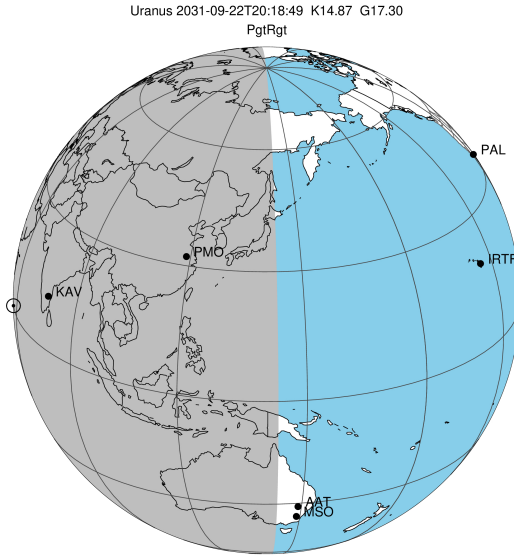


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-22T20:18:49.860
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427633353915848320
 2Mass ID (if available) : 05455482+2331505

Uranus 2031-09-22T20:18:49 K14.87 G17.30 PgtRgt

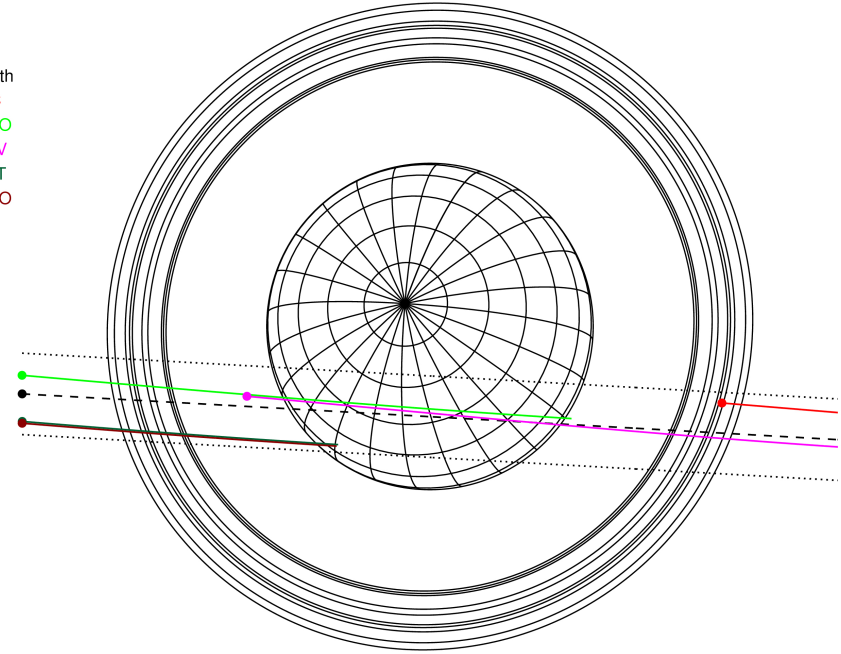
ICRS Star Coord at Epoch: 05h 45m 54.82252s +23:31:50.52015s

RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.872
 G magnitude : 17.300
 RP magnitude : 16.540
 BP magnitude : 17.918
 DUPflag : 0
 Distance (au) : 19.034
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 5.08
 Sun-Target sep (deg) : 92.42
 Sun-Moon sep (deg) : 166.56
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.60



2031-09-22T20:18:49.8600 ra: 05 45 54.8225 s: +23 31 50.520 C/A 1.020° PA 356.79 deg v_sky + 5.07 km/s D 19.03 AU
 Credit: Styled after SORA/Lucky Star

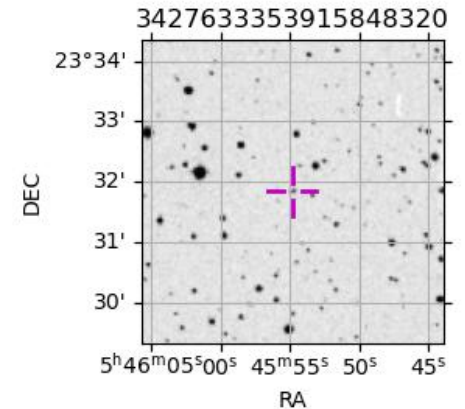
Earth
 PIC
 PMO
 KAV
 AAT
 MSO



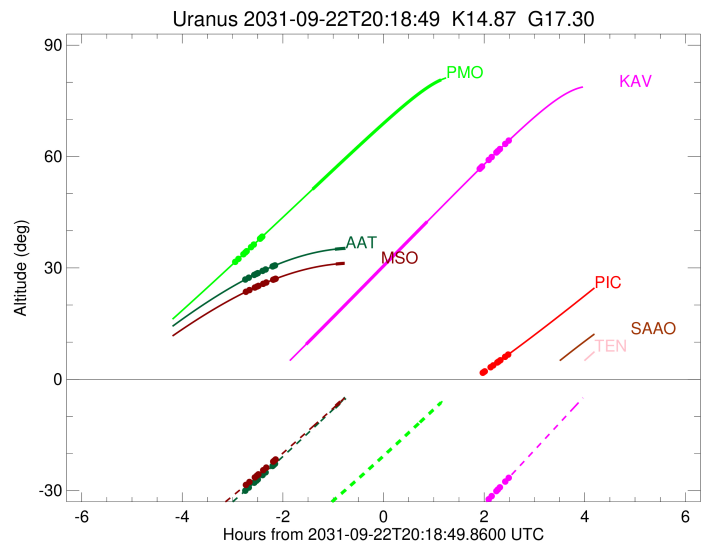
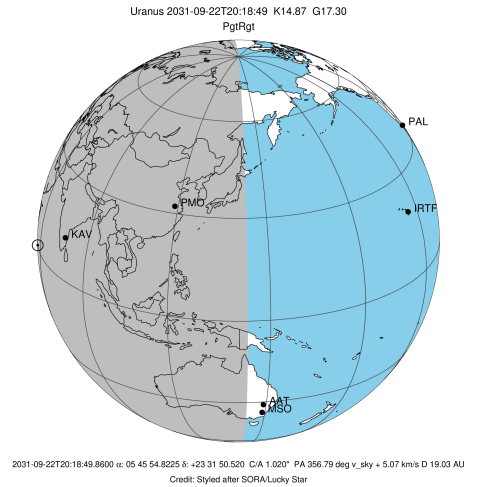
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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			+++	SEP 22 22:38 - SEP 22 22:46	PnnRne
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+ +		SEP 22 17:20 - SEP 22 21:27	PieRin
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		+ +	+++++	SEP 22 18:46 - SEP 22 22:46	PieRne
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	+++++	+		SEP 22 17:32 - SEP 22 19:20	PinRin
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+		SEP 22 17:33 - SEP 22 19:21	PinRin

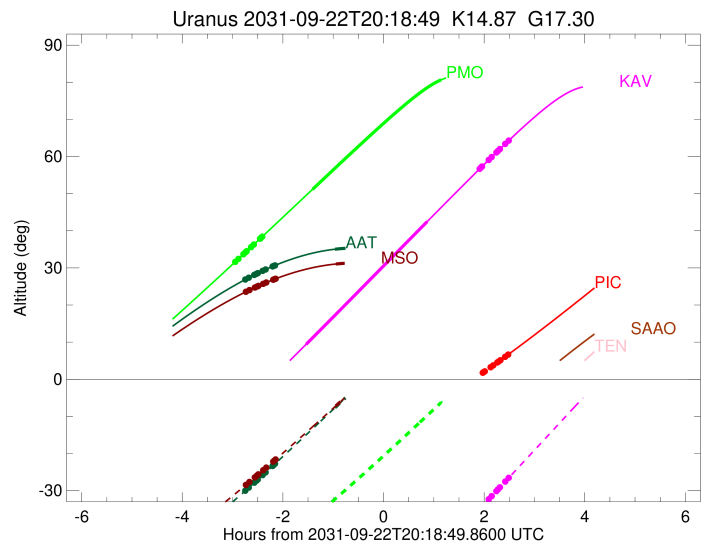
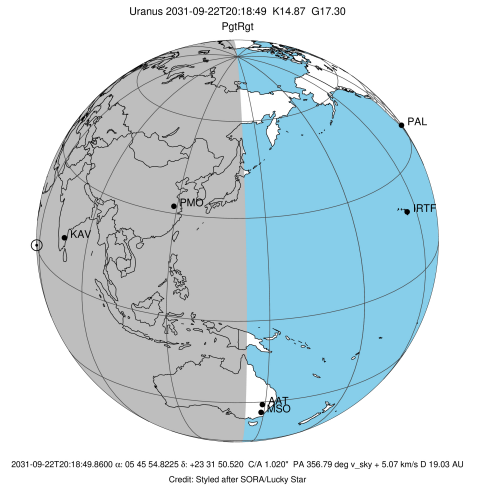


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-22T20:10:08.740
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 342763353915848320
 2Mass ID (if available) : 05455482+2331505
 ICRS Star Coord at Epoch: 05h 45m 54.82252s +23:31:50.52015s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.872
 G magnitude : 17.300
 RP magnitude : 16.540
 BP magnitude : 17.918
 DUPflag : 0
 Distance (au) : 19.034
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 5.08
 Sun-Target sep (deg) : 92.42
 Sun-Moon sep (deg) : 166.19
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.60
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.616
 C/A sky separation (km) : 8508.5
 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



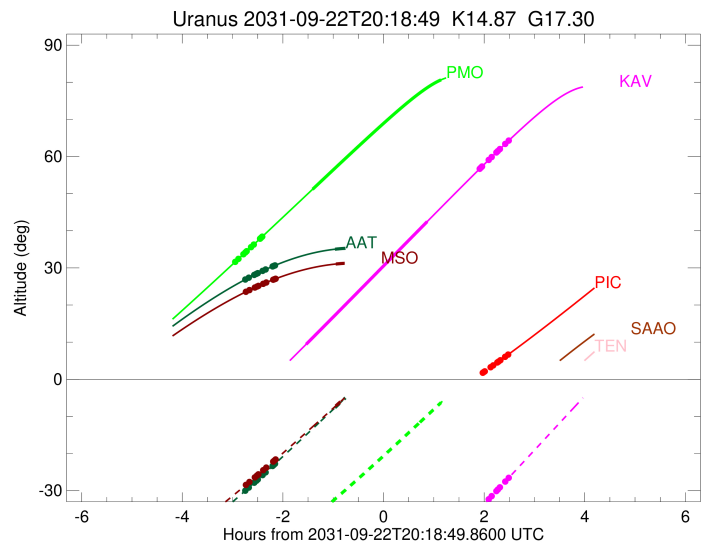
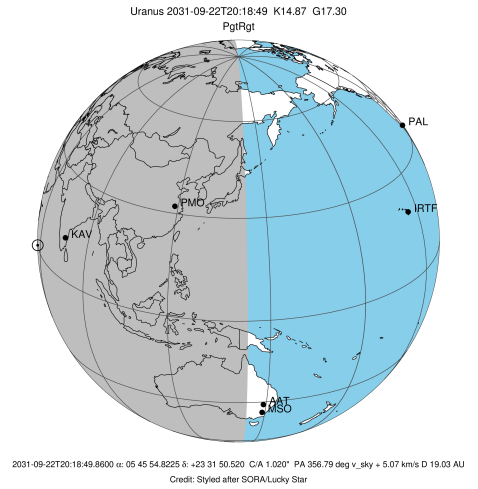
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-09-22T17:35:51.810	-23.70x	3.11x	51549.75	-5.48			
lambda	I	2031-09-22T17:40:30.028	-23.72x	2.26x	50026.71	-5.47			
delta	I	2031-09-22T17:45:45.792	-23.71x	1.29x	48300.35	-5.46			
gamma	I	2031-09-22T17:47:49.421	-23.70x	0.91x	47625.13	-5.46			
eta	I	2031-09-22T17:49:11.675	-23.69x	0.66x	47176.12	-5.46			
beta	I	2031-09-22T17:53:45.902	-23.66x	-0.18x	45681.05	-5.45			
alpha	I	2031-09-22T17:56:39.587	-23.63x	-0.71x	44734.17	-5.44			
4	I	2031-09-22T18:03:11.044	-23.53x	-1.91x	42609.17	-5.43			
5	I	2031-09-22T18:04:20.923	-23.51x	-2.13x	42220.97	-5.43			
6	I	2031-09-22T18:05:40.443	-23.48x	-2.37x	41795.06	-5.43			
Uranus	I	2031-09-22T18:56:20.029	-21.51x	-11.61	25400.15			6.29	6.59
Uranus	E	2031-09-22T21:24:03.436	-6.20x	-35.81	25052.89			-11.40	-11.92
6	E	2031-09-22T22:17:17.343	1.76x	-42.16	41877.67	5.13			
5	E	2031-09-22T22:18:37.952	1.97x	-42.29	42280.52	5.13			
4	E	2031-09-22T22:19:27.708	2.11x	-42.37	42546.94	5.13			
alpha	E	2031-09-22T22:26:26.704	3.22x	-43.04	44692.22	5.13			
beta	E	2031-09-22T22:29:31.845	3.71x	-43.32	45641.76	5.13			
eta	E	2031-09-22T22:34:31.376	4.52x	-43.75	47176.12	5.12			
gamma	E	2031-09-22T22:35:59.824	4.76x	-43.88	47629.26	5.12			
delta	E	2031-09-22T22:38:10.844	5.12	-44.05	48300.35	5.12			
lambda	E	2031-09-22T22:43:48.076	6.04	-44.50	50026.71	5.12			
epsilon	E	2031-09-22T22:46:18.580	6.45	-44.68	50796.69	5.12			

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-22T20:11:06.610
 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 : 342763353915848320
 2Mass ID (if available) : 05455482+2331505
 ICRS Star Coord at Epoch: 05h 45m 54.82252s +23:31:50.52015s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.872
 G magnitude : 17.300
 RP magnitude : 16.540
 BP magnitude : 17.918
 DUPflag : 0
 Distance (au) : 19.034
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 5.08
 Sun-Target sep (deg) : 92.42
 Sun-Moon sep (deg) : 166.50
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.60
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.933
 C/A sky separation (km) : 12879.5
 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



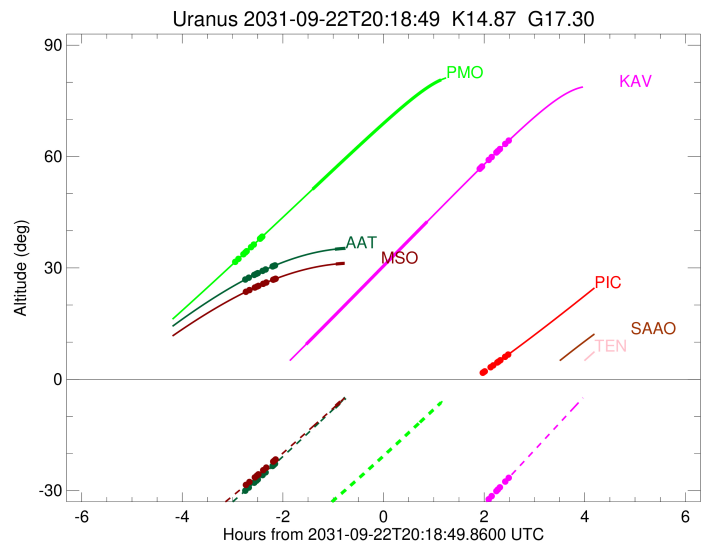
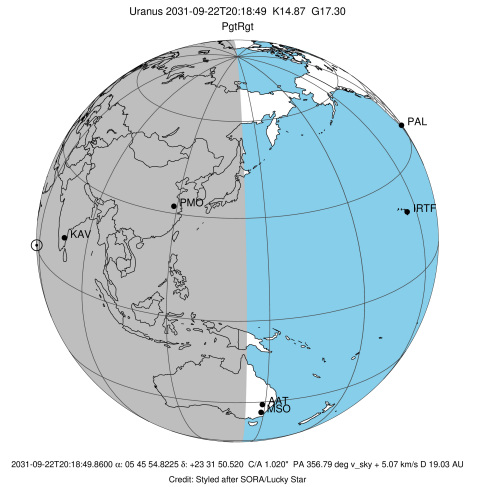
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-09-22T17:20:40.209		31.35	-52.36	51553.34	-4.89		
lambda	I	2031-09-22T17:25:52.850		32.44	-51.70	50026.71	-4.87		
delta	I	2031-09-22T17:31:48.026		33.69	-50.92	48300.35	-4.85		
gamma	I	2031-09-22T17:34:07.355		34.18	-50.61	47625.53	-4.84		
eta	I	2031-09-22T17:35:40.302		34.50	-50.40	47176.12	-4.83		
beta	I	2031-09-22T17:40:50.614		35.59	-49.67	45680.77	-4.81		
alpha	I	2031-09-22T17:44:08.137		36.29	-49.19	44731.62	-4.79		
4	I	2031-09-22T17:51:32.866		37.85	-48.09	42611.23	-4.76		
5	I	2031-09-22T17:52:51.814		38.13	-47.89	42228.13	-4.75		
6	I	2031-09-22T17:54:23.871		38.46	-47.66	41795.70	-4.74		
Uranus	I	2031-09-22T18:54:08.409		51.15	-37.39	25480.24		4.41	4.62
Uranus	E	2031-09-22T21:27:31.886		80.67	-6.26	25007.86		-11.91	-12.46
6	E	2031-09-22T22:30:35.873		77.12	7.11x	41876.17	4.46		
5	E	2031-09-22T22:32:10.555		76.85	7.44x	42286.77	4.46		
4	E	2031-09-22T22:33:07.231		76.69	7.64x	42550.76	4.47		
alpha	E	2031-09-22T22:41:06.183		75.27	9.33x	44690.39	4.48		
beta	E	2031-09-22T22:44:38.206		74.62	10.07x	45642.30	4.49		
eta	E	2031-09-22T22:50:19.230		73.55	11.27x	47176.12	4.51		
gamma	E	2031-09-22T22:51:59.821		73.23	11.62x	47629.61	4.51		
delta	E	2031-09-22T22:54:28.452		72.75	12.15x	48300.35	4.52		
lambda	E	2031-09-22T23:00:50.233		71.51	13.48x	50026.71	4.53		
epsilon	E	2031-09-22T23:03:43.705		70.94	14.09x	50812.71	4.54		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-22T19:58:31.150
 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 : 342763353915848320
 2Mass ID (if available) : 05455482+2331505
 ICRS Star Coord at Epoch: 05h 45m 54.82252s +23:31:50.52015s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.872
 G magnitude : 17.300
 RP magnitude : 16.540
 BP magnitude : 17.918
 DUPflag : 0
 Distance (au) : 19.034
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 5.08
 Sun-Target sep (deg) : 92.42
 Sun-Moon sep (deg) : 165.88
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.60
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.979
 C/A sky separation (km) : 13515.6
 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



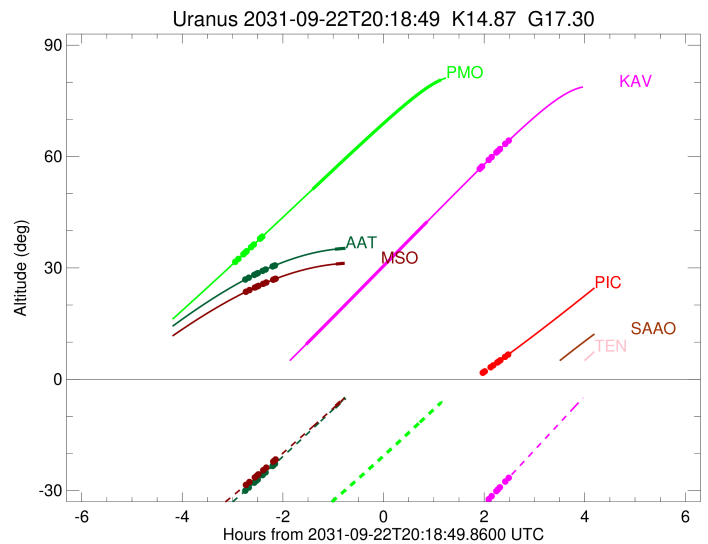
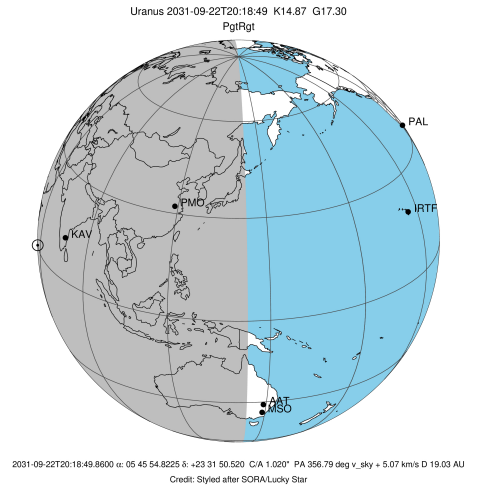
Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-09-22T17:17:34.950	-10.40x	-66.50	51553.48	-5.18		
lambda	I	2031-09-22T17:22:30.561	-9.33x	-67.52	50026.71	-5.15		
delta	I	2031-09-22T17:28:06.462	-8.10x	-68.65	48300.35	-5.13		
gamma	I	2031-09-22T17:30:18.260	-7.62x	-69.08	47625.55	-5.11		
eta	I	2031-09-22T17:31:46.203	-7.30x	-69.37	47176.12	-5.11		
beta	I	2031-09-22T17:36:39.870	-6.22x	-70.32	45680.76	-5.08		
alpha	I	2031-09-22T17:39:46.886	-5.54x	-70.90	44731.49	-5.06		
4	I	2031-09-22T17:46:48.074	-3.98x	-72.17	42611.33	-5.02		
5	I	2031-09-22T17:48:02.840	-3.71x	-72.38	42228.53	-5.01		
6	I	2031-09-22T17:49:30.149	-3.39x	-72.63	41795.75	-5.00		
Uranus	I	2031-09-22T18:46:29.490	9.40	-77.14	25485.93		4.25	4.45
Uranus	E	2031-09-22T21:10:58.946	42.49	-49.86	25002.04		-11.98	-12.53
6	E	2031-09-22T22:13:39.080	56.71	-34.91	41875.48	4.46		
5	E	2031-09-22T22:15:14.435	57.07	-34.52	42289.12	4.46		
4	E	2031-09-22T22:16:10.939	57.28	-34.30	42552.34	4.47		
alpha	E	2031-09-22T22:24:09.636	59.05	-32.37	44689.69	4.48		
beta	E	2031-09-22T22:27:42.337	59.83	-31.51	45642.57	4.48		
eta	E	2031-09-22T22:33:24.420	61.09	-30.14	47176.12	4.49		
gamma	E	2031-09-22T22:35:05.474	61.46	-29.73	47629.76	4.49		
delta	E	2031-09-22T22:37:34.790	62.00	-29.13	48300.35	4.49		
lambda	E	2031-09-22T22:43:58.880	63.39	-27.58	50026.71	4.50		
epsilon	E	2031-09-22T22:46:55.526	64.02	-26.86	50821.27	4.50		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-22T20:20:43.090
 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 : 342763353915848320
 2Mass ID (if available) : 05455482+2331505
 ICRS Star Coord at Epoch: 05h 45m 54.82252s +23:31:50.52015s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.872
 G magnitude : 17.300
 RP magnitude : 16.540
 BP magnitude : 17.918
 DUPflag : 0
 Distance (au) : 19.034
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 5.08
 Sun-Target sep (deg) : 92.42
 Sun-Moon sep (deg) : 166.64
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.60
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.399
 C/A sky separation (km) : 19311.2
 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	2031-09-22T17:32:32.638		26.69	-30.31	51554.79	-4.49		
lambda	I	2031-09-22T17:38:13.748		27.37	-29.16	50026.71	-4.46		
delta	I	2031-09-22T17:44:42.061		28.12	-27.85	48300.35	-4.43		
gamma	I	2031-09-22T17:47:14.571		28.40	-27.33	47626.37	-4.41		
eta	I	2031-09-22T17:48:56.756		28.59	-26.98	47176.12	-4.40		
beta	I	2031-09-22T17:54:38.245		29.20	-25.82	45679.79	-4.36		
alpha	I	2031-09-22T17:58:17.228		29.58	-25.07	44726.12	-4.34		
4	I	2031-09-22T18:06:27.912		30.39	-23.38	42614.41	-4.28		
5	I	2031-09-22T18:07:53.636		30.52	-23.09	42242.68	-4.27		
6	I	2031-09-22T18:09:38.599		30.69	-22.72	41798.04	-4.25		
Uranus	I	2031-09-22T19:20:55.789		35.03	-7.67	25558.34		0.40	0.42
Uranus	E	2031-09-22T21:17:36.855		31.06	17.22x	25018.64		-11.79	-12.33
6	E	2031-09-22T22:29:36.634		22.66	31.99x	41873.17	4.22		
5	E	2031-09-22T22:31:19.527		22.41	32.33x	42295.28	4.23		
4	E	2031-09-22T22:32:18.847		22.27	32.53x	42556.91	4.24		
alpha	E	2031-09-22T22:40:38.837		21.07	34.17x	44688.05	4.30		
beta	E	2031-09-22T22:44:20.617		20.53	34.88x	45643.40	4.32		
eta	E	2031-09-22T22:50:14.088		19.65	36.02x	47176.12	4.36		
gamma	E	2031-09-22T22:51:58.187		19.39	36.36x	47630.11	4.37		
delta	E	2031-09-22T22:54:31.443		19.00	36.84x	48300.35	4.38		
lambda	E	2031-09-22T23:01:03.973		17.99	38.09x	50026.71	4.42		
epsilon	E	2031-09-22T23:04:08.139		17.51	38.66x	50841.27	4.44		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-22T20:20:30.830
 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 : 342763353915848320
 2Mass ID (if available) : 05455482+2331505
 ICRS Star Coord at Epoch: 05h 45m 54.82252s +23:31:50.52015s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.872
 G magnitude : 17.300
 RP magnitude : 16.540
 BP magnitude : 17.918
 DUPflag : 0
 Distance (au) : 19.034
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 5.08
 Sun-Target sep (deg) : 92.42
 Sun-Moon sep (deg) : 166.61
 B (ring opening deg) : 77.98
 PA of pole (deg) : 47.60
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.417
 C/A sky separation (km) : 19555.0
 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_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	2031-09-22T17:33:18.075		23.40	-28.73	51554.67	-4.50		
lambda	I	2031-09-22T17:38:58.861		24.03	-27.65	50026.71	-4.47		
delta	I	2031-09-22T17:45:26.880		24.72	-26.42	48300.35	-4.43		
gamma	I	2031-09-22T17:47:59.280		24.98	-25.93	47626.40	-4.41		
eta	I	2031-09-22T17:49:41.410		25.15	-25.60	47176.12	-4.40		
beta	I	2031-09-22T17:55:22.730		25.72	-24.50	45679.74	-4.37		
alpha	I	2031-09-22T17:59:01.669		26.06	-23.79	44725.90	-4.34		
4	I	2031-09-22T18:07:12.185		26.81	-22.19	42614.50	-4.28		
5	I	2031-09-22T18:08:37.823		26.94	-21.91	42243.24	-4.27		
6	I	2031-09-22T18:10:22.882		27.09	-21.57	41798.15	-4.25		
Uranus	I	2031-09-22T19:21:58.567		31.05	-7.17	25558.79		0.23	0.24
Uranus	E	2031-09-22T21:16:08.334		27.53	16.07x	25021.98		-11.75	-12.29
6	E	2031-09-22T22:28:28.315		19.76	30.13x	41873.01	4.21		
5	E	2031-09-22T22:30:11.409		19.53	30.45x	42295.66	4.23		
4	E	2031-09-22T22:31:10.757		19.40	30.64x	42557.22	4.24		
alpha	E	2031-09-22T22:39:30.848		18.28	32.18x	44687.95	4.29		
beta	E	2031-09-22T22:43:12.720		17.78	32.85x	45643.46	4.32		
eta	E	2031-09-22T22:49:06.214		16.95	33.92x	47176.12	4.36		
gamma	E	2031-09-22T22:50:50.320		16.71	34.23x	47630.13	4.37		
delta	E	2031-09-22T22:53:23.568		16.34	34.69x	48300.35	4.38		
lambda	E	2031-09-22T22:59:56.059		15.40	35.85x	50026.71	4.42		
epsilon	E	2031-09-22T23:03:00.546		14.94	36.39x	50842.82	4.44		