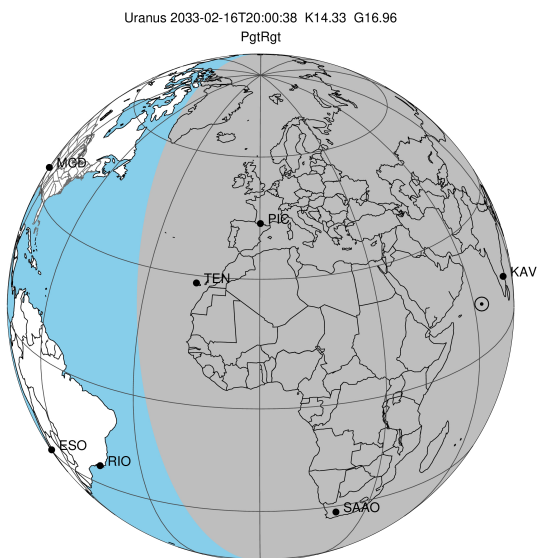


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-16T20:00:38.110
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427681255682493696
 2Mass ID (if available) : 05475998+2337372

ICRS Star Coord at Epoch: 05h 47m 59.99467s +23:37:37.14225s

RUWE (>1.4 is poor) : 1.44
 K magnitude : 14.326
 G magnitude : 16.956
 RP magnitude : 16.084
 BP magnitude : 17.604
 DUPflag : 0
 Distance (au) : 18.507
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.20
 Sun-Target sep (deg) : 119.25
 Sun-Moon sep (deg) : 88.38
 B (ring opening deg) : 77.56
 PA of pole (deg) : 48.95

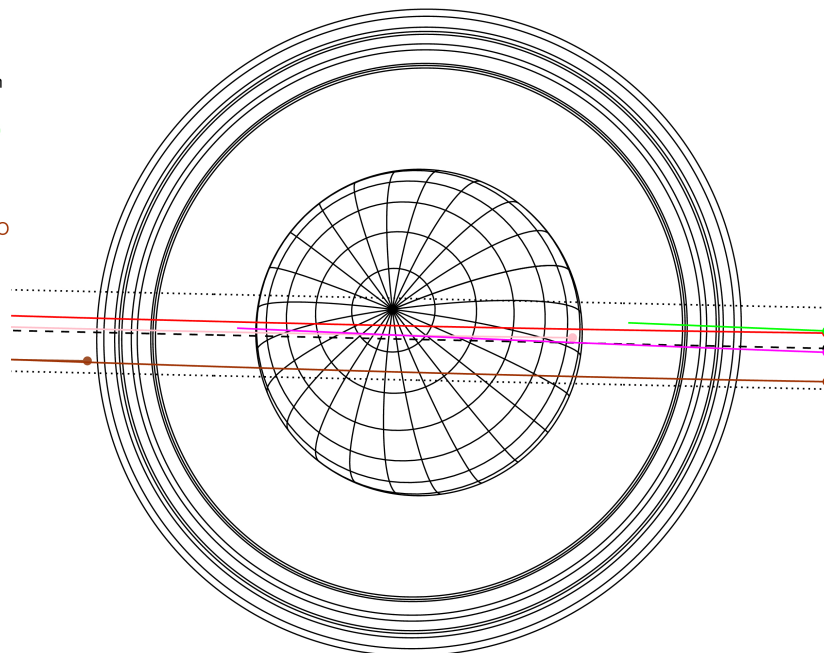
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2033-02-16T20:00:38.1100 α: 05 47 59.9947 δ: +23 37 37.142 C/A 0.075° PA 358.73 deg v_sky - 8.20 km/s D 18.51 AU
 Credit: Styled after SORA/Lucky Star

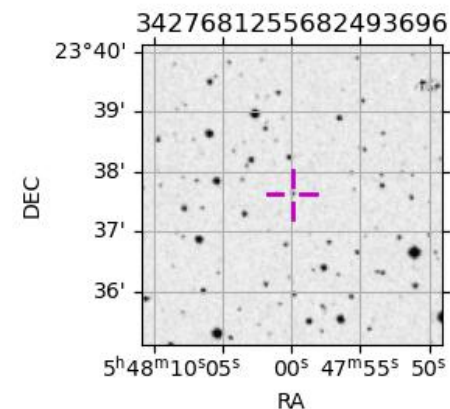
Uranus 2033-02-16T20:00:38 K14.33 G16.96 PgtRgt

Earth
 PIC
 PMO
 TEN
 KAV
 RIO
 SAAO

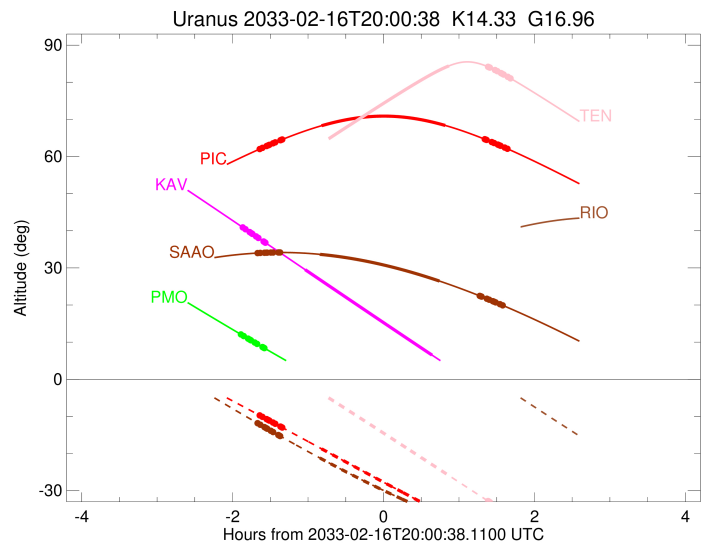
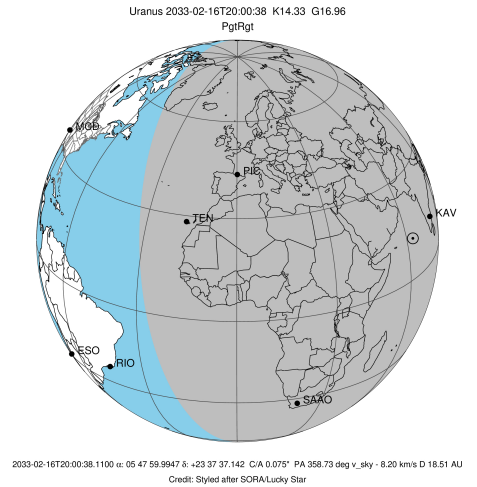


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEncode
PIC	Pic du Midi	42.9	0.1	+++++	+ +	+++++	FEB 16 18:23 - FEB 16 21:39	PieRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++			FEB 16 18:08 - FEB 16 18:25	PnnRin
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		+	+++++	FEB 16 20:52 - FEB 16 21:42	PneRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +		FEB 16 18:09 - FEB 16 20:39	PieRin
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	+++++	+ +	+++++	FEB 16 18:21 - FEB 16 21:36	PieRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

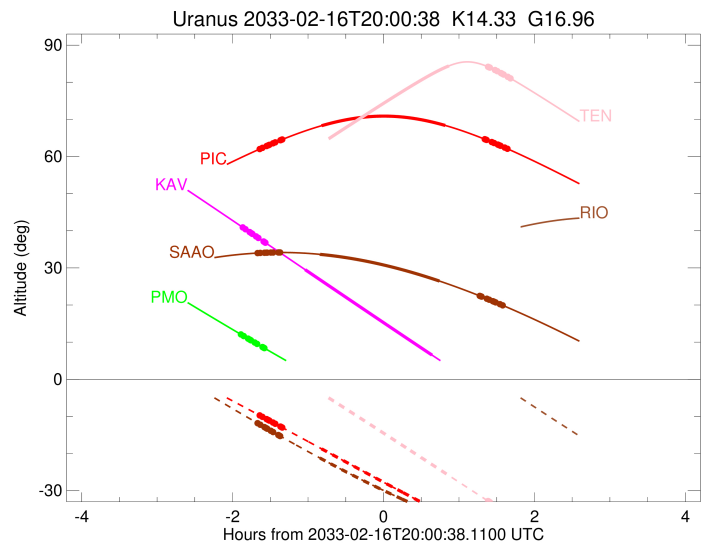
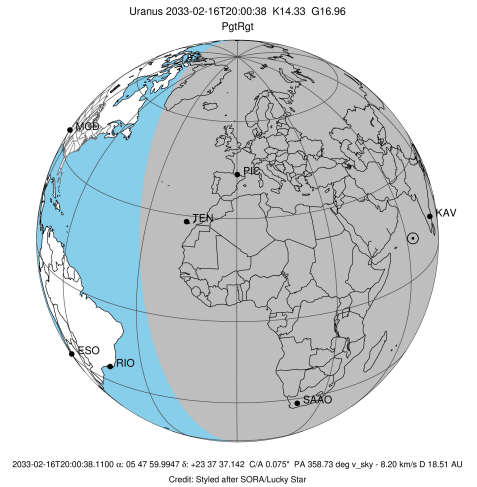


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-16T20:00:34.410
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3427681255682493696
 2Mass ID (if available) : 05475998+2337372
 ICRS Star Coord at Epoch: 05h 47m 59.99467s +23:37:37.14225s
 RUWE (>1.4 is poor) : 1.44
 K magnitude : 14.326
 G magnitude : 16.956
 RP magnitude : 16.084
 BP magnitude : 17.604
 DUPflag : 0
 Distance (au) : 18.507
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.20
 Sun-Target sep (deg) : 119.25
 Sun-Moon sep (deg) : 89.23
 B (ring opening deg) : 77.56
 PA of pole (deg) : 48.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.074
 C/A sky separation (km) : 991.8
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl1.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



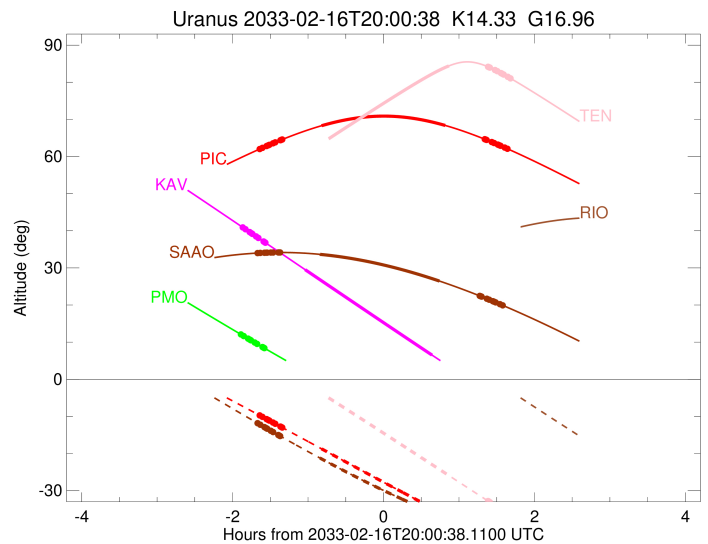
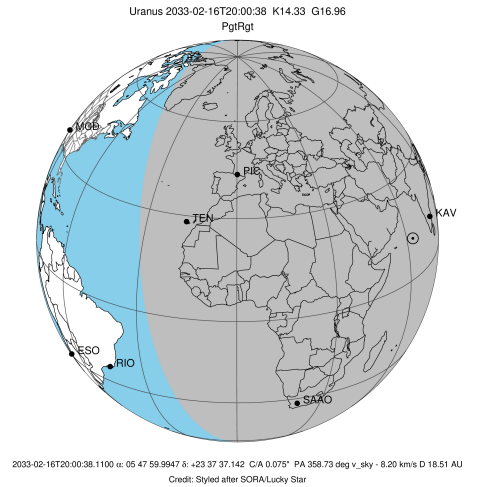
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-02-16T18:23:00.702		62.14	-9.88	50744.95	-8.66		
lambda	I	2033-02-16T18:24:23.654		62.34	-10.13	50026.71	-8.66		
delta	I	2033-02-16T18:27:43.025		62.84	-10.74	48300.35	-8.66		
gamma	I	2033-02-16T18:29:01.055		63.03	-10.97	47624.64	-8.66		
eta	I	2033-02-16T18:29:52.850		63.15	-11.13	47176.12	-8.66		
beta	I	2033-02-16T18:32:49.677		63.57	-11.67	45645.41	-8.66		
alpha	I	2033-02-16T18:34:40.273		63.84	-12.01	44685.59	-8.66		
4	I	2033-02-16T18:38:46.472		64.41	-12.76	42552.73	-8.66		
5	I	2033-02-16T18:39:30.486		64.51	-12.89	42172.38	-8.66		
6	I	2033-02-16T18:40:05.236		64.59	-13.00	41876.72	-8.66		
Uranus	I	2033-02-16T19:11:23.002		68.30	-18.73	25247.80		-9.18	-9.61
Uranus	E	2033-02-16T20:49:45.728		68.37	-36.44	25203.02		9.84	10.30
6	E	2033-02-16T21:21:02.063		64.69	-41.73	41796.91	8.61		
5	E	2033-02-16T21:22:00.476		64.55	-41.89	42294.54	8.61		
4	E	2033-02-16T21:22:35.180		64.47	-41.98	42592.05	8.61		
alpha	E	2033-02-16T21:26:45.888		63.90	-42.66	44751.84	8.61		
beta	E	2033-02-16T21:28:33.178		63.64	-42.95	45677.53	8.61		
eta	E	2033-02-16T21:31:27.355		63.23	-43.42	47176.12	8.61		
gamma	E	2033-02-16T21:32:19.881		63.10	-43.56	47628.15	8.61		
delta	E	2033-02-16T21:33:37.996		62.91	-43.77	48300.35	8.60		
lambda	E	2033-02-16T21:36:58.658		62.42	-44.30	50026.71	8.60		
epsilon	E	2033-02-16T21:39:56.356		61.97	-44.76	51555.04	8.60		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-16T19:50:30.350
 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 : 3427681255682493696
 2Mass ID (if available) : 05475998+2337372
 ICRS Star Coord at Epoch: 05h 47m 59.99467s +23:37:37.14225s
 RUWE (>1.4 is poor) : 1.44
 K magnitude : 14.326
 G magnitude : 16.956
 RP magnitude : 16.084
 BP magnitude : 17.604
 DUPflag : 0
 Distance (au) : 18.507
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.20
 Sun-Target sep (deg) : 119.25
 Sun-Moon sep (deg) : 88.21
 B (ring opening deg) : 77.56
 PA of pole (deg) : 48.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.213
 C/A sky separation (km) : 2853.7
 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	2033-02-16T18:08:06.452		11.91	-57.96	50745.47	-8.34		
lambda	I	2033-02-16T18:09:32.613		11.63	-57.70	50026.71	-8.34		
delta	I	2033-02-16T18:12:59.704		10.94	-57.07	48300.35	-8.33		
gamma	I	2033-02-16T18:14:20.806		10.67	-56.82	47624.73	-8.33		
eta	I	2033-02-16T18:15:14.676		10.50	-56.66	47176.12	-8.33		
beta	I	2033-02-16T18:18:18.640		9.89	-56.09	45645.65	-8.32		
alpha	I	2033-02-16T18:20:13.817		9.51	-55.73	44685.76	-8.31		
4	I	2033-02-16T18:24:30.371		8.67	-54.93	42553.66	-8.30		
5	I	2033-02-16T18:25:16.507		8.52	-54.79	42171.26	-8.30		
6	I	2033-02-16T18:25:52.665		8.40	-54.67	41876.34	-8.30		
Uranus	I	2033-02-16T18:58:43.688		2.05x	-48.25	25277.13		-8.73	-9.14
Uranus	E	2033-02-16T20:42:39.672		-16.21x	-26.59	25156.21		10.49	10.98
6	E	2033-02-16T21:16:22.982		-21.26x	-19.43	41796.19	7.98		
5	E	2033-02-16T21:17:25.739		-21.40x	-19.21	42291.29	7.98		
4	E	2033-02-16T21:18:03.986		-21.49x	-19.08	42594.36	7.98		
alpha	E	2033-02-16T21:22:34.360		-22.12x	-18.12	44752.14	7.97		
beta	E	2033-02-16T21:24:30.256		-22.38x	-17.71	45678.14	7.97		
eta	E	2033-02-16T21:27:38.287		-22.81x	-17.05	47176.12	7.97		
gamma	E	2033-02-16T21:28:35.052		-22.94x	-16.85	47628.41	7.97		
delta	E	2033-02-16T21:29:59.397		-23.12x	-16.55	48300.35	7.97		
lambda	E	2033-02-16T21:33:36.176		-23.60x	-15.78	50026.71	7.96		
epsilon	E	2033-02-16T21:36:48.207		-24.02x	-15.11	51555.26	7.96		

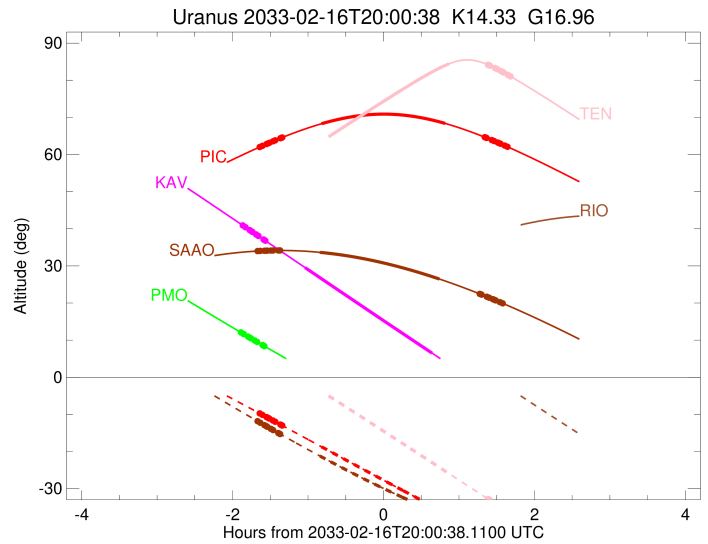
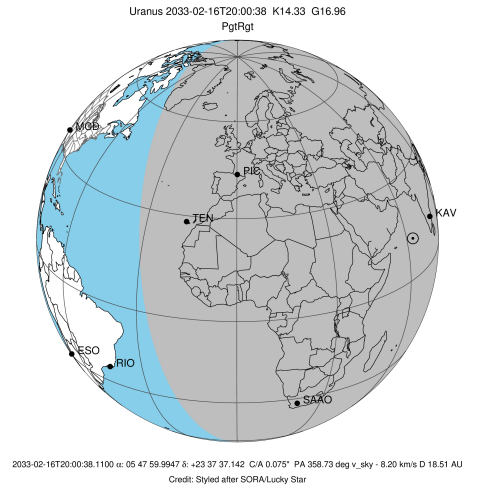
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-16T20:03:44.630
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : TEN
 Location : Teide Obs./Tenerife
 Latitude (deg) : 28.30050
 E. Longitude (deg) : 343.48909
 Altitude (km) : 2.395
 Gaia source ID : 3427681255682493696
 2Mass ID (if available) : 05475998+2337372
 ICRS Star Coord at Epoch: 05h 47m 59.99467s +23:37:37.14225s
 RUWE (>1.4 is poor) : 1.44
 K magnitude : 14.326
 G magnitude : 16.956
 RP magnitude : 16.084
 BP magnitude : 17.604
 DUPflag : 0
 Distance (au) : 18.507
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.20
 Sun-Target sep (deg) : 119.25
 Sun-Moon sep (deg) : 89.25
 B (ring opening deg) : 77.56
 PA of pole (deg) : 48.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.036
 C/A sky separation (km) : 479.1
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl1.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

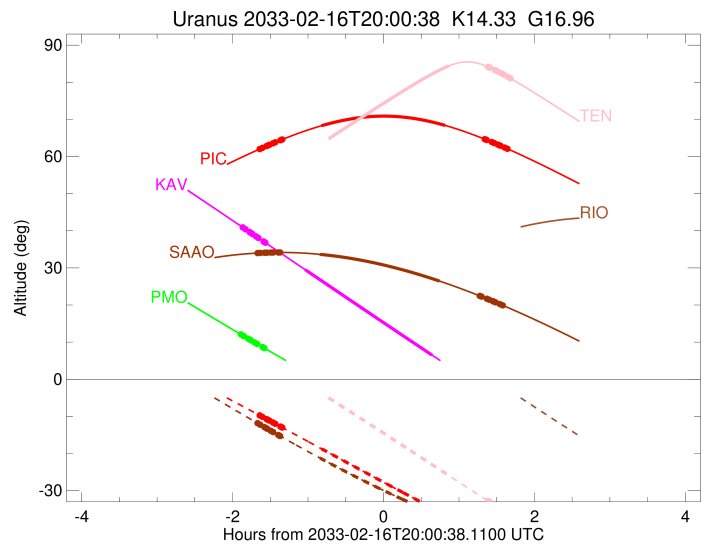
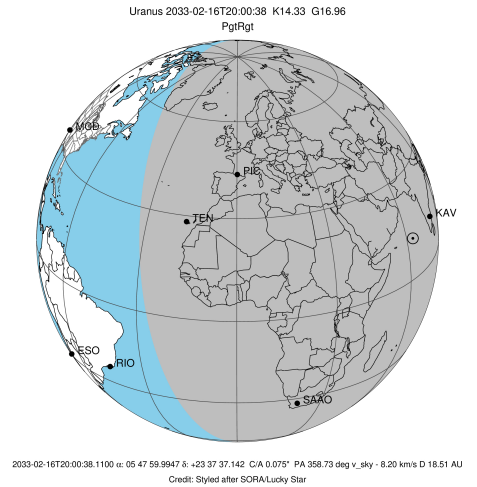
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-02-16T18:26:30.926		53.62	5.80x	50744.26	-8.66		
lambda	I	2033-02-16T18:27:53.795		53.93	5.51x	50026.71	-8.66		
delta	I	2033-02-16T18:31:13.126		54.66	4.80x	48300.35	-8.66		
gamma	I	2033-02-16T18:32:31.144		54.95	4.53x	47624.51	-8.66		
eta	I	2033-02-16T18:33:22.901		55.14	4.35x	47176.12	-8.66		
beta	I	2033-02-16T18:36:19.670		55.79	3.72x	45645.08	-8.67		
alpha	I	2033-02-16T18:38:10.174		56.20	3.33x	44685.38	-8.67		
4	I	2033-02-16T18:42:16.244		57.10	2.46x	42551.53	-8.67		
5	I	2033-02-16T18:42:59.935		57.26	2.30x	42173.89	-8.67		
6	I	2033-02-16T18:43:34.782		57.39	2.18x	41877.17	-8.67		
Uranus	I	2033-02-16T19:14:47.982		64.29	-4.52x	25218.83		-9.61	-10.06
Uranus	E	2033-02-16T20:52:40.395		84.42	-25.95	25237.48		9.34	9.77
6	E	2033-02-16T21:23:39.427		84.18	-32.77	41797.48	8.70		
5	E	2033-02-16T21:24:37.406		84.04	-32.98	42296.64	8.70		
4	E	2033-02-16T21:25:11.277		83.96	-33.11	42590.44	8.70		
alpha	E	2033-02-16T21:29:19.587		83.30	-34.02	44751.58	8.70		
beta	E	2033-02-16T21:31:05.738		83.00	-34.41	45677.08	8.70		
eta	E	2033-02-16T21:33:58.137		82.49	-35.04	47176.12	8.70		
gamma	E	2033-02-16T21:34:50.086		82.33	-35.23	47627.97	8.70		
delta	E	2033-02-16T21:36:07.392		82.10	-35.51	48300.35	8.70		
lambda	E	2033-02-16T21:39:25.903		81.47	-36.24	50026.71	8.70		
epsilon	E	2033-02-16T21:42:21.590		80.91	-36.88	51554.31	8.69		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-16T19:48:23.200
 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 : 3427681255682493696
 2Mass ID (if available) : 05475998+2337372
 ICRS Star Coord at Epoch: 05h 47m 59.99467s +23:37:37.14225s
 RUWE (>1.4 is poor) : 1.44
 K magnitude : 14.326
 G magnitude : 16.956
 RP magnitude : 16.084
 BP magnitude : 17.604
 DUPflag : 0
 Distance (au) : 18.507
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.20
 Sun-Target sep (deg) : 119.25
 Sun-Moon sep (deg) : 88.59
 B (ring opening deg) : 77.56
 PA of pole (deg) : 48.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.042
 C/A sky separation (km) : 564.7
 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	2033-02-16T18:09:33.504		40.72	-78.00	50743.71	-8.65		
lambda	I	2033-02-16T18:10:56.419		40.41	-78.34	50026.71	-8.65		
delta	I	2033-02-16T18:14:16.164		39.64	-79.15	48300.35	-8.64		
gamma	I	2033-02-16T18:15:34.417		39.34	-79.47	47624.37	-8.64		
eta	I	2033-02-16T18:16:26.321		39.15	-79.68	47176.12	-8.64		
beta	I	2033-02-16T18:19:23.794		38.47	-80.40	45644.73	-8.63		
alpha	I	2033-02-16T18:21:14.779		38.04	-80.85	44685.19	-8.63		
4	I	2033-02-16T18:25:22.287		37.10	-81.86	42550.33	-8.62		
5	I	2033-02-16T18:26:05.970		36.93	-82.04	42175.46	-8.62		
6	I	2033-02-16T18:26:41.187		36.79	-82.18	41877.59	-8.62		
Uranus	I	2033-02-16T18:58:15.895		29.54	-89.52	25201.96		-9.86	-10.31
Uranus	E	2033-02-16T20:39:14.129		6.51	-65.43	25225.23		9.52	9.96
6	E	2033-02-16T21:11:47.123		-0.79x	-57.49	41797.16	8.25		
5	E	2033-02-16T21:12:48.202		-1.02x	-57.24	42295.49	8.25		
4	E	2033-02-16T21:13:24.224		-1.15x	-57.09	42591.34	8.25		
alpha	E	2033-02-16T21:17:46.294		-2.12x	-56.03	44751.74	8.24		
beta	E	2033-02-16T21:19:38.467		-2.54x	-55.57	45677.35	8.23		
eta	E	2033-02-16T21:22:40.693		-3.21x	-54.83	47176.12	8.22		
gamma	E	2033-02-16T21:23:35.652		-3.41x	-54.61	47628.08	8.22		
delta	E	2033-02-16T21:24:57.423		-3.72x	-54.28	48300.35	8.22		
lambda	E	2033-02-16T21:28:27.551		-4.49x	-53.42	50026.71	8.21		
epsilon	E	2033-02-16T21:31:33.718		-5.18x	-52.67	51554.84	8.20		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-16T19:57:11.850
 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 : 3427681255682493696
 2Mass ID (if available) : 05475998+2337372
 ICRS Star Coord at Epoch: 05h 47m 59.99467s +23:37:37.14225s
 RUWE (>1.4 is poor) : 1.44
 K magnitude : 14.326
 G magnitude : 16.956
 RP magnitude : 16.084
 BP magnitude : 17.604
 DUPflag : 0
 Distance (au) : 18.507
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.20
 Sun-Target sep (deg) : 119.25
 Sun-Moon sep (deg) : 88.83
 B (ring opening deg) : 77.56
 PA of pole (deg) : 48.95
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.467
 C/A sky separation (km) : 6273.9
 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	2033-02-16T18:21:19.079		34.01	-11.99	50744.38	-8.67		
lambda	I	2033-02-16T18:22:41.847		34.03	-12.25	50026.71	-8.67		
delta	I	2033-02-16T18:26:01.040		34.08	-12.90	48300.35	-8.66		
gamma	I	2033-02-16T18:27:19.134		34.10	-13.15	47623.86	-8.66		
eta	I	2033-02-16T18:28:10.834		34.11	-13.32	47176.12	-8.66		
beta	I	2033-02-16T18:31:07.952		34.13	-13.89	45643.55	-8.65		
alpha	I	2033-02-16T18:32:58.568		34.14	-14.25	44684.70	-8.65		
4	I	2033-02-16T18:37:05.842		34.16	-15.04	42545.68	-8.64		
5	I	2033-02-16T18:37:48.255		34.16	-15.18	42182.36	-8.64		
6	I	2033-02-16T18:38:24.072		34.16	-15.29	41878.92	-8.64		
Uranus	I	2033-02-16T19:10:02.018		33.65	-21.21	25098.40		-11.25	-11.77
Uranus	E	2033-02-16T20:45:07.006		26.46	-36.57	25359.05		7.33	7.67
6	E	2033-02-16T21:17:02.721		22.48	-40.46	41799.75	8.50		
5	E	2033-02-16T21:18:02.459		22.34	-40.56	42302.70	8.50		
4	E	2033-02-16T21:18:35.643		22.27	-40.62	42585.08	8.50		
alpha	E	2033-02-16T21:22:50.334		21.69	-41.07	44750.44	8.50		
beta	E	2033-02-16T21:24:38.885		21.44	-41.25	45675.54	8.50		
eta	E	2033-02-16T21:27:35.386		21.03	-41.55	47176.12	8.51		
gamma	E	2033-02-16T21:28:28.442		20.90	-41.63	47627.40	8.51		
delta	E	2033-02-16T21:29:47.556		20.72	-41.76	48300.35	8.51		
lambda	E	2033-02-16T21:33:10.505		20.24	-42.08	50026.71	8.51		
epsilon	E	2033-02-16T21:36:09.490		19.81	-42.35	51549.22	8.50		