

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-01-18T08:13:53.390
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427506257238156416
 2Mass ID (if available) : 05511953+2338235

Uranus 2033-01-18T08:13:53 K12.44 G16.14 PgtRgt

ICRS Star Coord at Epoch: 05h 51m 19.53642s +23:38:23.56226s

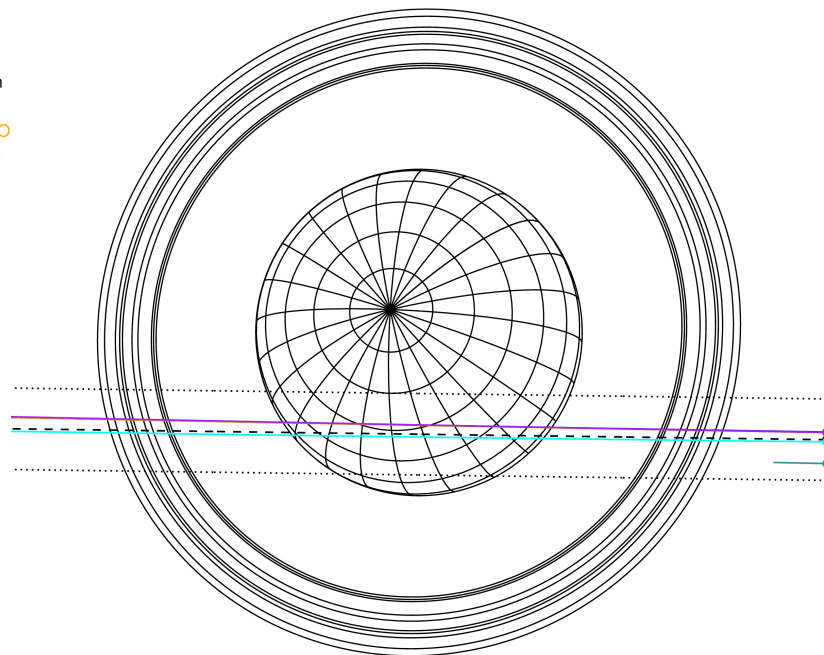
RUWE (>1.4 is poor) : 1.12
 K magnitude : 12.444
 G magnitude : 16.140
 RP magnitude : 15.100
 BP magnitude : 17.225
 DUPflag : 0
 Distance (au) : 18.157
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.41
 Sun-Target sep (deg) : 149.93
 Sun-Moon sep (deg) : 61.53
 B (ring opening deg) : 76.97
 PA of pole (deg) : 51.40

Uranus 2033-01-18T08:13:53 K12.44 G16.14
 PgtRgt



2033-01-18T08:13:53.3900 ex: 05 51 19.5364 s: +23 38 23.562 C/A 1.203° PA 359.23 deg v_sky -19.41 km/s D 18.16 AU
 Credit: Styled after SORA/Lucky Star

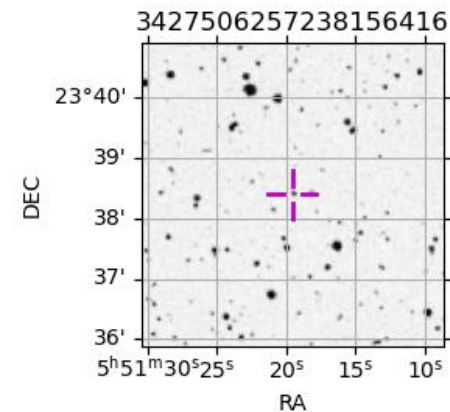
Earth
 PAL
 KPNO
 MCD
 IRTF
 ESO



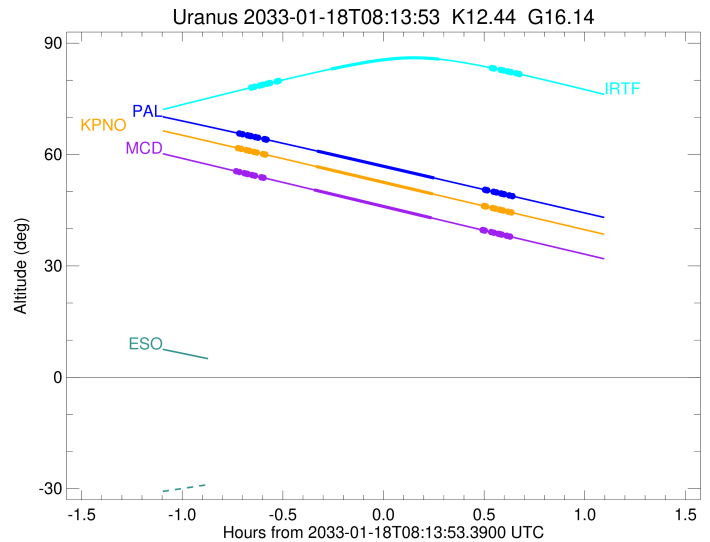
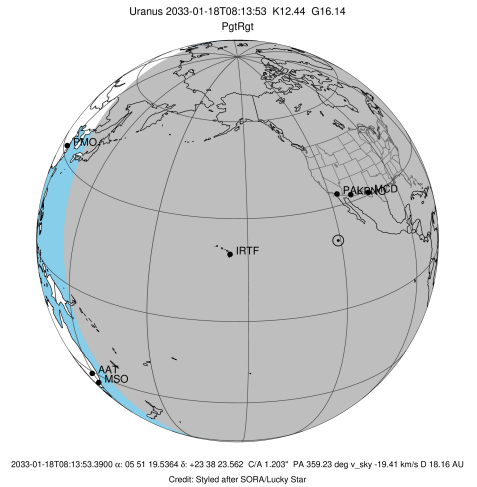
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1	+++++	+ +	+++++	JAN 18 07:31 - JAN 18 08:52	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	JAN 18 07:30 - JAN 18 08:52	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	JAN 18 07:30 - JAN 18 08:51	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	JAN 18 07:34 - JAN 18 08:54	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

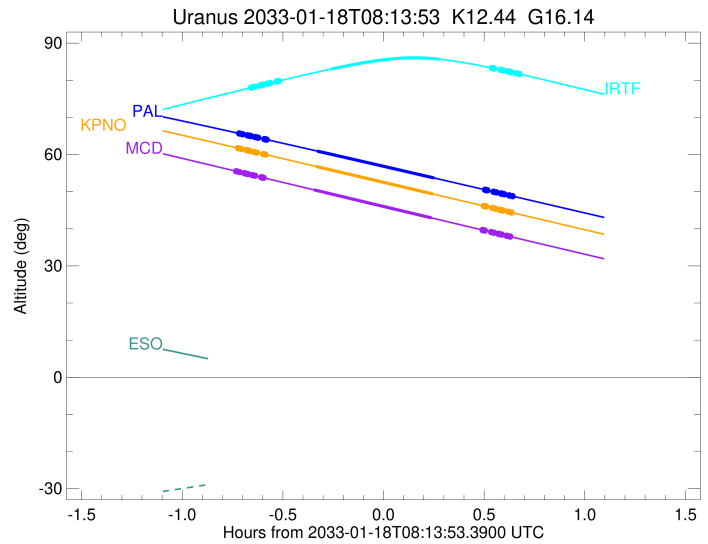
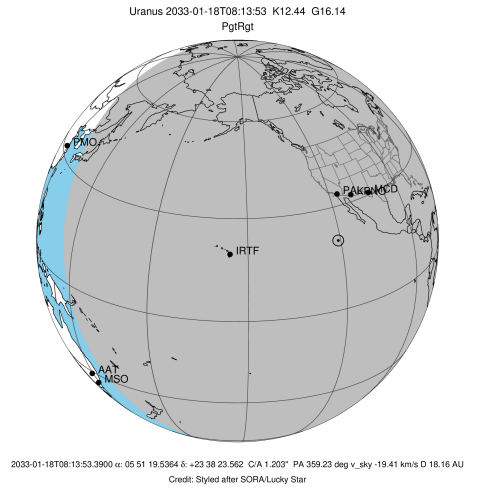


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-01-18T08:11:15.740
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3427506257238156416
 2Mass ID (if available) : 05511953+2338235
 ICRS Star Coord at Epoch: 05h 51m 19.53642s +23:38:23.56226s
 RUWE (>1.4 is poor) : 1.12
 K magnitude : 12.444
 G magnitude : 16.140
 RP magnitude : 15.100
 BP magnitude : 17.225
 DUPflag : 0
 Distance (au) : 18.157
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.41
 Sun-Target sep (deg) : 149.93
 Sun-Moon sep (deg) : 61.99
 B (ring opening deg) : 76.97
 PA of pole (deg) : 51.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.101
 C/A sky separation (km) : 14504.9
 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



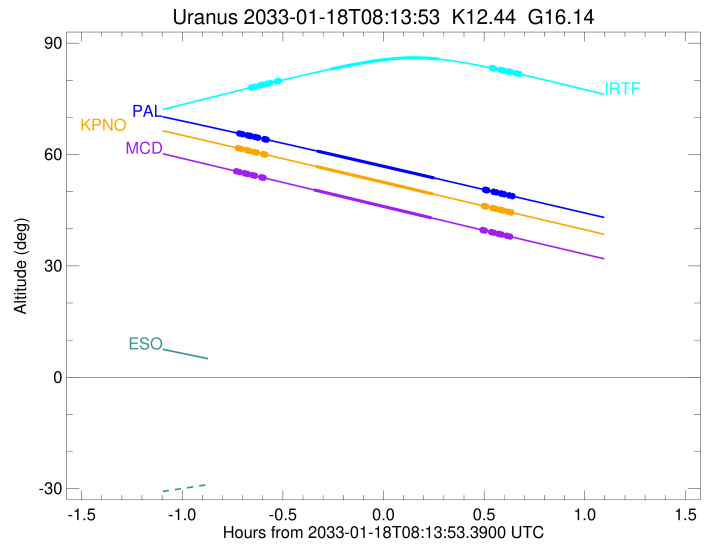
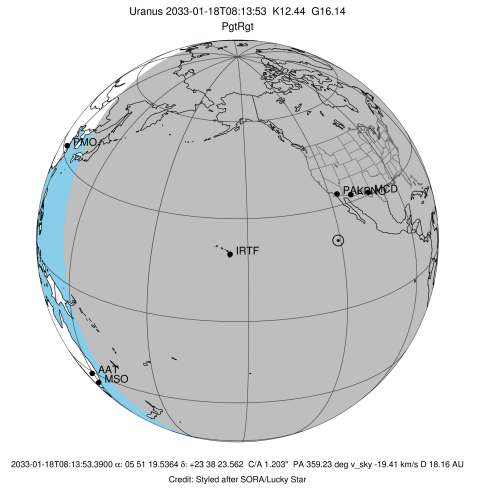
Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-01-18T07:31:12.869	65.60	-75.96	50786.52	-19.22		
lambda	I	2033-01-18T07:31:52.392	65.47	-76.02	50026.71	-19.21		
delta	I	2033-01-18T07:33:22.411	65.17	-76.16	48300.35	-19.14		
gamma	I	2033-01-18T07:33:57.580	65.05	-76.21	47627.59	-19.11		
eta	I	2033-01-18T07:34:21.211	64.97	-76.24	47176.12	-19.10		
beta	I	2033-01-18T07:35:40.904	64.70	-76.35	45656.96	-19.02		
alpha	I	2033-01-18T07:36:31.356	64.53	-76.42	44700.29	-18.97		
4	I	2033-01-18T07:38:22.360	64.16	-76.55	42594.37	-18.85		
5	I	2033-01-18T07:38:46.177	64.07	-76.58	42158.74	-18.83		
6	I	2033-01-18T07:39:02.781	64.02	-76.60	41843.88	-18.82		
Uranus	I	2033-01-18T07:54:03.822	60.94	-77.24	25003.88		-13.02	-13.62
Uranus	E	2033-01-18T08:28:59.802	53.68	-75.51	25505.64		3.95	4.13
6	E	2033-01-18T08:44:10.167	50.50	-73.63	41859.58	18.75		
5	E	2033-01-18T08:44:32.504	50.43	-73.57	42276.89	18.76		
4	E	2033-01-18T08:44:46.271	50.38	-73.54	42528.44	18.78		
alpha	E	2033-01-18T08:46:42.163	49.97	-73.27	44715.19	18.90		
beta	E	2033-01-18T08:47:31.691	49.80	-73.15	45652.56	18.94		
eta	E	2033-01-18T08:48:51.975	49.52	-72.95	47176.12	19.01		
gamma	E	2033-01-18T08:49:15.424	49.44	-72.89	47622.20	19.03		
delta	E	2033-01-18T08:49:51.031	49.31	-72.81	48300.35	19.06		
lambda	E	2033-01-18T08:51:21.457	49.00	-72.58	50026.71	19.12		
epsilon	E	2033-01-18T08:52:30.568	48.76	-72.40	51349.85	19.13		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-01-18T08:10:53.950
 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 : 3427506257238156416
 2Mass ID (if available) : 05511953+2338235
 ICRS Star Coord at Epoch: 05h 51m 19.53642s +23:38:23.56226s
 RUWE (>1.4 is poor) : 1.12
 K magnitude : 12.444
 G magnitude : 16.140
 RP magnitude : 15.100
 BP magnitude : 17.225
 DUPflag : 0
 Distance (au) : 18.157
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.41
 Sun-Target sep (deg) : 149.93
 Sun-Moon sep (deg) : 61.93
 B (ring opening deg) : 76.97
 PA of pole (deg) : 51.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.104
 C/A sky separation (km) : 14534.0
 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	2033-01-18T07:30:49.917	61.65	-78.58	50786.29	-19.20		
lambda	I	2033-01-18T07:31:29.456	61.51	-78.60	50026.71	-19.20		
delta	I	2033-01-18T07:32:59.543	61.19	-78.63	48300.35	-19.13		
gamma	I	2033-01-18T07:33:34.739	61.07	-78.64	47627.58	-19.10		
eta	I	2033-01-18T07:33:58.388	60.99	-78.64	47176.12	-19.08		
beta	I	2033-01-18T07:35:18.144	60.71	-78.66	45656.94	-19.01		
alpha	I	2033-01-18T07:36:08.639	60.53	-78.66	44700.25	-18.96		
4	I	2033-01-18T07:37:59.737	60.14	-78.66	42594.32	-18.83		
5	I	2033-01-18T07:38:23.573	60.05	-78.65	42158.71	-18.81		
6	I	2033-01-18T07:38:40.186	60.00	-78.65	41843.94	-18.81		
Uranus	I	2033-01-18T07:53:42.285	56.81	-78.04	25003.80		-13.02	-13.62
Uranus	E	2033-01-18T08:28:37.978	49.38	-73.78	25505.89		3.94	4.12
6	E	2033-01-18T08:43:49.736	46.14	-71.20	41859.59	18.73		
5	E	2033-01-18T08:44:12.102	46.06	-71.13	42276.88	18.73		
4	E	2033-01-18T08:44:25.889	46.01	-71.09	42528.44	18.75		
alpha	E	2033-01-18T08:46:21.933	45.60	-70.74	44715.19	18.87		
beta	E	2033-01-18T08:47:11.526	45.42	-70.60	45652.56	18.92		
eta	E	2033-01-18T08:48:31.915	45.14	-70.35	47176.12	18.99		
gamma	E	2033-01-18T08:48:55.395	45.05	-70.28	47622.20	19.01		
delta	E	2033-01-18T08:49:31.048	44.93	-70.17	48300.35	19.03		
lambda	E	2033-01-18T08:51:01.591	44.61	-69.89	50026.71	19.10		
epsilon	E	2033-01-18T08:52:10.791	44.36	-69.68	51349.85	19.10		

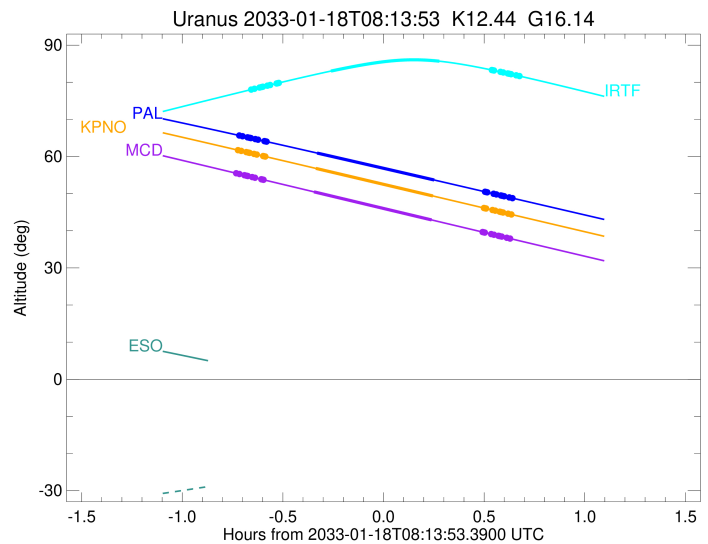
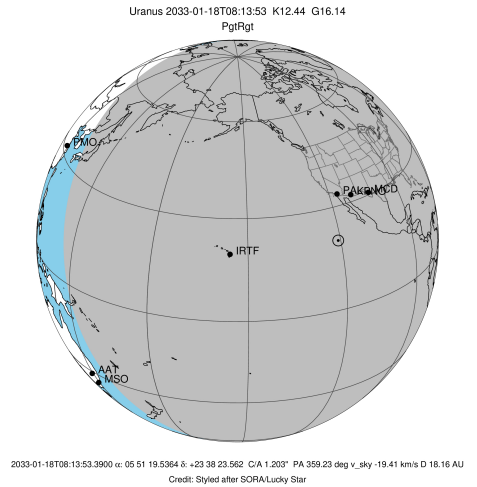
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-01-18T08:10:25.810
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : MCD
 Location : McDonald Obs. 2.7m
 Latitude (deg) : 30.67158
 E. Longitude (deg) : 255.97844
 Altitude (km) : 2.075
 Gaia source ID : 3427506257238156416
 2Mass ID (if available) : 05511953+2338235
 ICRS Star Coord at Epoch: 05h 51m 19.53642s +23:38:23.56226s
 RUWE (>1.4 is poor) : 1.12
 K magnitude : 12.444
 G magnitude : 16.140
 RP magnitude : 15.100
 BP magnitude : 17.225
 DUPflag : 0
 Distance (au) : 18.157
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.41
 Sun-Target sep (deg) : 149.93
 Sun-Moon sep (deg) : 61.83
 B (ring opening deg) : 76.97
 PA of pole (deg) : 51.40
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.099
 C/A sky separation (km) : 14473.1
 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_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	2033-01-18T07:30:17.388		55.43	-78.61	50786.36	-19.19		
lambda	I	2033-01-18T07:30:56.963		55.29	-78.54	50026.71	-19.18		
delta	I	2033-01-18T07:32:27.122		54.96	-78.37	48300.35	-19.11		
gamma	I	2033-01-18T07:33:02.346		54.84	-78.31	47627.58	-19.08		
eta	I	2033-01-18T07:33:26.013		54.75	-78.26	47176.12	-19.07		
beta	I	2033-01-18T07:34:45.831		54.46	-78.10	45656.95	-18.99		
alpha	I	2033-01-18T07:35:36.363		54.28	-78.00	44700.26	-18.94		
4	I	2033-01-18T07:37:27.541		53.88	-77.77	42594.35	-18.82		
5	I	2033-01-18T07:37:51.394		53.80	-77.71	42158.73	-18.80		
6	I	2033-01-18T07:38:08.022		53.74	-77.68	41843.91	-18.79		
Uranus	I	2033-01-18T07:53:10.353		50.49	-75.46	25003.88		-13.02	-13.62
Uranus	E	2033-01-18T08:28:13.708		42.93	-69.04	25504.66		3.98	4.17
6	E	2033-01-18T08:43:26.102		39.66	-65.99	41859.50	18.70		
5	E	2033-01-18T08:43:48.510		39.58	-65.92	42277.04	18.71		
4	E	2033-01-18T08:44:02.310		39.53	-65.87	42528.47	18.73		
alpha	E	2033-01-18T08:45:58.514		39.11	-65.47	44715.27	18.84		
beta	E	2033-01-18T08:46:48.175		38.94	-65.30	45652.60	18.89		
eta	E	2033-01-18T08:48:08.678		38.65	-65.03	47176.12	18.96		
gamma	E	2033-01-18T08:48:32.194		38.57	-64.95	47622.20	18.98		
delta	E	2033-01-18T08:49:07.900		38.44	-64.83	48300.35	19.01		
lambda	E	2033-01-18T08:50:38.581		38.11	-64.52	50026.71	19.07		
epsilon	E	2033-01-18T08:51:47.927		37.87	-64.28	51350.58	19.07		

```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch             : 2033-01-18T08:14:05.150
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        : 3427506257238156416
2Mass ID (if available) : 05511953+2338235
ICRS Star Coord at Epoch: 05h 51m 19.53642s +23:38:23.56226s
RUWE (>1.4 is poor)  : 1.12
K magnitude           : 12.444
G magnitude           : 16.140
RP magnitude          : 15.100
BP magnitude          : 17.225
DUPflag              : 0
Distance (au)         : 18.157
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -19.41
Sun-Target sep (deg)  : 149.93
Sun-Moon sep (deg)    : 62.34
B (ring opening deg)  : 76.97
PA of pole (deg)      : 51.40
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.243
C/A sky separation (km) : 16365.7
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	2033-01-18T07:34:46.447		78.11	-48.44	50780.61	-19.04		
lambda	I	2033-01-18T07:35:26.022		78.25	-48.60	50026.71	-19.03		
delta	I	2033-01-18T07:36:56.928		78.59	-48.95	48300.35	-18.95		
gamma	I	2033-01-18T07:37:32.478		78.71	-49.09	47627.39	-18.91		
eta	I	2033-01-18T07:37:56.357		78.80	-49.18	47176.12	-18.89		
beta	I	2033-01-18T07:39:17.011		79.09	-49.49	45656.20	-18.79		
alpha	I	2033-01-18T07:40:08.121		79.28	-49.69	44699.16	-18.73		
4	I	2033-01-18T07:42:00.686		79.68	-50.13	42592.70	-18.57		
5	I	2033-01-18T07:42:24.822		79.77	-50.22	42157.75	-18.55		
6	I	2033-01-18T07:42:41.512		79.83	-50.28	41845.70	-18.54		
Uranus	I	2033-01-18T07:58:12.556		83.02	-53.90	25004.60		-13.01	-13.61
Uranus	E	2033-01-18T08:30:32.769		85.68	-61.44	25533.04		2.75	2.88
6	E	2033-01-18T08:46:11.449		83.31	-65.10	41861.47	18.53		
5	E	2033-01-18T08:46:33.751		83.24	-65.19	42273.23	18.54		
4	E	2033-01-18T08:46:47.793		83.19	-65.24	42527.72	18.57		
alpha	E	2033-01-18T08:48:44.822		82.82	-65.70	44713.52	18.73		
beta	E	2033-01-18T08:49:34.816		82.65	-65.89	45651.69	18.79		
eta	E	2033-01-18T08:50:55.757		82.39	-66.21	47176.12	18.88		
gamma	E	2033-01-18T08:51:19.360		82.31	-66.30	47622.04	18.91		
delta	E	2033-01-18T08:51:55.204		82.19	-66.44	48300.35	18.94		
lambda	E	2033-01-18T08:53:26.138		81.88	-66.79	50026.71	19.03		
epsilon	E	2033-01-18T08:54:34.758		81.65	-67.06	51334.33	19.04		