

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-10-20T10:21:40.950
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3413036894669852928
 2Mass ID (if available) : 04480645+2222190

ICRS Star Coord at Epoch: 04h 48m 06.44524s +22:22:18.88548s

RUWE (>1.4 is poor) : 0.92
 K magnitude : 14.861
 G magnitude : 16.968
 RP magnitude : 16.232
 BP magnitude : 17.540
 DUPflag : 0
 Distance (au) : 18.601
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.28
 Sun-Target sep (deg) : 133.74
 Sun-Moon sep (deg) : 165.03
 B (ring opening deg) : 81.24
 PA of pole (deg) : -35.70

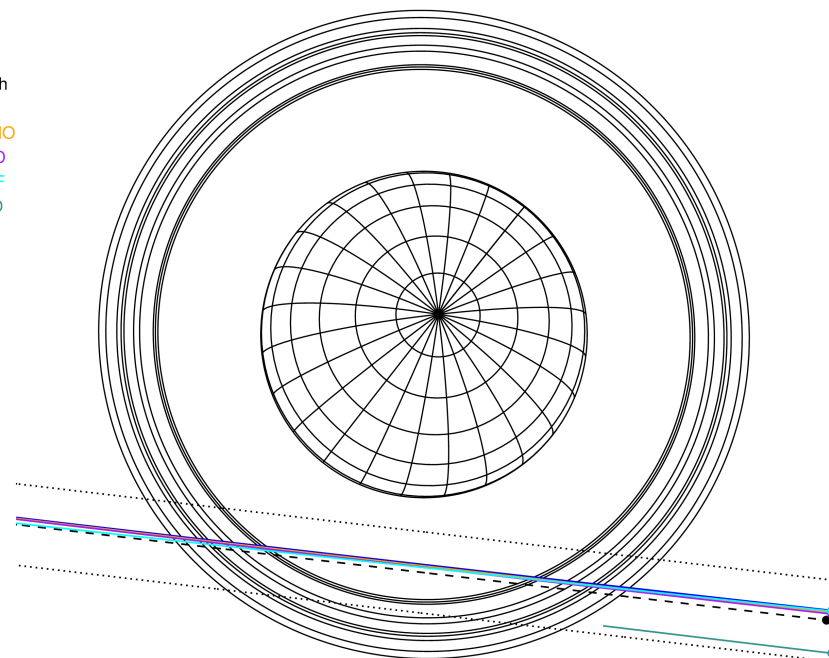
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



Uranus 2028-10-20T10:21:40 K14.86 G16.97 XRgt
 2028-10-20T10:21:40.9500 ra: 04 48 06.4452 s: +22 22 18.885 C/A 2.741" PA 353.27 deg v_sky -14.28 km/s D 18.60 AU
 Credit: Styled after SORA/Lucky Star

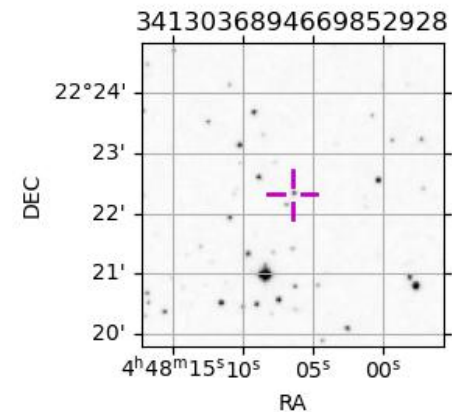
Uranus 2028-10-20T10:21:40 K14.86 G16.97 XRgt

Earth
 PAL
 KPNO
 MCD
 IRTF
 ESO

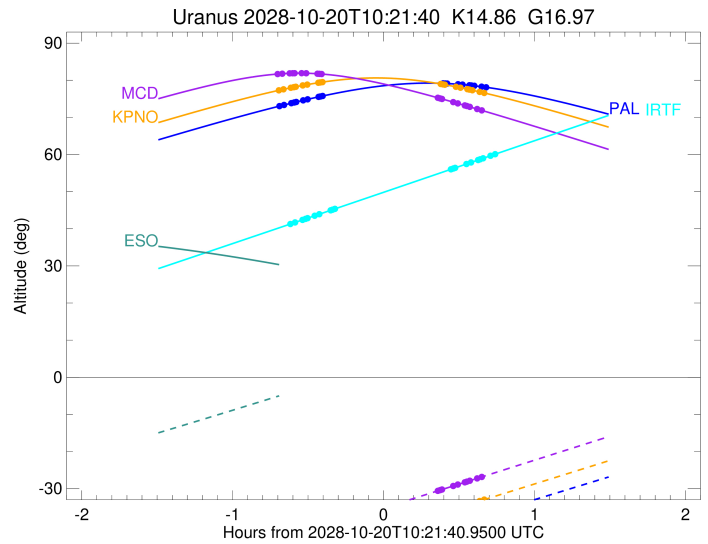
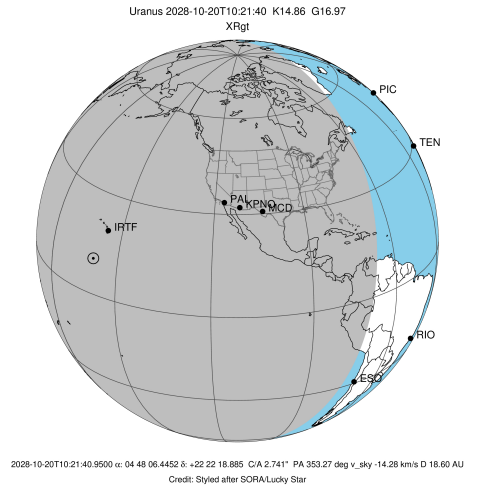


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	+++++		+++++	OCT 20 09:40 - OCT 20 11:02	PnnRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	OCT 20 09:40 - OCT 20 11:02	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	OCT 20 09:40 - OCT 20 11:01	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	OCT 20 09:45 - OCT 20 11:06	PnnRie
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 : 2028-10-20T10:21:50.680
 Event type : XRgt
 : No Uranus occs
 : 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 : 3413036894669852928
 2Mass ID (if available) : 04480645+2222190
 ICRS Star Coord at Epoch: 04h 48m 06.44524s +22:22:18.88548s
 RUWE (>1.4 is poor) : 0.92
 K magnitude : 14.861
 G magnitude : 16.968
 RP magnitude : 16.232
 BP magnitude : 17.540
 DUPflag : 0
 Distance (au) : 18.601
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.28
 Sun-Target sep (deg) : 133.74
 Sun-Moon sep (deg) : 165.19
 B (ring opening deg) : 81.24
 PA of pole (deg) : -35.70
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.654
 C/A sky separation (km) : 35805.3
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



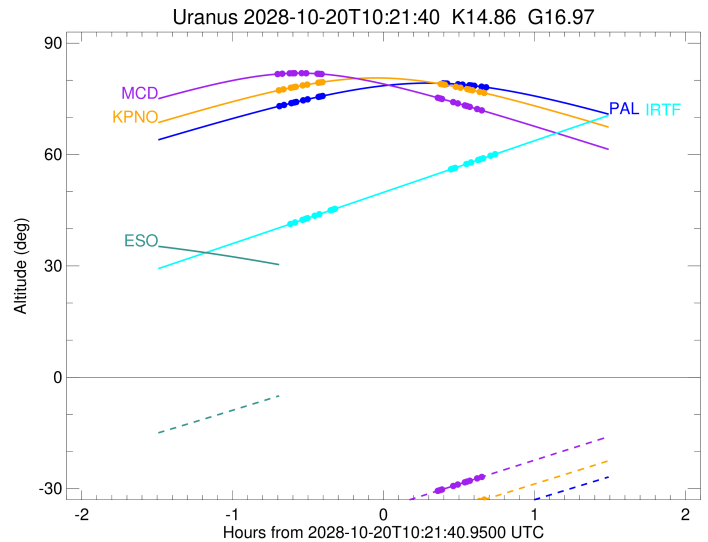
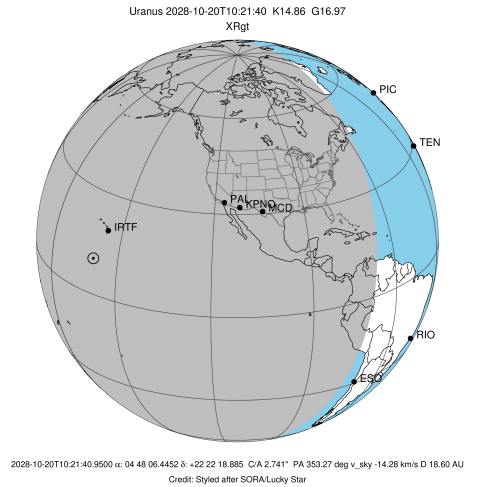
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-10-20T09:40:47.994		73.13	-52.86	50867.72	-10.38		
lambda	I	2028-10-20T09:42:10.198		73.36	-52.61	50026.71	-10.14		
delta	I	2028-10-20T09:45:03.893		73.84	-52.08	48300.35	-9.73		
gamma	I	2028-10-20T09:46:13.802		74.03	-51.87	47626.28	-9.55		
eta	I	2028-10-20T09:47:01.234		74.16	-51.72	47176.12	-9.43		
beta	I	2028-10-20T09:49:47.494		74.60	-51.21	45647.01	-8.96		
alpha	I	2028-10-20T09:51:29.013		74.87	-50.90	44752.15	-8.65		
4	I	2028-10-20T09:55:49.545		75.53	-50.09	42611.61	-7.76		
5	I	2028-10-20T09:56:27.945		75.62	-49.96	42312.06	-7.62		
6	I	2028-10-20T09:57:26.140		75.76	-49.78	41879.50	-7.41		

No planet occultations

6	E	2028-10-20T10:45:23.070		79.17	-40.39	41861.80	7.42		
5	E	2028-10-20T10:46:14.507		79.14	-40.22	42250.37	7.64		
4	E	2028-10-20T10:46:55.788		79.12	-40.08	42570.36	7.78		
alpha	E	2028-10-20T10:51:18.419		78.94	-39.20	44724.56	8.67		
beta	E	2028-10-20T10:53:05.560		78.84	-38.84	45671.43	8.98		
eta	E	2028-10-20T10:55:48.722		78.66	-38.28	47176.12	9.45		
gamma	E	2028-10-20T10:56:36.603		78.61	-38.12	47631.52	9.57		
delta	E	2028-10-20T10:57:45.812		78.52	-37.89	48300.35	9.75		
lambda	E	2028-10-20T11:00:39.112		78.28	-37.30	50026.71	10.16		
epsilon	E	2028-10-20T11:02:56.424		78.07	-36.83	51443.13	10.41		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2028-10-20T10:21:20.690
Event type           : XRgt
: No Uranus occs
: 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       : 3413036894669852928
2Mass ID (if available) : 04480645+2222190
ICRS Star Coord at Epoch: 04h 48m 06.44524s +22:22:18.88548s
RUWE (>1.4 is poor) : 0.92
K magnitude          : 14.861
G magnitude          : 16.968
RP magnitude         : 16.232
BP magnitude         : 17.540
DUPflag             : 0
Distance (au)        : 18.601
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -14.28
Sun-Target sep (deg) : 133.74
Sun-Moon sep (deg)   : 165.27
B (ring opening deg) : 81.24
PA of pole (deg)     : -35.70
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.670
C/A sky separation (km) : 36016.9
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural11.bsp
ural161.bsp
vgr2.ural161.bsp
peph.ural160.bsp
earthstns_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
    
```

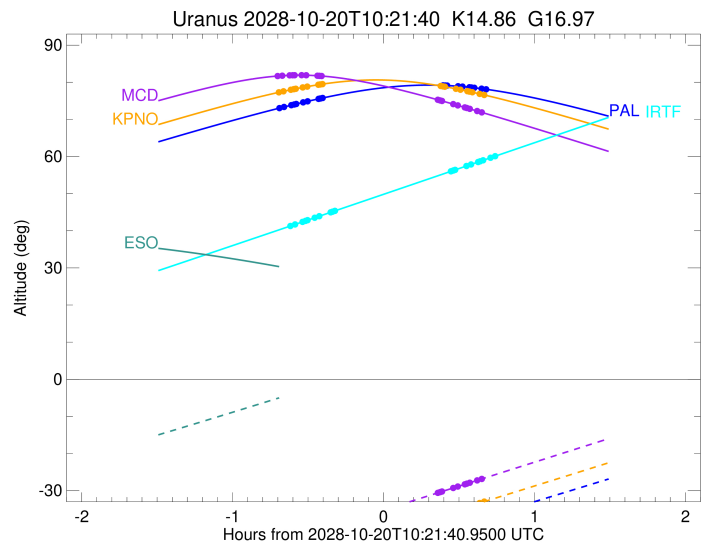
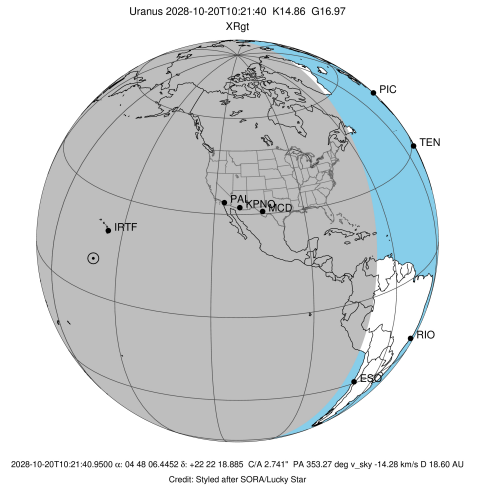


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-10-20T09:40:34.299		77.37	-49.55	50869.69	-10.33		
lambda	I	2028-10-20T09:41:57.137		77.57	-49.28	50026.71	-10.08		
delta	I	2028-10-20T09:44:51.899		77.99	-48.71	48300.35	-9.67		
gamma	I	2028-10-20T09:46:02.292		78.15	-48.48	47626.32	-9.49		
eta	I	2028-10-20T09:46:50.081		78.26	-48.32	47176.12	-9.36		
beta	I	2028-10-20T09:49:37.728		78.62	-47.77	45647.13	-8.88		
alpha	I	2028-10-20T09:51:20.262		78.83	-47.43	44752.12	-8.56		
4	I	2028-10-20T09:55:44.066		79.34	-46.55	42611.39	-7.65		
5	I	2028-10-20T09:56:23.044		79.40	-46.42	42311.82	-7.51		
6	I	2028-10-20T09:57:22.155		79.50	-46.23	41879.55	-7.29		

No planet occultations

6	E	2028-10-20T10:44:27.254		79.01	-36.58	41862.12	7.30		
5	E	2028-10-20T10:45:19.628		78.90	-36.40	42251.07	7.51		
4	E	2028-10-20T10:46:01.512		78.82	-36.25	42570.76	7.66		
alpha	E	2028-10-20T10:50:27.561		78.25	-35.33	44724.80	8.57		
beta	E	2028-10-20T10:52:15.782		78.00	-34.95	45671.31	8.89		
eta	E	2028-10-20T10:55:00.440		77.61	-34.37	47176.12	9.37		
gamma	E	2028-10-20T10:55:48.711		77.50	-34.20	47631.52	9.50		
delta	E	2028-10-20T10:56:58.455		77.32	-33.96	48300.35	9.68		
lambda	E	2028-10-20T10:59:52.953		76.88	-33.35	50026.71	10.10		
epsilon	E	2028-10-20T11:02:10.961		76.52	-32.87	51441.71	10.34		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-10-20T10:20:35.790
 Event type : XRgt
 : No Uranus occs
 : 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 : 3413036894669852928
 2Mass ID (if available) : 04480645+2222190
 ICRS Star Coord at Epoch: 04h 48m 06.44524s +22:22:18.88548s
 RUWE (>1.4 is poor) : 0.92
 K magnitude : 14.861
 G magnitude : 16.968
 RP magnitude : 16.232
 BP magnitude : 17.540
 DUPflag : 0
 Distance (au) : 18.601
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.28
 Sun-Target sep (deg) : 133.74
 Sun-Moon sep (deg) : 165.37
 B (ring opening deg) : 81.24
 PA of pole (deg) : -35.70
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.685
 C/A sky separation (km) : 36217.8
 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



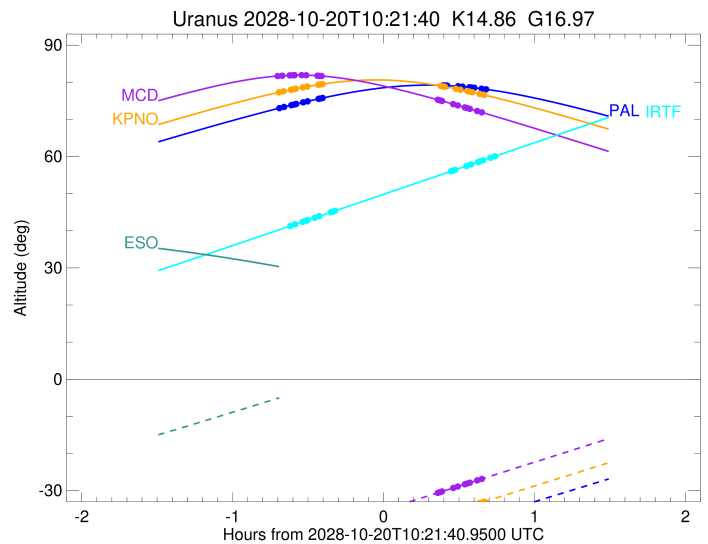
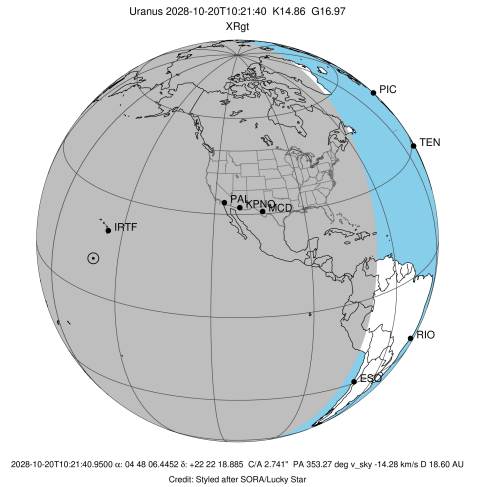
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-10-20T09:40:04.483		81.71	-43.96	50871.73	-10.28		
lambda	I	2028-10-20T09:41:27.962		81.77	-43.67	50026.71	-10.03		
delta	I	2028-10-20T09:44:23.790		81.87	-43.06	48300.35	-9.60		
gamma	I	2028-10-20T09:45:34.666		81.90	-42.82	47626.36	-9.42		
eta	I	2028-10-20T09:46:22.813		81.91	-42.65	47176.12	-9.29		
beta	I	2028-10-20T09:49:11.847		81.92	-42.06	45647.25	-8.80		
alpha	I	2028-10-20T09:50:55.403		81.90	-41.70	44752.07	-8.47		
4	I	2028-10-20T09:55:22.515		81.77	-40.77	42611.17	-7.54		
5	I	2028-10-20T09:56:02.080		81.74	-40.63	42311.56	-7.39		
6	I	2028-10-20T09:57:02.123		81.69	-40.42	41879.59	-7.17		

No planet occultations

6	E	2028-10-20T10:43:17.793		75.28	-30.59	41862.41	7.17		
5	E	2028-10-20T10:44:11.127		75.12	-30.40	42251.72	7.39		
4	E	2028-10-20T10:44:53.637		74.98	-30.25	42571.12	7.54		
alpha	E	2028-10-20T10:49:23.210		74.13	-29.29	44725.02	8.48		
beta	E	2028-10-20T10:51:12.551		73.78	-28.90	45671.20	8.80		
eta	E	2028-10-20T10:53:58.759		73.24	-28.30	47176.12	9.29		
gamma	E	2028-10-20T10:54:47.436		73.08	-28.13	47631.51	9.42		
delta	E	2028-10-20T10:55:57.738		72.85	-27.88	48300.35	9.61		
lambda	E	2028-10-20T10:58:53.496		72.26	-27.25	50026.71	10.03		
epsilon	E	2028-10-20T11:01:12.267		71.80	-26.75	51440.49	10.28		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2028-10-20T10:25:52.710
Event type           : XRgt
: No Uranus occs
: 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       : 3413036894669852928
2Mass ID (if available) : 04480645+2222190
ICRS Star Coord at Epoch: 04h 48m 06.44524s +22:22:18.88548s
RUWE (>1.4 is poor) : 0.92
K magnitude          : 14.861
G magnitude          : 16.968
RP magnitude         : 16.232
BP magnitude         : 17.540
DUPflag             : 0
Distance (au)        : 18.601
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -14.28
Sun-Target sep (deg) : 133.74
Sun-Moon sep (deg)   : 164.61
B (ring opening deg) : 81.24
PA of pole (deg)     : -35.70
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.691
C/A sky separation (km) : 36296.8
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	2028-10-20T09:45:08.887		41.39	-79.53	50870.01	-10.16		
lambda	I	2028-10-20T09:46:33.166		41.72	-79.69	50026.71	-9.91		
delta	I	2028-10-20T09:49:31.049		42.40	-80.01	48300.35	-9.49		
gamma	I	2028-10-20T09:50:42.765		42.67	-80.12	47626.33	-9.31		
eta	I	2028-10-20T09:51:31.481		42.86	-80.20	47176.12	-9.18		
beta	I	2028-10-20T09:54:22.563		43.52	-80.43	45647.18	-8.69		
alpha	I	2028-10-20T09:56:07.390		43.92	-80.55	44752.10	-8.37		
4	I	2028-10-20T10:00:37.981		44.96	-80.78	42611.27	-7.44		
5	I	2028-10-20T10:01:18.099		45.11	-80.81	42311.67	-7.29		
6	I	2028-10-20T10:02:19.012		45.35	-80.84	41879.58	-7.06		

No planet occultations

6	E	2028-10-20T10:48:30.657		56.02	-76.41	41862.84	7.10		
5	E	2028-10-20T10:49:24.591		56.23	-76.25	42252.67	7.33		
4	E	2028-10-20T10:50:07.413		56.40	-76.12	42571.67	7.48		
alpha	E	2028-10-20T10:54:39.011		57.45	-75.28	44725.40	8.42		
beta	E	2028-10-20T10:56:28.964		57.87	-74.93	45671.00	8.75		
eta	E	2028-10-20T10:59:16.102		58.52	-74.39	47176.12	9.24		
gamma	E	2028-10-20T11:00:05.017		58.71	-74.23	47631.50	9.38		
delta	E	2028-10-20T11:01:15.646		58.98	-74.00	48300.35	9.56		
lambda	E	2028-10-20T11:04:12.126		59.66	-73.41	50026.71	9.99		
epsilon	E	2028-10-20T11:06:31.078		60.20	-72.94	51437.34	10.25		