

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-11-07T20:11:29.590
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3418299844516075776
 2Mass ID (if available) : 05044826+2251277

Uranus 2029-11-07T20:11:29 K14.65 G16.70 PgtRgt

ICRS Star Coord at Epoch: 05h 04m 48.26491s +22:51:27.63930s

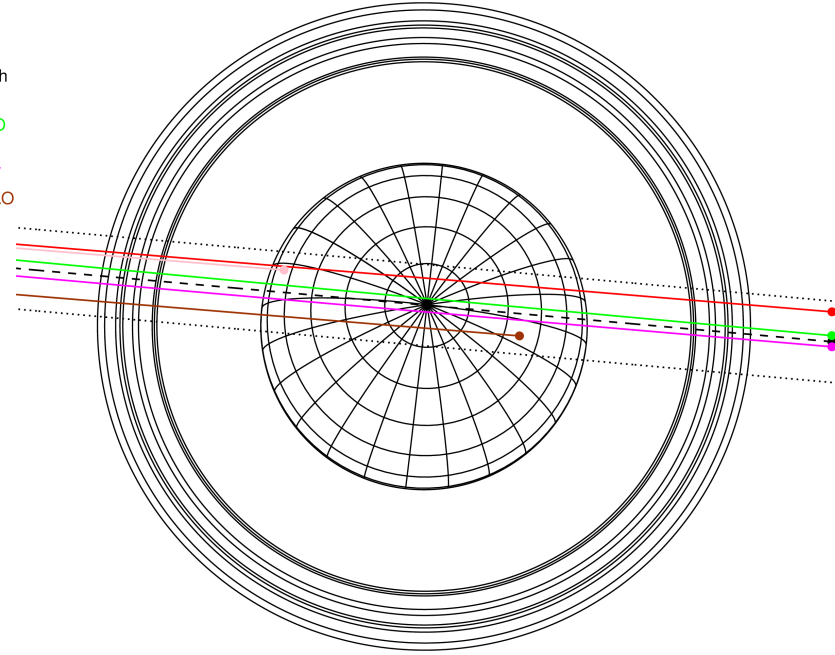
RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.648
 G magnitude : 16.695
 RP magnitude : 16.009
 BP magnitude : 17.235
 DUPflag : 0
 Distance (au) : 18.383
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.94
 Sun-Target sep (deg) : 147.99
 Sun-Moon sep (deg) : 171.32
 B (ring opening deg) : 82.25
 PA of pole (deg) : -7.97

Uranus 2029-11-07T20:11:29 K14.65 G16.70
 PgtRgt



2029-11-07T20:11:29.5900 ra: 05 04 48.2649 s: +22 51 27.639 C/A 0.2577 PA 174.87 deg v_sky -18.94 km/s D 18.38 AU
 Credit: Styled after SORA/Lucky Star

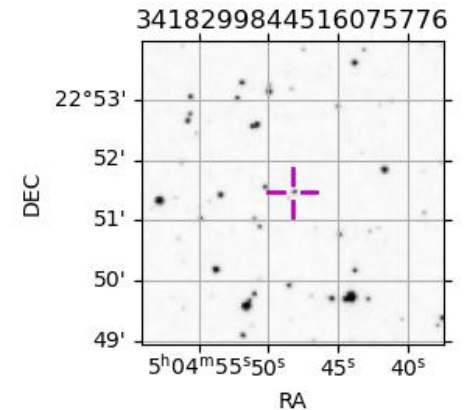
Earth
 PIC
 PMO
 TEN
 KAV
 SAAO



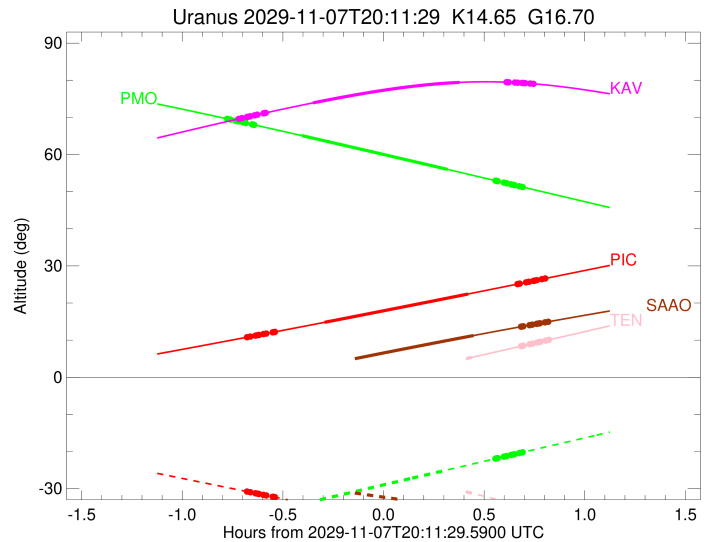
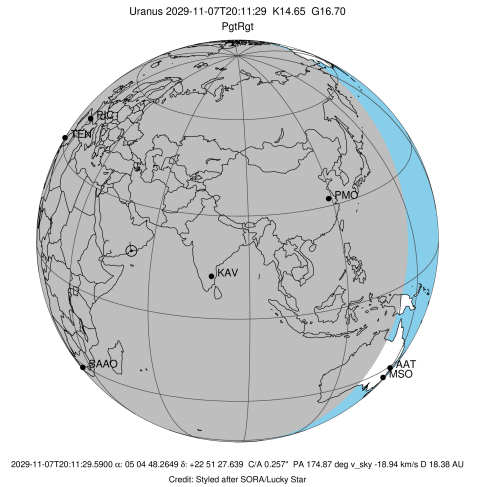
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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	+++++	+ +	+++++	NOV 07 19:30 - NOV 07 20:59	PieRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+ +	+++++	NOV 07 19:24 - NOV 07 20:52	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		+	+++++	NOV 07 20:37 - NOV 07 21:00	PneRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	NOV 07 19:28 - NOV 07 20:55	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					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8		+	+++++	NOV 07 20:38 - NOV 07 21:00	PneRne
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

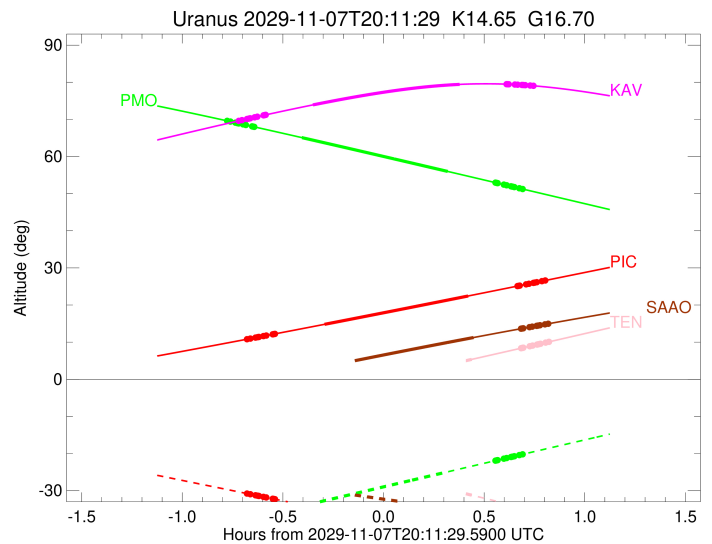
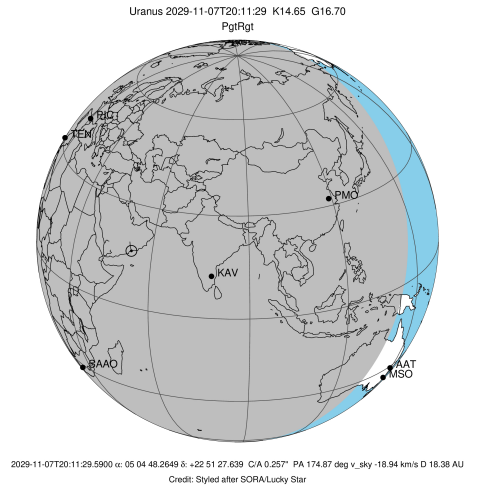


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-11-07T20:15:20.190
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3418299844516075776
 2Mass ID (if available) : 05044826+2251277
 ICRS Star Coord at Epoch: 05h 04m 48.26491s +22:51:27.63930s
 RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.648
 G magnitude : 16.695
 RP magnitude : 16.009
 BP magnitude : 17.235
 DUPflag : 0
 Distance (au) : 18.383
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.94
 Sun-Target sep (deg) : 147.99
 Sun-Moon sep (deg) : 170.57
 B (ring opening deg) : 82.25
 PA of pole (deg) : -7.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.568
 C/A sky separation (km) : 7573.7
 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	2029-11-07T19:30:28.604		10.73	-30.73	51517.32	-18.66		
lambda	I	2029-11-07T19:31:48.473		10.96	-30.97	50026.71	-18.66		
delta	I	2029-11-07T19:33:21.036		11.23	-31.25	48300.35	-18.64		
gamma	I	2029-11-07T19:33:57.470		11.33	-31.36	47621.19	-18.64		
eta	I	2029-11-07T19:34:21.354		11.40	-31.44	47176.12	-18.63		
beta	I	2029-11-07T19:35:43.494		11.64	-31.69	45646.16	-18.62		
alpha	I	2029-11-07T19:36:32.448		11.78	-31.84	44734.77	-18.61		
4	I	2029-11-07T19:38:30.187		12.12	-32.19	42544.99	-18.58		
5	I	2029-11-07T19:38:48.369		12.17	-32.25	42209.10	-18.57		
6	I	2029-11-07T19:39:08.547		12.23	-32.31	41831.66	-18.57		
Uranus	I	2029-11-07T19:53:55.309		14.80	-34.99	25486.21		2.71	2.84
Uranus	E	2029-11-07T20:36:44.717		22.44	-42.61	25524.09		1.87	1.96
6	E	2029-11-07T20:51:25.348		25.10	-45.13	41827.14	18.69		
5	E	2029-11-07T20:51:47.060		25.16	-45.20	42231.75	18.69		
4	E	2029-11-07T20:52:05.773		25.22	-45.25	42582.57	18.70		
alpha	E	2029-11-07T20:53:59.605		25.57	-45.57	44713.26	18.74		
beta	E	2029-11-07T20:54:50.703		25.72	-45.71	45670.82	18.75		
eta	E	2029-11-07T20:56:10.948		25.96	-45.94	47176.12	18.77		
gamma	E	2029-11-07T20:56:35.211		26.04	-46.01	47631.57	18.77		
delta	E	2029-11-07T20:57:10.825		26.15	-46.11	48300.35	18.78		
lambda	E	2029-11-07T20:58:42.692		26.43	-46.37	50026.71	18.80		
epsilon	E	2029-11-07T20:59:20.991		26.54	-46.47	50746.95	18.81		

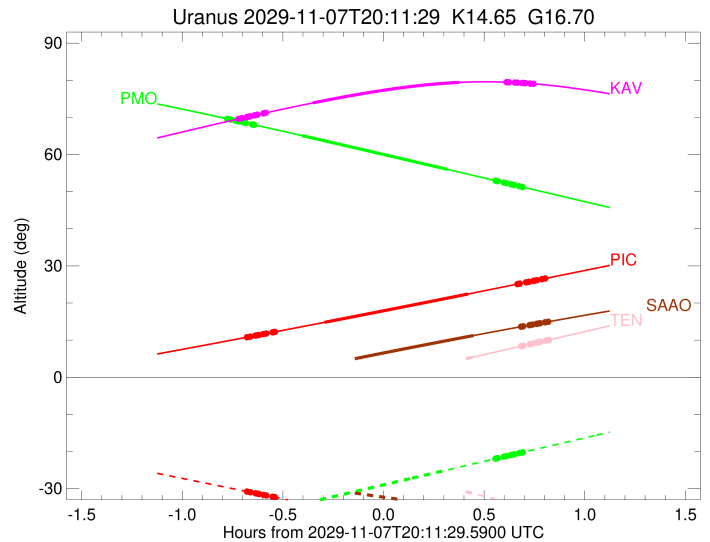
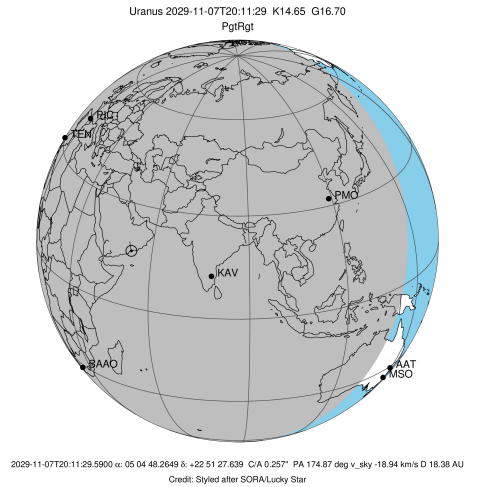
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-11-07T20:08:53.430
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 3418299844516075776
 2Mass ID (if available) : 05044826+2251277
 ICRS Star Coord at Epoch: 05h 04m 48.26491s +22:51:27.63930s
 RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.648
 G magnitude : 16.695
 RP magnitude : 16.009
 BP magnitude : 17.235
 DUPflag : 0
 Distance (au) : 18.383
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.94
 Sun-Target sep (deg) : 147.99
 Sun-Moon sep (deg) : 171.87
 B (ring opening deg) : 82.25
 PA of pole (deg) : -7.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.331
 C/A sky separation (km) : 4407.8
 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



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

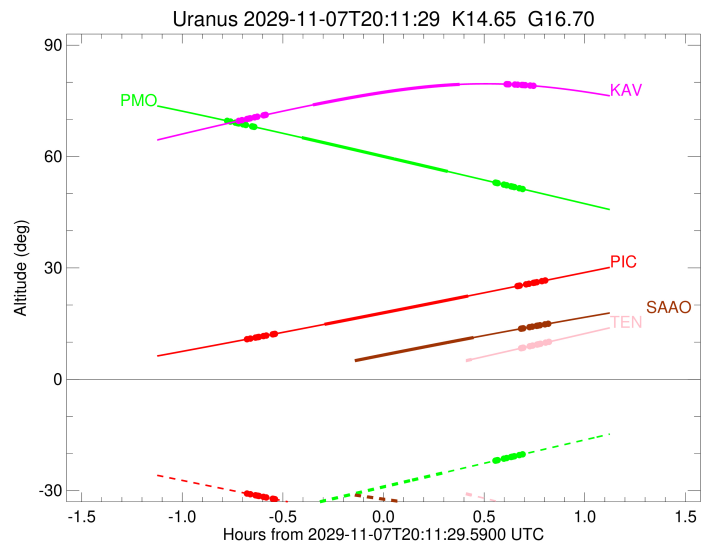
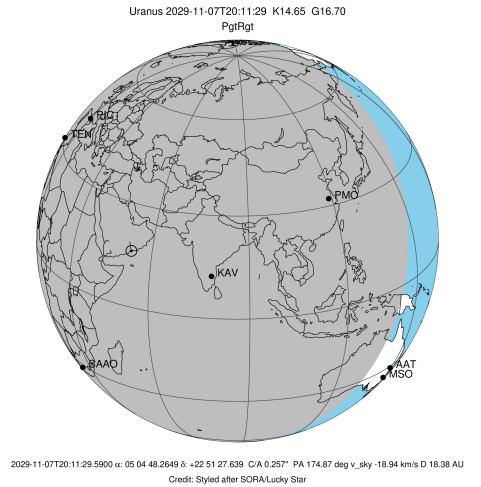
Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-11-07T19:24:33.810	69.67	-38.93	51528.68	-19.22		
lambda	I	2029-11-07T19:25:51.932	69.42	-38.66	50026.71	-19.22		
delta	I	2029-11-07T19:27:21.753	69.12	-38.34	48300.35	-19.22		
gamma	I	2029-11-07T19:27:57.103	69.00	-38.22	47621.09	-19.21		
eta	I	2029-11-07T19:28:20.263	68.92	-38.13	47176.12	-19.21		
beta	I	2029-11-07T19:29:39.853	68.66	-37.85	45647.27	-19.20		
alpha	I	2029-11-07T19:30:27.491	68.50	-37.68	44732.31	-19.20		
4	I	2029-11-07T19:32:21.260	68.11	-37.28	42548.22	-19.19		
5	I	2029-11-07T19:32:38.653	68.06	-37.22	42215.67	-19.18		
6	I	2029-11-07T19:32:58.391	67.99	-37.15	41835.30	-19.18		
Uranus	I	2029-11-07T19:47:09.743	65.09	-34.14	25530.57		1.69	1.77
Uranus	E	2029-11-07T20:30:39.080	55.99	-24.93	25549.44		0.98	1.03
6	E	2029-11-07T20:44:51.166	52.97	-21.93	41829.93	19.14		
5	E	2029-11-07T20:45:12.471	52.90	-21.85	42237.07	19.14		
4	E	2029-11-07T20:45:30.649	52.83	-21.79	42585.43	19.14		
alpha	E	2029-11-07T20:47:21.683	52.44	-21.40	44711.20	19.15		
beta	E	2029-11-07T20:48:11.845	52.26	-21.22	45671.87	19.15		
eta	E	2029-11-07T20:49:30.370	51.98	-20.95	47176.12	19.16		
gamma	E	2029-11-07T20:49:54.142	51.90	-20.86	47631.58	19.16		
delta	E	2029-11-07T20:50:29.044	51.78	-20.74	48300.35	19.16		
lambda	E	2029-11-07T20:51:59.124	51.46	-20.42	50026.71	19.17		
epsilon	E	2029-11-07T20:52:36.873	51.32	-20.29	50750.27	19.17		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-11-07T20:16:07.300
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : TEN
 Location : Teide Obs./Tenerife
 Latitude (deg) : 28.30050
 E. Longitude (deg) : 343.48909
 Altitude (km) : 2.395
 Gaia source ID : 3418299844516075776
 2Mass ID (if available) : 05044826+2251277
 ICRS Star Coord at Epoch: 05h 04m 48.26491s +22:51:27.63930s
 RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.648
 G magnitude : 16.695
 RP magnitude : 16.009
 BP magnitude : 17.235
 DUPflag : 0
 Distance (au) : 18.383
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.94
 Sun-Target sep (deg) : 147.99
 Sun-Moon sep (deg) : 170.41
 B (ring opening deg) : 82.25
 PA of pole (deg) : -7.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.527
 C/A sky separation (km) : 7029.2
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



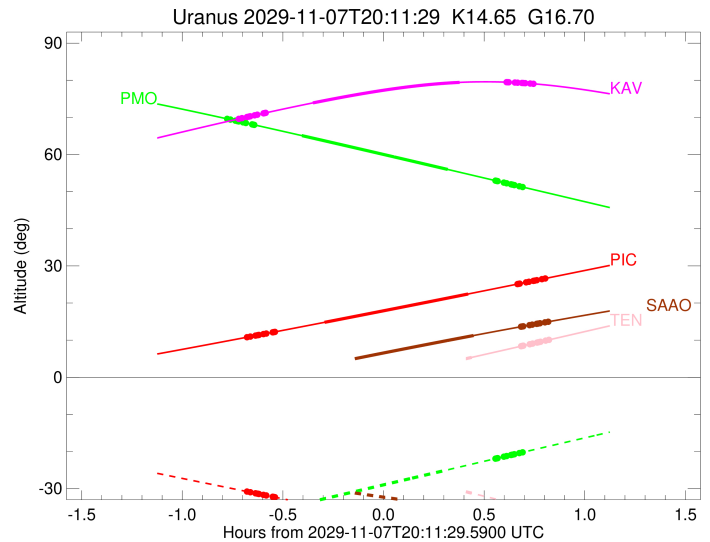
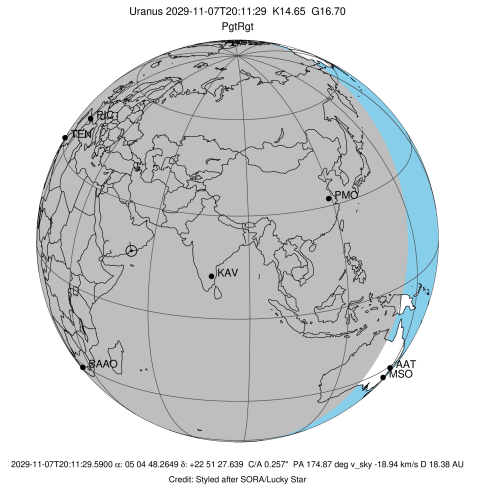
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-11-07T19:30:54.323	-7.80x	-16.58	51519.07	-18.57			
lambda	I	2029-11-07T19:32:14.682	-7.55x	-16.87	50026.71	-18.57			
delta	I	2029-11-07T19:33:47.692	-7.26x	-17.21	48300.35	-18.56			
gamma	I	2029-11-07T19:34:24.300	-7.14x	-17.34	47621.18	-18.55			
eta	I	2029-11-07T19:34:48.294	-7.06x	-17.43	47176.12	-18.55			
beta	I	2029-11-07T19:36:10.804	-6.80x	-17.73	45646.32	-18.53			
alpha	I	2029-11-07T19:37:00.004	-6.65x	-17.91	44734.42	-18.53			
4	I	2029-11-07T19:38:58.207	-6.27x	-18.33	42545.46	-18.50			
5	I	2029-11-07T19:39:16.432	-6.21x	-18.40	42210.06	-18.49			
6	I	2029-11-07T19:39:36.725	-6.15x	-18.47	41832.20	-18.49			
Uranus	I	2029-11-07T19:54:25.376	-3.29x	-21.70	25494.42			2.55	2.67
Uranus	E	2029-11-07T20:37:48.300	5.36	-31.23	25530.29			1.70	1.78
6	E	2029-11-07T20:52:30.041	8.36	-34.46	41827.73	18.63			
5	E	2029-11-07T20:52:51.841	8.44	-34.54	42232.89	18.63			
4	E	2029-11-07T20:53:10.589	8.50	-34.61	42583.19	18.64			
alpha	E	2029-11-07T20:55:04.726	8.89	-35.03	44712.81	18.68			
beta	E	2029-11-07T20:55:56.029	9.07	-35.22	45671.05	18.69			
eta	E	2029-11-07T20:57:16.535	9.35	-35.52	47176.12	18.70			
gamma	E	2029-11-07T20:57:40.883	9.43	-35.61	47631.58	18.71			
delta	E	2029-11-07T20:58:16.622	9.55	-35.74	48300.35	18.72			
lambda	E	2029-11-07T20:59:48.817	9.87	-36.08	50026.71	18.73			
epsilon	E	2029-11-07T21:00:27.291	10.00	-36.22	50747.60	18.74			

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-11-07T20:12:17.520
 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 : 3418299844516075776
 2Mass ID (if available) : 05044826+2251277
 ICRS Star Coord at Epoch: 05h 04m 48.26491s +22:51:27.63930s
 RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.648
 G magnitude : 16.695
 RP magnitude : 16.009
 BP magnitude : 17.235
 DUPflag : 0
 Distance (au) : 18.383
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.94
 Sun-Target sep (deg) : 147.99
 Sun-Moon sep (deg) : 171.35
 B (ring opening deg) : 82.25
 PA of pole (deg) : -7.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.172
 C/A sky separation (km) : 2290.8
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-11-07T19:28:01.139		69.54	-75.02	51533.63	-19.33		
lambda	I	2029-11-07T19:29:19.085		69.81	-74.72	50026.71	-19.33		
delta	I	2029-11-07T19:30:48.385		70.11	-74.37	48300.35	-19.33		
gamma	I	2029-11-07T19:31:23.524		70.23	-74.23	47621.05	-19.33		
eta	I	2029-11-07T19:31:46.540		70.31	-74.14	47176.12	-19.33		
beta	I	2029-11-07T19:33:05.595		70.57	-73.84	45647.88	-19.33		
alpha	I	2029-11-07T19:33:53.023		70.73	-73.65	44731.00	-19.33		
4	I	2029-11-07T19:35:45.850		71.11	-73.21	42549.98	-19.33		
5	I	2029-11-07T19:36:03.008		71.16	-73.14	42219.19	-19.33		
6	I	2029-11-07T19:36:22.710		71.23	-73.07	41837.23	-19.33		
Uranus	I	2029-11-07T19:50:24.731		73.90	-69.75	25546.97		1.10	1.15
Uranus	E	2029-11-07T20:34:10.125		79.43	-59.33	25558.15		0.29	0.31
6	E	2029-11-07T20:48:10.225		79.49	-55.97	41832.32	19.36		
5	E	2029-11-07T20:48:31.362		79.48	-55.89	42241.59	19.36		
4	E	2029-11-07T20:48:49.241		79.47	-55.82	42587.82	19.36		
alpha	E	2029-11-07T20:50:38.788		79.39	-55.38	44709.44	19.37		
beta	E	2029-11-07T20:51:28.521		79.35	-55.18	45672.74	19.37		
eta	E	2029-11-07T20:52:46.128		79.28	-54.87	47176.12	19.37		
gamma	E	2029-11-07T20:53:09.637		79.26	-54.78	47631.56	19.37		
delta	E	2029-11-07T20:53:44.157		79.22	-54.64	48300.35	19.37		
lambda	E	2029-11-07T20:55:13.259		79.13	-54.29	50026.71	19.38		
epsilon	E	2029-11-07T20:55:50.804		79.08	-54.14	50754.23	19.38		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-11-07T20:16:03.960
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : SAAO
 Location : So. Afr. Astro. Obs. (Sutherland)
 Latitude (deg) : -32.37953
 E. Longitude (deg) : 20.81070
 Altitude (km) : 1.768
 Gaia source ID : 3418299844516075776
 2Mass ID (if available) : 05044826+2251277
 ICRS Star Coord at Epoch: 05h 04m 48.26491s +22:51:27.63930s
 RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.648
 G magnitude : 16.695
 RP magnitude : 16.009
 BP magnitude : 17.235
 DUPflag : 0
 Distance (au) : 18.383
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.94
 Sun-Target sep (deg) : 147.99
 Sun-Moon sep (deg) : 170.59
 B (ring opening deg) : 82.25
 PA of pole (deg) : -7.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.019
 C/A sky separation (km) : 248.3
 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_itrf93_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	2029-11-07T19:31:00.432	-0.93x	-26.60	51539.24	-19.01		
lambda	I	2029-11-07T19:32:19.985	-0.68x	-26.80	50026.71	-19.01		
delta	I	2029-11-07T19:33:50.774	-0.39x	-27.03	48300.35	-19.02		
gamma	I	2029-11-07T19:34:26.497	-0.28x	-27.12	47621.00	-19.02		
eta	I	2029-11-07T19:34:49.891	-0.21x	-27.18	47176.12	-19.02		
beta	I	2029-11-07T19:36:10.202	0.05x	-27.38	45648.68	-19.02		
alpha	I	2029-11-07T19:36:58.535	0.20x	-27.50	44729.30	-19.02		
4	I	2029-11-07T19:38:52.976	0.56x	-27.78	42552.25	-19.02		
5	I	2029-11-07T19:39:10.270	0.61x	-27.82	42223.66	-19.02		
6	I	2029-11-07T19:39:30.425	0.67x	-27.87	41839.66	-19.02		
Uranus	I	2029-11-07T19:53:44.424	3.32x	-29.92	25557.65		0.37	0.39
Uranus	E	2029-11-07T20:38:20.665	11.24	-35.46	25556.34		-0.52	-0.54
6	E	2029-11-07T20:52:29.861	13.62	-36.89	41835.14	19.15		
5	E	2029-11-07T20:52:51.321	13.68	-36.92	42246.84	19.15		
4	E	2029-11-07T20:53:09.291	13.73	-36.95	42590.54	19.15		
alpha	E	2029-11-07T20:54:59.791	14.04	-37.12	44707.41	19.16		
beta	E	2029-11-07T20:55:50.224	14.17	-37.20	45673.73	19.16		
eta	E	2029-11-07T20:57:08.632	14.39	-37.32	47176.12	19.16		
gamma	E	2029-11-07T20:57:32.398	14.45	-37.36	47631.52	19.16		
delta	E	2029-11-07T20:58:07.298	14.55	-37.41	48300.35	19.16		
lambda	E	2029-11-07T20:59:37.374	14.79	-37.54	50026.71	19.17		
epsilon	E	2029-11-07T21:00:15.630	14.90	-37.60	50759.97	19.17		