

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T22:16:00.110
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3428371469808281344
 2Mass ID (if available) : 05424767+2331325

Uranus 2031-11-14T22:16:00 K14.36 G18.16 PgtRgt

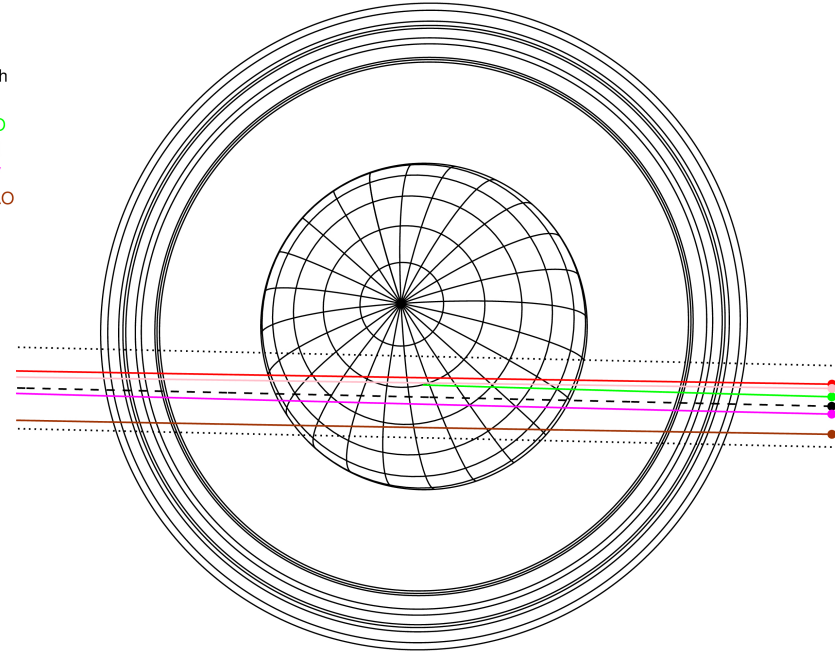
ICRS Star Coord at Epoch: 05h 42m 47.68121s +23:31:32.33861s

RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.362
 G magnitude : 18.164
 RP magnitude : 16.988
 BP magnitude : 19.563
 DUPflag : 0
 Distance (au) : 18.266
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.31
 Sun-Target sep (deg) : 145.84
 Sun-Moon sep (deg) : 146.44
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.93
 # a(km) ring



2031-11-14T22:16:00.1100 ra: 05 42 47.6812 s: +23 31 32.339 C/A 0.628° PA 358.71 deg v_sky -18.31 km/s D 18.27 AU
 Credit: Styled after SORA/Lucky Star

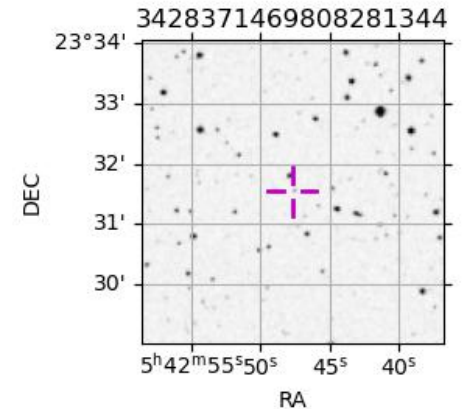
Earth
 PIC
 PMO
 TEN
 KAV
 SAAO



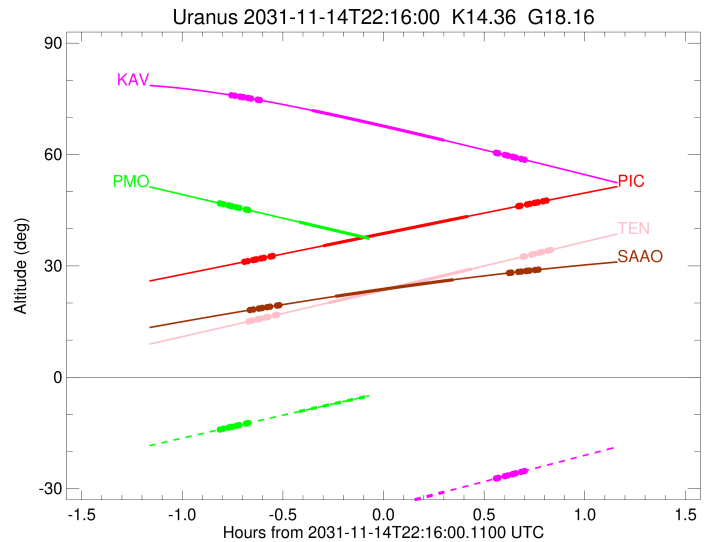
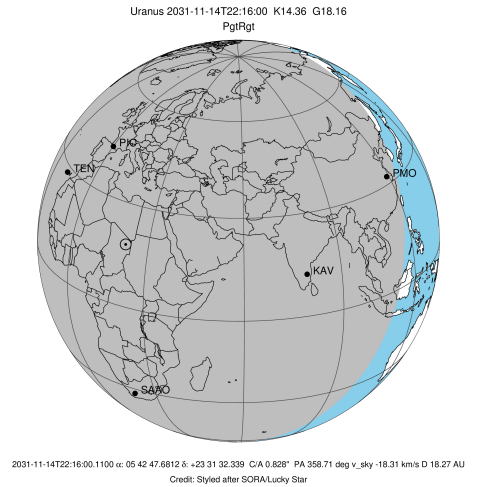
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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 14 21:34 - NOV 14 23:04	PieRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+		NOV 14 21:27 - NOV 14 21:50	PinRin
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 14 21:35 - NOV 14 23:06	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	NOV 14 21:30 - NOV 14 22:58	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 14 21:36 - NOV 14 23:02	PieRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



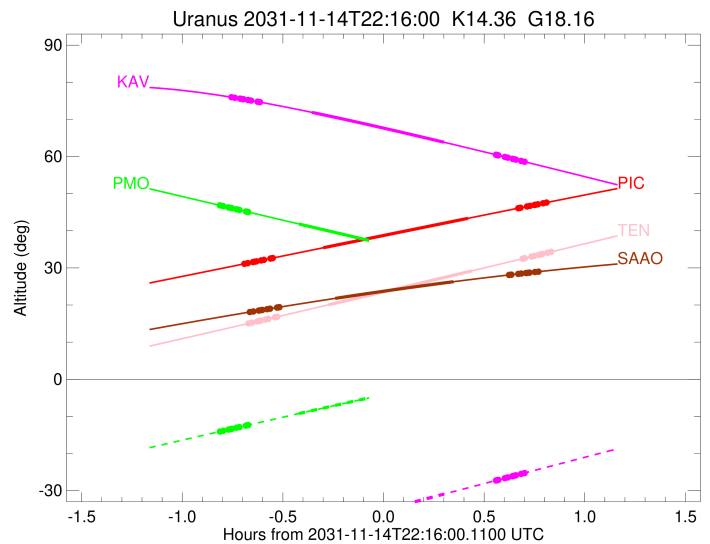
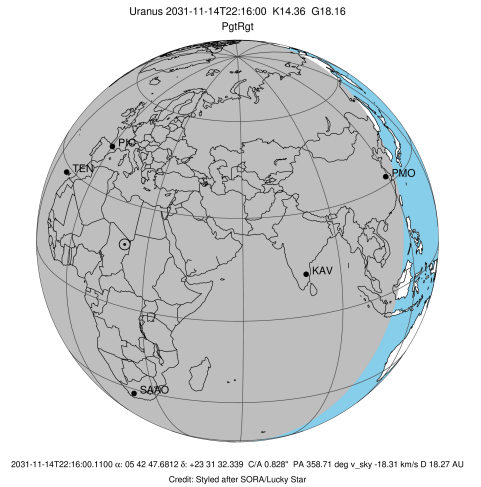
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T22:19:29.320
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3428371469808281344
 2Mass ID (if available) : 05424767+2331325
 ICRS Star Coord at Epoch: 05h 42m 47.68121s +23:31:32.33861s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.362
 G magnitude : 18.164
 RP magnitude : 16.988
 BP magnitude : 19.563
 DUPflag : 0
 Distance (au) : 18.266
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.31
 Sun-Target sep (deg) : 145.84
 Sun-Moon sep (deg) : 146.28
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.93
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.606
 C/A sky separation (km) : 8028.0
 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_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

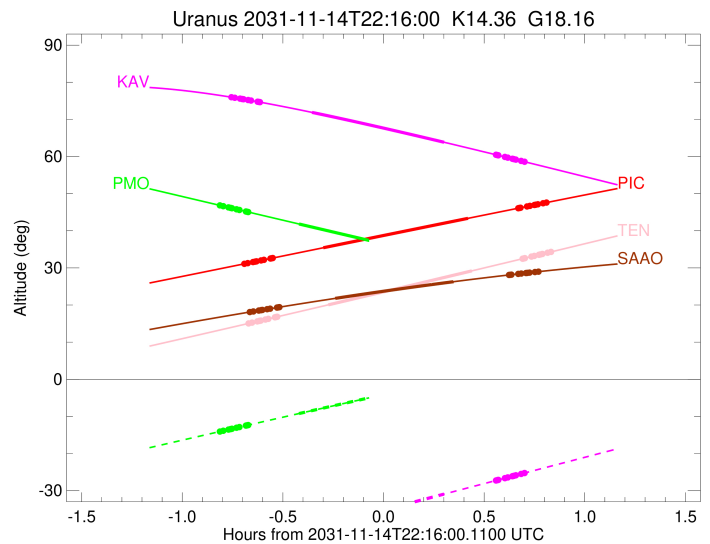
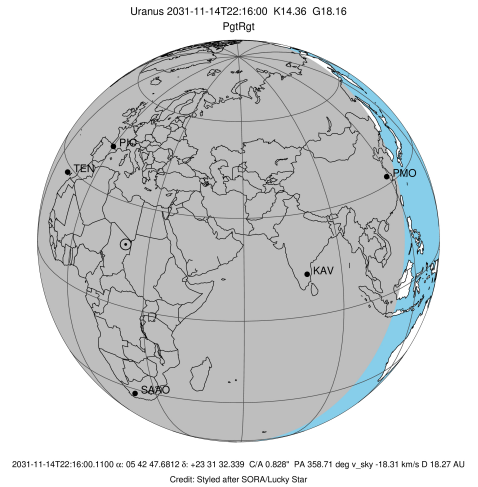
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-14T21:34:28.829		31.09	-53.37	51200.94	-18.40		
lambda	I	2031-11-14T21:35:32.735		31.29	-53.54	50026.71	-18.37		
delta	I	2031-11-14T21:37:06.756		31.57	-53.78	48300.35	-18.35		
gamma	I	2031-11-14T21:37:43.247		31.69	-53.88	47630.73	-18.35		
eta	I	2031-11-14T21:38:08.030		31.76	-53.94	47176.12	-18.34		
beta	I	2031-11-14T21:39:30.126		32.01	-54.15	45670.71	-18.33		
alpha	I	2031-11-14T21:40:22.579		32.17	-54.29	44708.18	-18.31		
4	I	2031-11-14T21:42:16.938		32.52	-54.58	42615.75	-18.28		
5	I	2031-11-14T21:42:37.447		32.59	-54.63	42246.23	-18.27		
6	I	2031-11-14T21:43:01.474		32.66	-54.69	41797.31	-18.27		
Uranus	I	2031-11-14T21:58:02.349		35.42	-56.90	25097.98		-10.36	-10.85
Uranus	E	2031-11-14T22:41:13.363		43.36	-62.24	25436.15		5.28	5.52
6	E	2031-11-14T22:56:12.105		46.08	-63.61	41868.71	18.37		
5	E	2031-11-14T22:56:29.480		46.14	-63.63	42194.69	18.38		
4	E	2031-11-14T22:56:47.862		46.19	-63.66	42526.74	18.39		
alpha	E	2031-11-14T22:58:48.013		46.55	-63.81	44739.59	18.43		
beta	E	2031-11-14T22:59:37.807		46.70	-63.88	45658.28	18.44		
eta	E	2031-11-14T23:01:00.047		46.95	-63.98	47176.12	18.46		
gamma	E	2031-11-14T23:01:24.145		47.02	-64.01	47621.10	18.47		
delta	E	2031-11-14T23:02:00.916		47.13	-64.05	48300.35	18.48		
lambda	E	2031-11-14T23:03:34.297		47.42	-64.17	50026.71	18.50		
epsilon	E	2031-11-14T23:04:38.741		47.61	-64.24	51219.19	18.53		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T22:11:47.310
 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 : 3428371469808281344
 2Mass ID (if available) : 05424767+2331325
 ICRS Star Coord at Epoch: 05h 42m 47.68121s +23:31:32.33861s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.362
 G magnitude : 18.164
 RP magnitude : 16.988
 BP magnitude : 19.563
 DUPflag : 0
 Distance (au) : 18.266
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.31
 Sun-Target sep (deg) : 145.84
 Sun-Moon sep (deg) : 147.37
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.93
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.692
 C/A sky separation (km) : 9161.5
 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_itrfr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



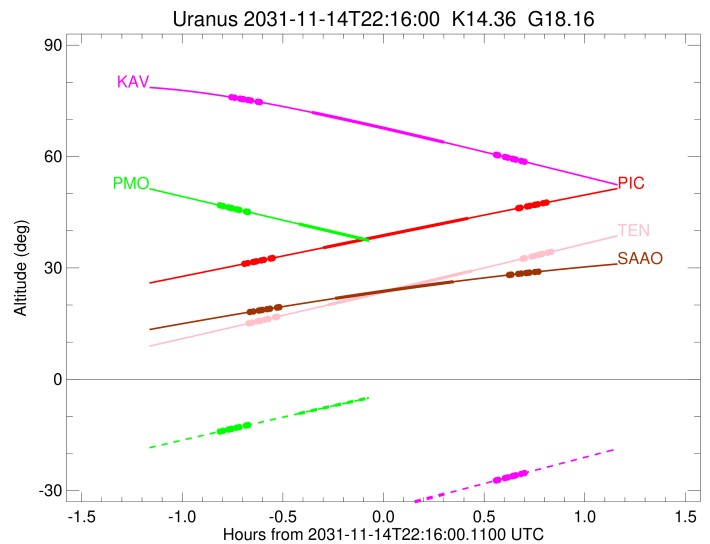
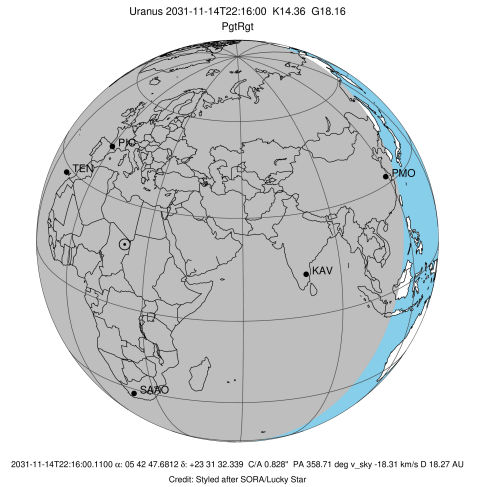
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-14T21:27:10.167		46.86	-14.09	51215.32	-18.48		
lambda	I	2031-11-14T21:28:14.611		46.63	-13.87	50026.71	-18.44		
delta	I	2031-11-14T21:29:48.316		46.29	-13.55	48300.35	-18.41		
gamma	I	2031-11-14T21:30:24.705		46.17	-13.42	47630.62	-18.40		
eta	I	2031-11-14T21:30:49.412		46.08	-13.34	47176.12	-18.39		
beta	I	2031-11-14T21:32:11.270		45.79	-13.06	45671.39	-18.37		
alpha	I	2031-11-14T21:33:03.578		45.60	-12.88	44709.46	-18.35		
4	I	2031-11-14T21:34:57.871		45.20	-12.48	42615.36	-18.30		
5	I	2031-11-14T21:35:18.502		45.12	-12.41	42242.98	-18.29		
6	I	2031-11-14T21:35:42.353		45.04	-12.33	41796.75	-18.28		
Uranus	I	2031-11-14T21:50:47.464		41.83	-9.24	25072.92		-10.65	-11.15
Uranus	E	2031-11-14T22:33:10.938		32.87	-0.72x	25451.54		4.93	5.16
6	E	2031-11-14T22:48:21.359		29.69	2.26x	41868.28	18.19		
5	E	2031-11-14T22:48:38.885		29.63	2.32x	42193.70	18.20		
4	E	2031-11-14T22:48:57.508		29.57	2.38x	42526.87	18.21		
alpha	E	2031-11-14T22:50:58.843		29.14	2.77x	44739.93	18.25		
beta	E	2031-11-14T22:51:49.112		28.97	2.93x	45658.53	18.27		
eta	E	2031-11-14T22:53:12.118		28.68	3.20x	47176.12	18.29		
gamma	E	2031-11-14T22:53:36.442		28.60	3.28x	47621.09	18.30		
delta	E	2031-11-14T22:54:13.558		28.47	3.40x	48300.35	18.31		
lambda	E	2031-11-14T22:55:47.808		28.14	3.70x	50026.71	18.33		
epsilon	E	2031-11-14T22:56:53.049		27.91	3.91x	51222.89	18.37		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T22:20:48.310
 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 : 3428371469808281344
 2Mass ID (if available) : 05424767+2331325
 ICRS Star Coord at Epoch: 05h 42m 47.68121s +23:31:32.33861s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.362
 G magnitude : 18.164
 RP magnitude : 16.988
 BP magnitude : 19.563
 DUPflag : 0
 Distance (au) : 18.266
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.31
 Sun-Target sep (deg) : 145.84
 Sun-Moon sep (deg) : 145.97
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.93
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.667
 C/A sky separation (km) : 8832.5
 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_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	2031-11-14T21:35:44.106		15.04	-44.52	51206.57	-18.27		
lambda	I	2031-11-14T21:36:48.807		15.26	-44.76	50026.71	-18.23		
delta	I	2031-11-14T21:38:23.558		15.59	-45.11	48300.35	-18.21		
gamma	I	2031-11-14T21:39:00.340		15.72	-45.24	47630.69	-18.20		
eta	I	2031-11-14T21:39:25.317		15.81	-45.34	47176.12	-18.20		
beta	I	2031-11-14T21:40:48.062		16.10	-45.64	45670.99	-18.18		
alpha	I	2031-11-14T21:41:40.931		16.28	-45.83	44708.71	-18.16		
4	I	2031-11-14T21:43:36.302		16.68	-46.26	42615.59	-18.13		
5	I	2031-11-14T21:43:57.052		16.76	-46.33	42244.83	-18.11		
6	I	2031-11-14T21:44:21.222		16.84	-46.42	41797.06	-18.11		
Uranus	I	2031-11-14T21:59:32.591		20.05	-49.77	25084.64		-10.52	-11.01
Uranus	E	2031-11-14T22:42:22.476		29.21	-59.12	25452.44		4.91	5.14
6	E	2031-11-14T22:57:30.163		32.48	-62.37	41868.07	18.25		
5	E	2031-11-14T22:57:47.623		32.54	-62.43	42193.18	18.25		
4	E	2031-11-14T22:58:06.219		32.61	-62.50	42526.94	18.27		
alpha	E	2031-11-14T23:00:07.176		33.04	-62.93	44740.14	18.31		
beta	E	2031-11-14T23:00:57.276		33.23	-63.10	45658.69	18.33		
eta	E	2031-11-14T23:02:19.990		33.52	-63.40	47176.12	18.35		
gamma	E	2031-11-14T23:02:44.228		33.61	-63.48	47621.08	18.36		
delta	E	2031-11-14T23:03:21.212		33.75	-63.61	48300.35	18.37		
lambda	E	2031-11-14T23:04:55.114		34.09	-63.94	50026.71	18.40		
epsilon	E	2031-11-14T23:06:00.304		34.32	-64.17	51226.55	18.44		

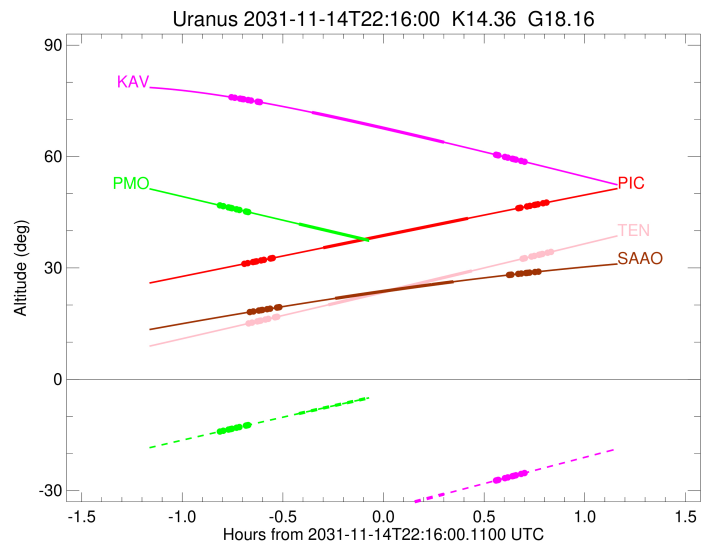
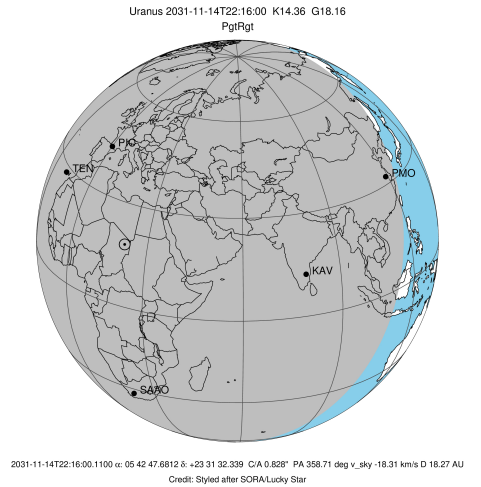
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-14T22:14:06.870
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 3428371469808281344
 2Mass ID (if available) : 05424767+2331325
 ICRS Star Coord at Epoch: 05h 42m 47.68121s +23:31:32.33861s
 RUWE (>1.4 is poor) : 1.00
 K magnitude : 14.362
 G magnitude : 18.164
 RP magnitude : 16.988
 BP magnitude : 19.563
 DUPflag : 0
 Distance (au) : 18.266
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.31
 Sun-Target sep (deg) : 145.84
 Sun-Moon sep (deg) : 147.21
 B (ring opening deg) : 78.50
 PA of pole (deg) : 44.93
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.919
 C/A sky separation (km) : 12171.2
 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	2031-11-14T21:30:34.978		75.99	-45.98	51237.69	-18.43		
lambda	I	2031-11-14T21:31:40.879		75.83	-45.72	50026.71	-18.36		
delta	I	2031-11-14T21:33:15.008		75.59	-45.35	48300.35	-18.32		
gamma	I	2031-11-14T21:33:51.597		75.50	-45.21	47630.43	-18.30		
eta	I	2031-11-14T21:34:16.432		75.43	-45.11	47176.12	-18.29		
beta	I	2031-11-14T21:35:38.742		75.22	-44.78	45672.47	-18.24		
alpha	I	2031-11-14T21:36:31.356		75.08	-44.57	44711.62	-18.21		
4	I	2031-11-14T21:38:26.787		74.77	-44.12	42614.53	-18.13		
5	I	2031-11-14T21:38:47.848		74.71	-44.03	42237.37	-18.11		
6	I	2031-11-14T21:39:11.658		74.65	-43.94	41795.94	-18.10		
Uranus	I	2031-11-14T21:54:39.615		71.90	-40.27	25030.92		-11.12	-11.64
Uranus	E	2031-11-14T22:34:03.527		63.85	-30.93	25504.20		3.51	3.68
6	E	2031-11-14T22:49:33.726		60.47	-27.27	41865.89	18.07		
5	E	2031-11-14T22:49:51.258		60.41	-27.20	42188.45	18.08		
4	E	2031-11-14T22:50:10.312		60.34	-27.12	42527.72	18.10		
alpha	E	2031-11-14T22:52:12.303		59.89	-26.64	44741.81	18.18		
beta	E	2031-11-14T22:53:02.735		59.71	-26.44	45659.97	18.21		
eta	E	2031-11-14T22:54:25.878		59.40	-26.12	47176.12	18.25		
gamma	E	2031-11-14T22:54:50.244		59.31	-26.02	47621.02	18.27		
delta	E	2031-11-14T22:55:27.418		59.17	-25.87	48300.35	18.28		
lambda	E	2031-11-14T22:57:01.730		58.82	-25.50	50026.71	18.33		
epsilon	E	2031-11-14T22:58:08.350		58.58	-25.24	51248.46	18.39		


```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch              : 2031-11-14T22:18:56.960
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        : 3428371469808281344
2Mass ID (if available) : 05424767+2331325
ICRS Star Coord at Epoch: 05h 42m 47.68121s +23:31:32.33861s
RUWE (>1.4 is poor)  : 1.00
K magnitude           : 14.362
G magnitude           : 18.164
RP magnitude          : 16.988
BP magnitude          : 19.563
DUPflag              : 0
Distance (au)         : 18.266
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -18.31
Sun-Target sep (deg)  : 145.84
Sun-Moon sep (deg)    : 146.20
B (ring opening deg)  : 78.50
PA of pole (deg)     : 44.93
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.195
C/A sky separation (km) : 15835.2
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.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	2031-11-14T21:36:02.871		18.09	-38.31	51264.15	-17.86		
lambda	I	2031-11-14T21:37:12.408		18.27	-38.37	50026.71	-17.77		
delta	I	2031-11-14T21:38:49.744		18.51	-38.44	48300.35	-17.70		
gamma	I	2031-11-14T21:39:27.640		18.61	-38.47	47630.17	-17.67		
eta	I	2031-11-14T21:39:53.353		18.67	-38.49	47176.12	-17.65		
beta	I	2031-11-14T21:41:18.651		18.88	-38.56	45673.72	-17.57		
alpha	I	2031-11-14T21:42:13.213		19.02	-38.60	44714.27	-17.52		
4	I	2031-11-14T21:44:13.625		19.31	-38.68	42613.25	-17.39		
5	I	2031-11-14T21:44:35.866		19.37	-38.70	42230.53	-17.35		
6	I	2031-11-14T21:45:00.357		19.43	-38.71	41795.23	-17.33		
Uranus	I	2031-11-14T22:01:37.425		21.79	-39.23	25000.35		-11.46	-11.99
Uranus	E	2031-11-14T22:36:53.045		26.28	-39.30	25548.76		1.52	1.59
6	E	2031-11-14T22:53:26.846		28.10	-38.85	41862.53	17.41		
5	E	2031-11-14T22:53:44.926		28.14	-38.84	42182.07	17.44		
4	E	2031-11-14T22:54:05.087		28.17	-38.83	42529.20	17.47		
alpha	E	2031-11-14T22:56:11.302		28.39	-38.75	44744.06	17.61		
beta	E	2031-11-14T22:57:03.323		28.47	-38.71	45661.85	17.66		
eta	E	2031-11-14T22:58:28.849		28.62	-38.65	47176.12	17.74		
gamma	E	2031-11-14T22:58:53.908		28.66	-38.64	47620.97	17.76		
delta	E	2031-11-14T22:59:32.121		28.72	-38.61	48300.35	17.80		
lambda	E	2031-11-14T23:01:08.923		28.88	-38.54	50026.71	17.87		
epsilon	E	2031-11-14T23:02:19.005		29.00	-38.49	51280.97	17.97		