

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-15T05:05:48.430
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3415727468343213952
 2Mass ID (if available) : 05123553+2305167

ICRS Star Coord at Epoch: 05h 12m 35.52369s +23:05:16.80765s

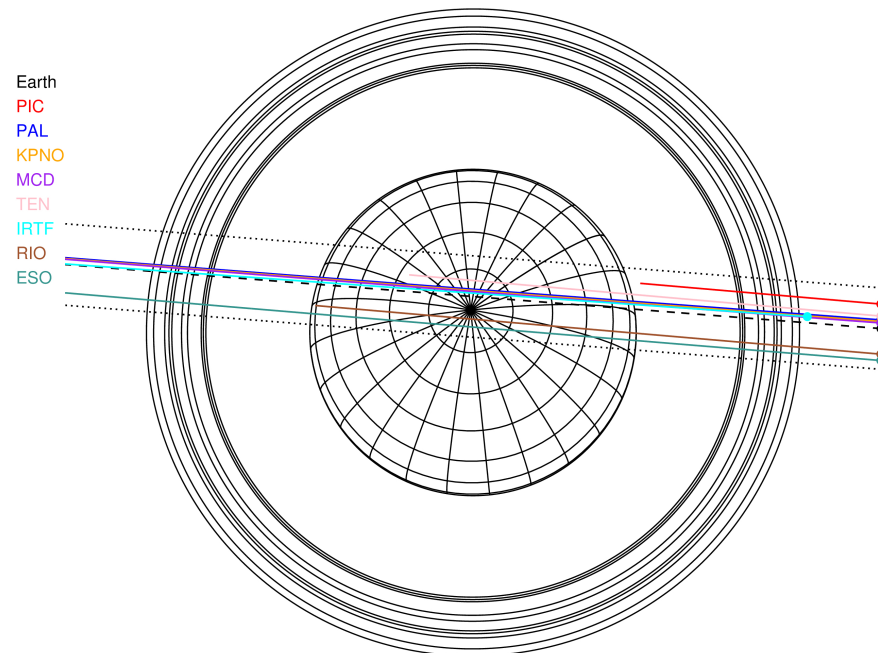
RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.762
 G magnitude : 17.236
 RP magnitude : 16.438
 BP magnitude : 17.901
 DUPflag : 0
 Distance (au) : 18.338
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.99
 Sun-Target sep (deg) : 144.71
 Sun-Moon sep (deg) : 108.97
 B (ring opening deg) : 82.05
 PA of pole (deg) : 5.85

#	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



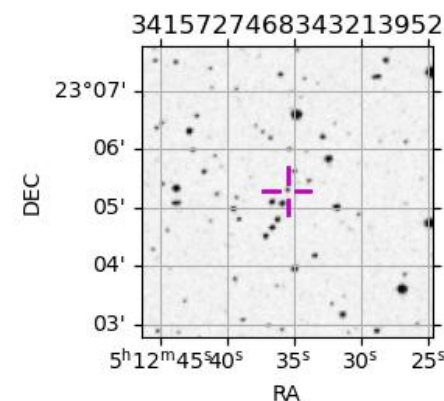
2031-01-15T05:05:48.4300 α: 05 12 35.5237 δ: +23 05 16.808 C/A 0.428° PA 175.52 deg v_sky -17.99 km/s D 18.34 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2031-01-15T05:05:48 K14.76 G17.24 PgtRgt

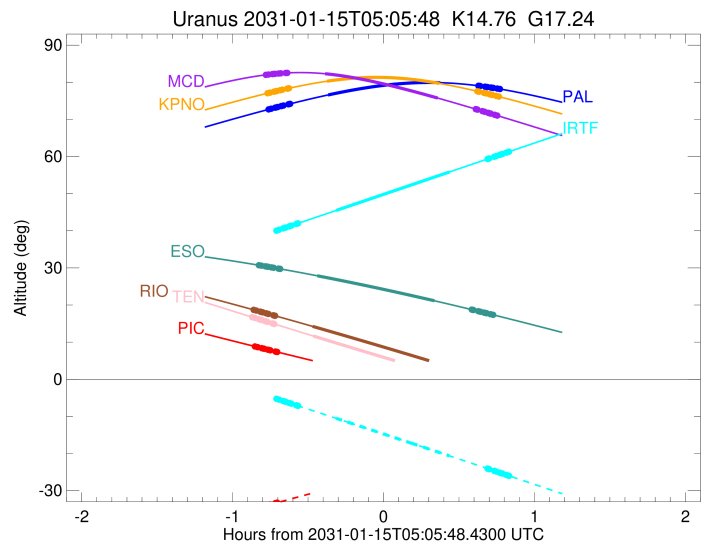
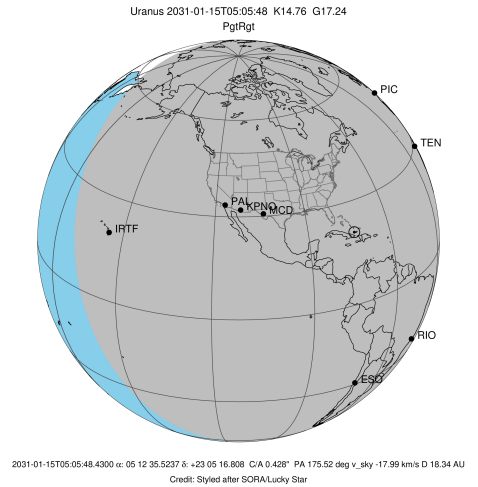


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEncode
PIC	Pic du Midi	42.9	0.1	+++++			JAN 15 04:15 - JAN 15 04:23	PnnRin
PAL	Palomar Mt (200")	33.4	243.1	+++++	+ +	+++++	JAN 15 04:20 - JAN 15 05:52	PieRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	JAN 15 04:20 - JAN 15 05:51	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	JAN 15 04:19 - JAN 15 05:51	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++	+		JAN 15 04:13 - JAN 15 04:37	PinRin
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	JAN 15 04:23 - JAN 15 05:55	PieRie
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+++++	+		JAN 15 04:14 - JAN 15 04:37	PinRin
ESO	European Southern Obs	-29.3	289.3	+++++	+ +	+++++	JAN 15 04:16 - JAN 15 05:49	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

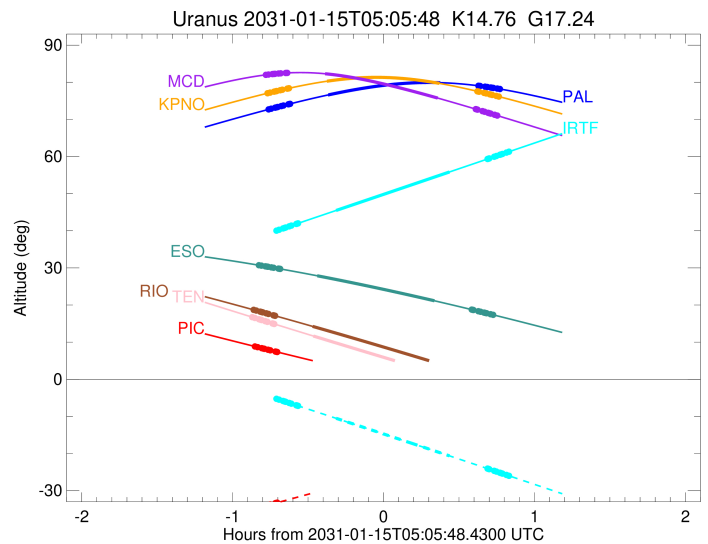
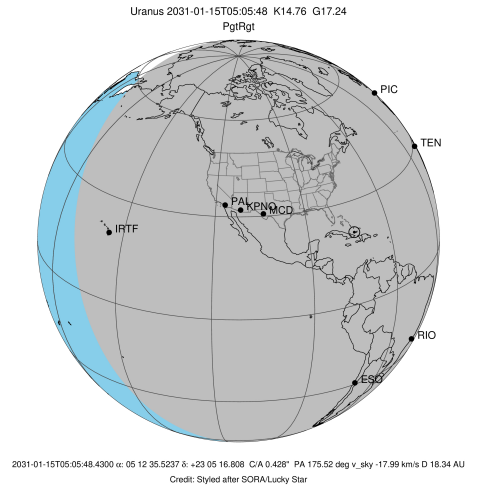


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-15T05:01:23.300
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3415727468343213952
 2Mass ID (if available) : 05123553+2305167
 ICRS Star Coord at Epoch: 05h 12m 35.52369s +23:05:16.80765s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.762
 G magnitude : 17.236
 RP magnitude : 16.438
 BP magnitude : 17.901
 DUPflag : 0
 Distance (au) : 18.338
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.99
 Sun-Target sep (deg) : 144.71
 Sun-Moon sep (deg) : 109.18
 B (ring opening deg) : 82.05
 PA of pole (deg) : 5.85
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.746
 C/A sky separation (km) : 9917.6
 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	2031-01-15T04:15:03.636		8.77	-34.80	50778.59	-17.59		
lambda	I	2031-01-15T04:15:46.375		8.65	-34.67	50026.71	-17.59		
delta	I	2031-01-15T04:17:24.622		8.38	-34.37	48300.35	-17.56		
gamma	I	2031-01-15T04:18:03.315		8.27	-34.25	47621.27	-17.54		
eta	I	2031-01-15T04:18:28.695		8.20	-34.17	47176.12	-17.54		
beta	I	2031-01-15T04:19:54.085		7.96	-33.91	45680.04	-17.51		
alpha	I	2031-01-15T04:20:48.505		7.81	-33.74	44727.96	-17.48		
4	I	2031-01-15T04:22:51.662		7.46	-33.37	42577.71	-17.43		
5	I	2031-01-15T04:23:07.491		7.42	-33.32	42302.04	-17.42		
6	I	2031-01-15T04:23:31.843		7.35	-33.25	41877.87	-17.41		
Uranus	I	2031-01-15T04:39:28.193		4.71x	-30.32	25532.97		1.66	1.74
Uranus	E	2031-01-15T05:23:11.549		-2.18x	-22.33	25377.24		4.41	4.62
6	E	2031-01-15T05:39:14.520		-4.56x	-19.43	41807.13	17.30		
5	E	2031-01-15T05:39:34.750		-4.61x	-19.37	42155.22	17.30		
4	E	2031-01-15T05:39:57.086		-4.67x	-19.30	42544.83	17.31		
alpha	E	2031-01-15T05:42:01.241		-4.97x	-18.93	44695.73	17.35		
beta	E	2031-01-15T05:42:56.020		-5.10x	-18.76	45646.99	17.37		
eta	E	2031-01-15T05:44:23.956		-5.31x	-18.50	47176.12	17.40		
gamma	E	2031-01-15T05:44:50.040		-5.37x	-18.42	47630.07	17.41		
delta	E	2031-01-15T05:45:28.534		-5.47x	-18.31	48300.35	17.42		
lambda	E	2031-01-15T05:47:07.580		-5.70x	-18.01	50026.71	17.44		
epsilon	E	2031-01-15T05:48:27.721		-5.89x	-17.77	51425.24	17.44		

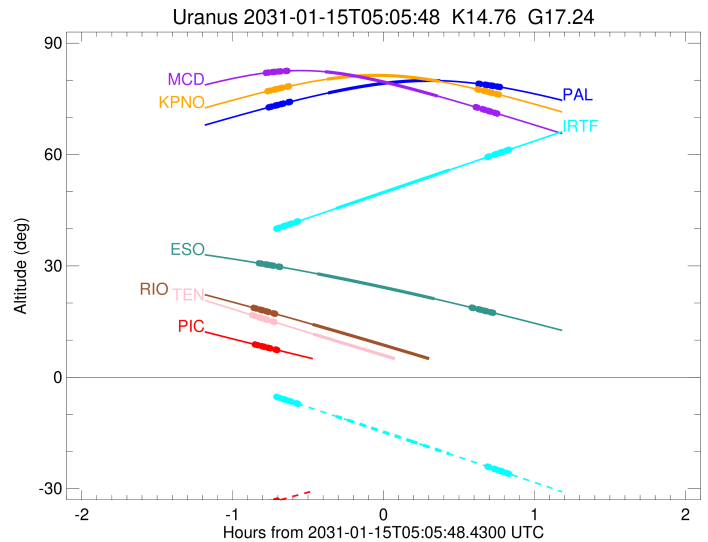
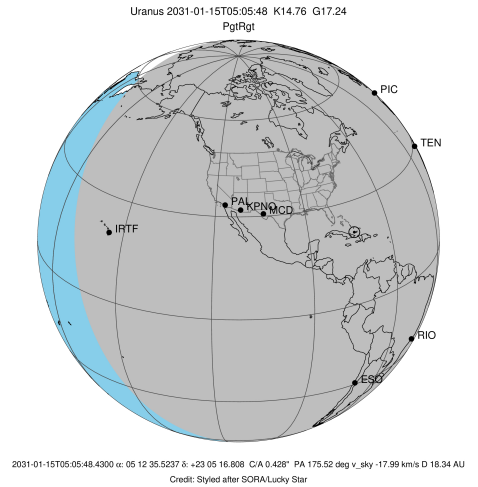
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-15T05:06:07.730
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3415727468343213952
 2Mass ID (if available) : 05123553+2305167
 ICRS Star Coord at Epoch: 05h 12m 35.52369s +23:05:16.80765s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.762
 G magnitude : 17.236
 RP magnitude : 16.438
 BP magnitude : 17.901
 DUPflag : 0
 Distance (au) : 18.338
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.99
 Sun-Target sep (deg) : 144.71
 Sun-Moon sep (deg) : 109.82
 B (ring opening deg) : 82.05
 PA of pole (deg) : 5.85
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.508
 C/A sky separation (km) : 6759.7
 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	2031-01-15T04:20:28.726		72.76	-40.99	50787.81	-18.19		
lambda	I	2031-01-15T04:21:10.546		72.89	-41.13	50026.71	-18.20		
delta	I	2031-01-15T04:22:45.452		73.17	-41.46	48300.35	-18.18		
gamma	I	2031-01-15T04:23:22.796		73.28	-41.59	47621.39	-18.18		
eta	I	2031-01-15T04:23:47.293		73.35	-41.68	47176.12	-18.17		
beta	I	2031-01-15T04:25:09.661		73.59	-41.97	45679.60	-18.16		
alpha	I	2031-01-15T04:26:01.961		73.74	-42.15	44729.97	-18.15		
4	I	2031-01-15T04:28:00.432		74.08	-42.56	42580.66	-18.13		
5	I	2031-01-15T04:28:15.643		74.12	-42.61	42304.83	-18.12		
6	I	2031-01-15T04:28:39.252		74.19	-42.70	41876.93	-18.12		
Uranus	I	2031-01-15T04:43:46.458		76.59	-45.86	25554.21		0.71	0.75
Uranus	E	2031-01-15T05:28:23.067		79.90	-55.11	25448.40		3.43	3.59
6	E	2031-01-15T05:43:29.842		79.06	-58.20	41804.65	18.12		
5	E	2031-01-15T05:43:49.309		79.03	-58.27	42156.20	18.12		
4	E	2031-01-15T05:44:10.800		79.00	-58.34	42548.06	18.13		
alpha	E	2031-01-15T05:46:09.359		78.82	-58.74	44697.85	18.15		
beta	E	2031-01-15T05:47:01.579		78.73	-58.92	45645.90	18.16		
eta	E	2031-01-15T05:48:25.805		78.59	-59.20	47176.12	18.17		
gamma	E	2031-01-15T05:48:50.797		78.55	-59.29	47630.34	18.18		
delta	E	2031-01-15T05:49:27.653		78.48	-59.41	48300.35	18.18		
lambda	E	2031-01-15T05:51:02.571		78.31	-59.73	50026.71	18.19		
epsilon	E	2031-01-15T05:52:20.557		78.16	-59.99	51445.96	18.19		

```

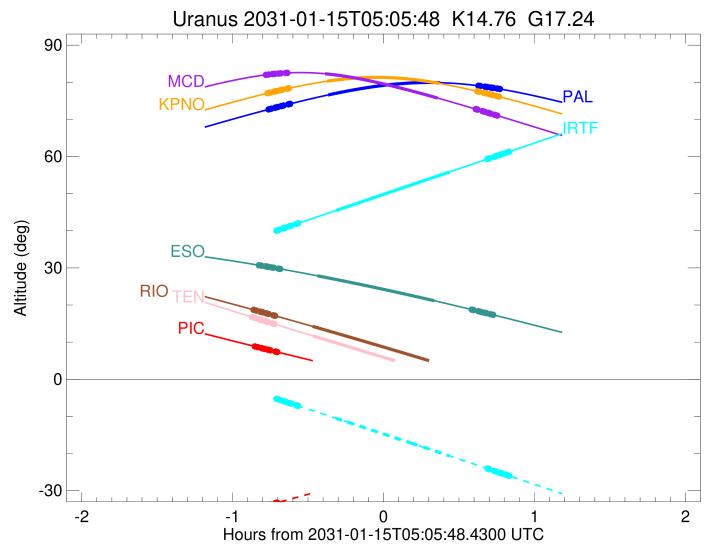
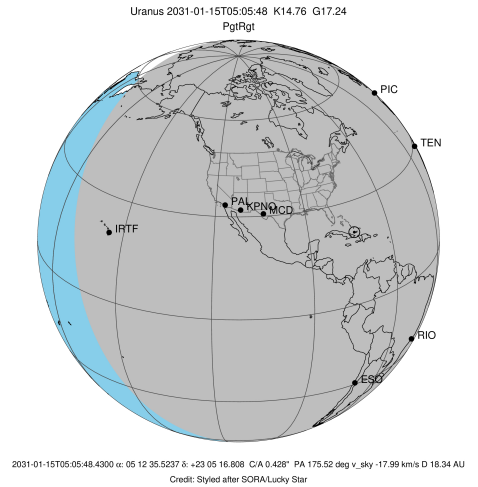
target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-01-15T05:05:41.470
Event type           : PgtRgt
: Ring occs: geocentric, topocentric
Observer code        : KPNO
Location              : Kitt Peak Natl Obs
Latitude (deg)       : 31.96333
E. Longitude (deg)   : 248.40000
Altitude (km)        : 2.120
Gaia source ID       : 3415727468343213952
2Mass ID (if available) : 05123553+2305167
ICRS Star Coord at Epoch: 05h 12m 35.52369s +23:05:16.80765s
RUWE (>1.4 is poor) : 1.02
K magnitude           : 14.762
G magnitude           : 17.236
RP magnitude          : 16.438
BP magnitude          : 17.901
DUPflag              : 0
Distance (au)        : 18.338
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -17.99
Sun-Target sep (deg) : 144.71
Sun-Moon sep (deg)   : 109.85
B (ring opening deg) : 82.05
PA of pole (deg)     : 5.85
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.494
C/A sky separation (km) : 6565.5
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_itrff93_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	2031-01-15T04:20:02.786		77.11	-45.35	50788.65	-18.22		
lambda	I	2031-01-15T04:20:44.596		77.22	-45.50	50026.71	-18.22		
delta	I	2031-01-15T04:22:19.372		77.48	-45.83	48300.35	-18.21		
gamma	I	2031-01-15T04:22:56.664		77.58	-45.96	47621.40	-18.20		
eta	I	2031-01-15T04:23:21.127		77.64	-46.05	47176.12	-18.20		
beta	I	2031-01-15T04:24:43.380		77.86	-46.34	45679.56	-18.19		
alpha	I	2031-01-15T04:25:35.594		77.99	-46.53	44730.13	-18.18		
4	I	2031-01-15T04:27:33.886		78.29	-46.94	42580.90	-18.16		
5	I	2031-01-15T04:27:49.074		78.33	-47.00	42305.04	-18.15		
6	I	2031-01-15T04:28:12.663		78.39	-47.08	41876.85	-18.15		
Uranus	I	2031-01-15T04:43:18.030		80.29	-50.28	25555.08		0.64	0.67
Uranus	E	2031-01-15T05:27:59.375		79.71	-59.66	25451.68		3.38	3.54
6	E	2031-01-15T05:43:04.671		77.58	-62.77	41804.54	18.14		
5	E	2031-01-15T05:43:24.128		77.53	-62.83	42156.26	18.14		
4	E	2031-01-15T05:43:45.607		77.47	-62.90	42548.22	18.14		
alpha	E	2031-01-15T05:45:44.062		77.15	-63.31	44697.95	18.16		
beta	E	2031-01-15T05:46:36.234		77.01	-63.48	45645.86	18.17		
eta	E	2031-01-15T05:48:00.401		76.77	-63.77	47176.12	18.19		
gamma	E	2031-01-15T05:48:25.377		76.70	-63.85	47630.35	18.19		
delta	E	2031-01-15T05:49:02.207		76.60	-63.98	48300.35	18.19		
lambda	E	2031-01-15T05:50:37.064		76.33	-64.30	50026.71	18.21		
epsilon	E	2031-01-15T05:51:55.051		76.11	-64.56	51446.82	18.20		

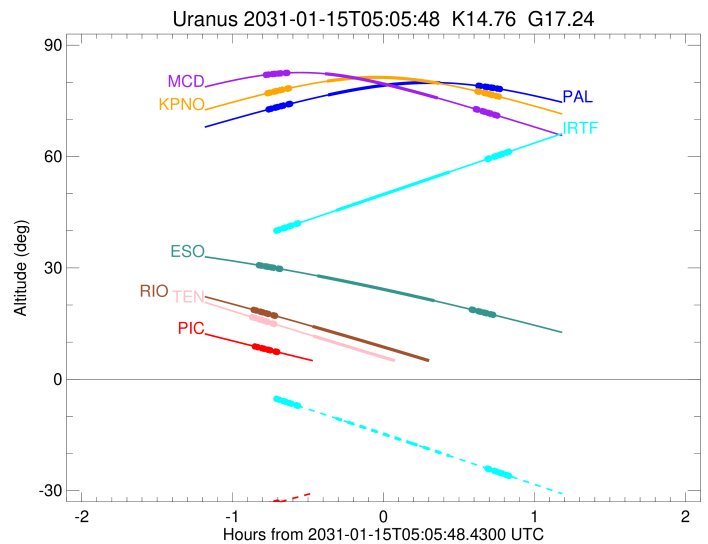
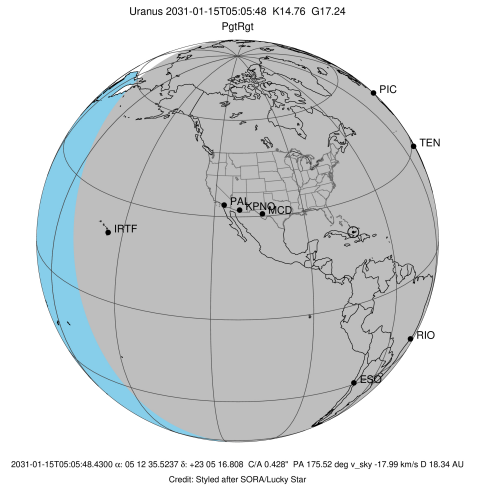
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-01-15T05:05:02.250
Event type          : PgtRgt
: 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      : 3415727468343213952
2Mass ID (if available) : 05123553+2305167
ICRS Star Coord at Epoch: 05h 12m 35.52369s +23:05:16.80765s
RUWE (>1.4 is poor) : 1.02
K magnitude          : 14.762
G magnitude          : 17.236
RP magnitude         : 16.438
BP magnitude         : 17.901
DUPflag             : 0
Distance (au)       : 18.338
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -17.99
Sun-Target sep (deg) : 144.71
Sun-Moon sep (deg)  : 109.89
B (ring opening deg) : 82.05
PA of pole (deg)    : 5.85
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.481
C/A sky separation (km) : 6392.1
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	2031-01-15T04:19:23.550		82.03	-51.75	50789.49	-18.24		
lambda	I	2031-01-15T04:20:05.358		82.09	-51.90	50026.71	-18.24		
delta	I	2031-01-15T04:21:40.021		82.21	-52.24	48300.35	-18.23		
gamma	I	2031-01-15T04:22:17.267		82.25	-52.37	47621.41	-18.23		
eta	I	2031-01-15T04:22:41.701		82.28	-52.46	47176.12	-18.22		
beta	I	2031-01-15T04:24:03.856		82.37	-52.75	45679.52	-18.21		
alpha	I	2031-01-15T04:24:55.994		82.41	-52.94	44730.29	-18.20		
4	I	2031-01-15T04:26:54.134		82.50	-53.36	42581.13	-18.18		
5	I	2031-01-15T04:27:09.302		82.51	-53.41	42305.25	-18.18		
6	I	2031-01-15T04:27:32.877		82.53	-53.50	41876.77	-18.17		
Uranus	I	2031-01-15T04:42:36.716		82.30	-56.72	25555.82		0.58	0.61
Uranus	E	2031-01-15T05:27:22.753		75.75	-66.13	25454.37		3.34	3.50
6	E	2031-01-15T05:42:27.115		72.78	-69.19	41804.45	18.14		
5	E	2031-01-15T05:42:46.570		72.72	-69.26	42156.31	18.15		
4	E	2031-01-15T05:43:08.047		72.64	-69.33	42548.34	18.15		
alpha	E	2031-01-15T05:45:06.463		72.24	-69.72	44698.03	18.17		
beta	E	2031-01-15T05:45:58.615		72.07	-69.89	45645.82	18.18		
eta	E	2031-01-15T05:47:22.767		71.78	-70.17	47176.12	18.19		
gamma	E	2031-01-15T05:47:47.739		71.70	-70.25	47630.36	18.19		
delta	E	2031-01-15T05:48:24.563		71.57	-70.37	48300.35	18.20		
lambda	E	2031-01-15T05:49:59.409		71.25	-70.68	50026.71	18.21		
epsilon	E	2031-01-15T05:51:17.426		70.98	-70.94	51447.47	18.20		

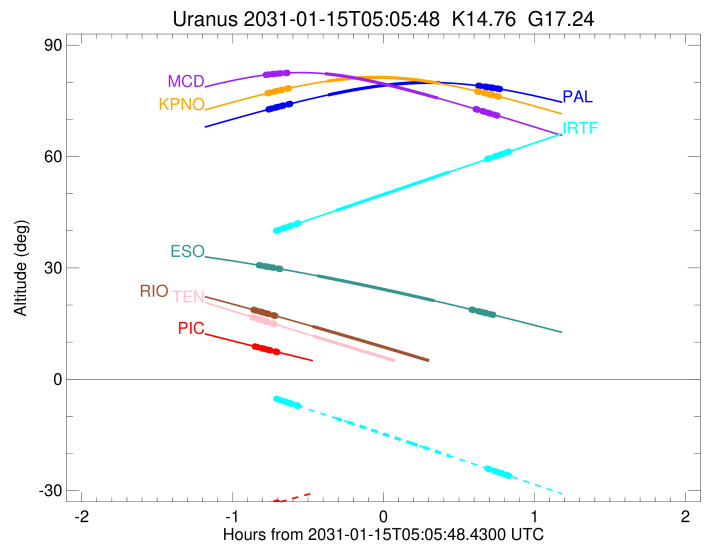
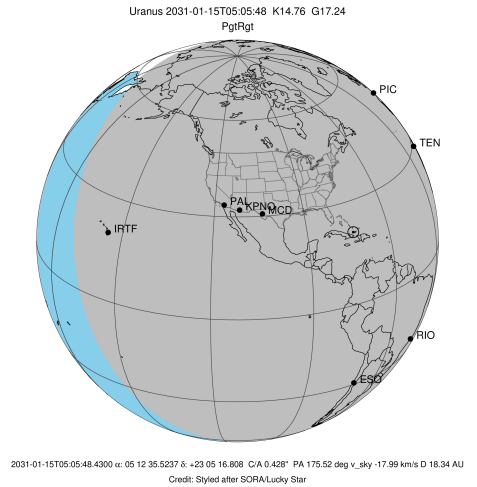
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-15T05:00:21.320
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : TEN
 Location : Teide Obs./Tenerife
 Latitude (deg) : 28.30050
 E. Longitude (deg) : 343.48909
 Altitude (km) : 2.395
 Gaia source ID : 3415727468343213952
 2Mass ID (if available) : 05123553+2305167
 ICRS Star Coord at Epoch: 05h 12m 35.52369s +23:05:16.80765s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.762
 G magnitude : 17.236
 RP magnitude : 16.438
 BP magnitude : 17.901
 DUPflag : 0
 Distance (au) : 18.338
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.99
 Sun-Target sep (deg) : 144.71
 Sun-Moon sep (deg) : 109.33
 B (ring opening deg) : 82.05
 PA of pole (deg) : 5.85
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.610
 C/A sky separation (km) : 8118.9
 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	2031-01-15T04:13:59.424		16.66	-49.01	50785.02	-17.82		
lambda	I	2031-01-15T04:14:41.974		16.51	-48.85	50026.71	-17.82		
delta	I	2031-01-15T04:16:18.924		16.17	-48.49	48300.35	-17.80		
gamma	I	2031-01-15T04:16:57.089		16.03	-48.35	47621.35	-17.79		
eta	I	2031-01-15T04:17:22.125		15.95	-48.26	47176.12	-17.78		
beta	I	2031-01-15T04:18:46.332		15.65	-47.95	45679.74	-17.76		
alpha	I	2031-01-15T04:19:39.870		15.46	-47.76	44729.35	-17.74		
4	I	2031-01-15T04:21:41.135		15.04	-47.31	42579.73	-17.70		
5	I	2031-01-15T04:21:56.711		14.98	-47.25	42303.97	-17.70		
6	I	2031-01-15T04:22:20.821		14.90	-47.16	41877.25	-17.70		
Uranus	I	2031-01-15T04:37:54.894		11.65	-43.74	25548.39		1.06	1.11
Uranus	E	2031-01-15T05:22:43.342		2.50x	-33.90	25416.12		3.90	4.09
6	E	2031-01-15T05:38:24.227		-0.61x	-30.49	41805.88	17.55		
5	E	2031-01-15T05:38:44.246		-0.68x	-30.41	42155.63	17.55		
4	E	2031-01-15T05:39:06.355		-0.75x	-30.33	42546.40	17.55		
alpha	E	2031-01-15T05:41:08.797		-1.15x	-29.89	44696.75	17.58		
beta	E	2031-01-15T05:42:02.789		-1.33x	-29.69	45646.45	17.60		
eta	E	2031-01-15T05:43:29.675		-1.62x	-29.38	47176.12	17.61		
gamma	E	2031-01-15T05:43:55.455		-1.70x	-29.28	47630.20	17.62		
delta	E	2031-01-15T05:44:33.490		-1.82x	-29.15	48300.35	17.62		
lambda	E	2031-01-15T05:46:11.411		-2.14x	-28.79	50026.71	17.64		
epsilon	E	2031-01-15T05:47:31.250		-2.40x	-28.50	51435.29	17.63		

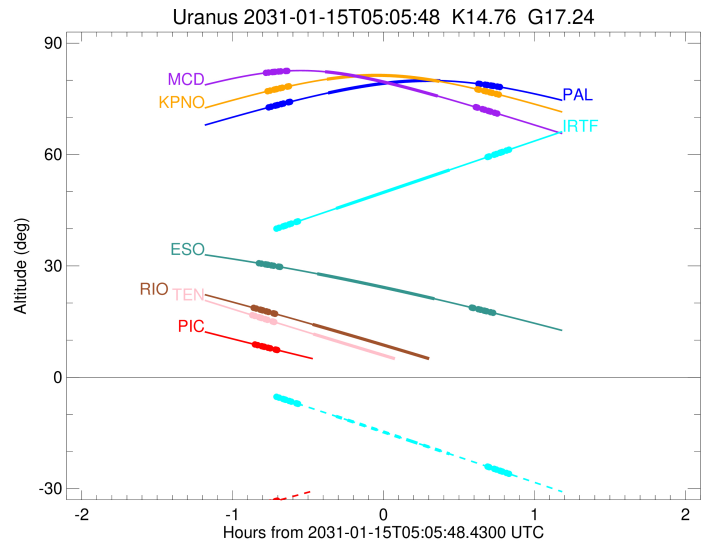
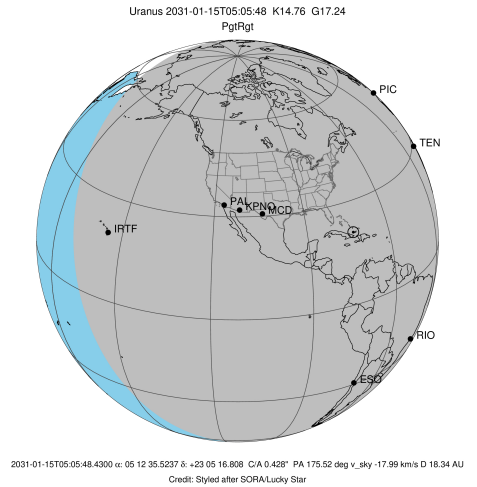
```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch              : 2031-01-15T05:09:33.900
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        : 3415727468343213952
2Mass ID (if available) : 05123553+2305167
ICRS Star Coord at Epoch: 05h 12m 35.52369s +23:05:16.80765s
RUWE (>1.4 is poor)  : 1.02
K magnitude            : 14.762
G magnitude            : 17.236
RP magnitude           : 16.438
BP magnitude           : 17.901
DUPflag               : 0
Distance (au)         : 18.338
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -17.99
Sun-Target sep (deg)  : 144.71
Sun-Moon sep (deg)    : 109.45
B (ring opening deg)  : 82.05
PA of pole (deg)      : 5.85
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.462
C/A sky separation (km) : 6146.3
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_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
    
```



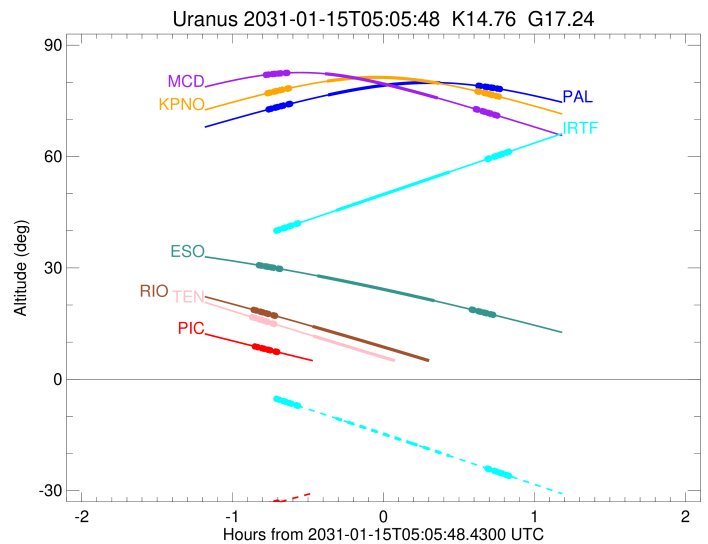
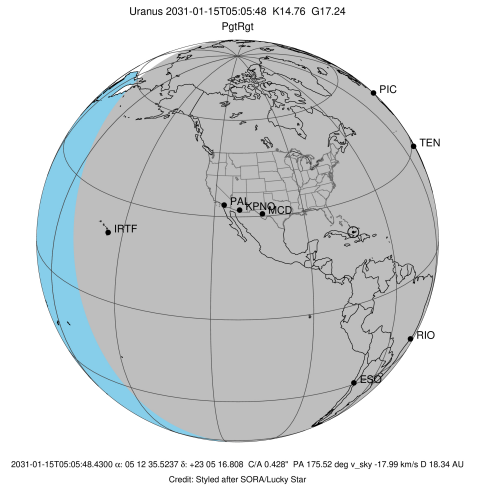
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-15T04:23:35.879		40.11	-5.34	50789.13	-18.10		
lambda	I	2031-01-15T04:24:17.987		40.27	-5.49	50026.71	-18.10		
delta	I	2031-01-15T04:25:53.363		40.64	-5.84	48300.35	-18.10		
gamma	I	2031-01-15T04:26:30.886		40.78	-5.98	47621.40	-18.09		
eta	I	2031-01-15T04:26:55.499		40.88	-6.07	47176.12	-18.09		
beta	I	2031-01-15T04:28:18.249		41.19	-6.38	45679.53	-18.08		
alpha	I	2031-01-15T04:29:10.762		41.39	-6.57	44730.25	-18.07		
4	I	2031-01-15T04:31:09.723		41.85	-7.01	42581.09	-18.06		
5	I	2031-01-15T04:31:24.994		41.90	-7.06	42305.21	-18.05		
6	I	2031-01-15T04:31:48.726		42.00	-7.15	41876.78	-18.05		
Uranus	I	2031-01-15T04:46:57.546		45.47	-10.51	25556.06		0.56	0.58
Uranus	E	2031-01-15T05:32:03.090		55.85	-20.64	25462.05		3.21	3.36
6	E	2031-01-15T05:47:07.655		59.32	-24.05	41804.10	18.14		
5	E	2031-01-15T05:47:27.147		59.40	-24.13	42156.52	18.14		
4	E	2031-01-15T05:47:48.657		59.48	-24.21	42548.85	18.14		
alpha	E	2031-01-15T05:49:47.113		59.94	-24.66	44698.38	18.16		
beta	E	2031-01-15T05:50:39.256		60.14	-24.86	45645.65	18.17		
eta	E	2031-01-15T05:52:03.444		60.46	-25.18	47176.12	18.18		
gamma	E	2031-01-15T05:52:28.425		60.56	-25.27	47630.41	18.19		
delta	E	2031-01-15T05:53:05.256		60.70	-25.41	48300.35	18.19		
lambda	E	2031-01-15T05:54:40.120		61.06	-25.77	50026.71	18.20		
epsilon	E	2031-01-15T05:55:58.331		61.36	-26.07	51450.85	18.20		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-15T05:00:58.710
 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 : 3415727468343213952
 2Mass ID (if available) : 05123553+2305167
 ICRS Star Coord at Epoch: 05h 12m 35.52369s +23:05:16.80765s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.762
 G magnitude : 17.236
 RP magnitude : 16.438
 BP magnitude : 17.901
 DUPflag : 0
 Distance (au) : 18.338
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.99
 Sun-Target sep (deg) : 144.71
 Sun-Moon sep (deg) : 109.37
 B (ring opening deg) : 82.05
 PA of pole (deg) : 5.85
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.156
 C/A sky separation (km) : 2074.7
 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	2031-01-15T04:14:31.344		18.64	-42.67	50808.72	-18.23		
lambda	I	2031-01-15T04:15:14.239		18.51	-42.60	50026.71	-18.23		
delta	I	2031-01-15T04:16:48.950		18.21	-42.46	48300.35	-18.23		
gamma	I	2031-01-15T04:17:26.191		18.10	-42.40	47621.65	-18.22		
eta	I	2031-01-15T04:17:50.639		18.02	-42.36	47176.12	-18.22		
beta	I	2031-01-15T04:19:12.826		17.76	-42.23	45678.57	-18.22		
alpha	I	2031-01-15T04:20:04.701		17.60	-42.15	44733.60	-18.22		
4	I	2031-01-15T04:22:02.630		17.23	-41.96	42585.99	-18.21		
5	I	2031-01-15T04:22:17.790		17.18	-41.93	42309.15	-18.21		
6	I	2031-01-15T04:22:41.661		17.11	-41.89	41874.75	-18.21		
Uranus	I	2031-01-15T04:37:38.070		14.24	-40.30	25552.25		-0.84	-0.88
Uranus	E	2031-01-15T05:24:20.859		4.92x	-34.06	25516.80		2.11	2.21
6	E	2031-01-15T05:39:20.234		1.83x	-31.73	41801.99	18.06		
5	E	2031-01-15T05:39:39.988		1.76x	-31.68	42158.14	18.06		
4	E	2031-01-15T05:40:01.721		1.68x	-31.62	42552.15	18.06		
alpha	E	2031-01-15T05:42:00.704		1.27x	-31.30	44700.54	18.06		
beta	E	2031-01-15T05:42:52.990		1.09x	-31.16	45644.74	18.06		
eta	E	2031-01-15T05:44:17.787		0.80x	-30.93	47176.12	18.06		
gamma	E	2031-01-15T05:44:42.957		0.71x	-30.86	47630.63	18.06		
delta	E	2031-01-15T05:45:20.046		0.58x	-30.76	48300.35	18.06		
lambda	E	2031-01-15T05:46:55.659		0.25x	-30.50	50026.71	18.05		
epsilon	E	2031-01-15T05:48:15.486		-0.03x	-30.28	51467.92	18.05		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-15T05:02:45.210
 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 : 3415727468343213952
 2Mass ID (if available) : 05123553+2305167
 ICRS Star Coord at Epoch: 05h 12m 35.52369s +23:05:16.80765s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.762
 G magnitude : 17.236
 RP magnitude : 16.438
 BP magnitude : 17.901
 DUPflag : 0
 Distance (au) : 18.338
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.99
 Sun-Target sep (deg) : 144.71
 Sun-Moon sep (deg) : 109.52
 B (ring opening deg) : 82.05
 PA of pole (deg) : 5.85
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.063
 C/A sky separation (km) : 844.5
 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_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	2031-01-15T04:16:34.974		30.69	-39.02	50813.34	-18.35		
lambda	I	2031-01-15T04:17:17.832		30.60	-39.05	50026.71	-18.35		
delta	I	2031-01-15T04:18:51.900		30.42	-39.11	48300.35	-18.35		
gamma	I	2031-01-15T04:19:28.881		30.35	-39.13	47621.71	-18.35		
eta	I	2031-01-15T04:19:53.164		30.30	-39.15	47176.12	-18.35		
beta	I	2031-01-15T04:21:14.789		30.14	-39.20	45678.33	-18.35		
alpha	I	2031-01-15T04:22:06.243		30.04	-39.23	44734.33	-18.35		
4	I	2031-01-15T04:24:03.307		29.81	-39.29	42587.08	-18.34		
5	I	2031-01-15T04:24:18.365		29.78	-39.30	42309.92	-18.34		
6	I	2031-01-15T04:24:42.136		29.73	-39.31	41874.21	-18.34		
Uranus	I	2031-01-15T04:39:31.303		27.87	-39.65	25545.48		-1.20	-1.25
Uranus	E	2031-01-15T05:26:00.682		21.15	-39.09	25531.15		1.72	1.80
6	E	2031-01-15T05:40:50.253		18.77	-38.40	41801.23	18.24		
5	E	2031-01-15T05:41:09.888		18.72	-38.38	42158.93	18.24		
4	E	2031-01-15T05:41:31.449		18.66	-38.36	42553.49	18.24		
alpha	E	2031-01-15T05:43:29.230		18.34	-38.25	44701.44	18.24		
beta	E	2031-01-15T05:44:20.933		18.19	-38.20	45644.39	18.24		
eta	E	2031-01-15T05:45:44.917		17.96	-38.12	47176.12	18.24		
gamma	E	2031-01-15T05:46:09.845		17.89	-38.10	47630.72	18.24		
delta	E	2031-01-15T05:46:46.565		17.79	-38.06	48300.35	18.24		
lambda	E	2031-01-15T05:48:21.241		17.53	-37.96	50026.71	18.23		
epsilon	E	2031-01-15T05:49:40.659		17.31	-37.88	51474.73	18.23		