

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-01-15T08:28:52.140  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3427500106844991616  
 2Mass ID (if available) : 05514782+2338293

Uranus 2033-01-15T08:28:52 K14.14 G16.68 PgtRgt

ICRS Star Coord at Epoch: 05h 51m 47.82681s +23:38:29.28592s

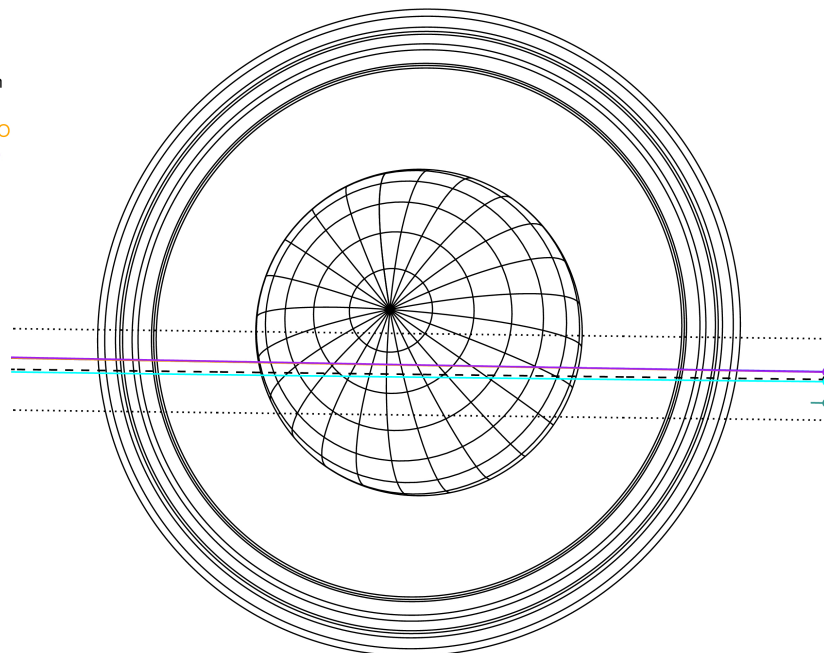
RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.140  
 G magnitude : 16.677  
 RP magnitude : 15.895  
 BP magnitude : 17.345  
 DUPflag : 0  
 Distance (au) : 18.133  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.19  
 Sun-Target sep (deg) : 153.08  
 Sun-Moon sep (deg) : 25.20  
 B (ring opening deg) : 76.88  
 PA of pole (deg) : 51.73

Uranus 2033-01-15T08:28:52 K14.14 G16.68  
 PgtRgt



2033-01-15T08:28:52.1400 ra: 05 51 47.8268 s: +23 38 29.286 C/A 0.493° PA 359.29 deg v\_sky -20.19 km/s D 18.13 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PAL  
 KPNO  
 MCD  
 IRTF  
 ESO

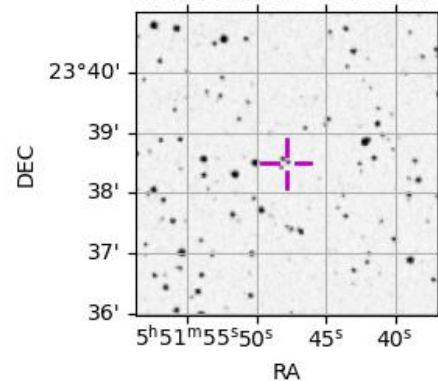


#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

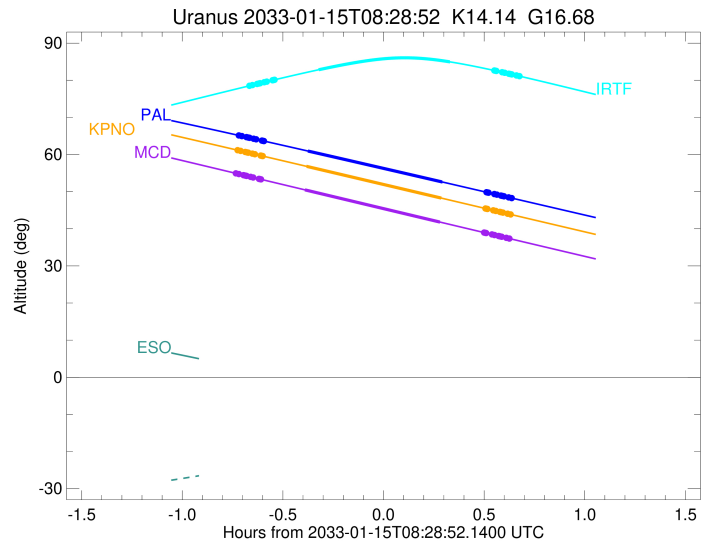
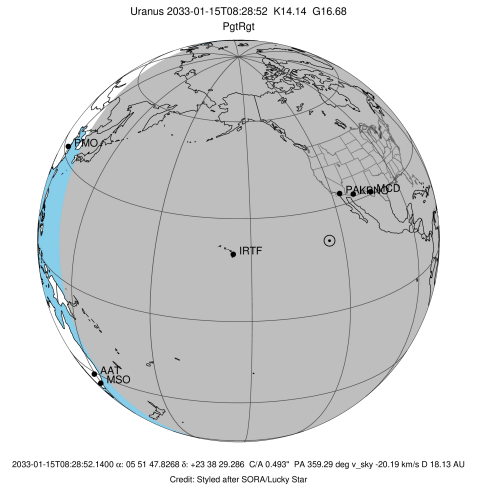
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 15 07:46 - JAN 15 09:07	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	JAN 15 07:45 - JAN 15 09:06	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	JAN 15 07:45 - JAN 15 09:06	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	JAN 15 07:49 - JAN 15 09:09	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

3427500106844991616

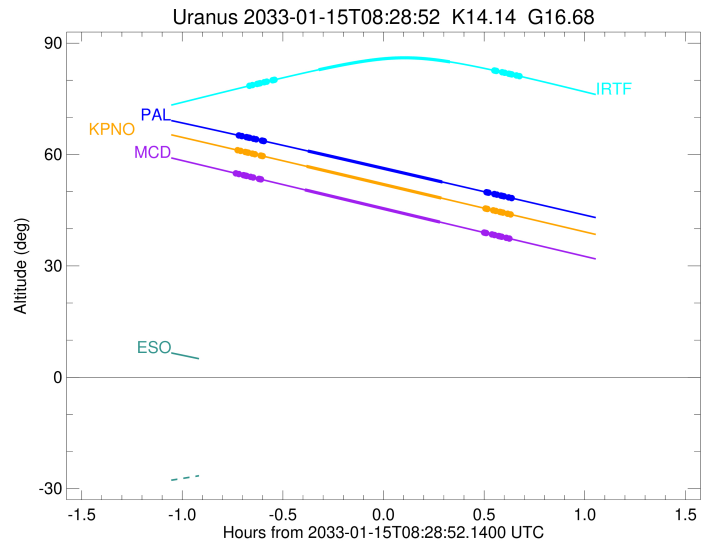
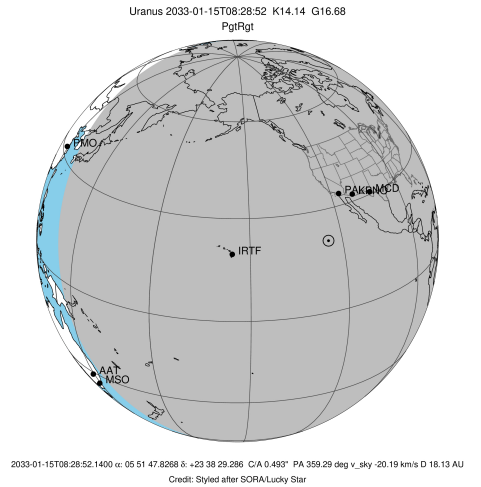


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-01-15T08:26:15.970  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3427500106844991616  
 2Mass ID (if available) : 05514782+2338293  
 ICRS Star Coord at Epoch: 05h 51m 47.82681s +23:38:29.28592s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.140  
 G magnitude : 16.677  
 RP magnitude : 15.895  
 BP magnitude : 17.345  
 DUPflag : 0  
 Distance (au) : 18.133  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.19  
 Sun-Target sep (deg) : 153.08  
 Sun-Moon sep (deg) : 25.16  
 B (ring opening deg) : 76.88  
 PA of pole (deg) : 51.73  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.390  
 C/A sky separation (km) : 5122.6  
 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



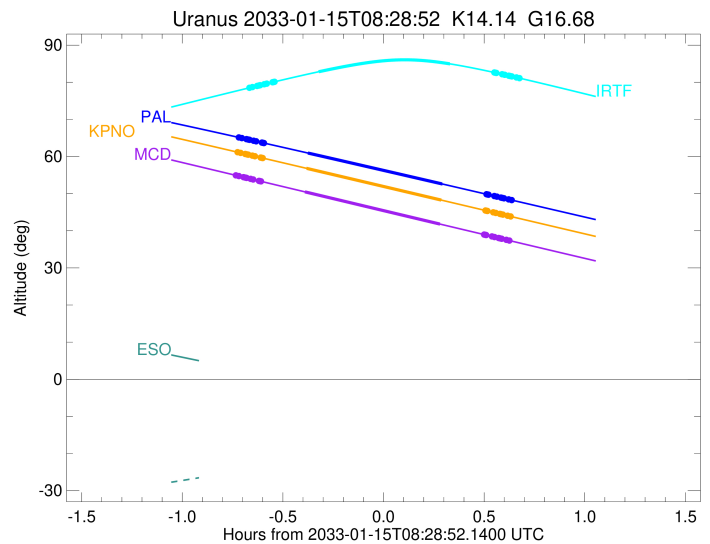
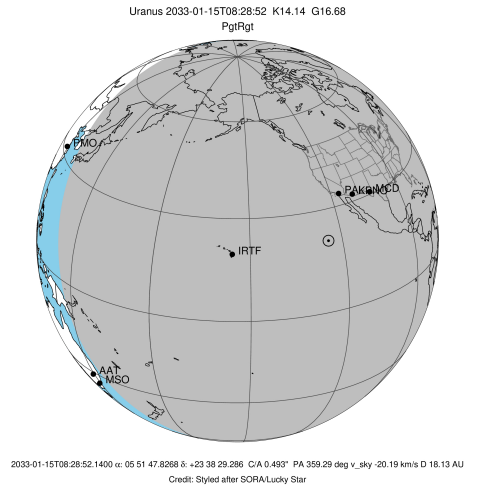
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-01-15T07:45:59.743		65.10	-77.62	50845.54	-20.77		
lambda	I	2033-01-15T07:46:39.153		64.96	-77.65	50026.71	-20.78		
delta	I	2033-01-15T07:48:02.270		64.68	-77.70	48300.35	-20.77		
gamma	I	2033-01-15T07:48:34.602		64.57	-77.72	47629.03	-20.76		
eta	I	2033-01-15T07:48:56.419		64.50	-77.73	47176.12	-20.76		
beta	I	2033-01-15T07:50:09.309		64.25	-77.77	45663.34	-20.75		
alpha	I	2033-01-15T07:50:55.308		64.10	-77.79	44710.60	-20.74		
4	I	2033-01-15T07:52:36.517		63.76	-77.82	42606.77	-20.72		
5	I	2033-01-15T07:52:58.046		63.68	-77.83	42172.91	-20.72		
6	I	2033-01-15T07:53:14.622		63.63	-77.83	41827.92	-20.72		
Uranus	I	2033-01-15T08:06:17.947		60.95	-77.68	25104.15		-11.81	-12.36
Uranus	E	2033-01-15T08:46:25.868		52.60	-73.62	25315.15		8.57	8.97
6	E	2033-01-15T08:59:35.045		49.84	-71.54	41856.27	20.65		
5	E	2033-01-15T08:59:55.721		49.77	-71.48	42282.98	20.64		
4	E	2033-01-15T09:00:08.187		49.73	-71.45	42530.02	20.64		
alpha	E	2033-01-15T09:01:53.941		49.36	-71.15	44718.70	20.66		
beta	E	2033-01-15T09:02:39.268		49.20	-71.02	45654.54	20.66		
eta	E	2033-01-15T09:03:52.893		48.94	-70.82	47176.12	20.67		
gamma	E	2033-01-15T09:04:14.491		48.87	-70.75	47622.60	20.67		
delta	E	2033-01-15T09:04:47.272		48.75	-70.66	48300.35	20.68		
lambda	E	2033-01-15T09:06:10.753		48.46	-70.42	50026.71	20.68		
epsilon	E	2033-01-15T09:07:16.651		48.23	-70.23	51389.85	20.67		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-01-15T08:25:54.840  
 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 : 3427500106844991616  
 2Mass ID (if available) : 05514782+2338293  
 ICRS Star Coord at Epoch: 05h 51m 47.82681s +23:38:29.28592s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.140  
 G magnitude : 16.677  
 RP magnitude : 15.895  
 BP magnitude : 17.345  
 DUPflag : 0  
 Distance (au) : 18.133  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.19  
 Sun-Target sep (deg) : 153.08  
 Sun-Moon sep (deg) : 25.08  
 B (ring opening deg) : 76.88  
 PA of pole (deg) : 51.73  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.392  
 C/A sky separation (km) : 5149.1  
 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	2033-01-15T07:45:37.137	61.12	-79.03	50845.23	-20.76		
lambda	I	2033-01-15T07:46:16.555	60.98	-79.00	50026.71	-20.76		
delta	I	2033-01-15T07:47:39.723	60.69	-78.93	48300.35	-20.75		
gamma	I	2033-01-15T07:48:12.075	60.57	-78.90	47629.02	-20.75		
eta	I	2033-01-15T07:48:33.905	60.50	-78.88	47176.12	-20.75		
beta	I	2033-01-15T07:49:46.842	60.24	-78.81	45663.32	-20.73		
alpha	I	2033-01-15T07:50:32.872	60.08	-78.76	44710.56	-20.73		
4	I	2033-01-15T07:52:14.147	59.72	-78.64	42606.74	-20.71		
5	I	2033-01-15T07:52:35.692	59.65	-78.61	42172.85	-20.71		
6	I	2033-01-15T07:52:52.273	59.59	-78.59	41827.97	-20.71		
Uranus	I	2033-01-15T08:05:56.198	56.82	-77.32	25103.42		-11.82	-12.37
Uranus	E	2033-01-15T08:46:05.583	48.27	-70.98	25315.40		8.56	8.96
6	E	2033-01-15T08:59:15.658	45.46	-68.50	41856.27	20.62		
5	E	2033-01-15T08:59:36.357	45.39	-68.44	42282.98	20.62		
4	E	2033-01-15T08:59:48.837	45.35	-68.40	42530.02	20.62		
alpha	E	2033-01-15T09:01:34.711	44.97	-68.05	44718.70	20.63		
beta	E	2033-01-15T09:02:20.089	44.81	-67.91	45654.54	20.64		
eta	E	2033-01-15T09:03:33.797	44.55	-67.67	47176.12	20.65		
gamma	E	2033-01-15T09:03:55.419	44.47	-67.60	47622.60	20.65		
delta	E	2033-01-15T09:04:28.238	44.36	-67.49	48300.35	20.65		
lambda	E	2033-01-15T09:05:51.813	44.06	-67.22	50026.71	20.66		
epsilon	E	2033-01-15T09:06:57.788	43.83	-67.00	51389.88	20.65		

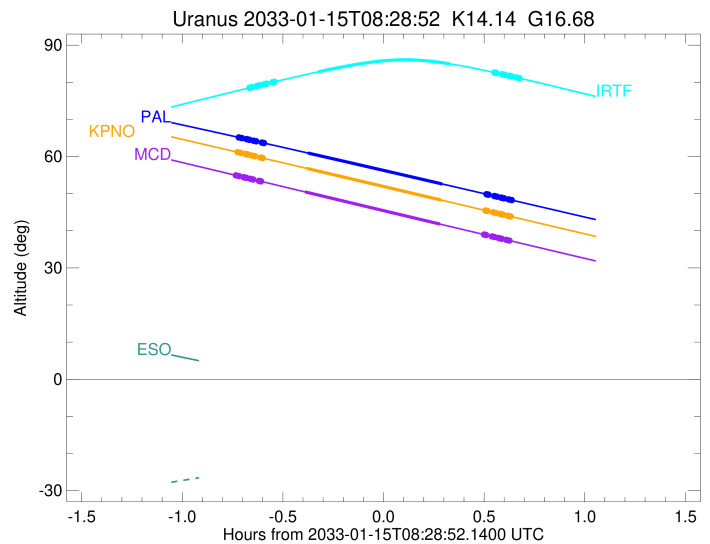
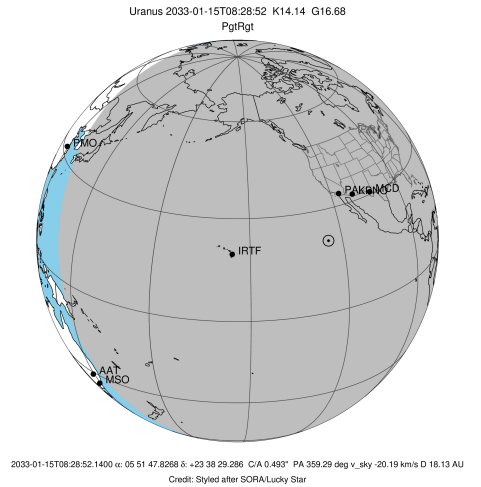
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-01-15T08:25:27.630  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 3427500106844991616  
 2Mass ID (if available) : 05514782+2338293  
 ICRS Star Coord at Epoch: 05h 51m 47.82681s +23:38:29.28592s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.140  
 G magnitude : 16.677  
 RP magnitude : 15.895  
 BP magnitude : 17.345  
 DUPflag : 0  
 Distance (au) : 18.133  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.19  
 Sun-Target sep (deg) : 153.08  
 Sun-Moon sep (deg) : 24.98  
 B (ring opening deg) : 76.88  
 PA of pole (deg) : 51.73  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.387  
 C/A sky separation (km) : 5084.7  
 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	2033-01-15T07:45:06.172		54.88	-77.01	50845.35	-20.73		
lambda	I	2033-01-15T07:45:45.637		54.74	-76.91	50026.71	-20.74		
delta	I	2033-01-15T07:47:08.894		54.44	-76.69	48300.35	-20.73		
gamma	I	2033-01-15T07:47:41.280		54.32	-76.61	47629.02	-20.73		
eta	I	2033-01-15T07:48:03.134		54.24	-76.55	47176.12	-20.72		
beta	I	2033-01-15T07:49:16.148		53.98	-76.35	45663.33	-20.71		
alpha	I	2033-01-15T07:50:02.227		53.81	-76.23	44710.58	-20.70		
4	I	2033-01-15T07:51:43.610		53.45	-75.95	42606.76	-20.69		
5	I	2033-01-15T07:52:05.177		53.37	-75.89	42172.88	-20.69		
6	I	2033-01-15T07:52:21.779		53.31	-75.85	41827.94	-20.69		
Uranus	I	2033-01-15T08:05:26.496		50.49	-73.55	25104.18		-11.81	-12.36
Uranus	E	2033-01-15T08:45:40.961		41.81	-65.61	25313.54		8.60	9.00
6	E	2033-01-15T08:58:52.180		38.98	-62.87	41856.18	20.59		
5	E	2033-01-15T08:59:12.923		38.91	-62.80	42283.13	20.59		
4	E	2033-01-15T08:59:25.421		38.86	-62.76	42530.06	20.59		
alpha	E	2033-01-15T09:01:11.474		38.48	-62.39	44718.77	20.60		
beta	E	2033-01-15T09:01:56.928		38.32	-62.23	45654.58	20.60		
eta	E	2033-01-15T09:03:10.761		38.06	-61.97	47176.12	20.61		
gamma	E	2033-01-15T09:03:32.421		37.98	-61.89	47622.61	20.61		
delta	E	2033-01-15T09:04:05.296		37.86	-61.78	48300.35	20.62		
lambda	E	2033-01-15T09:05:29.019		37.56	-61.48	50026.71	20.62		
epsilon	E	2033-01-15T09:06:35.143		37.33	-61.25	51390.54	20.61		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2033-01-15T08:29:00.290
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       : 3427500106844991616
2Mass ID (if available) : 05514782+2338293
ICRS Star Coord at Epoch: 05h 51m 47.82681s +23:38:29.28592s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 14.140
G magnitude           : 16.677
RP magnitude          : 15.895
BP magnitude          : 17.345
DUPflag               : 0
Distance (au)         : 18.133
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -20.19
Sun-Target sep (deg) : 153.08
Sun-Moon sep (deg)   : 25.61
B (ring opening deg) : 76.88
PA of pole (deg)     : 51.73
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.532
C/A sky separation (km) : 7002.9
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_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	2033-01-15T07:49:09.238		78.57	-52.08	50836.93	-20.75		
lambda	I	2033-01-15T07:49:48.272		78.71	-52.23	50026.71	-20.75		
delta	I	2033-01-15T07:51:11.485		79.02	-52.55	48300.35	-20.74		
gamma	I	2033-01-15T07:51:43.870		79.13	-52.68	47628.86	-20.73		
eta	I	2033-01-15T07:52:05.710		79.21	-52.76	47176.12	-20.73		
beta	I	2033-01-15T07:53:18.755		79.48	-53.04	45662.60	-20.71		
alpha	I	2033-01-15T07:54:04.873		79.64	-53.22	44709.35	-20.70		
4	I	2033-01-15T07:55:46.303		80.00	-53.61	42605.61	-20.67		
5	I	2033-01-15T07:56:07.938		80.08	-53.70	42170.90	-20.67		
6	I	2033-01-15T07:56:24.362		80.14	-53.76	41829.63	-20.67		
Uranus	I	2033-01-15T08:09:32.896		82.84	-56.82	25075.34		-12.20	-12.76
Uranus	E	2033-01-15T08:48:42.122		84.96	-65.94	25359.17		7.74	8.10
6	E	2033-01-15T09:01:55.128		82.64	-69.02	41858.16	20.66		
5	E	2033-01-15T09:02:15.550		82.57	-69.10	42279.71	20.66		
4	E	2033-01-15T09:02:28.094		82.53	-69.15	42529.14	20.66		
alpha	E	2033-01-15T09:04:13.687		82.18	-69.56	44717.09	20.69		
beta	E	2033-01-15T09:04:58.960		82.03	-69.74	45653.67	20.70		
eta	E	2033-01-15T09:06:12.469		81.78	-70.02	47176.12	20.72		
gamma	E	2033-01-15T09:06:34.007		81.70	-70.11	47622.43	20.72		
delta	E	2033-01-15T09:07:06.711		81.59	-70.23	48300.35	20.73		
lambda	E	2033-01-15T09:08:29.952		81.30	-70.56	50026.71	20.75		
epsilon	E	2033-01-15T09:09:34.967		81.08	-70.81	51375.92	20.74		