

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-27T09:07:29.580  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3404548321308072192  
 2Mass ID (if available) : 05352071+2328182

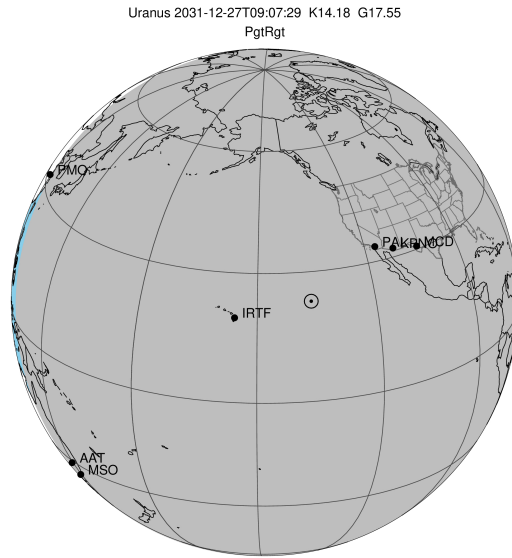
Uranus 2031-12-27T09:07:29 K14.18 G17.55 PgtRgt

ICRS Star Coord at Epoch: 05h 35m 20.71535s +23:28:18.13259s

RUWE (>1.4 is poor) : 0.00  
 K magnitude : 14.177  
 G magnitude : 17.554  
 RP magnitude : 16.415  
 BP magnitude : 18.144  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.92  
 Sun-Target sep (deg) : 169.39  
 Sun-Moon sep (deg) : 5.24  
 B (ring opening deg) : 79.67  
 PA of pole (deg) : 37.72

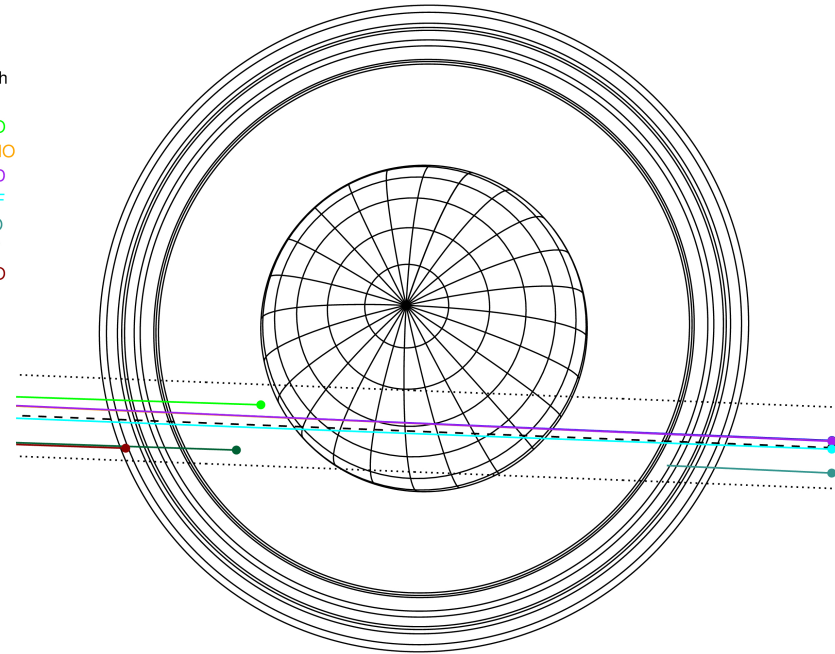
# a(km) ring

- 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



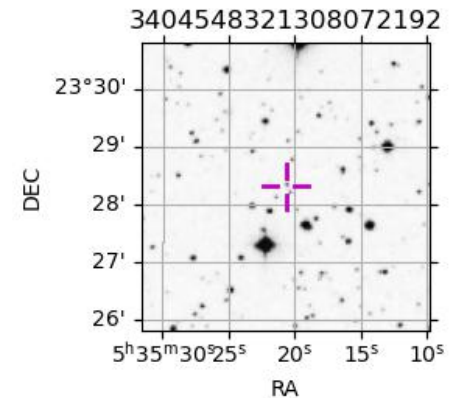
2031-12-27T09:07:29.5800 ra: 05 35 20.7153 s: +23 28 18.133 C/A 1.221" PA 357.74 deg v\_sky -22.92 km/s D 18.12 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PAL  
 PMO  
 KPNO  
 MCD  
 IRTF  
 ESO  
 AAT  
 MSO

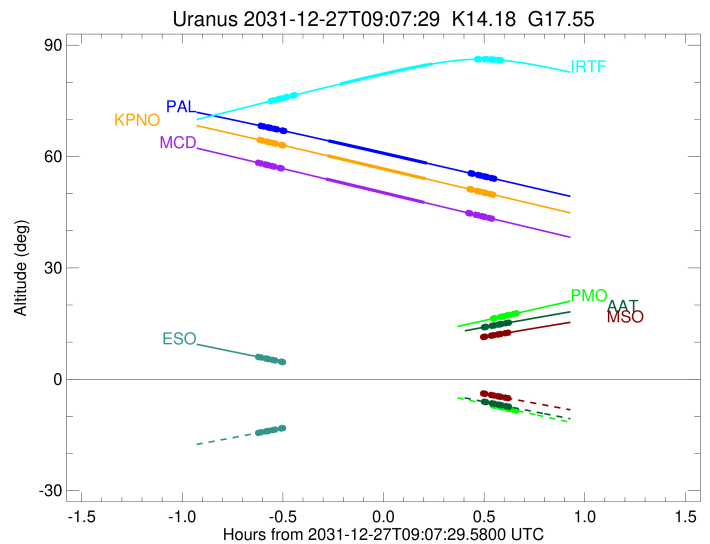
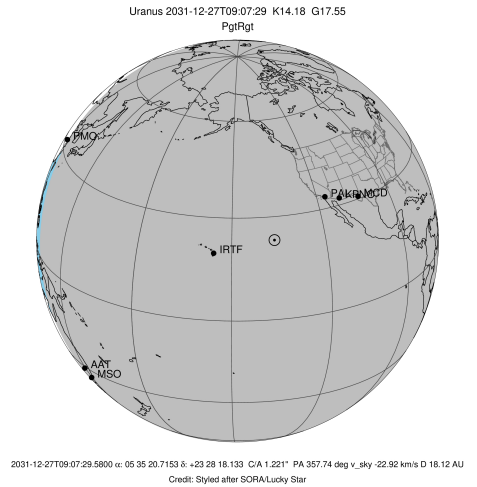


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	+++++	+ +	+++++	DEC 27 08:30 - DEC 27 09:40	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRne
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	DEC 27 08:30 - DEC 27 09:39	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	DEC 27 08:29 - DEC 27 09:39	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	DEC 27 08:33 - DEC 27 09:42	PieRie
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European Southern Obs	-29.3	289.3	+++++			DEC 27 08:29 - DEC 27 08:35	PnnRin
AAT	Siding Spring (AAT)	-31.3	149.1			+++++	DEC 27 09:37 - DEC 27 09:44	PnnRne
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0			+	DEC 27 09:44 - DEC 27 09:44	PnnRne

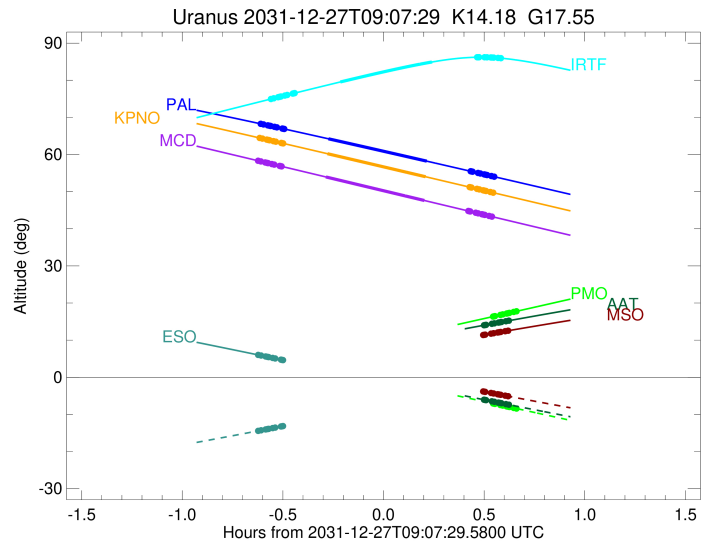
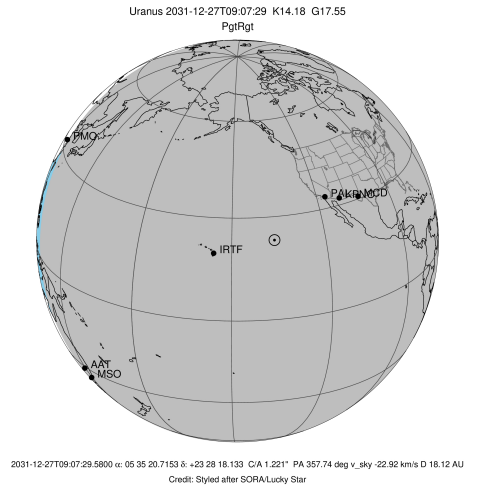


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-27T09:05:30.030  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3404548321308072192  
 2Mass ID (if available) : 05352071+2328182  
 ICRS Star Coord at Epoch: 05h 35m 20.71535s +23:28:18.13259s  
 RUWE (>1.4 is poor) : 0.00  
 K magnitude : 14.177  
 G magnitude : 17.554  
 RP magnitude : 16.415  
 BP magnitude : 18.144  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.92  
 Sun-Target sep (deg) : 169.39  
 Sun-Moon sep (deg) : 5.76  
 B (ring opening deg) : 79.67  
 PA of pole (deg) : 37.72  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.131  
 C/A sky separation (km) : 14861.1  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



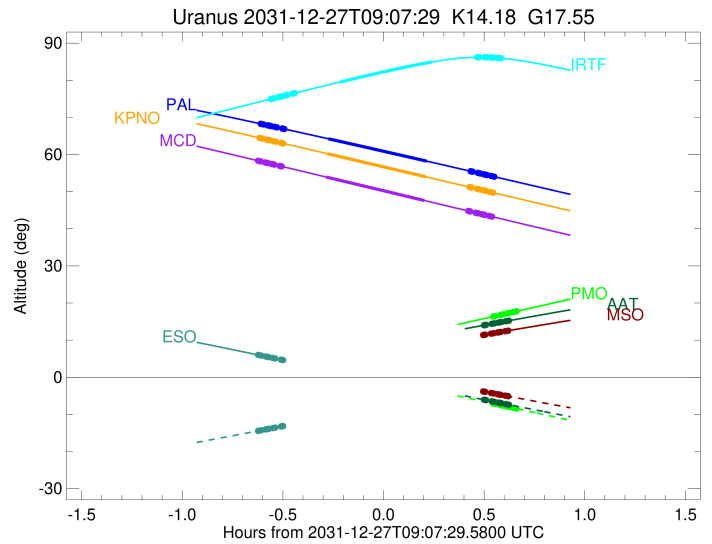
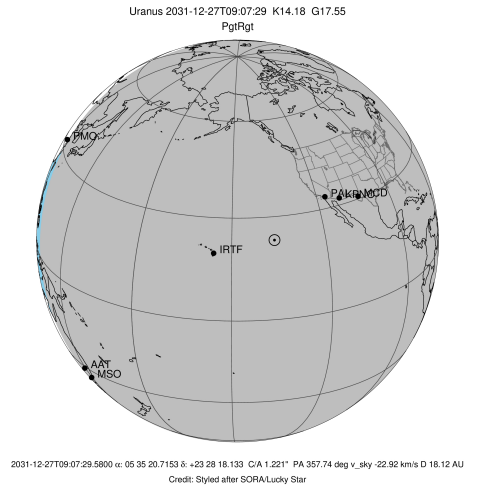
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-27T08:30:36.477		68.33	-76.46	51539.72	-22.44		
lambda	I	2031-12-27T08:31:44.055		68.11	-76.29	50026.71	-22.36		
delta	I	2031-12-27T08:33:01.415		67.85	-76.09	48300.35	-22.27		
gamma	I	2031-12-27T08:33:31.807		67.75	-76.01	47623.90	-22.24		
eta	I	2031-12-27T08:33:51.952		67.69	-75.96	47176.12	-22.22		
beta	I	2031-12-27T08:34:59.499		67.46	-75.78	45677.72	-22.13		
alpha	I	2031-12-27T08:35:41.412		67.33	-75.67	44752.30	-22.08		
4	I	2031-12-27T08:37:21.764		66.99	-75.40	42541.10	-21.92		
5	I	2031-12-27T08:37:39.385		66.94	-75.35	42162.81	-21.90		
6	I	2031-12-27T08:37:53.718		66.89	-75.31	41850.22	-21.88		
Uranus	I	2031-12-27T08:51:04.644		64.24	-73.06	25021.67		-10.04	-10.51
Uranus	E	2031-12-27T09:20:24.281		58.22	-67.52	25555.23		0.82	0.86
6	E	2031-12-27T09:33:29.131		55.50	-64.92	41854.53	21.83		
5	E	2031-12-27T09:33:50.206		55.42	-64.85	42312.27	21.85		
4	E	2031-12-27T09:34:02.089		55.38	-64.81	42571.60	21.87		
alpha	E	2031-12-27T09:35:38.746		55.04	-64.49	44694.16	22.02		
beta	E	2031-12-27T09:36:21.730		54.90	-64.35	45641.10	22.08		
eta	E	2031-12-27T09:37:31.118		54.65	-64.11	47176.12	22.16		
gamma	E	2031-12-27T09:37:51.377		54.58	-64.04	47625.33	22.18		
delta	E	2031-12-27T09:38:21.782		54.48	-63.94	48300.35	22.22		
lambda	E	2031-12-27T09:39:39.341		54.21	-63.68	50026.71	22.30		
epsilon	E	2031-12-27T09:40:17.816		54.07	-63.55	50885.33	22.38		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-27T09:11:16.530  
 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 : 3404548321308072192  
 2Mass ID (if available) : 05352071+2328182  
 ICRS Star Coord at Epoch: 05h 35m 20.71535s +23:28:18.13259s  
 RUWE (>1.4 is poor) : 0.00  
 K magnitude : 14.177  
 G magnitude : 17.554  
 RP magnitude : 16.415  
 BP magnitude : 18.144  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.92  
 Sun-Target sep (deg) : 169.39  
 Sun-Moon sep (deg) : 4.97  
 B (ring opening deg) : 79.67  
 PA of pole (deg) : 37.72  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.973  
 C/A sky separation (km) : 12778.8  
 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



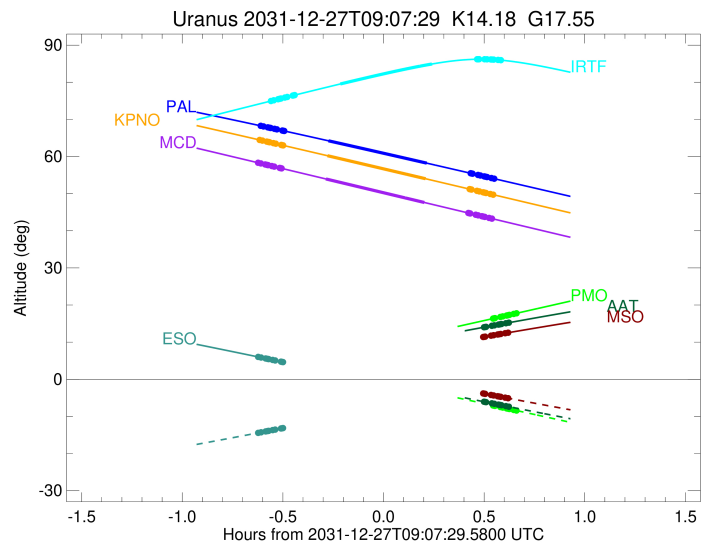
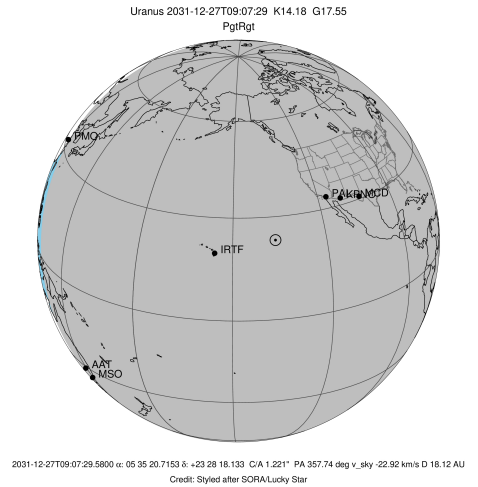
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-27T08:35:19.487		3.53x	5.16x	51533.43	-22.27		
lambda	I	2031-12-27T08:36:27.244		3.75x	4.95x	50026.71	-22.21		
delta	I	2031-12-27T08:37:45.053		4.00x	4.72x	48300.35	-22.16		
gamma	I	2031-12-27T08:38:15.585		4.10x	4.63x	47624.17	-22.13		
eta	I	2031-12-27T08:38:35.834		4.16x	4.57x	47176.12	-22.12		
beta	I	2031-12-27T08:39:43.612		4.38x	4.36x	45678.34	-22.06		
alpha	I	2031-12-27T08:40:25.686		4.52x	4.23x	44752.07	-22.02		
4	I	2031-12-27T08:42:06.078		4.84x	3.93x	42543.23	-21.91		
5	I	2031-12-27T08:42:23.859		4.90x	3.87x	42160.79	-21.90		
6	I	2031-12-27T08:42:38.235		4.94x	3.83x	41847.67	-21.89		
Uranus	I	2031-12-27T08:55:35.022		7.46	1.44x	25054.84		-9.71	-10.17
Uranus	E	2031-12-27T09:27:21.631		13.77	-4.58x	25542.81		1.71	1.79
6	E	2031-12-27T09:40:09.590		16.35	-7.06	41852.83	21.98		
5	E	2031-12-27T09:40:30.654		16.42	-7.13	42313.12	21.99		
4	E	2031-12-27T09:40:42.524		16.46	-7.17	42573.52	22.00		
alpha	E	2031-12-27T09:42:18.546		16.79	-7.48	44693.25	22.12		
beta	E	2031-12-27T09:43:01.399		16.93	-7.62	45641.06	22.16		
eta	E	2031-12-27T09:44:10.564		17.17	-7.84	47176.12	22.22		
gamma	E	2031-12-27T09:44:30.779		17.23	-7.91	47625.52	22.24		
delta	E	2031-12-27T09:45:01.104		17.34	-8.01	48300.35	22.27		
lambda	E	2031-12-27T09:46:18.532		17.60	-8.26	50026.71	22.33		
epsilon	E	2031-12-27T09:46:56.523		17.73	-8.39	50875.43	22.39		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-27T09:05:10.790  
 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 : 3404548321308072192  
 2Mass ID (if available) : 05352071+2328182  
 ICRS Star Coord at Epoch: 05h 35m 20.71535s +23:28:18.13259s  
 RUWE (>1.4 is poor) : 0.00  
 K magnitude : 14.177  
 G magnitude : 17.554  
 RP magnitude : 16.415  
 BP magnitude : 18.144  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.92  
 Sun-Target sep (deg) : 169.39  
 Sun-Moon sep (deg) : 5.80  
 B (ring opening deg) : 79.67  
 PA of pole (deg) : 37.72  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.135  
 C/A sky separation (km) : 14917.6  
 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	2031-12-27T08:30:17.011		64.52	-73.69	51539.92	-22.42		
lambda	I	2031-12-27T08:31:24.647		64.29	-73.48	50026.71	-22.34		
delta	I	2031-12-27T08:32:42.066		64.02	-73.23	48300.35	-22.26		
gamma	I	2031-12-27T08:33:12.483		63.91	-73.14	47623.90	-22.22		
eta	I	2031-12-27T08:33:32.644		63.84	-73.07	47176.12	-22.20		
beta	I	2031-12-27T08:34:40.248		63.61	-72.86	45677.70	-22.11		
alpha	I	2031-12-27T08:35:22.196		63.46	-72.72	44752.30	-22.06		
4	I	2031-12-27T08:37:02.643		63.11	-72.40	42541.03	-21.89		
5	I	2031-12-27T08:37:20.275		63.05	-72.34	42162.89	-21.88		
6	I	2031-12-27T08:37:34.620		63.00	-72.30	41850.30	-21.86		
Uranus	I	2031-12-27T08:50:46.766		60.22	-69.69	25020.82		-10.05	-10.52
Uranus	E	2031-12-27T09:20:03.878		54.01	-63.70	25555.43		0.80	0.84
6	E	2031-12-27T09:33:10.120		51.22	-60.96	41854.56	21.81		
5	E	2031-12-27T09:33:31.220		51.15	-60.89	42312.25	21.83		
4	E	2031-12-27T09:33:43.118		51.11	-60.84	42571.56	21.84		
alpha	E	2031-12-27T09:35:19.900		50.76	-60.51	44694.18	22.00		
beta	E	2031-12-27T09:36:02.936		50.61	-60.35	45641.10	22.05		
eta	E	2031-12-27T09:37:12.409		50.36	-60.11	47176.12	22.13		
gamma	E	2031-12-27T09:37:32.693		50.29	-60.04	47625.32	22.16		
delta	E	2031-12-27T09:38:03.134		50.18	-59.93	48300.35	22.19		
lambda	E	2031-12-27T09:39:20.784		49.91	-59.66	50026.71	22.27		
epsilon	E	2031-12-27T09:39:59.313		49.77	-59.53	50885.52	22.35		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-27T09:04:45.330  
 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 : 3404548321308072192  
 2Mass ID (if available) : 05352071+2328182  
 ICRS Star Coord at Epoch: 05h 35m 20.71535s +23:28:18.13259s  
 RUWE (>1.4 is poor) : 0.00  
 K magnitude : 14.177  
 G magnitude : 17.554  
 RP magnitude : 16.415  
 BP magnitude : 18.144  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.92  
 Sun-Target sep (deg) : 169.39  
 Sun-Moon sep (deg) : 5.87  
 B (ring opening deg) : 79.67  
 PA of pole (deg) : 37.72  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.133  
 C/A sky separation (km) : 14892.8  
 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

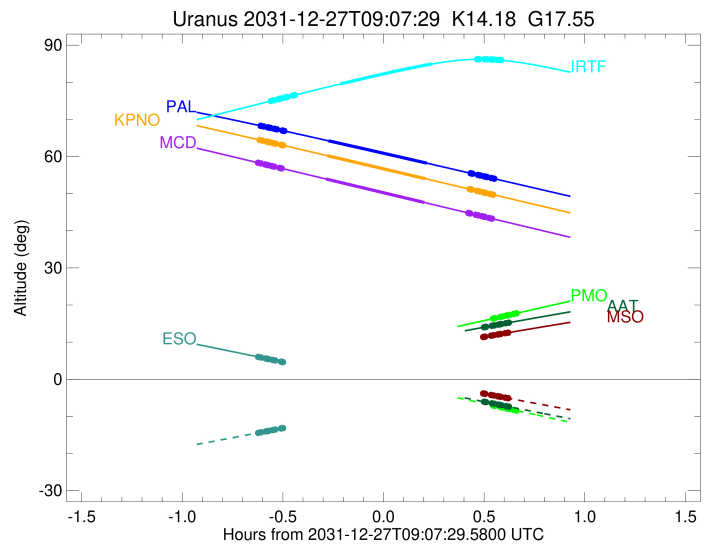
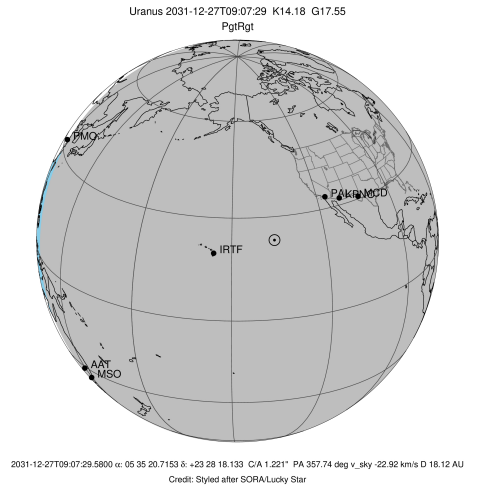


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-27T08:29:49.022		58.38	-68.14	51539.95	-22.40		
lambda	I	2031-12-27T08:30:56.709		58.14	-67.90	50026.71	-22.32		
delta	I	2031-12-27T08:32:14.185		57.86	-67.63	48300.35	-22.24		
gamma	I	2031-12-27T08:32:44.624		57.75	-67.52	47623.89	-22.20		
eta	I	2031-12-27T08:33:04.800		57.68	-67.45	47176.12	-22.18		
beta	I	2031-12-27T08:34:12.453		57.44	-67.22	45677.69	-22.09		
alpha	I	2031-12-27T08:34:54.432		57.29	-67.07	44752.31	-22.04		
4	I	2031-12-27T08:36:34.951		56.93	-66.72	42541.03	-21.88		
5	I	2031-12-27T08:36:52.595		56.86	-66.65	42162.89	-21.86		
6	I	2031-12-27T08:37:06.950		56.81	-66.60	41850.31	-21.84		
Uranus	I	2031-12-27T08:50:19.523		53.96	-63.81	25020.92		-10.05	-10.52
Uranus	E	2031-12-27T09:19:40.311		47.62	-57.53	25555.25		0.82	0.86
6	E	2031-12-27T09:32:47.259		44.79	-54.71	41854.51	21.78		
5	E	2031-12-27T09:33:08.389		44.72	-54.63	42312.28	21.80		
4	E	2031-12-27T09:33:20.302		44.67	-54.59	42571.62	21.81		
alpha	E	2031-12-27T09:34:57.196		44.33	-54.24	44694.15	21.97		
beta	E	2031-12-27T09:35:40.287		44.17	-54.09	45641.10	22.02		
eta	E	2031-12-27T09:36:49.847		43.92	-53.84	47176.12	22.11		
gamma	E	2031-12-27T09:37:10.156		43.85	-53.77	47625.33	22.13		
delta	E	2031-12-27T09:37:40.635		43.74	-53.66	48300.35	22.16		
lambda	E	2031-12-27T09:38:58.386		43.46	-53.38	50026.71	22.24		
epsilon	E	2031-12-27T09:39:36.947		43.32	-53.24	50885.13	22.32		



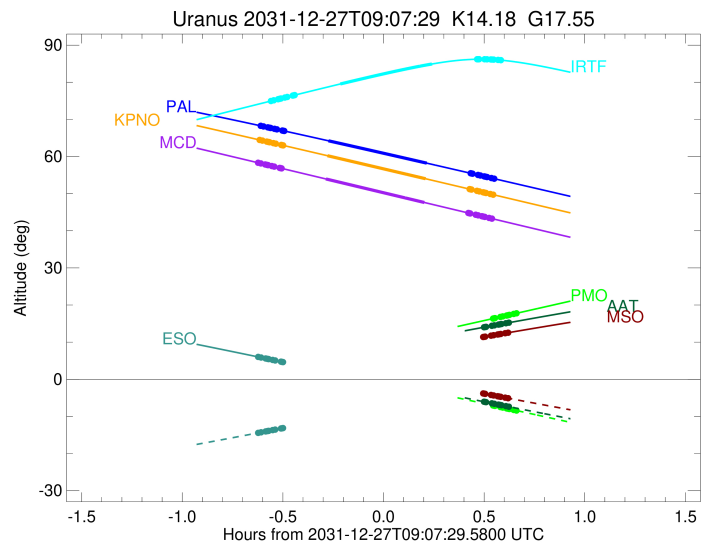
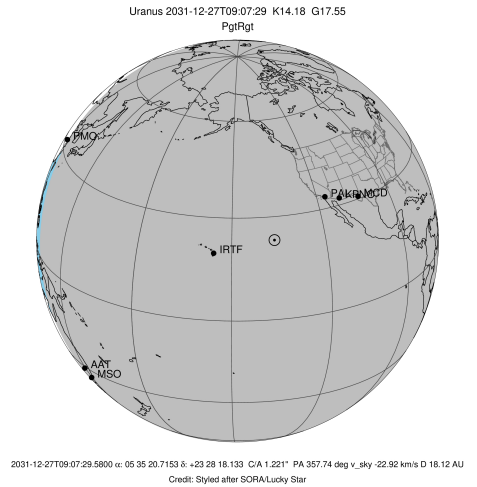
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch             : 2031-12-27T09:08:01.530
Event type            : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : IRTF
Location              : Mauna Kea/IRTF
Latitude (deg)       : 19.82622
E. Longitude (deg)   : 204.52800
Altitude (km)        : 4.168
Gaia source ID       : 3404548321308072192
2Mass ID (if available) : 05352071+2328182
ICRS Star Coord at Epoch: 05h 35m 20.71535s +23:28:18.13259s
RUWE (>1.4 is poor) : 0.00
K magnitude           : 14.177
G magnitude           : 17.554
RP magnitude          : 16.415
BP magnitude          : 18.144
DUPflag               : 0
Distance (au)         : 18.117
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -22.92
Sun-Target sep (deg) : 169.39
Sun-Moon sep (deg)   : 5.20
B (ring opening deg) : 79.67
PA of pole (deg)     : 37.72
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.257
C/A sky separation (km) : 16510.8
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
    
```



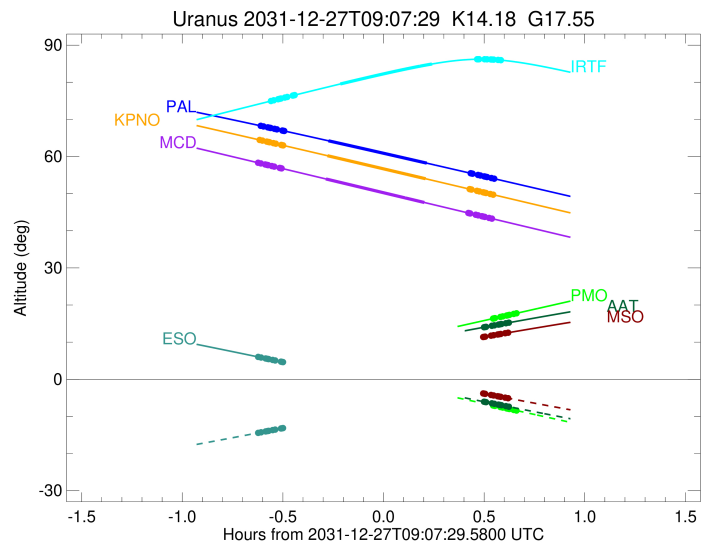
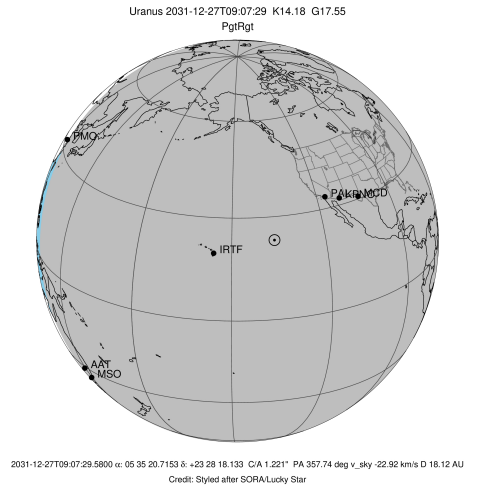
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-27T08:33:38.531		74.89	-64.41	51542.85	-22.24		
lambda	I	2031-12-27T08:34:46.859		75.15	-64.67	50026.71	-22.15		
delta	I	2031-12-27T08:36:04.979		75.44	-64.97	48300.35	-22.05		
gamma	I	2031-12-27T08:36:35.697		75.56	-65.09	47623.75	-22.00		
eta	I	2031-12-27T08:36:56.053		75.63	-65.16	47176.12	-21.98		
beta	I	2031-12-27T08:38:04.388		75.89	-65.42	45677.32	-21.87		
alpha	I	2031-12-27T08:38:46.790		76.05	-65.59	44752.38	-21.80		
4	I	2031-12-27T08:40:28.550		76.43	-65.97	42539.84	-21.60		
5	I	2031-12-27T08:40:46.324		76.49	-66.04	42164.20	-21.59		
6	I	2031-12-27T08:41:00.847		76.55	-66.10	41851.77	-21.56		
Uranus	I	2031-12-27T08:54:37.283		79.55	-69.21	25004.89		-10.20	-10.68
Uranus	E	2031-12-27T09:21:57.024		84.93	-75.41	25558.98		-0.06	-0.06
6	E	2031-12-27T09:35:25.017		86.21	-78.41	41856.35	21.57		
5	E	2031-12-27T09:35:46.201		86.21	-78.49	42311.17	21.60		
4	E	2031-12-27T09:35:58.167		86.21	-78.54	42569.49	21.61		
alpha	E	2031-12-27T09:37:36.009		86.21	-78.90	44695.23	21.81		
beta	E	2031-12-27T09:38:19.346		86.19	-79.05	45641.18	21.88		
eta	E	2031-12-27T09:39:29.318		86.15	-79.31	47176.12	21.99		
gamma	E	2031-12-27T09:39:49.724		86.13	-79.38	47625.11	22.02		
delta	E	2031-12-27T09:40:20.363		86.11	-79.49	48300.35	22.06		
lambda	E	2031-12-27T09:41:38.437		86.03	-79.78	50026.71	22.16		
epsilon	E	2031-12-27T09:42:17.684		85.98	-79.92	50897.41	22.26		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-27T09:03:44.400  
 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 : 3404548321308072192  
 2Mass ID (if available) : 05352071+2328182  
 ICRS Star Coord at Epoch: 05h 35m 20.71535s +23:28:18.13259s  
 RUWE (>1.4 is poor) : 0.00  
 K magnitude : 14.177  
 G magnitude : 17.554  
 RP magnitude : 16.415  
 BP magnitude : 18.144  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.92  
 Sun-Target sep (deg) : 169.39  
 Sun-Moon sep (deg) : 5.65  
 B (ring opening deg) : 79.67  
 PA of pole (deg) : 37.72  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.498  
 C/A sky separation (km) : 19689.1  
 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\_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	2031-12-27T08:29:49.642		6.08	-14.49	51549.27	-21.45		
lambda	I	2031-12-27T08:31:00.863		5.85	-14.29	50026.71	-21.32		
delta	I	2031-12-27T08:32:22.123		5.60	-14.05	48300.35	-21.17		
gamma	I	2031-12-27T08:32:54.149		5.50	-13.96	47623.38	-21.11		
eta	I	2031-12-27T08:33:15.362		5.43	-13.90	47176.12	-21.06		
beta	I	2031-12-27T08:34:26.797		5.21	-13.69	45676.24	-20.91		
alpha	I	2031-12-27T08:35:11.130		5.07	-13.56	44752.41	-20.80		
4	I	2031-12-27T08:36:58.139		4.73x	-13.25	42536.98	-20.52		
5	I	2031-12-27T08:37:16.583		4.67x	-13.19	42167.99	-20.49		
6	I	2031-12-27T08:37:31.856		4.62x	-13.15	41855.44	-20.44		
Uranus	I	2031-12-27T08:52:35.975		1.74x	-10.47	24992.97		-10.32	-10.80
Uranus	E	2031-12-27T09:15:31.432		-2.74x	-6.26	25541.11		-1.80	-1.88
6	E	2031-12-27T09:30:28.210		-5.71x	-3.43x	41859.23	20.36		
5	E	2031-12-27T09:30:50.370		-5.79x	-3.36x	42309.01	20.40		
4	E	2031-12-27T09:31:02.955		-5.83x	-3.32x	42566.07	20.43		
alpha	E	2031-12-27T09:32:46.477		-6.18x	-2.99x	44697.03	20.71		
beta	E	2031-12-27T09:33:31.994		-6.33x	-2.85x	45641.38	20.81		
eta	E	2031-12-27T09:34:45.462		-6.58x	-2.61x	47176.12	20.96		
gamma	E	2031-12-27T09:35:06.841		-6.65x	-2.55x	47624.78	21.01		
delta	E	2031-12-27T09:35:38.955		-6.76x	-2.44x	48300.35	21.07		
lambda	E	2031-12-27T09:37:00.618		-7.03x	-2.18x	50026.71	21.21		
epsilon	E	2031-12-27T09:37:42.510		-7.17x	-2.05x	50916.70	21.34		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-27T09:11:00.170  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 3404548321308072192  
 2Mass ID (if available) : 05352071+2328182  
 ICRS Star Coord at Epoch: 05h 35m 20.71535s +23:28:18.13259s  
 RUWE (>1.4 is poor) : 0.00  
 K magnitude : 14.177  
 G magnitude : 17.554  
 RP magnitude : 16.415  
 BP magnitude : 18.144  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.92  
 Sun-Target sep (deg) : 169.39  
 Sun-Moon sep (deg) : 4.36  
 B (ring opening deg) : 79.67  
 PA of pole (deg) : 37.72  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.523  
 C/A sky separation (km) : 20005.9  
 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

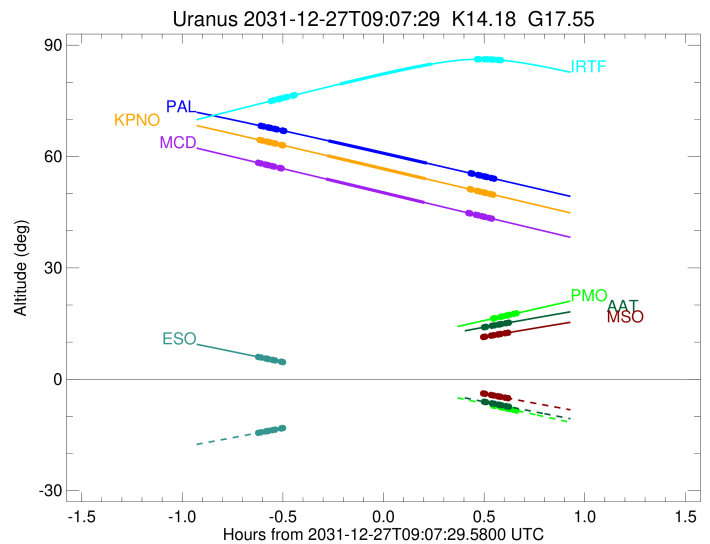
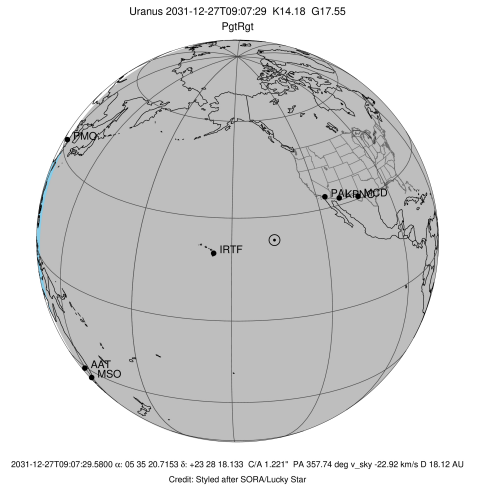


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-27T08:37:13.398		3.37x	5.33x	51548.83	-21.36		
lambda	I	2031-12-27T08:38:24.909		3.59x	5.10x	50026.71	-21.22		
delta	I	2031-12-27T08:39:46.527		3.84x	4.83x	48300.35	-21.08		
gamma	I	2031-12-27T08:40:18.696		3.94x	4.73x	47623.40	-21.01		
eta	I	2031-12-27T08:40:40.005		4.00x	4.66x	47176.12	-20.97		
beta	I	2031-12-27T08:41:51.765		4.22x	4.43x	45676.31	-20.81		
alpha	I	2031-12-27T08:42:36.310		4.36x	4.28x	44752.42	-20.71		
4	I	2031-12-27T08:44:23.838		4.69x	3.94x	42537.10	-20.41		
5	I	2031-12-27T08:44:42.388		4.75x	3.88x	42167.81	-20.38		
6	I	2031-12-27T08:44:57.742		4.80x	3.83x	41855.29	-20.34		
Uranus	I	2031-12-27T09:00:11.487		7.56	0.90x	24993.35		-10.32	-10.79
Uranus	E	2031-12-27T09:22:26.698		11.47	-3.29x	25533.86		-2.13	-2.23
6	E	2031-12-27T09:37:28.294		14.02	-6.05	41860.01	20.41		
5	E	2031-12-27T09:37:50.323		14.08	-6.12	42308.33	20.45		
4	E	2031-12-27T09:38:02.861		14.11	-6.16	42565.11	20.48		
alpha	E	2031-12-27T09:39:46.159		14.40	-6.47	44697.58	20.78		
beta	E	2031-12-27T09:40:31.496		14.53	-6.61	45641.46	20.89		
eta	E	2031-12-27T09:41:44.679		14.73	-6.83	47176.12	21.05		
gamma	E	2031-12-27T09:42:05.966		14.79	-6.89	47624.67	21.09		
delta	E	2031-12-27T09:42:37.947		14.87	-6.99	48300.35	21.16		
lambda	E	2031-12-27T09:43:59.233		15.10	-7.23	50026.71	21.31		
epsilon	E	2031-12-27T09:44:41.226		15.21	-7.36	50923.28	21.45		



```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-27T09:10:51.490
Event type           : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : MSO
Location              : Mt. Stromlo Observatory
Latitude (deg)       : -35.32000
E. Longitude (deg)   : 149.00833
Altitude (km)        : 0.770
Gaia source ID       : 3404548321308072192
2Mass ID (if available) : 05352071+2328182
ICRS Star Coord at Epoch: 05h 35m 20.71535s +23:28:18.13259s
RUWE (>1.4 is poor) : 0.00
K magnitude           : 14.177
G magnitude           : 17.554
RP magnitude          : 16.415
BP magnitude          : 18.144
DUPflag              : 0
Distance (au)        : 18.117
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -22.92
Sun-Target sep (deg) : 169.39
Sun-Moon sep (deg)   : 4.35
B (ring opening deg) : 79.67
PA of pole (deg)     : 37.72
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.545
C/A sky separation (km) : 20307.5
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl.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	2031-12-27T08:37:09.900		1.29x	7.02x	51549.31	-21.29		
lambda	I	2031-12-27T08:38:21.657		1.50x	6.80x	50026.71	-21.16		
delta	I	2031-12-27T08:39:43.551		1.74x	6.54x	48300.35	-21.00		
gamma	I	2031-12-27T08:40:15.836		1.83x	6.44x	47623.37	-20.93		
eta	I	2031-12-27T08:40:37.222		1.90x	6.37x	47176.12	-20.89		
beta	I	2031-12-27T08:41:49.263		2.11x	6.15x	45676.21	-20.73		
alpha	I	2031-12-27T08:42:33.985		2.24x	6.01x	44752.41	-20.62		
4	I	2031-12-27T08:44:22.004		2.56x	5.68x	42536.85	-20.32		
5	I	2031-12-27T08:44:40.616		2.61x	5.62x	42168.19	-20.28		
6	I	2031-12-27T08:44:56.043		2.65x	5.57x	41855.62	-20.24		
Uranus	I	2031-12-27T09:00:20.310		5.32	2.74x	24994.68		-10.30	-10.78
Uranus	E	2031-12-27T09:22:01.173		8.94	-1.16x	25529.11		-2.32	-2.43
6	E	2031-12-27T09:37:13.228		11.38	-3.83x	41860.30	20.30		
5	E	2031-12-27T09:37:35.338		11.44	-3.89x	42308.07	20.35		
4	E	2031-12-27T09:37:47.933		11.47	-3.93x	42564.75	20.38		
alpha	E	2031-12-27T09:39:31.738		11.74	-4.23x	44697.78	20.69		
beta	E	2031-12-27T09:40:17.260		11.86	-4.36x	45641.49	20.80		
eta	E	2031-12-27T09:41:30.737		12.05	-4.57x	47176.12	20.97		
gamma	E	2031-12-27T09:41:52.105		12.11	-4.63x	47624.64	21.01		
delta	E	2031-12-27T09:42:24.208		12.19	-4.72x	48300.35	21.08		
lambda	E	2031-12-27T09:43:45.785		12.40	-4.95x	50026.71	21.24		
epsilon	E	2031-12-27T09:44:28.018		12.51	-5.07	50925.38	21.38		