

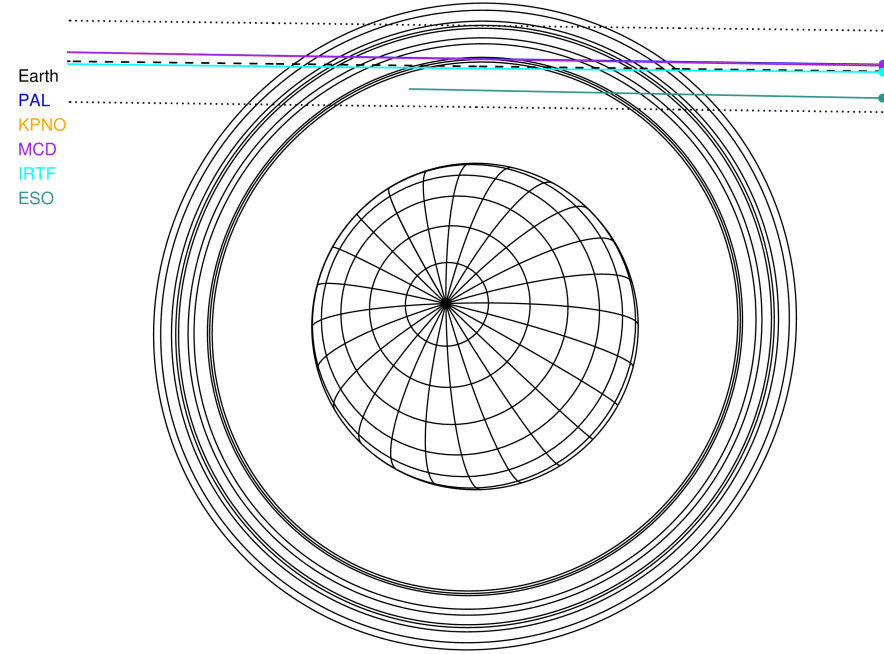
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-01-15T07:29:13.470  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3427500111141004928  
 2Mass ID (if available) : 05514822+2338328

ICRS Star Coord at Epoch: 05h 51m 48.22345s +23:38:32.95097s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 12.734  
 G magnitude : 16.613  
 RP magnitude : 15.548  
 BP magnitude : 17.799  
 DUPflag : 0  
 Distance (au) : 18.132  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.20  
 Sun-Target sep (deg) : 153.12  
 Sun-Moon sep (deg) : 24.69  
 B (ring opening deg) : 76.88  
 PA of pole (deg) : 51.73



2033-01-15T07:29:13.4700 ra: 05 51 48.2235 s: +23 38 32.951 C/A 3.105° PA 179.29 deg v\_sky -20.20 km/s D 18.13 AU  
 Credit: Styled after SORA/Lucky Star

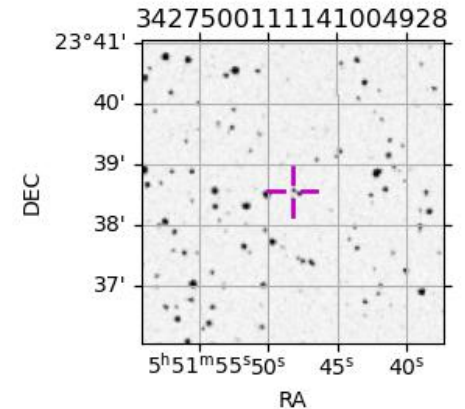
Uranus 2033-01-15T07:29:13 K12.73 G16.61 XRgt



#	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

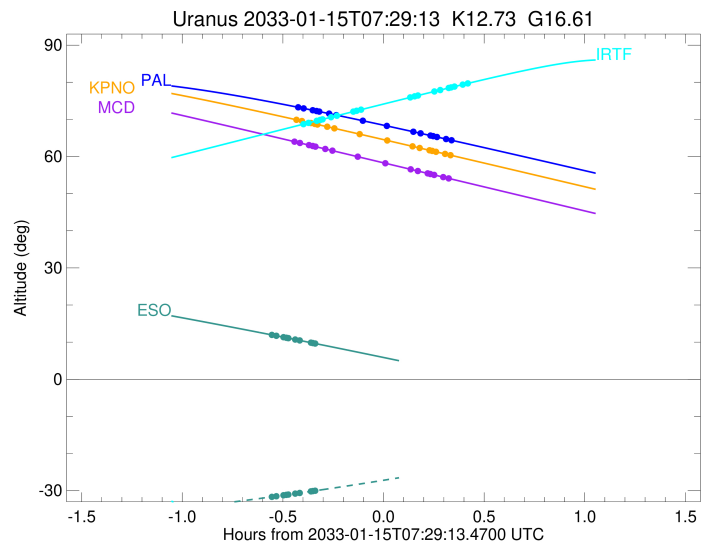
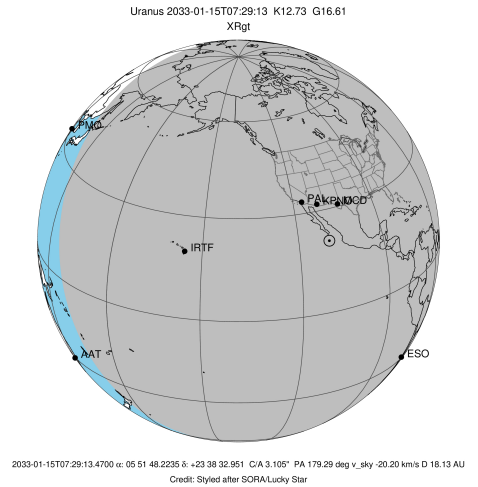
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 07:03 - JAN 15 07:50	PnnRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	JAN 15 07:03 - JAN 15 07:49	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	JAN 15 07:02 - JAN 15 07:49	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	JAN 15 07:05 - JAN 15 07:54	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	+++++			JAN 15 06:55 - JAN 15 07:08	PnnRin
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             : 2033-01-15T07:27:30.120
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       : 3427500111141004928
2Mass ID (if available) : 05514822+2338328
ICRS Star Coord at Epoch: 05h 51m 48.22345s +23:38:32.95097s
RUWE (>1.4 is poor) : 1.03
K magnitude          : 12.734
G magnitude          : 16.613
RP magnitude         : 15.548
BP magnitude         : 17.799
DUPflag             : 0
Distance (au)        : 18.132
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -20.20
Sun-Target sep (deg) : 153.12
Sun-Moon sep (deg)   : 24.83
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 (") : 3.188
C/A sky separation (km) : 41929.0
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_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```

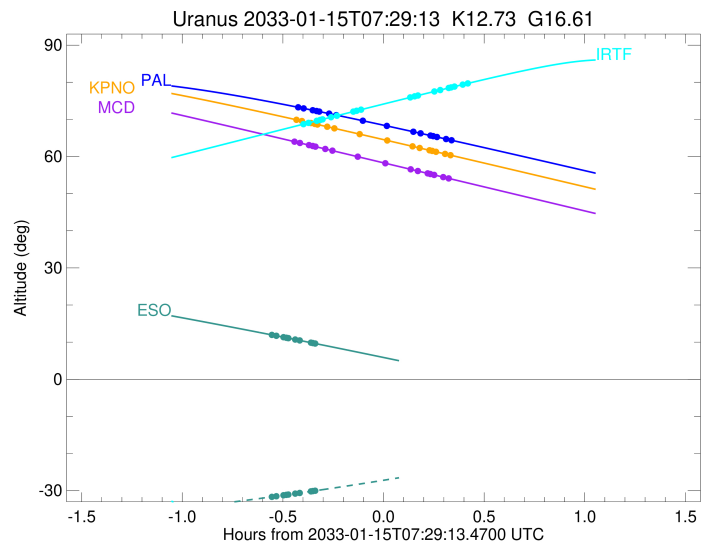
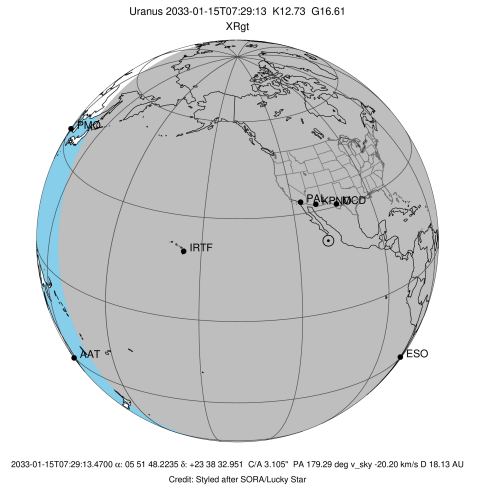


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-01-15T07:03:40.310		73.28	-73.08	51241.29	-11.92		
lambda	I	2033-01-15T07:05:26.196		72.96	-73.35	50026.71	-11.15		
delta	I	2033-01-15T07:08:08.819		72.47	-73.76	48300.35	-10.07		
gamma	I	2033-01-15T07:09:16.889		72.26	-73.92	47631.49	-9.58		
eta	I	2033-01-15T07:10:05.314		72.11	-74.04	47176.12	-9.22		
beta	I	2033-01-15T07:13:00.229		71.56	-74.45	45680.98	-7.85		
alpha	I	2033-01-15T07:15:07.827		71.16	-74.74	44749.11	-6.77		
4	I	2033-01-15T07:22:59.516		69.66	-75.73	42598.75	-2.23		

No planet occultations

4	E	2033-01-15T07:30:13.815		68.24	-76.50	42590.49	2.23		
alpha	E	2033-01-15T07:38:09.508		66.67	-77.17	44751.67	6.76		
beta	E	2033-01-15T07:40:16.740		66.25	-77.32	45677.62	7.84		
eta	E	2033-01-15T07:43:12.222		65.66	-77.49	47176.12	9.21		
gamma	E	2033-01-15T07:44:00.400		65.50	-77.53	47628.52	9.57		
delta	E	2033-01-15T07:45:08.874		65.27	-77.58	48300.35	10.05		
lambda	E	2033-01-15T07:47:51.744		64.72	-77.70	50026.71	11.13		
epsilon	E	2033-01-15T07:50:04.024		64.27	-77.77	51551.76	11.90		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-01-15T07:27:05.210  
 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 : 3427500111141004928  
 2Mass ID (if available) : 05514822+2338328  
 ICRS Star Coord at Epoch: 05h 51m 48.22345s +23:38:32.95097s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 12.734  
 G magnitude : 16.613  
 RP magnitude : 15.548  
 BP magnitude : 17.799  
 DUPflag : 0  
 Distance (au) : 18.132  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.20  
 Sun-Target sep (deg) : 153.12  
 Sun-Moon sep (deg) : 24.75  
 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 (") : 3.183  
 C/A sky separation (km) : 41854.9  
 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

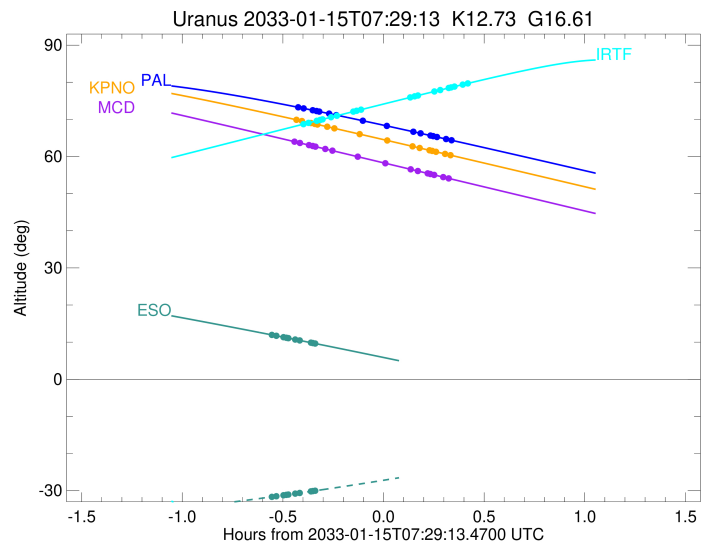
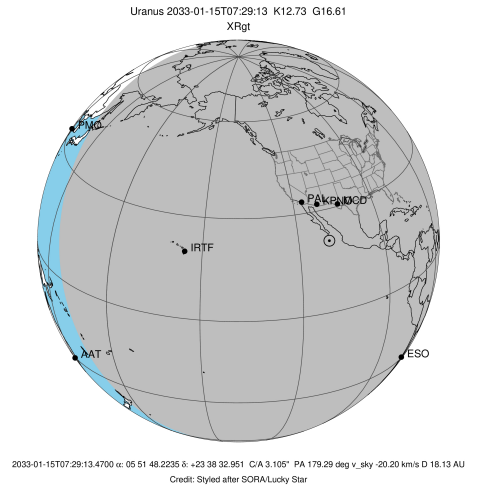


Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-01-15T07:03:09.861	69.92	-77.02	51240.00	-11.96		
lambda	I	2033-01-15T07:04:55.226	69.56	-77.23	50026.71	-11.19		
delta	I	2033-01-15T07:07:37.057	69.02	-77.55	48300.35	-10.12		
gamma	I	2033-01-15T07:08:44.719	68.79	-77.67	47631.49	-9.64		
eta	I	2033-01-15T07:09:32.820	68.62	-77.76	47176.12	-9.29		
beta	I	2033-01-15T07:12:26.239	68.03	-78.05	45680.96	-7.93		
alpha	I	2033-01-15T07:14:32.268	67.60	-78.25	44749.03	-6.87		
4	I	2033-01-15T07:22:03.246	66.05	-78.82	42599.33	-2.55		

No planet occultations

4	E	2033-01-15T07:30:20.433	64.33	-79.18	42589.88	2.55		
alpha	E	2033-01-15T07:37:55.473	62.74	-79.24	44751.64	6.86		
beta	E	2033-01-15T07:40:01.159	62.30	-79.21	45677.57	7.92		
eta	E	2033-01-15T07:42:55.184	61.69	-79.13	47176.12	9.28		
gamma	E	2033-01-15T07:43:43.051	61.52	-79.11	47628.51	9.63		
delta	E	2033-01-15T07:44:51.135	61.28	-79.06	48300.35	10.11		
lambda	E	2033-01-15T07:47:33.262	60.71	-78.93	50026.71	11.17		
epsilon	E	2033-01-15T07:49:45.091	60.25	-78.81	51551.86	11.94		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-01-15T07:26:31.210  
 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 : 3427500111141004928  
 2Mass ID (if available) : 05514822+2338328  
 ICRS Star Coord at Epoch: 05h 51m 48.22345s +23:38:32.95097s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 12.734  
 G magnitude : 16.613  
 RP magnitude : 15.548  
 BP magnitude : 17.799  
 DUPflag : 0  
 Distance (au) : 18.132  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.20  
 Sun-Target sep (deg) : 153.12  
 Sun-Moon sep (deg) : 24.65  
 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 (") : 3.183  
 C/A sky separation (km) : 41855.6  
 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

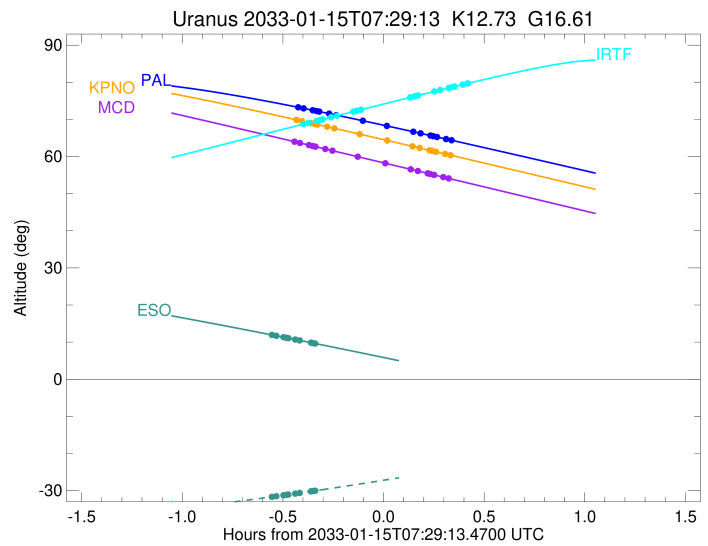
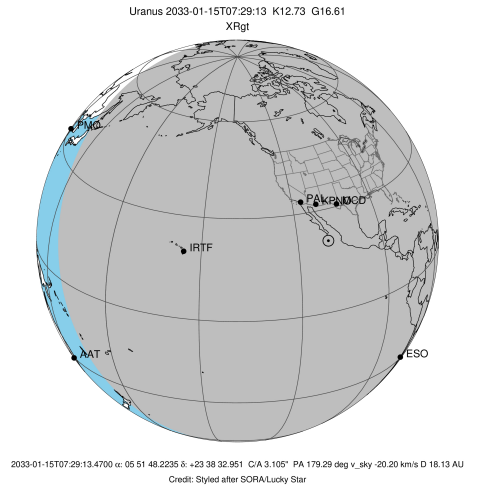


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-01-15T07:02:34.607		64.03	-80.52	51239.63	-11.95		
lambda	I	2033-01-15T07:04:20.022		63.65	-80.54	50026.71	-11.18		
delta	I	2033-01-15T07:07:01.981		63.07	-80.54	48300.35	-10.12		
gamma	I	2033-01-15T07:08:09.698		62.83	-80.52	47631.50	-9.63		
eta	I	2033-01-15T07:08:57.838		62.66	-80.51	47176.12	-9.28		
beta	I	2033-01-15T07:11:51.401		62.04	-80.43	45680.96	-7.92		
alpha	I	2033-01-15T07:13:57.538		61.59	-80.35	44749.01	-6.86		
4	I	2033-01-15T07:21:28.845		59.97	-79.88	42599.36	-2.55		

No planet occultations

4	E	2033-01-15T07:29:46.821		58.19	-79.08	42589.92	2.55		
alpha	E	2033-01-15T07:37:22.271		56.55	-78.13	44751.65	6.85		
beta	E	2033-01-15T07:39:28.096		56.10	-77.84	45677.59	7.91		
eta	E	2033-01-15T07:42:22.319		55.47	-77.42	47176.12	9.26		
gamma	E	2033-01-15T07:43:10.242		55.30	-77.31	47628.52	9.62		
delta	E	2033-01-15T07:44:18.406		55.05	-77.13	48300.35	10.09		
lambda	E	2033-01-15T07:47:00.729		54.47	-76.71	50026.71	11.16		
epsilon	E	2033-01-15T07:49:12.717		53.99	-76.36	51551.81	11.92		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-01-15T07:30:41.580  
 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 : 3427500111141004928  
 2Mass ID (if available) : 05514822+2338328  
 ICRS Star Coord at Epoch: 05h 51m 48.22345s +23:38:32.95097s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 12.734  
 G magnitude : 16.613  
 RP magnitude : 15.548  
 BP magnitude : 17.799  
 DUPflag : 0  
 Distance (au) : 18.132  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.20  
 Sun-Target sep (deg) : 153.12  
 Sun-Moon sep (deg) : 25.28  
 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 (") : 3.073  
 C/A sky separation (km) : 40411.8  
 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

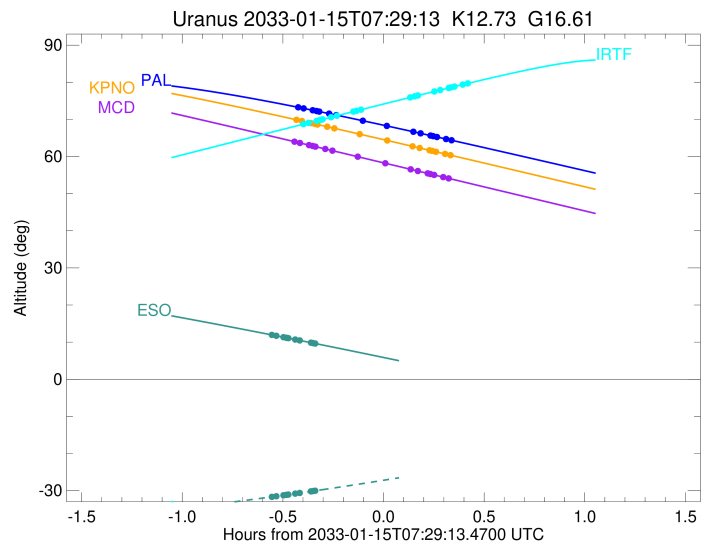
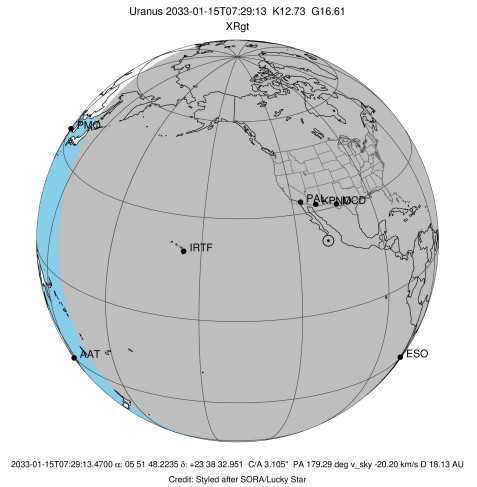


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-01-15T07:05:16.618		68.70	-41.91	51223.24	-12.79		
lambda	I	2033-01-15T07:06:53.156		69.07	-42.29	50026.71	-12.12		
delta	I	2033-01-15T07:09:21.083		69.63	-42.86	48300.35	-11.21		
gamma	I	2033-01-15T07:10:21.852		69.86	-43.09	47631.54	-10.80		
eta	I	2033-01-15T07:11:04.588		70.02	-43.25	47176.12	-10.51		
beta	I	2033-01-15T07:13:34.594		70.59	-43.83	45680.68	-9.41		
alpha	I	2033-01-15T07:15:18.287		70.99	-44.23	44747.71	-8.59		
4	I	2033-01-15T07:20:11.006		72.09	-45.36	42604.67	-5.98		
5	I	2033-01-15T07:21:07.951		72.31	-45.58	42277.11	-5.48		
6	I	2033-01-15T07:22:44.156		72.67	-45.95	41795.13	-4.51		

No planet occultations

6	E	2033-01-15T07:37:00.681		75.89	-49.26	41801.41	4.51		
5	E	2033-01-15T07:38:40.077		76.26	-49.64	42305.79	5.49		
4	E	2033-01-15T07:39:28.825		76.44	-49.83	42582.52	5.99		
alpha	E	2033-01-15T07:44:25.130		77.53	-50.98	44750.82	8.60		
beta	E	2033-01-15T07:46:08.268		77.91	-51.38	45676.57	9.42		
eta	E	2033-01-15T07:48:38.550		78.46	-51.96	47176.12	10.52		
gamma	E	2033-01-15T07:49:20.944		78.61	-52.12	47628.18	10.81		
delta	E	2033-01-15T07:50:21.977		78.84	-52.36	48300.35	11.22		
lambda	E	2033-01-15T07:52:49.780		79.37	-52.93	50026.71	12.13		
epsilon	E	2033-01-15T07:54:52.190		79.81	-53.41	51554.11	12.81		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-01-15T07:24:47.720  
 Event type : XRgt  
 : No Uranus occs  
 : 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 : 3427500111141004928  
 2Mass ID (if available) : 05514822+2338328  
 ICRS Star Coord at Epoch: 05h 51m 48.22345s +23:38:32.95097s  
 RUWE (>1.4 is poor) : 1.03  
 K magnitude : 12.734  
 G magnitude : 16.613  
 RP magnitude : 15.548  
 BP magnitude : 17.799  
 DUPflag : 0  
 Distance (au) : 18.132  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -20.20  
 Sun-Target sep (deg) : 153.12  
 Sun-Moon sep (deg) : 23.96  
 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 (") : 2.812  
 C/A sky separation (km) : 36985.6  
 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	2033-01-15T06:55:55.238		11.95	-31.68	51177.33	-14.31		
lambda	I	2033-01-15T06:57:17.404		11.71	-31.51	50026.71	-13.81		
delta	I	2033-01-15T06:59:25.377		11.33	-31.25	48300.35	-13.16		
gamma	I	2033-01-15T07:00:16.744		11.17	-31.14	47631.58	-12.88		
eta	I	2033-01-15T07:00:52.389		11.07	-31.06	47176.12	-12.68		
beta	I	2033-01-15T07:02:53.893		10.70	-30.81	45679.71	-11.95		
alpha	I	2033-01-15T07:04:13.946		10.46	-30.63	44744.36	-11.43		
4	I	2033-01-15T07:07:33.092		9.86	-30.20	42610.57	-9.97		
5	I	2033-01-15T07:08:08.602		9.76	-30.12	42260.18	-9.73		
6	I	2033-01-15T07:08:57.431		9.61	-30.02	41795.07	-9.30		

No planet occultations

6	E	2033-01-15T07:39:08.717	4.00x	-25.74	41807.84	9.28		
5	E	2033-01-15T07:40:01.089	3.83x	-25.61	42312.21	9.70		
4	E	2033-01-15T07:40:28.285	3.75x	-25.54	42573.47	9.94		
alpha	E	2033-01-15T07:43:51.905	3.10x	-25.03	44748.89	11.39		
beta	E	2033-01-15T07:45:11.714	2.85x	-24.82	45674.65	11.90		
eta	E	2033-01-15T07:47:14.069	2.46x	-24.51	47176.12	12.62		
gamma	E	2033-01-15T07:47:49.553	2.34x	-24.42	47627.58	12.82		
delta	E	2033-01-15T07:48:41.455	2.18x	-24.28	48300.35	13.10		
lambda	E	2033-01-15T07:50:50.019	1.76x	-23.95	50026.71	13.74		
epsilon	E	2033-01-15T07:52:39.238	1.41x	-23.66	51555.23	14.24		