

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-03-17T14:13:50.300  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 670904987198804352  
 2Mass ID (if available) : 08044035+2057084

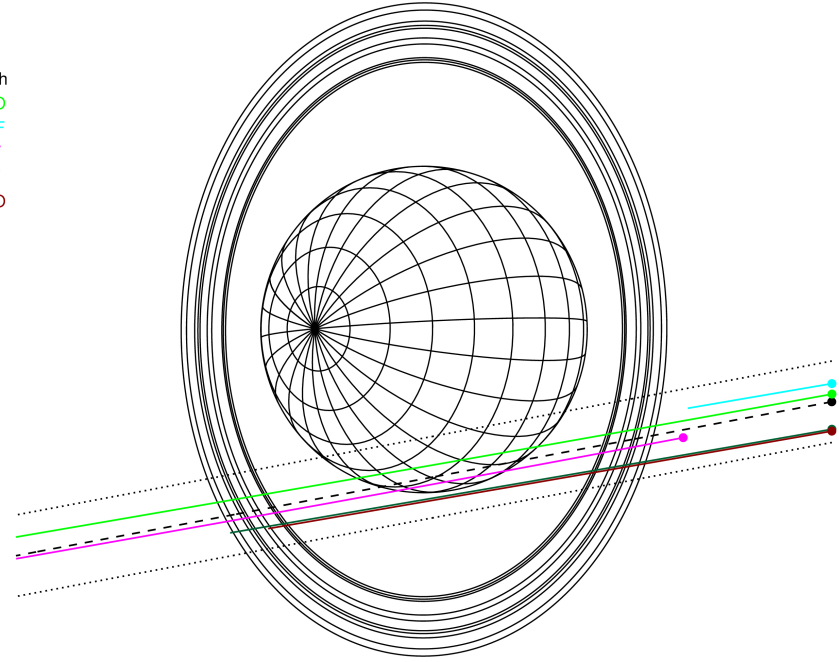
Uranus 2040-03-17T14:13:50 K14.67 G18.68 PgtRgt

ICRS Star Coord at Epoch: 08h 04m 40.34882s +20:57:07.99111s  
 RUWE (>1.4 is poor) : 3.32  
 K magnitude : 14.668  
 G magnitude : 18.676  
 RP magnitude : 17.224  
 BP magnitude : 19.780  
 DUPflag : 0  
 Distance (au) : 18.036  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.19  
 Sun-Target sep (deg) : 121.86  
 Sun-Moon sep (deg) : 66.72  
 B (ring opening deg) : 48.03  
 PA of pole (deg) : 89.62



2040-03-17T14:13:50.3000 α: 08 04 40.3488 δ: +20 57 07.991 C/A 1.754" PA 10.69 deg v\_sky - 9.19 km/s D 18.04 AU  
 Credit: Styled after SORA/Lucky Star

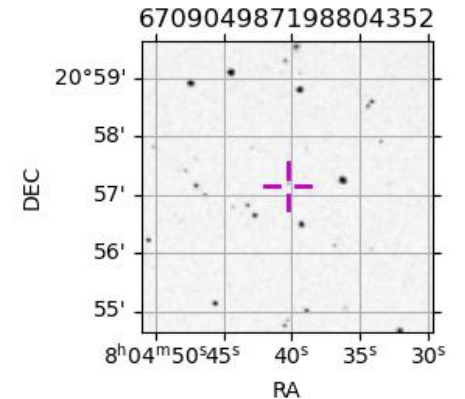
Earth  
 PMO  
 IRTF  
 KAV  
 AAT  
 MSO



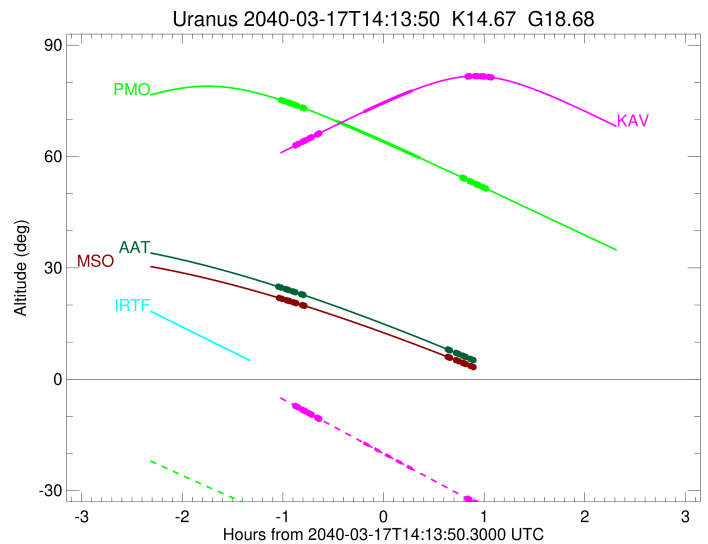
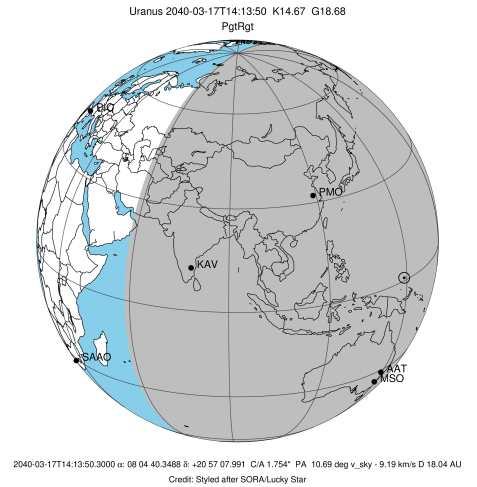
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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 17 13:13 - MAR 17 15:14	PieRie
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	+++++	+ +	+++++	MAR 17 13:21 - MAR 17 15:18	PieRie
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 17 13:11 - MAR 17 15:07	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++		++++	MAR 17 13:12 - MAR 17 14:56	PnnRie

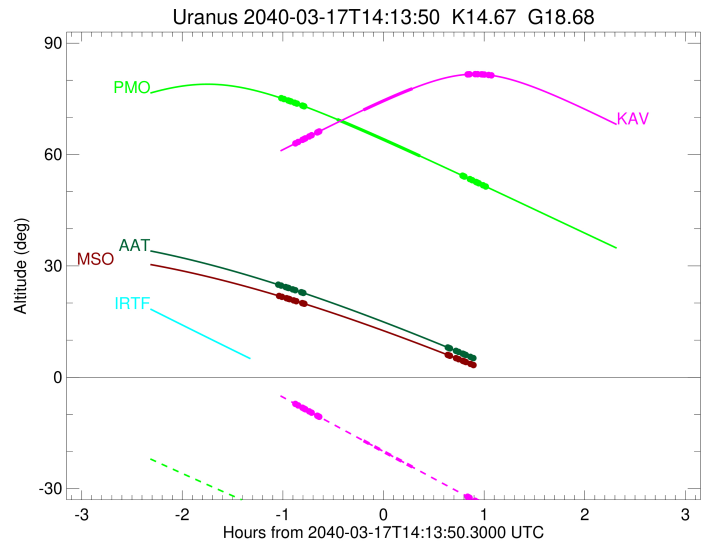
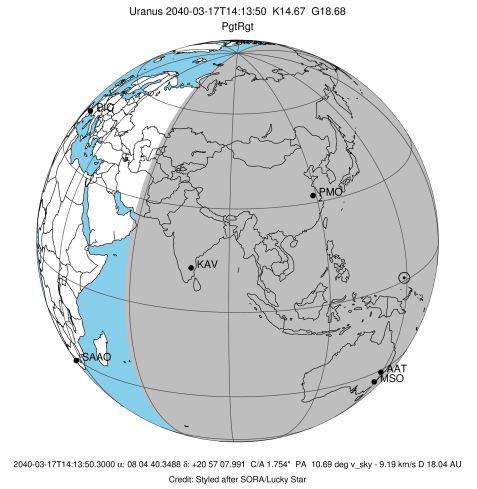


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-03-17T14:10:40.820  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 670904987198804352  
 2Mass ID (if available) : 08044035+2057084  
 ICRS Star Coord at Epoch: 08h 04m 40.34882s +20:57:07.99111s  
 RUWE (>1.4 is poor) : 3.32  
 K magnitude : 14.668  
 G magnitude : 18.676  
 RP magnitude : 17.224  
 BP magnitude : 19.780  
 DUPflag : 0  
 Distance (au) : 18.036  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.19  
 Sun-Target sep (deg) : 121.86  
 Sun-Moon sep (deg) : 67.61  
 B (ring opening deg) : 48.03  
 PA of pole (deg) : 89.62  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.617  
 C/A sky separation (km) : 21148.1  
 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



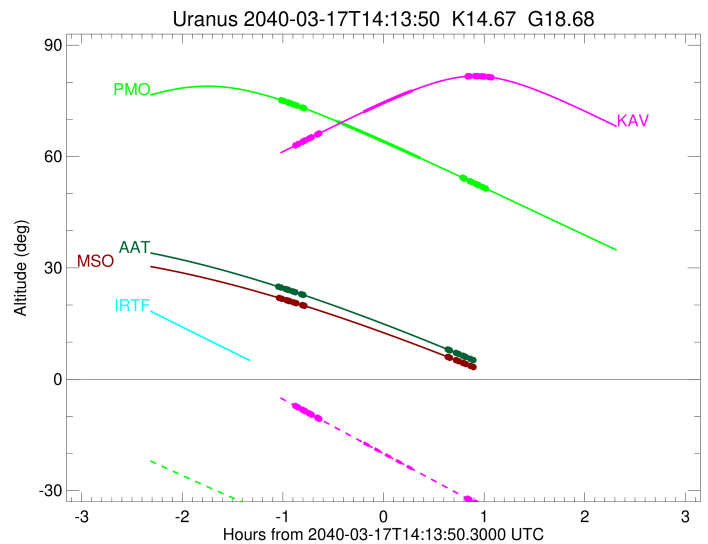
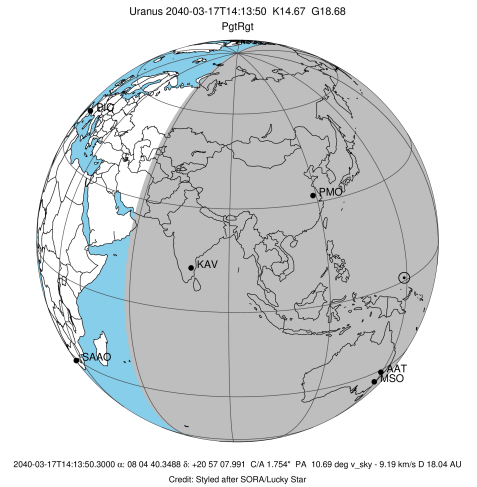
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-03-17T13:13:16.428		75.13	-37.62	50894.74	-11.58		
lambda	I	2040-03-17T13:14:31.338		74.94	-37.86	50026.71	-11.57		
delta	I	2040-03-17T13:17:01.223		74.56	-38.33	48300.35	-11.47		
gamma	I	2040-03-17T13:17:59.648		74.41	-38.51	47631.42	-11.43		
eta	I	2040-03-17T13:18:39.536		74.30	-38.64	47176.12	-11.40		
beta	I	2040-03-17T13:20:51.119		73.95	-39.05	45679.53	-11.30		
alpha	I	2040-03-17T13:22:17.469		73.71	-39.31	44719.36	-11.23		
4	I	2040-03-17T13:25:26.192		73.19	-39.90	42612.16	-11.05		
5	I	2040-03-17T13:25:52.631		73.12	-39.98	42296.76	-11.03		
6	I	2040-03-17T13:26:35.409		72.99	-40.11	41866.80	-11.01		
Uranus	I	2040-03-17T13:46:05.139		69.49	-43.61	25402.09		-27.67	-28.77
Uranus	E	2040-03-17T14:35:40.431		59.59	-51.50	25506.03		15.60	16.30
6	E	2040-03-17T15:00:54.485		54.32	-54.71	41849.53	10.89		
5	E	2040-03-17T15:01:36.656		54.17	-54.79	42248.70	10.91		
4	E	2040-03-17T15:02:01.133		54.08	-54.83	42533.83	10.93		
alpha	E	2040-03-17T15:05:15.200		53.40	-55.19	44689.71	11.10		
beta	E	2040-03-17T15:06:41.793		53.10	-55.34	45644.04	11.16		
eta	E	2040-03-17T15:08:58.223		52.62	-55.58	47176.12	11.26		
gamma	E	2040-03-17T15:09:37.978		52.48	-55.65	47624.17	11.28		
delta	E	2040-03-17T15:10:37.806		52.27	-55.75	48300.35	11.32		
lambda	E	2040-03-17T15:13:09.698		51.73	-56.00	50026.71	11.41		
epsilon	E	2040-03-17T15:14:41.042		51.41	-56.14	51071.08	11.42		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-03-17T14:16:15.920  
 Event type : PgtRgt  
 : Uranus occs: geocentric, 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 : 670904987198804352  
 2Mass ID (if available) : 08044035+2057084  
 ICRS Star Coord at Epoch: 08h 04m 40.34882s +20:57:07.99111s  
 RUWE (>1.4 is poor) : 3.32  
 K magnitude : 14.668  
 G magnitude : 18.676  
 RP magnitude : 17.224  
 BP magnitude : 19.780  
 DUPflag : 0  
 Distance (au) : 18.036  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.19  
 Sun-Target sep (deg) : 121.86  
 Sun-Moon sep (deg) : 67.48  
 B (ring opening deg) : 48.03  
 PA of pole (deg) : 89.62  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.842  
 C/A sky separation (km) : 24089.9  
 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	2040-03-17T13:21:42.989		63.10	-7.28	50876.63	-11.22		
lambda	I	2040-03-17T13:22:58.665		63.39	-7.59	50026.71	-11.20		
delta	I	2040-03-17T13:25:33.619		63.97	-8.22	48300.35	-11.08		
gamma	I	2040-03-17T13:26:34.142		64.20	-8.47	47631.50	-11.02		
eta	I	2040-03-17T13:27:15.517		64.36	-8.63	47176.12	-10.99		
beta	I	2040-03-17T13:29:32.338		64.87	-9.19	45678.93	-10.85		
alpha	I	2040-03-17T13:31:02.436		65.21	-9.56	44716.95	-10.76		
4	I	2040-03-17T13:34:20.038		65.95	-10.36	42610.55	-10.53		
5	I	2040-03-17T13:34:47.458		66.06	-10.47	42300.54	-10.50		
6	I	2040-03-17T13:35:32.029		66.22	-10.65	41869.10	-10.46		
Uranus	I	2040-03-17T14:01:53.146		72.00	-17.08	25478.19		-19.42	-20.27
Uranus	E	2040-03-17T14:31:01.783		77.75	-24.18	25551.45		5.82	6.10
6	E	2040-03-17T15:03:55.676		81.59	-32.17	41853.15	10.46		
5	E	2040-03-17T15:04:39.350		81.61	-32.34	42255.69	10.50		
4	E	2040-03-17T15:05:04.566		81.62	-32.44	42536.23	10.53		
alpha	E	2040-03-17T15:08:24.991		81.66	-33.25	44688.33	10.77		
beta	E	2040-03-17T15:09:54.227		81.65	-33.61	45644.94	10.86		
eta	E	2040-03-17T15:12:14.129		81.61	-34.18	47176.12	10.99		
gamma	E	2040-03-17T15:12:54.849		81.59	-34.34	47624.55	11.03		
delta	E	2040-03-17T15:13:55.964		81.55	-34.59	48300.35	11.08		
lambda	E	2040-03-17T15:16:30.819		81.43	-35.21	50026.71	11.21		
epsilon	E	2040-03-17T15:18:01.218		81.34	-35.58	51043.13	11.23		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-03-17T14:05:17.390  
 Event type : PgtRgt  
 : Uranus occs: geocentric, 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 : 670904987198804352  
 2Mass ID (if available) : 08044035+2057084  
 ICRS Star Coord at Epoch: 08h 04m 40.34882s +20:57:07.99111s  
 RUWE (>1.4 is poor) : 3.32  
 K magnitude : 14.668  
 G magnitude : 18.676  
 RP magnitude : 17.224  
 BP magnitude : 19.780  
 DUPflag : 0  
 Distance (au) : 18.035  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.19  
 Sun-Target sep (deg) : 121.86  
 Sun-Moon sep (deg) : 67.24  
 B (ring opening deg) : 48.03  
 PA of pole (deg) : 89.62  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.008  
 C/A sky separation (km) : 26267.6  
 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\_itrf93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

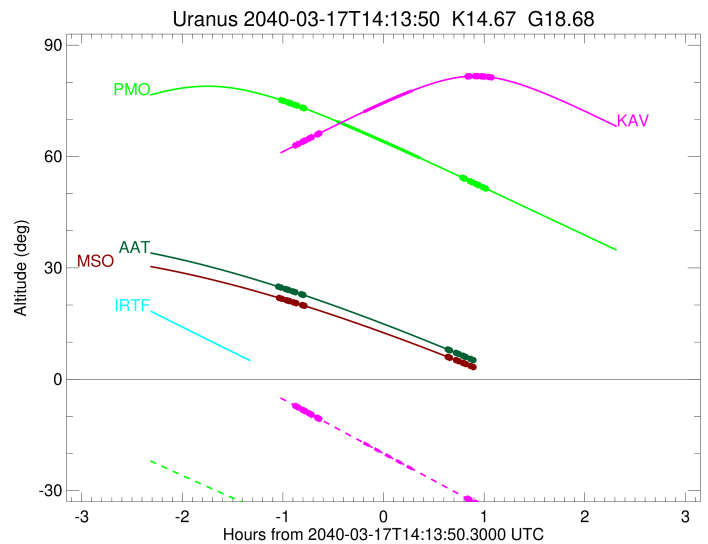
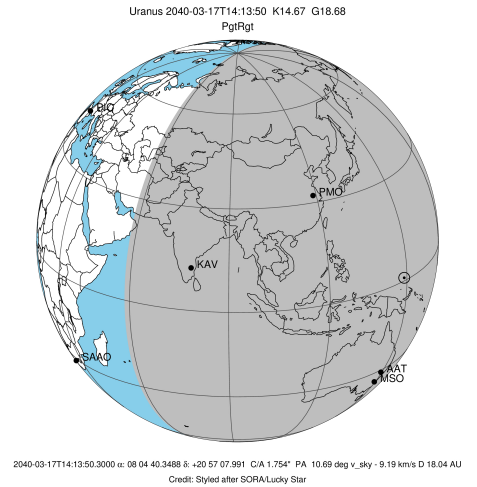


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2040-03-17T13:11:33.299		24.88	-54.88	50859.38	-10.78		
lambda	I	2040-03-17T13:12:50.532		24.69	-55.00	50026.71	-10.75		
delta	I	2040-03-17T13:15:32.348		24.29	-55.25	48300.35	-10.59		
gamma	I	2040-03-17T13:16:35.708		24.14	-55.35	47631.54	-10.52		
eta	I	2040-03-17T13:17:19.086		24.03	-55.41	47176.12	-10.48		
beta	I	2040-03-17T13:19:42.952		23.68	-55.62	45678.26	-10.31		
alpha	I	2040-03-17T13:21:18.034		23.44	-55.76	44714.63	-10.19		
4	I	2040-03-17T13:24:47.500		22.91	-56.04	42608.80	-9.90		
5	I	2040-03-17T13:25:16.352		22.84	-56.08	42303.77	-9.86		
6	I	2040-03-17T13:26:03.385		22.72	-56.14	41871.11	-9.81		

No planet occultations

6	E	2040-03-17T14:52:08.012		8.03	-56.55	41855.41	9.65		
5	E	2040-03-17T14:52:55.163		7.88	-56.50	42260.08	9.70		
4	E	2040-03-17T14:53:22.334		7.80	-56.47	42537.91	9.74		
alpha	E	2040-03-17T14:56:58.282		7.13	-56.21	44687.57	10.01		
beta	E	2040-03-17T14:58:34.196		6.83	-56.08	45645.56	10.12		
eta	E	2040-03-17T15:01:04.028		6.36	-55.89	47176.12	10.28		
gamma	E	2040-03-17T15:01:47.592		6.23	-55.83	47624.79	10.32		
delta	E	2040-03-17T15:02:52.856		6.02	-55.74	48300.35	10.38		
lambda	E	2040-03-17T15:05:37.975		5.50	-55.50	50026.71	10.53		
epsilon	E	2040-03-17T15:07:12.634		5.21	-55.36	51026.70	10.55		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2040-03-17T14:05:31.120  
 Event type : PgtRgt  
 : Uranus occs: geocentric, 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 : 670904987198804352  
 2Mass ID (if available) : 08044035+2057084  
 ICRS Star Coord at Epoch: 08h 04m 40.34882s +20:57:07.99111s  
 RUWE (>1.4 is poor) : 3.32  
 K magnitude : 14.668  
 G magnitude : 18.676  
 RP magnitude : 17.224  
 BP magnitude : 19.780  
 DUPflag : 0  
 Distance (au) : 18.035  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -9.19  
 Sun-Target sep (deg) : 121.86  
 Sun-Moon sep (deg) : 67.20  
 B (ring opening deg) : 48.03  
 PA of pole (deg) : 89.62  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.033  
 C/A sky separation (km) : 26598.9  
 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	2040-03-17T13:12:03.183		21.84	-51.27	50857.35	-10.71		
lambda	I	2040-03-17T13:13:20.713		21.66	-51.37	50026.71	-10.68		
delta	I	2040-03-17T13:16:03.607		21.29	-51.60	48300.35	-10.52		
gamma	I	2040-03-17T13:17:07.413		21.14	-51.68	47631.55	-10.45		
eta	I	2040-03-17T13:17:51.105		21.04	-51.74	47176.12	-10.40		
beta	I	2040-03-17T13:20:16.074		20.71	-51.92	45678.17	-10.23		
alpha	I	2040-03-17T13:21:51.938		20.48	-52.04	44714.34	-10.11		
4	I	2040-03-17T13:25:23.279		19.98	-52.29	42608.55	-9.81		
5	I	2040-03-17T13:25:52.366		19.91	-52.32	42304.17	-9.76		
6	I	2040-03-17T13:26:39.799		19.80	-52.37	41871.36	-9.71		

No planet occultations

6	E	2040-03-17T14:52:05.819		6.03	-52.72	41855.83	9.56		
5	E	2040-03-17T14:52:53.366		5.89	-52.68	42260.90	9.62		
4	E	2040-03-17T14:53:20.758		5.81	-52.65	42538.24	9.65		
alpha	E	2040-03-17T14:56:58.439		5.17	-52.42	44687.43	9.94		
beta	E	2040-03-17T14:58:35.071		4.88x	-52.32	45645.68	10.05		
eta	E	2040-03-17T15:01:05.917		4.43x	-52.14	47176.12	10.21		
gamma	E	2040-03-17T15:01:49.766		4.30x	-52.09	47624.83	10.26		
delta	E	2040-03-17T15:02:55.432		4.10x	-52.01	48300.35	10.32		
lambda	E	2040-03-17T15:05:41.515		3.61x	-51.81	50026.71	10.47		
epsilon	E	2040-03-17T15:07:16.385		3.32x	-51.68	51023.50	10.50		