

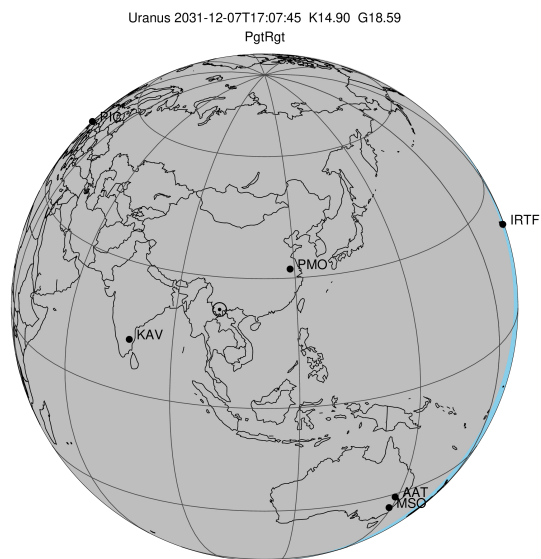
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-07T17:07:45.290  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3404402597359421568  
 2Mass ID (if available) : 05385950+2330056

ICRS Star Coord at Epoch: 05h 38m 59.51307s +23:30:05.49203s

RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.902  
 G magnitude : 18.591  
 RP magnitude : 17.529  
 BP magnitude : 19.706  
 DUPflag : 0  
 Distance (au) : 18.118  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.96  
 Sun-Target sep (deg) : 169.75  
 Sun-Moon sep (deg) : 86.22  
 B (ring opening deg) : 79.12  
 PA of pole (deg) : 41.42

# a(km) ring

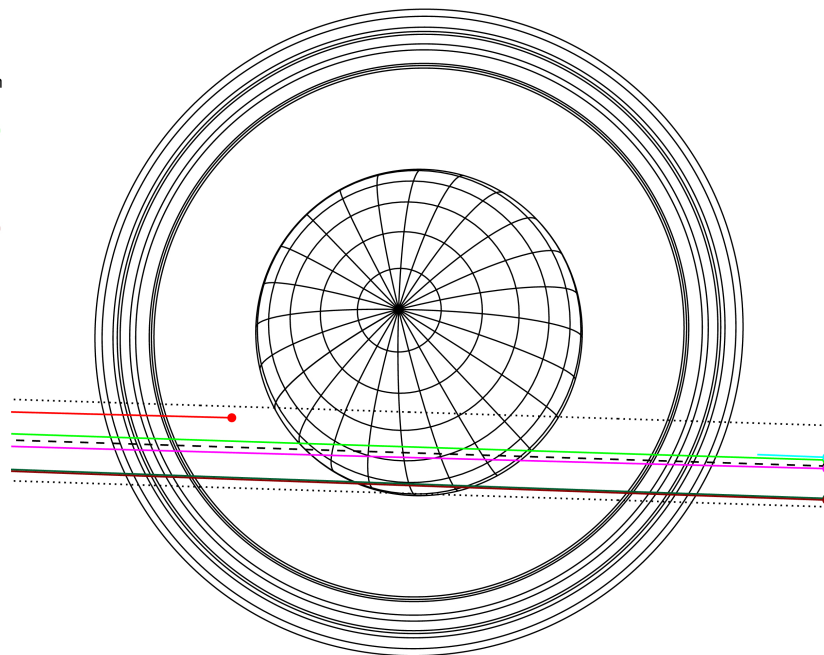
- 1 41837.2 6
- 2 42235.0 5
- 3 42571.2 4
- 4 44718.5 alpha
- 5 45661.1 beta
- 6 47176.1 eta
- 7 47626.3 gamma
- 8 48300.3 delta
- 9 50026.7 lambda
- 10 51149.4 epsilon



2031-12-07T17:07:45.2900 ra: 05 38 59.5131 s: +23 30 05.492 C/A 1.430° PA 358.17 deg v\_sky -22.96 km/s D 18.12 AU  
 Credit: Styled after SORA/Lucky Star

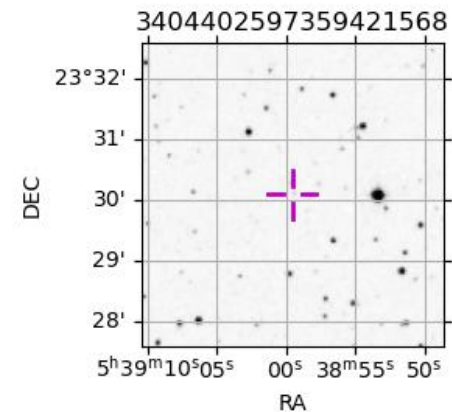
Uranus 2031-12-07T17:07:45 K14.90 G18.59 PgtRgt

Earth  
 PIC  
 PMO  
 IRTF  
 KAV  
 AAT  
 MSO

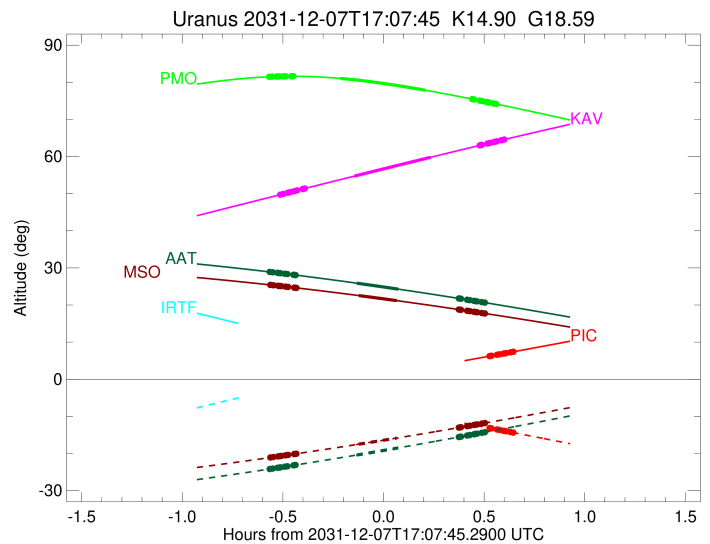
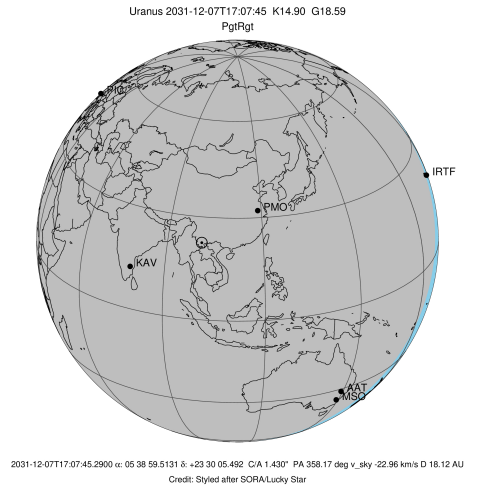


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1			+++++	DEC 07 17:39 - DEC 07 17:46	PnnRne
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+ +	+++++	DEC 07 16:33 - DEC 07 17:41	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	+++++	+ +	+++++	DEC 07 16:36 - DEC 07 17:43	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	+++++	+ +	+++++	DEC 07 16:33 - DEC 07 17:37	PieRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+ +	+++++	DEC 07 16:33 - DEC 07 17:37	PieRie



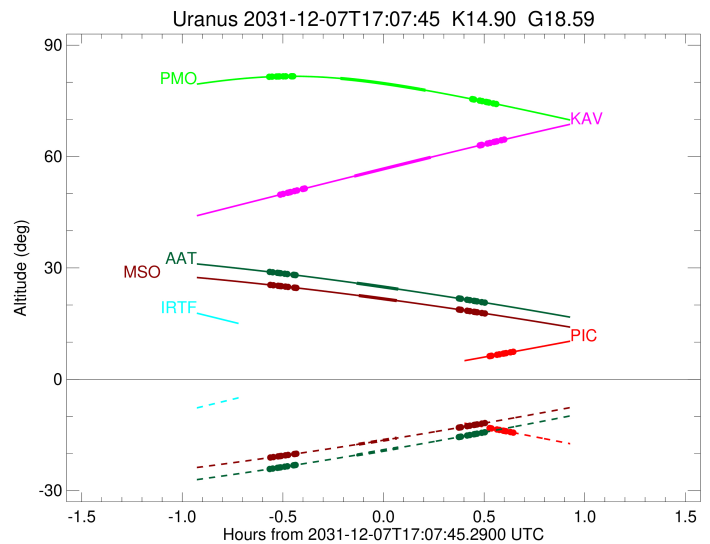
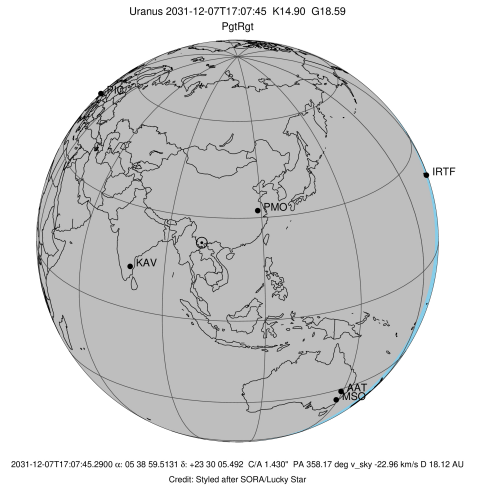
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-07T17:10:46.210  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 3404402597359421568  
 2Mass ID (if available) : 05385950+2330056  
 ICRS Star Coord at Epoch: 05h 38m 59.51307s +23:30:05.49203s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.902  
 G magnitude : 18.591  
 RP magnitude : 17.529  
 BP magnitude : 19.706  
 DUPflag : 0  
 Distance (au) : 18.118  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.96  
 Sun-Target sep (deg) : 169.75  
 Sun-Moon sep (deg) : 86.28  
 B (ring opening deg) : 79.12  
 PA of pole (deg) : 41.42  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.075  
 C/A sky separation (km) : 14120.5  
 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	2031-12-07T16:35:10.064	-3.80x	-2.38x	51440.05	-22.11			
lambda	I	2031-12-07T16:36:14.154	-3.64x	-2.55x	50026.71	-22.03			
delta	I	2031-12-07T16:37:32.653	-3.45x	-2.76x	48300.35	-21.96			
gamma	I	2031-12-07T16:38:03.335	-3.38x	-2.84x	47627.14	-21.93			
eta	I	2031-12-07T16:38:23.914	-3.33x	-2.90x	47176.12	-21.91			
beta	I	2031-12-07T16:39:32.243	-3.16x	-3.08x	45681.08	-21.83			
alpha	I	2031-12-07T16:40:15.350	-3.05x	-3.20x	44740.52	-21.79			
4	I	2031-12-07T16:41:54.683	-2.81x	-3.46x	42579.88	-21.65			
5	I	2031-12-07T16:42:14.384	-2.76x	-3.52x	42164.37	-21.63			
6	I	2031-12-07T16:42:30.407	-2.72x	-3.56x	41811.01	-21.61			
Uranus	I	2031-12-07T16:55:41.428	-0.73x	-5.72	25020.57			-10.61	-11.11
Uranus	E	2031-12-07T17:26:17.706	4.10x	-10.88	25543.52			1.76	1.85
6	E	2031-12-07T17:39:24.410	6.24	-13.14	41878.79	21.69			
5	E	2031-12-07T17:39:42.201	6.29	-13.20	42265.35	21.70			
4	E	2031-12-07T17:39:54.880	6.32	-13.23	42536.46	21.73			
alpha	E	2031-12-07T17:41:34.789	6.60	-13.52	44716.51	21.87			
beta	E	2031-12-07T17:42:17.289	6.71	-13.65	45646.54	21.92			
eta	E	2031-12-07T17:43:26.932	6.91	-13.85	47176.12	22.00			
gamma	E	2031-12-07T17:43:47.218	6.96	-13.91	47622.56	22.02			
delta	E	2031-12-07T17:44:17.980	7.05	-14.00	48300.35	22.05			
lambda	E	2031-12-07T17:45:36.143	7.26	-14.22	50026.71	22.12			
epsilon	E	2031-12-07T17:46:22.343	7.39	-14.36	51049.72	22.21			

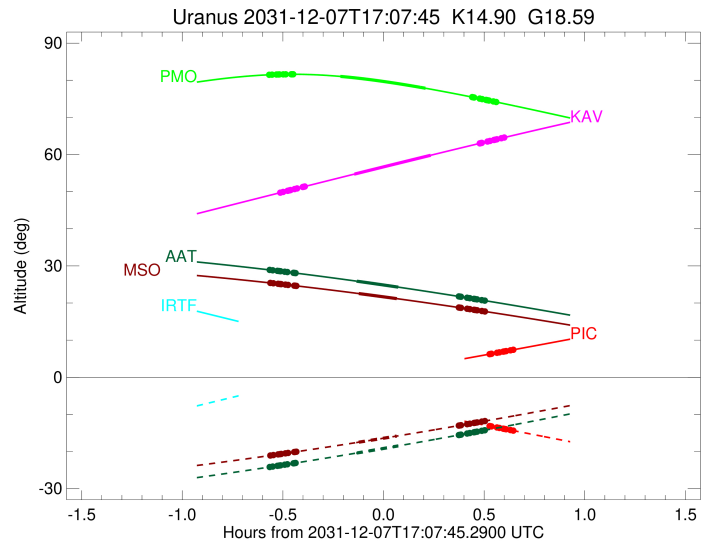
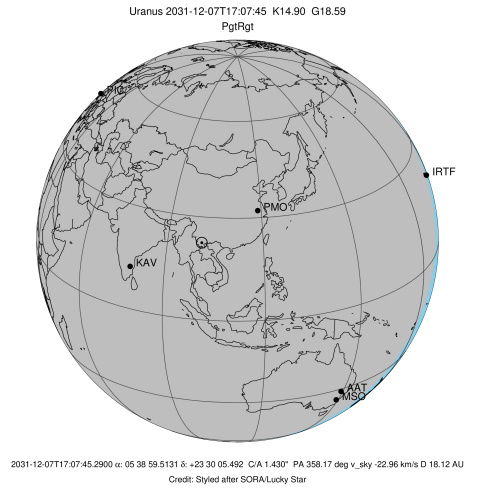
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-07T17:07:16.940  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 3404402597359421568  
 2Mass ID (if available) : 05385950+2330056  
 ICRS Star Coord at Epoch: 05h 38m 59.51307s +23:30:05.49203s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.902  
 G magnitude : 18.591  
 RP magnitude : 17.529  
 BP magnitude : 19.706  
 DUPflag : 0  
 Distance (au) : 18.118  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.96  
 Sun-Target sep (deg) : 169.75  
 Sun-Moon sep (deg) : 87.12  
 B (ring opening deg) : 79.12  
 PA of pole (deg) : 41.42  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.366  
 C/A sky separation (km) : 17955.4  
 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\_itrff93\_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

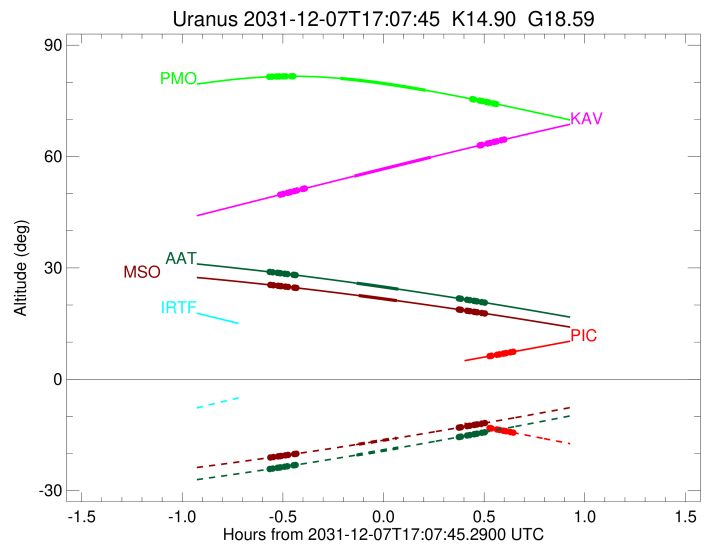
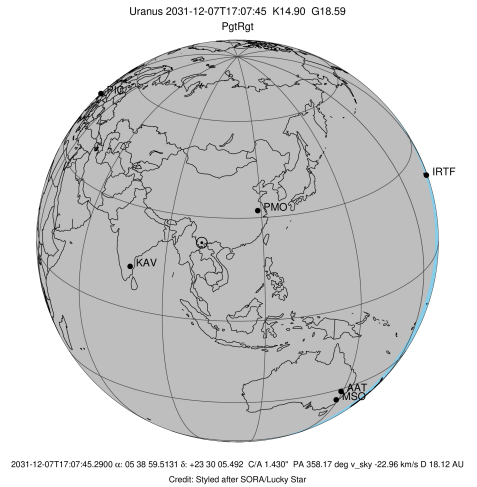
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-07T16:33:26.712		81.47	-77.58	51462.96	-22.08		
lambda	I	2031-12-07T16:34:32.021		81.51	-77.42	50026.71	-21.95		
delta	I	2031-12-07T16:35:50.901		81.56	-77.22	48300.35	-21.82		
gamma	I	2031-12-07T16:36:21.806		81.57	-77.14	47626.66	-21.77		
eta	I	2031-12-07T16:36:42.516		81.58	-77.09	47176.12	-21.74		
beta	I	2031-12-07T16:37:51.456		81.60	-76.91	45681.22	-21.61		
alpha	I	2031-12-07T16:38:34.928		81.61	-76.79	44742.94	-21.53		
4	I	2031-12-07T16:40:16.018		81.62	-76.53	42575.23	-21.29		
5	I	2031-12-07T16:40:36.018		81.62	-76.47	42160.80	-21.25		
6	I	2031-12-07T16:40:51.941		81.62	-76.43	41814.68	-21.23		
Uranus	I	2031-12-07T16:54:52.394		81.05	-74.02	24994.24		-10.88	-11.39
Uranus	E	2031-12-07T17:20:15.878		77.86	-69.19	25558.68		-0.26	-0.27
6	E	2031-12-07T17:34:12.969		75.47	-66.39	41879.45	21.22		
5	E	2031-12-07T17:34:30.804		75.41	-66.33	42258.30	21.25		
4	E	2031-12-07T17:34:43.908		75.37	-66.29	42533.93	21.29		
alpha	E	2031-12-07T17:36:25.931		75.06	-65.94	44719.45	21.53		
beta	E	2031-12-07T17:37:09.006		74.93	-65.80	45647.75	21.61		
eta	E	2031-12-07T17:38:19.528		74.71	-65.56	47176.12	21.73		
gamma	E	2031-12-07T17:38:40.042		74.65	-65.49	47622.27	21.77		
delta	E	2031-12-07T17:39:11.156		74.56	-65.38	48300.35	21.82		
lambda	E	2031-12-07T17:40:30.058		74.31	-65.11	50026.71	21.94		
epsilon	E	2031-12-07T17:41:17.938		74.16	-64.95	51078.82	22.07		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-07T17:10:08.320  
 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 : 3404402597359421568  
 2Mass ID (if available) : 05385950+2330056  
 ICRS Star Coord at Epoch: 05h 38m 59.51307s +23:30:05.49203s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.902  
 G magnitude : 18.591  
 RP magnitude : 17.529  
 BP magnitude : 19.706  
 DUPflag : 0  
 Distance (au) : 18.118  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.96  
 Sun-Target sep (deg) : 169.75  
 Sun-Moon sep (deg) : 87.01  
 B (ring opening deg) : 79.12  
 PA of pole (deg) : 41.42  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.493  
 C/A sky separation (km) : 19613.0  
 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\_itrff93\_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	2031-12-07T16:36:44.214		49.68	-59.88	51470.63	-21.73		
lambda	I	2031-12-07T16:37:50.977		49.93	-60.13	50026.71	-21.57		
delta	I	2031-12-07T16:39:11.272		50.23	-60.42	48300.35	-21.43		
gamma	I	2031-12-07T16:39:42.767		50.35	-60.54	47626.48	-21.36		
eta	I	2031-12-07T16:40:03.867		50.43	-60.62	47176.12	-21.32		
beta	I	2031-12-07T16:41:14.194		50.70	-60.88	45681.23	-21.17		
alpha	I	2031-12-07T16:41:58.546		50.87	-61.04	44743.78	-21.07		
4	I	2031-12-07T16:43:42.083		51.26	-61.43	42573.46	-20.78		
5	I	2031-12-07T16:44:02.544		51.33	-61.50	42159.65	-20.74		
6	I	2031-12-07T16:44:18.721		51.39	-61.56	41816.14	-20.70		
Uranus	I	2031-12-07T16:59:04.092		54.73	-64.80	24997.73		-10.85	-11.35
Uranus	E	2031-12-07T17:21:49.698		59.80	-69.63	25549.96		-1.35	-1.41
6	E	2031-12-07T17:36:29.335		63.01	-72.57	41879.65	20.76		
5	E	2031-12-07T17:36:47.376		63.08	-72.63	42254.48	20.79		
4	E	2031-12-07T17:37:00.860		63.13	-72.67	42532.72	20.84		
alpha	E	2031-12-07T17:38:45.060		63.50	-73.00	44721.01	21.13		
beta	E	2031-12-07T17:39:28.873		63.66	-73.14	45648.44	21.23		
eta	E	2031-12-07T17:40:40.554		63.92	-73.37	47176.12	21.39		
gamma	E	2031-12-07T17:41:01.388		63.99	-73.43	47622.12	21.43		
delta	E	2031-12-07T17:41:32.990		64.10	-73.53	48300.35	21.49		
lambda	E	2031-12-07T17:42:53.032		64.39	-73.78	50026.71	21.64		
epsilon	E	2031-12-07T17:43:42.293		64.57	-73.93	51094.90	21.80		

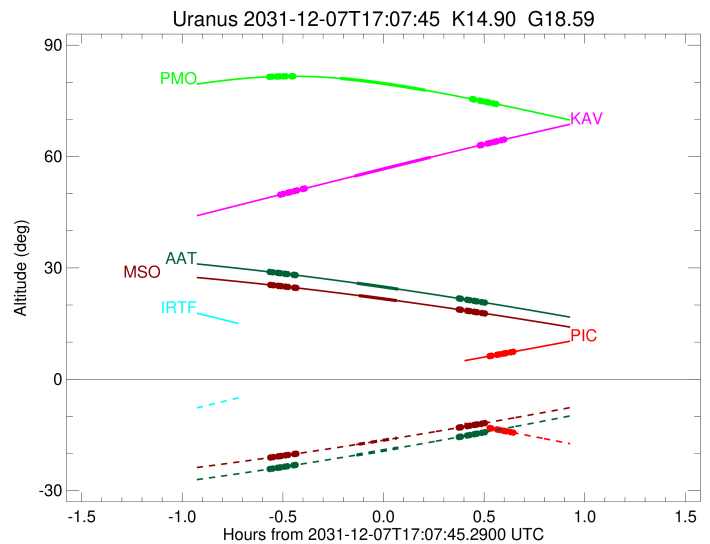
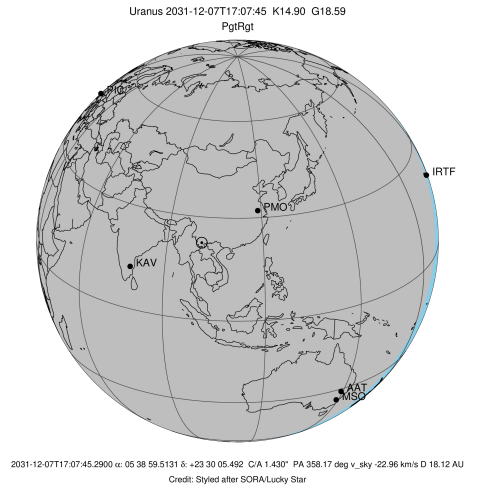
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-07T17:05:33.690  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 3404402597359421568  
 2Mass ID (if available) : 05385950+2330056  
 ICRS Star Coord at Epoch: 05h 38m 59.51307s +23:30:05.49203s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.902  
 G magnitude : 18.591  
 RP magnitude : 17.529  
 BP magnitude : 19.706  
 DUPflag : 0  
 Distance (au) : 18.118  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.96  
 Sun-Target sep (deg) : 169.75  
 Sun-Moon sep (deg) : 86.58  
 B (ring opening deg) : 79.12  
 PA of pole (deg) : 41.42  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.807  
 C/A sky separation (km) : 23740.5  
 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	2031-12-07T16:33:33.348		28.94	-24.21	51493.40	-20.85		
lambda	I	2031-12-07T16:34:44.144		28.82	-24.05	50026.71	-20.63		
delta	I	2031-12-07T16:36:08.283		28.66	-23.86	48300.35	-20.40		
gamma	I	2031-12-07T16:36:41.417		28.60	-23.78	47625.91	-20.31		
eta	I	2031-12-07T16:37:03.603		28.56	-23.73	47176.12	-20.24		
beta	I	2031-12-07T16:38:17.867		28.43	-23.55	45681.09	-20.00		
alpha	I	2031-12-07T16:39:04.740		28.34	-23.44	44746.21	-19.85		
4	I	2031-12-07T16:40:55.571		28.13	-23.18	42567.91	-19.40		
5	I	2031-12-07T16:41:17.361		28.09	-23.13	42156.84	-19.32		
6	I	2031-12-07T16:41:34.291		28.06	-23.09	41820.91	-19.27		
Uranus	I	2031-12-07T16:59:45.170		25.89	-20.41	25089.21		-9.89	-10.35
Uranus	E	2031-12-07T17:12:07.879		24.28	-18.49	25452.17		-4.65	-4.87
6	E	2031-12-07T17:30:14.437		21.77	-15.56	41879.71	19.23		
5	E	2031-12-07T17:30:33.461		21.73	-15.51	42246.02	19.29		
4	E	2031-12-07T17:30:48.242		21.69	-15.47	42530.40	19.36		
alpha	E	2031-12-07T17:32:40.212		21.42	-15.16	44724.34	19.80		
beta	E	2031-12-07T17:33:26.800		21.31	-15.03	45650.00	19.96		
eta	E	2031-12-07T17:34:42.809		21.12	-14.82	47176.12	20.19		
gamma	E	2031-12-07T17:35:04.845		21.07	-14.76	47621.84	20.26		
delta	E	2031-12-07T17:35:38.257		20.99	-14.66	48300.35	20.35		
lambda	E	2031-12-07T17:37:02.600		20.78	-14.43	50026.71	20.58		
epsilon	E	2031-12-07T17:37:55.942		20.65	-14.28	51127.91	20.80		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-07T17:05:40.370  
 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 : 3404402597359421568  
 2Mass ID (if available) : 05385950+2330056  
 ICRS Star Coord at Epoch: 05h 38m 59.51307s +23:30:05.49203s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 14.902  
 G magnitude : 18.591  
 RP magnitude : 17.529  
 BP magnitude : 19.706  
 DUPflag : 0  
 Distance (au) : 18.118  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.96  
 Sun-Target sep (deg) : 169.75  
 Sun-Moon sep (deg) : 86.53  
 B (ring opening deg) : 79.12  
 PA of pole (deg) : 41.42  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.826  
 C/A sky separation (km) : 24001.2  
 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\_itrff93\_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	2031-12-07T16:33:44.861		25.44	-21.11	51494.61	-20.77		
lambda	I	2031-12-07T16:34:55.989		25.32	-20.96	50026.71	-20.55		
delta	I	2031-12-07T16:36:20.477		25.18	-20.78	48300.35	-20.32		
gamma	I	2031-12-07T16:36:53.757		25.12	-20.70	47625.88	-20.22		
eta	I	2031-12-07T16:37:16.041		25.08	-20.66	47176.12	-20.15		
beta	I	2031-12-07T16:38:30.656		24.96	-20.49	45681.07	-19.90		
alpha	I	2031-12-07T16:39:17.756		24.88	-20.39	44746.35	-19.74		
4	I	2031-12-07T16:41:09.220		24.68	-20.14	42567.58	-19.29		
5	I	2031-12-07T16:41:31.127		24.64	-20.09	42156.71	-19.21		
6	I	2031-12-07T16:41:48.135		24.61	-20.06	41821.21	-19.15		
Uranus	I	2031-12-07T17:00:24.287		22.55	-17.48	25102.88		-9.74	-10.19
Uranus	E	2031-12-07T17:11:42.619		21.18	-15.84	25437.83		-4.95	-5.18
6	E	2031-12-07T17:30:14.288		18.79	-13.02	41879.70	19.11		
5	E	2031-12-07T17:30:33.393		18.74	-12.97	42245.40	19.17		
4	E	2031-12-07T17:30:48.281		18.71	-12.93	42530.25	19.25		
alpha	E	2031-12-07T17:32:40.874		18.46	-12.63	44724.58	19.71		
beta	E	2031-12-07T17:33:27.685		18.35	-12.51	45650.11	19.86		
eta	E	2031-12-07T17:34:44.038		18.18	-12.31	47176.12	20.11		
gamma	E	2031-12-07T17:35:06.170		18.12	-12.25	47621.82	20.17		
delta	E	2031-12-07T17:35:39.725		18.05	-12.16	48300.35	20.27		
lambda	E	2031-12-07T17:37:04.406		17.85	-11.94	50026.71	20.50		
epsilon	E	2031-12-07T17:37:58.067		17.73	-11.80	51130.34	20.72		