

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-04-15T06:10:26.010  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3427508426197598464  
 2Mass ID (if available) : 05503587+2338080

Uranus 2033-04-15T06:10:26 K13.35 G15.53 PgtRgt

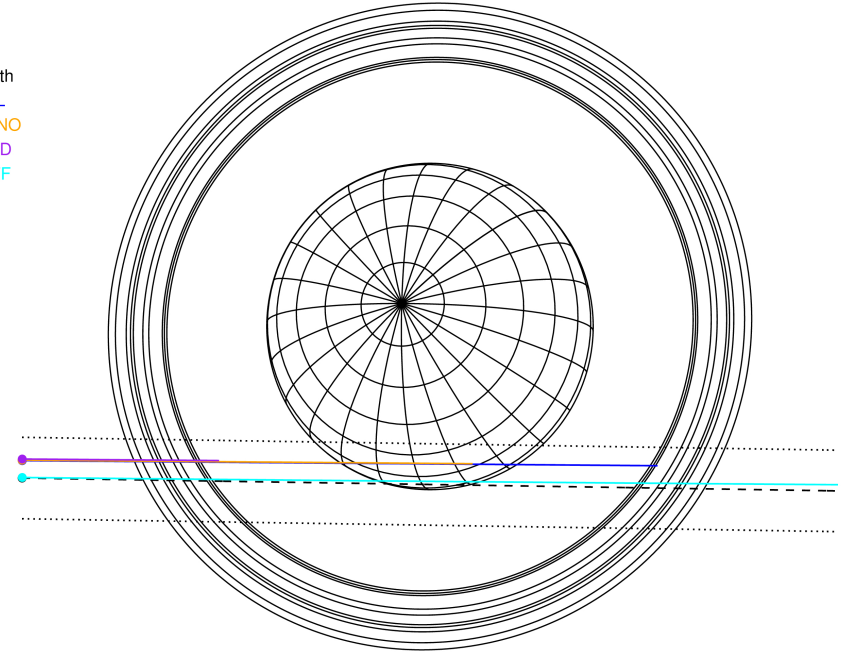
ICRS Star Coord at Epoch: 05h 50m 35.86465s +23:38:07.97077s

RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.354  
 G magnitude : 15.529  
 RP magnitude : 14.813  
 BP magnitude : 16.080  
 DUPflag : 0  
 Distance (au) : 19.438  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 20.01  
 Sun-Target sep (deg) : 62.71  
 Sun-Moon sep (deg) : 122.26  
 B (ring opening deg) : 77.10  
 PA of pole (deg) : 50.88



2033-04-15T06:10:26.0100 ex: 05 50 35.8646 8: +23 38 07.971 C/A 1.749° PA 359.10 deg v\_sky +20.01 km/s D 19.44 AU  
 Credit: Styled after SORA/Lucky Star

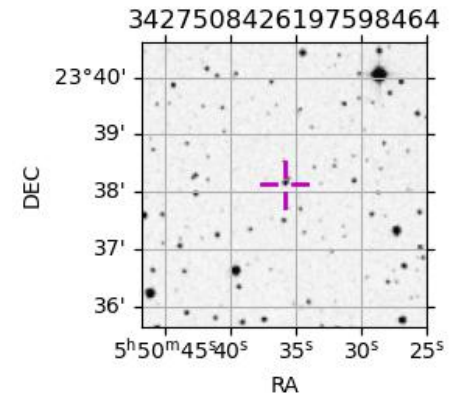
Earth  
 PAL  
 KPNO  
 MCD  
 IRTF



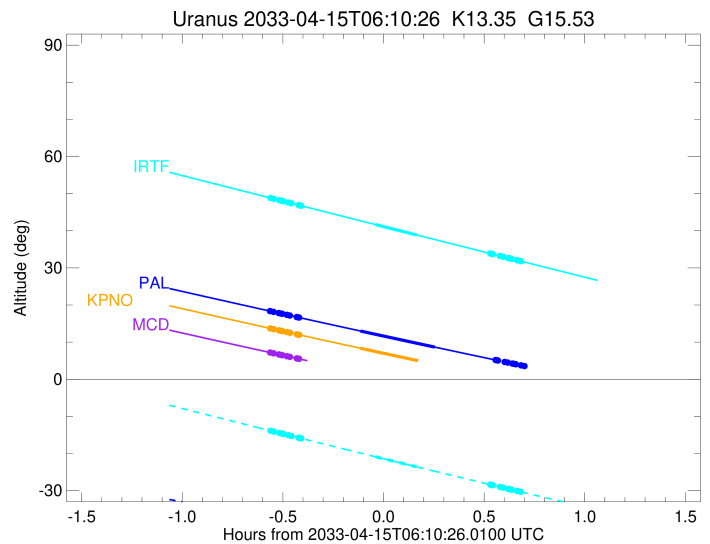
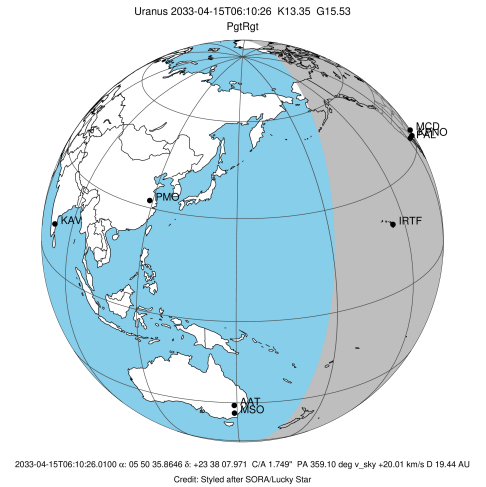
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1	+++++	+ +	+++	APR 15 05:36 - APR 15 06:44	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+		APR 15 05:36 - APR 15 06:03	PinRin
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++			APR 15 05:36 - APR 15 05:45	PnnRin
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	APR 15 05:36 - APR 15 06:51	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					PnnRnn
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



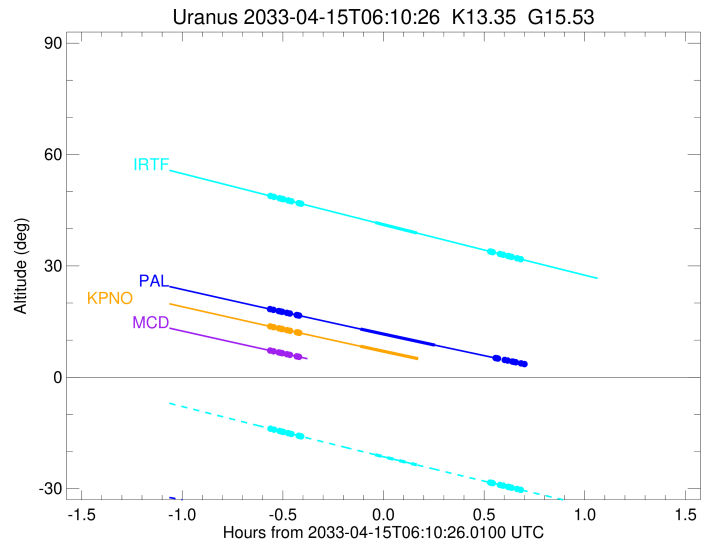
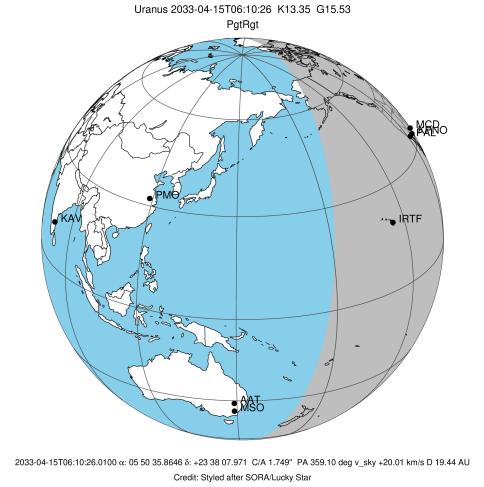
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-04-15T06:15:02.730  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3427508426197598464  
 2Mass ID (if available) : 05503587+2338080  
 ICRS Star Coord at Epoch: 05h 50m 35.86465s +23:38:07.97077s  
 RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.354  
 G magnitude : 15.529  
 RP magnitude : 14.813  
 BP magnitude : 16.080  
 DUPflag : 0  
 Distance (au) : 19.438  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 20.01  
 Sun-Target sep (deg) : 62.71  
 Sun-Moon sep (deg) : 122.84  
 B (ring opening deg) : 77.10  
 PA of pole (deg) : 50.88  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.526  
 C/A sky separation (km) : 21517.8  
 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\_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	2033-04-15T05:36:21.867		18.41	-36.82	51412.18	-18.41		
lambda	I	2033-04-15T05:37:37.563		18.16	-36.99	50026.71	-18.25		
delta	I	2033-04-15T05:39:12.563		17.84	-37.21	48300.35	-18.09		
gamma	I	2033-04-15T05:39:49.589		17.72	-37.30	47631.57	-18.03		
eta	I	2033-04-15T05:40:14.882		17.63	-37.35	47176.12	-17.98		
beta	I	2033-04-15T05:41:38.770		17.35	-37.55	45673.85	-17.83		
alpha	I	2033-04-15T05:42:32.351		17.17	-37.67	44722.27	-17.72		
4	I	2033-04-15T05:44:33.249		16.77	-37.94	42598.07	-17.44		
5	I	2033-04-15T05:44:58.484		16.69	-37.99	42158.65	-17.37		
6	I	2033-04-15T05:45:16.180		16.63	-38.03	41849.41	-17.31		
Uranus	I	2033-04-15T06:03:34.127		12.99	-40.33	25552.67		-1.34	-1.41
Uranus	E	2033-04-15T06:25:44.670		8.66	-42.73	25068.66		-12.07	-12.63
6	E	2033-04-15T06:43:48.134		5.19	-44.33	41795.47	17.41		
5	E	2033-04-15T06:44:16.425		5.10	-44.37	42292.40	17.48		
4	E	2033-04-15T06:44:32.736		5.05	-44.39	42590.48	17.55		
alpha	E	2033-04-15T06:46:34.965		4.67x	-44.54	44745.18	17.83		
beta	E	2033-04-15T06:47:26.393		4.50x	-44.61	45667.24	17.95		
eta	E	2033-04-15T06:48:50.115		4.24x	-44.71	47176.12	18.11		
gamma	E	2033-04-15T06:49:14.779		4.16x	-44.74	47623.34	18.16		
delta	E	2033-04-15T06:49:51.998		4.04x	-44.79	48300.35	18.22		
lambda	E	2033-04-15T06:51:26.310		3.75x	-44.90	50026.71	18.38		
epsilon	E	2033-04-15T06:52:30.681		3.54x	-44.97	51213.32	18.55		

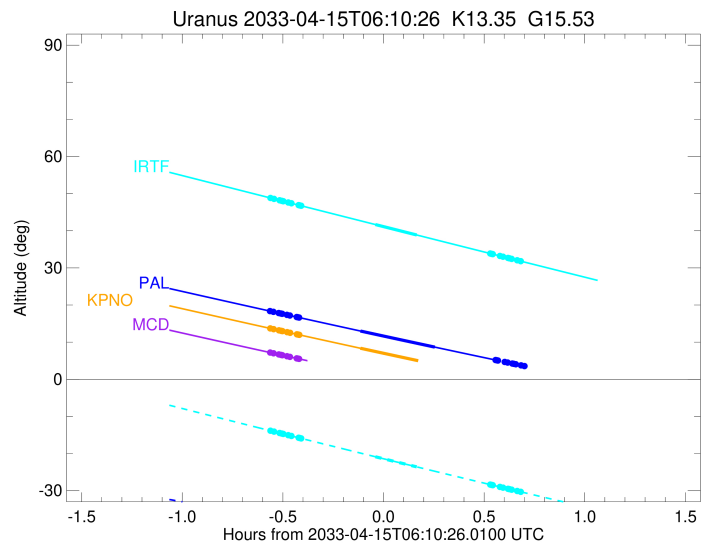
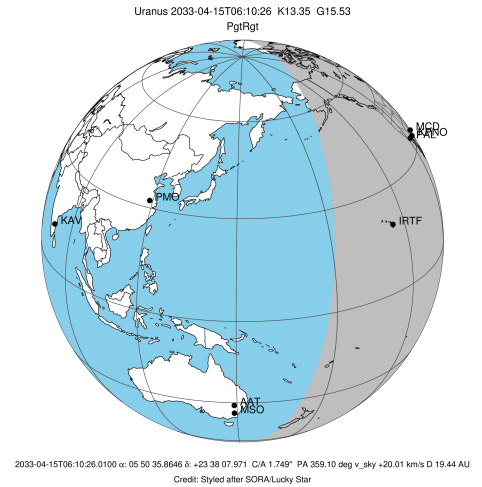
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2033-04-15T06:15:04.790
Event type           : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : KPNO
Location             : Kitt Peak Natl Obs
Latitude (deg)       : 31.96333
E. Longitude (deg)   : 248.40000
Altitude (km)        : 2.120
Gaia source ID       : 3427508426197598464
2Mass ID (if available) : 05503587+2338080
ICRS Star Coord at Epoch: 05h 50m 35.86465s +23:38:07.97077s
RUWE (>1.4 is poor) : 1.02
K magnitude           : 13.354
G magnitude           : 15.529
RP magnitude          : 14.813
BP magnitude          : 16.080
DUPflag              : 0
Distance (au)        : 19.438
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : 20.01
Sun-Target sep (deg) : 62.71
Sun-Moon sep (deg)   : 122.78
B (ring opening deg) : 77.10
PA of pole (deg)     : 50.88
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.521
C/A sky separation (km) : 21436.8
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_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	2033-04-15T05:36:26.415		13.75	-40.72	51411.67	-18.46		
lambda	I	2033-04-15T05:37:41.883		13.49	-40.88	50026.71	-18.30		
delta	I	2033-04-15T05:39:16.625		13.18	-41.08	48300.35	-18.14		
gamma	I	2033-04-15T05:39:53.548		13.05	-41.15	47631.57	-18.08		
eta	I	2033-04-15T05:40:18.770		12.97	-41.20	47176.12	-18.04		
beta	I	2033-04-15T05:41:42.419		12.69	-41.38	45673.82	-17.88		
alpha	I	2033-04-15T05:42:35.846		12.51	-41.49	44722.20	-17.77		
4	I	2033-04-15T05:44:36.376		12.11	-41.73	42597.99	-17.50		
5	I	2033-04-15T05:45:01.530		12.03	-41.78	42158.60	-17.43		
6	I	2033-04-15T05:45:19.161		11.97	-41.82	41849.50	-17.37		
Uranus	I	2033-04-15T06:03:31.109		8.36	-43.84	25553.35		-1.27	-1.33
Uranus	E	2033-04-15T06:25:52.031		4.02x	-45.87	25066.48		-12.10	-12.66
6	E	2033-04-15T06:43:49.535		0.59x	-47.08	41795.48	17.47		
5	E	2033-04-15T06:44:17.740		0.51x	-47.11	42292.53	17.54		
4	E	2033-04-15T06:44:33.987		0.45x	-47.12	42590.39	17.60		
alpha	E	2033-04-15T06:46:35.843		0.07x	-47.23	44745.14	17.89		
beta	E	2033-04-15T06:47:27.119		-0.09x	-47.28	45667.20	18.00		
eta	E	2033-04-15T06:48:50.601		-0.35x	-47.35	47176.12	18.16		
gamma	E	2033-04-15T06:49:15.195		-0.43x	-47.37	47623.33	18.21		
delta	E	2033-04-15T06:49:52.309		-0.54x	-47.40	48300.35	18.27		
lambda	E	2033-04-15T06:51:26.362		-0.84x	-47.47	50026.71	18.43		
epsilon	E	2033-04-15T06:52:30.522		-1.03x	-47.52	51212.61	18.60		

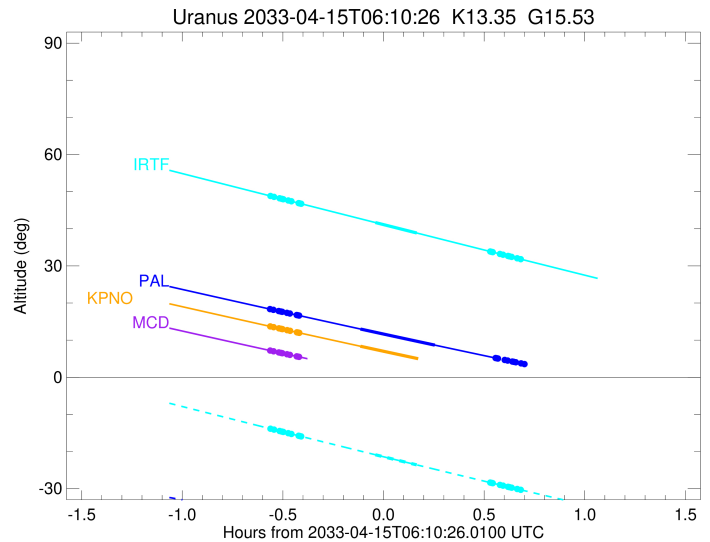
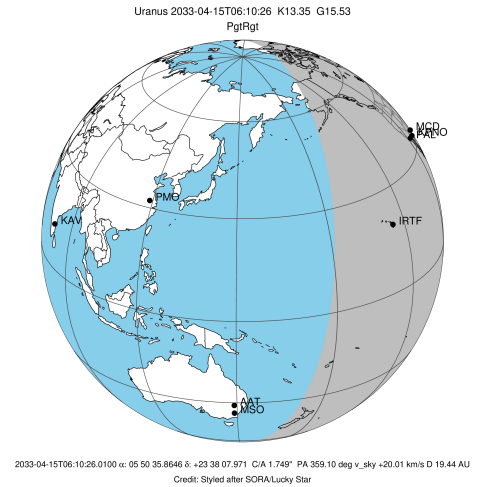
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-04-15T06:15:01.180  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 3427508426197598464  
 2Mass ID (if available) : 05503587+2338080  
 ICRS Star Coord at Epoch: 05h 50m 35.86465s +23:38:07.97077s  
 RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.354  
 G magnitude : 15.529  
 RP magnitude : 14.813  
 BP magnitude : 16.080  
 DUPflag : 0  
 Distance (au) : 19.438  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 20.01  
 Sun-Target sep (deg) : 62.71  
 Sun-Moon sep (deg) : 122.69  
 B (ring opening deg) : 77.10  
 PA of pole (deg) : 50.88  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.508  
 C/A sky separation (km) : 21259.4  
 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	2033-04-15T05:36:25.212		7.24	-45.31	51410.48	-18.54		
lambda	I	2033-04-15T05:37:40.275		6.99	-45.43	50026.71	-18.38		
delta	I	2033-04-15T05:39:14.578		6.68	-45.59	48300.35	-18.23		
gamma	I	2033-04-15T05:39:51.325		6.56	-45.65	47631.57	-18.17		
eta	I	2033-04-15T05:40:16.425		6.48	-45.69	47176.12	-18.12		
beta	I	2033-04-15T05:41:39.664		6.20	-45.83	45673.75	-17.97		
alpha	I	2033-04-15T05:42:32.822		6.03	-45.91	44722.05	-17.87		
4	I	2033-04-15T05:44:32.712		5.63	-46.10	42597.81	-17.59		
5	I	2033-04-15T05:44:57.721		5.55	-46.14	42158.48	-17.53		
6	I	2033-04-15T05:45:15.232		5.50	-46.17	41849.70	-17.46		
Uranus	I	2033-04-15T06:03:15.799		1.98x	-47.66	25554.71		-1.11	-1.16
Uranus	E	2033-04-15T06:26:00.609		-2.36x	-48.96	25061.96		-12.16	-12.72
6	E	2033-04-15T06:43:46.893		-5.67x	-49.49	41795.52	17.57		
5	E	2033-04-15T06:44:14.954		-5.75x	-49.49	42292.80	17.63		
4	E	2033-04-15T06:44:31.088		-5.80x	-49.50	42590.19	17.70		
alpha	E	2033-04-15T06:46:32.307		-6.17x	-49.53	44745.05	17.98		
beta	E	2033-04-15T06:47:23.327		-6.33x	-49.54	45667.12	18.09		
eta	E	2033-04-15T06:48:46.407		-6.58x	-49.55	47176.12	18.25		
gamma	E	2033-04-15T06:49:10.883		-6.65x	-49.56	47623.32	18.29		
delta	E	2033-04-15T06:49:47.825		-6.77x	-49.56	48300.35	18.36		
lambda	E	2033-04-15T06:51:21.450		-7.05x	-49.58	50026.71	18.52		
epsilon	E	2033-04-15T06:52:25.248		-7.24x	-49.58	51211.14	18.68		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2033-04-15T06:14:36.930
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       : 3427508426197598464
2Mass ID (if available) : 05503587+2338080
ICRS Star Coord at Epoch: 05h 50m 35.86465s +23:38:07.97077s
RUWE (>1.4 is poor) : 1.02
K magnitude           : 13.354
G magnitude           : 15.529
RP magnitude          : 14.813
BP magnitude          : 16.080
DUPflag              : 0
Distance (au)         : 19.438
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : 20.01
Sun-Target sep (deg) : 62.71
Sun-Moon sep (deg)   : 123.14
B (ring opening deg) : 77.10
PA of pole (deg)     : 50.88
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.720
C/A sky separation (km) : 24252.6
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_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	2033-04-15T05:36:28.668		48.90	-13.81	51429.98	-17.63		
lambda	I	2033-04-15T05:37:48.857		48.59	-14.11	50026.71	-17.43		
delta	I	2033-04-15T05:39:28.488		48.21	-14.48	48300.35	-17.23		
gamma	I	2033-04-15T05:40:07.405		48.06	-14.63	47631.58	-17.14		
eta	I	2033-04-15T05:40:34.020		47.96	-14.73	47176.12	-17.08		
beta	I	2033-04-15T05:42:02.423		47.62	-15.06	45674.89	-16.88		
alpha	I	2033-04-15T05:42:59.014		47.40	-15.27	44724.65	-16.73		
4	I	2033-04-15T05:45:07.396		46.91	-15.76	42600.77	-16.37		
5	I	2033-04-15T05:45:34.367		46.81	-15.86	42160.77	-16.28		
6	I	2033-04-15T05:45:53.623		46.74	-15.93	41846.19	-16.20		
Uranus	I	2033-04-15T06:07:59.873		41.68	-20.87	25487.42		-4.53	-4.74
Uranus	E	2033-04-15T06:20:21.283		38.86	-23.60	25188.07		-10.44	-10.93
6	E	2033-04-15T06:42:12.215		33.89	-28.36	41794.98	16.28		
5	E	2033-04-15T06:42:42.220		33.78	-28.47	42287.83	16.37		
4	E	2033-04-15T06:43:00.062		33.71	-28.53	42593.60	16.46		
alpha	E	2033-04-15T06:45:09.885		33.22	-29.00	44746.63	16.83		
beta	E	2033-04-15T06:46:04.293		33.01	-29.19	45668.58	16.98		
eta	E	2033-04-15T06:47:32.565		32.68	-29.51	47176.12	17.19		
gamma	E	2033-04-15T06:47:58.553		32.58	-29.60	47623.64	17.25		
delta	E	2033-04-15T06:48:37.681		32.43	-29.74	48300.35	17.34		
lambda	E	2033-04-15T06:50:16.654		32.06	-30.09	50026.71	17.54		
epsilon	E	2033-04-15T06:51:25.408		31.80	-30.34	51237.48	17.75		