

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-09-18T07:44:18.370  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3377569978155912576  
 2Mass ID (if available) : 06233241+2334130

ICRS Star Coord at Epoch: 06h 23m 32.42601s +23:34:12.61488s

RUWE (>1.4 is poor) : 0.96  
 K magnitude : 14.636  
 G magnitude : 18.462  
 RP magnitude : 17.256  
 BP magnitude : 19.886  
 DUPflag : 0  
 Distance (au) : 19.122  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 11.64  
 Sun-Target sep (deg) : 79.86  
 Sun-Moon sep (deg) : 21.79  
 B (ring opening deg) : 70.60  
 PA of pole (deg) : 67.73

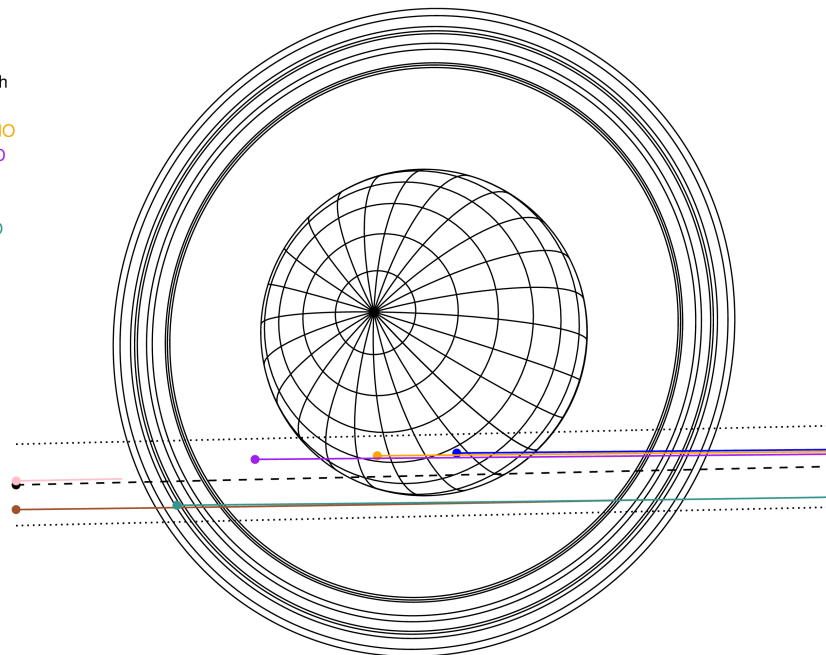
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2033-09-18T07:44:18.3700 α: 06 23 32.4260 β: +23 34 12.615 C/A 1.613° PA 1.29 deg v\_sky +11.64 km/s D 19.12 AU  
 Credit: Styled after SORA/Lucky Star

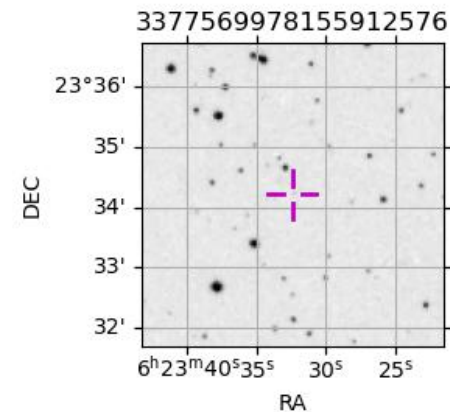
Uranus 2033-09-18T07:44:18 K14.64 G18.46 PgtRgt

Earth  
 PAL  
 KPNO  
 MCD  
 TEN  
 RIO  
 ESO



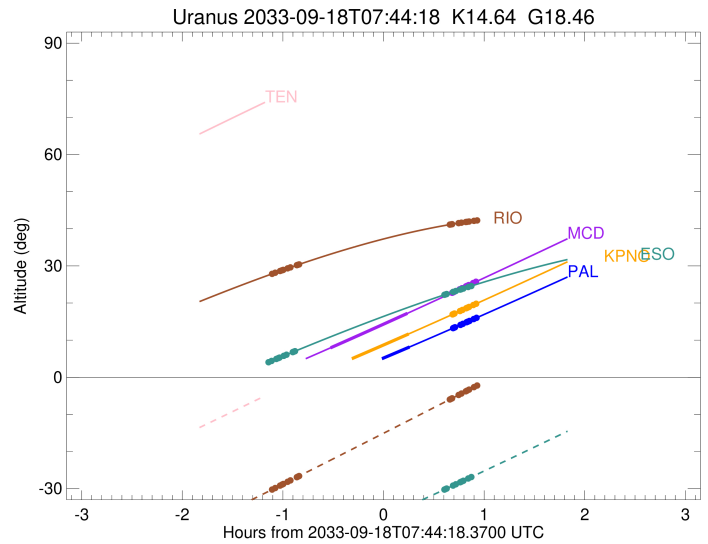
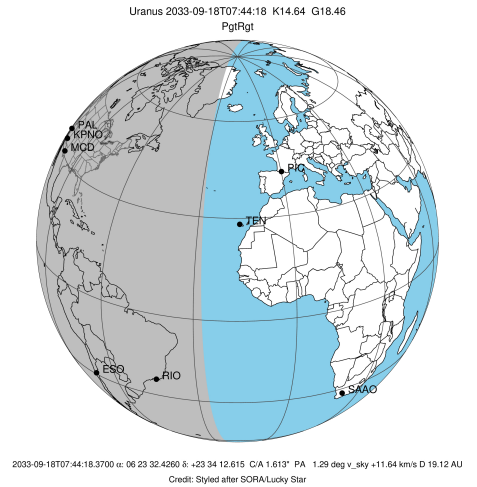
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1		+	+++++++	SEP 18 07:59 - SEP 18 08:39	PneRne
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4		+	+++++++	SEP 18 07:59 - SEP 18 08:39	PneRne
MCD	McDonald Obs. 2.7m	30.7	256.0		+	+++++++	SEP 18 07:12 - SEP 18 08:39	PieRne
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+++++++		+++	SEP 18 06:38 - SEP 18 08:25	PnnRie
ESO	European Southern Obs	-29.3	289.3	+++++++		+++++++	SEP 18 06:41 - SEP 18 08:36	PnnRie
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



3377569978155912576

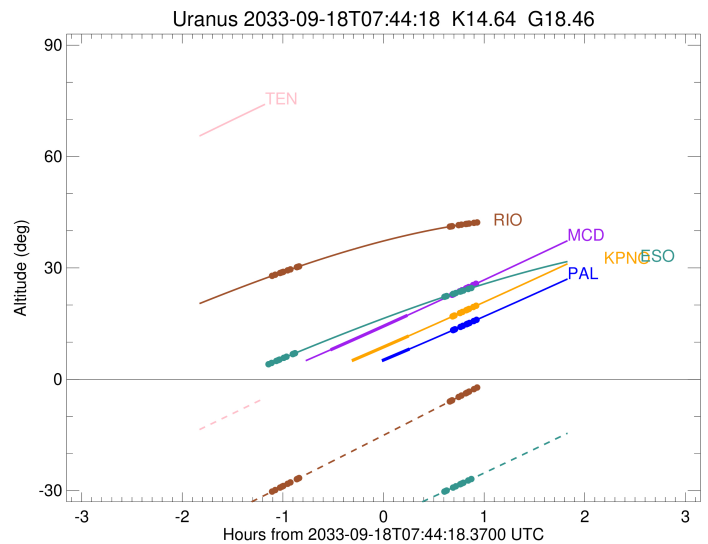
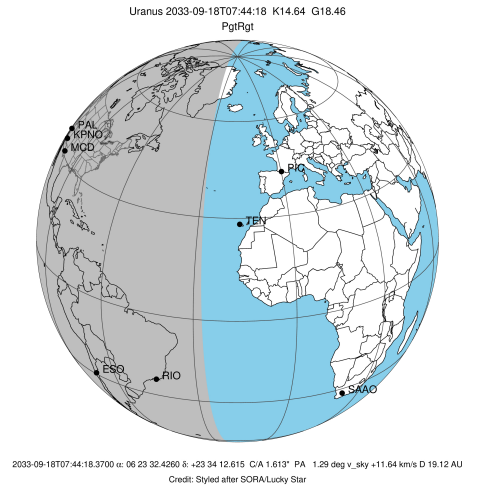
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-09-18T07:36:20.340  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3377569978155912576  
 2Mass ID (if available) : 06233241+2334130  
 ICRS Star Coord at Epoch: 06h 23m 32.42601s +23:34:12.61488s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 14.636  
 G magnitude : 18.462  
 RP magnitude : 17.256  
 BP magnitude : 19.886  
 DUPflag : 0  
 Distance (au) : 19.122  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 11.64  
 Sun-Target sep (deg) : 79.86  
 Sun-Moon sep (deg) : 22.64  
 B (ring opening deg) : 70.60  
 PA of pole (deg) : 67.73  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.365  
 C/A sky separation (km) : 18929.3  
 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	2033-09-18T06:31:30.335	-8.06x	-51.39	51127.38	-11.52			
lambda	I	2033-09-18T06:33:05.774	-7.78x	-51.55	50026.71	-11.51			
delta	I	2033-09-18T06:35:36.252	-7.35x	-51.80	48300.35	-11.43			
gamma	I	2033-09-18T06:36:35.200	-7.18x	-51.89	47627.30	-11.40			
eta	I	2033-09-18T06:37:14.810	-7.06x	-51.95	47176.12	-11.38			
beta	I	2033-09-18T06:39:26.701	-6.68x	-52.16	45680.67	-11.30			
alpha	I	2033-09-18T06:40:50.984	-6.44x	-52.28	44729.75	-11.25			
4	I	2033-09-18T06:44:05.126	-5.87x	-52.57	42559.23	-11.11			
5	I	2033-09-18T06:44:40.251	-5.77x	-52.62	42178.65	-11.08			
6	I	2033-09-18T06:45:07.080	-5.69x	-52.65	41879.64	-11.06			
Uranus	I	2033-09-18T07:12:05.884	-0.84x	-54.43	25500.83	6.29	6.58		
Uranus	E	2033-09-18T07:59:53.918	8.17	-54.86	25136.28	-17.37	-18.14		
6	E	2033-09-18T08:25:45.323	13.23	-53.61	41815.07	10.87			
5	E	2033-09-18T08:26:22.116	13.35	-53.56	42221.74	10.88			
4	E	2033-09-18T08:26:57.698	13.47	-53.52	42613.50	10.92			
alpha	E	2033-09-18T08:30:11.934	14.11	-53.29	44736.15	11.04			
beta	E	2033-09-18T08:31:34.300	14.38	-53.19	45652.08	11.08			
eta	E	2033-09-18T08:33:51.488	14.83	-53.01	47176.12	11.15			
gamma	E	2033-09-18T08:34:31.409	14.97	-52.96	47621.73	11.17			
delta	E	2033-09-18T08:35:32.075	15.17	-52.88	48300.35	11.20			
lambda	E	2033-09-18T08:38:05.757	15.68	-52.67	50026.71	11.27			
epsilon	E	2033-09-18T08:39:21.295	15.93	-52.56	50878.79	11.27			

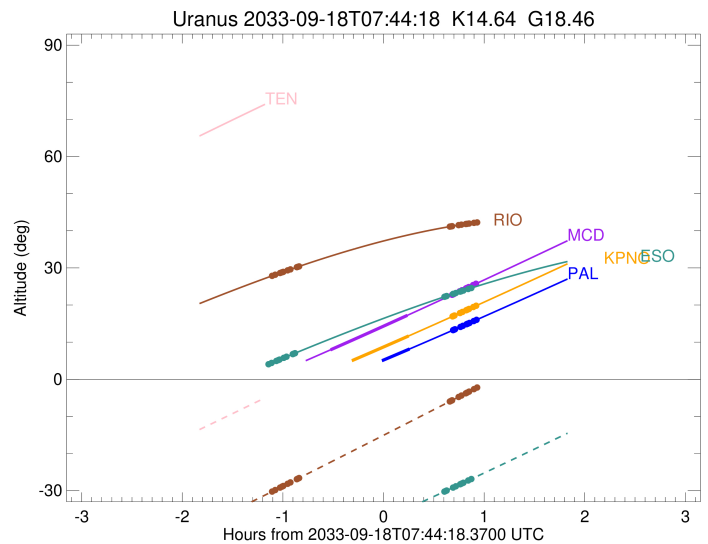
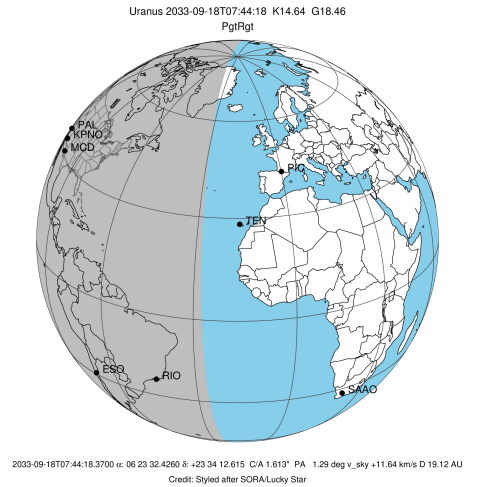
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2033-09-18T07:36:06.410
Event type           : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : KPNO
Location             : Kitt Peak Natl Obs
Latitude (deg)       : 31.96333
E. Longitude (deg)  : 248.40000
Altitude (km)        : 2.120
Gaia source ID       : 3377569978155912576
2Mass ID (if available) : 06233241+2334130
ICRS Star Coord at Epoch: 06h 23m 32.42601s +23:34:12.61488s
RUWE (>1.4 is poor) : 0.96
K magnitude          : 14.636
G magnitude          : 18.462
RP magnitude         : 17.256
BP magnitude         : 19.886
DUPflag             : 0
Distance (au)        : 19.122
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : 11.64
Sun-Target sep (deg) : 79.86
Sun-Moon sep (deg)  : 22.67
B (ring opening deg) : 70.60
PA of pole (deg)    : 67.73
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.387
C/A sky separation (km) : 19239.9
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
    
```



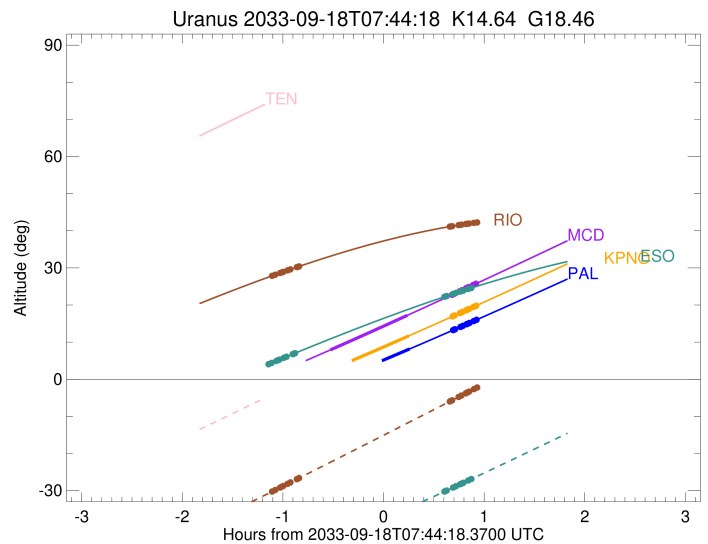
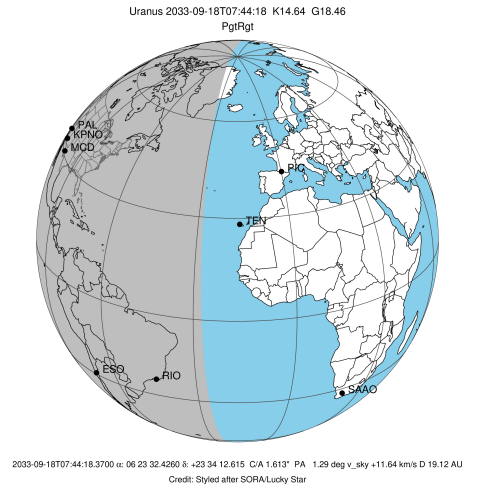
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-09-18T06:31:15.142	-5.16x	-54.52	51124.89	-11.46			
lambda	I	2033-09-18T06:32:50.870	-4.87x	-54.64	50026.71	-11.45			
delta	I	2033-09-18T06:35:22.178	-4.41x	-54.83	48300.35	-11.37			
gamma	I	2033-09-18T06:36:21.465	-4.23x	-54.90	47627.26	-11.34			
eta	I	2033-09-18T06:37:01.302	-4.11x	-54.94	47176.12	-11.31			
beta	I	2033-09-18T06:39:13.979	-3.71x	-55.09	45680.70	-11.23			
alpha	I	2033-09-18T06:40:38.771	-3.45x	-55.19	44729.98	-11.18			
4	I	2033-09-18T06:43:54.175	-2.85x	-55.39	42559.57	-11.04			
5	I	2033-09-18T06:44:29.613	-2.74x	-55.43	42178.20	-11.00			
6	I	2033-09-18T06:44:56.591	-2.66x	-55.45	41879.66	-10.98			
Uranus	I	2033-09-18T07:12:16.834	2.48x	-56.45	25506.57	5.97	6.25		
Uranus	E	2033-09-18T07:59:14.205	11.65	-55.28	25144.02	-17.20	-17.96		
6	E	2033-09-18T08:25:26.247	16.93	-53.15	41815.38	10.79			
5	E	2033-09-18T08:26:03.223	17.05	-53.09	42221.06	10.80			
4	E	2033-09-18T08:26:39.128	17.17	-53.03	42613.64	10.84			
alpha	E	2033-09-18T08:29:54.756	17.84	-52.69	44736.38	10.96			
beta	E	2033-09-18T08:31:17.671	18.12	-52.55	45652.22	11.01			
eta	E	2033-09-18T08:33:35.747	18.59	-52.30	47176.12	11.08			
gamma	E	2033-09-18T08:34:15.921	18.73	-52.23	47621.71	11.10			
delta	E	2033-09-18T08:35:16.971	18.93	-52.12	48300.35	11.13			
lambda	E	2033-09-18T08:37:51.597	19.46	-51.83	50026.71	11.20			
epsilon	E	2033-09-18T08:39:07.403	19.72	-51.68	50876.73	11.20			

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-09-18T07:35:57.270  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 3377569978155912576  
 2Mass ID (if available) : 06233241+2334130  
 ICRS Star Coord at Epoch: 06h 23m 32.42601s +23:34:12.61488s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 14.636  
 G magnitude : 18.462  
 RP magnitude : 17.256  
 BP magnitude : 19.886  
 DUPflag : 0  
 Distance (au) : 19.122  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 11.64  
 Sun-Target sep (deg) : 79.86  
 Sun-Moon sep (deg) : 22.70  
 B (ring opening deg) : 70.60  
 PA of pole (deg) : 67.73  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.416  
 C/A sky separation (km) : 19639.9  
 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	2033-09-18T06:31:01.572	-0.21x	-57.46	51121.60	-11.37			
lambda	I	2033-09-18T06:32:37.756	0.09x	-57.51	50026.71	-11.36			
delta	I	2033-09-18T06:35:10.282	0.58x	-57.58	48300.35	-11.28			
gamma	I	2033-09-18T06:36:10.066	0.77x	-57.61	47627.22	-11.24			
eta	I	2033-09-18T06:36:50.234	0.90x	-57.62	47176.12	-11.22			
beta	I	2033-09-18T06:39:04.057	1.33x	-57.67	45680.75	-11.13			
alpha	I	2033-09-18T06:40:29.592	1.61x	-57.70	44730.28	-11.08			
4	I	2033-09-18T06:43:46.825	2.24x	-57.75	42560.02	-10.93			
5	I	2033-09-18T06:44:22.708	2.36x	-57.75	42177.61	-10.89			
6	I	2033-09-18T06:44:49.905	2.45x	-57.76	41879.69	-10.88			
Uranus	I	2033-09-18T07:12:40.561	7.92	-57.35	25513.81			5.54	5.80
Uranus	E	2033-09-18T07:58:30.832	17.21	-53.92	25154.45			-16.97	-17.72
6	E	2033-09-18T08:25:11.882	22.75	-50.65	41815.78	10.68			
5	E	2033-09-18T08:25:49.125	22.88	-50.57	42220.21	10.69			
4	E	2033-09-18T08:26:25.475	23.00	-50.48	42613.81	10.73			
alpha	E	2033-09-18T08:29:43.053	23.69	-50.02	44736.67	10.86			
beta	E	2033-09-18T08:31:06.740	23.98	-49.83	45652.39	10.91			
eta	E	2033-09-18T08:33:26.063	24.47	-49.49	47176.12	10.98			
gamma	E	2033-09-18T08:34:06.594	24.61	-49.40	47621.69	11.00			
delta	E	2033-09-18T08:35:08.184	24.83	-49.25	48300.35	11.03			
lambda	E	2033-09-18T08:37:44.135	25.37	-48.86	50026.71	11.10			
epsilon	E	2033-09-18T08:39:00.342	25.64	-48.68	50874.18	11.11			

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-09-18T07:40:25.490  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 3377569978155912576  
 2Mass ID (if available) : 06233241+2334130  
 ICRS Star Coord at Epoch: 06h 23m 32.42601s +23:34:12.61488s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 14.636  
 G magnitude : 18.462  
 RP magnitude : 17.256  
 BP magnitude : 19.886  
 DUPflag : 0  
 Distance (au) : 19.122  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 11.64  
 Sun-Target sep (deg) : 79.86  
 Sun-Moon sep (deg) : 22.18  
 B (ring opening deg) : 70.60  
 PA of pole (deg) : 67.73  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.935  
 C/A sky separation (km) : 26839.5  
 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\_itrf93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



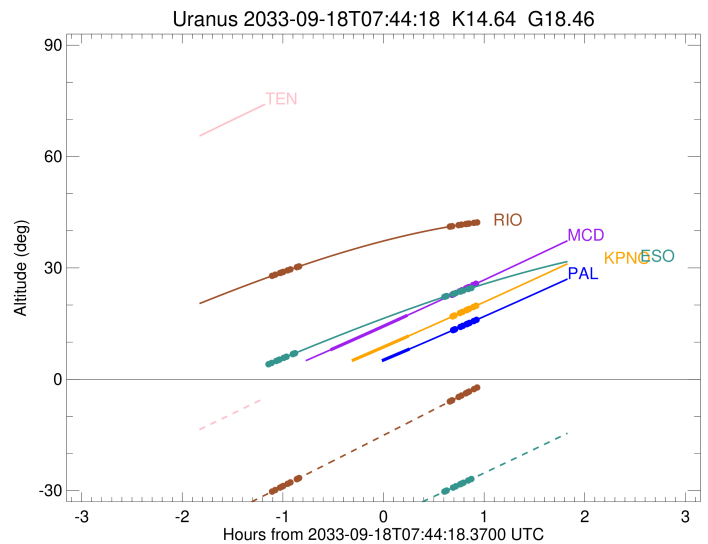
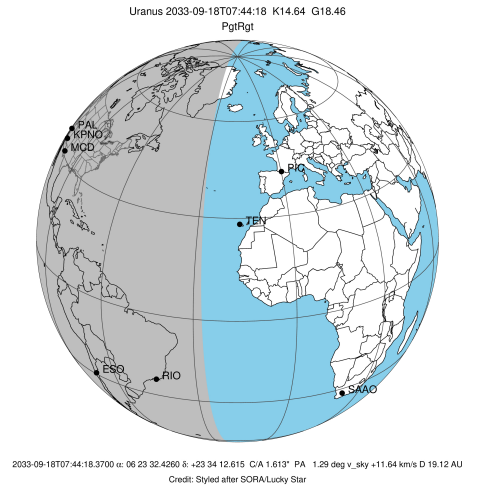
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-09-18T06:38:03.153		27.89	-30.21	51054.92	-10.05		
lambda	I	2033-09-18T06:39:45.371		28.16	-29.83	50026.71	-10.02		
delta	I	2033-09-18T06:42:39.066		28.63	-29.18	48300.35	-9.86		
gamma	I	2033-09-18T06:43:47.665		28.81	-28.92	47626.26	-9.79		
eta	I	2033-09-18T06:44:33.738		28.93	-28.74	47176.12	-9.75		
beta	I	2033-09-18T06:47:08.400		29.34	-28.16	45681.22	-9.58		
alpha	I	2033-09-18T06:48:47.601		29.60	-27.78	44736.28	-9.47		
4	I	2033-09-18T06:52:39.827		30.20	-26.91	42569.47	-9.18		
5	I	2033-09-18T06:53:24.717		30.32	-26.74	42167.04	-9.11		
6	I	2033-09-18T06:53:56.303		30.40	-26.62	41879.18	-9.07		

No planet occultations

6	E	2033-09-18T08:23:48.751		41.13	-5.99	41823.58	8.98		
5	E	2033-09-18T08:24:30.437		41.18	-5.83	42204.87	9.02		
4	E	2033-09-18T08:25:14.991		41.24	-5.66	42616.03	9.09		
alpha	E	2033-09-18T08:29:06.457		41.52	-4.77x	44741.58	9.37		
beta	E	2033-09-18T08:30:42.958		41.64	-4.40x	45655.72	9.47		
eta	E	2033-09-18T08:33:22.262		41.82	-3.79x	47176.12	9.63		
gamma	E	2033-09-18T08:34:08.381		41.87	-3.61x	47621.30	9.67		
delta	E	2033-09-18T08:35:18.337		41.95	-3.34x	48300.35	9.74		
lambda	E	2033-09-18T08:38:14.247		42.13	-2.66x	50026.71	9.89		
epsilon	E	2033-09-18T08:39:35.451		42.22	-2.35x	50832.16	9.92		



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-09-18T07:37:29.390  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 3377569978155912576  
 2Mass ID (if available) : 06233241+2334130  
 ICRS Star Coord at Epoch: 06h 23m 32.42601s +23:34:12.61488s  
 RUWE (>1.4 is poor) : 0.96  
 K magnitude : 14.636  
 G magnitude : 18.462  
 RP magnitude : 17.256  
 BP magnitude : 19.886  
 DUPflag : 0  
 Distance (au) : 19.122  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 11.64  
 Sun-Target sep (deg) : 79.86  
 Sun-Moon sep (deg) : 22.32  
 B (ring opening deg) : 70.60  
 PA of pole (deg) : 67.73  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.922  
 C/A sky separation (km) : 26648.8  
 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\_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	2033-09-18T06:35:54.975		4.09x	-50.63	51058.35	-10.25		
lambda	I	2033-09-18T06:37:35.565		4.40x	-50.34	50026.71	-10.21		
delta	I	2033-09-18T06:40:25.899		4.94x	-49.85	48300.35	-10.06		
gamma	I	2033-09-18T06:41:33.155		5.15	-49.66	47626.31	-9.99		
eta	I	2033-09-18T06:42:18.330		5.29	-49.53	47176.12	-9.94		
beta	I	2033-09-18T06:44:49.935		5.77	-49.08	45681.22	-9.78		
alpha	I	2033-09-18T06:46:27.176		6.07	-48.79	44736.00	-9.67		
4	I	2033-09-18T06:50:14.688		6.78	-48.12	42569.00	-9.37		
5	I	2033-09-18T06:50:58.558		6.92	-47.98	42167.48	-9.30		
6	I	2033-09-18T06:51:29.519		7.01	-47.89	41879.25	-9.26		

No planet occultations

6	E	2033-09-18T08:20:35.444		22.21	-30.27	41823.54	9.13		
5	E	2033-09-18T08:21:16.457		22.31	-30.12	42204.94	9.16		
4	E	2033-09-18T08:22:00.283		22.42	-29.97	42616.03	9.24		
alpha	E	2033-09-18T08:25:48.135		22.99	-29.17	44741.57	9.51		
beta	E	2033-09-18T08:27:23.191		23.23	-28.84	45655.72	9.62		
eta	E	2033-09-18T08:30:00.180		23.62	-28.29	47176.12	9.77		
gamma	E	2033-09-18T08:30:45.644		23.73	-28.13	47621.30	9.81		
delta	E	2033-09-18T08:31:54.620		23.89	-27.89	48300.35	9.88		
lambda	E	2033-09-18T08:34:48.128		24.31	-27.27	50026.71	10.02		
epsilon	E	2033-09-18T08:36:08.230		24.51	-26.99	50831.93	10.05		