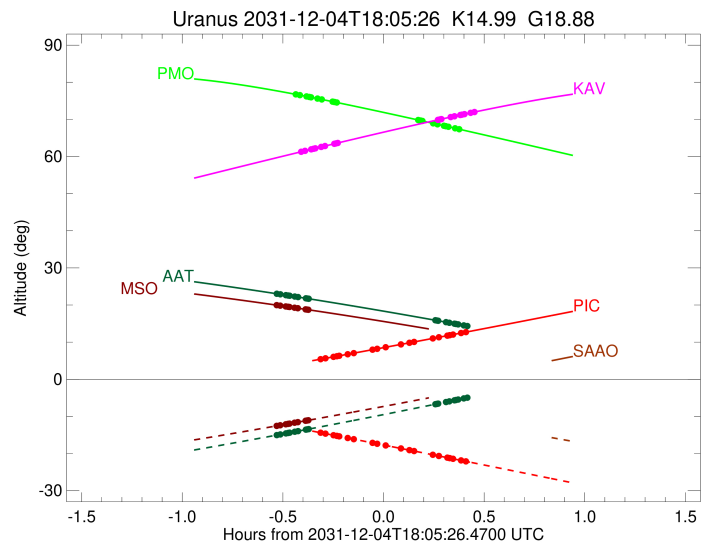
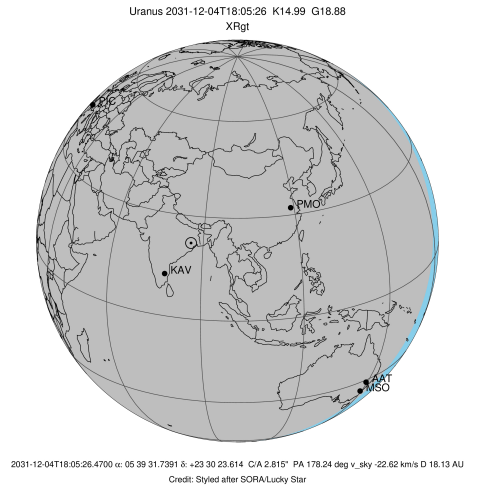


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-04T17:46:57.382		5.45	-14.44	50949.49	-12.90		
lambda	I	2031-12-04T17:48:09.562		5.65	-14.66	50026.71	-12.53		
delta	I	2031-12-04T17:50:33.489		6.04	-15.08	48300.35	-11.44		
gamma	I	2031-12-04T17:51:33.209		6.21	-15.25	47631.57	-10.95		
eta	I	2031-12-04T17:52:15.474		6.32	-15.38	47176.12	-10.60		
beta	I	2031-12-04T17:54:48.488		6.75	-15.83	45658.57	-9.21		
alpha	I	2031-12-04T17:56:39.823		7.05	-16.15	44691.21	-8.12		
4	I	2031-12-04T18:02:05.042		7.96	-17.11	42611.73	-4.57		
5	I	2031-12-04T18:03:21.917		8.17	-17.34	42293.33	-3.70		
6	I	2031-12-04T18:06:25.011		8.68	-17.88	41817.62	-1.47		

No planet occultations

6	E	2031-12-04T18:10:22.946		9.35	-18.59	41822.65	1.47		
5	E	2031-12-04T18:13:25.546		9.87	-19.14	42307.93	3.70		
4	E	2031-12-04T18:14:36.759		10.07	-19.35	42600.45	4.58		
alpha	E	2031-12-04T18:20:03.147		10.99	-20.32	44684.77	8.14		
beta	E	2031-12-04T18:21:53.435		11.31	-20.65	45644.66	9.23		
eta	E	2031-12-04T18:24:27.609		11.75	-21.12	47176.12	10.62		
gamma	E	2031-12-04T18:25:09.530		11.87	-21.24	47628.85	10.98		
delta	E	2031-12-04T18:26:09.354		12.04	-21.42	48300.35	11.47		
lambda	E	2031-12-04T18:28:32.902		12.45	-21.85	50026.71	12.57		
epsilon	E	2031-12-04T18:29:29.412		12.61	-22.02	50748.18	12.94		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-04T18:04:09.170
 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 : 3404422526007683072
 2Mass ID (if available) : 05393173+2330236
 ICRS Star Coord at Epoch: 05h 39m 31.73912s +23:30:23.61365s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.987
 G magnitude : 18.879
 RP magnitude : 17.790
 BP magnitude : 20.118
 DUPflag : 0
 Distance (au) : 18.129
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.62
 Sun-Target sep (deg) : 166.63
 Sun-Moon sep (deg) : 51.23
 B (ring opening deg) : 79.03
 PA of pole (deg) : 41.94
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.883
 C/A sky separation (km) : 37904.1
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

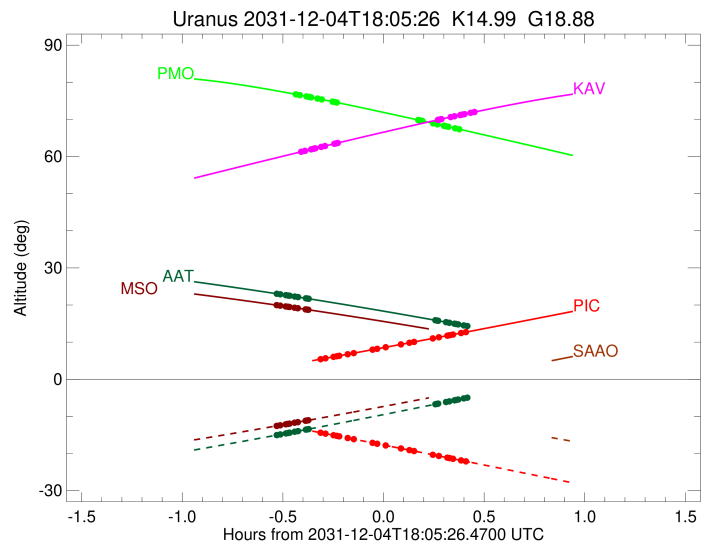
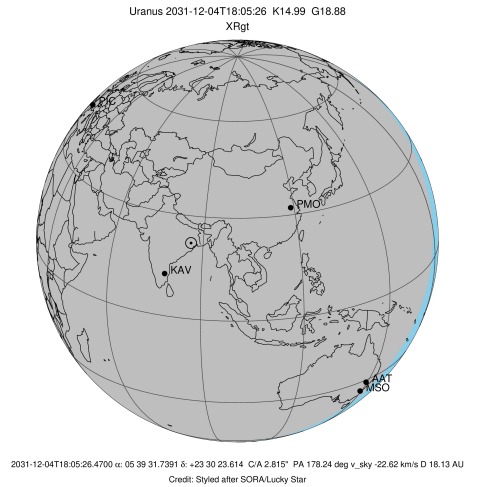


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-04T17:39:28.341		76.72	-64.90	50992.22	-15.21		
lambda	I	2031-12-04T17:40:32.085		76.54	-64.68	50026.71	-14.95		
delta	I	2031-12-04T17:42:30.645		76.19	-64.28	48300.35	-14.16		
gamma	I	2031-12-04T17:43:18.453		76.05	-64.11	47631.56	-13.82		
eta	I	2031-12-04T17:43:51.712		75.95	-64.00	47176.12	-13.57		
beta	I	2031-12-04T17:45:47.133		75.61	-63.60	45661.90	-12.65		
alpha	I	2031-12-04T17:47:05.525		75.37	-63.34	44695.33	-11.97		
4	I	2031-12-04T17:50:12.784		74.80	-62.69	42615.60	-10.19		
5	I	2031-12-04T17:50:46.531		74.70	-62.58	42275.61	-9.88		
6	I	2031-12-04T17:51:35.297		74.54	-62.41	41805.69	-9.35		

No planet occultations

6	E	2031-12-04T18:15:46.143		69.84	-57.37	41836.86	9.34		
5	E	2031-12-04T18:16:34.661		69.68	-57.20	42314.20	9.88		
4	E	2031-12-04T18:17:02.836		69.59	-57.10	42591.20	10.19		
alpha	E	2031-12-04T18:20:11.712		68.95	-56.44	44685.80	11.97		
beta	E	2031-12-04T18:21:29.341		68.69	-56.17	45643.12	12.64		
eta	E	2031-12-04T18:23:26.299		68.29	-55.75	47176.12	13.56		
gamma	E	2031-12-04T18:23:59.343		68.18	-55.64	47628.24	13.81		
delta	E	2031-12-04T18:24:47.428		68.02	-55.47	48300.35	14.15		
lambda	E	2031-12-04T18:26:46.084		67.61	-55.05	50026.71	14.94		
epsilon	E	2031-12-04T18:27:34.462		67.45	-54.88	50756.56	15.20		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-04T18:07:13.320
 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 : 3404422526007683072
 2Mass ID (if available) : 05393173+2330236
 ICRS Star Coord at Epoch: 05h 39m 31.73912s +23:30:23.61365s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.987
 G magnitude : 18.879
 RP magnitude : 17.790
 BP magnitude : 20.118
 DUPflag : 0
 Distance (au) : 18.129
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.62
 Sun-Target sep (deg) : 166.63
 Sun-Moon sep (deg) : 51.54
 B (ring opening deg) : 79.03
 PA of pole (deg) : 41.94
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.733
 C/A sky separation (km) : 35931.3
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

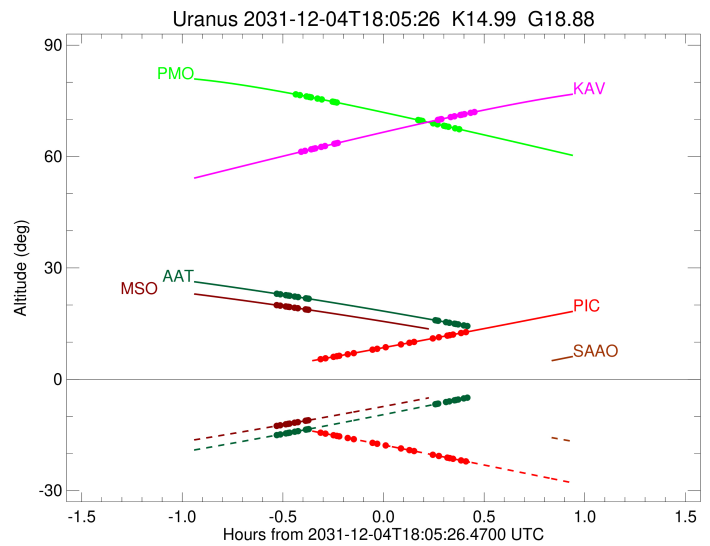
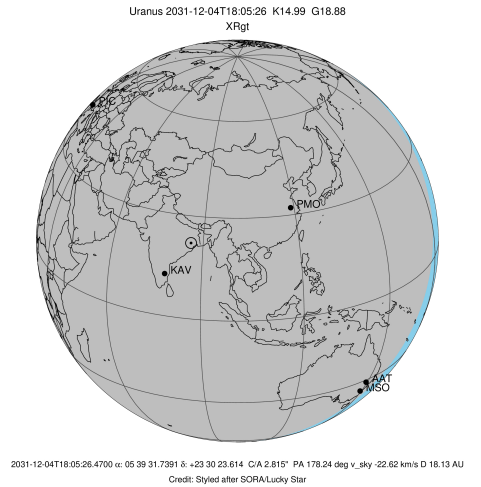


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-04T17:41:02.795		61.32	-73.88	51012.05	-16.20		
lambda	I	2031-12-04T17:42:03.772		61.54	-74.08	50026.71	-15.99		
delta	I	2031-12-04T17:43:53.972		61.94	-74.42	48300.35	-15.33		
gamma	I	2031-12-04T17:44:38.004		62.10	-74.55	47631.52	-15.05		
eta	I	2031-12-04T17:45:08.474		62.21	-74.65	47176.12	-14.84		
beta	I	2031-12-04T17:46:52.968		62.59	-74.96	45663.31	-14.09		
alpha	I	2031-12-04T17:48:02.771		62.84	-75.17	44697.27	-13.55		
4	I	2031-12-04T17:50:44.317		63.43	-75.65	42616.27	-12.18		
5	I	2031-12-04T17:51:13.031		63.53	-75.73	42268.85	-11.95		
6	I	2031-12-04T17:51:52.653		63.67	-75.85	41802.99	-11.55		

No planet occultations

6	E	2031-12-04T18:21:39.693		69.88	-79.73	41841.55	11.56		
5	E	2031-12-04T18:22:19.011		70.01	-79.77	42315.12	11.96		
4	E	2031-12-04T18:22:42.100		70.08	-79.80	42586.96	12.19		
alpha	E	2031-12-04T18:25:24.981		70.62	-79.96	44686.68	13.57		
beta	E	2031-12-04T18:26:33.873		70.84	-80.02	45642.46	14.11		
eta	E	2031-12-04T18:28:19.657		71.18	-80.10	47176.12	14.87		
gamma	E	2031-12-04T18:28:49.837		71.28	-80.11	47627.89	15.07		
delta	E	2031-12-04T18:29:34.038		71.42	-80.14	48300.35	15.36		
lambda	E	2031-12-04T18:31:24.046		71.77	-80.18	50026.71	16.02		
epsilon	E	2031-12-04T18:32:09.688		71.91	-80.20	50763.68	16.23		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-04T18:02:26.770
 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 : 3404422526007683072
 2Mass ID (if available) : 05393173+2330236
 ICRS Star Coord at Epoch: 05h 39m 31.73912s +23:30:23.61365s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.987
 G magnitude : 18.879
 RP magnitude : 17.790
 BP magnitude : 20.118
 DUPflag : 0
 Distance (au) : 18.129
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.62
 Sun-Target sep (deg) : 166.63
 Sun-Moon sep (deg) : 50.52
 B (ring opening deg) : 79.03
 PA of pole (deg) : 41.94
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.458
 C/A sky separation (km) : 32323.9
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



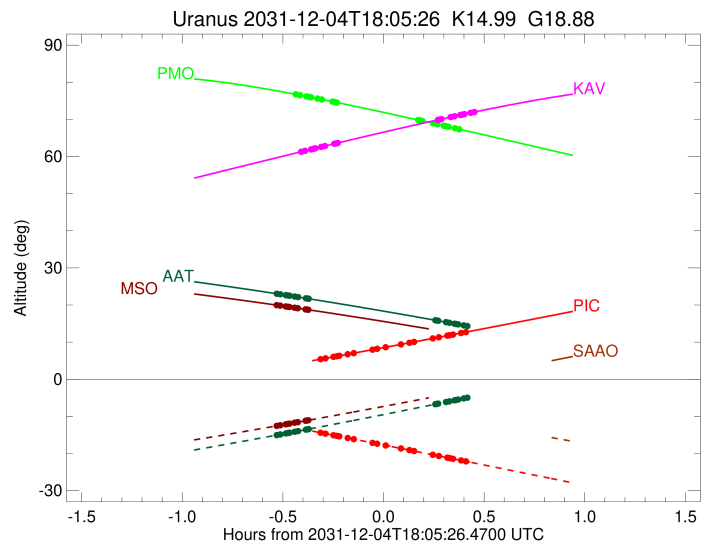
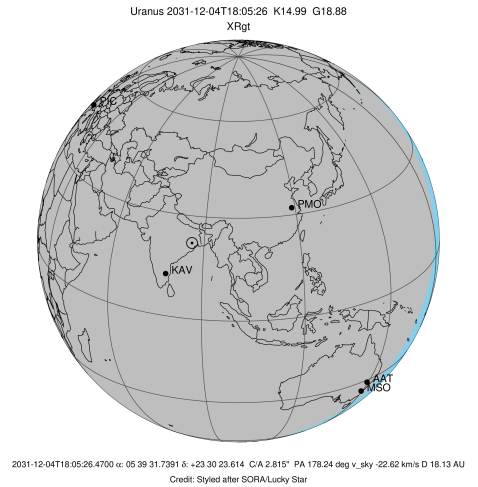
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-04T17:33:43.645		23.02	-15.02	51053.10	-17.67		
lambda	I	2031-12-04T17:34:41.761		22.89	-14.86	50026.71	-17.53		
delta	I	2031-12-04T17:36:21.583		22.65	-14.58	48300.35	-17.05		
gamma	I	2031-12-04T17:37:01.055		22.56	-14.47	47631.39	-16.84		
eta	I	2031-12-04T17:37:28.199		22.50	-14.39	47176.12	-16.70		
beta	I	2031-12-04T17:39:00.061		22.28	-14.13	45665.88	-16.17		
alpha	I	2031-12-04T17:40:00.403		22.14	-13.96	44701.07	-15.79		
4	I	2031-12-04T17:42:16.290		21.81	-13.57	42616.53	-14.86		
5	I	2031-12-04T17:42:40.574		21.76	-13.51	42257.00	-14.72		
6	I	2031-12-04T17:43:11.970		21.68	-13.42	41799.36	-14.45		

No planet occultations

6	E	2031-12-04T18:20:54.261		15.90	-6.72	41847.69	14.42		
5	E	2031-12-04T18:21:25.595		15.81	-6.62	42314.97	14.69		
4	E	2031-12-04T18:21:44.191		15.76	-6.57	42580.94	14.83		
alpha	E	2031-12-04T18:24:01.893		15.39	-6.15	44688.31	15.75		
beta	E	2031-12-04T18:25:01.583		15.23	-5.96	45641.75	16.13		
eta	E	2031-12-04T18:26:35.146		14.97	-5.67	47176.12	16.66		
gamma	E	2031-12-04T18:27:02.121		14.90	-5.59	47627.35	16.80		
delta	E	2031-12-04T18:27:41.938		14.79	-5.47	48300.35	17.00		
lambda	E	2031-12-04T18:29:22.037		14.51	-5.16	50026.71	17.48		
epsilon	E	2031-12-04T18:30:04.699		14.40	-5.03	50776.52	17.62		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-04T18:02:35.580
 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 : 3404422526007683072
 2Mass ID (if available) : 05393173+2330236
 ICRS Star Coord at Epoch: 05h 39m 31.73912s +23:30:23.61365s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.987
 G magnitude : 18.879
 RP magnitude : 17.790
 BP magnitude : 20.118
 DUPflag : 0
 Distance (au) : 18.129
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.62
 Sun-Target sep (deg) : 166.63
 Sun-Moon sep (deg) : 50.50
 B (ring opening deg) : 79.03
 PA of pole (deg) : 41.94
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.438
 C/A sky separation (km) : 32051.3
 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_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	2031-12-04T17:33:41.695		19.96	-12.54	51055.80	-17.77		
lambda	I	2031-12-04T17:34:39.650		19.83	-12.39	50026.71	-17.63		
delta	I	2031-12-04T17:36:18.878		19.61	-12.13	48300.35	-17.16		
gamma	I	2031-12-04T17:36:58.091		19.53	-12.02	47631.38	-16.96		
eta	I	2031-12-04T17:37:25.047		19.47	-11.95	47176.12	-16.82		
beta	I	2031-12-04T17:38:56.207		19.27	-11.71	45666.05	-16.30		
alpha	I	2031-12-04T17:39:56.033		19.14	-11.55	44701.33	-15.93		
4	I	2031-12-04T17:42:10.584		18.84	-11.18	42616.51	-15.03		
5	I	2031-12-04T17:42:34.646		18.78	-11.12	42256.23	-14.89		
6	I	2031-12-04T17:43:05.632		18.71	-11.03	41799.17	-14.63		

No planet occultations

6	E	2031-12-04T18:21:18.601		13.20	-4.59x	41848.13	14.60		
5	E	2031-12-04T18:21:49.526		13.12	-4.50x	42314.89	14.86		
4	E	2031-12-04T18:22:07.890		13.08	-4.45x	42580.49	15.00		
alpha	E	2031-12-04T18:24:24.245		12.73	-4.05x	44688.45	15.90		
beta	E	2031-12-04T18:25:23.413		12.58	-3.88x	45641.70	16.26		
eta	E	2031-12-04T18:26:56.264		12.34	-3.61x	47176.12	16.78		
gamma	E	2031-12-04T18:27:23.047		12.27	-3.53x	47627.31	16.92		
delta	E	2031-12-04T18:28:02.601		12.16	-3.41x	48300.35	17.12		
lambda	E	2031-12-04T18:29:42.092		11.91	-3.12x	50026.71	17.58		
epsilon	E	2031-12-04T18:30:24.584		11.80	-3.00x	50777.70	17.72		