

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-05T08:31:22.890
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3377544109571670144
 2Mass ID (if available) : 06191967+2338015

ICRS Star Coord at Epoch: 06h 19m 19.67784s +23:38:01.37388s

RUWE (>1.4 is poor) : 1.08
 K magnitude : 14.865
 G magnitude : 17.332
 RP magnitude : 16.534
 BP magnitude : 18.001
 DUPflag : 0
 Distance (au) : 18.036
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.34
 Sun-Target sep (deg) : 158.61
 Sun-Moon sep (deg) : 34.69
 B (ring opening deg) : 71.46
 PA of pole (deg) : 66.04

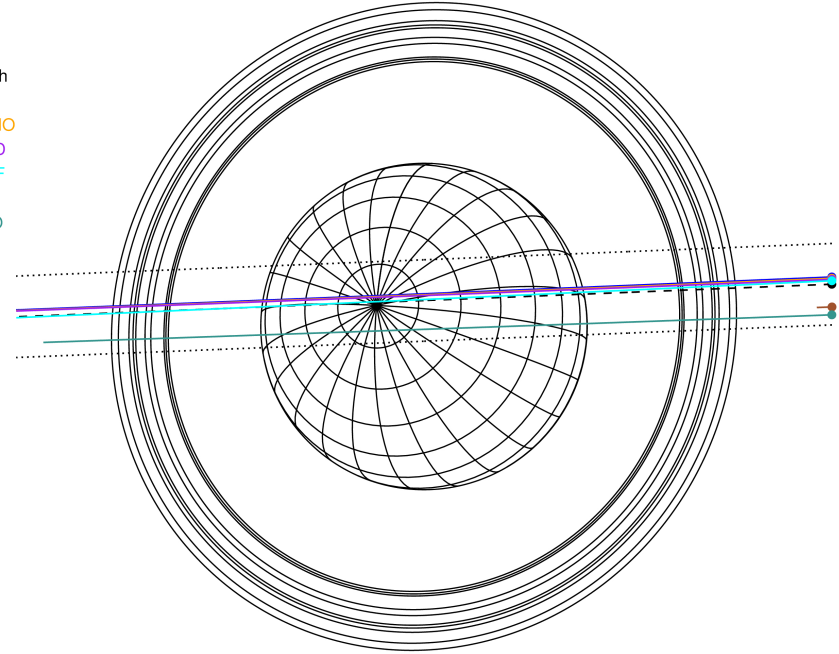
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2033-12-05T08:31:22.8900 α: 06 19 19.6778 s: +23 38 01.374 C/A 0.319° PA 182.28 deg v_sky -21.34 km/s D 18.04 AU
 Credit: Styled after SORA/Lucky Star

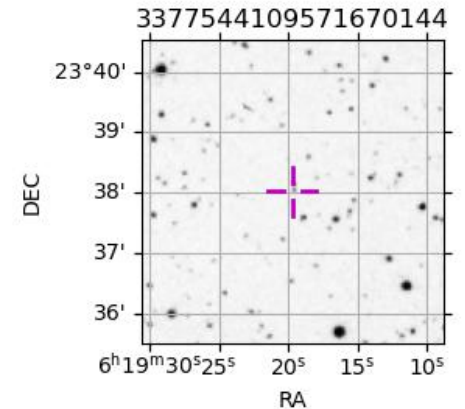
Uranus 2033-12-05T08:31:22 K14.87 G17.33 PgtRgt

Earth
 PAL
 KPNO
 MCD
 IRTF
 RIO
 ESO

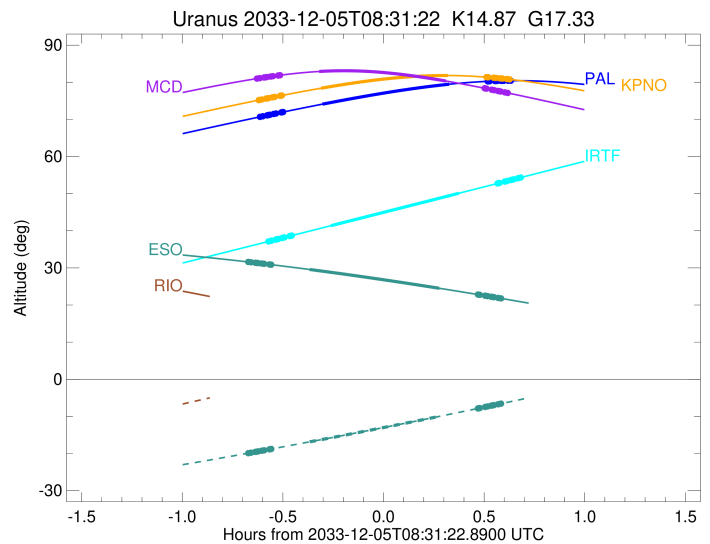
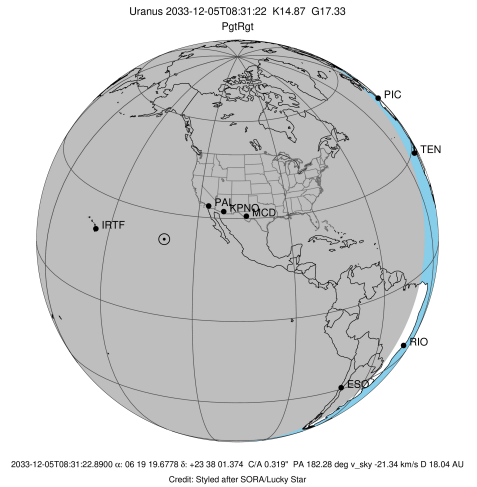


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1	+++++	+ +	+++++	DEC 05 07:54 - DEC 05 09:09	PieRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	DEC 05 07:54 - DEC 05 09:09	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	DEC 05 07:53 - DEC 05 09:08	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	DEC 05 07:57 - DEC 05 09:12	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 05 07:51 - DEC 05 09:06	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



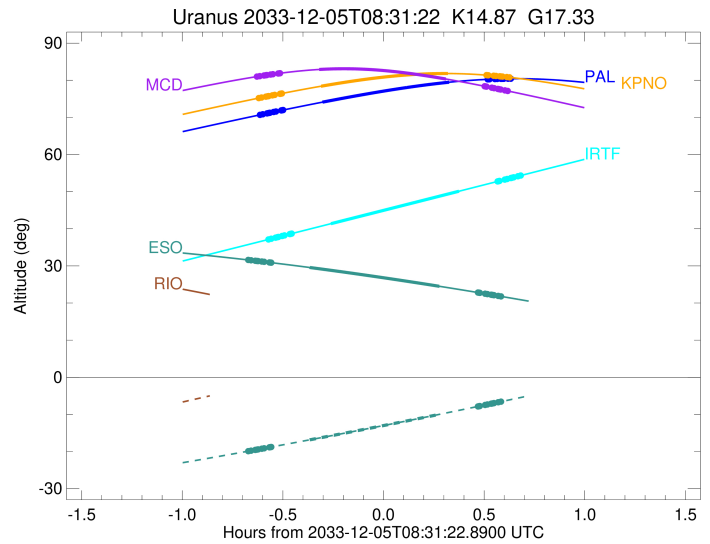
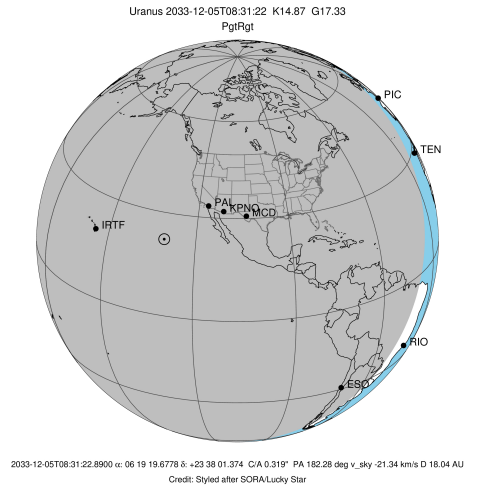
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-05T08:32:07.370
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3377544109571670144
 2Mass ID (if available) : 06191967+2338015
 ICRS Star Coord at Epoch: 06h 19m 19.67784s +23:38:01.37388s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 14.865
 G magnitude : 17.332
 RP magnitude : 16.534
 BP magnitude : 18.001
 DUPflag : 0
 Distance (au) : 18.036
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.34
 Sun-Target sep (deg) : 158.61
 Sun-Moon sep (deg) : 35.15
 B (ring opening deg) : 71.46
 PA of pole (deg) : 66.04
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.391
 C/A sky separation (km) : 5116.1
 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



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

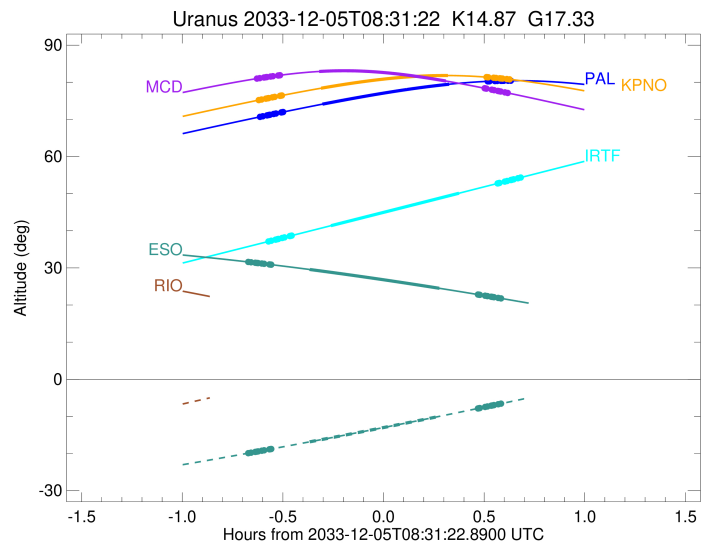
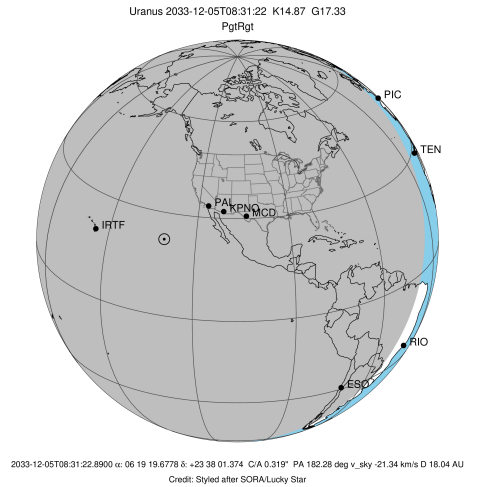
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-05T07:54:49.905		70.74	-78.62	50789.54	-22.53		
lambda	I	2033-12-05T07:55:23.755		70.85	-78.58	50026.71	-22.53		
delta	I	2033-12-05T07:56:40.382		71.09	-78.48	48300.35	-22.53		
gamma	I	2033-12-05T07:57:10.378		71.19	-78.44	47624.73	-22.52		
eta	I	2033-12-05T07:57:30.298		71.25	-78.41	47176.12	-22.52		
beta	I	2033-12-05T07:58:36.662		71.46	-78.32	45681.03	-22.51		
alpha	I	2033-12-05T07:59:19.238		71.59	-78.26	44725.69	-22.51		
4	I	2033-12-05T08:00:56.643		71.89	-78.11	42533.80	-22.49		
5	I	2033-12-05T08:01:09.274		71.93	-78.09	42237.30	-22.47		
6	I	2033-12-05T08:01:26.082		71.99	-78.06	41859.99	-22.48		
Uranus	I	2033-12-05T08:13:09.856		74.11	-76.74	25228.40		-14.51	-15.17
Uranus	E	2033-12-05T08:50:56.804		79.48	-70.67	25064.82		17.93	18.72
6	E	2033-12-05T09:02:26.628		80.26	-68.53	41824.04	22.51		
5	E	2033-12-05T09:02:43.976		80.27	-68.47	42212.85	22.50		
4	E	2033-12-05T09:03:01.301		80.28	-68.42	42613.78	22.52		
alpha	E	2033-12-05T09:04:34.636		80.33	-68.12	44719.19	22.54		
beta	E	2033-12-05T09:05:15.784		80.36	-67.99	45642.43	22.54		
eta	E	2033-12-05T09:06:23.764		80.38	-67.77	47176.12	22.55		
gamma	E	2033-12-05T09:06:43.743		80.39	-67.71	47626.65	22.55		
delta	E	2033-12-05T09:07:13.614		80.40	-67.61	48300.35	22.56		
lambda	E	2033-12-05T09:08:30.135		80.42	-67.37	50026.71	22.57		
epsilon	E	2033-12-05T09:09:33.699		80.43	-67.16	51461.27	22.56		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-05T08:31:44.810
 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 : 3377544109571670144
 2Mass ID (if available) : 06191967+2338015
 ICRS Star Coord at Epoch: 06h 19m 19.67784s +23:38:01.37388s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 14.865
 G magnitude : 17.332
 RP magnitude : 16.534
 BP magnitude : 18.001
 DUPflag : 0
 Distance (au) : 18.036
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.34
 Sun-Target sep (deg) : 158.61
 Sun-Moon sep (deg) : 35.22
 B (ring opening deg) : 71.46
 PA of pole (deg) : 66.04
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.379
 C/A sky separation (km) : 4960.4
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-05T07:54:28.268		75.25	-77.47	50790.24	-22.55		
lambda	I	2033-12-05T07:55:02.114		75.36	-77.38	50026.71	-22.56		
delta	I	2033-12-05T07:56:18.660		75.59	-77.19	48300.35	-22.55		
gamma	I	2033-12-05T07:56:48.623		75.68	-77.12	47624.75	-22.55		
eta	I	2033-12-05T07:57:08.523		75.74	-77.06	47176.12	-22.54		
beta	I	2033-12-05T07:58:14.815		75.94	-76.89	45681.01	-22.53		
alpha	I	2033-12-05T07:58:57.351		76.07	-76.78	44725.56	-22.53		
4	I	2033-12-05T08:00:34.644		76.36	-76.53	42533.69	-22.52		
5	I	2033-12-05T08:00:47.241		76.40	-76.50	42237.65	-22.50		
6	I	2033-12-05T08:01:04.053		76.44	-76.45	41859.84	-22.51		
Uranus	I	2033-12-05T08:12:46.586		78.41	-74.47	25224.90		-14.59	-15.25
Uranus	E	2033-12-05T08:50:35.349		81.82	-67.23	25066.25		17.90	18.69
6	E	2033-12-05T09:02:04.545		81.39	-64.90	41823.91	22.52		
5	E	2033-12-05T09:02:21.896		81.37	-64.84	42213.09	22.52		
4	E	2033-12-05T09:02:39.195		81.35	-64.78	42613.73	22.53		
alpha	E	2033-12-05T09:04:12.465		81.23	-64.46	44719.09	22.55		
beta	E	2033-12-05T09:04:53.590		81.17	-64.32	45642.41	22.55		
eta	E	2033-12-05T09:06:01.529		81.07	-64.09	47176.12	22.56		
gamma	E	2033-12-05T09:06:21.497		81.04	-64.02	47626.67	22.56		
delta	E	2033-12-05T09:06:51.349		81.00	-63.92	48300.35	22.57		
lambda	E	2033-12-05T09:08:07.828		80.88	-63.66	50026.71	22.58		
epsilon	E	2033-12-05T09:09:11.386		80.77	-63.44	51461.91	22.57		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-05T08:31:11.210
 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 : 3377544109571670144
 2Mass ID (if available) : 06191967+2338015
 ICRS Star Coord at Epoch: 06h 19m 19.67784s +23:38:01.37388s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 14.865
 G magnitude : 17.332
 RP magnitude : 16.534
 BP magnitude : 18.001
 DUPflag : 0
 Distance (au) : 18.036
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.34
 Sun-Target sep (deg) : 158.61
 Sun-Moon sep (deg) : 35.31
 B (ring opening deg) : 71.46
 PA of pole (deg) : 66.04
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.370
 C/A sky separation (km) : 4845.3
 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

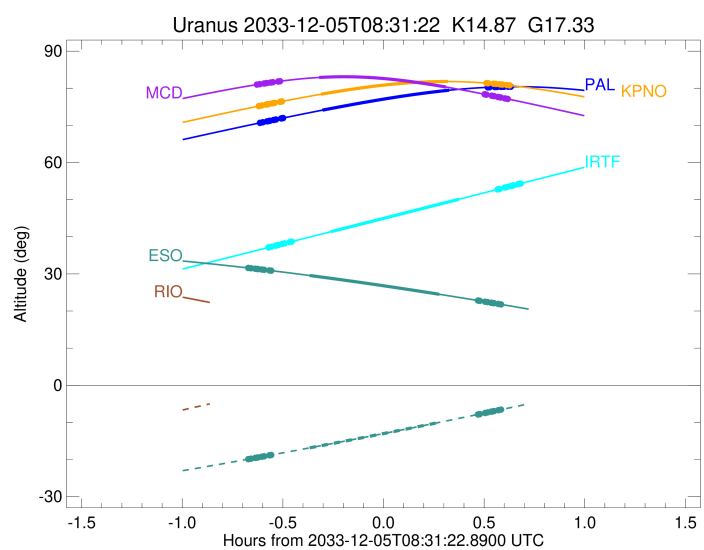
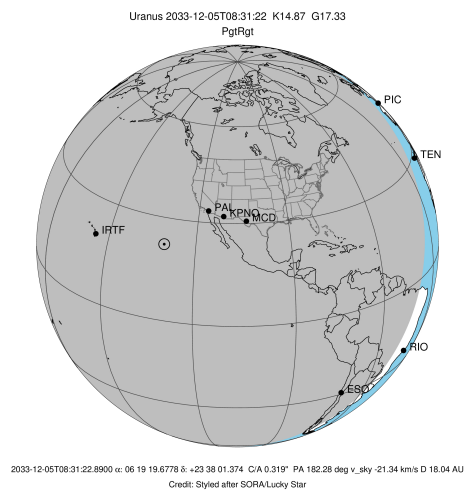


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-05T07:53:55.419		81.04	-72.95	50790.85	-22.57		
lambda	I	2033-12-05T07:54:29.262		81.12	-72.84	50026.71	-22.58		
delta	I	2033-12-05T07:55:45.740		81.29	-72.58	48300.35	-22.57		
gamma	I	2033-12-05T07:56:15.676		81.36	-72.49	47624.77	-22.57		
eta	I	2033-12-05T07:56:35.559		81.40	-72.42	47176.12	-22.56		
beta	I	2033-12-05T07:57:41.792		81.55	-72.20	45681.00	-22.55		
alpha	I	2033-12-05T07:58:24.294		81.64	-72.06	44725.44	-22.55		
4	I	2033-12-05T08:00:01.496		81.84	-71.74	42533.59	-22.54		
5	I	2033-12-05T08:00:14.065		81.86	-71.70	42237.94	-22.52		
6	I	2033-12-05T08:00:30.881		81.90	-71.64	41859.70	-22.53		
Uranus	I	2033-12-05T08:12:12.452		82.91	-69.27	25222.09		-14.66	-15.32
Uranus	E	2033-12-05T08:50:02.693		80.33	-61.34	25067.20		17.88	18.67
6	E	2033-12-05T09:01:31.569		78.39	-58.89	41823.84	22.53		
5	E	2033-12-05T09:01:48.925		78.34	-58.83	42213.23	22.52		
4	E	2033-12-05T09:02:06.210		78.29	-58.77	42613.70	22.54		
alpha	E	2033-12-05T09:03:39.456		78.01	-58.44	44719.04	22.56		
beta	E	2033-12-05T09:04:20.574		77.88	-58.29	45642.40	22.56		
eta	E	2033-12-05T09:05:28.500		77.68	-58.05	47176.12	22.57		
gamma	E	2033-12-05T09:05:48.465		77.61	-57.98	47626.68	22.57		
delta	E	2033-12-05T09:06:18.312		77.52	-57.87	48300.35	22.57		
lambda	E	2033-12-05T09:07:34.780		77.28	-57.60	50026.71	22.58		
epsilon	E	2033-12-05T09:08:38.346		77.09	-57.37	51462.26	22.58		

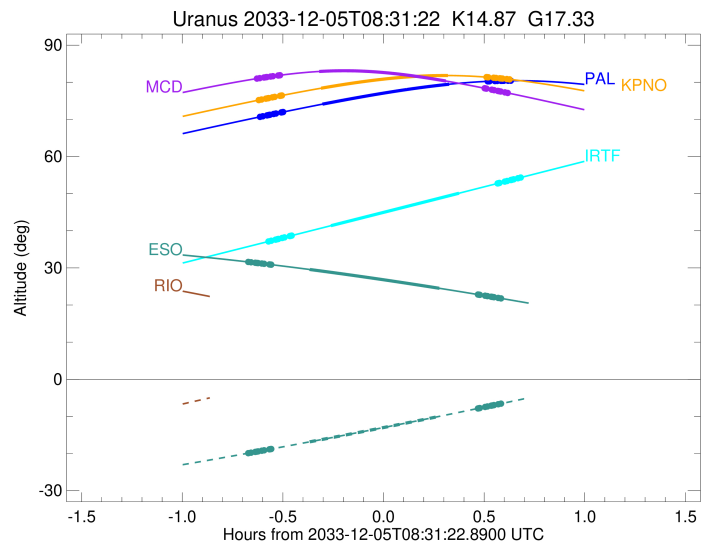
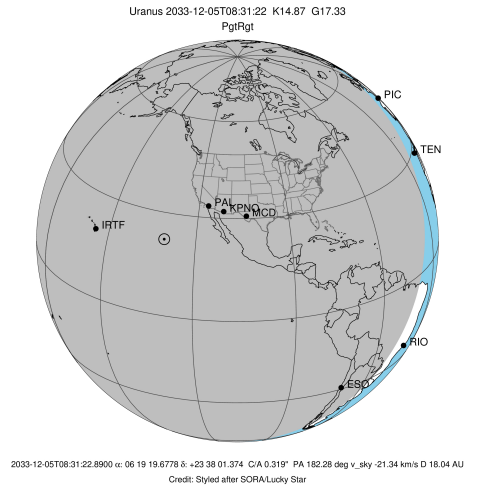
```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch              : 2033-12-05T08:34:52.460
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        : 3377544109571670144
2Mass ID (if available) : 06191967+2338015
ICRS Star Coord at Epoch: 06h 19m 19.67784s +23:38:01.37388s
RUWE (>1.4 is poor)  : 1.08
K magnitude           : 14.865
G magnitude           : 17.332
RP magnitude          : 16.534
BP magnitude          : 18.001
DUPflag              : 0
Distance (au)         : 18.036
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -21.34
Sun-Target sep (deg)  : 158.61
Sun-Moon sep (deg)    : 34.51
B (ring opening deg)  : 71.46
PA of pole (deg)      : 66.04
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.323
C/A sky separation (km) : 4222.8
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	2033-12-05T07:57:21.548		37.19	-58.42	50792.03	-22.43		
lambda	I	2033-12-05T07:57:55.654		37.32	-58.55	50026.71	-22.44		
delta	I	2033-12-05T07:59:12.597		37.61	-58.85	48300.35	-22.43		
gamma	I	2033-12-05T07:59:42.710		37.72	-58.96	47624.81	-22.43		
eta	I	2033-12-05T08:00:02.712		37.80	-59.04	47176.12	-22.43		
beta	I	2033-12-05T08:01:09.329		38.05	-59.30	45680.98	-22.43		
alpha	I	2033-12-05T08:01:52.085		38.21	-59.46	44725.17	-22.43		
4	I	2033-12-05T08:03:29.814		38.58	-59.84	42533.38	-22.42		
5	I	2033-12-05T08:03:42.409		38.63	-59.89	42238.65	-22.40		
6	I	2033-12-05T08:03:59.362		38.70	-59.95	41859.38	-22.41		
Uranus	I	2033-12-05T08:15:42.944		41.37	-62.66	25212.83		-14.86	-15.54
Uranus	E	2033-12-05T08:53:54.020		50.12	-71.47	25075.83		17.72	18.50
6	E	2033-12-05T09:05:23.742		52.76	-74.12	41822.98	22.51		
5	E	2033-12-05T09:05:41.221		52.82	-74.18	42214.88	22.50		
4	E	2033-12-05T09:05:58.426		52.89	-74.25	42613.35	22.52		
alpha	E	2033-12-05T09:07:31.762		53.25	-74.60	44718.34	22.53		
beta	E	2033-12-05T09:08:12.943		53.40	-74.76	45642.26	22.53		
eta	E	2033-12-05T09:09:20.948		53.66	-75.02	47176.12	22.54		
gamma	E	2033-12-05T09:09:40.938		53.74	-75.10	47626.78	22.54		
delta	E	2033-12-05T09:10:10.813		53.85	-75.21	48300.35	22.55		
lambda	E	2033-12-05T09:11:27.361		54.15	-75.50	50026.71	22.56		
epsilon	E	2033-12-05T09:12:31.206		54.39	-75.75	51467.04	22.55		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-05T08:28:41.810
 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 : 3377544109571670144
 2Mass ID (if available) : 06191967+2338015
 ICRS Star Coord at Epoch: 06h 19m 19.67784s +23:38:01.37388s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 14.865
 G magnitude : 17.332
 RP magnitude : 16.534
 BP magnitude : 18.001
 DUPflag : 0
 Distance (au) : 18.036
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.34
 Sun-Target sep (deg) : 158.61
 Sun-Moon sep (deg) : 35.33
 B (ring opening deg) : 71.46
 PA of pole (deg) : 66.04
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.034
 C/A sky separation (km) : 444.6
 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	2033-12-05T07:51:19.127		31.58	-19.87	50813.53	-22.65		
lambda	I	2033-12-05T07:51:53.868		31.52	-19.77	50026.71	-22.65		
delta	I	2033-12-05T07:53:10.097		31.38	-19.57	48300.35	-22.65		
gamma	I	2033-12-05T07:53:39.903		31.33	-19.48	47625.37	-22.65		
eta	I	2033-12-05T07:53:59.741		31.30	-19.43	47176.12	-22.65		
beta	I	2033-12-05T07:55:05.741		31.18	-19.25	45680.50	-22.64		
alpha	I	2033-12-05T07:55:48.261		31.10	-19.13	44721.30	-22.64		
4	I	2033-12-05T07:57:24.923		30.93	-18.86	42530.65	-22.64		
5	I	2033-12-05T07:57:36.870		30.91	-18.83	42248.35	-22.64		
6	I	2033-12-05T07:57:54.308		30.87	-18.78	41854.77	-22.63		
Uranus	I	2033-12-05T08:09:22.620		29.57	-16.85	25124.22		-16.75	-17.50
Uranus	E	2033-12-05T08:48:02.600		24.51	-9.99	25138.38		16.46	17.20
6	E	2033-12-05T08:59:31.753		22.83	-7.86	41818.93	22.58		
5	E	2033-12-05T08:59:49.691		22.78	-7.81	42222.89	22.58		
4	E	2033-12-05T09:00:06.368		22.74	-7.75	42611.45	22.58		
alpha	E	2033-12-05T09:01:39.445		22.51	-7.46	44715.10	22.58		
beta	E	2033-12-05T09:02:20.634		22.41	-7.33	45641.70	22.58		
eta	E	2033-12-05T09:03:28.540		22.23	-7.12	47176.12	22.58		
gamma	E	2033-12-05T09:03:48.520		22.18	-7.06	47627.25	22.58		
delta	E	2033-12-05T09:04:18.329		22.11	-6.97	48300.35	22.58		
lambda	E	2033-12-05T09:05:34.787		21.91	-6.73	50026.71	22.58		
epsilon	E	2033-12-05T09:06:39.453		21.75	-6.52	51486.75	22.58		