

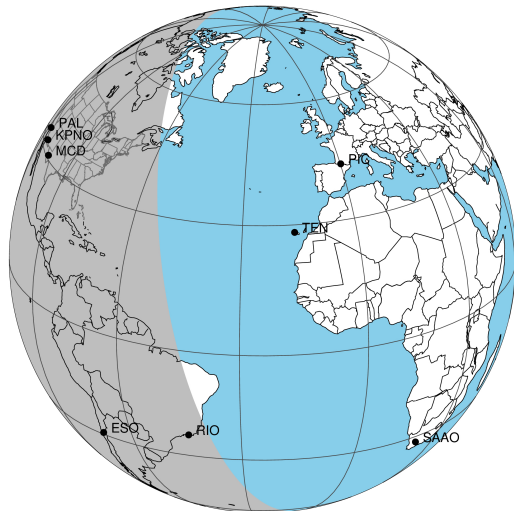
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2028-08-12T09:02:41.270  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3413038887534574336  
 2Mass ID (if available) : 04472122+2220308

Uranus 2028-08-12T09:02:41 K13.98 G15.90 PgtRgt

ICRS Star Coord at Epoch: 04h 47m 21.22424s +22:20:30.86960s

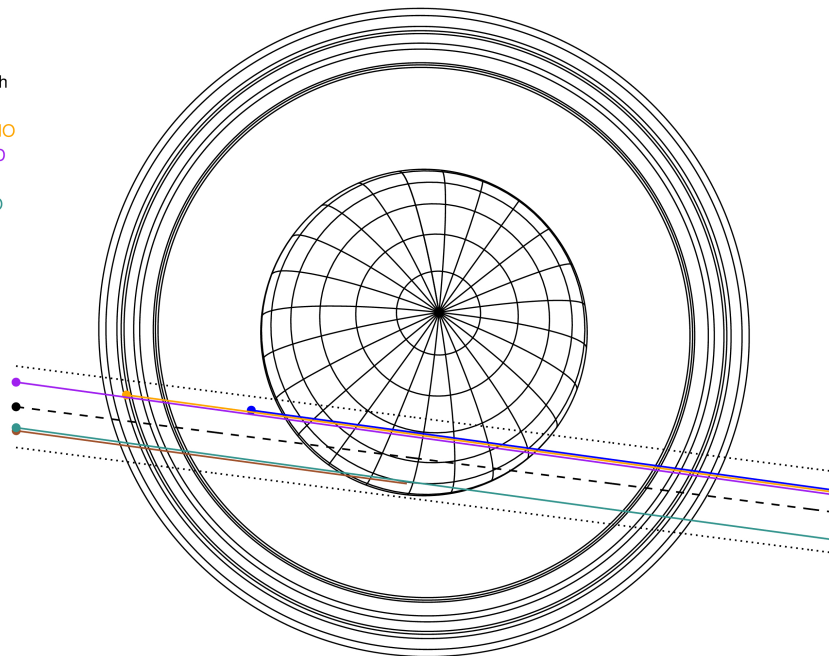
RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.981  
 G magnitude : 15.903  
 RP magnitude : 15.235  
 BP magnitude : 16.397  
 DUPflag : 0  
 Distance (au) : 19.696  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 18.19  
 Sun-Target sep (deg) : 66.54  
 Sun-Moon sep (deg) : 36.48  
 B (ring opening deg) : 81.16  
 PA of pole (deg) : -36.79

Uranus 2028-08-12T09:02:41 K13.98 G15.90  
 PgtRgt



2028-08-12T09:02:41.2700 ex: 04 47 21.2242 s: +22 20 30.870 C/A 1.376° PA 352.66 deg v\_sky +18.19 km/s D 19.70 AU  
 Credit: Styled after SORA/Lucky Star

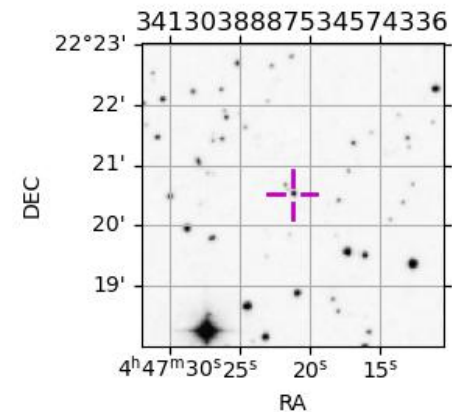
Earth  
 PAL  
 KPNO  
 MCD  
 RIO  
 ESO



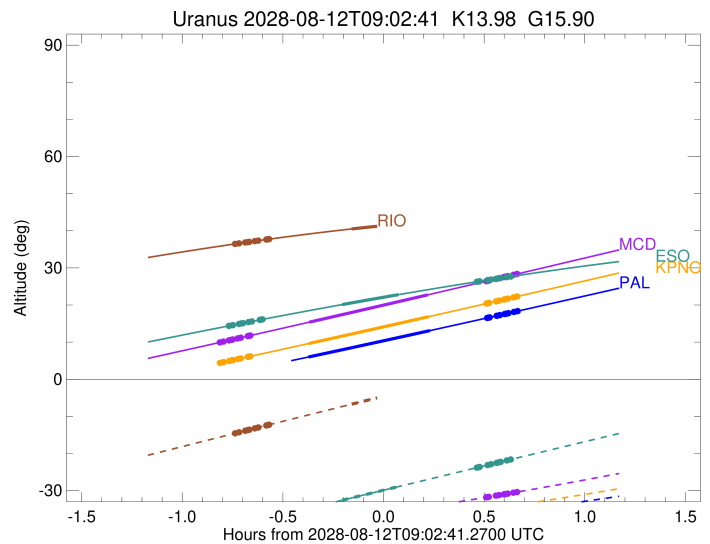
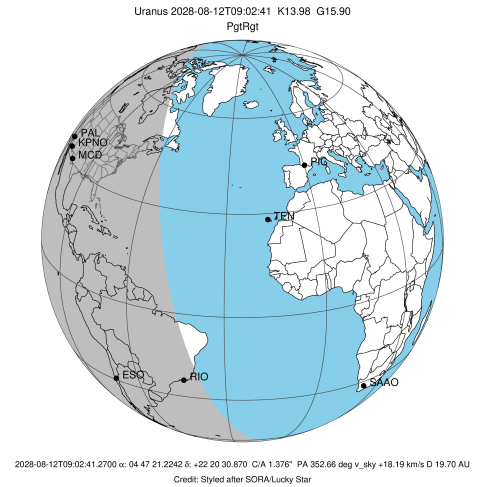
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1		+	+	AUG 12 08:40 - AUG 12 09:42	PieRne
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+	+	AUG 12 08:17 - AUG 12 09:42	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+	+	AUG 12 08:14 - AUG 12 09:42	PieRie
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	+++++	+		AUG 12 08:18 - AUG 12 08:53	PinRin
ESO	European Southern Obs	-29.3	289.3	+++++	+	+	AUG 12 08:16 - AUG 12 09:40	PieRie
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



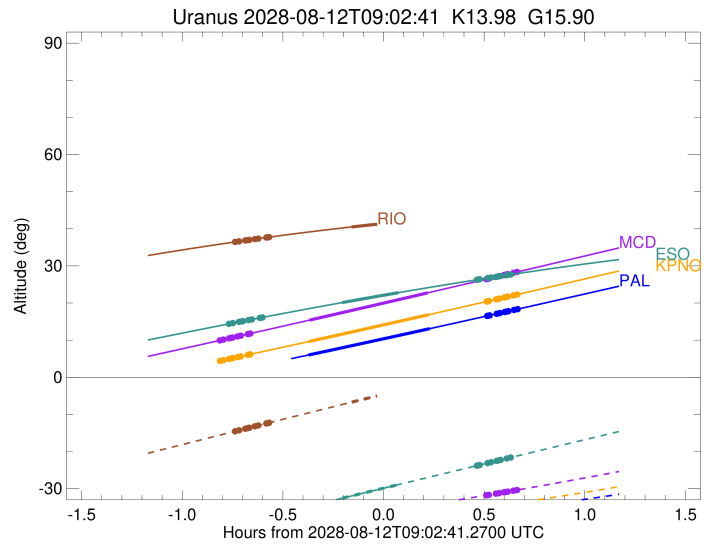
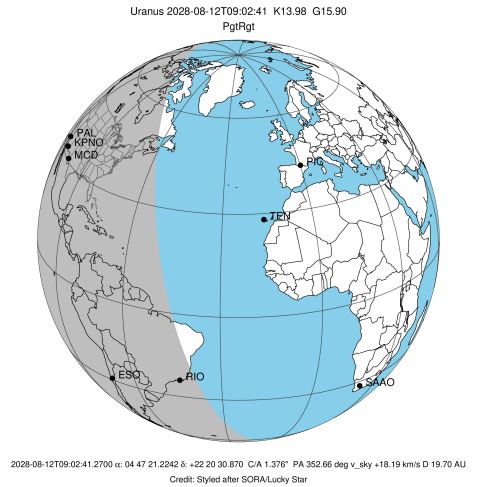
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2028-08-12T08:58:06.990  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3413038887534574336  
 2Mass ID (if available) : 04472122+2220308  
 ICRS Star Coord at Epoch: 04h 47m 21.22424s +22:20:30.86960s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.981  
 G magnitude : 15.903  
 RP magnitude : 15.235  
 BP magnitude : 16.397  
 DUPflag : 0  
 Distance (au) : 19.696  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 18.19  
 Sun-Target sep (deg) : 66.54  
 Sun-Moon sep (deg) : 35.95  
 B (ring opening deg) : 81.16  
 PA of pole (deg) : -36.79  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.101  
 C/A sky separation (km) : 15725.1  
 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	2028-08-12T08:14:12.624	1.02x	-41.78	51008.15	-17.42			
lambda	I	2028-08-12T08:15:08.896	1.19x	-41.75	50026.71	-17.42			
delta	I	2028-08-12T08:16:48.200	1.51x	-41.71	48300.35	-17.35			
gamma	I	2028-08-12T08:17:27.140	1.63x	-41.69	47625.49	-17.31			
eta	I	2028-08-12T08:17:53.108	1.71x	-41.68	47176.12	-17.29			
beta	I	2028-08-12T08:19:22.049	1.99x	-41.63	45641.62	-17.21			
alpha	I	2028-08-12T08:20:14.241	2.15x	-41.60	44745.58	-17.16			
4	I	2028-08-12T08:22:19.567	2.55x	-41.53	42599.69	-17.03			
5	I	2028-08-12T08:22:39.090	2.61x	-41.52	42265.18	-17.00			
6	I	2028-08-12T08:23:05.106	2.69x	-41.50	41831.55	-16.97			
Uranus	I	2028-08-12T08:40:17.808	5.99	-40.72	25065.94	-8.18	-8.57		
Uranus	E	2028-08-12T09:16:31.835	13.11	-38.04	25544.50	-1.38	-1.44		
6	E	2028-08-12T09:33:33.729	16.52	-36.34	41811.56	16.84			
5	E	2028-08-12T09:33:54.578	16.59	-36.30	42161.44	16.86			
4	E	2028-08-12T09:34:16.139	16.66	-36.26	42526.28	16.89			
alpha	E	2028-08-12T09:36:23.423	17.09	-36.03	44684.73	17.02			
beta	E	2028-08-12T09:37:21.397	17.28	-35.93	45672.83	17.07			
eta	E	2028-08-12T09:38:49.284	17.58	-35.76	47176.12	17.14			
gamma	E	2028-08-12T09:39:15.373	17.66	-35.72	47623.56	17.16			
delta	E	2028-08-12T09:39:54.778	17.80	-35.64	48300.35	17.19			
lambda	E	2028-08-12T09:41:35.011	18.14	-35.45	50026.71	17.26			
epsilon	E	2028-08-12T09:42:33.181	18.33	-35.34	51031.61	17.25			

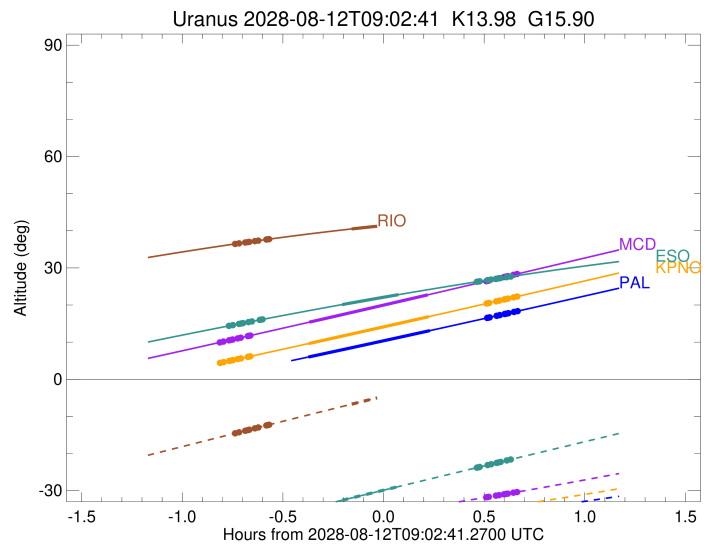
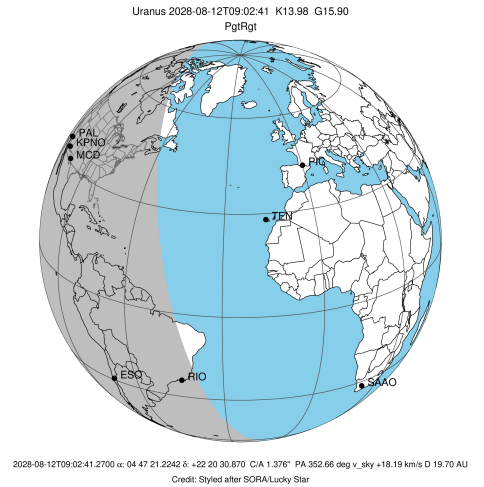
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2028-08-12T08:57:59.550
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       : 3413038887534574336
2Mass ID (if available) : 04472122+2220308
ICRS Star Coord at Epoch: 04h 47m 21.22424s +22:20:30.86960s
RUWE (>1.4 is poor) : 1.03
K magnitude           : 13.981
G magnitude           : 15.903
RP magnitude          : 15.235
BP magnitude          : 16.397
DUPflag              : 0
Distance (au)        : 19.696
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : 18.19
Sun-Target sep (deg) : 66.54
Sun-Moon sep (deg)   : 35.97
B (ring opening deg) : 81.16
PA of pole (deg)     : -36.79
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.121
C/A sky separation (km) : 16018.3
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
    
```



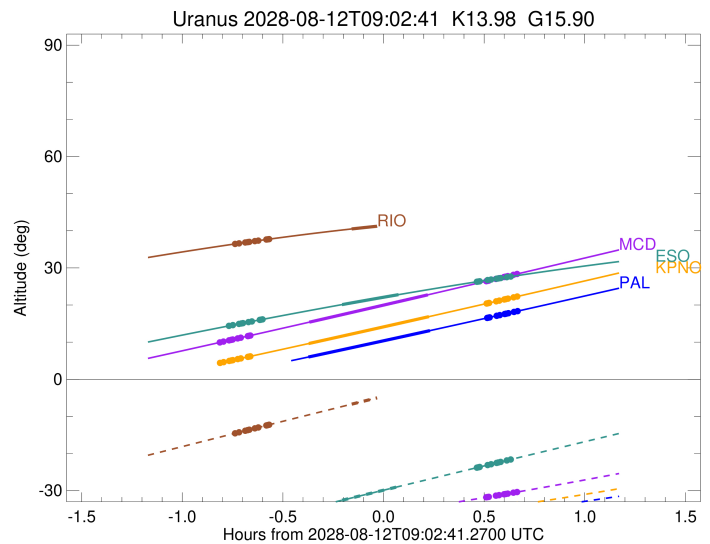
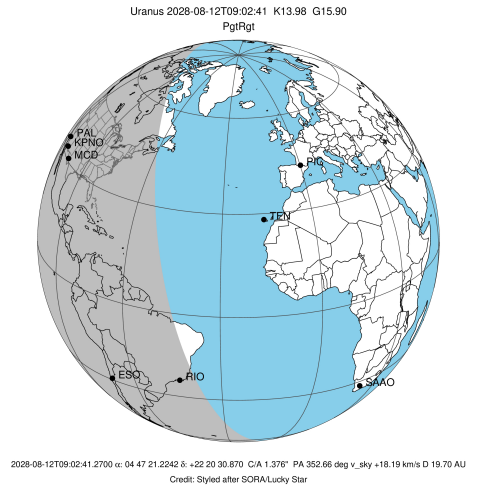
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-08-12T08:14:05.837		4.43x	-42.33	51006.00	-17.35		
lambda	I	2028-08-12T08:15:02.205		4.62x	-42.29	50026.71	-17.35		
delta	I	2028-08-12T08:16:41.909		4.94x	-42.20	48300.35	-17.28		
gamma	I	2028-08-12T08:17:21.013		5.07	-42.16	47625.45	-17.24		
eta	I	2028-08-12T08:17:47.089		5.15	-42.14	47176.12	-17.22		
beta	I	2028-08-12T08:19:16.417		5.45	-42.05	45641.59	-17.14		
alpha	I	2028-08-12T08:20:08.852		5.62	-42.00	44745.44	-17.08		
4	I	2028-08-12T08:22:14.776		6.03	-41.88	42599.44	-16.94		
5	I	2028-08-12T08:22:34.413		6.09	-41.86	42264.65	-16.91		
6	I	2028-08-12T08:23:00.547		6.18	-41.83	41831.24	-16.89		
Uranus	I	2028-08-12T08:40:21.868		9.62	-40.60	25060.24		-8.23	-8.62
Uranus	E	2028-08-12T09:16:13.558		16.87	-37.11	25541.61		-1.51	-1.58
6	E	2028-08-12T09:33:23.899		20.40	-35.04	41811.29	16.76		
5	E	2028-08-12T09:33:44.851		20.47	-34.99	42161.19	16.78		
4	E	2028-08-12T09:34:06.536		20.55	-34.95	42526.24	16.81		
alpha	E	2028-08-12T09:36:14.449		20.99	-34.67	44684.75	16.94		
beta	E	2028-08-12T09:37:12.685		21.19	-34.55	45672.71	16.99		
eta	E	2028-08-12T09:38:40.975		21.49	-34.36	47176.12	17.07		
gamma	E	2028-08-12T09:39:07.177		21.58	-34.30	47623.53	17.09		
delta	E	2028-08-12T09:39:46.755		21.72	-34.21	48300.35	17.12		
lambda	E	2028-08-12T09:41:27.410		22.07	-33.99	50026.71	17.19		
epsilon	E	2028-08-12T09:42:25.673		22.27	-33.86	51029.11	17.18		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2028-08-12T08:57:56.250  
 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 : 3413038887534574336  
 2Mass ID (if available) : 04472122+2220308  
 ICRS Star Coord at Epoch: 04h 47m 21.22424s +22:20:30.86960s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.981  
 G magnitude : 15.903  
 RP magnitude : 15.235  
 BP magnitude : 16.397  
 DUPflag : 0  
 Distance (au) : 19.696  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 18.19  
 Sun-Target sep (deg) : 66.54  
 Sun-Moon sep (deg) : 36.03  
 B (ring opening deg) : 81.16  
 PA of pole (deg) : -36.79  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.148  
 C/A sky separation (km) : 16403.9  
 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



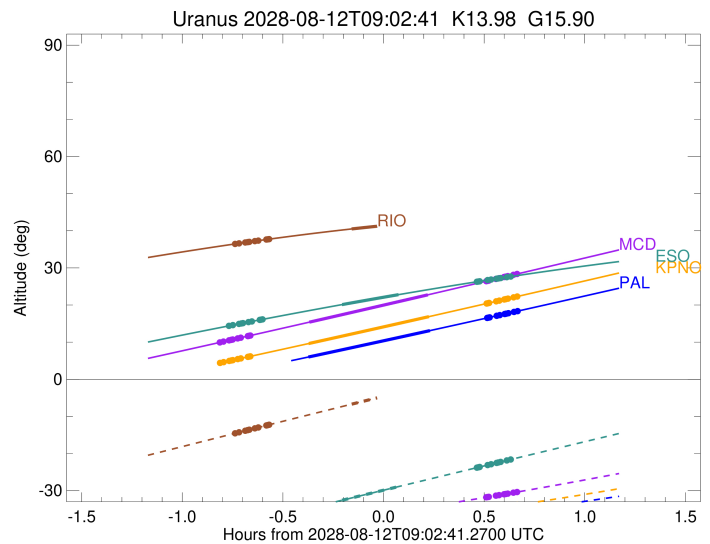
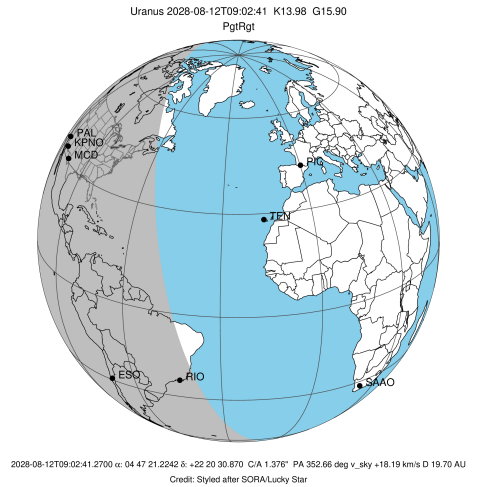
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-08-12T08:14:02.568		9.96	-41.45	51003.13	-17.25		
lambda	I	2028-08-12T08:14:59.087		10.15	-41.37	50026.71	-17.25		
delta	I	2028-08-12T08:16:39.371		10.49	-41.22	48300.35	-17.17		
gamma	I	2028-08-12T08:17:18.710		10.62	-41.16	47625.41	-17.14		
eta	I	2028-08-12T08:17:44.942		10.71	-41.12	47176.12	-17.12		
beta	I	2028-08-12T08:19:14.830		11.02	-40.98	45641.55	-17.03		
alpha	I	2028-08-12T08:20:07.613		11.20	-40.90	44745.26	-16.97		
4	I	2028-08-12T08:22:14.393		11.63	-40.70	42599.10	-16.83		
5	I	2028-08-12T08:22:34.194		11.69	-40.67	42263.94	-16.79		
6	I	2028-08-12T08:23:00.495		11.78	-40.63	41830.84	-16.77		
Uranus	I	2028-08-12T08:40:34.034		15.38	-38.80	25052.85		-8.30	-8.68
Uranus	E	2028-08-12T09:15:55.672		22.75	-34.32	25537.40		-1.68	-1.76
6	E	2028-08-12T09:33:17.893		26.41	-31.79	41810.94	16.64		
5	E	2028-08-12T09:33:38.989		26.48	-31.74	42160.87	16.66		
4	E	2028-08-12T09:34:00.849		26.56	-31.69	42526.19	16.69		
alpha	E	2028-08-12T09:36:09.641		27.02	-31.36	44684.78	16.83		
beta	E	2028-08-12T09:37:08.246		27.22	-31.21	45672.56	16.88		
eta	E	2028-08-12T09:38:37.102		27.54	-30.98	47176.12	16.96		
gamma	E	2028-08-12T09:39:03.462		27.63	-30.92	47623.49	16.98		
delta	E	2028-08-12T09:39:43.283		27.77	-30.81	48300.35	17.01		
lambda	E	2028-08-12T09:41:24.531		28.13	-30.55	50026.71	17.09		
epsilon	E	2028-08-12T09:42:22.937		28.34	-30.40	51025.88	17.08		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2028-08-12T09:00:18.720  
 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 : 3413038887534574336  
 2Mass ID (if available) : 04472122+2220308  
 ICRS Star Coord at Epoch: 04h 47m 21.22424s +22:20:30.86960s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.981  
 G magnitude : 15.903  
 RP magnitude : 15.235  
 BP magnitude : 16.397  
 DUPflag : 0  
 Distance (au) : 19.696  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 18.19  
 Sun-Target sep (deg) : 66.54  
 Sun-Moon sep (deg) : 36.64  
 B (ring opening deg) : 81.16  
 PA of pole (deg) : -36.79  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.668  
 C/A sky separation (km) : 23827.0  
 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	2028-08-12T08:18:39.799		36.49	-14.50	50943.83	-15.71		
lambda	I	2028-08-12T08:19:38.114		36.61	-14.28	50026.71	-15.68		
delta	I	2028-08-12T08:21:28.794		36.85	-13.86	48300.35	-15.51		
gamma	I	2028-08-12T08:22:12.476		36.95	-13.70	47624.51	-15.43		
eta	I	2028-08-12T08:22:41.575		37.01	-13.59	47176.12	-15.38		
beta	I	2028-08-12T08:24:21.970		37.22	-13.21	45641.07	-15.19		
alpha	I	2028-08-12T08:25:21.554		37.34	-12.98	44740.82	-15.07		
4	I	2028-08-12T08:27:45.394		37.64	-12.44	42591.32	-14.74		
5	I	2028-08-12T08:28:08.637		37.69	-12.35	42248.08	-14.67		
6	I	2028-08-12T08:28:38.233		37.75	-12.24	41822.31	-14.61		
Uranus	I	2028-08-12T08:53:11.876		40.50	-6.70	25008.72		-8.67	-9.07
Uranus	E	2028-08-12T09:08:17.916		41.89	-3.32x	25306.10		-5.81	-6.08
6	E	2028-08-12T09:32:29.275		43.60	2.05x	41804.78	14.56		
5	E	2028-08-12T09:32:53.279		43.62	2.13x	42156.28	14.62		
4	E	2028-08-12T09:33:18.565		43.64	2.23x	42526.12	14.69		
alpha	E	2028-08-12T09:35:44.006		43.77	2.76x	44685.97	15.01		
beta	E	2028-08-12T09:36:49.256		43.83	3.00x	45669.41	15.13		
eta	E	2028-08-12T09:38:28.198		43.91	3.36x	47176.12	15.32		
gamma	E	2028-08-12T09:38:57.310		43.93	3.47x	47622.76	15.37		
delta	E	2028-08-12T09:39:41.299		43.97	3.63x	48300.35	15.44		
lambda	E	2028-08-12T09:41:32.485		44.06	4.04x	50026.71	15.61		
epsilon	E	2028-08-12T09:42:32.554		44.10	4.26x	50967.03	15.64		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2028-08-12T08:58:18.630  
 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 : 3413038887534574336  
 2Mass ID (if available) : 04472122+2220308  
 ICRS Star Coord at Epoch: 04h 47m 21.22424s +22:20:30.86960s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 13.981  
 G magnitude : 15.903  
 RP magnitude : 15.235  
 BP magnitude : 16.397  
 DUPflag : 0  
 Distance (au) : 19.696  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 18.19  
 Sun-Target sep (deg) : 66.54  
 Sun-Moon sep (deg) : 36.24  
 B (ring opening deg) : 81.16  
 PA of pole (deg) : -36.79  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.643  
 C/A sky separation (km) : 23473.4  
 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\_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	2028-08-12T08:16:49.892		14.42	-39.90	50947.30	-15.92		
lambda	I	2028-08-12T08:17:47.646		14.59	-39.69	50026.71	-15.90		
delta	I	2028-08-12T08:19:36.820		14.91	-39.30	48300.35	-15.73		
gamma	I	2028-08-12T08:20:19.892		15.04	-39.14	47624.56	-15.65		
eta	I	2028-08-12T08:20:48.587		15.12	-39.03	47176.12	-15.60		
beta	I	2028-08-12T08:22:27.548		15.41	-38.68	45641.08	-15.42		
alpha	I	2028-08-12T08:23:26.239		15.58	-38.46	44741.11	-15.30		
4	I	2028-08-12T08:25:47.886		15.99	-37.95	42591.81	-14.98		
5	I	2028-08-12T08:26:10.727		16.06	-37.86	42249.05	-14.91		
6	I	2028-08-12T08:26:39.890		16.14	-37.76	41822.80	-14.85		
Uranus	I	2028-08-12T08:50:19.108		20.11	-32.59	25000.09		-8.74	-9.14
Uranus	E	2028-08-12T09:07:09.387		22.79	-28.91	25328.23		-5.55	-5.81
6	E	2028-08-12T09:30:28.970		26.26	-23.82	41804.99	14.76		
5	E	2028-08-12T09:30:52.649		26.32	-23.73	42156.40	14.82		
4	E	2028-08-12T09:31:17.582		26.38	-23.64	42526.09	14.88		
alpha	E	2028-08-12T09:33:41.164		26.71	-23.12	44685.91	15.20		
beta	E	2028-08-12T09:34:45.637		26.86	-22.89	45669.53	15.31		
eta	E	2028-08-12T09:36:23.422		27.09	-22.53	47176.12	15.49		
gamma	E	2028-08-12T09:36:52.207		27.16	-22.43	47622.78	15.54		
delta	E	2028-08-12T09:37:35.705		27.26	-22.27	48300.35	15.61		
lambda	E	2028-08-12T09:39:25.696		27.51	-21.87	50026.71	15.78		
epsilon	E	2028-08-12T09:40:25.261		27.64	-21.66	50968.92	15.80		