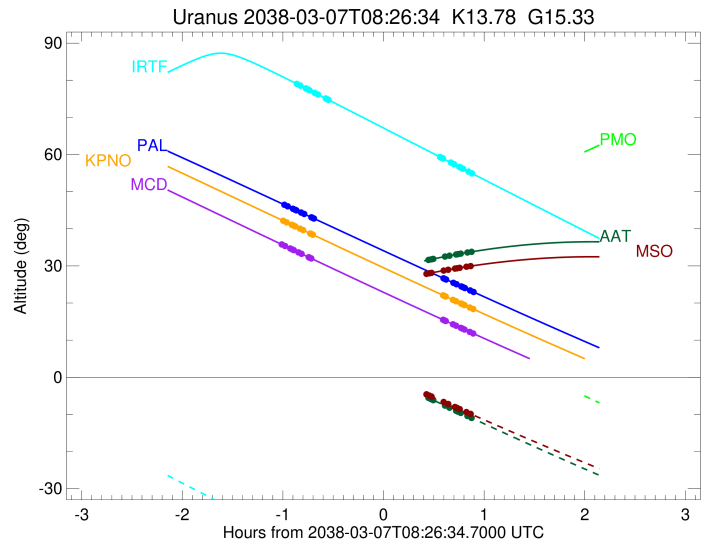
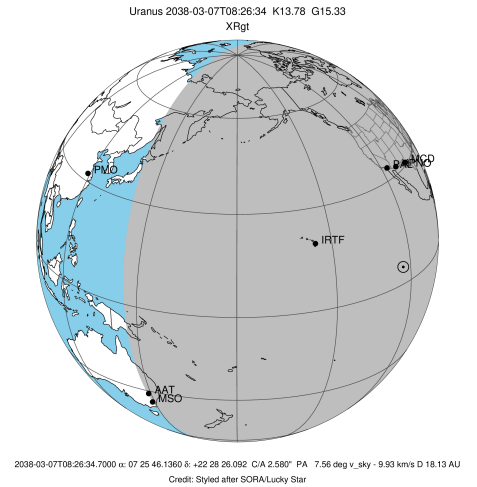




target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2038-03-07T08:20:06.140  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 866276491080622592  
 2Mass ID (if available) : 07254614+2228261  
 ICRS Star Coord at Epoch: 07h 25m 46.13597s +22:28:26.09227s  
 RUWE (>1.4 is poor) : 1.23  
 K magnitude : 13.784  
 G magnitude : 15.328  
 RP magnitude : 14.808  
 BP magnitude : 15.668  
 DUPflag : 0  
 Distance (au) : 18.130  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.93  
 Sun-Target sep (deg) : 123.41  
 Sun-Moon sep (deg) : 108.44  
 B (ring opening deg) : 56.96  
 PA of pole (deg) : 83.31  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.367  
 C/A sky separation (km) : 31125.7  
 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  
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 pg3f0000r.bsp  
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 naif0012.tls  
 earth\_flat\_IAU.spk

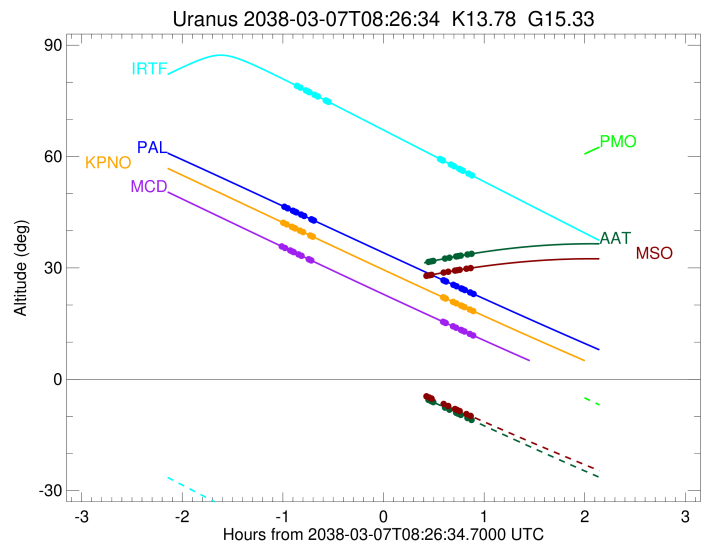
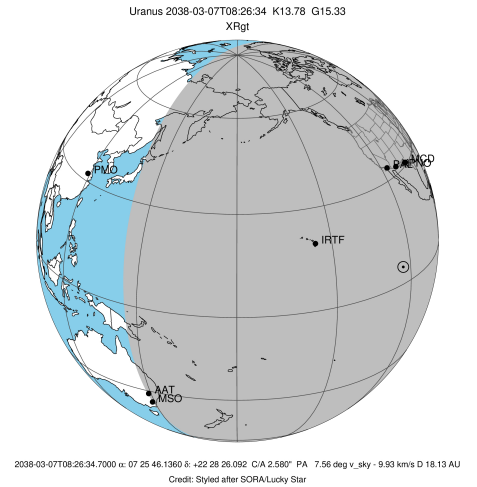


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-03-07T07:28:07.286		46.33	-61.15	50801.16	-9.50		
lambda	I	2038-03-07T07:29:29.445		46.04	-61.22	50026.71	-9.38		
delta	I	2038-03-07T07:32:35.747		45.39	-61.38	48300.35	-9.15		
gamma	I	2038-03-07T07:33:50.274		45.13	-61.44	47622.05	-9.05		
eta	I	2038-03-07T07:34:39.722		44.96	-61.48	47176.12	-8.98		
beta	I	2038-03-07T07:37:28.682		44.37	-61.60	45679.18	-8.74		
alpha	I	2038-03-07T07:39:17.964		43.99	-61.67	44727.09	-8.57		
4	I	2038-03-07T07:43:36.788		43.08	-61.81	42576.72	-8.13		
5	I	2038-03-07T07:44:28.502		42.90	-61.83	42160.73	-8.02		
6	I	2038-03-07T07:45:09.712		42.76	-61.85	41841.15	-7.93		

No planet occultations

6	E	2038-03-07T09:02:15.765		26.68	-58.30	41795.75	7.83		
5	E	2038-03-07T09:03:03.610		26.51	-58.21	42197.04	7.91		
4	E	2038-03-07T09:03:56.968		26.33	-58.11	42616.53	8.02		
alpha	E	2038-03-07T09:08:17.447		25.44	-57.61	44751.16	8.44		
beta	E	2038-03-07T09:10:05.074		25.07	-57.40	45668.91	8.60		
eta	E	2038-03-07T09:12:57.844		24.47	-57.05	47176.12	8.83		
gamma	E	2038-03-07T09:13:48.338		24.30	-56.95	47623.63	8.89		
delta	E	2038-03-07T09:15:04.024		24.04	-56.79	48300.35	8.99		
lambda	E	2038-03-07T09:18:13.811		23.39	-56.39	50026.71	9.20		
epsilon	E	2038-03-07T09:20:45.818		22.87	-56.06	51437.44	9.32		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2038-03-07T08:19:39.120  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 866276491080622592  
 2Mass ID (if available) : 07254614+2228261  
 ICRS Star Coord at Epoch: 07h 25m 46.13597s +22:28:26.09227s  
 RUWE (>1.4 is poor) : 1.23  
 K magnitude : 13.784  
 G magnitude : 15.328  
 RP magnitude : 14.808  
 BP magnitude : 15.668  
 DUPflag : 0  
 Distance (au) : 18.130  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.93  
 Sun-Target sep (deg) : 123.41  
 Sun-Moon sep (deg) : 108.37  
 B (ring opening deg) : 56.96  
 PA of pole (deg) : 83.31  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.362  
 C/A sky separation (km) : 31056.1  
 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

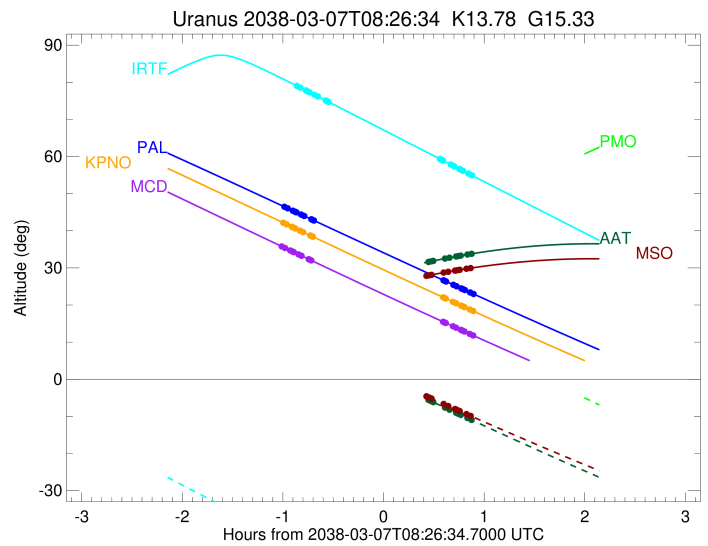
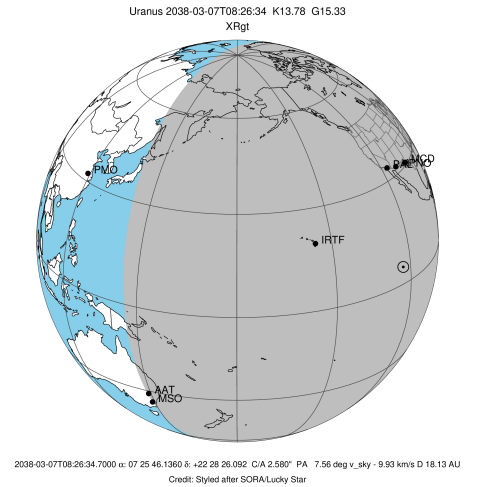


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-03-07T07:27:26.937		42.02	-63.31	50800.89	-9.50		
lambda	I	2038-03-07T07:28:49.133		41.73	-63.34	50026.71	-9.37		
delta	I	2038-03-07T07:31:55.563		41.07	-63.38	48300.35	-9.14		
gamma	I	2038-03-07T07:33:10.133		40.80	-63.39	47622.06	-9.05		
eta	I	2038-03-07T07:33:59.607		40.63	-63.40	47176.12	-8.98		
beta	I	2038-03-07T07:36:48.637		40.03	-63.41	45679.17	-8.74		
alpha	I	2038-03-07T07:38:37.947		39.64	-63.41	44727.04	-8.57		
4	I	2038-03-07T07:42:56.765		38.72	-63.38	42576.63	-8.13		
5	I	2038-03-07T07:43:48.444		38.54	-63.36	42160.80	-8.02		
6	I	2038-03-07T07:44:29.624		38.39	-63.35	41841.25	-7.94		

No planet occultations

6	E	2038-03-07T09:02:02.276		22.09	-56.81	41795.72	7.82		
5	E	2038-03-07T09:02:50.151		21.93	-56.70	42197.23	7.91		
4	E	2038-03-07T09:03:43.512		21.74	-56.58	42616.53	8.01		
alpha	E	2038-03-07T09:08:04.201		20.84	-55.95	44751.13	8.43		
beta	E	2038-03-07T09:09:51.945		20.47	-55.69	45668.86	8.59		
eta	E	2038-03-07T09:12:44.953		19.88	-55.26	47176.12	8.82		
gamma	E	2038-03-07T09:13:35.523		19.70	-55.13	47623.64	8.88		
delta	E	2038-03-07T09:14:51.327		19.44	-54.94	48300.35	8.97		
lambda	E	2038-03-07T09:18:01.442		18.79	-54.45	50026.71	9.18		
epsilon	E	2038-03-07T09:20:33.797		18.27	-54.06	51438.01	9.30		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2038-03-07T08:19:10.610  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 866276491080622592  
 2Mass ID (if available) : 07254614+2228261  
 ICRS Star Coord at Epoch: 07h 25m 46.13597s +22:28:26.09227s  
 RUWE (>1.4 is poor) : 1.23  
 K magnitude : 13.784  
 G magnitude : 15.328  
 RP magnitude : 14.808  
 BP magnitude : 15.668  
 DUPflag : 0  
 Distance (au) : 18.130  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.93  
 Sun-Target sep (deg) : 123.41  
 Sun-Moon sep (deg) : 108.27  
 B (ring opening deg) : 56.96  
 PA of pole (deg) : 83.31  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.349  
 C/A sky separation (km) : 30883.8  
 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

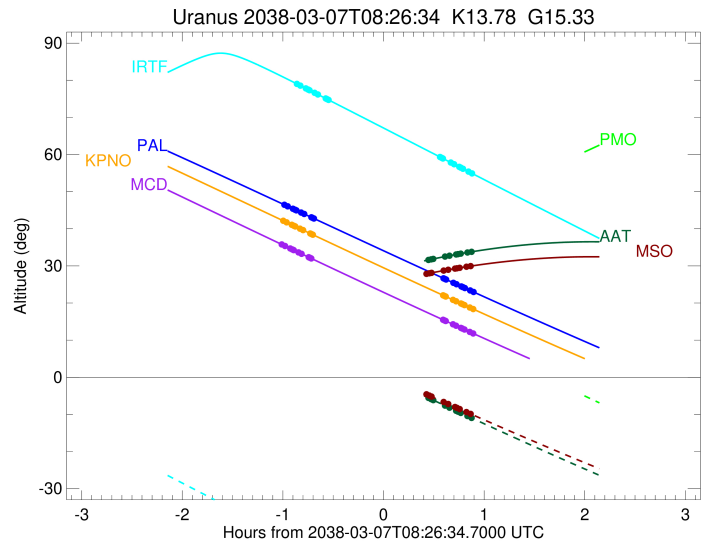
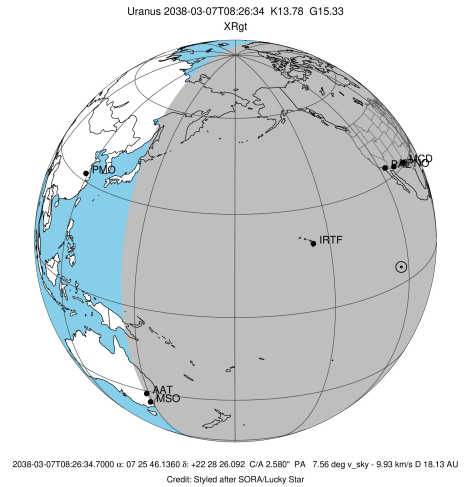


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-03-07T07:26:32.515		35.64	-64.29	50800.08	-9.49		
lambda	I	2038-03-07T07:27:54.655		35.35	-64.23	50026.71	-9.37		
delta	I	2038-03-07T07:31:01.100		34.68	-64.08	48300.35	-9.14		
gamma	I	2038-03-07T07:32:15.651		34.42	-64.01	47622.07	-9.05		
eta	I	2038-03-07T07:33:05.109		34.24	-63.97	47176.12	-8.98		
beta	I	2038-03-07T07:35:54.025		33.64	-63.80	45679.13	-8.75		
alpha	I	2038-03-07T07:37:43.222		33.25	-63.69	44726.87	-8.58		
4	I	2038-03-07T07:42:01.581		32.33	-63.39	42576.38	-8.15		
5	I	2038-03-07T07:42:53.079		32.15	-63.33	42160.98	-8.05		
6	I	2038-03-07T07:43:34.110		32.00	-63.27	41841.50	-7.96		

No planet occultations

6	E	2038-03-07T09:02:01.042		15.50	-52.95	41795.67	7.84		
5	E	2038-03-07T09:02:48.858		15.34	-52.82	42197.67	7.92		
4	E	2038-03-07T09:03:42.083		15.16	-52.66	42616.51	8.03		
alpha	E	2038-03-07T09:08:02.563		14.26	-51.91	44751.08	8.43		
beta	E	2038-03-07T09:09:50.290		13.89	-51.59	45668.76	8.59		
eta	E	2038-03-07T09:12:43.381		13.30	-51.08	47176.12	8.81		
gamma	E	2038-03-07T09:13:33.992		13.13	-50.93	47623.66	8.87		
delta	E	2038-03-07T09:14:49.866		12.87	-50.70	48300.35	8.96		
lambda	E	2038-03-07T09:18:00.225		12.22	-50.13	50026.71	9.17		
epsilon	E	2038-03-07T09:20:32.968		11.70	-49.67	51439.23	9.28		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2038-03-07T08:23:13.810  
 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 : 866276491080622592  
 2Mass ID (if available) : 07254614+2228261  
 ICRS Star Coord at Epoch: 07h 25m 46.13597s +22:28:26.09227s  
 RUWE (>1.4 is poor) : 1.23  
 K magnitude : 13.784  
 G magnitude : 15.328  
 RP magnitude : 14.808  
 BP magnitude : 15.668  
 DUPflag : 0  
 Distance (au) : 18.130  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.93  
 Sun-Target sep (deg) : 123.41  
 Sun-Moon sep (deg) : 108.84  
 B (ring opening deg) : 56.96  
 PA of pole (deg) : 83.31  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.568  
 C/A sky separation (km) : 33771.2  
 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

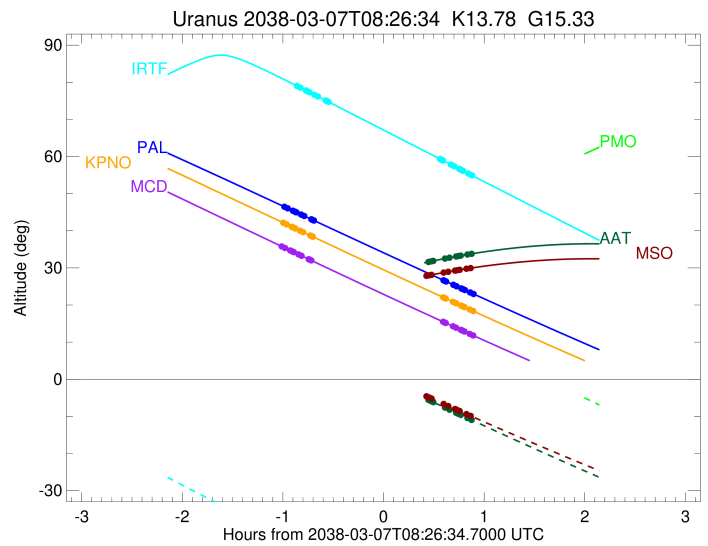
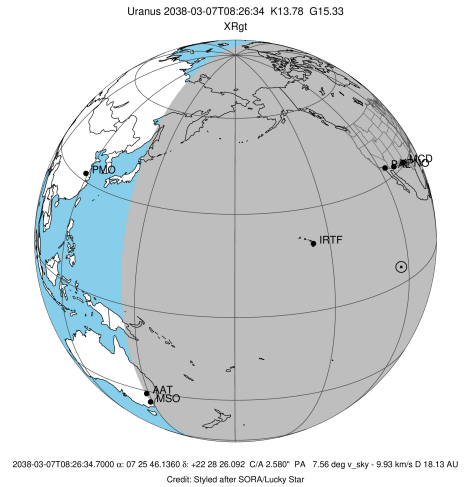


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-03-07T07:35:35.208		78.89	-44.54	50815.34	-9.12		
lambda	I	2038-03-07T07:37:02.591		78.55	-44.88	50026.71	-8.96		
delta	I	2038-03-07T07:40:18.263		77.81	-45.62	48300.35	-8.68		
gamma	I	2038-03-07T07:41:37.034		77.51	-45.93	47621.83	-8.55		
eta	I	2038-03-07T07:42:29.420		77.31	-46.12	47176.12	-8.46		
beta	I	2038-03-07T07:45:29.576		76.63	-46.81	45679.84	-8.15		
alpha	I	2038-03-07T07:47:27.012		76.18	-47.26	44729.83	-7.93		
4	I	2038-03-07T07:52:09.441		75.10	-48.33	42580.97	-7.35		
5	I	2038-03-07T07:53:07.665		74.88	-48.55	42158.14	-7.20		
6	I	2038-03-07T07:53:54.280		74.70	-48.73	41836.91	-7.08		

No planet occultations

6	E	2038-03-07T09:00:11.395		59.36	-63.19	41796.94	7.03		
5	E	2038-03-07T09:01:03.921		59.16	-63.37	42189.96	7.15		
4	E	2038-03-07T09:02:03.555		58.93	-63.57	42616.48	7.29		
alpha	E	2038-03-07T09:06:46.025		57.83	-64.52	44751.85	7.87		
beta	E	2038-03-07T09:08:41.196		57.39	-64.90	45670.47	8.08		
eta	E	2038-03-07T09:11:43.912		56.68	-65.50	47176.12	8.39		
gamma	E	2038-03-07T09:12:36.972		56.48	-65.67	47623.27	8.47		
delta	E	2038-03-07T09:13:56.348		56.17	-65.93	48300.35	8.59		
lambda	E	2038-03-07T09:17:14.041		55.41	-66.56	50026.71	8.87		
epsilon	E	2038-03-07T09:19:48.987		54.81	-67.05	51416.68	9.02		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2038-03-07T08:29:52.290  
 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 : 866276491080622592  
 2Mass ID (if available) : 07254614+2228261  
 ICRS Star Coord at Epoch: 07h 25m 46.13597s +22:28:26.09227s  
 RUWE (>1.4 is poor) : 1.23  
 K magnitude : 13.784  
 G magnitude : 15.328  
 RP magnitude : 14.808  
 BP magnitude : 15.668  
 DUPflag : 0  
 Distance (au) : 18.130  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.93  
 Sun-Target sep (deg) : 123.41  
 Sun-Moon sep (deg) : 108.69  
 B (ring opening deg) : 56.96  
 PA of pole (deg) : 83.31  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.977  
 C/A sky separation (km) : 39151.6  
 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  
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 pg3f0000r.bsp  
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 naif0012.tls  
 earth\_flat\_IAU.spk

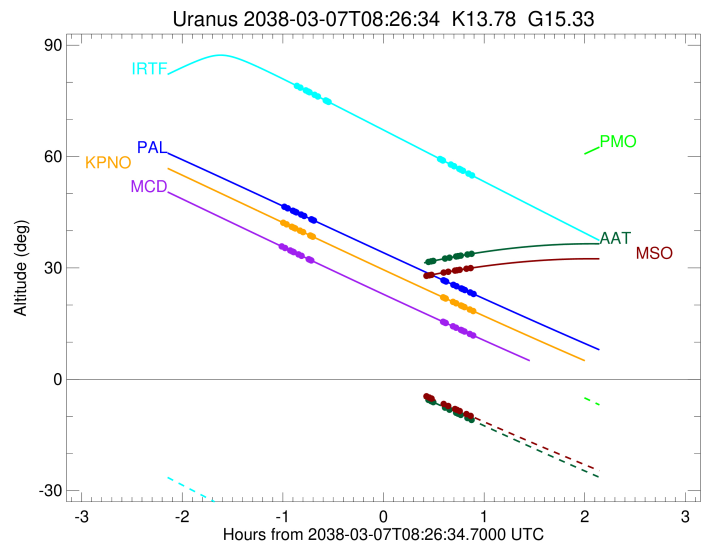
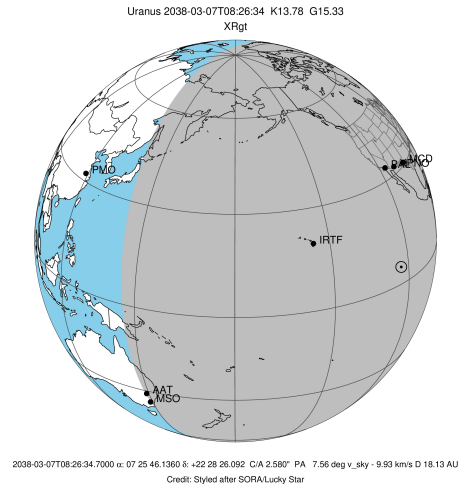


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-03-07T07:50:31.778		24.09	7.84x	50851.58	-7.66		
lambda	I	2038-03-07T07:52:21.581		24.35	7.45x	50026.71	-7.41		
delta	I	2038-03-07T07:56:21.767		24.90	6.59x	48300.35	-6.95		
gamma	I	2038-03-07T07:58:00.865		25.12	6.24x	47621.40	-6.75		
eta	I	2038-03-07T07:59:07.553		25.27	6.00x	47176.12	-6.61		
beta	I	2038-03-07T08:03:03.540		25.80	5.16x	45680.90	-6.07		
alpha	I	2038-03-07T08:05:43.738		26.15	4.59x	44736.14	-5.67		
4	I	2038-03-07T08:12:44.725		27.06	3.09x	42591.65	-4.52		
5	I	2038-03-07T08:14:24.621		27.27	2.73x	42154.85	-4.21		
6	I	2038-03-07T08:15:48.994		27.44	2.43x	41825.36	-3.94		

No planet occultations

6	E	2038-03-07T08:53:11.338		31.59	-5.51	41802.72	3.95		
5	E	2038-03-07T08:54:40.438		31.73	-5.82	42173.00	4.22		
4	E	2038-03-07T08:56:21.377		31.89	-6.18	42614.02	4.53		
alpha	E	2038-03-07T09:03:18.997		32.52	-7.65	44752.40	5.69		
beta	E	2038-03-07T09:05:55.548		32.75	-8.20	45674.08	6.09		
eta	E	2038-03-07T09:09:51.590		33.08	-9.02	47176.12	6.63		
gamma	E	2038-03-07T09:10:58.203		33.17	-9.25	47622.48	6.77		
delta	E	2038-03-07T09:12:36.779		33.30	-9.60	48300.35	6.98		
lambda	E	2038-03-07T09:16:36.020		33.61	-10.43	50026.71	7.44		
epsilon	E	2038-03-07T09:19:31.680		33.83	-11.05	51362.18	7.69		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2038-03-07T08:29:37.550  
 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 : 866276491080622592  
 2Mass ID (if available) : 07254614+2228261  
 ICRS Star Coord at Epoch: 07h 25m 46.13597s +22:28:26.09227s  
 RUWE (>1.4 is poor) : 1.23  
 K magnitude : 13.784  
 G magnitude : 15.328  
 RP magnitude : 14.808  
 BP magnitude : 15.668  
 DUPflag : 0  
 Distance (au) : 18.130  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.93  
 Sun-Target sep (deg) : 123.41  
 Sun-Moon sep (deg) : 108.63  
 B (ring opening deg) : 56.96  
 PA of pole (deg) : 83.31  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.996  
 C/A sky separation (km) : 39396.7  
 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	2038-03-07T07:50:40.457		21.00	7.94x	50853.74	-7.58		
lambda	I	2038-03-07T07:52:31.809		21.24	7.56x	50026.71	-7.33		
delta	I	2038-03-07T07:56:35.136		21.77	6.73x	48300.35	-6.85		
gamma	I	2038-03-07T07:58:15.718		21.98	6.38x	47621.38	-6.64		
eta	I	2038-03-07T07:59:23.472		22.12	6.15x	47176.12	-6.50		
beta	I	2038-03-07T08:03:23.806		22.62	5.33x	45680.94	-5.94		
alpha	I	2038-03-07T08:06:07.568		22.96	4.78x	44736.49	-5.54		
4	I	2038-03-07T08:13:22.047		23.82	3.30x	42592.30	-4.34		
5	I	2038-03-07T08:15:06.734		24.03	2.94x	42154.83	-4.01		
6	I	2038-03-07T08:16:35.890		24.20	2.64x	41824.59	-3.72		

No planet occultations

6	E	2038-03-07T08:51:59.234		27.84	-4.55x	41803.19	3.73		
5	E	2038-03-07T08:53:33.102		27.98	-4.86x	42172.13	4.01		
4	E	2038-03-07T08:55:18.849		28.14	-5.22	42613.78	4.34		
alpha	E	2038-03-07T09:02:30.021		28.74	-6.66	44752.37	5.55		
beta	E	2038-03-07T09:05:10.166		28.96	-7.20	45674.25	5.96		
eta	E	2038-03-07T09:09:10.604		29.27	-8.00	47176.12	6.52		
gamma	E	2038-03-07T09:10:18.298		29.35	-8.23	47622.45	6.67		
delta	E	2038-03-07T09:11:58.379		29.48	-8.56	48300.35	6.88		
lambda	E	2038-03-07T09:16:00.821		29.77	-9.37	50026.71	7.35		
epsilon	E	2038-03-07T09:18:58.163		29.97	-9.96	51359.52	7.61		