

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-19T04:37:10.090
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3404586421959360768
 2Mass ID (if available) : 05365159+2329056

ICRS Star Coord at Epoch: 05h 36m 51.59658s +23:29:05.48015s

RUWE (>1.4 is poor) : 1.01
 K magnitude : 14.689
 G magnitude : 18.511
 RP magnitude : 17.409
 BP magnitude : 19.771
 DUPflag : 0
 Distance (au) : 18.103
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.43
 Sun-Target sep (deg) : 178.07
 Sun-Moon sep (deg) : 111.47
 B (ring opening deg) : 79.45
 PA of pole (deg) : 39.30

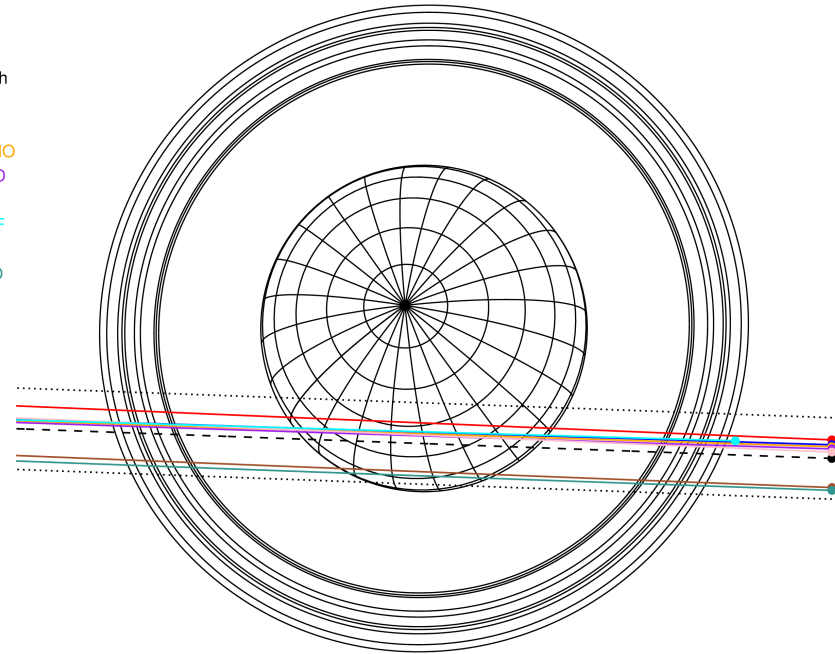
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2031-12-19T04:37:10.0900 ra: 05 36 51.5966 s: +23 29 05.480 C/A 1.365° PA 357.91 deg v_sky -23.43 km/s D 18.10 AU
 Credit: Styled after SORA/Lucky Star

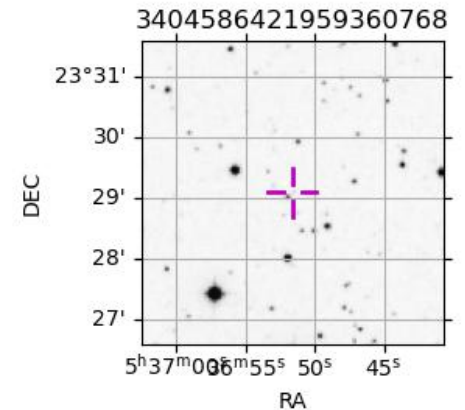
Uranus 2031-12-19T04:37:10 K14.69 G18.51 PgtRgt

Earth
 PIC
 PAL
 KPNO
 MCD
 TEN
 IRTF
 RIO
 ESO



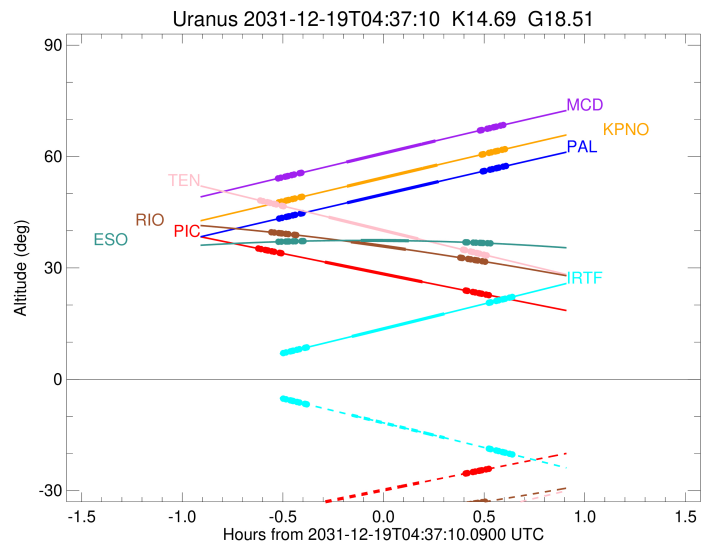
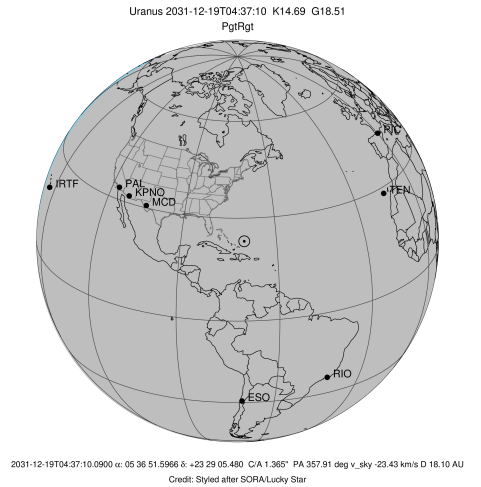
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++	+ +	+++++	DEC 19 03:59 - DEC 19 05:08	PieRie
PAL	Palomar Mt (200")	33.4	243.1	+++++	+ +	+++++	DEC 19 04:05 - DEC 19 05:13	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	DEC 19 04:05 - DEC 19 05:13	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	DEC 19 04:05 - DEC 19 05:12	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++	+ +	+++++	DEC 19 04:00 - DEC 19 05:07	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	DEC 19 04:07 - DEC 19 05:15	PieRie
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+++++	+ +	+++++	DEC 19 04:03 - DEC 19 05:07	PieRie
ESO	European Southern Obs	-29.3	289.3	+++++	+ +	+++++	DEC 19 04:05 - DEC 19 05:08	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



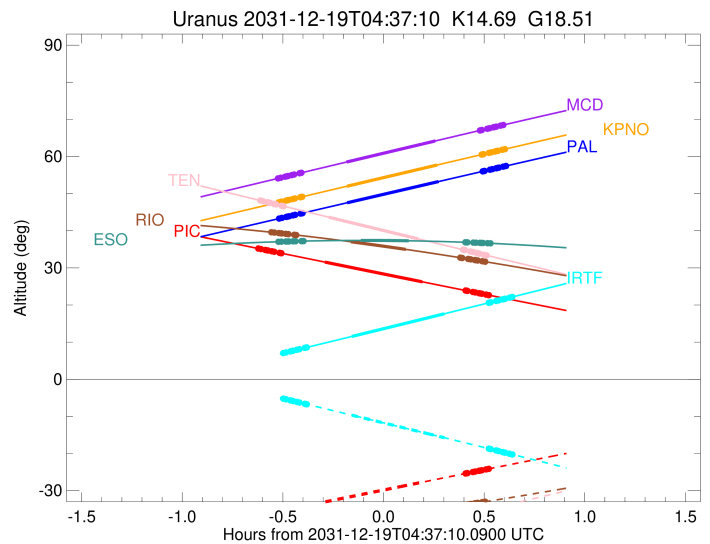
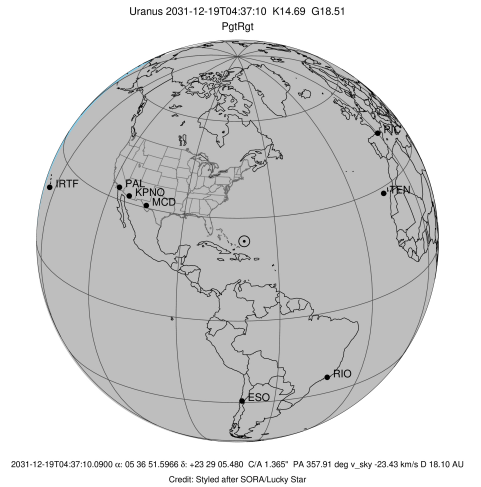
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-19T04:33:59.390
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       : 3404586421959360768
2Mass ID (if available) : 05365159+2329056
ICRS Star Coord at Epoch: 05h 36m 51.59658s +23:29:05.48015s
RUWE (>1.4 is poor) : 1.01
K magnitude          : 14.689
G magnitude          : 18.511
RP magnitude         : 17.409
BP magnitude         : 19.771
DUPflag             : 0
Distance (au)        : 18.103
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -23.43
Sun-Target sep (deg) : 178.07
Sun-Moon sep (deg)   : 111.67
B (ring opening deg) : 79.45
PA of pole (deg)     : 39.30
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.126
C/A sky separation (km) : 14783.9
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall11.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	2031-12-19T03:59:34.383		35.27	-36.73	51510.66	-22.77		
lambda	I	2031-12-19T04:00:39.725		35.07	-36.53	50026.71	-22.68		
delta	I	2031-12-19T04:01:55.988		34.83	-36.29	48300.35	-22.59		
gamma	I	2031-12-19T04:02:25.894		34.74	-36.20	47625.15	-22.56		
eta	I	2031-12-19T04:02:45.809		34.68	-36.14	47176.12	-22.54		
beta	I	2031-12-19T04:03:52.281		34.48	-35.94	45680.27	-22.45		
alpha	I	2031-12-19T04:04:33.801		34.35	-35.81	44749.75	-22.39		
4	I	2031-12-19T04:06:11.962		34.05	-35.51	42555.42	-22.23		
5	I	2031-12-19T04:06:30.430		33.99	-35.46	42155.02	-22.21		
6	I	2031-12-19T04:06:44.792		33.95	-35.41	41833.67	-22.20		
Uranus	I	2031-12-19T04:19:42.472		31.56	-33.03	25016.93		-10.32	-10.80
Uranus	E	2031-12-19T04:48:45.077		26.25	-27.72	25551.86		1.16	1.21
6	E	2031-12-19T05:01:39.629		23.91	-25.38	41868.03	22.12		
5	E	2031-12-19T05:01:59.167		23.85	-25.32	42298.78	22.14		
4	E	2031-12-19T05:02:10.841		23.81	-25.29	42555.29	22.16		
alpha	E	2031-12-19T05:03:47.323		23.52	-24.99	44702.48	22.32		
beta	E	2031-12-19T05:04:29.426		23.40	-24.87	45642.30	22.37		
eta	E	2031-12-19T05:05:37.859		23.19	-24.66	47176.12	22.45		
gamma	E	2031-12-19T05:05:57.801		23.13	-24.60	47624.08	22.47		
delta	E	2031-12-19T05:06:27.868		23.04	-24.51	48300.35	22.51		
lambda	E	2031-12-19T05:07:44.431		22.81	-24.28	50026.71	22.59		
epsilon	E	2031-12-19T05:08:25.202		22.69	-24.16	50948.41	22.67		

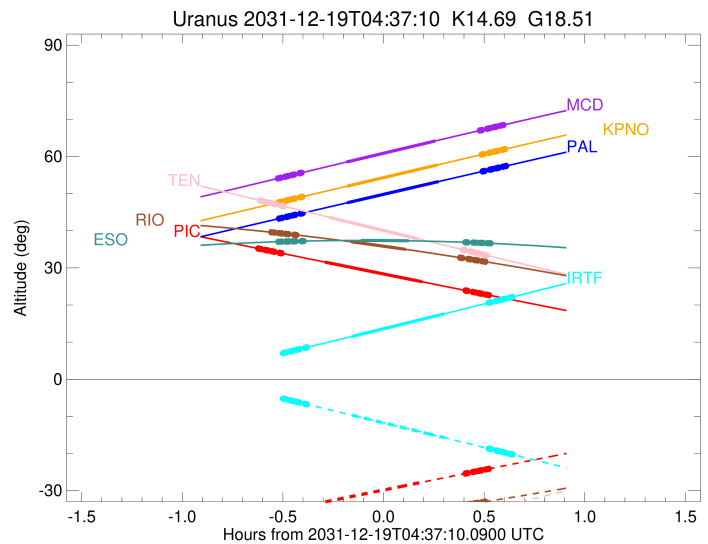
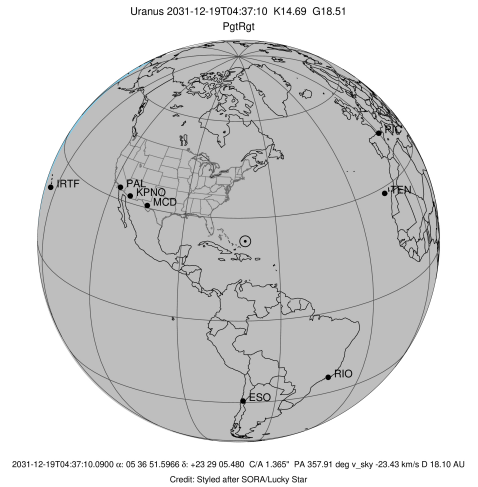
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-19T04:39:42.510
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3404586421959360768
 2Mass ID (if available) : 05365159+2329056
 ICRS Star Coord at Epoch: 05h 36m 51.59658s +23:29:05.48015s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 14.689
 G magnitude : 18.511
 RP magnitude : 17.409
 BP magnitude : 19.771
 DUPflag : 0
 Distance (au) : 18.103
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.43
 Sun-Target sep (deg) : 178.07
 Sun-Moon sep (deg) : 112.40
 B (ring opening deg) : 79.45
 PA of pole (deg) : 39.30
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.235
 C/A sky separation (km) : 16219.2
 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	2031-12-19T04:05:47.640		43.24	-41.47	51514.19	-22.62		
lambda	I	2031-12-19T04:06:53.585		43.47	-41.70	50026.71	-22.52		
delta	I	2031-12-19T04:08:10.414		43.74	-41.96	48300.35	-22.42		
gamma	I	2031-12-19T04:08:40.562		43.84	-42.07	47625.04	-22.38		
eta	I	2031-12-19T04:09:00.635		43.91	-42.14	47176.12	-22.35		
beta	I	2031-12-19T04:10:07.688		44.15	-42.37	45680.12	-22.25		
alpha	I	2031-12-19T04:10:49.570		44.29	-42.52	44750.07	-22.18		
4	I	2031-12-19T04:12:28.798		44.64	-42.86	42554.30	-21.99		
5	I	2031-12-19T04:12:47.422		44.70	-42.93	42155.19	-21.97		
6	I	2031-12-19T04:13:01.891		44.75	-42.98	41834.83	-21.95		
Uranus	I	2031-12-19T04:26:19.353		47.54	-45.76	25004.76		-10.44	-10.92
Uranus	E	2031-12-19T04:53:35.570		53.26	-51.46	25558.48		0.32	0.33
6	E	2031-12-19T05:06:45.805		56.01	-54.20	41869.38	22.00		
5	E	2031-12-19T05:07:05.274		56.08	-54.27	42296.42	22.03		
4	E	2031-12-19T05:07:17.006		56.12	-54.31	42553.32	22.05		
alpha	E	2031-12-19T05:08:54.027		56.45	-54.65	44703.82	22.25		
beta	E	2031-12-19T05:09:36.197		56.60	-54.80	45642.62	22.31		
eta	E	2031-12-19T05:10:44.748		56.84	-55.03	47176.12	22.42		
gamma	E	2031-12-19T05:11:04.707		56.91	-55.10	47623.88	22.45		
delta	E	2031-12-19T05:11:34.812		57.01	-55.21	48300.35	22.49		
lambda	E	2031-12-19T05:12:51.394		57.28	-55.47	50026.71	22.59		
epsilon	E	2031-12-19T05:13:32.772		57.42	-55.62	50962.58	22.70		

```

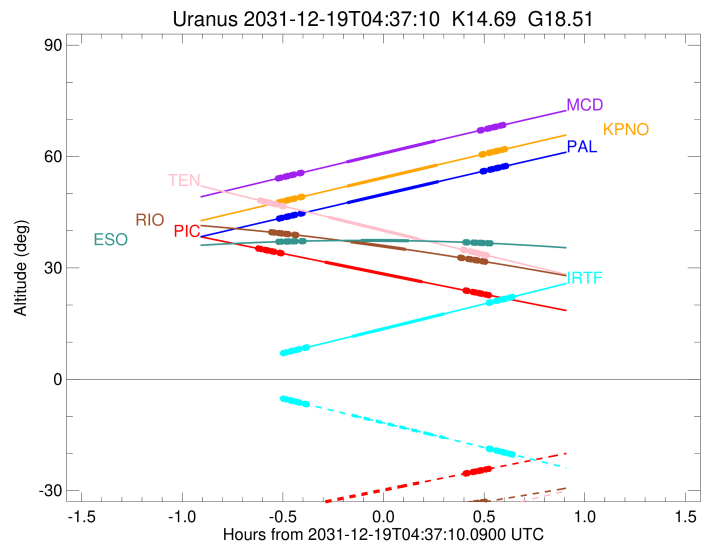
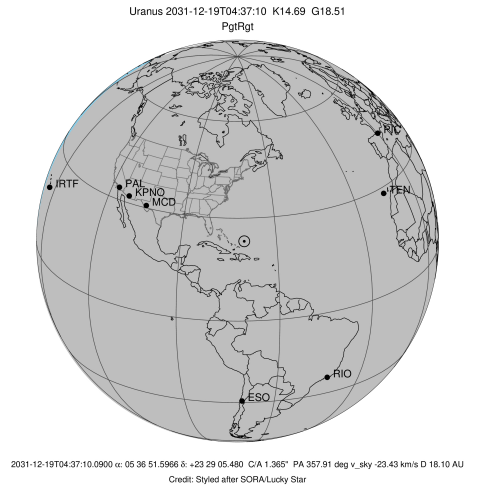
target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-19T04:39:29.810
Event type          : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code       : KPNO
Location            : Kitt Peak Natl Obs
Latitude (deg)      : 31.96333
E. Longitude (deg)  : 248.40000
Altitude (km)       : 2.120
Gaia source ID      : 3404586421959360768
2Mass ID (if available) : 05365159+2329056
ICRS Star Coord at Epoch: 05h 36m 51.59658s +23:29:05.48015s
RUWE (>1.4 is poor) : 1.01
K magnitude          : 14.689
G magnitude          : 18.511
RP magnitude         : 17.409
BP magnitude         : 19.771
DUPflag             : 0
Distance (au)       : 18.103
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -23.43
Sun-Target sep (deg) : 178.07
Sun-Moon sep (deg)  : 112.43
B (ring opening deg) : 79.45
PA of pole (deg)    : 39.30
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.257
C/A sky separation (km) : 16502.4
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall11.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	2031-12-19T04:05:41.704		47.62	-45.82	51515.29	-22.61		
lambda	I	2031-12-19T04:06:47.746		47.85	-46.05	50026.71	-22.50		
delta	I	2031-12-19T04:08:04.643		48.12	-46.33	48300.35	-22.40		
gamma	I	2031-12-19T04:08:34.823		48.23	-46.43	47625.00	-22.35		
eta	I	2031-12-19T04:08:54.916		48.30	-46.50	47176.12	-22.33		
beta	I	2031-12-19T04:10:02.051		48.54	-46.74	45680.07	-22.22		
alpha	I	2031-12-19T04:10:43.984		48.69	-46.89	44750.15	-22.15		
4	I	2031-12-19T04:12:23.389		49.04	-47.24	42553.98	-21.95		
5	I	2031-12-19T04:12:42.032		49.11	-47.31	42155.26	-21.93		
6	I	2031-12-19T04:12:56.512		49.16	-47.36	41835.16	-21.90		
Uranus	I	2031-12-19T04:26:18.086		52.01	-50.20	25002.43		-10.46	-10.95
Uranus	E	2031-12-19T04:53:11.994		57.72	-55.90	25558.86		0.17	0.18
6	E	2031-12-19T05:06:26.356		60.52	-58.70	41869.57	21.96		
5	E	2031-12-19T05:06:45.840		60.59	-58.77	42296.06	21.98		
4	E	2031-12-19T05:06:57.596		60.63	-58.81	42553.04	22.01		
alpha	E	2031-12-19T05:08:34.819		60.98	-59.15	44704.02	22.21		
beta	E	2031-12-19T05:09:17.051		61.12	-59.30	45642.67	22.28		
eta	E	2031-12-19T05:10:25.700		61.37	-59.54	47176.12	22.39		
gamma	E	2031-12-19T05:10:45.684		61.44	-59.61	47623.85	22.42		
delta	E	2031-12-19T05:11:15.829		61.54	-59.72	48300.35	22.46		
lambda	E	2031-12-19T05:12:32.501		61.81	-59.99	50026.71	22.57		
epsilon	E	2031-12-19T05:13:14.010		61.96	-60.13	50964.56	22.68		

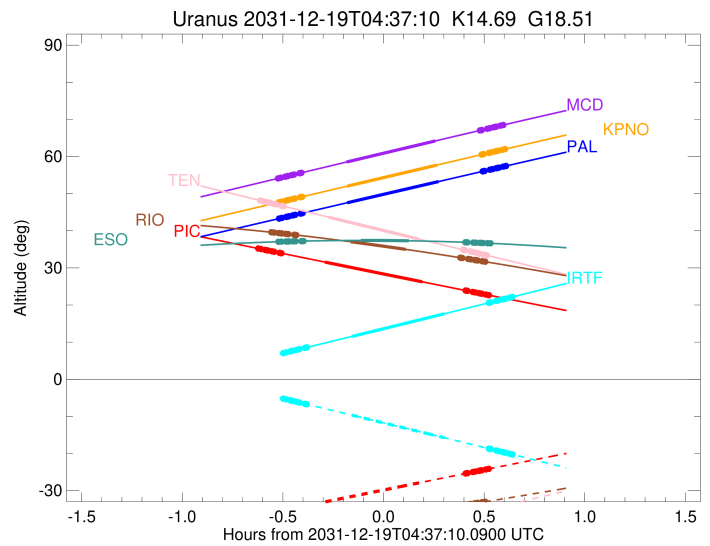
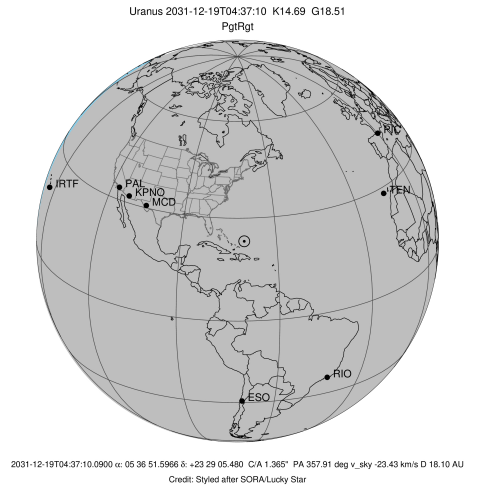
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-19T04:39:07.570
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       : 3404586421959360768
2Mass ID (if available) : 05365159+2329056
ICRS Star Coord at Epoch: 05h 36m 51.59658s +23:29:05.48015s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 14.689
G magnitude           : 18.511
RP magnitude          : 17.409
BP magnitude          : 19.771
DUPflag              : 0
Distance (au)         : 18.103
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -23.43
Sun-Target sep (deg) : 178.07
Sun-Moon sep (deg)   : 112.45
B (ring opening deg) : 79.45
PA of pole (deg)     : 39.30
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.281
C/A sky separation (km) : 16819.7
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall11.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	2031-12-19T04:05:27.456		54.06	-52.24	51516.54	-22.59		
lambda	I	2031-12-19T04:06:33.597		54.29	-52.48	50026.71	-22.48		
delta	I	2031-12-19T04:07:50.560		54.57	-52.75	48300.35	-22.38		
gamma	I	2031-12-19T04:08:20.772		54.68	-52.86	47624.96	-22.33		
eta	I	2031-12-19T04:08:40.885		54.75	-52.93	47176.12	-22.30		
beta	I	2031-12-19T04:09:48.105		54.99	-53.17	45680.02	-22.19		
alpha	I	2031-12-19T04:10:30.089		55.14	-53.32	44750.26	-22.12		
4	I	2031-12-19T04:12:09.682		55.50	-53.68	42553.61	-21.91		
5	I	2031-12-19T04:12:28.344		55.57	-53.75	42155.33	-21.88		
6	I	2031-12-19T04:12:42.834		55.62	-53.80	41835.53	-21.86		
Uranus	I	2031-12-19T04:26:09.109		58.52	-56.69	25000.05		-10.48	-10.97
Uranus	E	2031-12-19T04:52:37.149		64.20	-62.36	25559.00		0.00	0.00
6	E	2031-12-19T05:05:56.308		67.03	-65.20	41869.79	21.90		
5	E	2031-12-19T05:06:15.810		67.10	-65.27	42295.66	21.93		
4	E	2031-12-19T05:06:27.594		67.14	-65.31	42552.72	21.95		
alpha	E	2031-12-19T05:08:05.046		67.48	-65.65	44704.24	22.17		
beta	E	2031-12-19T05:08:47.348		67.63	-65.80	45642.73	22.24		
eta	E	2031-12-19T05:09:56.109		67.87	-66.04	47176.12	22.35		
gamma	E	2031-12-19T05:10:16.122		67.94	-66.11	47623.82	22.38		
delta	E	2031-12-19T05:10:46.313		68.05	-66.22	48300.35	22.43		
lambda	E	2031-12-19T05:12:03.085		68.32	-66.49	50026.71	22.54		
epsilon	E	2031-12-19T05:12:44.739		68.46	-66.64	50966.72	22.65		

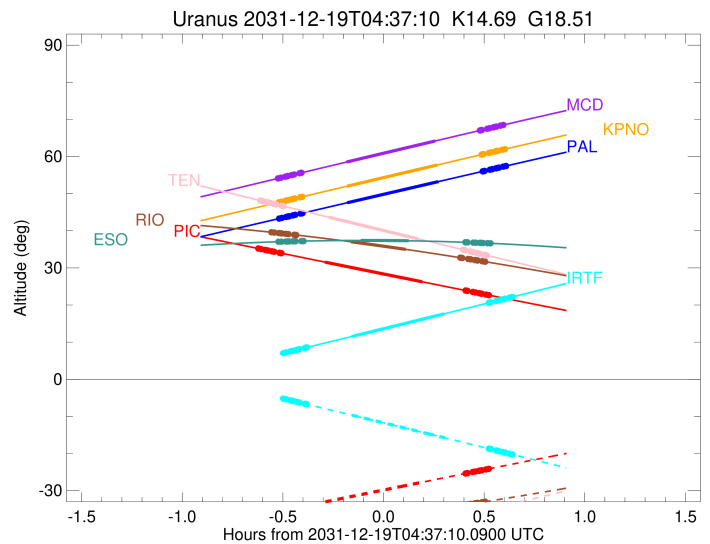
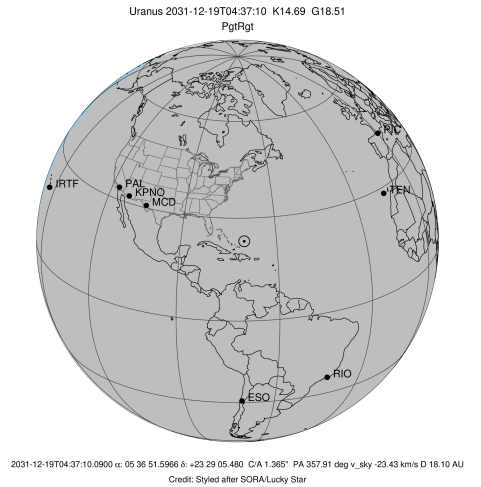
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-19T04:33:55.640
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : TEN
 Location : Teide Obs./Tenerife
 Latitude (deg) : 28.30050
 E. Longitude (deg) : 343.48909
 Altitude (km) : 2.395
 Gaia source ID : 3404586421959360768
 2Mass ID (if available) : 05365159+2329056
 ICRS Star Coord at Epoch: 05h 36m 51.59658s +23:29:05.48015s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 14.689
 G magnitude : 18.511
 RP magnitude : 17.409
 BP magnitude : 19.771
 DUPflag : 0
 Distance (au) : 18.103
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.43
 Sun-Target sep (deg) : 178.07
 Sun-Moon sep (deg) : 111.80
 B (ring opening deg) : 79.45
 PA of pole (deg) : 39.30
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.272
 C/A sky separation (km) : 16695.9
 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	2031-12-19T04:00:08.968		48.21	-50.00	51517.69	-22.60		
lambda	I	2031-12-19T04:01:15.140		47.97	-49.76	50026.71	-22.49		
delta	I	2031-12-19T04:02:32.083		47.69	-49.48	48300.35	-22.38		
gamma	I	2031-12-19T04:03:02.290		47.58	-49.37	47624.93	-22.34		
eta	I	2031-12-19T04:03:22.397		47.50	-49.30	47176.12	-22.31		
beta	I	2031-12-19T04:04:29.605		47.26	-49.05	45679.97	-22.19		
alpha	I	2031-12-19T04:05:11.576		47.10	-48.90	44750.33	-22.12		
4	I	2031-12-19T04:06:51.167		46.74	-48.53	42553.37	-21.91		
5	I	2031-12-19T04:07:09.815		46.67	-48.46	42155.39	-21.89		
6	I	2031-12-19T04:07:24.291		46.62	-48.41	41835.78	-21.86		
Uranus	I	2031-12-19T04:20:49.751		43.66	-45.46	24999.73		-10.49	-10.97
Uranus	E	2031-12-19T04:47:33.653		37.81	-39.61	25558.86		0.17	0.17
6	E	2031-12-19T05:00:55.277		34.90	-36.70	41869.45	21.79		
5	E	2031-12-19T05:01:14.927		34.83	-36.63	42296.30	21.82		
4	E	2031-12-19T05:01:26.772		34.78	-36.59	42553.24	21.84		
alpha	E	2031-12-19T05:03:04.711		34.43	-36.24	44703.87	22.05		
beta	E	2031-12-19T05:03:47.265		34.27	-36.08	45642.63	22.11		
eta	E	2031-12-19T05:04:56.430		34.02	-35.83	47176.12	22.22		
gamma	E	2031-12-19T05:05:16.565		33.95	-35.76	47623.88	22.25		
delta	E	2031-12-19T05:05:46.935		33.84	-35.65	48300.35	22.30		
lambda	E	2031-12-19T05:07:04.180		33.56	-35.37	50026.71	22.40		
epsilon	E	2031-12-19T05:07:45.909		33.41	-35.22	50962.49	22.51		

```

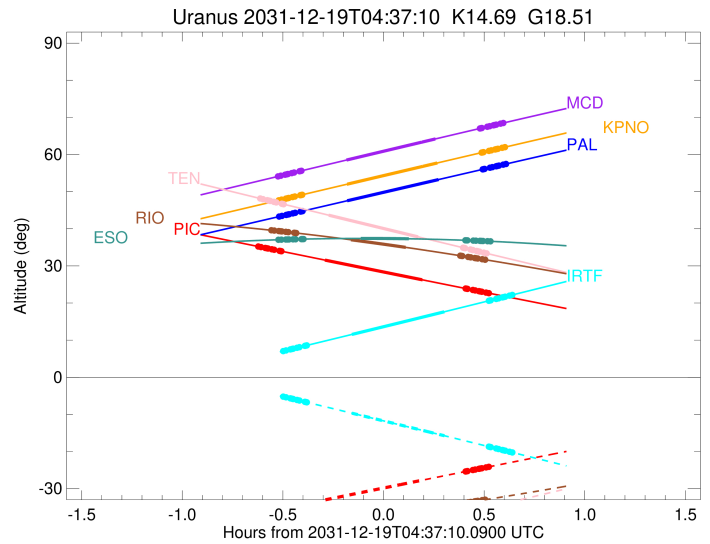
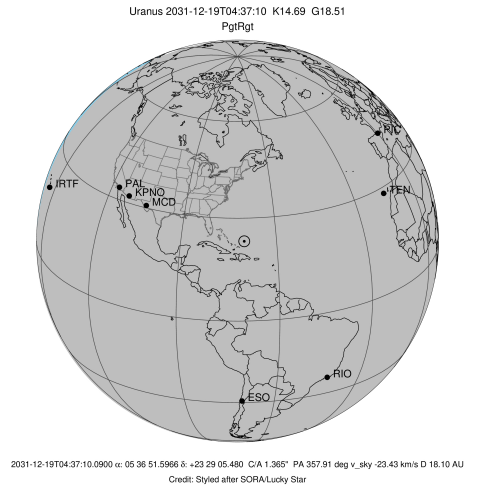
target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-19T04:41:16.510
Event type           : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : IRTF
Location             : Mauna Kea/IRTF
Latitude (deg)       : 19.82622
E. Longitude (deg)   : 204.52800
Altitude (km)        : 4.168
Gaia source ID       : 3404586421959360768
2Mass ID (if available) : 05365159+2329056
ICRS Star Coord at Epoch: 05h 36m 51.59658s +23:29:05.48015s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 14.689
G magnitude           : 18.511
RP magnitude          : 17.409
BP magnitude          : 19.771
DUPflag              : 0
Distance (au)         : 18.103
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -23.43
Sun-Target sep (deg) : 178.07
Sun-Moon sep (deg)   : 112.04
B (ring opening deg) : 79.45
PA of pole (deg)     : 39.30
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.231
C/A sky separation (km) : 16165.2
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall11.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	2031-12-19T04:07:00.699		6.99	-5.16	51513.59	-22.40		
lambda	I	2031-12-19T04:08:07.275		7.23	-5.40	50026.71	-22.30		
delta	I	2031-12-19T04:09:24.865		7.51	-5.68	48300.35	-22.20		
gamma	I	2031-12-19T04:09:55.309		7.63	-5.79	47625.05	-22.16		
eta	I	2031-12-19T04:10:15.580		7.70	-5.86	47176.12	-22.13		
beta	I	2031-12-19T04:11:23.289		7.95	-6.11	45680.14	-22.03		
alpha	I	2031-12-19T04:12:05.582		8.10	-6.26	44750.02	-21.97		
4	I	2031-12-19T04:13:45.761		8.46	-6.63	42554.45	-21.78		
5	I	2031-12-19T04:14:04.571		8.53	-6.69	42155.17	-21.76		
6	I	2031-12-19T04:14:19.186		8.59	-6.75	41834.67	-21.74		
Uranus	I	2031-12-19T04:27:43.656		11.53	-9.67	25005.61		-10.43	-10.91
Uranus	E	2031-12-19T04:55:19.069		17.64	-15.75	25558.47		0.32	0.33
6	E	2031-12-19T05:08:35.284		20.61	-18.69	41869.41	21.83		
5	E	2031-12-19T05:08:54.903		20.68	-18.77	42296.35	21.85		
4	E	2031-12-19T05:09:06.727		20.72	-18.81	42553.27	21.88		
alpha	E	2031-12-19T05:10:44.521		21.09	-19.17	44703.87	22.07		
beta	E	2031-12-19T05:11:27.024		21.25	-19.33	45642.63	22.14		
eta	E	2031-12-19T05:12:36.117		21.51	-19.59	47176.12	22.24		
gamma	E	2031-12-19T05:12:56.234		21.58	-19.66	47623.87	22.27		
delta	E	2031-12-19T05:13:26.577		21.69	-19.78	48300.35	22.32		
lambda	E	2031-12-19T05:14:43.764		21.98	-20.06	50026.71	22.42		
epsilon	E	2031-12-19T05:15:25.495		22.14	-20.22	50963.17	22.52		

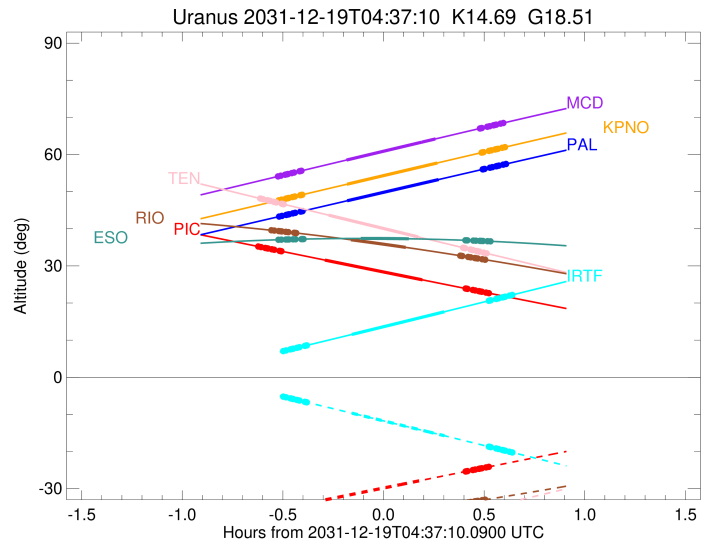
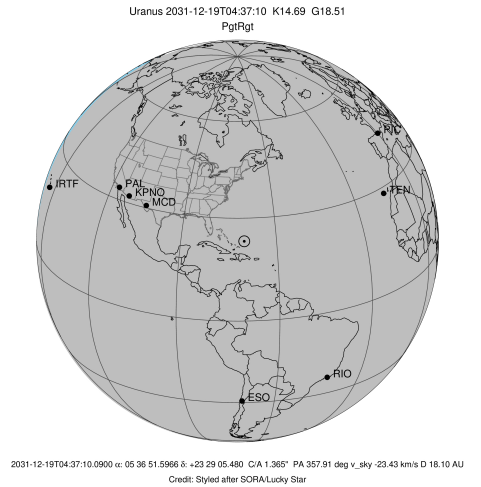
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-19T04:35:19.290
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      : 3404586421959360768
2Mass ID (if available) : 05365159+2329056
ICRS Star Coord at Epoch: 05h 36m 51.59658s +23:29:05.48015s
RUWE (>1.4 is poor) : 1.01
K magnitude          : 14.689
G magnitude          : 18.511
RP magnitude         : 17.409
BP magnitude         : 19.771
DUPflag             : 0
Distance (au)       : 18.103
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -23.43
Sun-Target sep (deg) : 178.07
Sun-Moon sep (deg)  : 111.83
B (ring opening deg) : 79.45
PA of pole (deg)    : 39.30
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.708
C/A sky separation (km) : 22421.9
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall11.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	2031-12-19T04:03:26.616		39.63	-40.49	51535.45	-21.59		
lambda	I	2031-12-19T04:04:36.846		39.52	-40.38	50026.71	-21.40		
delta	I	2031-12-19T04:05:57.886		39.38	-40.26	48300.35	-21.20		
gamma	I	2031-12-19T04:06:29.843		39.33	-40.21	47624.27	-21.11		
eta	I	2031-12-19T04:06:51.099		39.29	-40.18	47176.12	-21.05		
beta	I	2031-12-19T04:08:02.538		39.17	-40.07	45678.83	-20.84		
alpha	I	2031-12-19T04:08:47.178		39.10	-40.00	44751.67	-20.70		
4	I	2031-12-19T04:10:34.477		38.92	-39.83	42547.29	-20.30		
5	I	2031-12-19T04:10:54.252		38.88	-39.80	42157.76	-20.25		
6	I	2031-12-19T04:11:09.630		38.86	-39.78	41842.34	-20.19		
Uranus	I	2031-12-19T04:27:31.968		37.03	-38.08	25030.38		-10.18	-10.66
Uranus	E	2031-12-19T04:43:48.772		34.99	-36.15	25490.55		-3.60	-3.77
6	E	2031-12-19T05:00:03.879		32.75	-34.02	41873.44	20.16		
5	E	2031-12-19T05:00:24.437		32.70	-33.97	42287.41	20.21		
4	E	2031-12-19T05:00:37.284		32.67	-33.94	42546.99	20.27		
alpha	E	2031-12-19T05:02:22.854		32.42	-33.70	44708.49	20.66		
beta	E	2031-12-19T05:03:08.013		32.31	-33.59	45643.93	20.80		
eta	E	2031-12-19T05:04:21.303		32.13	-33.42	47176.12	21.01		
gamma	E	2031-12-19T05:04:42.555		32.08	-33.37	47623.25	21.07		
delta	E	2031-12-19T05:05:14.628		32.00	-33.30	48300.35	21.15		
lambda	E	2031-12-19T05:06:35.846		31.80	-33.10	50026.71	21.35		
epsilon	E	2031-12-19T05:07:21.721		31.68	-33.00	51008.74	21.54		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-19T04:37:10.790
 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 : 3404586421959360768
 2Mass ID (if available) : 05365159+2329056
 ICRS Star Coord at Epoch: 05h 36m 51.59658s +23:29:05.48015s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 14.689
 G magnitude : 18.511
 RP magnitude : 17.409
 BP magnitude : 19.771
 DUPflag : 0
 Distance (au) : 18.103
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.43
 Sun-Target sep (deg) : 178.07
 Sun-Moon sep (deg) : 112.00
 B (ring opening deg) : 79.45
 PA of pole (deg) : 39.30
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.758
 C/A sky separation (km) : 23075.9
 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	2031-12-19T04:05:33.154		37.03	-36.87	51536.82	-21.43		
lambda	I	2031-12-19T04:06:43.974		37.07	-36.91	50026.71	-21.24		
delta	I	2031-12-19T04:08:05.672		37.10	-36.96	48300.35	-21.02		
gamma	I	2031-12-19T04:08:37.906		37.12	-36.97	47624.21	-20.93		
eta	I	2031-12-19T04:08:59.347		37.13	-36.99	47176.12	-20.87		
beta	I	2031-12-19T04:10:11.458		37.15	-37.03	45678.70	-20.64		
alpha	I	2031-12-19T04:10:56.532		37.17	-37.05	44751.77	-20.49		
4	I	2031-12-19T04:12:45.042		37.21	-37.11	42546.71	-20.06		
5	I	2031-12-19T04:13:05.010		37.22	-37.11	42158.11	-20.01		
6	I	2031-12-19T04:13:20.552		37.22	-37.12	41843.00	-19.95		
Uranus	I	2031-12-19T04:30:21.978		37.40	-37.46	25048.01		-10.01	-10.47
Uranus	E	2031-12-19T04:44:42.768		37.30	-37.49	25465.60		-4.21	-4.41
6	E	2031-12-19T05:01:35.576		36.90	-37.24	41873.92	19.95		
5	E	2031-12-19T05:01:56.250		36.89	-37.23	42286.07	20.01		
4	E	2031-12-19T05:02:09.247		36.88	-37.23	42546.17	20.06		
alpha	E	2031-12-19T05:03:55.859		36.82	-37.18	44709.16	20.49		
beta	E	2031-12-19T05:04:41.359		36.79	-37.16	45644.14	20.64		
eta	E	2031-12-19T05:05:55.176		36.75	-37.13	47176.12	20.87		
gamma	E	2031-12-19T05:06:16.569		36.73	-37.12	47623.17	20.93		
delta	E	2031-12-19T05:06:48.854		36.71	-37.10	48300.35	21.02		
lambda	E	2031-12-19T05:08:10.555		36.66	-37.06	50026.71	21.24		
epsilon	E	2031-12-19T05:08:56.992		36.63	-37.04	51015.49	21.43		