

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-12-16T17:53:07.640
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 55991534429751552
 2Mass ID (if available) : 03254023+1827166

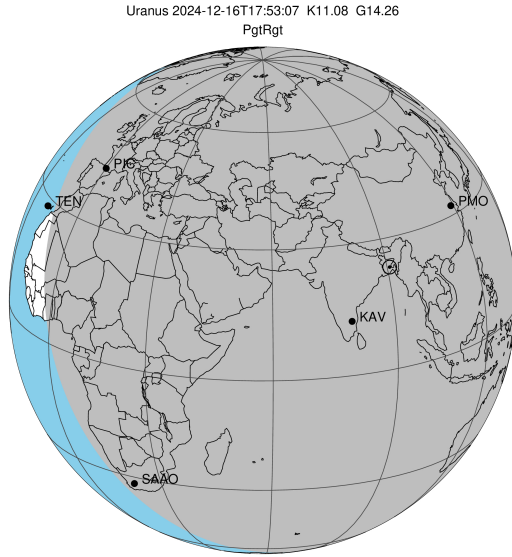
ICRS Star Coord at Epoch: 03h 25m 40.14044s +18:27:12.69149s

RUWE (>1.4 is poor) : 1.07
 K magnitude : 11.083
 G magnitude : 14.258
 RP magnitude : 13.217
 BP magnitude : 15.353
 DUPflag : 0
 Distance (au) : 18.707
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.12
 Sun-Target sep (deg) : 148.80
 Sun-Moon sep (deg) : 49.27
 B (ring opening deg) : 65.02
 PA of pole (deg) : -86.40
 # 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

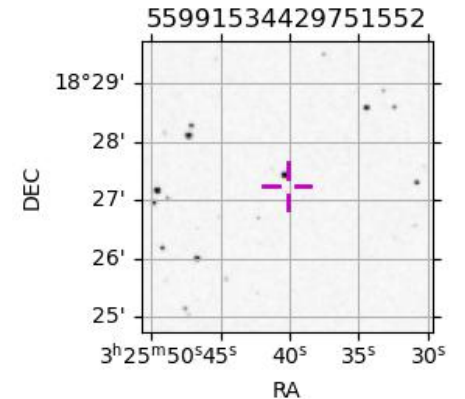
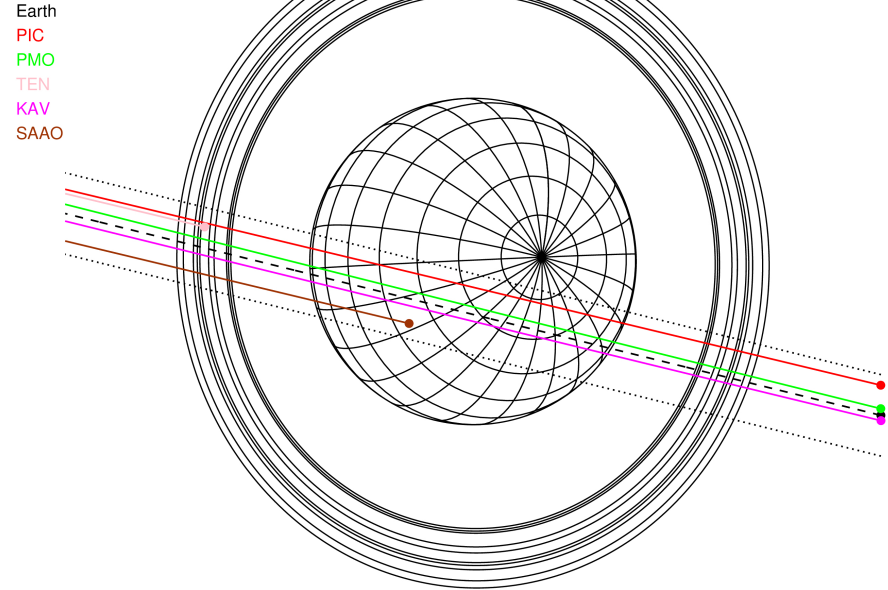
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++	+ +	+++++	DEC 16 17:15 - DEC 16 18:35	PieRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+ +	+++++	DEC 16 17:08 - DEC 16 18:28	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			+++++	DEC 16 18:34 - DEC 16 18:37	PnnRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	DEC 16 17:11 - DEC 16 18:30	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		+	+++++	DEC 16 18:15 - DEC 16 18:34	PneRne
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

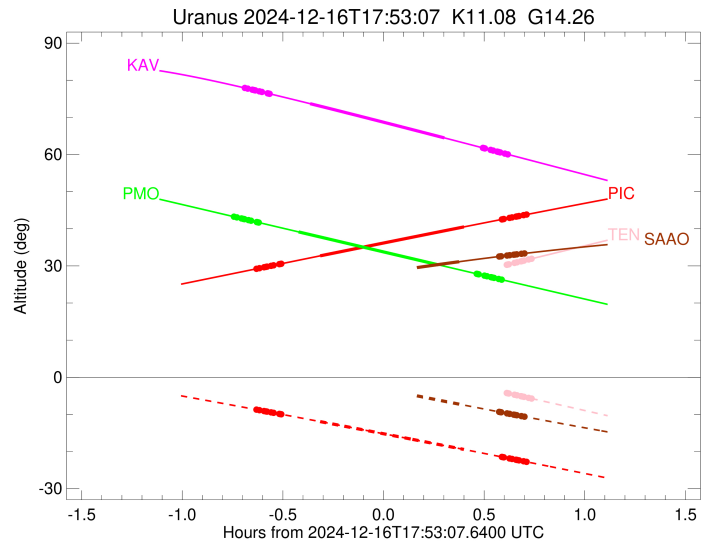
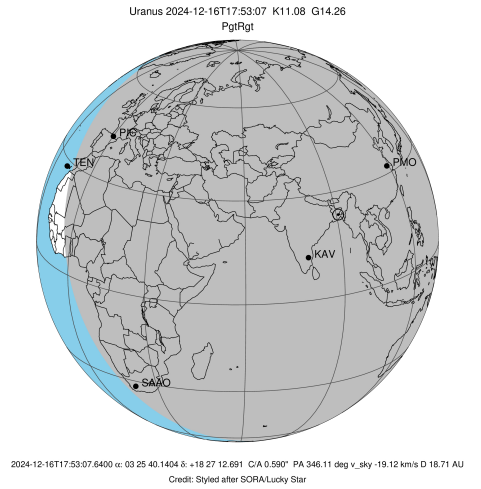


2024-12-16T17:53:07.6400 cc: 03 25 40.1404 s: +18 27 12.691 C/A 0.590° PA 346.11 deg v_sky -19.12 km/s D 18.71 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2024-12-16T17:53:07 K11.08 G14.26 PgtRgt

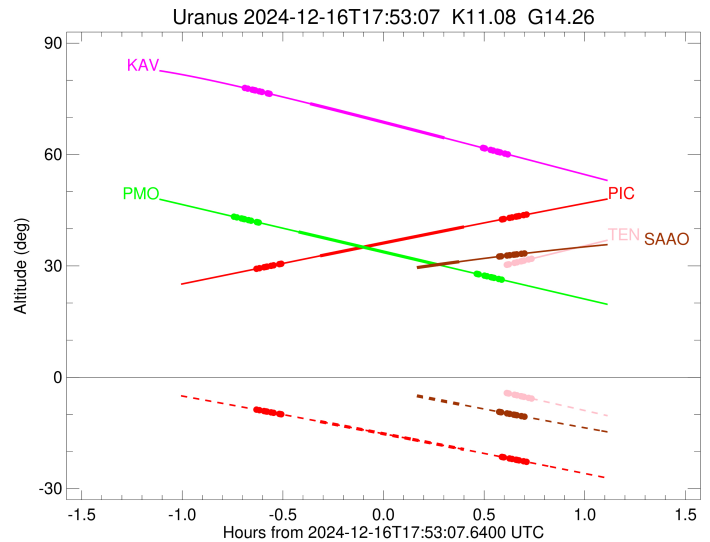
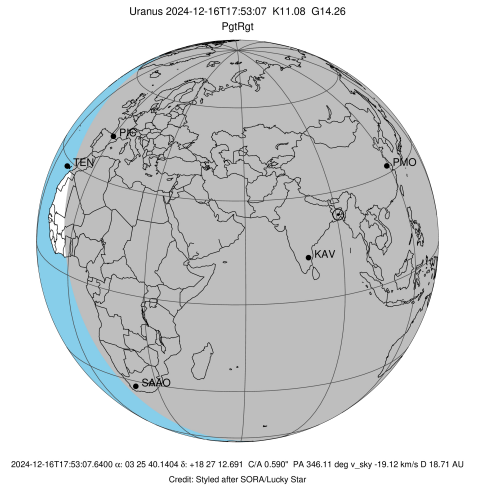


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-12-16T17:55:44.200
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 55991534429751552
 2Mass ID (if available) : 03254023+1827166
 ICRS Star Coord at Epoch: 03h 25m 40.14044s +18:27:12.69149s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 11.083
 G magnitude : 14.258
 RP magnitude : 13.217
 BP magnitude : 15.353
 DUPflag : 0
 Distance (au) : 18.707
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.12
 Sun-Target sep (deg) : 148.80
 Sun-Moon sep (deg) : 49.96
 B (ring opening deg) : 65.02
 PA of pole (deg) : -86.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.289
 C/A sky separation (km) : 3922.4
 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



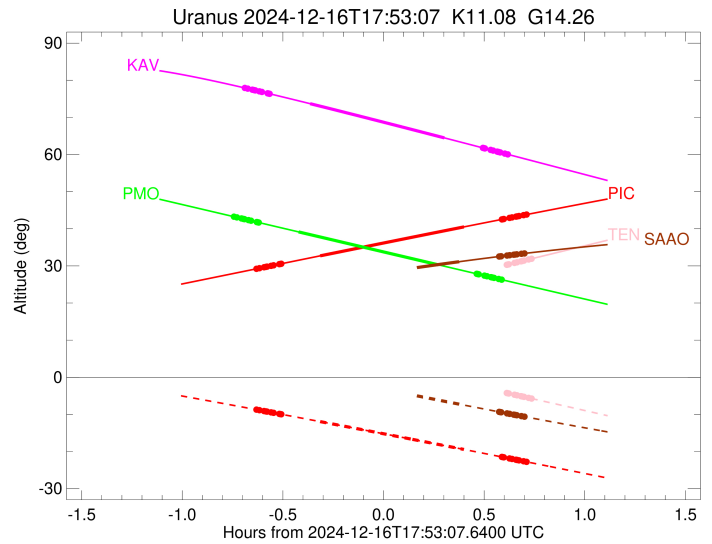
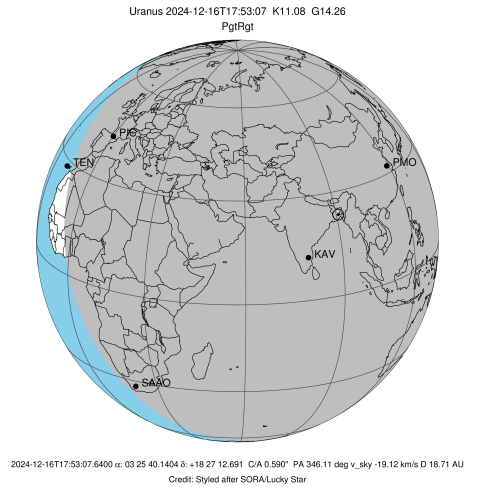
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2024-12-16T17:15:09.827		29.20	-8.71	51274.49	-20.98		
lambda	I	2024-12-16T17:16:09.283		29.38	-8.87	50026.71	-20.99		
delta	I	2024-12-16T17:17:31.555		29.63	-9.10	48300.35	-20.98		
gamma	I	2024-12-16T17:18:03.609		29.73	-9.19	47627.82	-20.98		
eta	I	2024-12-16T17:18:25.140		29.80	-9.25	47176.12	-20.98		
beta	I	2024-12-16T17:19:38.151		30.02	-9.46	45643.28	-20.97		
alpha	I	2024-12-16T17:20:23.395		30.16	-9.59	44696.29	-20.97		
4	I	2024-12-16T17:22:03.790		30.47	-9.87	42584.69	-20.96		
5	I	2024-12-16T17:22:24.070		30.53	-9.93	42155.47	-20.96		
6	I	2024-12-16T17:22:38.070		30.57	-9.97	41876.50	-20.97		
Uranus	I	2024-12-16T17:34:14.087		32.71	-11.94	25169.20		22.29	23.24
Uranus	E	2024-12-16T18:17:08.497		40.51	-19.45	25087.81		-24.71	-25.73
6	E	2024-12-16T18:28:21.922		42.52	-21.45	41795.64	21.04		
5	E	2024-12-16T18:28:47.187		42.59	-21.53	42311.35	21.04		
4	E	2024-12-16T18:28:59.142		42.63	-21.56	42565.86	21.04		
alpha	E	2024-12-16T18:30:41.951		42.93	-21.87	44735.91	21.05		
beta	E	2024-12-16T18:31:26.932		43.07	-22.00	45680.32	21.06		
eta	E	2024-12-16T18:32:37.895		43.27	-22.22	47176.12	21.07		
gamma	E	2024-12-16T18:32:59.229		43.34	-22.28	47625.56	21.07		
delta	E	2024-12-16T18:33:31.255		43.43	-22.38	48300.35	21.07		
lambda	E	2024-12-16T18:34:53.172		43.67	-22.62	50026.71	21.08		
epsilon	E	2024-12-16T18:35:37.514		43.80	-22.75	50961.43	21.07		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-12-16T17:48:41.500
 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 : 55991534429751552
 2Mass ID (if available) : 03254023+1827166
 ICRS Star Coord at Epoch: 03h 25m 40.14044s +18:27:12.69149s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 11.083
 G magnitude : 14.258
 RP magnitude : 13.217
 BP magnitude : 15.353
 DUPflag : 0
 Distance (au) : 18.707
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.12
 Sun-Target sep (deg) : 148.80
 Sun-Moon sep (deg) : 49.16
 B (ring opening deg) : 65.02
 PA of pole (deg) : -86.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.508
 C/A sky separation (km) : 6897.0
 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



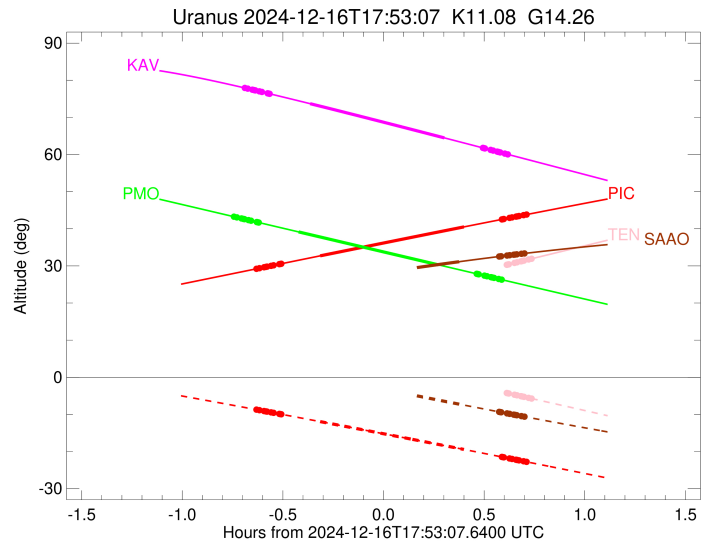
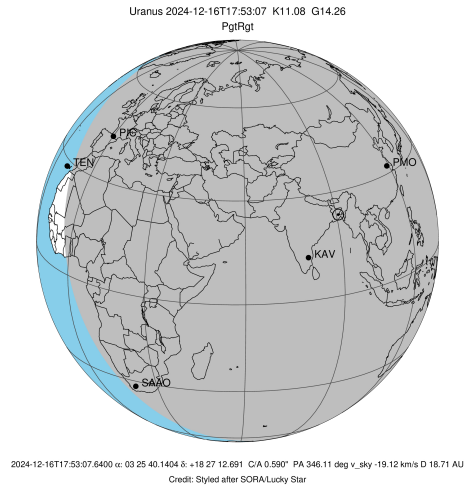
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2024-12-16T17:08:27.842		43.27	-72.76	51248.18	-21.00		
lambda	I	2024-12-16T17:09:25.960		43.07	-72.57	50026.71	-21.01		
delta	I	2024-12-16T17:10:48.158		42.78	-72.31	48300.35	-20.99		
gamma	I	2024-12-16T17:11:20.182		42.66	-72.21	47628.18	-20.99		
eta	I	2024-12-16T17:11:41.725		42.59	-72.14	47176.12	-20.98		
beta	I	2024-12-16T17:12:54.718		42.33	-71.90	45644.01	-20.96		
alpha	I	2024-12-16T17:13:40.106		42.17	-71.75	44694.41	-20.95		
4	I	2024-12-16T17:15:20.406		41.81	-71.43	42588.08	-20.92		
5	I	2024-12-16T17:15:40.904		41.74	-71.36	42154.91	-20.91		
6	I	2024-12-16T17:15:54.940		41.69	-71.31	41875.06	-20.91		
Uranus	I	2024-12-16T17:27:48.054		39.16	-68.95	25222.17		20.61	21.50
Uranus	E	2024-12-16T18:09:29.368		30.29	-60.35	25078.94		-24.97	-26.00
6	E	2024-12-16T18:20:51.706		27.88	-57.96	41795.18	20.80		
5	E	2024-12-16T18:21:17.217		27.79	-57.87	42309.67	20.80		
4	E	2024-12-16T18:21:29.546		27.75	-57.82	42568.65	20.81		
alpha	E	2024-12-16T18:23:13.294		27.38	-57.46	44734.19	20.83		
beta	E	2024-12-16T18:23:58.864		27.22	-57.30	45680.62	20.84		
eta	E	2024-12-16T18:25:10.553		26.97	-57.05	47176.12	20.85		
gamma	E	2024-12-16T18:25:32.117		26.89	-56.97	47625.85	20.86		
delta	E	2024-12-16T18:26:04.452		26.78	-56.86	48300.35	20.86		
lambda	E	2024-12-16T18:27:27.174		26.49	-56.57	50026.71	20.88		
epsilon	E	2024-12-16T18:28:11.100		26.33	-56.41	50943.85	20.86		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-12-16T17:57:10.020
 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 : 55991534429751552
 2Mass ID (if available) : 03254023+1827166
 ICRS Star Coord at Epoch: 03h 25m 40.14044s +18:27:12.69149s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 11.083
 G magnitude : 14.258
 RP magnitude : 13.217
 BP magnitude : 15.353
 DUPflag : 0
 Distance (au) : 18.708
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.12
 Sun-Target sep (deg) : 148.80
 Sun-Moon sep (deg) : 49.97
 B (ring opening deg) : 65.02
 PA of pole (deg) : -86.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.332
 C/A sky separation (km) : 4501.4
 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	2024-12-16T17:16:26.288	14.31	9.95x	51270.31	-20.86		
lambda	I	2024-12-16T17:17:25.880	14.52	9.77x	50026.71	-20.87		
delta	I	2024-12-16T17:18:48.620	14.82	9.51x	48300.35	-20.86		
gamma	I	2024-12-16T17:19:20.854	14.94	9.41x	47627.88	-20.86		
eta	I	2024-12-16T17:19:42.511	15.01	9.34x	47176.12	-20.86		
beta	I	2024-12-16T17:20:55.937	15.28	9.12x	45643.39	-20.85		
alpha	I	2024-12-16T17:21:41.462	15.44	8.98x	44695.97	-20.85		
4	I	2024-12-16T17:23:22.403	15.80	8.66x	42585.26	-20.84		
5	I	2024-12-16T17:23:42.834	15.88	8.60x	42155.34	-20.83		
6	I	2024-12-16T17:23:56.916	15.93	8.56x	41876.28	-20.84		
Uranus	I	2024-12-16T17:35:39.325	18.46	6.36x	25177.73		22.03	22.97
Uranus	E	2024-12-16T18:18:33.616	27.81	-1.98x	25084.89		-24.80	-25.82
6	E	2024-12-16T18:29:50.016	30.29	-4.23x	41795.52	20.95		
5	E	2024-12-16T18:30:15.384	30.38	-4.32x	42310.98	20.94		
4	E	2024-12-16T18:30:27.445	30.42	-4.36x	42566.52	20.95		
alpha	E	2024-12-16T18:32:10.644	30.80	-4.70x	44735.51	20.97		
beta	E	2024-12-16T18:32:55.838	30.97	-4.86x	45680.40	20.97		
eta	E	2024-12-16T18:34:07.086	31.23	-5.09	47176.12	20.98		
gamma	E	2024-12-16T18:34:28.508	31.31	-5.17	47625.63	20.99		
delta	E	2024-12-16T18:35:00.657	31.43	-5.27	48300.35	20.99		
lambda	E	2024-12-16T18:36:22.891	31.73	-5.55	50026.71	21.00		
epsilon	E	2024-12-16T18:37:07.190	31.89	-5.70	50956.98	20.99		

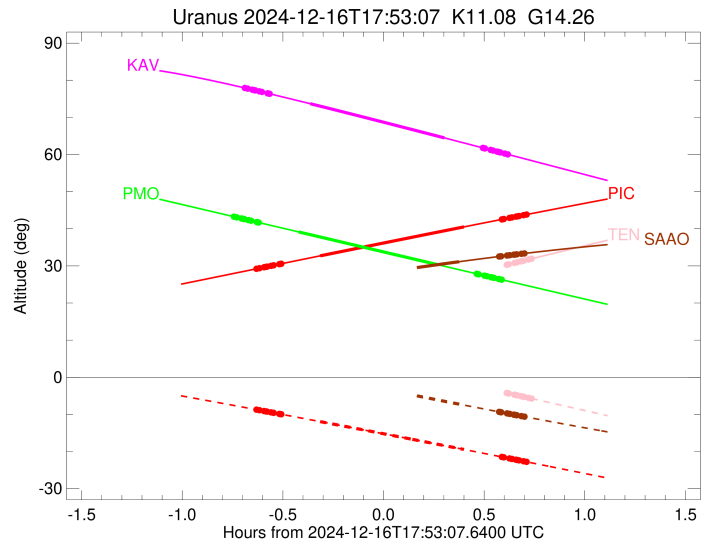
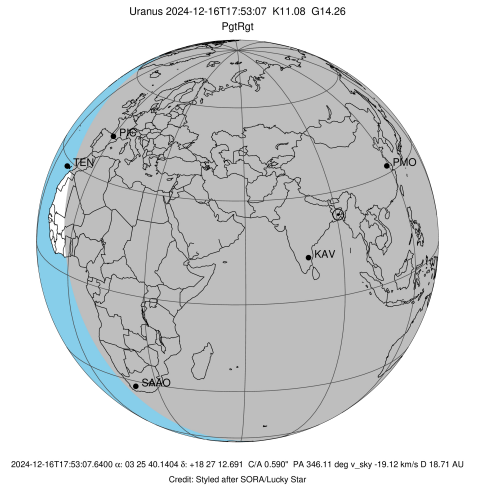
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-12-16T17:51:21.070
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 55991534429751552
 2Mass ID (if available) : 03254023+1827166
 ICRS Star Coord at Epoch: 03h 25m 40.14044s +18:27:12.69149s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 11.083
 G magnitude : 14.258
 RP magnitude : 13.217
 BP magnitude : 15.353
 DUPflag : 0
 Distance (au) : 18.707
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.12
 Sun-Target sep (deg) : 148.80
 Sun-Moon sep (deg) : 49.78
 B (ring opening deg) : 65.02
 PA of pole (deg) : -86.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.671
 C/A sky separation (km) : 9100.2
 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_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	2024-12-16T17:11:43.085		77.95	-66.27	51232.86	-21.03		
lambda	I	2024-12-16T17:12:40.368		77.75	-66.48	50026.71	-21.05		
delta	I	2024-12-16T17:14:02.447		77.46	-66.76	48300.35	-21.02		
gamma	I	2024-12-16T17:14:34.425		77.35	-66.87	47628.39	-21.01		
eta	I	2024-12-16T17:14:55.959		77.27	-66.95	47176.12	-21.00		
beta	I	2024-12-16T17:16:08.883		77.02	-67.20	45644.49	-20.97		
alpha	I	2024-12-16T17:16:54.327		76.85	-67.36	44693.35	-20.95		
4	I	2024-12-16T17:18:34.528		76.49	-67.71	42590.08	-20.90		
5	I	2024-12-16T17:18:55.139		76.42	-67.78	42154.82	-20.89		
6	I	2024-12-16T17:19:09.206		76.37	-67.83	41874.06	-20.88		
Uranus	I	2024-12-16T17:31:15.833		73.70	-70.28	25260.99		19.32	20.16
Uranus	E	2024-12-16T18:11:17.327		64.48	-77.10	25080.68		-24.92	-25.94
6	E	2024-12-16T18:22:43.037		61.80	-78.33	41794.90	20.83		
5	E	2024-12-16T18:23:08.433		61.70	-78.37	42307.81	20.83		
4	E	2024-12-16T18:23:20.974		61.65	-78.39	42571.29	20.85		
alpha	E	2024-12-16T18:25:04.266		61.25	-78.53	44732.50	20.89		
beta	E	2024-12-16T18:25:49.790		61.07	-78.58	45680.86	20.91		
eta	E	2024-12-16T18:27:01.200		60.79	-78.67	47176.12	20.94		
gamma	E	2024-12-16T18:27:22.687		60.70	-78.69	47626.13	20.95		
delta	E	2024-12-16T18:27:54.867		60.58	-78.73	48300.35	20.96		
lambda	E	2024-12-16T18:29:17.191		60.25	-78.81	50026.71	20.98		
epsilon	E	2024-12-16T18:30:00.081		60.09	-78.85	50926.93	20.97		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2024-12-16T17:56:41.110
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      : 55991534429751552
2Mass ID (if available) : 03254023+1827166
ICRS Star Coord at Epoch: 03h 25m 40.14044s +18:27:12.69149s
RUWE (>1.4 is poor) : 1.07
K magnitude          : 11.083
G magnitude          : 14.258
RP magnitude         : 13.217
BP magnitude         : 15.353
DUPflag             : 0
Distance (au)       : 18.707
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -19.12
Sun-Target sep (deg) : 148.80
Sun-Moon sep (deg)  : 50.08
B (ring opening deg) : 65.02
PA of pole (deg)    : -86.40
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.867
C/A sky separation (km) : 11769.7
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_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	2024-12-16T17:17:04.553		22.91	3.54x	51212.96	-20.59		
lambda	I	2024-12-16T17:18:02.103		23.06	3.36x	50026.71	-20.60		
delta	I	2024-12-16T17:19:25.998		23.28	3.09x	48300.35	-20.56		
gamma	I	2024-12-16T17:19:58.691		23.36	2.99x	47628.65	-20.54		
eta	I	2024-12-16T17:20:20.732		23.42	2.92x	47176.12	-20.52		
beta	I	2024-12-16T17:21:35.344		23.61	2.68x	45645.15	-20.48		
alpha	I	2024-12-16T17:22:21.975		23.73	2.54x	44692.08	-20.44		
4	I	2024-12-16T17:24:04.538		23.99	2.21x	42592.57	-20.37		
5	I	2024-12-16T17:24:25.798		24.05	2.15x	42154.99	-20.35		
6	I	2024-12-16T17:24:40.276		24.08	2.10x	41872.67	-20.34		
Uranus	I	2024-12-16T17:37:26.213		25.99	-0.30x	25313.37		17.45	18.22
Uranus	E	2024-12-16T18:15:42.301		31.13	-7.25	25095.23		-24.50	-25.51
6	E	2024-12-16T18:27:33.217		32.52	-9.31	41794.75	20.40		
5	E	2024-12-16T18:27:59.028		32.57	-9.39	42305.25	20.41		
4	E	2024-12-16T18:28:12.138		32.59	-9.43	42574.45	20.43		
alpha	E	2024-12-16T18:29:57.222		32.79	-9.73	44730.41	20.51		
beta	E	2024-12-16T18:30:43.707		32.88	-9.86	45681.07	20.54		
eta	E	2024-12-16T18:31:56.361		33.01	-10.07	47176.12	20.59		
gamma	E	2024-12-16T18:32:18.226		33.05	-10.13	47626.46	20.60		
delta	E	2024-12-16T18:32:50.918		33.11	-10.22	48300.35	20.62		
lambda	E	2024-12-16T18:34:14.534		33.26	-10.46	50026.71	20.67		
epsilon	E	2024-12-16T18:34:57.119		33.33	-10.58	50907.39	20.66		