

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-04T20:27:56.810
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3415549102644822784
 2Mass ID (if available) : 05141038+2306587

Uranus 2031-01-04T20:27:56 K14.07 G17.78 PgtRgt

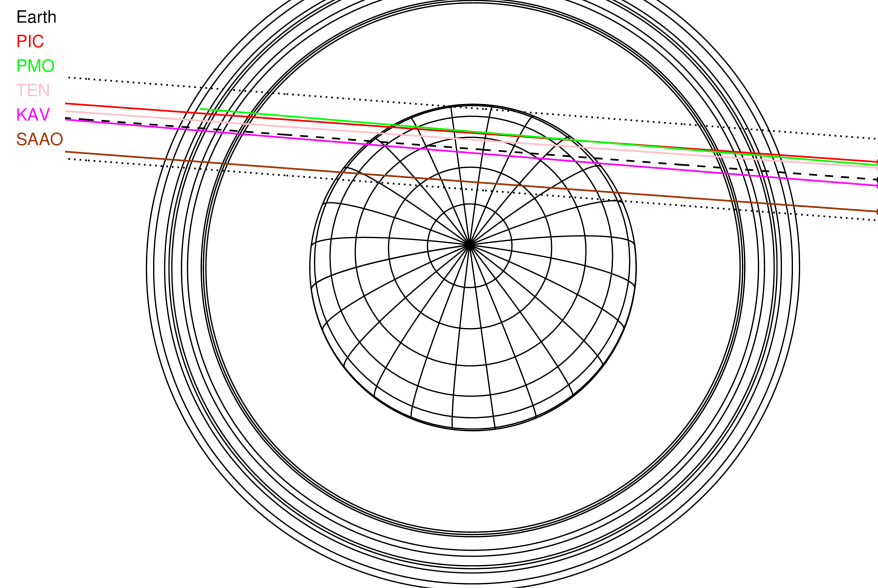
ICRS Star Coord at Epoch: 05h 14m 10.40542s +23:06:58.91289s

RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.069
 G magnitude : 17.779
 RP magnitude : 16.678
 BP magnitude : 19.087
 DUPflag : 0
 Distance (au) : 18.251
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.79
 Sun-Target sep (deg) : 155.62
 Sun-Moon sep (deg) : 17.95
 B (ring opening deg) : 81.97
 PA of pole (deg) : 8.55

#	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

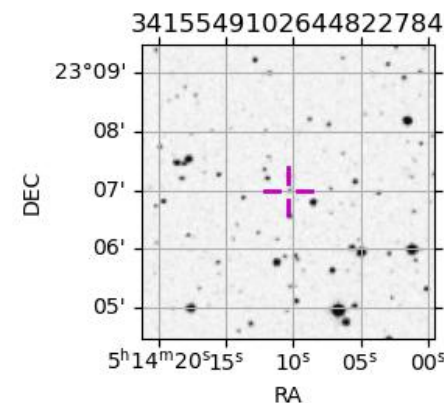


2031-01-04T20:27:56.8100 α: 05 14 10.4054 α: +23 06 58.913 C/A 1.405° PA 175.66 deg v_sky -20.79 km/s D 18.25 AU
 Credit: Styled after SORA/Lucky Star

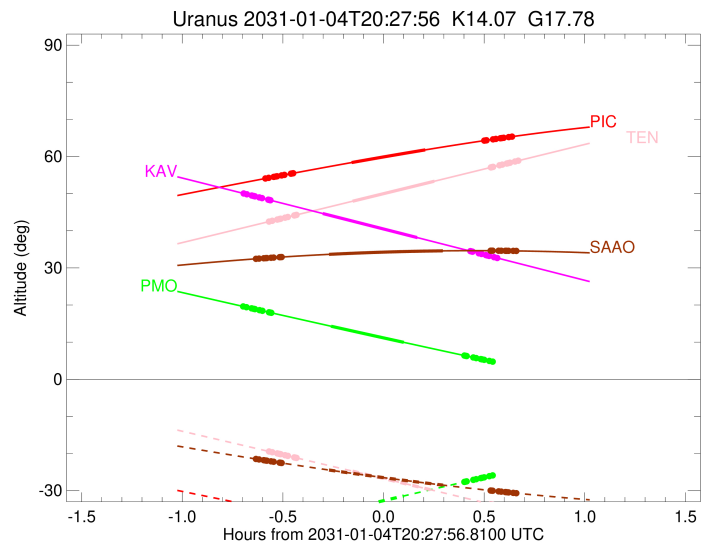
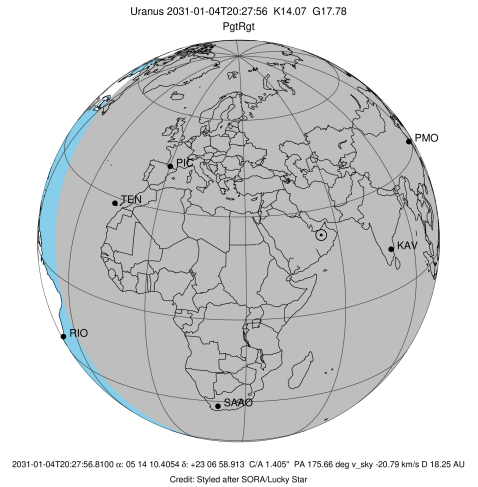


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++	+ +	+++++	JAN 04 19:53 - JAN 04 21:06	PieRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+ +	+++++	JAN 04 19:46 - JAN 04 20:57	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	+++++	+ +	+++++	JAN 04 19:54 - JAN 04 21:08	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	JAN 04 19:46 - JAN 04 21:02	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	+++++	+ +	+++++	JAN 04 19:50 - JAN 04 21:07	PieRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

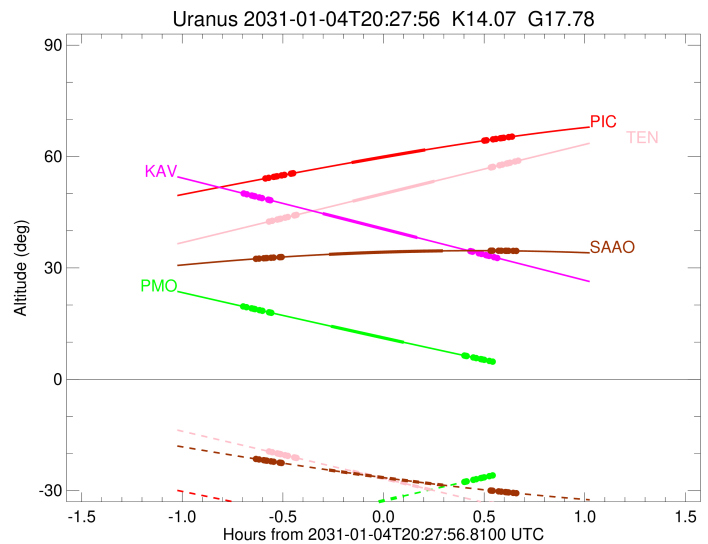
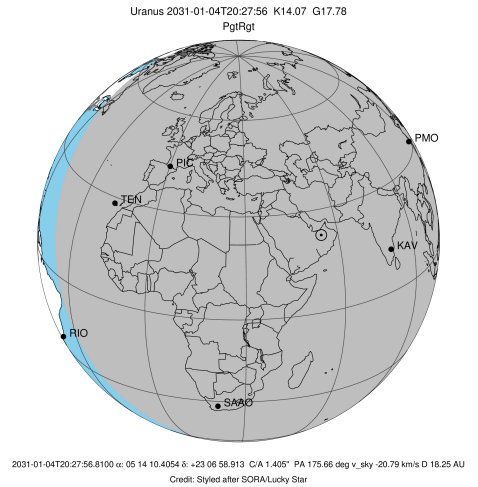


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-04T20:29:35.310
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3415549102644822784
 2Mass ID (if available) : 05141038+2306587
 ICRS Star Coord at Epoch: 05h 14m 10.40542s +23:06:58.91289s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.069
 G magnitude : 17.779
 RP magnitude : 16.678
 BP magnitude : 19.087
 DUPflag : 0
 Distance (au) : 18.251
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.79
 Sun-Target sep (deg) : 155.62
 Sun-Moon sep (deg) : 17.92
 B (ring opening deg) : 81.97
 PA of pole (deg) : 8.55
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.587
 C/A sky separation (km) : 21004.9
 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



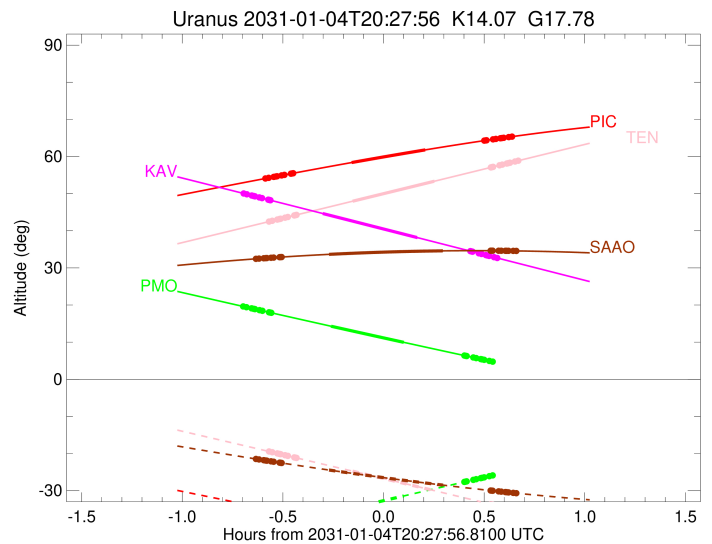
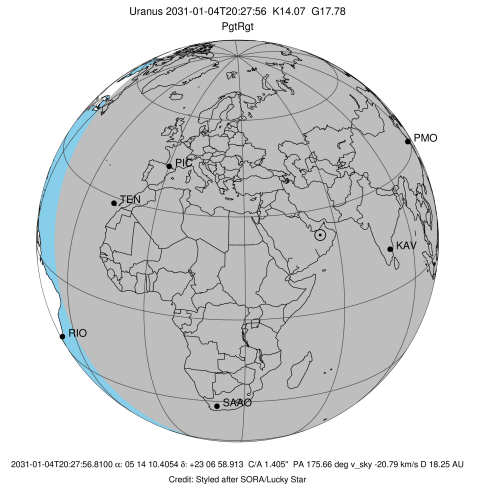
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-04T19:53:05.725		54.15	-34.82	50744.46	-19.15		
lambda	I	2031-01-04T19:53:43.278		54.26	-34.94	50026.71	-19.08		
delta	I	2031-01-04T19:55:14.097		54.52	-35.21	48300.35	-18.93		
gamma	I	2031-01-04T19:55:50.038		54.62	-35.32	47621.10	-18.87		
eta	I	2031-01-04T19:56:13.652		54.69	-35.40	47176.12	-18.82		
beta	I	2031-01-04T19:57:33.454		54.91	-35.64	45680.36	-18.66		
alpha	I	2031-01-04T19:58:25.838		55.06	-35.80	44705.54	-18.54		
4	I	2031-01-04T20:00:23.164		55.39	-36.16	42544.84	-18.26		
5	I	2031-01-04T20:00:39.334		55.44	-36.21	42251.49	-18.21		
6	I	2031-01-04T20:01:00.022		55.50	-36.27	41874.49	-18.16		
Uranus	I	2031-01-04T20:18:28.110		58.38	-39.47	25281.67		5.52	5.78
Uranus	E	2031-01-04T20:40:22.552		61.79	-43.46	25051.97		7.52	7.87
6	E	2031-01-04T20:57:56.673		64.28	-46.63	41801.32	18.19		
5	E	2031-01-04T20:58:16.643		64.32	-46.69	42158.56	18.23		
4	E	2031-01-04T20:58:37.878		64.37	-46.76	42552.52	18.29		
alpha	E	2031-01-04T21:00:34.458		64.63	-47.10	44699.39	18.57		
beta	E	2031-01-04T21:01:25.191		64.74	-47.25	45645.44	18.69		
eta	E	2031-01-04T21:02:46.697		64.92	-47.50	47176.12	18.86		
gamma	E	2031-01-04T21:03:10.757		64.97	-47.57	47630.35	18.90		
delta	E	2031-01-04T21:03:46.142		65.04	-47.67	48300.35	18.97		
lambda	E	2031-01-04T21:05:16.789		65.24	-47.94	50026.71	19.12		
epsilon	E	2031-01-04T21:06:30.148		65.39	-48.16	51433.61	19.18		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-04T20:23:18.880
 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 : 3415549102644822784
 2Mass ID (if available) : 05141038+2306587
 ICRS Star Coord at Epoch: 05h 14m 10.40542s +23:06:58.91289s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.069
 G magnitude : 17.779
 RP magnitude : 16.678
 BP magnitude : 19.087
 DUPflag : 0
 Distance (au) : 18.251
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.79
 Sun-Target sep (deg) : 155.62
 Sun-Moon sep (deg) : 18.76
 B (ring opening deg) : 81.97
 PA of pole (deg) : 8.55
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.602
 C/A sky separation (km) : 21207.4
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



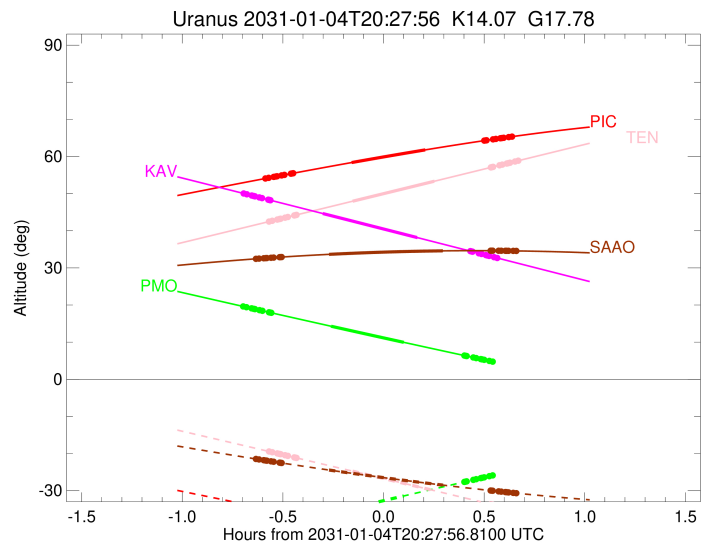
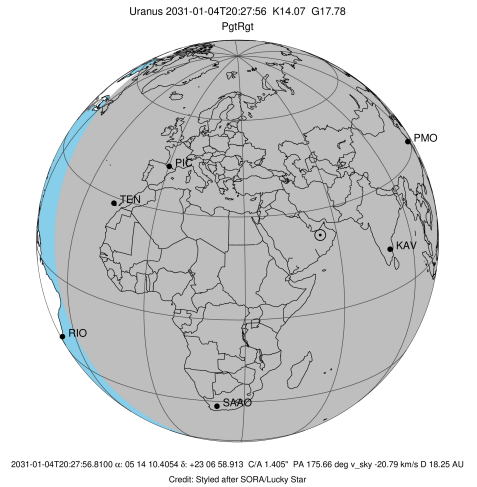
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-04T19:46:28.340		19.54	-41.46	50744.27	-18.93		
lambda	I	2031-01-04T19:47:06.310		19.41	-41.32	50026.71	-18.87		
delta	I	2031-01-04T19:48:38.187		19.10	-41.00	48300.35	-18.71		
gamma	I	2031-01-04T19:49:14.557		18.98	-40.87	47621.09	-18.64		
eta	I	2031-01-04T19:49:38.454		18.89	-40.79	47176.12	-18.60		
beta	I	2031-01-04T19:50:59.236		18.62	-40.50	45680.40	-18.43		
alpha	I	2031-01-04T19:51:52.272		18.44	-40.31	44705.74	-18.31		
4	I	2031-01-04T19:53:51.130		18.03	-39.89	42545.06	-18.02		
5	I	2031-01-04T19:54:07.502		17.98	-39.84	42251.95	-17.96		
6	I	2031-01-04T19:54:28.489		17.91	-39.76	41874.61	-17.92		
Uranus	I	2031-01-04T20:12:17.823		14.29	-36.00	25279.83		5.54	5.80
Uranus	E	2031-01-04T20:33:59.385		9.95	-31.43	25042.47		7.59	7.95
6	E	2031-01-04T20:52:00.497		6.40	-27.66	41801.70	17.83		
5	E	2031-01-04T20:52:20.842		6.33	-27.59	42158.16	17.87		
4	E	2031-01-04T20:52:42.490		6.26	-27.52	42551.84	17.92		
alpha	E	2031-01-04T20:54:41.457		5.88	-27.10	44698.94	18.21		
beta	E	2031-01-04T20:55:33.250		5.71	-26.92	45645.64	18.32		
eta	E	2031-01-04T20:56:56.389		5.44	-26.64	47176.12	18.48		
gamma	E	2031-01-04T20:57:20.930		5.36	-26.55	47630.29	18.53		
delta	E	2031-01-04T20:57:57.030		5.24	-26.43	48300.35	18.59		
lambda	E	2031-01-04T20:59:29.498		4.94x	-26.11	50026.71	18.74		
epsilon	E	2031-01-04T21:00:44.089		4.70x	-25.85	51429.08	18.81		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-04T20:31:04.430
 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 : 3415549102644822784
 2Mass ID (if available) : 05141038+2306587
 ICRS Star Coord at Epoch: 05h 14m 10.40542s +23:06:58.91289s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.069
 G magnitude : 17.779
 RP magnitude : 16.678
 BP magnitude : 19.087
 DUPflag : 0
 Distance (au) : 18.251
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.79
 Sun-Target sep (deg) : 155.62
 Sun-Moon sep (deg) : 17.64
 B (ring opening deg) : 81.97
 PA of pole (deg) : 8.55
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.507
 C/A sky separation (km) : 19953.5
 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



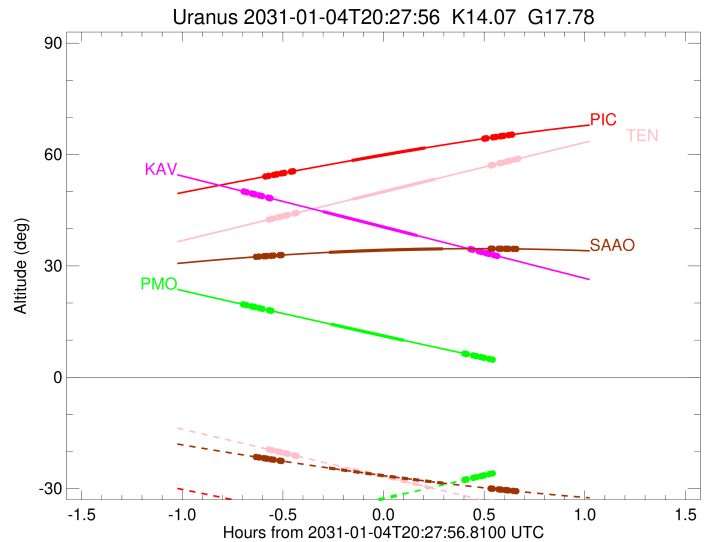
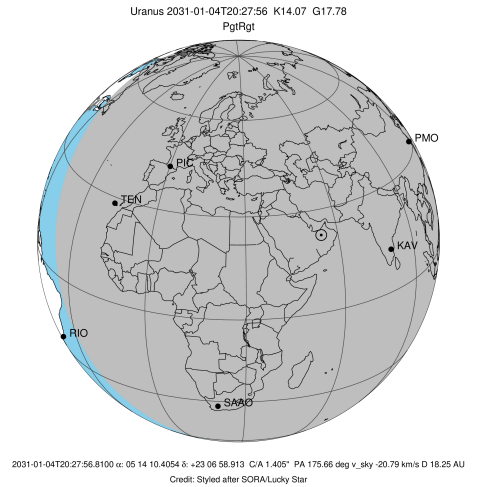
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-04T19:54:10.548		42.56	-19.52	50743.98	-19.31		
lambda	I	2031-01-04T19:54:47.743		42.69	-19.66	50026.71	-19.26		
delta	I	2031-01-04T19:56:17.695		43.02	-19.97	48300.35	-19.12		
gamma	I	2031-01-04T19:56:53.268		43.15	-20.10	47621.07	-19.07		
eta	I	2031-01-04T19:57:16.630		43.24	-20.18	47176.12	-19.03		
beta	I	2031-01-04T19:58:35.526		43.53	-20.46	45680.50	-18.88		
alpha	I	2031-01-04T19:59:27.240		43.72	-20.64	44706.31	-18.78		
4	I	2031-01-04T20:01:22.973		44.14	-21.05	42545.81	-18.53		
5	I	2031-01-04T20:01:38.841		44.20	-21.11	42253.57	-18.48		
6	I	2031-01-04T20:01:59.301		44.28	-21.18	41875.03	-18.44		
Uranus	I	2031-01-04T20:18:44.609		47.97	-24.76	25322.12		5.09	5.33
Uranus	E	2031-01-04T20:43:05.160		53.34	-30.00	25082.50		7.28	7.63
6	E	2031-01-04T20:59:54.812		57.06	-33.64	41800.62	18.50		
5	E	2031-01-04T21:00:14.515		57.13	-33.72	42159.34	18.54		
4	E	2031-01-04T21:00:35.442		57.21	-33.79	42553.80	18.59		
alpha	E	2031-01-04T21:02:30.231		57.63	-34.21	44700.21	18.84		
beta	E	2031-01-04T21:03:20.200		57.82	-34.39	45645.09	18.95		
eta	E	2031-01-04T21:04:40.665		58.11	-34.68	47176.12	19.10		
gamma	E	2031-01-04T21:05:04.432		58.20	-34.77	47630.44	19.14		
delta	E	2031-01-04T21:05:39.386		58.33	-34.89	48300.35	19.19		
lambda	E	2031-01-04T21:07:08.999		58.66	-35.22	50026.71	19.33		
epsilon	E	2031-01-04T21:08:21.947		58.93	-35.48	51440.78	19.39		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-04T20:24:04.030
 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 : 3415549102644822784
 2Mass ID (if available) : 05141038+2306587
 ICRS Star Coord at Epoch: 05h 14m 10.40542s +23:06:58.91289s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.069
 G magnitude : 17.779
 RP magnitude : 16.678
 BP magnitude : 19.087
 DUPflag : 0
 Distance (au) : 18.251
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.79
 Sun-Target sep (deg) : 155.62
 Sun-Moon sep (deg) : 18.79
 B (ring opening deg) : 81.97
 PA of pole (deg) : 8.55
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.350
 C/A sky separation (km) : 17868.4
 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_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	2031-01-04T19:46:36.829		49.97	-73.06	50743.53	-19.77		
lambda	I	2031-01-04T19:47:13.117		49.83	-72.94	50026.71	-19.73		
delta	I	2031-01-04T19:48:40.846		49.49	-72.66	48300.35	-19.62		
gamma	I	2031-01-04T19:49:15.508		49.36	-72.55	47621.02	-19.58		
eta	I	2031-01-04T19:49:38.253		49.28	-72.48	47176.12	-19.54		
beta	I	2031-01-04T19:50:54.987		48.98	-72.23	45680.80	-19.43		
alpha	I	2031-01-04T19:51:45.137		48.79	-72.07	44708.34	-19.34		
4	I	2031-01-04T19:53:37.313		48.36	-71.70	42548.38	-19.14		
5	I	2031-01-04T19:53:52.515		48.31	-71.65	42258.78	-19.10		
6	I	2031-01-04T19:54:12.514		48.23	-71.58	41876.26	-19.08		
Uranus	I	2031-01-04T20:09:48.848		44.65	-68.40	25398.09		4.19	4.38
Uranus	E	2031-01-04T20:38:02.654		38.16	-62.31	25137.35		6.84	7.16
6	E	2031-01-04T20:53:48.061		34.53	-58.80	41799.69	18.99		
5	E	2031-01-04T20:54:07.357		34.46	-58.73	42160.59	19.01		
4	E	2031-01-04T20:54:27.813		34.38	-58.65	42555.65	19.05		
alpha	E	2031-01-04T20:56:19.962		33.95	-58.24	44701.38	19.25		
beta	E	2031-01-04T20:57:08.836		33.76	-58.05	45644.63	19.33		
eta	E	2031-01-04T20:58:27.824		33.45	-57.76	47176.12	19.44		
gamma	E	2031-01-04T20:58:51.181		33.36	-57.67	47630.55	19.47		
delta	E	2031-01-04T20:59:25.542		33.23	-57.54	48300.35	19.52		
lambda	E	2031-01-04T21:00:53.764		32.89	-57.21	50026.71	19.62		
epsilon	E	2031-01-04T21:02:06.150		32.62	-56.94	51449.81	19.66		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-04T20:28:46.870
 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 : 3415549102644822784
 2Mass ID (if available) : 05141038+2306587
 ICRS Star Coord at Epoch: 05h 14m 10.40542s +23:06:58.91289s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.069
 G magnitude : 17.779
 RP magnitude : 16.678
 BP magnitude : 19.087
 DUPflag : 0
 Distance (au) : 18.251
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.79
 Sun-Target sep (deg) : 155.62
 Sun-Moon sep (deg) : 18.00
 B (ring opening deg) : 81.97
 PA of pole (deg) : 8.55
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.008
 C/A sky separation (km) : 13346.2
 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	2031-01-04T19:50:15.665		32.47	-21.52	50745.32	-20.41		
lambda	I	2031-01-04T19:50:50.884		32.50	-21.60	50026.71	-20.39		
delta	I	2031-01-04T19:52:15.658		32.60	-21.80	48300.35	-20.33		
gamma	I	2031-01-04T19:52:49.088		32.63	-21.88	47620.96	-20.31		
eta	I	2031-01-04T19:53:11.000		32.65	-21.93	47176.12	-20.29		
beta	I	2031-01-04T19:54:24.779		32.73	-22.11	45681.11	-20.23		
alpha	I	2031-01-04T19:55:12.741		32.78	-22.22	44711.68	-20.19		
4	I	2031-01-04T19:56:59.930		32.89	-22.47	42552.72	-20.08		
5	I	2031-01-04T19:57:14.197		32.90	-22.50	42266.98	-20.06		
6	I	2031-01-04T19:57:33.575		32.92	-22.55	41877.88	-20.05		
Uranus	I	2031-01-04T20:11:41.073		33.65	-24.45	25497.42		2.58	2.70
Uranus	E	2031-01-04T20:45:39.980		34.59	-28.51	25270.28		5.63	5.90
6	E	2031-01-04T20:59:50.405		34.64	-29.97	41797.50	20.05		
5	E	2031-01-04T21:00:08.943		34.64	-30.00	42164.87	20.06		
4	E	2031-01-04T21:00:28.437		34.63	-30.03	42560.99	20.09		
alpha	E	2031-01-04T21:02:14.970		34.62	-30.20	44704.90	20.19		
beta	E	2031-01-04T21:03:01.375		34.62	-30.27	45643.44	20.24		
eta	E	2031-01-04T21:04:16.976		34.61	-30.39	47176.12	20.30		
gamma	E	2031-01-04T21:04:39.367		34.60	-30.42	47630.87	20.32		
delta	E	2031-01-04T21:05:12.299		34.60	-30.47	48300.35	20.34		
lambda	E	2031-01-04T21:06:37.042		34.58	-30.60	50026.71	20.40		
epsilon	E	2031-01-04T21:07:48.004		34.57	-30.71	51475.94	20.42		