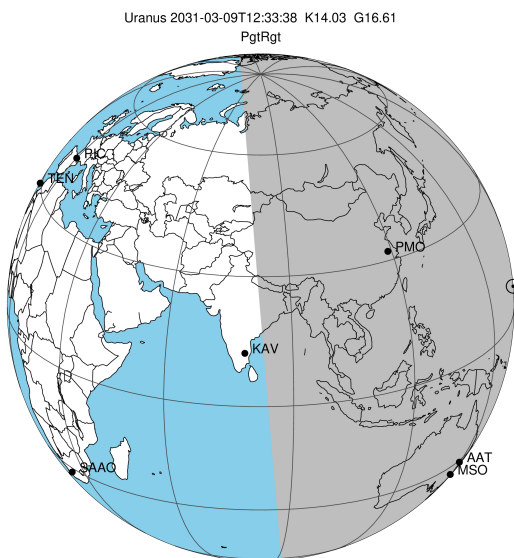


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-03-09T12:33:38.270
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3415397236897636736
 2Mass ID (if available) : 05094754+2302164

Uranus 2031-03-09T12:33:38 K14.03 G16.61 PgtRgt

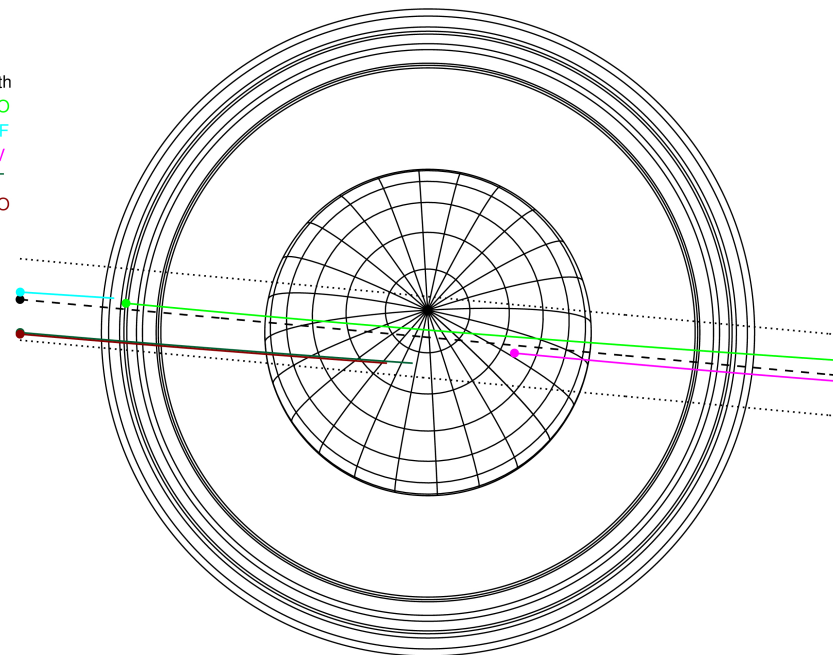
ICRS Star Coord at Epoch: 05h 09m 47.53598s +23:02:16.32304s

RUWE (>1.4 is poor) : 1.03
 K magnitude : 14.026
 G magnitude : 16.610
 RP magnitude : 15.780
 BP magnitude : 17.331
 DUPflag : 0
 Distance (au) : 19.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 6.24
 Sun-Target sep (deg) : 90.16
 Sun-Moon sep (deg) : 93.90
 B (ring opening deg) : 82.14
 PA of pole (deg) : 0.97



2031-03-09T12:33:38.2700 ex: 05 09 47.5360 ex: +23 02 16.323 C/A 0.050° PA 354.69 deg v_sky + 6.24 km/s D 19.11 AU
 Credit: Styled after SORA/Lucky Star

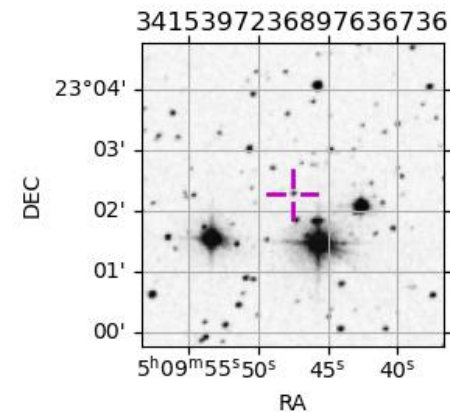
Earth
 PMO
 IRTF
 KAV
 AAT
 MSO



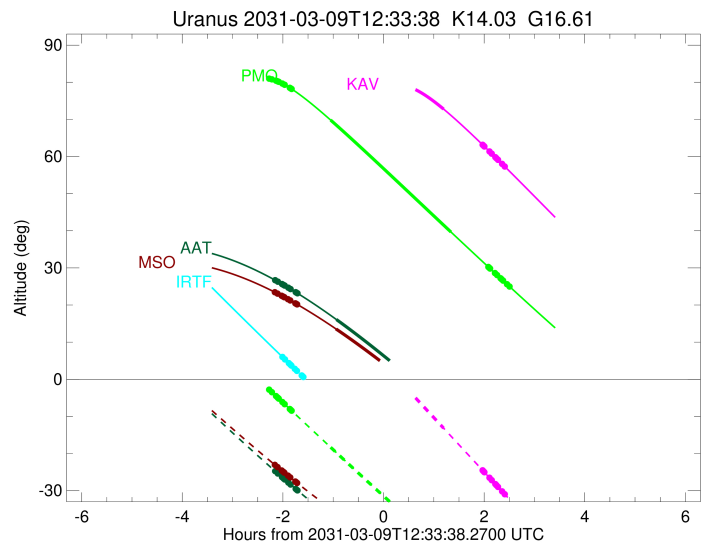
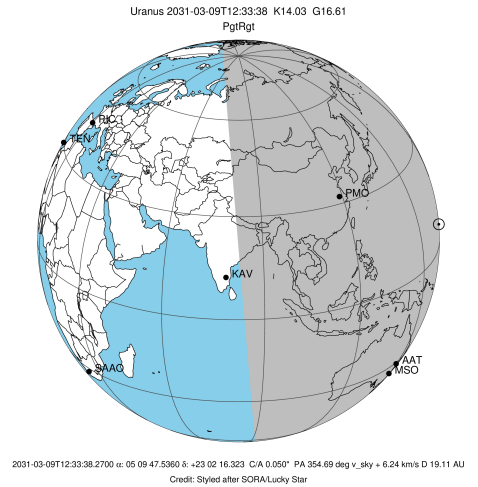
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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 09 10:28 - MAR 09 15:04	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	++			MAR 09 10:33 - MAR 09 10:36	PnnRin
KAV	Kavalur Observatory	12.6	78.8		+	+++++	MAR 09 13:45 - MAR 09 14:58	PneRne
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 09 10:24 - MAR 09 11:37	PinRin
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+		MAR 09 10:24 - MAR 09 11:36	PinRin

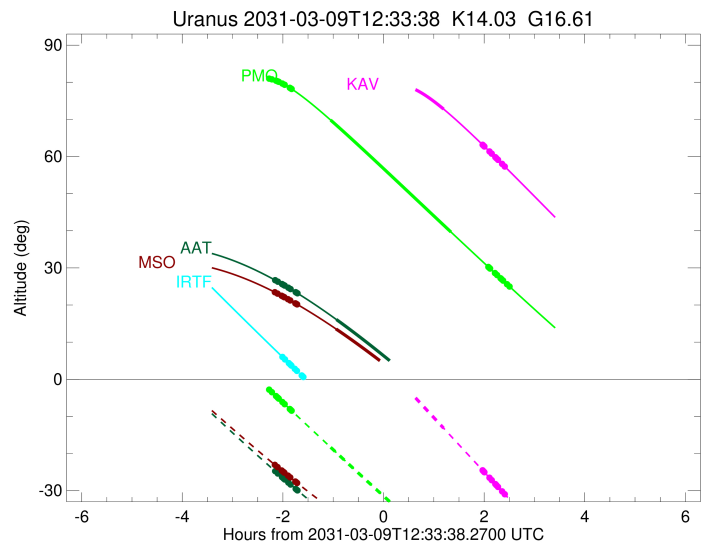
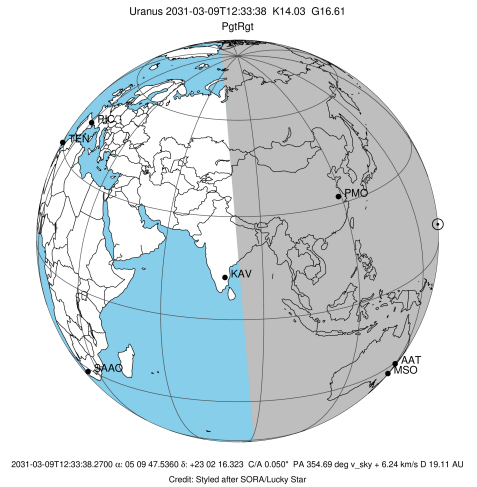


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-03-09T12:42:57.410
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 3415397236897636736
 2Mass ID (if available) : 05094754+2302164
 ICRS Star Coord at Epoch: 05h 09m 47.53598s +23:02:16.32304s
 RUWE (>1.4 is poor) : 1.03
 K magnitude : 14.026
 G magnitude : 16.610
 RP magnitude : 15.780
 BP magnitude : 17.331
 DUPflag : 0
 Distance (au) : 19.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 6.24
 Sun-Target sep (deg) : 90.16
 Sun-Moon sep (deg) : 94.73
 B (ring opening deg) : 82.14
 PA of pole (deg) : 0.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.027
 C/A sky separation (km) : 380.7
 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



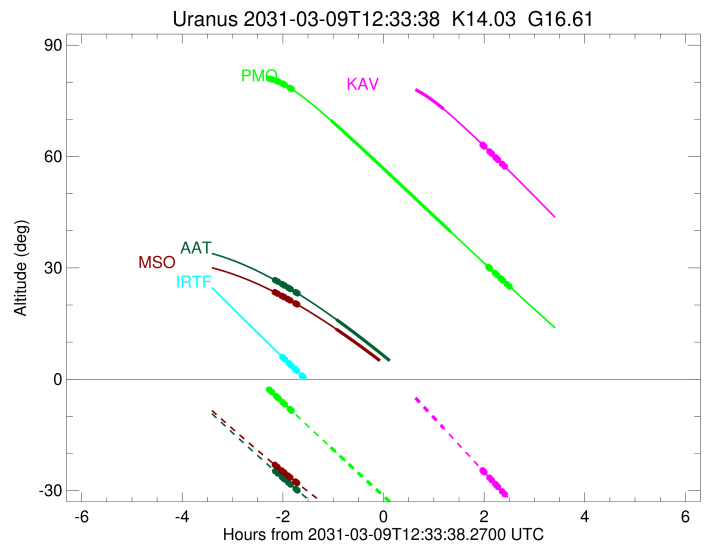
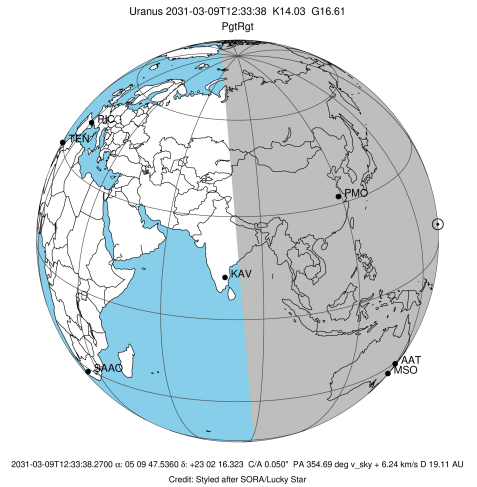
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-03-09T10:17:42.581		80.96	-2.89x	51017.80	-5.80		
lambda	I	2031-03-09T10:20:33.507		80.80	-3.49x	50026.71	-5.80		
delta	I	2031-03-09T10:25:31.168		80.43	-4.54x	48300.35	-5.80		
gamma	I	2031-03-09T10:27:27.900		80.25	-4.95x	47623.17	-5.80		
eta	I	2031-03-09T10:28:44.956		80.13	-5.23	47176.12	-5.80		
beta	I	2031-03-09T10:33:03.348		79.66	-6.14	45676.74	-5.80		
alpha	I	2031-03-09T10:35:51.732		79.32	-6.73	44699.47	-5.81		
4	I	2031-03-09T10:42:00.761		78.50	-8.04	42556.13	-5.81		
5	I	2031-03-09T10:42:48.707		78.38	-8.21	42278.66	-5.81		
6	I	2031-03-09T10:43:57.240		78.22	-8.45	41879.73	-5.81		
Uranus	I	2031-03-09T11:30:35.818		69.82	-18.33	25550.95		0.91	0.96
Uranus	E	2031-03-09T13:54:07.777		39.66	-47.04	25555.25		-0.62	-0.65
6	E	2031-03-09T14:38:34.255		30.28	-54.39	41794.80	6.12		
5	E	2031-03-09T14:39:39.138		30.05	-54.55	42192.72	6.12		
4	E	2031-03-09T14:40:43.665		29.83	-54.71	42587.24	6.13		
alpha	E	2031-03-09T14:46:34.342		28.60	-55.55	44738.18	6.14		
beta	E	2031-03-09T14:49:02.162		28.09	-55.90	45645.84	6.14		
eta	E	2031-03-09T14:53:11.096		27.22	-56.46	47176.12	6.15		
gamma	E	2031-03-09T14:54:24.743		26.97	-56.62	47629.26	6.15		
delta	E	2031-03-09T14:56:13.758		26.59	-56.86	48300.35	6.16		
lambda	E	2031-03-09T15:00:53.899		25.62	-57.46	50026.71	6.17		
epsilon	E	2031-03-09T15:04:14.678		24.92	-57.87	51265.63	6.17		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-03-09T12:47:18.040
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : IRTF
 Location : Mauna Kea/IRTF
 Latitude (deg) : 19.82622
 E. Longitude (deg) : 204.52800
 Altitude (km) : 4.168
 Gaia source ID : 3415397236897636736
 2Mass ID (if available) : 05094754+2302164
 ICRS Star Coord at Epoch: 05h 09m 47.53598s +23:02:16.32304s
 RUWE (>1.4 is poor) : 1.03
 K magnitude : 14.026
 G magnitude : 16.610
 RP magnitude : 15.780
 BP magnitude : 17.331
 DUPflag : 0
 Distance (au) : 19.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 6.24
 Sun-Target sep (deg) : 90.16
 Sun-Moon sep (deg) : 93.64
 B (ring opening deg) : 82.14
 PA of pole (deg) : 0.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.155
 C/A sky separation (km) : 2141.6
 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



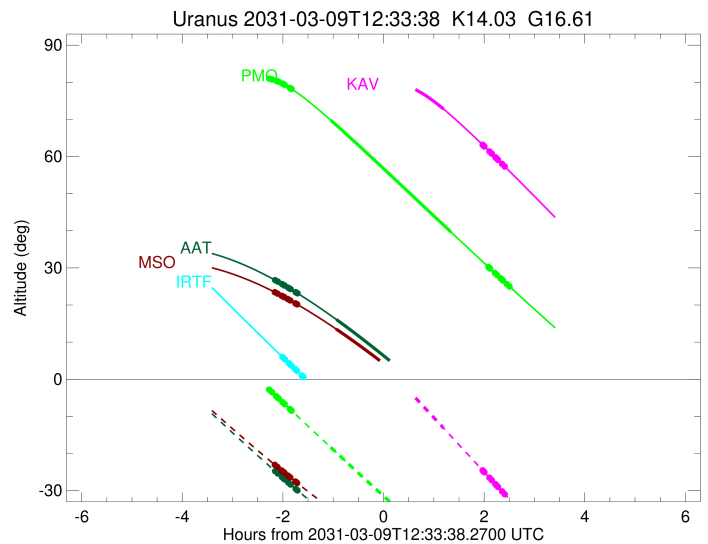
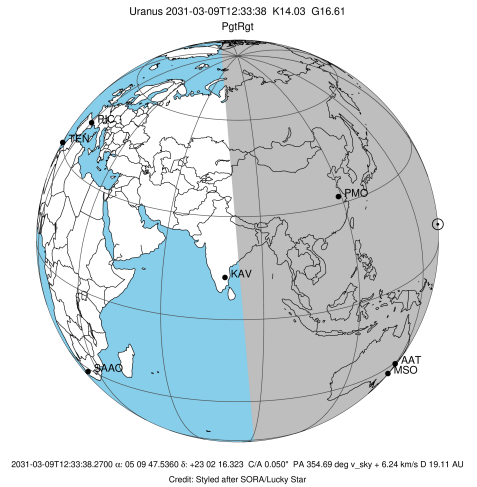
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-03-09T10:33:30.954		5.92	-74.78	51013.48	-6.19		
lambda	I	2031-03-09T10:36:10.238		5.34	-74.75	50026.71	-6.20		
delta	I	2031-03-09T10:40:48.557		4.33x	-74.64	48300.35	-6.21		
gamma	I	2031-03-09T10:42:37.618		3.94x	-74.58	47623.11	-6.21		
eta	I	2031-03-09T10:43:49.563		3.68x	-74.53	47176.12	-6.21		
beta	I	2031-03-09T10:47:50.658		2.81x	-74.32	45676.95	-6.22		
alpha	I	2031-03-09T10:50:27.613		2.24x	-74.16	44699.97	-6.23		
4	I	2031-03-09T10:56:11.260		1.01x	-73.71	42556.99	-6.24		
5	I	2031-03-09T10:56:55.830		0.85x	-73.65	42280.03	-6.24		
6	I	2031-03-09T10:57:59.789		0.62x	-73.55	41879.74	-6.24		
Uranus	I	2031-03-09T11:41:13.557		-8.53x	-67.35	25542.58		1.30	1.36
Uranus	E	2031-03-09T13:52:08.492		-33.21x	-39.07	25559.00		-0.02	-0.02
6	E	2031-03-09T14:32:59.013		-39.21x	-29.56	41794.95	6.65		
5	E	2031-03-09T14:33:59.272		-39.35x	-29.32	42195.96	6.65		
4	E	2031-03-09T14:34:58.439		-39.48x	-29.09	42589.20	6.65		
alpha	E	2031-03-09T14:40:21.427		-40.16x	-27.83	44739.38	6.66		
beta	E	2031-03-09T14:42:37.581		-40.45x	-27.30	45646.42	6.66		
eta	E	2031-03-09T14:46:27.049		-40.91x	-26.40	47176.12	6.67		
gamma	E	2031-03-09T14:47:34.960		-41.05x	-26.14	47629.08	6.67		
delta	E	2031-03-09T14:49:15.576		-41.24x	-25.74	48300.35	6.67		
lambda	E	2031-03-09T14:53:34.183		-41.74x	-24.73	50026.71	6.68		
epsilon	E	2031-03-09T14:56:37.436		-42.08x	-24.01	51250.90	6.68		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-03-09T12:32:08.840
 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 : 3415397236897636736
 2Mass ID (if available) : 05094754+2302164
 ICRS Star Coord at Epoch: 05h 09m 47.53598s +23:02:16.32304s
 RUWE (>1.4 is poor) : 1.03
 K magnitude : 14.026
 G magnitude : 16.610
 RP magnitude : 15.780
 BP magnitude : 17.331
 DUPflag : 0
 Distance (au) : 19.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 6.24
 Sun-Target sep (deg) : 90.16
 Sun-Moon sep (deg) : 94.82
 B (ring opening deg) : 82.14
 PA of pole (deg) : 0.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.135
 C/A sky separation (km) : 1875.4
 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



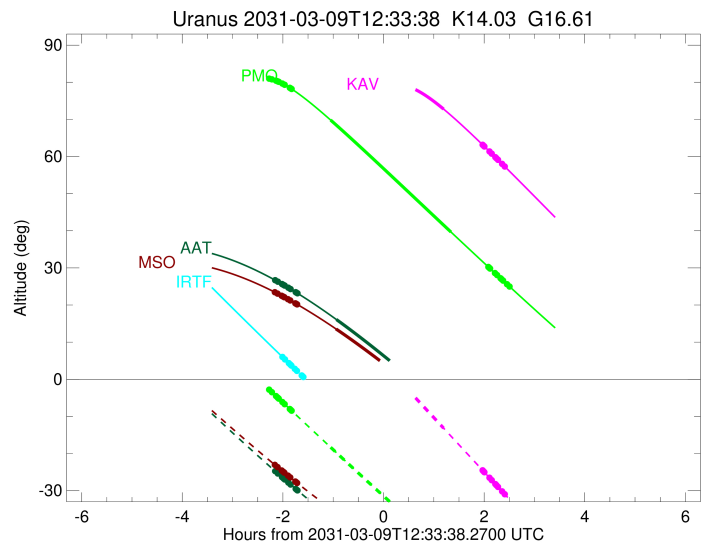
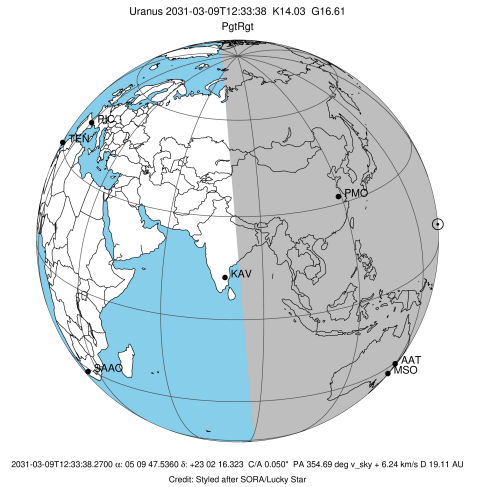
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-03-09T10:05:52.062		49.97	39.69x	51026.79	-5.85		
lambda	I	2031-03-09T10:08:43.044		50.62	39.02x	50026.71	-5.85		
delta	I	2031-03-09T10:13:38.405		51.74	37.87x	48300.35	-5.84		
gamma	I	2031-03-09T10:15:34.313		52.18	37.42x	47623.29	-5.84		
eta	I	2031-03-09T10:16:50.887		52.47	37.12x	47176.12	-5.84		
beta	I	2031-03-09T10:21:07.840		53.44	36.11x	45676.37	-5.83		
alpha	I	2031-03-09T10:23:55.466		54.07	35.45x	44698.65	-5.83		
4	I	2031-03-09T10:30:03.208		55.46	34.00x	42554.76	-5.83		
5	I	2031-03-09T10:30:51.111		55.64	33.81x	42276.44	-5.82		
6	I	2031-03-09T10:31:59.131		55.90	33.55x	41879.66	-5.82		
Uranus	I	2031-03-09T11:18:47.292		66.21	22.38x	25557.53		0.39	0.41
Uranus	E	2031-03-09T13:45:19.136		72.78	-13.17	25538.44		-1.46	-1.53
6	E	2031-03-09T14:31:41.220		63.20	-24.49	41794.76	5.86		
5	E	2031-03-09T14:32:48.118		62.96	-24.76	42187.95	5.86		
4	E	2031-03-09T14:33:55.954		62.71	-25.04	42584.18	5.86		
alpha	E	2031-03-09T14:40:02.683		61.37	-26.53	44736.25	5.87		
beta	E	2031-03-09T14:42:37.469		60.80	-27.16	45645.00	5.87		
eta	E	2031-03-09T14:46:58.017		59.83	-28.22	47176.12	5.88		
gamma	E	2031-03-09T14:48:15.120		59.55	-28.53	47629.54	5.88		
delta	E	2031-03-09T14:50:09.147		59.12	-29.00	48300.35	5.88		
lambda	E	2031-03-09T14:55:02.363		58.03	-30.19	50026.71	5.89		
epsilon	E	2031-03-09T14:58:36.596		57.23	-31.06	51289.34	5.90		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-03-09T12:46:39.140
 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 : 3415397236897636736
 2Mass ID (if available) : 05094754+2302164
 ICRS Star Coord at Epoch: 05h 09m 47.53598s +23:02:16.32304s
 RUWE (>1.4 is poor) : 1.03
 K magnitude : 14.026
 G magnitude : 16.610
 RP magnitude : 15.780
 BP magnitude : 17.331
 DUPflag : 0
 Distance (au) : 19.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 6.24
 Sun-Target sep (deg) : 90.16
 Sun-Moon sep (deg) : 94.06
 B (ring opening deg) : 82.14
 PA of pole (deg) : 0.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.358
 C/A sky separation (km) : 4963.7
 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_itrfr93_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	2031-03-09T10:24:44.217		26.65	-24.81	51064.19	-5.83		
lambda	I	2031-03-09T10:27:42.258		26.28	-25.40	50026.71	-5.83		
delta	I	2031-03-09T10:32:38.344		25.65	-26.37	48300.35	-5.83		
gamma	I	2031-03-09T10:34:34.329		25.40	-26.75	47623.74	-5.83		
eta	I	2031-03-09T10:35:51.043		25.23	-27.00	47176.12	-5.84		
beta	I	2031-03-09T10:40:08.212		24.66	-27.83	45674.95	-5.84		
alpha	I	2031-03-09T10:42:55.849		24.28	-28.38	44695.90	-5.84		
4	I	2031-03-09T10:49:03.033		23.44	-29.55	42550.33	-5.85		
5	I	2031-03-09T10:49:51.156		23.33	-29.71	42268.79	-5.85		
6	I	2031-03-09T10:50:57.824		23.18	-29.92	41879.13	-5.85		
Uranus	I	2031-03-09T11:37:21.418		16.11	-38.39	25552.38		-0.83	-0.87
Uranus	E	2031-03-09T13:54:19.242		-9.11x	-54.15	25513.13		-2.18	-2.28
6	E	2031-03-09T14:37:56.961		-17.96x	-54.03	41794.85	6.28		
5	E	2031-03-09T14:38:58.809		-18.18x	-53.99	42184.82	6.28		
4	E	2031-03-09T14:40:02.325		-18.39x	-53.95	42582.06	6.28		
alpha	E	2031-03-09T14:45:44.306		-19.57x	-53.69	44734.92	6.30		
beta	E	2031-03-09T14:48:08.629		-20.07x	-53.57	45644.49	6.31		
eta	E	2031-03-09T14:52:11.270		-20.90x	-53.35	47176.12	6.32		
gamma	E	2031-03-09T14:53:23.043		-21.15x	-53.27	47629.71	6.32		
delta	E	2031-03-09T14:55:09.094		-21.52x	-53.17	48300.35	6.33		
lambda	E	2031-03-09T14:59:41.733		-22.46x	-52.87	50026.71	6.34		
epsilon	E	2031-03-09T15:03:03.049		-23.16x	-52.62	51303.51	6.35		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-03-09T12:45:56.640
 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 : 3415397236897636736
 2Mass ID (if available) : 05094754+2302164
 ICRS Star Coord at Epoch: 05h 09m 47.53598s +23:02:16.32304s
 RUWE (>1.4 is poor) : 1.03
 K magnitude : 14.026
 G magnitude : 16.610
 RP magnitude : 15.780
 BP magnitude : 17.331
 DUPflag : 0
 Distance (au) : 19.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 6.24
 Sun-Target sep (deg) : 90.16
 Sun-Moon sep (deg) : 94.02
 B (ring opening deg) : 82.14
 PA of pole (deg) : 0.97
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.380
 C/A sky separation (km) : 5260.3
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-03-09T10:24:20.628		23.42	-23.11	51066.19	-5.84		
lambda	I	2031-03-09T10:27:18.687		23.07	-23.66	50026.71	-5.84		
delta	I	2031-03-09T10:32:14.251		22.49	-24.58	48300.35	-5.84		
gamma	I	2031-03-09T10:34:10.035		22.25	-24.93	47623.77	-5.84		
eta	I	2031-03-09T10:35:26.627		22.10	-25.17	47176.12	-5.85		
beta	I	2031-03-09T10:39:43.396		21.57	-25.96	45674.87	-5.85		
alpha	I	2031-03-09T10:42:30.786		21.22	-26.46	44695.76	-5.85		
4	I	2031-03-09T10:48:37.465		20.44	-27.57	42550.08	-5.85		
5	I	2031-03-09T10:49:25.550		20.33	-27.72	42268.33	-5.85		
6	I	2031-03-09T10:50:32.066		20.19	-27.91	41879.08	-5.85		
Uranus	I	2031-03-09T11:36:54.452		13.57	-35.81	25550.95		-0.91	-0.96
Uranus	E	2031-03-09T13:53:24.859		-10.36x	-50.12	25508.93		-2.28	-2.39
6	E	2031-03-09T14:37:07.897		-18.87x	-50.09	41794.88	6.27		
5	E	2031-03-09T14:38:09.742		-19.07x	-50.06	42184.30	6.27		
4	E	2031-03-09T14:39:13.391		-19.28x	-50.02	42581.70	6.27		
alpha	E	2031-03-09T14:44:55.905		-20.41x	-49.80	44734.68	6.29		
beta	E	2031-03-09T14:47:20.470		-20.89x	-49.70	45644.40	6.30		
eta	E	2031-03-09T14:51:23.490		-21.69x	-49.51	47176.12	6.31		
gamma	E	2031-03-09T14:52:35.375		-21.93x	-49.45	47629.74	6.31		
delta	E	2031-03-09T14:54:21.581		-22.29x	-49.35	48300.35	6.32		
lambda	E	2031-03-09T14:58:54.630		-23.20x	-49.10	50026.71	6.33		
epsilon	E	2031-03-09T15:02:16.663		-23.87x	-48.89	51306.14	6.34		