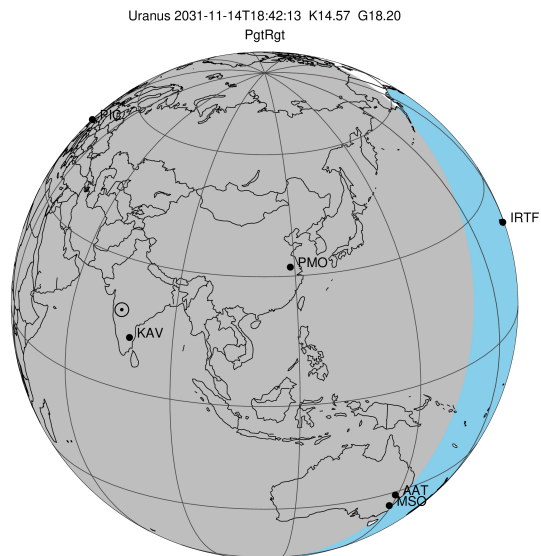


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T18:42:13.720
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3428371469808281856
 2Mass ID (if available) : 05424896+2331325

ICRS Star Coord at Epoch: 05h 42m 48.96877s +23:31:32.44549s

RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.570
 G magnitude : 18.204
 RP magnitude : 17.192
 BP magnitude : 19.272
 DUPflag : 0
 Distance (au) : 18.267
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.27
 Sun-Target sep (deg) : 145.68
 Sun-Moon sep (deg) : 144.35
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.95
 # a(km) ring

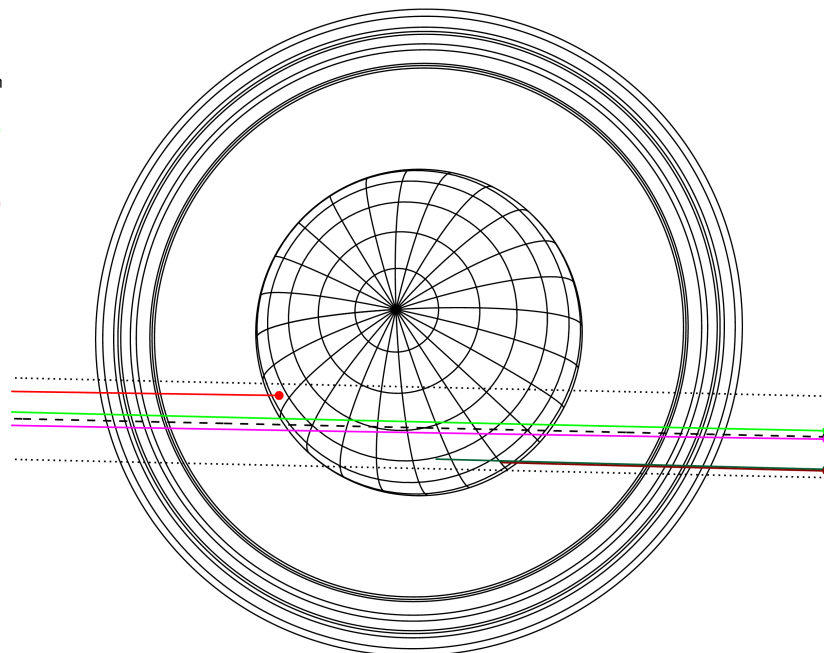
- 1 41837.2 6
- 2 42235.0 5
- 3 42571.2 4
- 4 44718.5 alpha
- 5 45661.1 beta
- 6 47176.1 eta
- 7 47626.3 gamma
- 8 48300.3 delta
- 9 50026.7 lambda
- 10 51149.4 epsilon



2031-11-14T18:42:13.7200 ex: 05 42 48.9688 s: +23 31 32.445 C/A 1.119° PA 358.71 deg v_sky -18.27 km/s D 18.27 AU
 Credit: Styled after SORA/Lucky Star

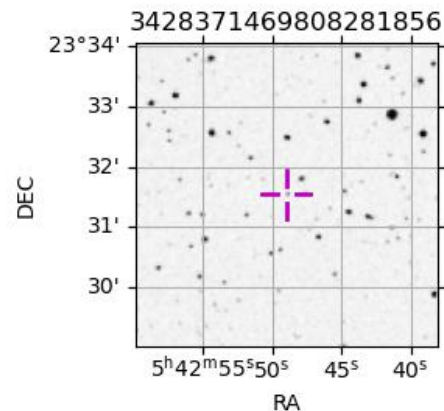
Uranus 2031-11-14T18:42:13 K14.57 G18.20 PgtRgt

Earth
 PIC
 PMO
 KAV
 AAT
 MSO

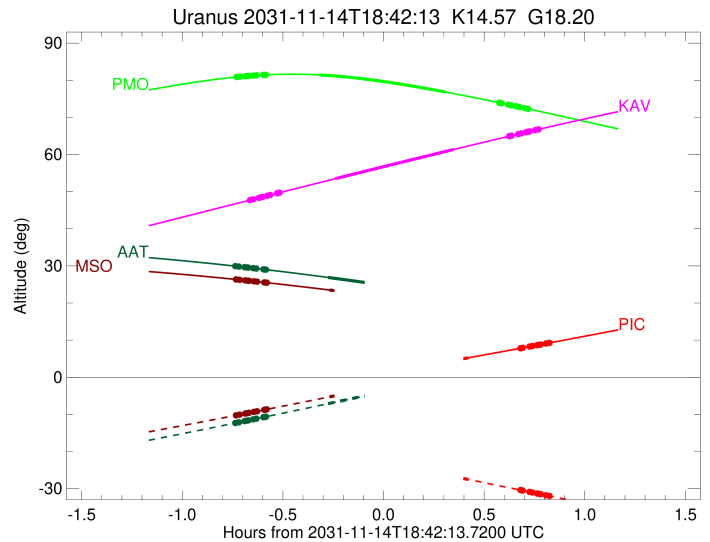
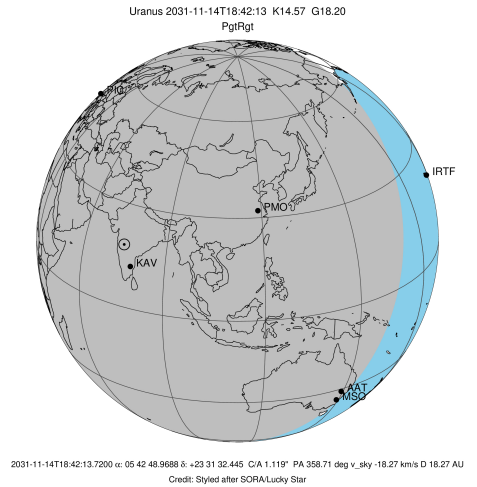


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1		+	+++++++	NOV 14 19:07 - NOV 14 19:31	PneRne
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++++	+	+++++++	NOV 14 17:58 - NOV 14 19:25	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	+++++++	+	+++++++	NOV 14 18:02 - NOV 14 19:28	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	+++++++	+		NOV 14 17:57 - NOV 14 18:25	PinRin
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++++	+		NOV 14 17:58 - NOV 14 18:26	PinRin

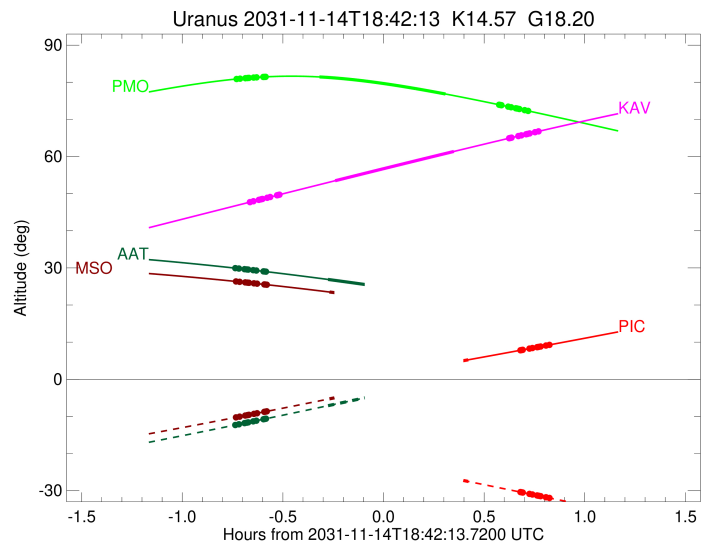
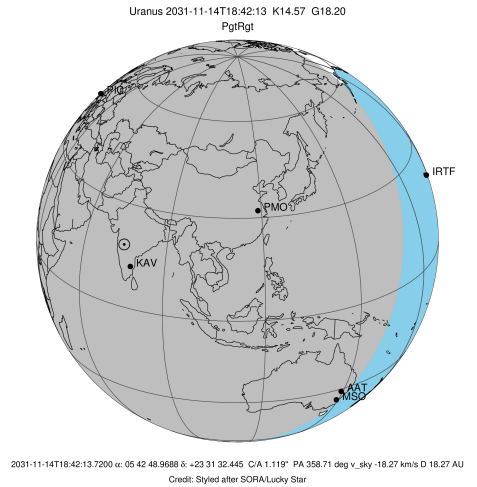


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T18:46:04.380
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3428371469808281856
 2Mass ID (if available) : 05424896+2331325
 ICRS Star Coord at Epoch: 05h 42m 48.96877s +23:31:32.44549s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.570
 G magnitude : 18.204
 RP magnitude : 17.192
 BP magnitude : 19.272
 DUPflag : 0
 Distance (au) : 18.267
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.27
 Sun-Target sep (deg) : 145.68
 Sun-Moon sep (deg) : 143.83
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.770
 C/A sky separation (km) : 10203.9
 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_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	2031-11-14T18:00:35.221	-5.06x	-15.32	51217.09	-17.92			
lambda	I	2031-11-14T18:01:41.798	-4.90x	-15.52	50026.71	-17.87			
delta	I	2031-11-14T18:03:18.470	-4.67x	-15.81	48300.35	-17.84			
gamma	I	2031-11-14T18:03:56.015	-4.58x	-15.92	47630.61	-17.83			
eta	I	2031-11-14T18:04:21.507	-4.52x	-16.00	47176.12	-17.82			
beta	I	2031-11-14T18:05:45.971	-4.32x	-16.25	45671.48	-17.80			
alpha	I	2031-11-14T18:06:39.947	-4.19x	-16.41	44709.63	-17.78			
4	I	2031-11-14T18:08:37.942	-3.90x	-16.77	42615.30	-17.73			
5	I	2031-11-14T18:08:59.256	-3.85x	-16.83	42242.53	-17.71			
6	I	2031-11-14T18:09:23.859	-3.79x	-16.91	41796.68	-17.70			
Uranus	I	2031-11-14T18:25:01.680	-1.46x	-19.75	25061.20	-10.79	-11.29		
Uranus	E	2031-11-14T19:07:29.716	5.24	-27.53	25476.20	4.33	4.53		
6	E	2031-11-14T19:23:04.315	7.81	-30.39	41866.87	17.82			
5	E	2031-11-14T19:23:22.132	7.86	-30.44	42190.52	17.83			
4	E	2031-11-14T19:23:41.333	7.92	-30.50	42527.34	17.84			
alpha	E	2031-11-14T19:25:45.141	8.26	-30.88	44741.07	17.90			
beta	E	2031-11-14T19:26:36.375	8.41	-31.04	45659.39	17.92			
eta	E	2031-11-14T19:28:00.906	8.64	-31.30	47176.12	17.96			
gamma	E	2031-11-14T19:28:25.679	8.71	-31.37	47621.04	17.96			
delta	E	2031-11-14T19:29:03.479	8.82	-31.49	48300.35	17.98			
lambda	E	2031-11-14T19:30:39.419	9.09	-31.78	50026.71	18.01			
epsilon	E	2031-11-14T19:31:46.660	9.28	-31.99	51238.42	18.06			

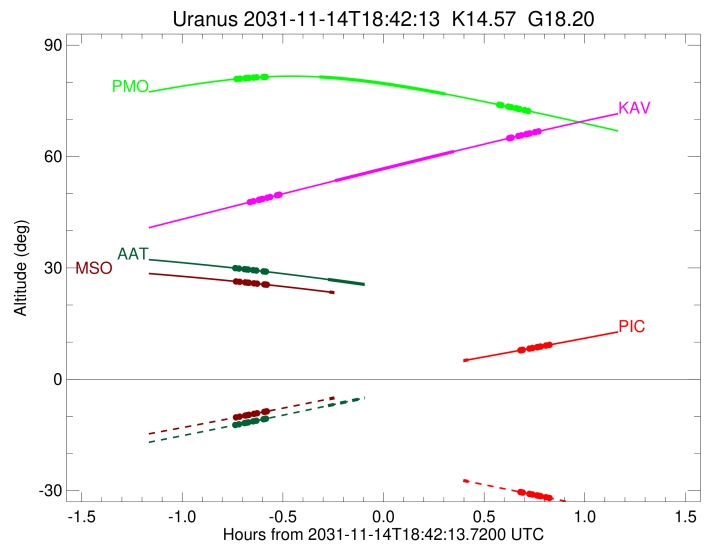
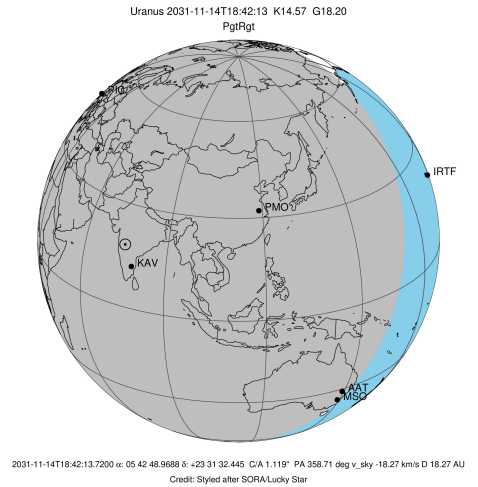
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T18:41:38.550
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 3428371469808281856
 2Mass ID (if available) : 05424896+2331325
 ICRS Star Coord at Epoch: 05h 42m 48.96877s +23:31:32.44549s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.570
 G magnitude : 18.204
 RP magnitude : 17.192
 BP magnitude : 19.272
 DUPflag : 0
 Distance (au) : 18.267
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.27
 Sun-Target sep (deg) : 145.68
 Sun-Moon sep (deg) : 144.99
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.056
 C/A sky separation (km) : 13986.9
 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_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	2031-11-14T17:58:21.076		80.88	-57.91	51250.06	-18.15		
lambda	I	2031-11-14T17:59:28.693		80.98	-57.68	50026.71	-18.07		
delta	I	2031-11-14T18:01:04.358		81.10	-57.36	48300.35	-18.02		
gamma	I	2031-11-14T18:01:41.572		81.15	-57.23	47630.32	-17.99		
eta	I	2031-11-14T18:02:06.827		81.18	-57.15	47176.12	-17.98		
beta	I	2031-11-14T18:03:30.566		81.27	-56.86	45673.04	-17.92		
alpha	I	2031-11-14T18:04:24.111		81.33	-56.68	44712.78	-17.88		
4	I	2031-11-14T18:06:21.896		81.43	-56.28	42614.02	-17.77		
5	I	2031-11-14T18:06:43.496		81.45	-56.21	42234.43	-17.75		
6	I	2031-11-14T18:07:07.648		81.47	-56.12	41795.60	-17.73		
Uranus	I	2031-11-14T18:23:06.879		81.44	-52.83	25012.17		-11.33	-11.86
Uranus	E	2031-11-14T19:00:43.496		76.84	-44.95	25529.31		2.58	2.71
6	E	2031-11-14T19:16:43.267		73.95	-41.56	41864.10	17.73		
5	E	2031-11-14T19:17:01.063		73.89	-41.50	42184.93	17.75		
4	E	2031-11-14T19:17:20.693		73.83	-41.43	42528.47	17.77		
alpha	E	2031-11-14T19:19:24.857		73.44	-40.99	44743.04	17.88		
beta	E	2031-11-14T19:20:16.113		73.28	-40.81	45660.97	17.92		
eta	E	2031-11-14T19:21:40.508		73.01	-40.51	47176.12	17.98		
gamma	E	2031-11-14T19:22:05.240		72.93	-40.43	47620.99	18.00		
delta	E	2031-11-14T19:22:42.967		72.81	-40.29	48300.35	18.02		
lambda	E	2031-11-14T19:24:18.618		72.50	-39.96	50026.71	18.08		
epsilon	E	2031-11-14T19:25:27.063		72.27	-39.71	51265.26	18.15		

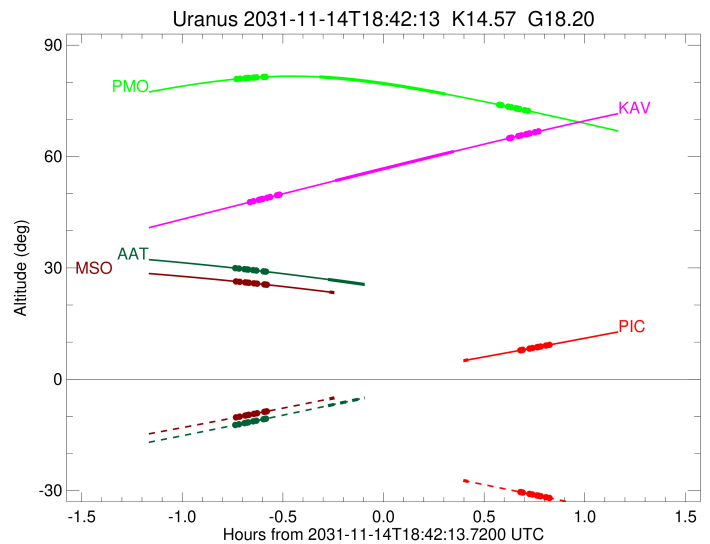
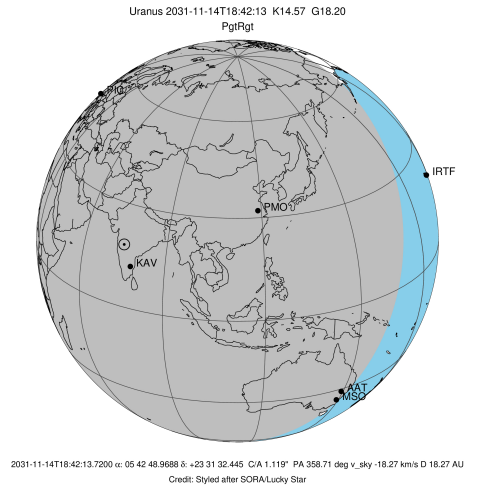
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T18:45:12.310
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 3428371469808281856
 2Mass ID (if available) : 05424896+2331325
 ICRS Star Coord at Epoch: 05h 42m 48.96877s +23:31:32.44549s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.570
 G magnitude : 18.204
 RP magnitude : 17.192
 BP magnitude : 19.272
 DUPflag : 0
 Distance (au) : 18.267
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.27
 Sun-Target sep (deg) : 145.68
 Sun-Moon sep (deg) : 144.39
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.184
 C/A sky separation (km) : 15687.3
 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

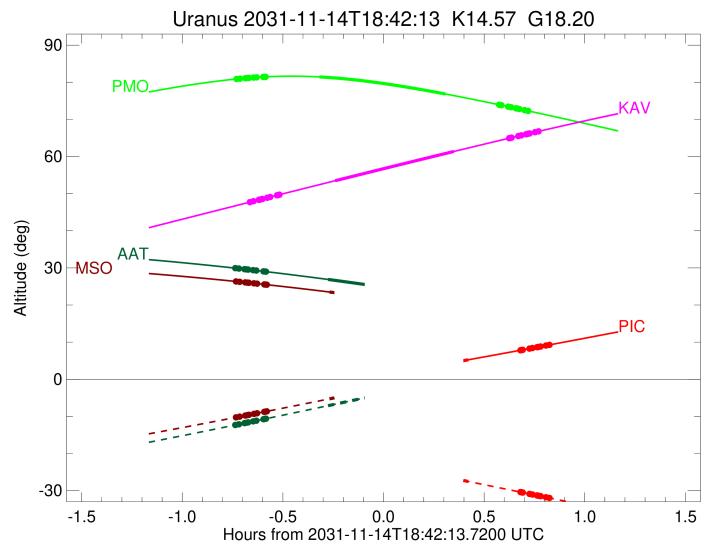
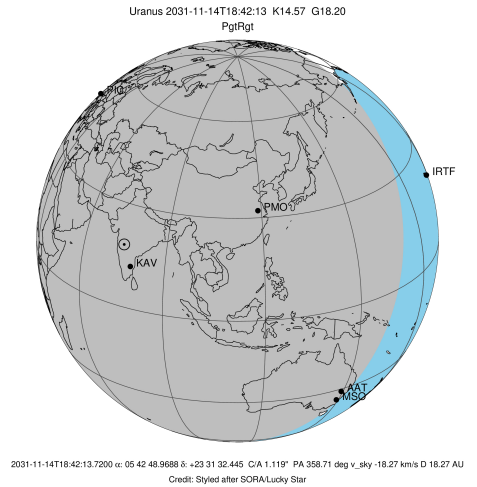
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-14T18:02:18.584		47.70	-81.32	51261.43	-17.90		
lambda	I	2031-11-14T18:03:27.824		47.96	-81.52	50026.71	-17.81		
delta	I	2031-11-14T18:05:04.948		48.33	-81.80	48300.35	-17.74		
gamma	I	2031-11-14T18:05:42.758		48.47	-81.91	47630.20	-17.71		
eta	I	2031-11-14T18:06:08.414		48.57	-81.98	47176.12	-17.69		
beta	I	2031-11-14T18:07:33.521		48.89	-82.21	45673.58	-17.62		
alpha	I	2031-11-14T18:08:27.962		49.10	-82.36	44713.95	-17.57		
4	I	2031-11-14T18:10:28.042		49.56	-82.66	42613.43	-17.43		
5	I	2031-11-14T18:10:50.181		49.64	-82.71	42231.42	-17.40		
6	I	2031-11-14T18:11:14.654		49.73	-82.77	41795.31	-17.38		
Uranus	I	2031-11-14T18:27:47.505		53.48	-84.18	25001.10		-11.45	-11.98
Uranus	E	2031-11-14T19:03:13.222		61.37	-79.93	25547.60		1.60	1.68
6	E	2031-11-14T19:19:42.755		64.94	-76.49	41862.42	17.46		
5	E	2031-11-14T19:20:00.776		65.00	-76.42	42181.88	17.48		
4	E	2031-11-14T19:20:20.896		65.07	-76.35	42529.25	17.52		
alpha	E	2031-11-14T19:22:26.775		65.52	-75.89	44744.11	17.66		
beta	E	2031-11-14T19:23:18.661		65.70	-75.70	45661.89	17.71		
eta	E	2031-11-14T19:24:43.973		66.00	-75.39	47176.12	17.78		
gamma	E	2031-11-14T19:25:08.972		66.09	-75.29	47620.97	17.81		
delta	E	2031-11-14T19:25:47.093		66.22	-75.15	48300.35	17.84		
lambda	E	2031-11-14T19:27:23.670		66.56	-74.80	50026.71	17.91		
epsilon	E	2031-11-14T19:28:33.607		66.80	-74.54	51281.19	18.01		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T18:39:26.520
 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 : 3428371469808281856
 2Mass ID (if available) : 05424896+2331325
 ICRS Star Coord at Epoch: 05h 42m 48.96877s +23:31:32.44549s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.570
 G magnitude : 18.204
 RP magnitude : 17.192
 BP magnitude : 19.272
 DUPflag : 0
 Distance (au) : 18.267
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.27
 Sun-Target sep (deg) : 145.68
 Sun-Moon sep (deg) : 144.97
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.491
 C/A sky separation (km) : 19749.4
 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_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	2031-11-14T17:57:54.536		29.95	-12.35	51298.16	-17.38		
lambda	I	2031-11-14T17:59:08.086		29.83	-12.12	50026.71	-17.25		
delta	I	2031-11-14T18:00:48.532		29.66	-11.81	48300.35	-17.13		
gamma	I	2031-11-14T18:01:27.742		29.59	-11.69	47629.82	-17.07		
eta	I	2031-11-14T18:01:54.340		29.54	-11.61	47176.12	-17.04		
beta	I	2031-11-14T18:03:22.735		29.39	-11.33	45675.21	-16.92		
alpha	I	2031-11-14T18:04:19.357		29.29	-11.16	44717.68	-16.83		
4	I	2031-11-14T18:06:25.427		29.07	-10.77	42611.22	-16.61		
5	I	2031-11-14T18:06:49.034		29.03	-10.69	42222.04	-16.55		
6	I	2031-11-14T18:07:14.242		28.99	-10.61	41794.79	-16.52		
Uranus	I	2031-11-14T18:25:41.077		26.89	-7.12	25008.89		-11.37	-11.89
Uranus	E	2031-11-14T18:53:59.664		23.23	-1.60x	25556.05		-0.81	-0.85
6	E	2031-11-14T19:12:28.010		20.59	2.08x	41858.92	16.47		
5	E	2031-11-14T19:12:47.046		20.55	2.14x	42176.29	16.51		
4	E	2031-11-14T19:13:08.738		20.49	2.22x	42531.08	16.56		
alpha	E	2031-11-14T19:15:21.545		20.16	2.66x	44746.00	16.78		
beta	E	2031-11-14T19:16:16.084		20.03	2.84x	45663.64	16.86		
eta	E	2031-11-14T19:17:45.435		19.80	3.15x	47176.12	16.99		
gamma	E	2031-11-14T19:18:11.599		19.74	3.23x	47620.96	17.02		
delta	E	2031-11-14T19:18:51.458		19.64	3.37x	48300.35	17.07		
lambda	E	2031-11-14T19:20:32.243		19.38	3.71x	50026.71	17.19		
epsilon	E	2031-11-14T19:21:46.717		19.19	3.96x	51309.67	17.32		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T18:39:34.730
 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 : 3428371469808281856
 2Mass ID (if available) : 05424896+2331325
 ICRS Star Coord at Epoch: 05h 42m 48.96877s +23:31:32.44549s
 RUWE (>1.4 is poor) : 0.99
 K magnitude : 14.570
 G magnitude : 18.204
 RP magnitude : 17.192
 BP magnitude : 19.272
 DUPflag : 0
 Distance (au) : 18.267
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.27
 Sun-Target sep (deg) : 145.68
 Sun-Moon sep (deg) : 144.92
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.510
 C/A sky separation (km) : 20011.2
 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	2031-11-14T17:58:06.857		26.36	-10.28	51300.21	-17.33		
lambda	I	2031-11-14T17:59:20.770		26.25	-10.07	50026.71	-17.19		
delta	I	2031-11-14T18:01:01.567		26.09	-9.77	48300.35	-17.06		
gamma	I	2031-11-14T18:01:40.923		26.03	-9.66	47629.79	-17.01		
eta	I	2031-11-14T18:02:07.619		25.99	-9.58	47176.12	-16.98		
beta	I	2031-11-14T18:03:36.353		25.85	-9.32	45675.30	-16.85		
alpha	I	2031-11-14T18:04:33.199		25.75	-9.15	44717.90	-16.76		
4	I	2031-11-14T18:06:39.847		25.55	-8.78	42611.07	-16.53		
5	I	2031-11-14T18:07:03.583		25.51	-8.71	42221.49	-16.48		
6	I	2031-11-14T18:07:28.880		25.47	-8.63	41794.78	-16.44		
Uranus	I	2031-11-14T18:26:06.848		23.51	-5.28	25011.78		-11.34	-11.86
Uranus	E	2031-11-14T18:53:50.934		20.17	-0.12x	25554.53		-1.00	-1.05
6	E	2031-11-14T19:12:30.228		17.67	3.43x	41858.65	16.40		
5	E	2031-11-14T19:12:49.348		17.63	3.49x	42175.89	16.43		
4	E	2031-11-14T19:13:11.168		17.58	3.56x	42531.24	16.49		
alpha	E	2031-11-14T19:15:24.535		17.27	3.99x	44746.14	16.72		
beta	E	2031-11-14T19:16:19.288		17.14	4.16x	45663.78	16.80		
eta	E	2031-11-14T19:17:48.963		16.93	4.45x	47176.12	16.92		
gamma	E	2031-11-14T19:18:15.219		16.87	4.54x	47620.96	16.96		
delta	E	2031-11-14T19:18:55.217		16.77	4.67x	48300.35	17.01		
lambda	E	2031-11-14T19:20:36.334		16.53	4.99x	50026.71	17.13		
epsilon	E	2031-11-14T19:21:51.167		16.36	5.23x	51311.85	17.27		