

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-16T09:09:47.790
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3428383362576743296
 2Mass ID (if available) : 05423483+2331334

ICRS Star Coord at Epoch: 05h 42m 34.89606s +23:31:32.53602s

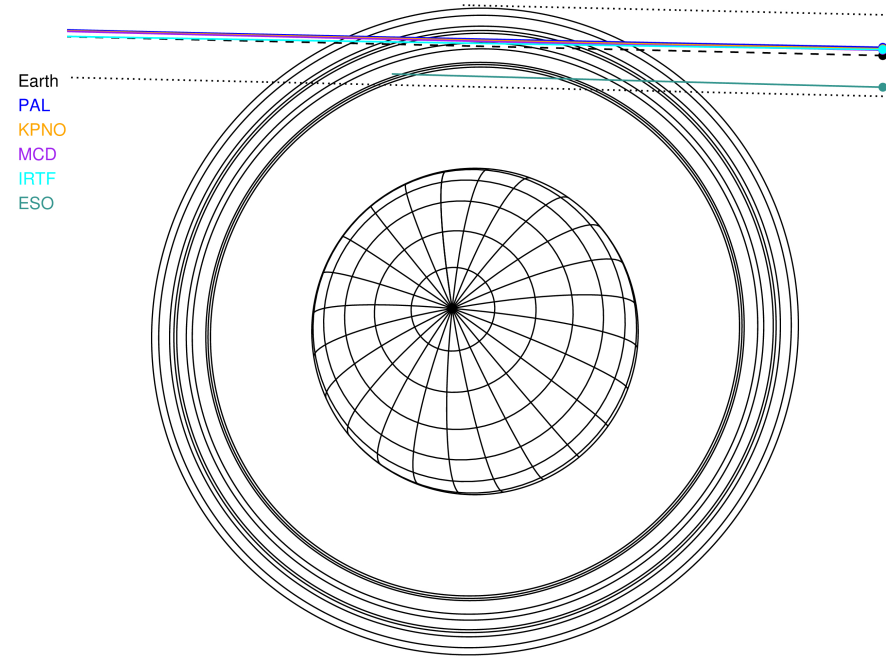
RUWE (>1.4 is poor) : 1.14
 K magnitude : 13.634
 G magnitude : 17.234
 RP magnitude : 16.094
 BP magnitude : 18.529
 DUPflag : 0
 Distance (au) : 18.252
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.75
 Sun-Target sep (deg) : 147.35
 Sun-Moon sep (deg) : 167.03
 B (ring opening deg) : 78.54
 PA of pole (deg) : 44.74

#	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



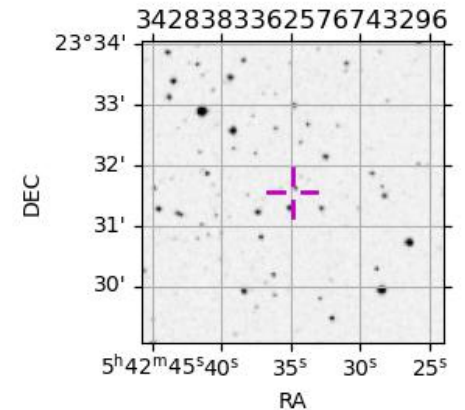
2031-11-16T09:09:47.7900 ra: 05 42 34.8961 δ: +23 31 32.536 C/A 3.382° PA 178.68 deg v_sky -18.75 km/s D 18.25 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2031-11-16T09:09:47 K13.63 G17.23 XRgt



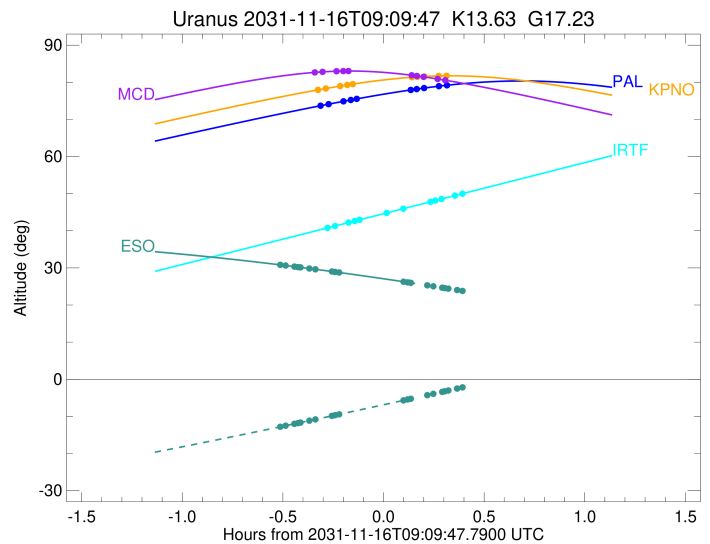
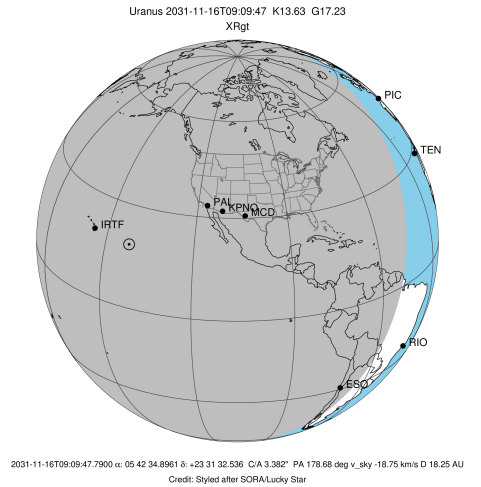
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	+++++		+++++	NOV 16 08:51 - NOV 16 09:27	PnnRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	NOV 16 08:51 - NOV 16 09:27	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	NOV 16 08:50 - NOV 16 09:27	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	NOV 16 08:53 - NOV 16 09:32	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	+++++		+++	NOV 16 08:39 - NOV 16 09:17	PnnRie
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            : 2031-11-16T09:10:40.800
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       : 3428383362576743296
2Mass ID (if available) : 05423483+2331334
ICRS Star Coord at Epoch: 05h 42m 34.89606s +23:31:32.53602s
RUWE (>1.4 is poor) : 1.14
K magnitude           : 13.634
G magnitude           : 17.234
RP magnitude          : 16.094
BP magnitude          : 18.529
DUPflag              : 0
Distance (au)         : 18.252
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -18.75
Sun-Target sep (deg) : 147.35
Sun-Moon sep (deg)   : 167.14
B (ring opening deg) : 78.54
PA of pole (deg)     : 44.74
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.460
C/A sky separation (km) : 45797.3
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
  
```

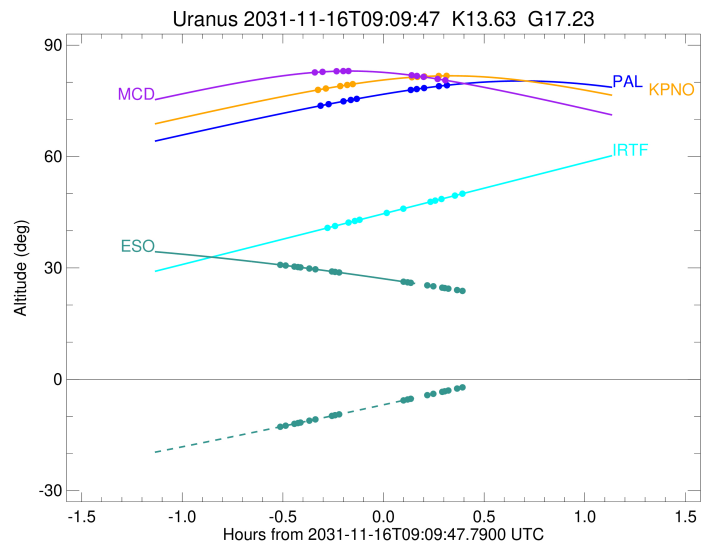
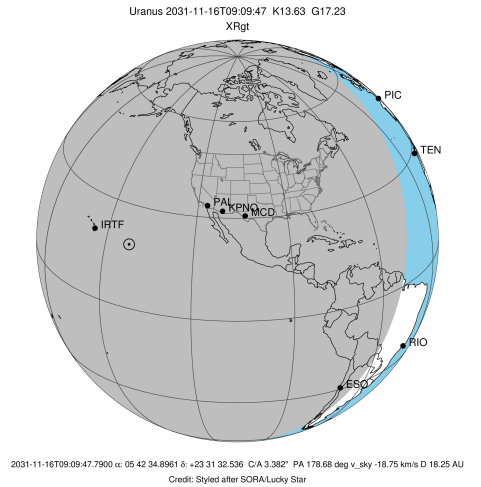


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-16T08:51:49.014		73.83	-67.06	50781.84	-7.92		
lambda	I	2031-11-16T08:53:27.425		74.11	-66.77	50026.71	-7.36		
delta	I	2031-11-16T08:57:53.811		74.88	-65.99	48300.35	-5.57		
gamma	I	2031-11-16T09:00:05.538		75.25	-65.60	47629.65	-4.61		
eta	I	2031-11-16T09:01:53.331		75.54	-65.27	47176.12	-3.80		

No planet occultations

eta	E	2031-11-16T09:17:51.869		77.93	-62.31	47176.12	3.80		
gamma	E	2031-11-16T09:19:39.117		78.16	-61.97	47627.38	4.61		
delta	E	2031-11-16T09:21:51.259		78.44	-61.55	48300.35	5.57		
lambda	E	2031-11-16T09:26:17.438		78.95	-60.70	50026.71	7.37		
epsilon	E	2031-11-16T09:27:55.068		79.12	-60.38	50776.35	7.93		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-16T09:10:14.290
 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 : 3428383362576743296
 2Mass ID (if available) : 05423483+2331334
 ICRS Star Coord at Epoch: 05h 42m 34.89606s +23:31:32.53602s
 RUWE (>1.4 is poor) : 1.14
 K magnitude : 13.634
 G magnitude : 17.234
 RP magnitude : 16.094
 BP magnitude : 18.529
 DUPflag : 0
 Distance (au) : 18.252
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.75
 Sun-Target sep (deg) : 147.35
 Sun-Moon sep (deg) : 167.21
 B (ring opening deg) : 78.54
 PA of pole (deg) : 44.74
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.445
 C/A sky separation (km) : 45610.7
 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

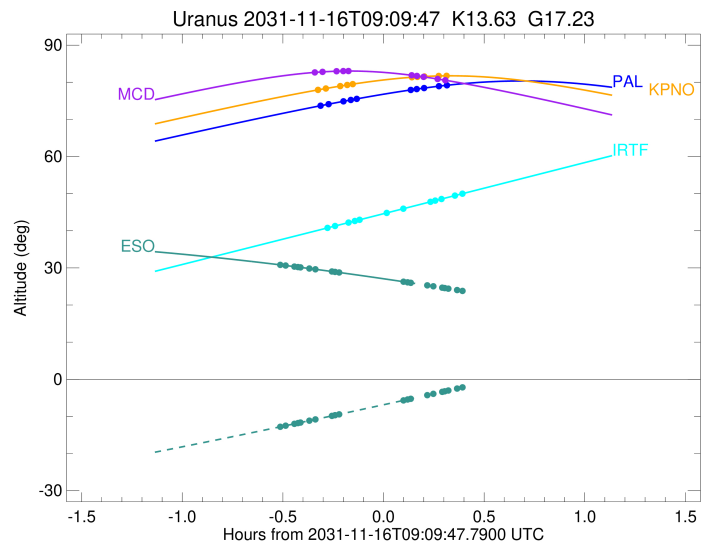
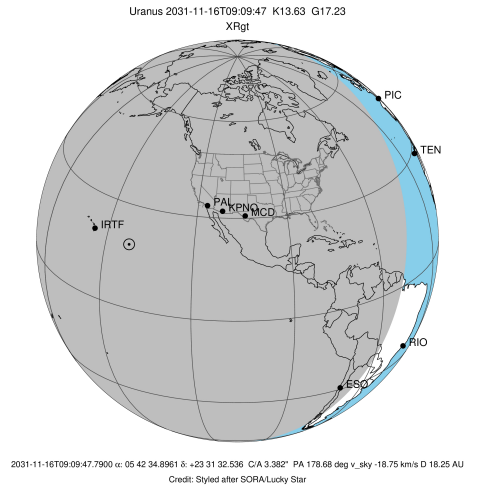


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-16T08:51:01.942		78.08	-63.99	50783.51	-8.08		
lambda	I	2031-11-16T08:52:38.406		78.33	-63.68	50026.71	-7.54		
delta	I	2031-11-16T08:56:56.261		78.98	-62.84	48300.35	-5.82		
gamma	I	2031-11-16T08:59:01.170		79.28	-62.43	47629.72	-4.91		
eta	I	2031-11-16T09:00:40.966		79.52	-62.10	47176.12	-4.17		

No planet occultations

eta	E	2031-11-16T09:18:11.670		81.35	-58.59	47176.12	4.17		
gamma	E	2031-11-16T09:19:50.936		81.45	-58.25	47627.30	4.92		
delta	E	2031-11-16T09:21:56.282		81.56	-57.83	48300.35	5.82		
lambda	E	2031-11-16T09:26:13.990		81.71	-56.95	50026.71	7.55		
epsilon	E	2031-11-16T09:27:49.671		81.73	-56.62	50777.67	8.09		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-16T09:09:34.330
 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 : 3428383362576743296
 2Mass ID (if available) : 05423483+2331334
 ICRS Star Coord at Epoch: 05h 42m 34.89606s +23:31:32.53602s
 RUWE (>1.4 is poor) : 1.14
 K magnitude : 13.634
 G magnitude : 17.234
 RP magnitude : 16.094
 BP magnitude : 18.529
 DUPflag : 0
 Distance (au) : 18.252
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.75
 Sun-Target sep (deg) : 147.35
 Sun-Moon sep (deg) : 167.31
 B (ring opening deg) : 78.54
 PA of pole (deg) : 44.74
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.433
 C/A sky separation (km) : 45449.0
 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



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

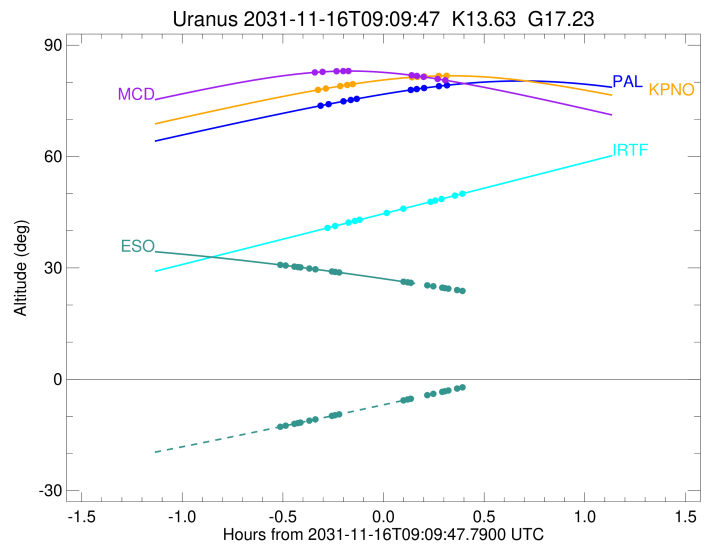
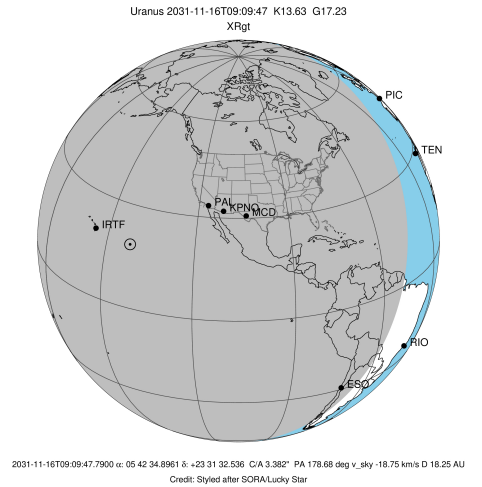
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-16T08:50:04.459		82.71	-58.48	50785.05	-8.22		
lambda	I	2031-11-16T08:51:39.351		82.81	-58.15	50026.71	-7.70		
delta	I	2031-11-16T08:55:50.459		82.98	-57.27	48300.35	-6.02		
gamma	I	2031-11-16T08:57:50.250		83.02	-56.85	47629.78	-5.16		
eta	I	2031-11-16T08:59:24.401		83.03	-56.53	47176.12	-4.47		

No planet occultations

eta	E	2031-11-16T09:18:08.772		81.90	-52.56	47176.12	4.47		
gamma	E	2031-11-16T09:19:42.417		81.72	-52.23	47627.23	5.17		
delta	E	2031-11-16T09:21:42.679		81.46	-51.80	48300.35	6.03		
lambda	E	2031-11-16T09:25:53.730		80.89	-50.91	50026.71	7.70		
epsilon	E	2031-11-16T09:27:27.835		80.66	-50.58	50778.75	8.22		

```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch             : 2031-11-16T09:14:01.970
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       : 3428383362576743296
2Mass ID (if available) : 05423483+2331334
ICRS Star Coord at Epoch: 05h 42m 34.89606s +23:31:32.53602s
RUWE (>1.4 is poor) : 1.14
K magnitude          : 13.634
G magnitude          : 17.234
RP magnitude         : 16.094
BP magnitude         : 18.529
DUPflag             : 0
Distance (au)        : 18.252
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -18.75
Sun-Target sep (deg) : 147.35
Sun-Moon sep (deg)   : 166.53
B (ring opening deg) : 78.54
PA of pole (deg)     : 44.74
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.409
C/A sky separation (km) : 45129.6
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
    
```

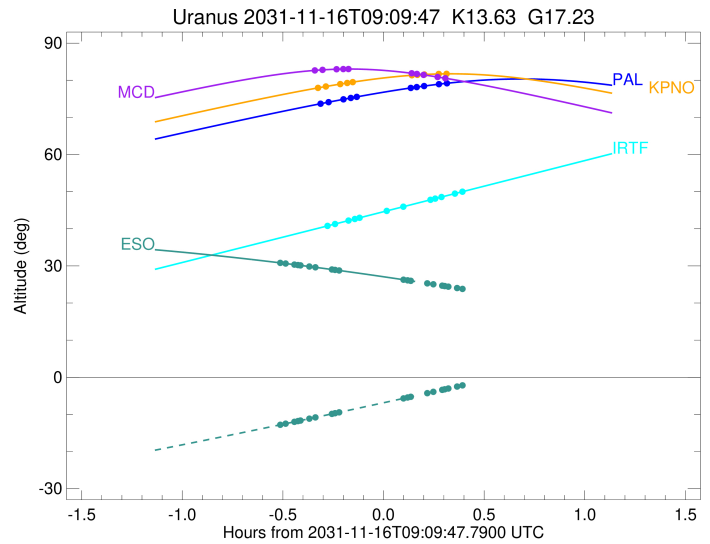
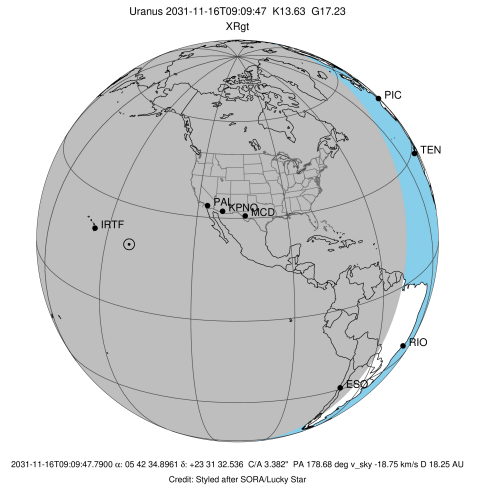


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-16T08:53:50.201		40.94	-72.81	50786.39	-8.41		
lambda	I	2031-11-16T08:55:22.921		41.30	-73.17	50026.71	-7.91		
delta	I	2031-11-16T08:59:24.477		42.22	-74.12	48300.35	-6.35		
gamma	I	2031-11-16T09:01:16.904		42.64	-74.56	47629.85	-5.57		
eta	I	2031-11-16T09:02:43.149		42.97	-74.90	47176.12	-4.95		
beta	I	2031-11-16T09:11:17.556		44.94	-76.92	45642.84	-0.94		

No planet occultations

beta	E	2031-11-16T09:15:10.171		45.82	-77.83	45642.14	0.94		
eta	E	2031-11-16T09:23:44.785		47.79	-79.84	47176.12	4.96		
gamma	E	2031-11-16T09:25:10.365		48.12	-80.18	47627.07	5.58		
delta	E	2031-11-16T09:27:03.037		48.55	-80.62	48300.35	6.37		
lambda	E	2031-11-16T09:31:03.927		49.47	-81.56	50026.71	7.94		
epsilon	E	2031-11-16T09:32:35.874		49.82	-81.92	50782.37	8.44		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-16T09:06:52.120
 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 : 3428383362576743296
 2Mass ID (if available) : 05423483+2331334
 ICRS Star Coord at Epoch: 05h 42m 34.89606s +23:31:32.53602s
 RUWE (>1.4 is poor) : 1.14
 K magnitude : 13.634
 G magnitude : 17.234
 RP magnitude : 16.094
 BP magnitude : 18.529
 DUPflag : 0
 Distance (au) : 18.252
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.75
 Sun-Target sep (deg) : 147.35
 Sun-Moon sep (deg) : 167.44
 B (ring opening deg) : 78.54
 PA of pole (deg) : 44.74
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.018
 C/A sky separation (km) : 39954.5
 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	2031-11-16T08:39:28.948		30.77	-12.72	50831.48	-11.67		
lambda	I	2031-11-16T08:40:38.435		30.64	-12.50	50026.71	-11.42		
delta	I	2031-11-16T08:43:15.078		30.34	-12.00	48300.35	-10.61		
gamma	I	2031-11-16T08:44:19.231		30.22	-11.80	47630.78	-10.26		
eta	I	2031-11-16T08:45:04.106		30.14	-11.66	47176.12	-10.00		
beta	I	2031-11-16T08:47:44.586		29.83	-11.15	45648.15	-9.02		
alpha	I	2031-11-16T08:49:35.777		29.61	-10.79	44684.62	-8.29		
4	I	2031-11-16T08:54:24.856		29.03	-9.86	42588.94	-6.15		
5	I	2031-11-16T08:55:09.718		28.94	-9.72	42315.15	-5.82		
6	I	2031-11-16T08:56:35.808		28.76	-9.44	41845.42	-5.13		

No planet occultations

6	E	2031-11-16T09:15:49.318		26.27	-5.68	41865.62	5.13		
5	E	2031-11-16T09:17:08.562		26.09	-5.42	42302.98	5.81		
4	E	2031-11-16T09:17:50.812		25.99	-5.28	42560.19	6.14		
alpha	E	2031-11-16T09:22:46.647		25.31	-4.30x	44696.58	8.28		
beta	E	2031-11-16T09:24:35.553		25.06	-3.94x	45641.16	9.01		
eta	E	2031-11-16T09:27:17.094		24.67	-3.40x	47176.12	9.99		
gamma	E	2031-11-16T09:28:01.559		24.57	-3.25x	47625.73	10.24		
delta	E	2031-11-16T09:29:06.329		24.41	-3.03x	48300.35	10.59		
lambda	E	2031-11-16T09:31:43.298		24.03	-2.51x	50026.71	11.39		
epsilon	E	2031-11-16T09:32:51.986		23.87	-2.28x	50820.29	11.64		