

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-03-15T13:42:01.390  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 630943069583664640  
 2Mass ID (if available) : 09230106+1606441

Uranus 2044-03-15T13:42:01 K14.51 G15.92 XRgt

ICRS Star Coord at Epoch: 09h 23m 01.07740s +16:06:44.07381s

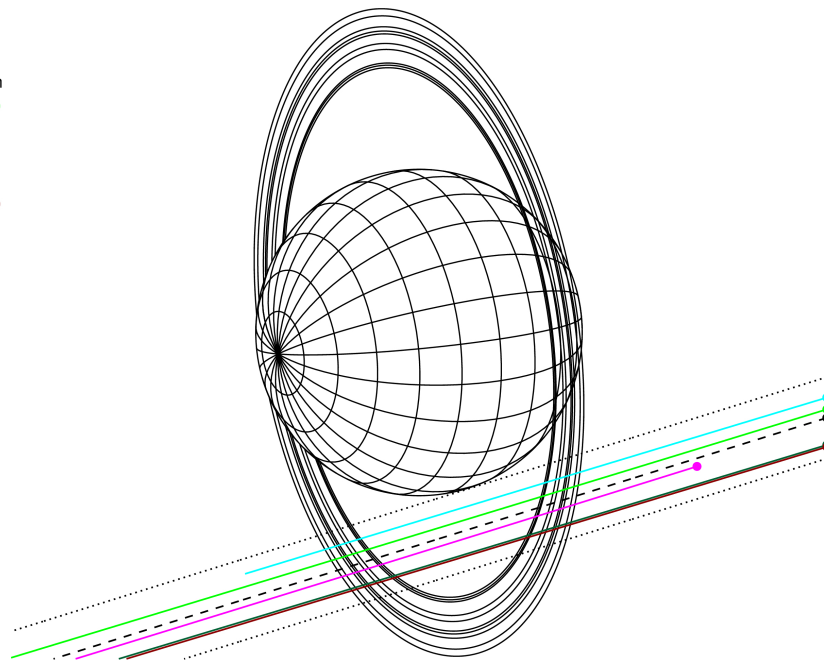
RUWE (>1.4 is poor) : 1.08  
 K magnitude : 14.510  
 G magnitude : 15.923  
 RP magnitude : 15.429  
 BP magnitude : 16.249  
 DUPflag : 0  
 Distance (au) : 17.591  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.15  
 Sun-Target sep (deg) : 143.07  
 Sun-Moon sep (deg) : 58.22  
 B (ring opening deg) : 29.16  
 PA of pole (deg) : 98.68

Uranus 2044-03-15T13:42:01 K14.51 G15.92 XRgt



2044-03-15T13:42:01.3900 α: 09 23 01.0774 δ: +16 06 44.074 C/A 2.487'' PA 17.31 deg v\_sky -17.15 km/s D 17.59 AU  
 Credit: Styled after SORA/Lucky Star

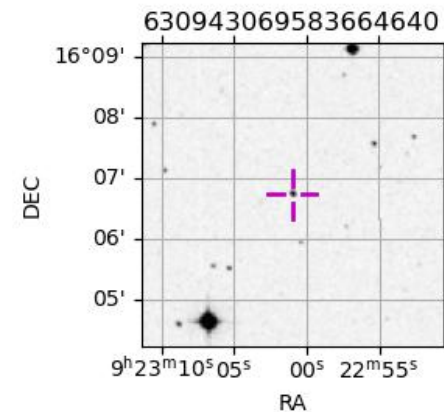
Earth  
 PMO  
 IRTF  
 KAV  
 AAT  
 MSO



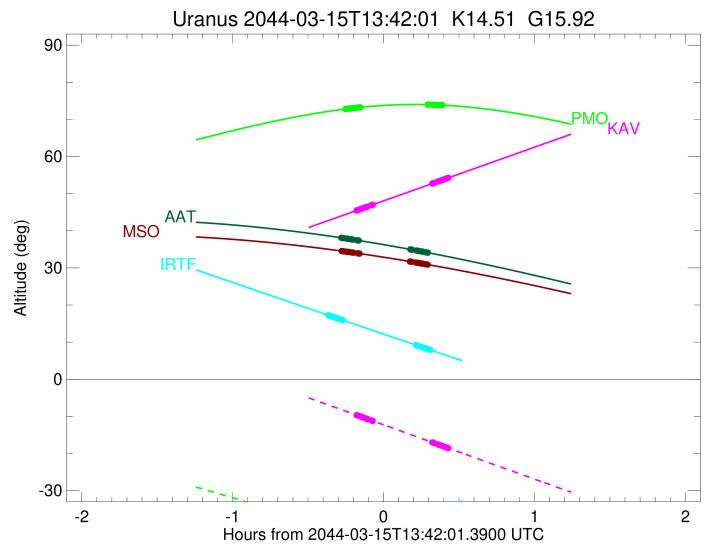
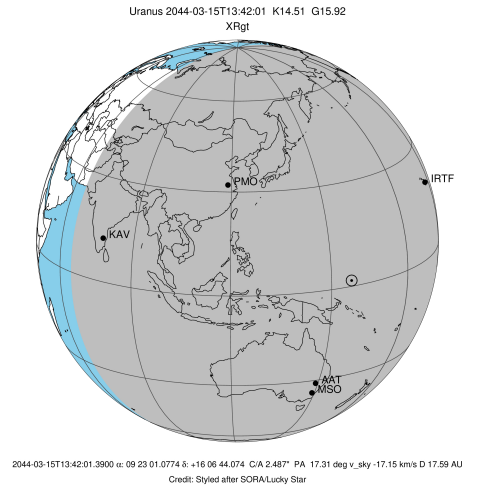
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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 15 13:26 - MAR 15 14:05	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 15 13:19 - MAR 15 14:00	PnnRie
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	MAR 15 13:31 - MAR 15 14:07	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 15 13:25 - MAR 15 13:59	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++		+++++	MAR 15 13:25 - MAR 15 13:59	PnnRie



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-03-15T13:42:59.060  
 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 : 630943069583664640  
 2Mass ID (if available) : 09230106+1606441  
 ICRS Star Coord at Epoch: 09h 23m 01.07740s +16:06:44.07381s  
 RUWE (>1.4 is poor) : 1.08  
 K magnitude : 14.510  
 G magnitude : 15.923  
 RP magnitude : 15.429  
 BP magnitude : 16.249  
 DUPflag : 0  
 Distance (au) : 17.591  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.15  
 Sun-Target sep (deg) : 143.07  
 Sun-Moon sep (deg) : 59.06  
 B (ring opening deg) : 29.16  
 PA of pole (deg) : 98.68  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.365  
 C/A sky separation (km) : 30176.6  
 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

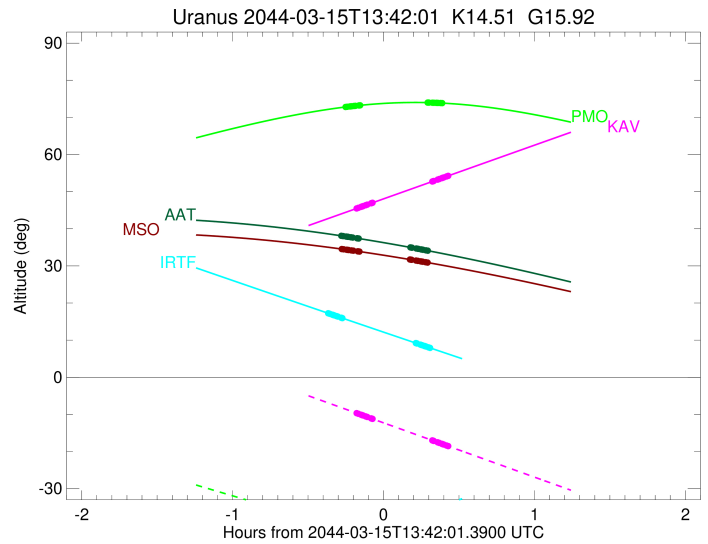
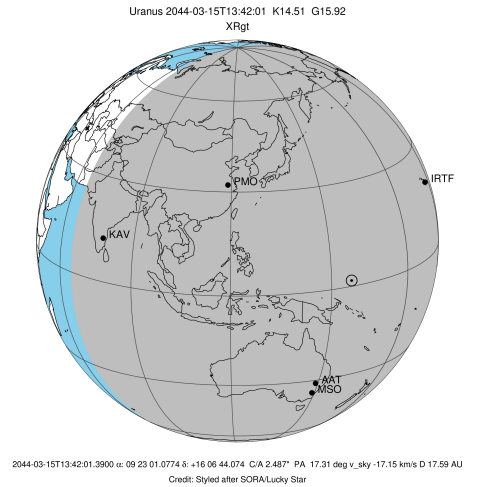


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2044-03-15T13:26:45.697		72.80	-40.56	51494.83	-28.88		
lambda	I	2044-03-15T13:27:37.095		72.87	-40.72	50026.71	-28.33		
delta	I	2044-03-15T13:28:38.691		72.95	-40.91	48300.35	-27.72		
gamma	I	2044-03-15T13:29:02.965		72.98	-40.99	47630.67	-27.45		
eta	I	2044-03-15T13:29:19.576		73.00	-41.04	47176.12	-27.27		
beta	I	2044-03-15T13:30:16.002		73.08	-41.21	45651.08	-26.59		
alpha	I	2044-03-15T13:30:50.719		73.12	-41.32	44740.02	-26.16		
4	I	2044-03-15T13:32:16.022		73.22	-41.58	42542.74	-24.97		
5	I	2044-03-15T13:32:30.633		73.24	-41.62	42239.64	-24.80		
6	I	2044-03-15T13:32:46.250		73.26	-41.67	41870.16	-24.53		

No planet occultations

6	E	2044-03-15T13:59:32.059		73.99	-46.39	41812.28	24.52		
5	E	2044-03-15T13:59:53.660		73.99	-46.45	42315.23	24.79		
4	E	2044-03-15T14:00:03.213		73.98	-46.48	42605.88	24.96		
alpha	E	2044-03-15T14:01:25.173		73.96	-46.71	44690.78	26.15		
beta	E	2044-03-15T14:02:01.847		73.94	-46.81	45644.98	26.58		
eta	E	2044-03-15T14:02:58.793		73.92	-46.97	47176.12	27.26		
gamma	E	2044-03-15T14:03:15.115		73.91	-47.02	47622.54	27.44		
delta	E	2044-03-15T14:03:39.698		73.90	-47.09	48300.35	27.70		
lambda	E	2044-03-15T14:04:41.324		73.87	-47.26	50026.71	28.31		
epsilon	E	2044-03-15T14:05:24.052		73.85	-47.38	51244.88	28.87		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-03-15T13:37:15.780  
 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 : 630943069583664640  
 2Mass ID (if available) : 09230106+1606441  
 ICRS Star Coord at Epoch: 09h 23m 01.07740s +16:06:44.07381s  
 RUWE (>1.4 is poor) : 1.08  
 K magnitude : 14.510  
 G magnitude : 15.923  
 RP magnitude : 15.429  
 BP magnitude : 16.249  
 DUPflag : 0  
 Distance (au) : 17.591  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.15  
 Sun-Target sep (deg) : 143.07  
 Sun-Moon sep (deg) : 58.01  
 B (ring opening deg) : 29.16  
 PA of pole (deg) : 98.68  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.214  
 C/A sky separation (km) : 28248.6  
 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

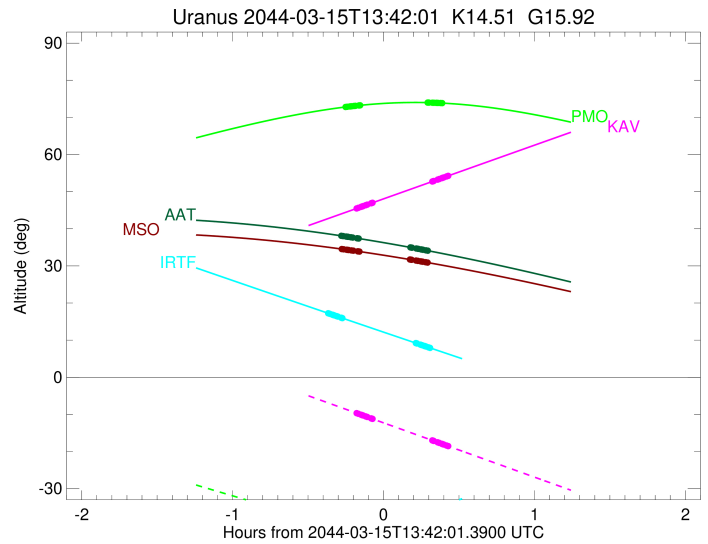
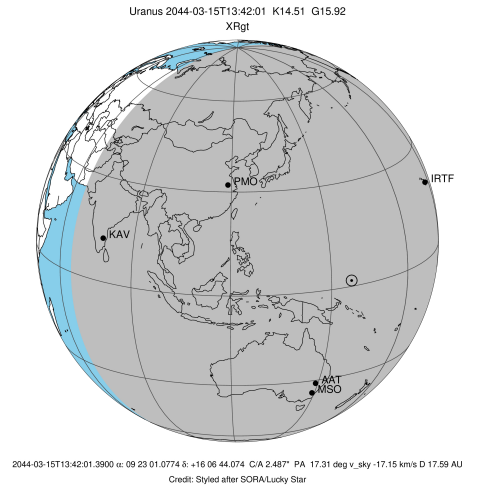


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2044-03-15T13:19:51.564		17.28	-44.90	51484.76	-29.29		
lambda	I	2044-03-15T13:20:41.815		17.08	-44.71	50026.71	-28.82		
delta	I	2044-03-15T13:21:42.244		16.85	-44.49	48300.35	-28.31		
gamma	I	2044-03-15T13:22:05.984		16.76	-44.40	47630.82	-28.09		
eta	I	2044-03-15T13:22:22.214		16.70	-44.34	47176.12	-27.94		
beta	I	2044-03-15T13:23:17.127		16.49	-44.13	45652.06	-27.38		
alpha	I	2044-03-15T13:23:50.814		16.36	-44.00	44741.49	-27.02		
4	I	2044-03-15T13:25:13.138		16.04	-43.70	42540.59	-26.05		
5	I	2044-03-15T13:25:27.212		15.98	-43.64	42234.53	-25.92		
6	I	2044-03-15T13:25:41.997		15.93	-43.59	41871.84	-25.70		

No planet occultations

6	E	2044-03-15T13:54:50.596		9.22	-36.97	41810.08	25.61		
5	E	2044-03-15T13:55:11.507		9.14	-36.89	42314.94	25.82		
4	E	2044-03-15T13:55:20.755		9.10	-36.85	42607.67	25.96		
alpha	E	2044-03-15T13:56:39.878		8.80	-36.55	44689.69	26.91		
beta	E	2044-03-15T13:57:15.670		8.66	-36.41	45645.68	27.27		
eta	E	2044-03-15T13:58:11.305		8.45	-36.20	47176.12	27.82		
gamma	E	2044-03-15T13:58:27.304		8.39	-36.14	47622.35	27.97		
delta	E	2044-03-15T13:58:51.454		8.30	-36.04	48300.35	28.18		
lambda	E	2044-03-15T13:59:52.165		8.06	-35.81	50026.71	28.68		
epsilon	E	2044-03-15T14:00:33.763		7.91	-35.65	51226.44	29.15		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-03-15T13:45:57.510  
 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 : 630943069583664640  
 2Mass ID (if available) : 09230106+1606441  
 ICRS Star Coord at Epoch: 09h 23m 01.07740s +16:06:44.07381s  
 RUWE (>1.4 is poor) : 1.08  
 K magnitude : 14.510  
 G magnitude : 15.923  
 RP magnitude : 15.429  
 BP magnitude : 16.249  
 DUPflag : 0  
 Distance (au) : 17.591  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.15  
 Sun-Target sep (deg) : 143.07  
 Sun-Moon sep (deg) : 59.12  
 B (ring opening deg) : 29.16  
 PA of pole (deg) : 98.68  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.584  
 C/A sky separation (km) : 32964.0  
 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

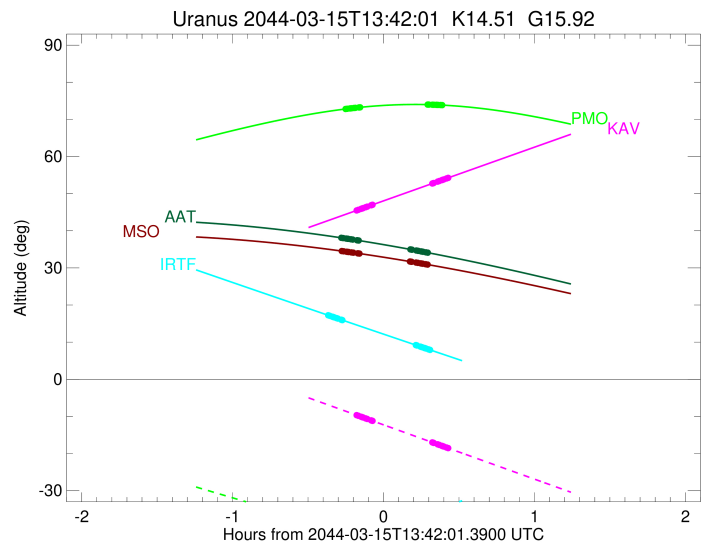
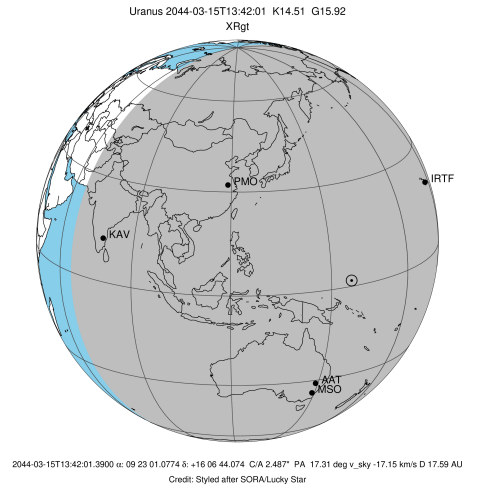


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2044-03-15T13:31:08.280		45.43	-9.62	51508.44	-27.24		
lambda	I	2044-03-15T13:32:03.432		45.65	-9.84	50026.71	-26.57		
delta	I	2044-03-15T13:33:09.356		45.92	-10.11	48300.35	-25.79		
gamma	I	2044-03-15T13:33:35.495		46.02	-10.22	47630.43	-25.46		
eta	I	2044-03-15T13:33:53.421		46.09	-10.29	47176.12	-25.23		
beta	I	2044-03-15T13:34:54.776		46.34	-10.54	45649.66	-24.36		
alpha	I	2044-03-15T13:35:32.792		46.49	-10.69	44737.64	-23.78		
4	I	2044-03-15T13:37:07.328		46.87	-11.08	42546.32	-22.22		
5	I	2044-03-15T13:37:23.560		46.94	-11.14	42247.58	-21.99		
6	I	2044-03-15T13:37:41.510		47.01	-11.22	41867.25	-21.61		

No planet occultations

6	E	2044-03-15T14:01:24.306		52.73	-17.00	41816.10	21.64		
5	E	2044-03-15T14:01:48.267		52.82	-17.10	42314.99	22.02		
4	E	2044-03-15T14:01:58.978		52.87	-17.14	42602.70	22.25		
alpha	E	2044-03-15T14:03:30.085		53.23	-17.51	44692.70	23.82		
beta	E	2044-03-15T14:04:10.005		53.39	-17.68	45643.99	24.40		
eta	E	2044-03-15T14:05:11.778		53.64	-17.93	47176.12	25.27		
gamma	E	2044-03-15T14:05:29.375		53.71	-18.00	47622.87	25.51		
delta	E	2044-03-15T14:05:55.764		53.82	-18.10	48300.35	25.84		
lambda	E	2044-03-15T14:07:01.562		54.08	-18.37	50026.71	26.62		
epsilon	E	2044-03-15T14:07:47.945		54.27	-18.56	51273.26	27.30		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-03-15T13:38:46.360  
 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 : 630943069583664640  
 2Mass ID (if available) : 09230106+1606441  
 ICRS Star Coord at Epoch: 09h 23m 01.07740s +16:06:44.07381s  
 RUWE (>1.4 is poor) : 1.08  
 K magnitude : 14.510  
 G magnitude : 15.923  
 RP magnitude : 15.429  
 BP magnitude : 16.249  
 DUPflag : 0  
 Distance (au) : 17.591  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.15  
 Sun-Target sep (deg) : 143.07  
 Sun-Moon sep (deg) : 58.39  
 B (ring opening deg) : 29.16  
 PA of pole (deg) : 98.68  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.770  
 C/A sky separation (km) : 35344.8  
 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

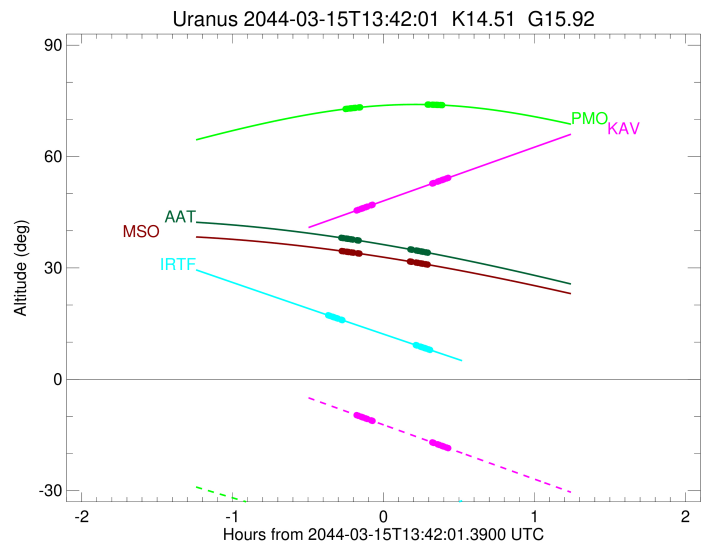
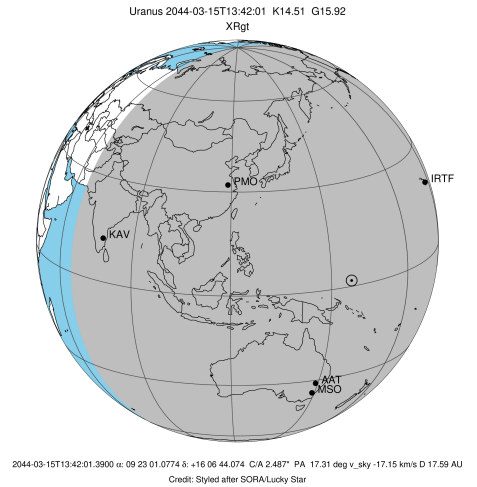


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2044-03-15T13:25:01.267		38.13	-55.28	51520.14	-25.81		
lambda	I	2044-03-15T13:26:00.125		38.03	-55.35	50026.71	-25.00		
delta	I	2044-03-15T13:27:10.489		37.91	-55.44	48300.35	-24.05		
gamma	I	2044-03-15T13:27:38.596		37.86	-55.48	47630.17	-23.63		
eta	I	2044-03-15T13:27:57.924		37.83	-55.50	47176.12	-23.34		
beta	I	2044-03-15T13:29:04.699		37.71	-55.58	45648.33	-22.25		
alpha	I	2044-03-15T13:29:46.490		37.63	-55.63	44735.14	-21.52		
4	I	2044-03-15T13:31:32.194		37.45	-55.75	42550.17	-19.50		
5	I	2044-03-15T13:31:50.396		37.41	-55.77	42255.47	-19.19		
6	I	2044-03-15T13:32:11.422		37.38	-55.79	41863.97	-18.69		

No planet occultations

6	E	2044-03-15T13:52:41.218		34.99	-56.83	41819.76	18.67		
5	E	2044-03-15T13:53:08.369		34.93	-56.84	42314.03	19.17		
4	E	2044-03-15T13:53:20.739		34.90	-56.85	42599.58	19.47		
alpha	E	2044-03-15T13:55:03.387		34.69	-56.90	44694.54	21.49		
beta	E	2044-03-15T13:55:47.246		34.59	-56.93	45643.24	22.22		
eta	E	2044-03-15T13:56:54.677		34.45	-56.96	47176.12	23.30		
gamma	E	2044-03-15T13:57:13.744		34.41	-56.96	47623.16	23.59		
delta	E	2044-03-15T13:57:42.201		34.35	-56.98	48300.35	24.00		
lambda	E	2044-03-15T13:58:52.704		34.20	-57.01	50026.71	24.95		
epsilon	E	2044-03-15T13:59:42.930		34.09	-57.02	51295.77	25.76		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2044-03-15T13:38:46.770  
 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 : 630943069583664640  
 2Mass ID (if available) : 09230106+1606441  
 ICRS Star Coord at Epoch: 09h 23m 01.07740s +16:06:44.07381s  
 RUWE (>1.4 is poor) : 1.08  
 K magnitude : 14.510  
 G magnitude : 15.923  
 RP magnitude : 15.429  
 BP magnitude : 16.249  
 DUPflag : 0  
 Distance (au) : 17.591  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.15  
 Sun-Target sep (deg) : 143.07  
 Sun-Moon sep (deg) : 58.35  
 B (ring opening deg) : 29.16  
 PA of pole (deg) : 98.68  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.795  
 C/A sky separation (km) : 35665.0  
 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	2044-03-15T13:25:12.265		34.56	-51.49	51521.55	-25.57		
lambda	I	2044-03-15T13:26:11.762		34.47	-51.56	50026.71	-24.74		
delta	I	2044-03-15T13:27:22.915		34.35	-51.63	48300.35	-23.76		
gamma	I	2044-03-15T13:27:51.371		34.31	-51.66	47630.13	-23.34		
eta	I	2044-03-15T13:28:10.950		34.28	-51.69	47176.12	-23.04		
beta	I	2044-03-15T13:29:18.692		34.17	-51.76	45648.16	-21.91		
alpha	I	2044-03-15T13:30:01.165		34.10	-51.80	44734.78	-21.16		
4	I	2044-03-15T13:31:48.934		33.93	-51.91	42550.73	-19.06		
5	I	2044-03-15T13:32:07.507		33.90	-51.93	42256.58	-18.74		
6	I	2044-03-15T13:32:29.115		33.86	-51.95	41863.47	-18.22		

No planet occultations

6	E	2044-03-15T13:52:29.902		31.72	-52.83	41820.35	18.19		
5	E	2044-03-15T13:52:57.646		31.67	-52.84	42313.82	18.72		
4	E	2044-03-15T13:53:10.332		31.65	-52.85	42599.07	19.04		
alpha	E	2044-03-15T13:54:55.047		31.44	-52.90	44694.83	21.13		
beta	E	2044-03-15T13:55:39.591		31.36	-52.92	45643.14	21.88		
eta	E	2044-03-15T13:56:47.989		31.22	-52.94	47176.12	23.00		
gamma	E	2044-03-15T13:57:07.304		31.19	-52.95	47623.20	23.30		
delta	E	2044-03-15T13:57:36.109		31.13	-52.96	48300.35	23.72		
lambda	E	2044-03-15T13:58:47.396		30.99	-52.99	50026.71	24.70		
epsilon	E	2044-03-15T13:59:38.254		30.89	-53.01	51299.16	25.52		