

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-11-16T19:50:14.780  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3416341992263575296  
 2Mass ID (if available) : 05225135+2315030

Uranus 2030-11-16T19:50:14 K12.70 G15.38 PgtRgt

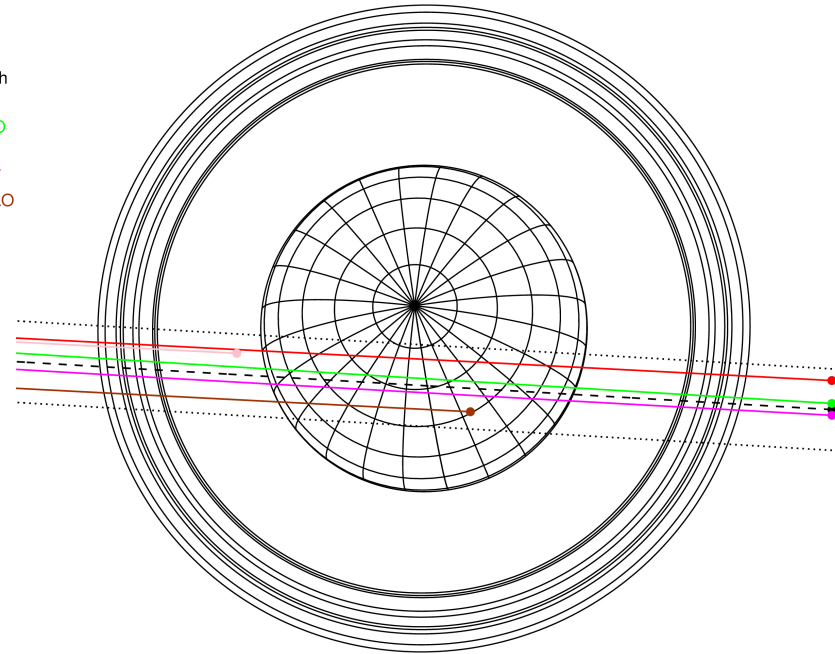
ICRS Star Coord at Epoch: 05h 22m 51.34906s +23:15:02.96120s

RUWE (>1.4 is poor) : 0.97  
 K magnitude : 12.696  
 G magnitude : 15.381  
 RP magnitude : 14.496  
 BP magnitude : 16.174  
 DUPflag : 0  
 Distance (au) : 18.277  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.10  
 Sun-Target sep (deg) : 152.59  
 Sun-Moon sep (deg) : 45.43  
 B (ring opening deg) : 81.31  
 PA of pole (deg) : 22.28



2030-11-16T19:50:14.7800 ra: 05 22 51.3491 s: +23 15 02.961 C/A 0.668 PA 356.64 deg v\_sky -20.10 km/s D 18.28 AU  
 Credit: Styled after SORA/Lucky Star

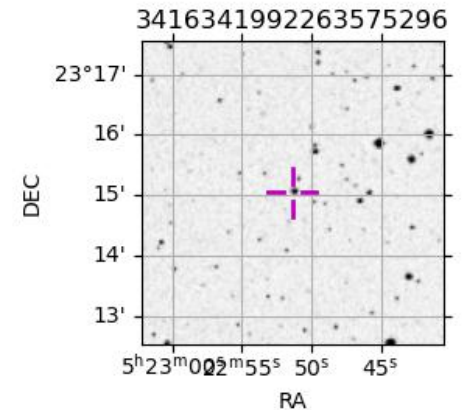
Earth  
 PIC  
 PMO  
 TEN  
 KAV  
 SAAO



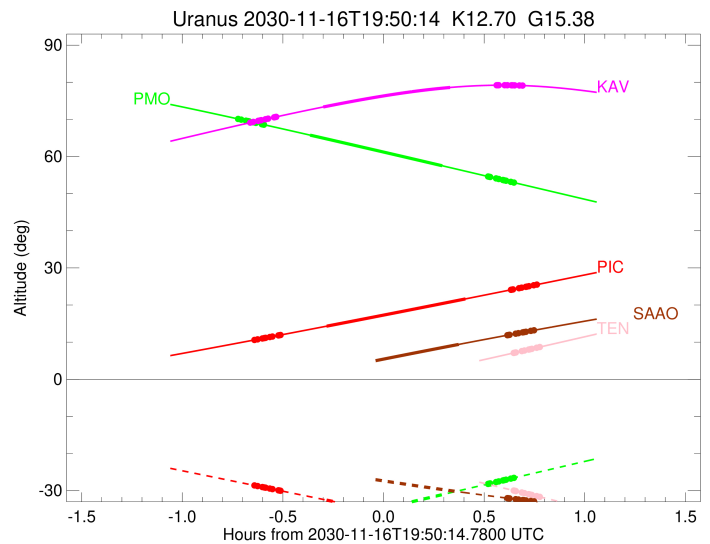
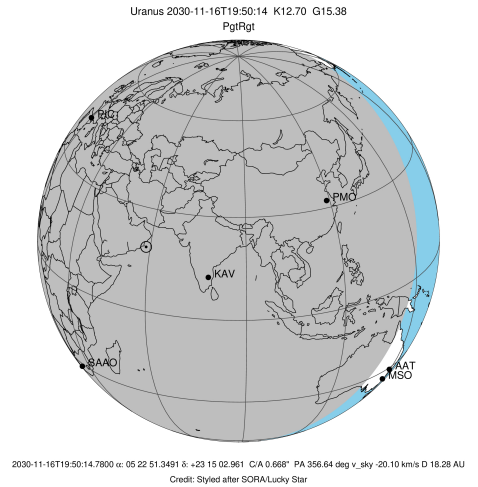
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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 16 19:12 - NOV 16 20:36	PieRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+ +	+++++	NOV 16 19:07 - NOV 16 20:29	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			+++++	NOV 16 20:29 - NOV 16 20:37	PnnRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	NOV 16 19:10 - NOV 16 20:31	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 16 20:12 - NOV 16 20:35	PneRne
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

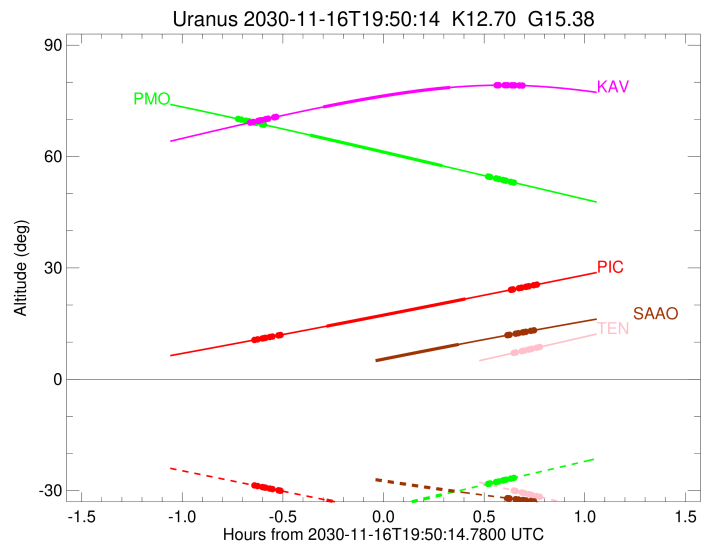
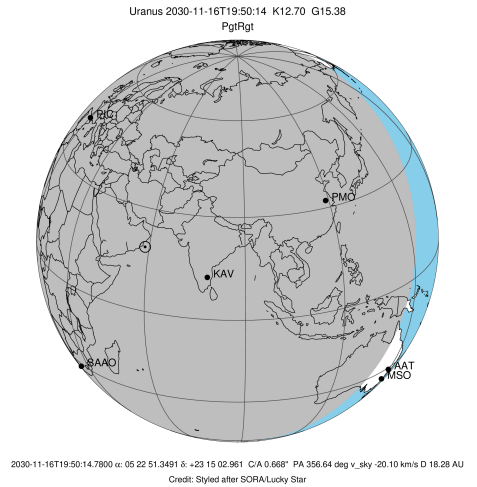


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-11-16T19:53:54.540  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 3416341992263575296  
 2Mass ID (if available) : 05225135+2315030  
 ICRS Star Coord at Epoch: 05h 22m 51.34906s +23:15:02.96120s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 12.696  
 G magnitude : 15.381  
 RP magnitude : 14.496  
 BP magnitude : 16.174  
 DUPflag : 0  
 Distance (au) : 18.277  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.10  
 Sun-Target sep (deg) : 152.59  
 Sun-Moon sep (deg) : 46.11  
 B (ring opening deg) : 81.31  
 PA of pole (deg) : 22.28  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.363  
 C/A sky separation (km) : 4816.9  
 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



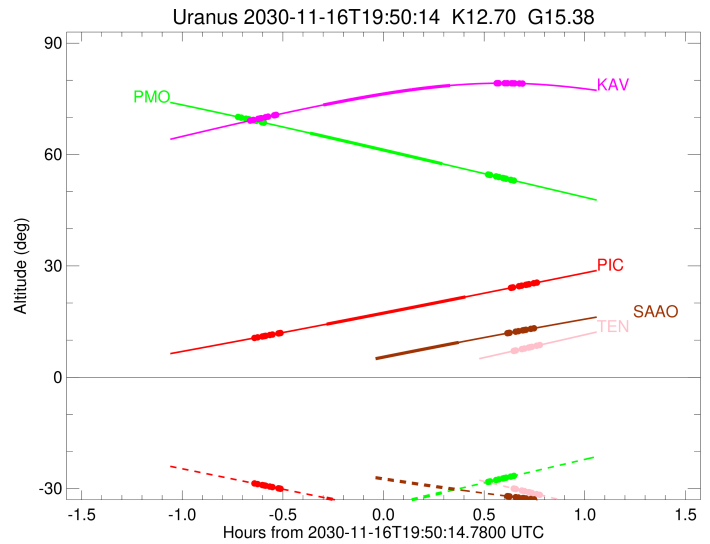
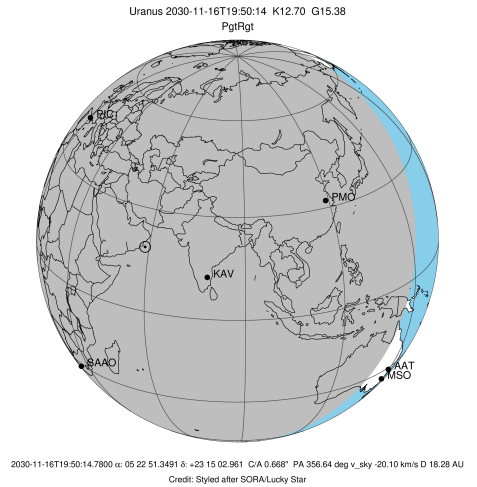
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-11-16T19:12:02.186		10.63	-28.65	50841.02	-19.98		
lambda	I	2030-11-16T19:12:42.927		10.75	-28.77	50026.71	-19.99		
delta	I	2030-11-16T19:14:09.314		11.00	-29.04	48300.35	-19.98		
gamma	I	2030-11-16T19:14:43.155		11.09	-29.14	47624.19	-19.98		
eta	I	2030-11-16T19:15:05.583		11.16	-29.21	47176.12	-19.98		
beta	I	2030-11-16T19:16:21.300		11.37	-29.44	45663.60	-19.97		
alpha	I	2030-11-16T19:17:10.287		11.51	-29.59	44684.76	-19.97		
4	I	2030-11-16T19:18:57.990		11.82	-29.92	42534.93	-19.96		
5	I	2030-11-16T19:19:17.111		11.88	-29.98	42155.50	-19.96		
6	I	2030-11-16T19:19:34.354		11.93	-30.03	41811.45	-19.96		
Uranus	I	2030-11-16T19:33:15.815		14.30	-32.55	25354.77		-5.12	-5.36
Uranus	E	2030-11-16T20:14:39.652		21.64	-40.08	25522.56		2.15	2.25
6	E	2030-11-16T20:28:16.166		24.10	-42.51	41870.05	20.07		
5	E	2030-11-16T20:28:38.373		24.17	-42.58	42314.86	20.07		
4	E	2030-11-16T20:28:52.634		24.21	-42.62	42600.49	20.07		
alpha	E	2030-11-16T20:30:39.742		24.53	-42.94	44750.82	20.09		
beta	E	2030-11-16T20:31:25.117		24.67	-43.07	45662.91	20.10		
eta	E	2030-11-16T20:32:40.395		24.90	-43.29	47176.12	20.11		
gamma	E	2030-11-16T20:33:02.835		24.97	-43.36	47627.31	20.11		
delta	E	2030-11-16T20:33:36.303		25.07	-43.46	48300.35	20.11		
lambda	E	2030-11-16T20:35:02.120		25.33	-43.71	50026.71	20.12		
epsilon	E	2030-11-16T20:36:10.307		25.53	-43.91	51398.99	20.12		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-11-16T19:47:55.860  
 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 : 3416341992263575296  
 2Mass ID (if available) : 05225135+2315030  
 ICRS Star Coord at Epoch: 05h 22m 51.34906s +23:15:02.96120s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 12.696  
 G magnitude : 15.381  
 RP magnitude : 14.496  
 BP magnitude : 16.174  
 DUPflag : 0  
 Distance (au) : 18.277  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.10  
 Sun-Target sep (deg) : 152.59  
 Sun-Moon sep (deg) : 45.73  
 B (ring opening deg) : 81.31  
 PA of pole (deg) : 22.28  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.591  
 C/A sky separation (km) : 7835.9  
 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



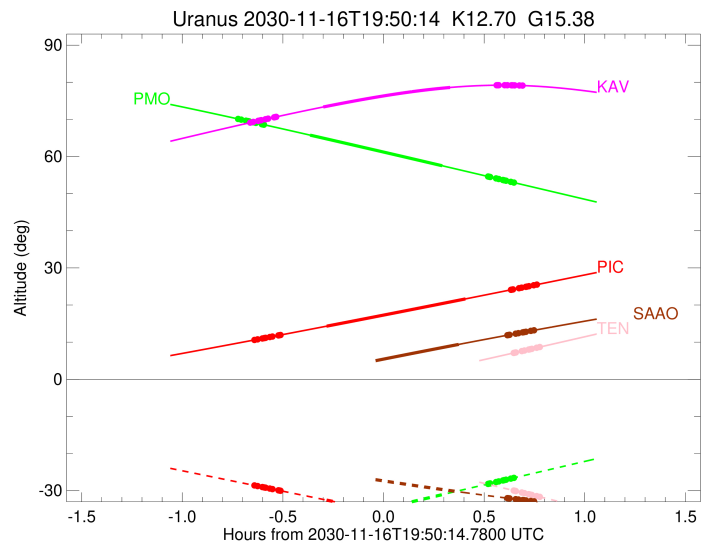
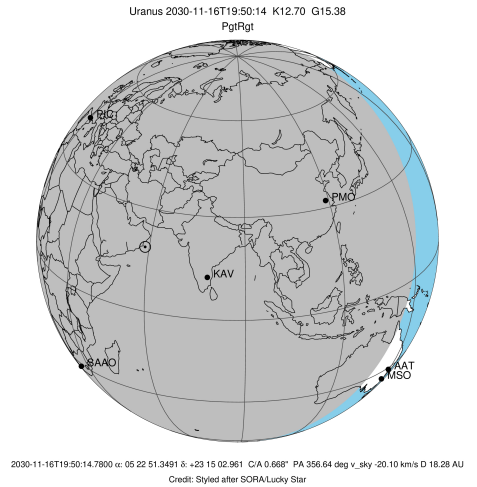
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-11-16T19:07:10.722		70.07	-43.92	50823.56	-20.24		
lambda	I	2030-11-16T19:07:50.077		69.94	-43.78	50026.71	-20.24		
delta	I	2030-11-16T19:09:15.401		69.65	-43.48	48300.35	-20.22		
gamma	I	2030-11-16T19:09:48.860		69.54	-43.36	47623.84	-20.21		
eta	I	2030-11-16T19:10:11.011		69.47	-43.28	47176.12	-20.21		
beta	I	2030-11-16T19:11:25.815		69.22	-43.02	45665.12	-20.19		
alpha	I	2030-11-16T19:12:14.371		69.06	-42.85	44684.62	-20.17		
4	I	2030-11-16T19:14:01.127		68.70	-42.47	42532.85	-20.14		
5	I	2030-11-16T19:14:19.954		68.63	-42.41	42156.62	-20.13		
6	I	2030-11-16T19:14:36.934		68.58	-42.35	41814.33	-20.13		
Uranus	I	2030-11-16T19:28:20.385		65.77	-39.44	25279.38		-6.01	-6.29
Uranus	E	2030-11-16T20:07:45.893		57.52	-31.08	25547.63		1.20	1.26
6	E	2030-11-16T20:21:26.832		54.62	-28.19	41871.70	20.09		
5	E	2030-11-16T20:21:48.906		54.54	-28.11	42314.21	20.09		
4	E	2030-11-16T20:22:03.061		54.49	-28.06	42598.27	20.09		
alpha	E	2030-11-16T20:23:50.082		54.11	-27.68	44750.16	20.13		
beta	E	2030-11-16T20:24:35.454		53.95	-27.52	45664.05	20.14		
eta	E	2030-11-16T20:25:50.490		53.68	-27.26	47176.12	20.16		
gamma	E	2030-11-16T20:26:12.854		53.60	-27.18	47627.03	20.16		
delta	E	2030-11-16T20:26:46.238		53.49	-27.06	48300.35	20.17		
lambda	E	2030-11-16T20:28:11.779		53.18	-26.76	50026.71	20.19		
epsilon	E	2030-11-16T20:29:18.921		52.94	-26.53	51382.76	20.18		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-11-16T19:54:35.790  
 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 : 3416341992263575296  
 2Mass ID (if available) : 05225135+2315030  
 ICRS Star Coord at Epoch: 05h 22m 51.34906s +23:15:02.96120s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 12.696  
 G magnitude : 15.381  
 RP magnitude : 14.496  
 BP magnitude : 16.174  
 DUPflag : 0  
 Distance (au) : 18.277  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.10  
 Sun-Target sep (deg) : 152.59  
 Sun-Moon sep (deg) : 45.98  
 B (ring opening deg) : 81.31  
 PA of pole (deg) : 22.28  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.405  
 C/A sky separation (km) : 5370.1  
 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	2030-11-16T19:12:31.719	-7.96x	-13.40	50838.32	-19.83			
lambda	I	2030-11-16T19:13:12.620	-7.83x	-13.54	50026.71	-19.84			
delta	I	2030-11-16T19:14:39.641	-7.56x	-13.85	48300.35	-19.84			
gamma	I	2030-11-16T19:15:13.734	-7.45x	-13.97	47624.14	-19.83			
eta	I	2030-11-16T19:15:36.326	-7.38x	-14.05	47176.12	-19.83			
beta	I	2030-11-16T19:16:52.596	-7.14x	-14.32	45663.83	-19.82			
alpha	I	2030-11-16T19:17:41.965	-6.99x	-14.50	44684.72	-19.82			
4	I	2030-11-16T19:19:30.502	-6.65x	-14.89	42534.60	-19.80			
5	I	2030-11-16T19:19:49.752	-6.58x	-14.96	42155.64	-19.80			
6	I	2030-11-16T19:20:07.109	-6.53x	-15.02	41811.88	-19.80			
Uranus	I	2030-11-16T19:33:56.175	-3.88x	-17.99	25342.79	-5.27		-5.52	
Uranus	E	2030-11-16T20:15:22.470	4.31x	-26.98	25528.82	1.96		2.05	
6	E	2030-11-16T20:29:05.402	7.10	-29.98	41870.43	19.93			
5	E	2030-11-16T20:29:27.736	7.17	-30.06	42314.74	19.94			
4	E	2030-11-16T20:29:42.072	7.22	-30.11	42599.99	19.94			
alpha	E	2030-11-16T20:31:29.913	7.59	-30.51	44750.68	19.96			
beta	E	2030-11-16T20:32:15.606	7.74	-30.67	45663.18	19.97			
eta	E	2030-11-16T20:33:31.357	8.00	-30.95	47176.12	19.98			
gamma	E	2030-11-16T20:33:53.937	8.08	-31.03	47627.24	19.98			
delta	E	2030-11-16T20:34:27.621	8.19	-31.16	48300.35	19.99			
lambda	E	2030-11-16T20:35:53.976	8.49	-31.47	50026.71	20.00			
epsilon	E	2030-11-16T20:37:02.390	8.72	-31.72	51395.11	19.99			

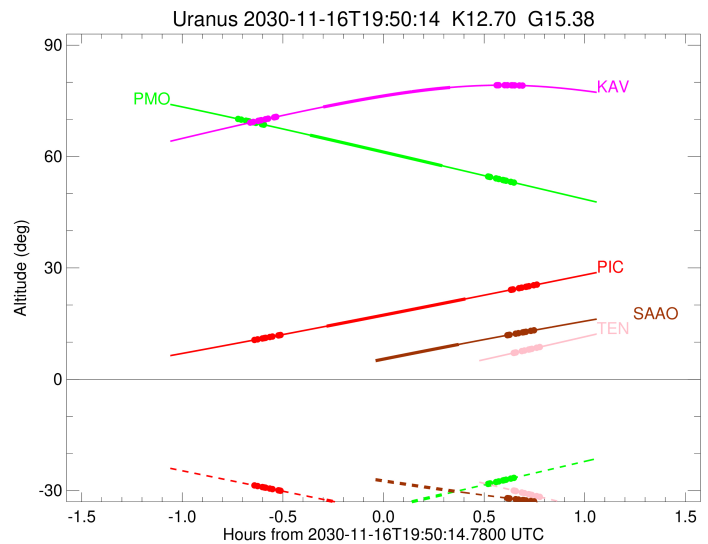
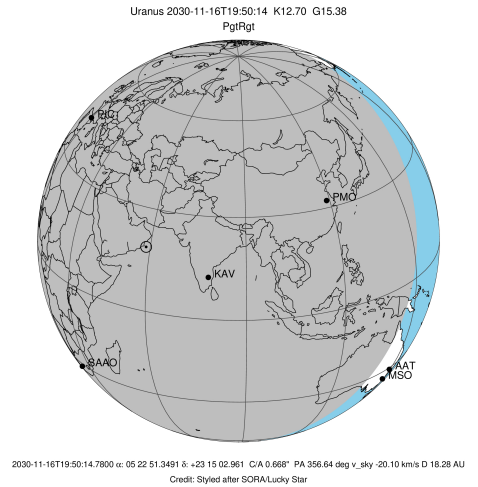
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-11-16T19:51:03.280  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 3416341992263575296  
 2Mass ID (if available) : 05225135+2315030  
 ICRS Star Coord at Epoch: 05h 22m 51.34906s +23:15:02.96120s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 12.696  
 G magnitude : 15.381  
 RP magnitude : 14.496  
 BP magnitude : 16.174  
 DUPflag : 0  
 Distance (au) : 18.277  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.10  
 Sun-Target sep (deg) : 152.59  
 Sun-Moon sep (deg) : 46.16  
 B (ring opening deg) : 81.31  
 PA of pole (deg) : 22.28  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.758  
 C/A sky separation (km) : 10044.8  
 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	2030-11-16T19:10:48.304		69.19	-78.18	50814.40	-20.12		
lambda	I	2030-11-16T19:11:27.427		69.32	-78.05	50026.71	-20.13		
delta	I	2030-11-16T19:12:53.262		69.61	-77.76	48300.35	-20.10		
gamma	I	2030-11-16T19:13:26.945		69.73	-77.64	47623.64	-20.08		
eta	I	2030-11-16T19:13:49.232		69.80	-77.57	47176.12	-20.07		
beta	I	2030-11-16T19:15:04.514		70.05	-77.31	45665.99	-20.04		
alpha	I	2030-11-16T19:15:53.475		70.22	-77.14	44684.63	-20.02		
4	I	2030-11-16T19:17:41.154		70.57	-76.76	42531.73	-19.96		
5	I	2030-11-16T19:18:00.068		70.63	-76.70	42157.53	-19.96		
6	I	2030-11-16T19:18:17.138		70.69	-76.64	41816.11	-19.95		
Uranus	I	2030-11-16T19:32:16.424		73.35	-73.60	25228.75		-6.54	-6.85
Uranus	E	2030-11-16T20:10:07.059		78.61	-64.98	25557.98		0.36	0.38
6	E	2030-11-16T20:23:59.545		79.21	-61.75	41873.13	19.98		
5	E	2030-11-16T20:24:21.612		79.21	-61.66	42313.30	19.99		
4	E	2030-11-16T20:24:35.762		79.21	-61.61	42596.08	19.99		
alpha	E	2030-11-16T20:26:23.299		79.21	-61.19	44749.43	20.06		
beta	E	2030-11-16T20:27:08.916		79.21	-61.01	45665.14	20.08		
eta	E	2030-11-16T20:28:24.100		79.20	-60.72	47176.12	20.11		
gamma	E	2030-11-16T20:28:46.501		79.19	-60.63	47626.75	20.12		
delta	E	2030-11-16T20:29:19.966		79.18	-60.50	48300.35	20.14		
lambda	E	2030-11-16T20:30:45.635		79.15	-60.16	50026.71	20.17		
epsilon	E	2030-11-16T20:31:52.004		79.11	-59.90	51365.96	20.16		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2030-11-16T19:54:25.530
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      : 3416341992263575296
2Mass ID (if available) : 05225135+2315030
ICRS Star Coord at Epoch: 05h 22m 51.34906s +23:15:02.96120s
RUWE (>1.4 is poor) : 0.97
K magnitude          : 12.696
G magnitude          : 15.381
RP magnitude         : 14.496
BP magnitude         : 16.174
DUPflag             : 0
Distance (au)       : 18.277
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -20.10
Sun-Target sep (deg) : 152.59
Sun-Moon sep (deg)  : 45.97
B (ring opening deg) : 81.31
PA of pole (deg)    : 22.28
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.954
C/A sky separation (km) : 12648.0
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_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	2030-11-16T19:14:04.647	-1.25x	-22.01	50803.68	-19.55			
lambda	I	2030-11-16T19:14:44.374	-1.13x	-22.12	50026.71	-19.55			
delta	I	2030-11-16T19:16:12.793	-0.85x	-22.35	48300.35	-19.50			
gamma	I	2030-11-16T19:16:47.525	-0.74x	-22.44	47623.40	-19.48			
eta	I	2030-11-16T19:17:10.494	-0.67x	-22.50	47176.12	-19.47			
beta	I	2030-11-16T19:18:28.111	-0.43x	-22.70	45667.05	-19.42			
alpha	I	2030-11-16T19:19:18.717	-0.27x	-22.83	44684.74	-19.38			
4	I	2030-11-16T19:21:10.099	0.08x	-23.12	42530.48	-19.29			
5	I	2030-11-16T19:21:29.566	0.14x	-23.17	42158.92	-19.28			
6	I	2030-11-16T19:21:47.163	0.20x	-23.21	41818.40	-19.27			
Uranus	I	2030-11-16T19:36:30.339	2.93x	-25.42	25167.07	-7.14	-7.48		
Uranus	E	2030-11-16T20:12:41.165	9.39	-30.31	25555.45	-0.67	-0.70		
6	E	2030-11-16T20:27:12.552	11.87	-32.03	41874.64	19.38			
5	E	2030-11-16T20:27:35.142	11.94	-32.07	42311.88	19.39			
4	E	2030-11-16T20:27:49.653	11.98	-32.10	42593.39	19.40			
alpha	E	2030-11-16T20:29:40.441	12.29	-32.30	44748.44	19.50			
beta	E	2030-11-16T20:30:27.461	12.42	-32.39	45666.41	19.54			
eta	E	2030-11-16T20:31:44.623	12.63	-32.53	47176.12	19.59			
gamma	E	2030-11-16T20:32:07.599	12.69	-32.57	47626.42	19.61			
delta	E	2030-11-16T20:32:41.952	12.79	-32.63	48300.35	19.63			
lambda	E	2030-11-16T20:34:09.782	13.03	-32.79	50026.71	19.68			
epsilon	E	2030-11-16T20:35:16.731	13.22	-32.91	51345.61	19.68			