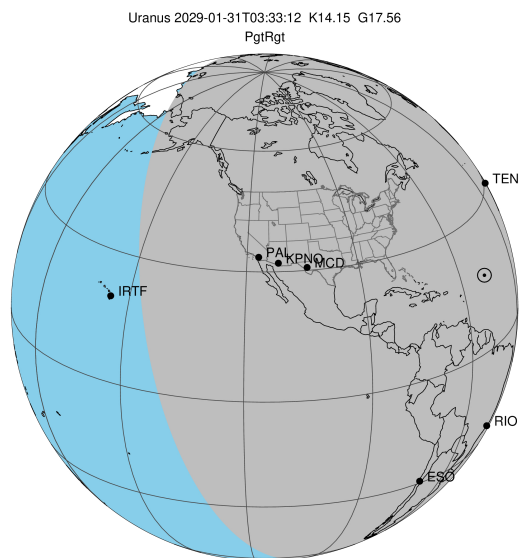


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-31T03:33:12.950
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 144990231830152320
 2Mass ID (if available) : 04330404+2154528

Uranus 2029-01-31T03:33:12 K14.15 G17.56 PgtRgt

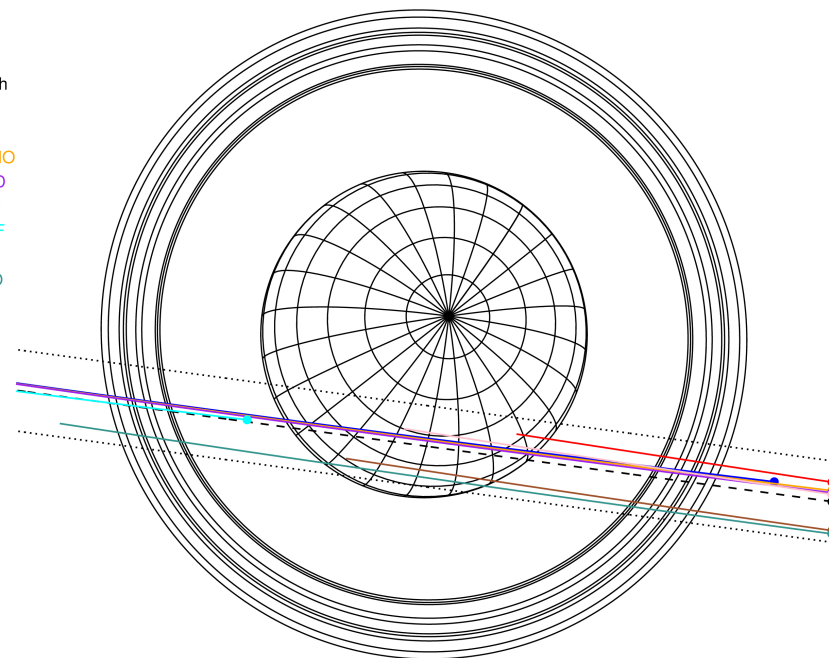
ICRS Star Coord at Epoch: 04h 33m 04.03853s +21:54:52.62876s

RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.148
 G magnitude : 17.562
 RP magnitude : 16.549
 BP magnitude : 18.725
 DUPflag : 0
 Distance (au) : 18.790
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.01
 Sun-Target sep (deg) : 118.77
 Sun-Moon sep (deg) : 73.38
 B (ring opening deg) : 79.10
 PA of pole (deg) : -53.35



2029-01-31T03:33:12.9500 α: 04 33 04.0385 δ: +21 54 52.6229 C/A 1.263° PA 352.23 deg v_sky - 8.02 km/s D 18.79 AU
 Credit: Styled after SORA/Lucky Star

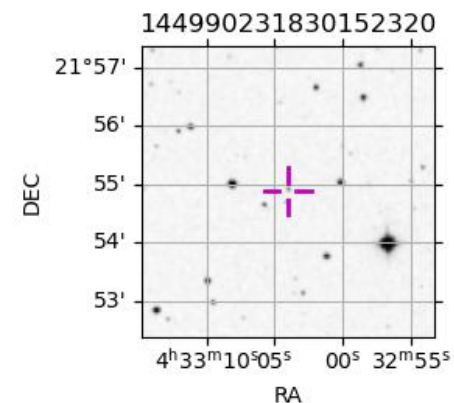
Earth
 PIC
 PAL
 KPNO
 MCD
 TEN
 IRTF
 RIO
 ESO



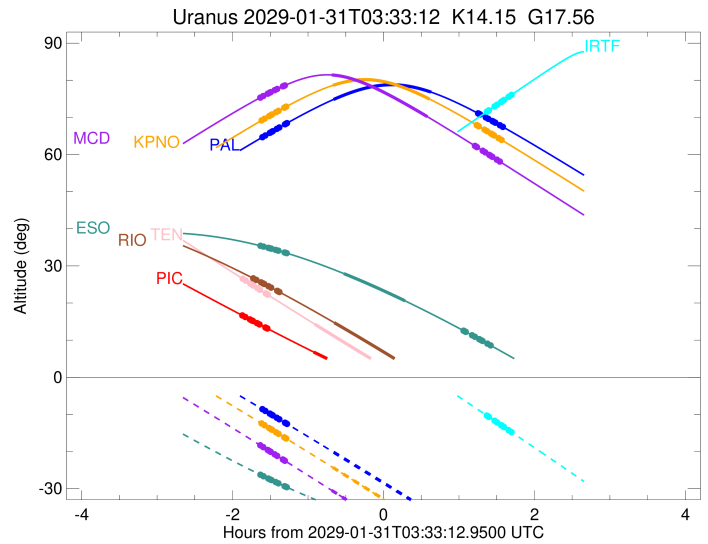
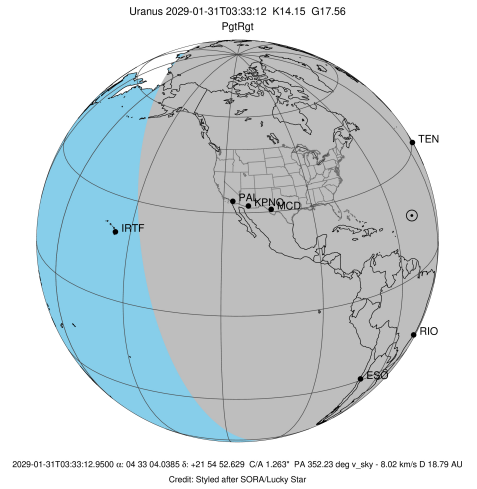
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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	+++++	+		JAN 31 01:40 - JAN 31 02:37	PinRin
PAL	Palomar Mt (200")	33.4	243.1	+++++	+ +	+++++	JAN 31 01:56 - JAN 31 05:07	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	JAN 31 01:55 - JAN 31 05:06	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	JAN 31 01:54 - JAN 31 05:05	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++	+		JAN 31 01:40 - JAN 31 02:38	PinRin
IRTF	Mauna Kea/IRTF	19.8	204.5			+++++	JAN 31 04:55 - JAN 31 05:14	PnnRne
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+++++	+		JAN 31 01:48 - JAN 31 02:54	PinRin
ESO	European Southern Obs	-29.3	289.3	+++++	+ +	+++++	JAN 31 01:54 - JAN 31 04:57	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

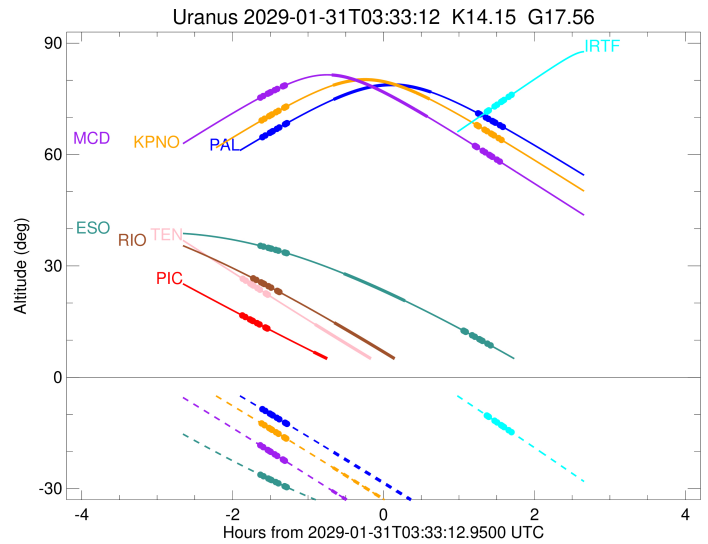
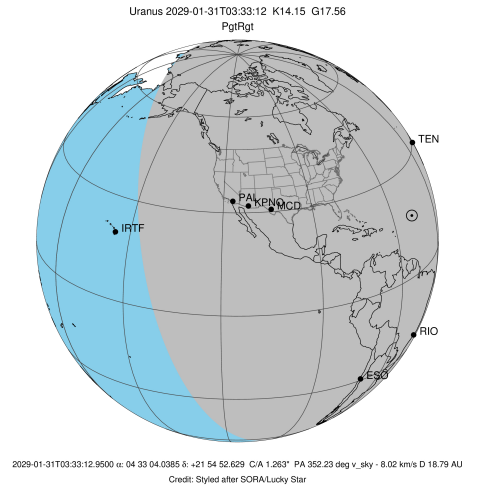


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-31T03:23:30.770
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 144990231830152320
 2Mass ID (if available) : 04330404+2154528
 ICRS Star Coord at Epoch: 04h 33m 04.03853s +21:54:52.62876s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.148
 G magnitude : 17.562
 RP magnitude : 16.549
 BP magnitude : 18.725
 DUPflag : 0
 Distance (au) : 18.789
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.01
 Sun-Target sep (deg) : 118.77
 Sun-Moon sep (deg) : 73.13
 B (ring opening deg) : 79.10
 PA of pole (deg) : -53.35
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.969
 C/A sky separation (km) : 13211.2
 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	2029-01-31T01:40:12.047		16.79	-58.54	51522.31	-7.88		
lambda	I	2029-01-31T01:43:22.179		16.23	-58.14	50026.71	-7.85		
delta	I	2029-01-31T01:47:02.360		15.58	-57.66	48300.35	-7.83		
gamma	I	2029-01-31T01:48:28.192		15.32	-57.47	47629.11	-7.81		
eta	I	2029-01-31T01:49:26.190		15.15	-57.34	47176.12	-7.81		
beta	I	2029-01-31T01:52:38.653		14.59	-56.91	45676.70	-7.78		
alpha	I	2029-01-31T01:54:46.244		14.21	-56.62	44685.92	-7.76		
4	I	2029-01-31T01:59:20.824		13.41	-55.99	42559.36	-7.71		
5	I	2029-01-31T02:00:06.634		13.27	-55.88	42208.86	-7.71		
6	I	2029-01-31T02:00:57.725		13.12	-55.76	41814.19	-7.69		
Uranus	I	2029-01-31T02:37:40.508		6.81	-50.16	25527.48		2.52	2.64
Uranus	E	2029-01-31T04:08:32.704		-7.43x	-34.32	25024.09		-10.60	-11.09
6	E	2029-01-31T04:46:38.968		-12.56x	-27.35	41877.09	7.43		
5	E	2029-01-31T04:47:34.509		-12.67x	-27.18	42301.05	7.44		
4	E	2029-01-31T04:48:16.752		-12.76x	-27.05	42606.63	7.45		
alpha	E	2029-01-31T04:53:03.389		-13.36x	-26.17	44750.69	7.48		
beta	E	2029-01-31T04:55:02.633		-13.60x	-25.81	45641.15	7.49		
eta	E	2029-01-31T04:58:27.444		-14.01x	-25.18	47176.12	7.51		
gamma	E	2029-01-31T04:59:26.764		-14.13x	-25.00	47621.47	7.51		
delta	E	2029-01-31T05:00:57.119		-14.31x	-24.72	48300.35	7.52		
lambda	E	2029-01-31T05:04:46.529		-14.77x	-24.02	50026.71	7.53		
epsilon	E	2029-01-31T05:06:42.867		-14.99x	-23.67	50903.54	7.55		

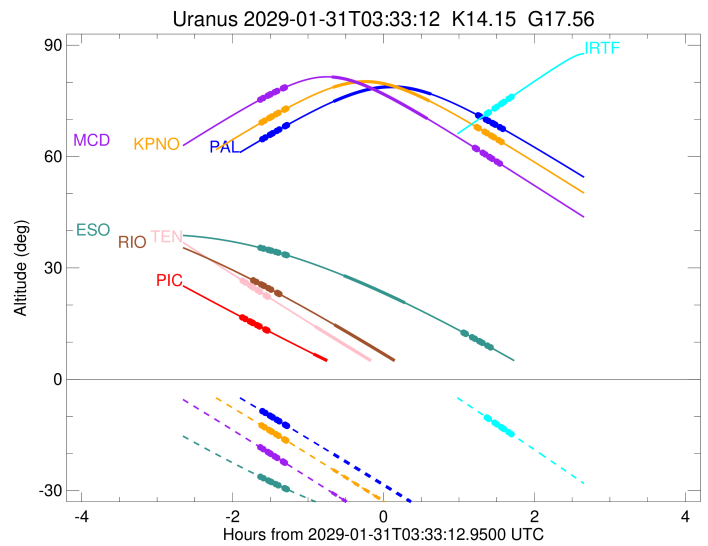
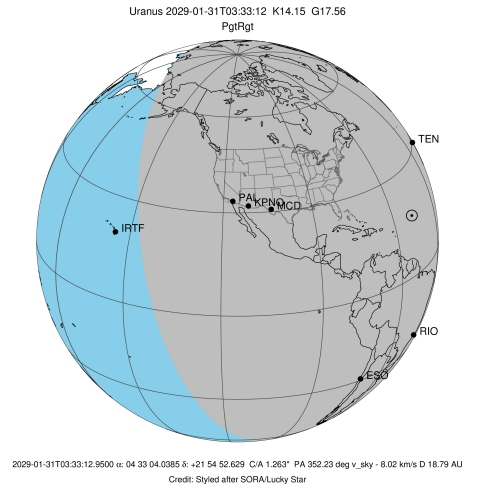
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-31T03:32:58.500
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 144990231830152320
 2Mass ID (if available) : 04330404+2154528
 ICRS Star Coord at Epoch: 04h 33m 04.03853s +21:54:52.62876s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.148
 G magnitude : 17.562
 RP magnitude : 16.549
 BP magnitude : 18.725
 DUPflag : 0
 Distance (au) : 18.790
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.01
 Sun-Target sep (deg) : 118.77
 Sun-Moon sep (deg) : 74.32
 B (ring opening deg) : 79.10
 PA of pole (deg) : -53.35
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.177
 C/A sky separation (km) : 16042.5
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-01-31T01:56:09.207		64.52	-8.44	51527.22	-8.03		
lambda	I	2029-01-31T01:59:16.436		65.13	-9.07	50026.71	-8.00		
delta	I	2029-01-31T02:02:52.632		65.84	-9.80	48300.35	-7.97		
gamma	I	2029-01-31T02:04:16.963		66.11	-10.08	47628.94	-7.95		
eta	I	2029-01-31T02:05:13.924		66.30	-10.27	47176.12	-7.94		
beta	I	2029-01-31T02:08:23.161		66.91	-10.91	45676.17	-7.91		
alpha	I	2029-01-31T02:10:28.525		67.31	-11.34	44686.34	-7.89		
4	I	2029-01-31T02:14:58.700		68.17	-12.25	42561.38	-7.83		
5	I	2029-01-31T02:15:43.599		68.31	-12.41	42212.42	-7.82		
6	I	2029-01-31T02:16:34.259		68.47	-12.58	41815.91	-7.80		
Uranus	I	2029-01-31T02:53:28.946		74.83	-20.17	25549.97		1.35	1.41
Uranus	E	2029-01-31T04:11:04.880		76.81	-36.36	24997.12		-10.87	-11.37
6	E	2029-01-31T04:48:30.497		71.08	-44.15	41878.29	7.77		
5	E	2029-01-31T04:49:23.747		70.92	-44.33	42304.97	7.79		
4	E	2029-01-31T04:50:03.984		70.80	-44.47	42609.07	7.80		
alpha	E	2029-01-31T04:54:36.762		69.98	-45.41	44749.62	7.85		
beta	E	2029-01-31T04:56:30.331		69.63	-45.80	45641.06	7.88		
eta	E	2029-01-31T04:59:44.851		69.03	-46.47	47176.12	7.91		
gamma	E	2029-01-31T05:00:41.100		68.85	-46.66	47621.30	7.92		
delta	E	2029-01-31T05:02:06.778		68.58	-46.96	48300.35	7.93		
lambda	E	2029-01-31T05:05:43.980		67.90	-47.70	50026.71	7.96		
epsilon	E	2029-01-31T05:07:37.206		67.54	-48.09	50929.23	8.00		

```

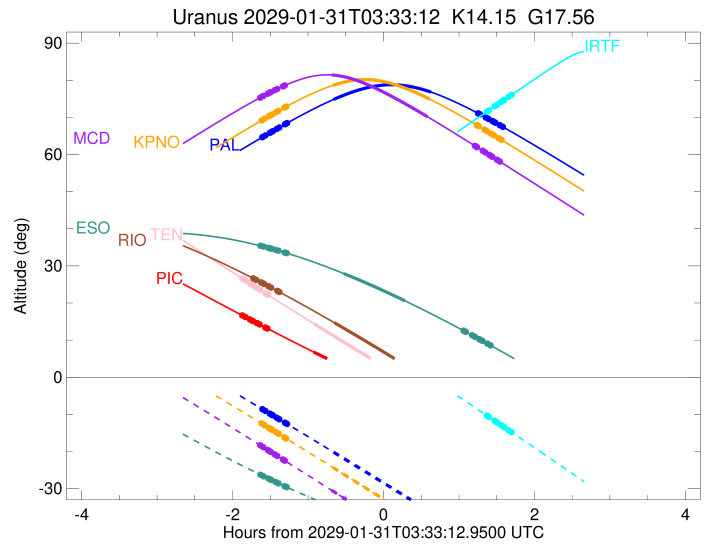
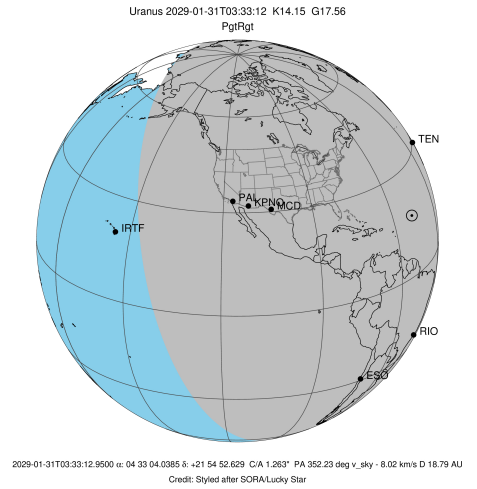
target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2029-01-31T03:32:05.090
Event type           : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : KPNO
Location             : Kitt Peak Natl Obs
Latitude (deg)       : 31.96333
E. Longitude (deg)   : 248.40000
Altitude (km)        : 2.120
Gaia source ID       : 144990231830152320
2Mass ID (if available) : 04330404+2154528
ICRS Star Coord at Epoch: 04h 33m 04.03853s +21:54:52.62876s
RUWE (>1.4 is poor) : 0.95
K magnitude          : 14.148
G magnitude          : 17.562
RP magnitude         : 16.549
BP magnitude         : 18.725
DUPflag             : 0
Distance (au)        : 18.790
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -8.01
Sun-Target sep (deg) : 118.77
Sun-Moon sep (deg)   : 74.31
B (ring opening deg) : 79.10
PA of pole (deg)     : -53.35
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.193
C/A sky separation (km) : 16252.9
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-01-31T01:55:32.901		69.04	-12.28	51528.05	-8.04		
lambda	I	2029-01-31T01:58:40.074		69.65	-12.93	50026.71	-8.01		
delta	I	2029-01-31T02:02:16.120		70.35	-13.67	48300.35	-7.97		
gamma	I	2029-01-31T02:03:40.408		70.62	-13.97	47628.91	-7.96		
eta	I	2029-01-31T02:04:37.336		70.80	-14.16	47176.12	-7.95		
beta	I	2029-01-31T02:07:46.511		71.40	-14.82	45676.09	-7.91		
alpha	I	2029-01-31T02:09:51.827		71.79	-15.25	44686.41	-7.89		
4	I	2029-01-31T02:14:21.976		72.63	-16.19	42561.67	-7.83		
5	I	2029-01-31T02:15:06.847		72.77	-16.35	42212.94	-7.82		
6	I	2029-01-31T02:15:57.561		72.92	-16.53	41816.16	-7.80		
Uranus	I	2029-01-31T02:52:58.441		78.64	-24.30	25551.61		1.22	1.28
Uranus	E	2029-01-31T04:09:48.998		74.95	-40.60	24996.41		-10.88	-11.38
6	E	2029-01-31T04:47:25.399		67.92	-48.53	41878.34	7.75		
5	E	2029-01-31T04:48:18.808		67.74	-48.71	42305.13	7.77		
4	E	2029-01-31T04:48:59.153		67.61	-48.85	42609.17	7.78		
alpha	E	2029-01-31T04:53:32.651		66.69	-49.80	44749.57	7.83		
beta	E	2029-01-31T04:55:26.523		66.31	-50.20	45641.06	7.86		
eta	E	2029-01-31T04:58:41.535		65.65	-50.87	47176.12	7.89		
gamma	E	2029-01-31T04:59:37.924		65.46	-51.07	47621.29	7.90		
delta	E	2029-01-31T05:01:03.813		65.17	-51.37	48300.35	7.91		
lambda	E	2029-01-31T05:04:41.539		64.43	-52.12	50026.71	7.94		
epsilon	E	2029-01-31T05:06:35.155		64.04	-52.51	50930.20	7.98		

```

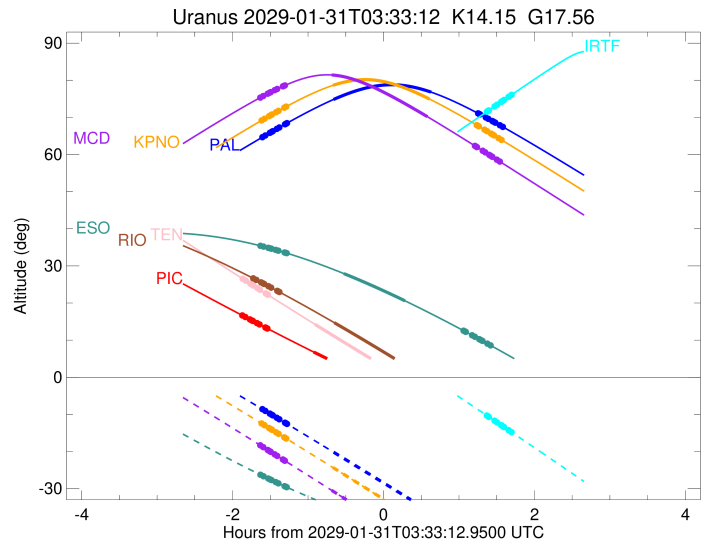
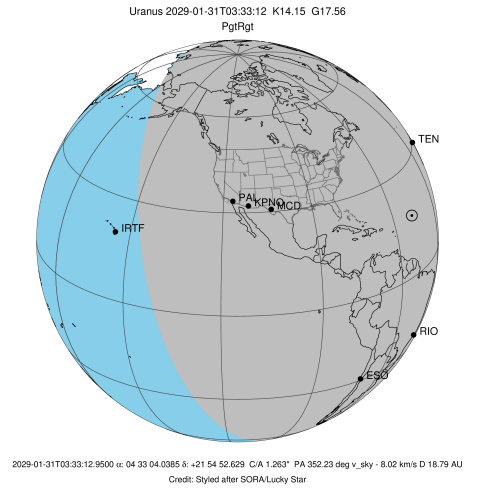
target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2029-01-31T03:30:45.630
Event type           : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : MCD
Location             : McDonald Obs. 2.7m
Latitude (deg)       : 30.67158
E. Longitude (deg)   : 255.97844
Altitude (km)        : 2.075
Gaia source ID       : 144990231830152320
2Mass ID (if available) : 04330404+2154528
ICRS Star Coord at Epoch: 04h 33m 04.03853s +21:54:52.62876s
RUWE (>1.4 is poor) : 0.95
K magnitude           : 14.148
G magnitude           : 17.562
RP magnitude          : 16.549
BP magnitude          : 18.725
DUPflag              : 0
Distance (au)         : 18.790
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -8.01
Sun-Target sep (deg) : 118.77
Sun-Moon sep (deg)   : 74.27
B (ring opening deg) : 79.10
PA of pole (deg)     : -53.35
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.207
C/A sky separation (km) : 16453.2
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	2029-01-31T01:54:28.791		75.19	-18.16	51528.95	-8.05		
lambda	I	2029-01-31T01:57:35.880		75.76	-18.82	50026.71	-8.02		
delta	I	2029-01-31T02:01:11.742		76.40	-19.59	48300.35	-7.98		
gamma	I	2029-01-31T02:02:35.973		76.64	-19.89	47628.88	-7.96		
eta	I	2029-01-31T02:03:32.862		76.80	-20.09	47176.12	-7.95		
beta	I	2029-01-31T02:06:41.952		77.34	-20.76	45676.00	-7.91		
alpha	I	2029-01-31T02:08:47.204		77.68	-21.20	44686.49	-7.89		
4	I	2029-01-31T02:13:17.306		78.39	-22.16	42561.99	-7.83		
5	I	2029-01-31T02:14:02.143		78.50	-22.32	42213.50	-7.82		
6	I	2029-01-31T02:14:52.912		78.63	-22.50	41816.43	-7.80		
Uranus	I	2029-01-31T02:52:00.168		81.43	-30.46	25553.13		1.09	1.14
Uranus	E	2029-01-31T04:08:09.434		70.19	-46.83	24995.87		-10.88	-11.39
6	E	2029-01-31T04:45:58.891		62.32	-54.83	41878.37	7.72		
5	E	2029-01-31T04:46:52.519		62.13	-55.02	42305.24	7.74		
4	E	2029-01-31T04:47:33.022		61.99	-55.16	42609.24	7.75		
alpha	E	2029-01-31T04:52:07.576		61.01	-56.12	44749.54	7.80		
beta	E	2029-01-31T04:54:01.888		60.61	-56.51	45641.06	7.83		
eta	E	2029-01-31T04:57:17.639		59.91	-57.19	47176.12	7.86		
gamma	E	2029-01-31T04:58:14.239		59.71	-57.38	47621.29	7.87		
delta	E	2029-01-31T04:59:40.450		59.40	-57.68	48300.35	7.88		
lambda	E	2029-01-31T05:03:18.984		58.62	-58.43	50026.71	7.92		
epsilon	E	2029-01-31T05:05:13.101		58.22	-58.82	50930.85	7.95		

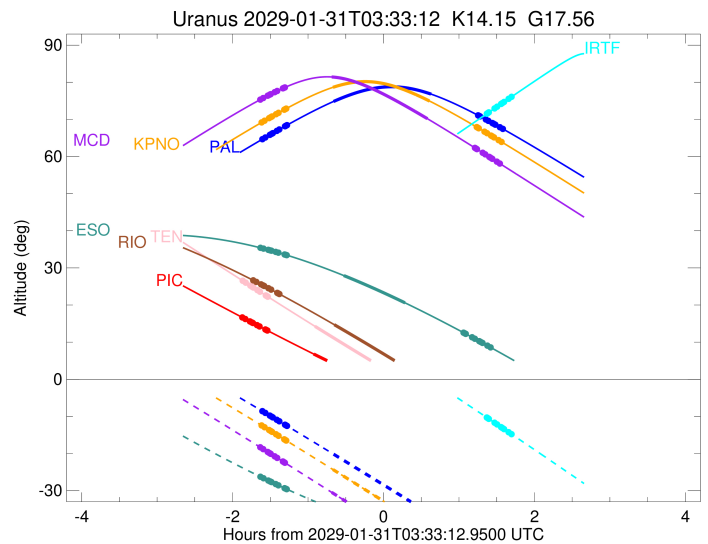
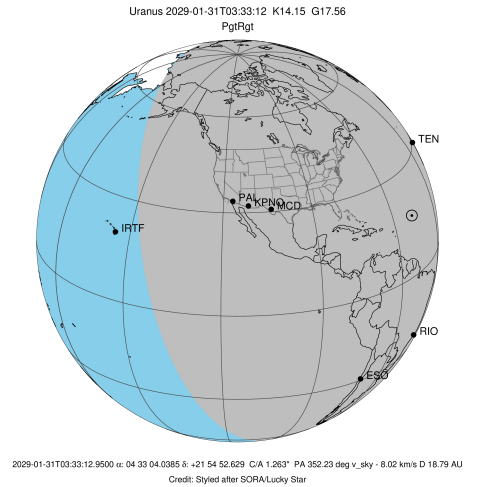
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2029-01-31T03:21:28.630
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       : 144990231830152320
2Mass ID (if available) : 04330404+2154528
ICRS Star Coord at Epoch: 04h 33m 04.03853s +21:54:52.62876s
RUWE (>1.4 is poor) : 0.95
K magnitude          : 14.148
G magnitude          : 17.562
RP magnitude         : 16.549
BP magnitude         : 18.725
DUPflag             : 0
Distance (au)        : 18.789
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -8.01
Sun-Target sep (deg) : 118.77
Sun-Moon sep (deg)   : 73.16
B (ring opening deg) : 79.10
PA of pole (deg)     : -53.35
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.105
C/A sky separation (km) : 15059.7
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	2029-01-31T01:40:32.388		26.70	-78.16	51528.31	-7.91		
lambda	I	2029-01-31T01:43:42.692		26.01	-77.84	50026.71	-7.88		
delta	I	2029-01-31T01:47:22.389		25.22	-77.43	48300.35	-7.84		
gamma	I	2029-01-31T01:48:48.117		24.91	-77.26	47628.92	-7.82		
eta	I	2029-01-31T01:49:46.025		24.71	-77.14	47176.12	-7.81		
beta	I	2029-01-31T01:52:58.468		24.02	-76.73	45676.12	-7.78		
alpha	I	2029-01-31T01:55:05.971		23.56	-76.44	44686.38	-7.75		
4	I	2029-01-31T01:59:40.841		22.57	-75.77	42561.47	-7.69		
5	I	2029-01-31T02:00:26.517		22.41	-75.66	42212.57	-7.69		
6	I	2029-01-31T02:01:18.080		22.23	-75.53	41815.97	-7.67		
Uranus	I	2029-01-31T02:38:42.025		14.27	-68.81	25546.62		1.58	1.65
Uranus	E	2029-01-31T04:03:18.744		-3.04x	-50.89	25006.24		-10.78	-11.28
6	E	2029-01-31T04:42:19.194		-10.55x	-42.32	41877.70	7.36		
5	E	2029-01-31T04:43:15.343		-10.72x	-42.11	42302.97	7.37		
4	E	2029-01-31T04:43:57.913		-10.86x	-41.95	42607.81	7.38		
alpha	E	2029-01-31T04:48:46.682		-11.75x	-40.89	44750.22	7.42		
beta	E	2029-01-31T04:50:46.861		-12.12x	-40.45	45641.09	7.43		
eta	E	2029-01-31T04:54:13.039		-12.76x	-39.69	47176.12	7.46		
gamma	E	2029-01-31T04:55:12.715		-12.94x	-39.47	47621.39	7.46		
delta	E	2029-01-31T04:56:43.615		-13.22x	-39.14	48300.35	7.47		
lambda	E	2029-01-31T05:00:34.270		-13.92x	-38.29	50026.71	7.49		
epsilon	E	2029-01-31T05:02:32.671		-14.28x	-37.86	50914.70	7.52		

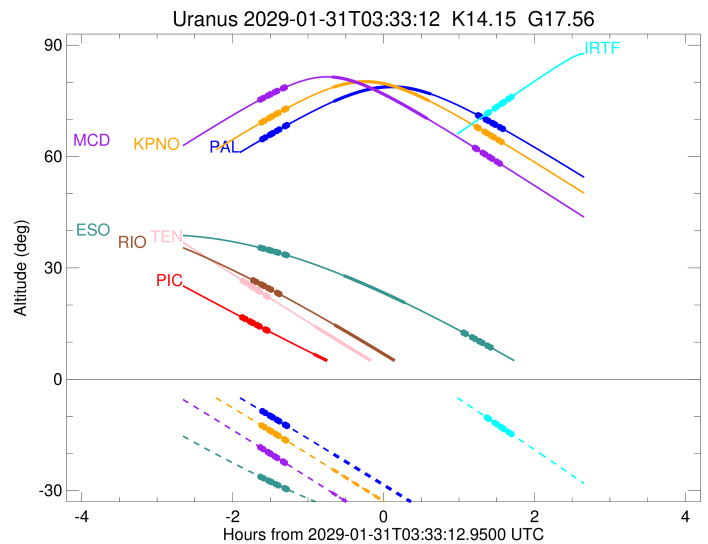
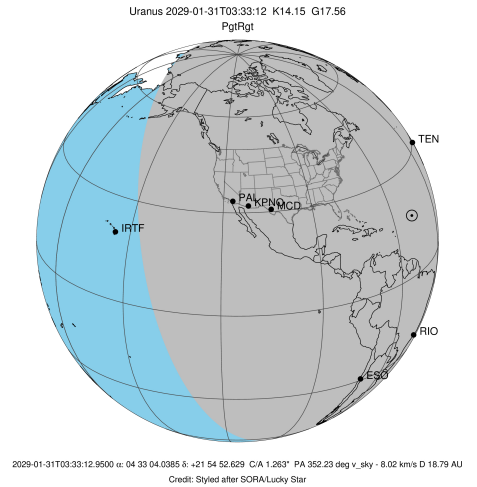
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-31T03:40:14.830
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : IRTF
 Location : Mauna Kea/IRTF
 Latitude (deg) : 19.82622
 E. Longitude (deg) : 204.52800
 Altitude (km) : 4.168
 Gaia source ID : 144990231830152320
 2Mass ID (if available) : 04330404+2154528
 ICRS Star Coord at Epoch: 04h 33m 04.03853s +21:54:52.62876s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.148
 G magnitude : 17.562
 RP magnitude : 16.549
 BP magnitude : 18.725
 DUPflag : 0
 Distance (au) : 18.790
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.01
 Sun-Target sep (deg) : 118.77
 Sun-Moon sep (deg) : 74.31
 B (ring opening deg) : 79.10
 PA of pole (deg) : -53.35
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.216
 C/A sky separation (km) : 16566.8
 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	2029-01-31T02:02:30.827		31.54	27.08x	51527.43	-7.86		
lambda	I	2029-01-31T02:05:42.302		32.27	26.44x	50026.71	-7.83		
delta	I	2029-01-31T02:09:23.345		33.11	25.71x	48300.35	-7.79		
gamma	I	2029-01-31T02:10:49.562		33.44	25.42x	47628.93	-7.78		
eta	I	2029-01-31T02:11:47.793		33.66	25.22x	47176.12	-7.77		
beta	I	2029-01-31T02:15:01.253		34.40	24.57x	45676.14	-7.74		
alpha	I	2029-01-31T02:17:09.401		34.89	24.14x	44686.38	-7.71		
4	I	2029-01-31T02:21:45.585		35.95	23.21x	42561.54	-7.66		
5	I	2029-01-31T02:22:31.465		36.13	23.05x	42212.72	-7.65		
6	I	2029-01-31T02:23:23.283		36.32	22.87x	41816.06	-7.63		
Uranus	I	2029-01-31T03:01:15.062		45.05	14.96x	25552.15		1.17	1.23
Uranus	E	2029-01-31T04:17:36.559		62.76	-1.78x	24994.83		-10.89	-11.40
6	E	2029-01-31T04:55:26.069		71.55	-10.32	41878.56	7.76		
5	E	2029-01-31T04:56:19.478		71.75	-10.52	42305.93	7.77		
4	E	2029-01-31T04:56:59.766		71.91	-10.67	42609.68	7.78		
alpha	E	2029-01-31T05:01:32.753		72.96	-11.71	44749.29	7.85		
beta	E	2029-01-31T05:03:26.413		73.40	-12.14	45641.06	7.87		
eta	E	2029-01-31T05:06:40.881		74.15	-12.88	47176.12	7.91		
gamma	E	2029-01-31T05:07:37.083		74.37	-13.10	47621.25	7.93		
delta	E	2029-01-31T05:09:02.678		74.70	-13.42	48300.35	7.94		
lambda	E	2029-01-31T05:12:39.535		75.54	-14.25	50026.71	7.98		
epsilon	E	2029-01-31T05:14:33.477		75.98	-14.68	50936.93	8.02		

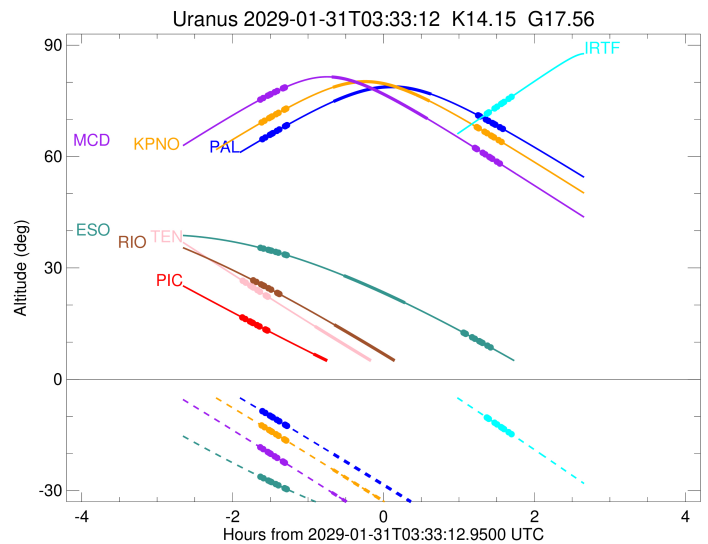
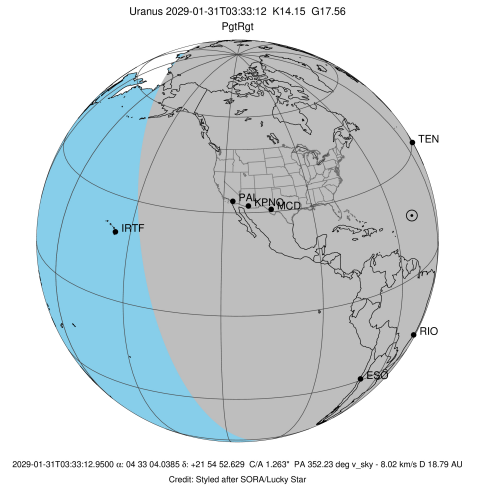
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2029-01-31T03:23:23.680
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      : 144990231830152320
2Mass ID (if available) : 04330404+2154528
ICRS Star Coord at Epoch: 04h 33m 04.03853s +21:54:52.62876s
RUWE (>1.4 is poor) : 0.95
K magnitude         : 14.148
G magnitude         : 17.562
RP magnitude        : 16.549
BP magnitude        : 18.725
DUPflag            : 0
Distance (au)       : 18.789
f0 (km)            : 0.000
g0 (km)            : 0.000
skyplane vel. (km/s) : -8.01
Sun-Target sep (deg) : 118.77
Sun-Moon sep (deg)  : 73.25
B (ring opening deg) : 79.10
PA of pole (deg)    : -53.35
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.545
C/A sky separation (km) : 21050.7
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_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	2029-01-31T01:48:48.656		26.80	-45.66	51543.13	-7.68		
lambda	I	2029-01-31T01:52:06.986		26.22	-46.00	50026.71	-7.62		
delta	I	2029-01-31T01:55:54.561		25.56	-46.37	48300.35	-7.55		
gamma	I	2029-01-31T01:57:23.719		25.30	-46.51	47628.28	-7.52		
eta	I	2029-01-31T01:58:23.894		25.12	-46.61	47176.12	-7.50		
beta	I	2029-01-31T02:01:44.993		24.53	-46.92	45674.10	-7.43		
alpha	I	2029-01-31T02:03:58.039		24.13	-47.11	44688.26	-7.39		
4	I	2029-01-31T02:08:47.143		23.27	-47.52	42568.32	-7.27		
5	I	2029-01-31T02:09:34.637		23.12	-47.58	42224.67	-7.25		
6	I	2029-01-31T02:10:30.318		22.95	-47.65	41821.95	-7.22		
Uranus	I	2029-01-31T02:54:01.386		14.72	-49.81	25538.58		-2.03	-2.12
Uranus	E	2029-01-31T03:51:02.670		3.15x	-48.46	25017.54		-10.66	-11.16
6	E	2029-01-31T04:36:09.415		-6.43x	-44.31	41879.28	6.98		
5	E	2029-01-31T04:37:08.940		-6.65x	-44.20	42308.94	7.00		
4	E	2029-01-31T04:37:53.572		-6.81x	-44.11	42611.61	7.01		
alpha	E	2029-01-31T04:42:55.225		-7.89x	-43.50	44748.06	7.11		
beta	E	2029-01-31T04:45:00.769		-8.35x	-43.24	45641.14	7.15		
eta	E	2029-01-31T04:48:34.710		-9.12x	-42.78	47176.12	7.20		
gamma	E	2029-01-31T04:49:36.422		-9.34x	-42.65	47621.14	7.22		
delta	E	2029-01-31T04:51:10.366		-9.68x	-42.44	48300.35	7.24		
lambda	E	2029-01-31T04:55:07.929		-10.55x	-41.91	50026.71	7.29		
epsilon	E	2029-01-31T04:57:15.568		-11.01x	-41.63	50959.08	7.34		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-31T03:26:57.260
 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 : 144990231830152320
 2Mass ID (if available) : 04330404+2154528
 ICRS Star Coord at Epoch: 04h 33m 04.03853s +21:54:52.62876s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.148
 G magnitude : 17.562
 RP magnitude : 16.549
 BP magnitude : 18.725
 DUPflag : 0
 Distance (au) : 18.789
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -8.01
 Sun-Target sep (deg) : 118.77
 Sun-Moon sep (deg) : 73.60
 B (ring opening deg) : 79.10
 PA of pole (deg) : -53.35
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.626
 C/A sky separation (km) : 22156.2
 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	2029-01-31T01:54:32.423		35.49	-26.12	51544.60	-7.66		
lambda	I	2029-01-31T01:57:51.507		35.20	-26.67	50026.71	-7.60		
delta	I	2029-01-31T02:01:39.876		34.86	-27.29	48300.35	-7.52		
gamma	I	2029-01-31T02:03:09.407		34.72	-27.53	47628.20	-7.49		
eta	I	2029-01-31T02:04:09.833		34.63	-27.69	47176.12	-7.47		
beta	I	2029-01-31T02:07:31.959		34.31	-28.23	45673.81	-7.39		
alpha	I	2029-01-31T02:09:45.683		34.09	-28.59	44688.57	-7.34		
4	I	2029-01-31T02:14:36.721		33.61	-29.35	42569.32	-7.21		
5	I	2029-01-31T02:15:24.470		33.53	-29.47	42226.45	-7.20		
6	I	2029-01-31T02:16:20.754		33.43	-29.62	41822.86	-7.16		
Uranus	I	2029-01-31T03:01:36.821		27.94	-35.95	25519.73		-2.81	-2.95
Uranus	E	2029-01-31T03:50:24.599		20.58	-40.94	25042.71		-10.40	-10.88
6	E	2029-01-31T04:36:56.802		12.54	-43.36	41879.49	6.99		
5	E	2029-01-31T04:37:56.239		12.36	-43.39	42310.08	7.02		
4	E	2029-01-31T04:38:40.696		12.22	-43.40	42612.36	7.04		
alpha	E	2029-01-31T04:43:40.777		11.31	-43.50	44747.44	7.15		
beta	E	2029-01-31T04:45:45.644		10.93	-43.53	45641.21	7.20		
eta	E	2029-01-31T04:49:17.994		10.28	-43.57	47176.12	7.26		
gamma	E	2029-01-31T04:50:19.193		10.09	-43.58	47621.10	7.28		
delta	E	2029-01-31T04:51:52.326		9.80	-43.59	48300.35	7.31		
lambda	E	2029-01-31T04:55:47.610		9.07	-43.60	50026.71	7.37		
epsilon	E	2029-01-31T04:57:55.432		8.67	-43.60	50970.36	7.42		