

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-17T20:39:01.090
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3415726124017657984
 2Mass ID (if available) : 05121369+2304559

ICRS Star Coord at Epoch: 05h 12m 13.69695s +23:04:55.79204s

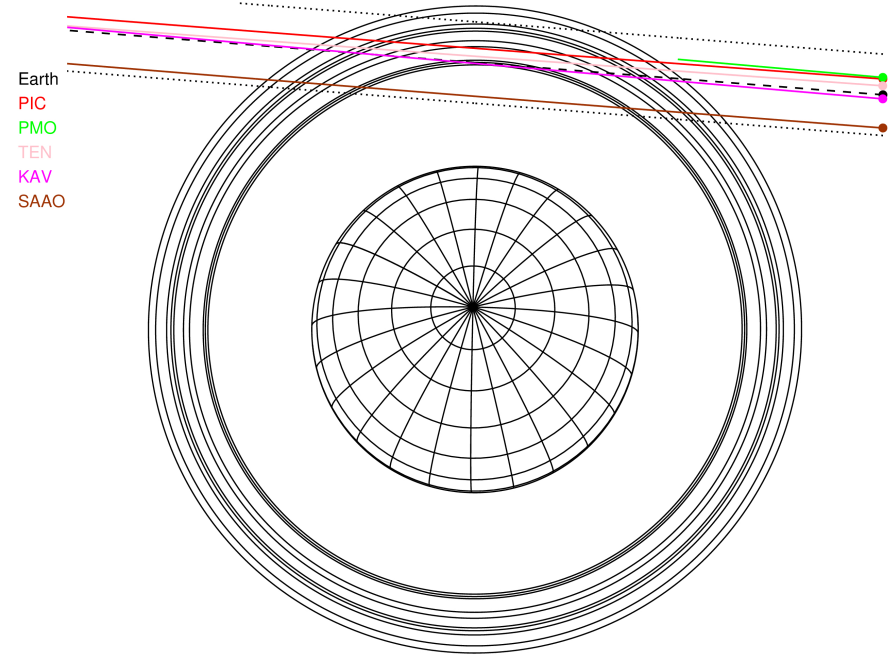
RUWE (>1.4 is poor) : 1.06
 K magnitude : 13.212
 G magnitude : 15.284
 RP magnitude : 14.590
 BP magnitude : 15.811
 DUPflag : 0
 Distance (au) : 18.364
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.13
 Sun-Target sep (deg) : 141.93
 Sun-Moon sep (deg) : 144.97
 B (ring opening deg) : 82.06
 PA of pole (deg) : 5.22

#	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



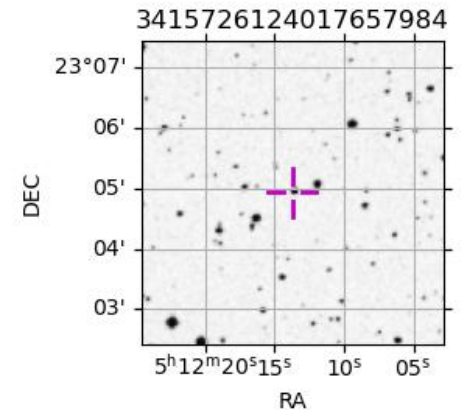
2031-01-17T20:39:01.0900 ex: 05 12 13.69695 s: +23 04 55.792 C/A 3.135° PA 175.48 deg v_sky -17.13 km/s D 18.36 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2031-01-17T20:39:01 K13.21 G15.28 XRgt

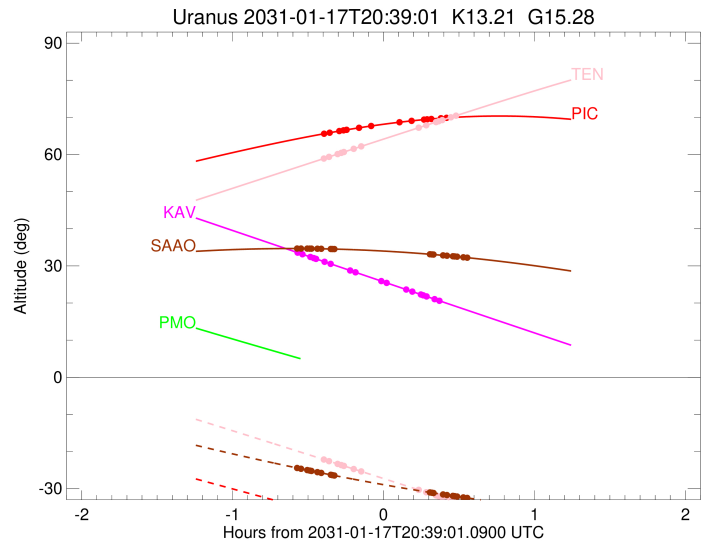
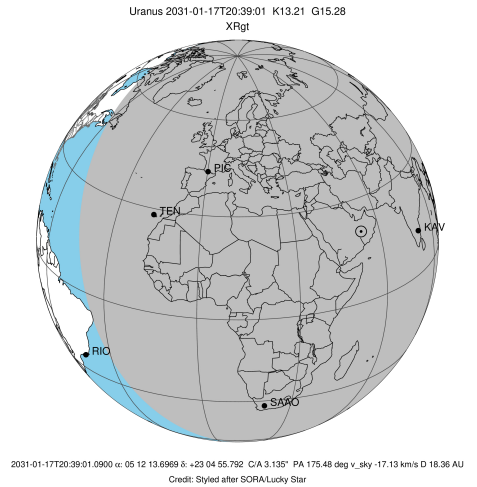


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++++		+++++++	JAN 17 20:16 - JAN 17 21:03	PnnRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald Obs. 2.7m	30.7	256.0					PnnRnn
TEN	Teide Obs./Tenerife	28.3	343.5	+++++++		+++++++	JAN 17 20:16 - JAN 17 21:07	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++++		+++++++	JAN 17 20:05 - JAN 17 21:01	PnnRie
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	+++++++		+++++++	JAN 17 20:05 - JAN 17 21:12	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-17T20:39:52.610
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3415726124017657984
 2Mass ID (if available) : 05121369+2304559
 ICRS Star Coord at Epoch: 05h 12m 13.69695s +23:04:55.79204s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 13.212
 G magnitude : 15.284
 RP magnitude : 14.590
 BP magnitude : 15.811
 DUPflag : 0
 Distance (au) : 18.364
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.13
 Sun-Target sep (deg) : 141.93
 Sun-Moon sep (deg) : 145.37
 B (ring opening deg) : 82.06
 PA of pole (deg) : 5.22
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.297
 C/A sky separation (km) : 43914.3
 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



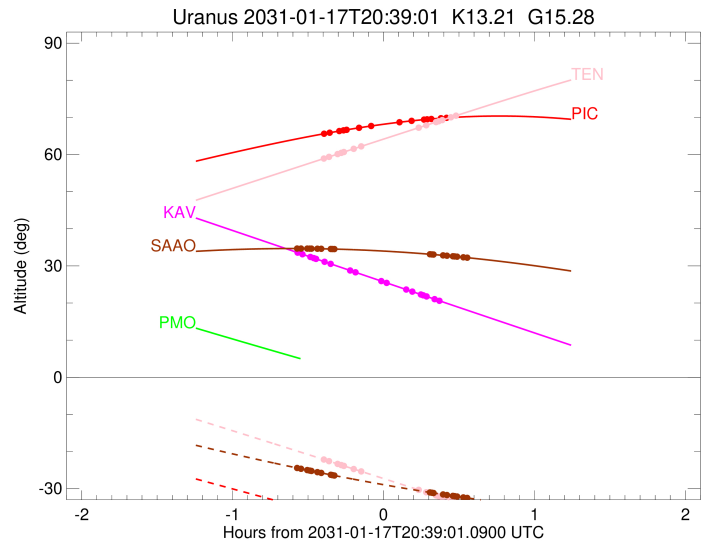
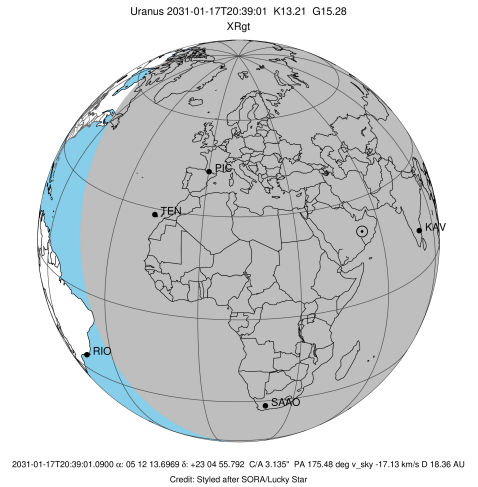
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-17T20:16:09.405		65.70	-36.87	50773.37	-8.56		
lambda	I	2031-01-17T20:17:39.353		65.88	-37.15	50026.71	-8.09		
delta	I	2031-01-17T20:21:28.990		66.33	-37.85	48300.35	-6.93		
gamma	I	2031-01-17T20:23:11.016		66.53	-38.16	47621.79	-6.37		
eta	I	2031-01-17T20:24:23.265		66.66	-38.37	47176.12	-5.96		
beta	I	2031-01-17T20:29:17.635		67.20	-39.27	45676.79	-4.19		
alpha	I	2031-01-17T20:34:24.609		67.72	-40.20	44693.14	-2.18		

No planet occultations

alpha	E	2031-01-17T20:45:02.401		68.68	-42.12	44688.37	2.18		
beta	E	2031-01-17T20:50:09.718		69.07	-43.04	45669.14	4.19		
eta	E	2031-01-17T20:55:05.817		69.40	-43.92	47176.12	5.97		
gamma	E	2031-01-17T20:56:18.540		69.48	-44.14	47624.91	6.37		
delta	E	2031-01-17T20:58:00.051		69.58	-44.44	48300.35	6.93		
lambda	E	2031-01-17T21:01:49.623		69.78	-45.12	50026.71	8.09		
epsilon	E	2031-01-17T21:03:55.643		69.88	-45.50	51083.68	8.56		

```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch             : 2031-01-17T20:41:43.230
Event type            : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code         : TEN
Location              : Teide Obs./Tenerife
Latitude (deg)        : 28.30050
E. Longitude (deg)    : 343.48909
Altitude (km)         : 2.395
Gaia source ID        : 3415726124017657984
2Mass ID (if available) : 05121369+2304559
ICRS Star Coord at Epoch: 05h 12m 13.69695s +23:04:55.79204s
RUWE (>1.4 is poor)  : 1.06
K magnitude           : 13.212
G magnitude           : 15.284
RP magnitude          : 14.590
BP magnitude          : 15.811
DUPflag               : 0
Distance (au)         : 18.364
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -17.13
Sun-Target sep (deg)  : 141.93
Sun-Moon sep (deg)    : 145.14
B (ring opening deg)  : 82.06
PA of pole (deg)      : 5.22
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.204
C/A sky separation (km) : 42676.5
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
  
```

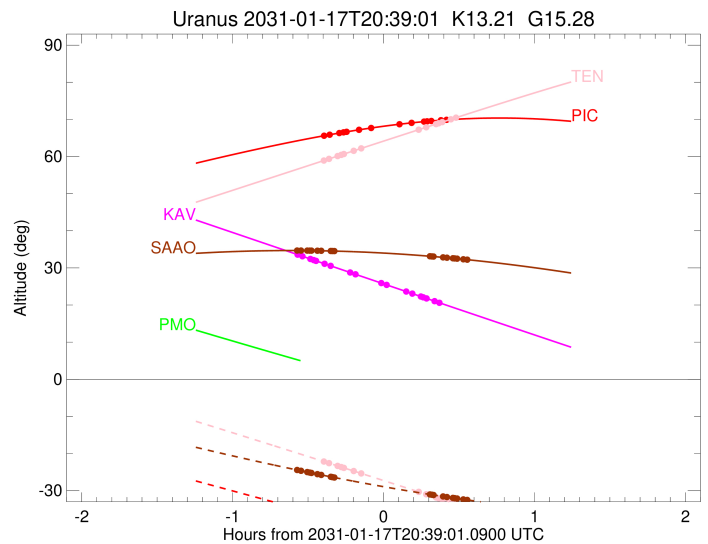
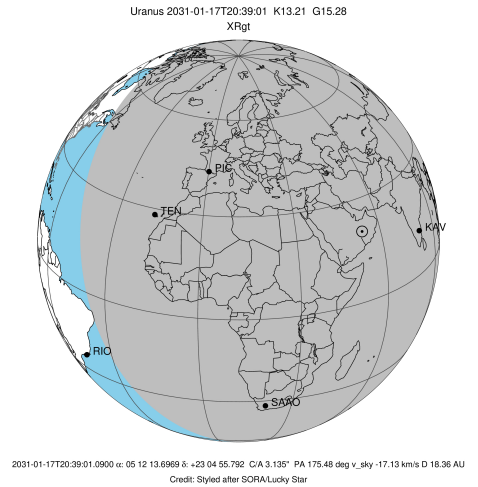


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-17T20:16:01.681		59.08	-22.31	50766.89	-9.28		
lambda	I	2031-01-17T20:17:23.373		59.38	-22.61	50026.71	-8.88		
delta	I	2031-01-17T20:20:48.997		60.13	-23.35	48300.35	-7.90		
gamma	I	2031-01-17T20:22:17.493		60.46	-23.66	47621.62	-7.44		
eta	I	2031-01-17T20:23:18.704		60.69	-23.88	47176.12	-7.11		
beta	I	2031-01-17T20:27:10.354		61.54	-24.72	45677.89	-5.79		
alpha	I	2031-01-17T20:30:17.925		62.23	-25.39	44696.52	-4.63		

No planet occultations

alpha	E	2031-01-17T20:52:50.894		67.19	-30.29	44686.44	4.64		
beta	E	2031-01-17T20:55:58.646		67.88	-30.97	45667.29	5.80		
eta	E	2031-01-17T20:59:51.790		68.73	-31.82	47176.12	7.12		
gamma	E	2031-01-17T21:00:53.403		68.95	-32.04	47625.27	7.45		
delta	E	2031-01-17T21:02:21.273		69.27	-32.36	48300.35	7.91		
lambda	E	2031-01-17T21:05:46.543		70.02	-33.11	50026.71	8.90		
epsilon	E	2031-01-17T21:07:44.187		70.45	-33.54	51104.02	9.30		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-17T20:33:09.010
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 3415726124017657984
 2Mass ID (if available) : 05121369+2304559
 ICRS Star Coord at Epoch: 05h 12m 13.69695s +23:04:55.79204s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 13.212
 G magnitude : 15.284
 RP magnitude : 14.590
 BP magnitude : 15.811
 DUPflag : 0
 Distance (au) : 18.364
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.13
 Sun-Target sep (deg) : 141.93
 Sun-Moon sep (deg) : 145.94
 B (ring opening deg) : 82.06
 PA of pole (deg) : 5.22
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.116
 C/A sky separation (km) : 41508.2
 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

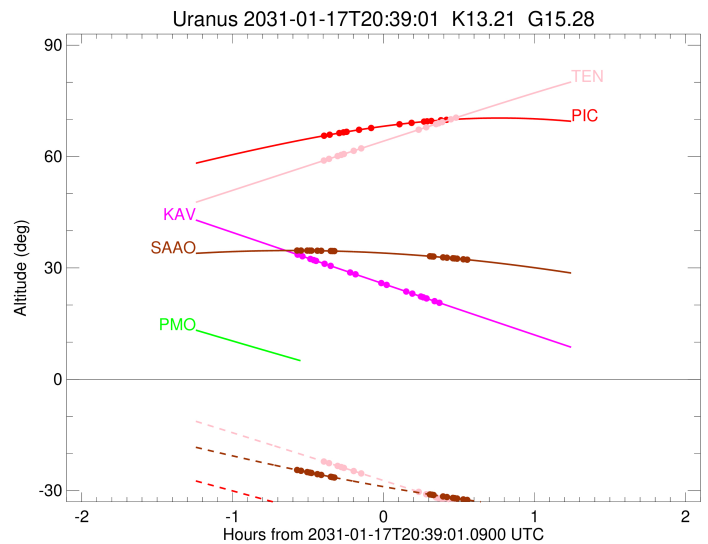
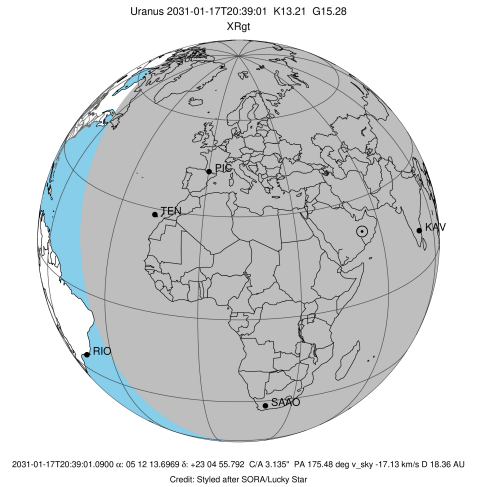


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-01-17T20:05:32.782		33.42	-71.20	50759.86	-9.85		
lambda	I	2031-01-17T20:06:48.700		33.13	-70.93	50026.71	-9.50		
delta	I	2031-01-17T20:09:58.883		32.40	-70.24	48300.35	-8.64		
gamma	I	2031-01-17T20:11:19.230		32.09	-69.95	47621.45	-8.25		
eta	I	2031-01-17T20:12:14.091		31.88	-69.75	47176.12	-7.98		
beta	I	2031-01-17T20:15:34.964		31.11	-69.02	45678.77	-6.91		
alpha	I	2031-01-17T20:18:05.985		30.53	-68.46	44699.22	-6.03		
4	I	2031-01-17T20:26:04.161		28.69	-66.69	42535.83	-2.94		
5	I	2031-01-17T20:28:03.294		28.24	-66.24	42227.35	-2.09		

No planet occultations

5	E	2031-01-17T20:37:50.096		25.98	-64.04	42208.50	2.09		
4	E	2031-01-17T20:39:55.173		25.50	-63.57	42528.44	2.93		
alpha	E	2031-01-17T20:47:55.098		23.66	-61.74	44685.73	6.01		
beta	E	2031-01-17T20:50:27.125		23.08	-61.16	45666.20	6.88		
eta	E	2031-01-17T20:53:50.688		22.30	-60.39	47176.12	7.94		
gamma	E	2031-01-17T20:54:46.315		22.09	-60.17	47625.48	8.21		
delta	E	2031-01-17T20:56:06.594		21.78	-59.87	48300.35	8.60		
lambda	E	2031-01-17T20:59:17.881		21.05	-59.13	50026.71	9.44		
epsilon	E	2031-01-17T21:01:10.455		20.62	-58.70	51115.21	9.78		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-01-17T20:38:35.590
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : SAAO
 Location : So. Afr. Astro. Obs. (Sutherland)
 Latitude (deg) : -32.37953
 E. Longitude (deg) : 20.81070
 Altitude (km) : 1.768
 Gaia source ID : 3415726124017657984
 2Mass ID (if available) : 05121369+2304559
 ICRS Star Coord at Epoch: 05h 12m 13.69695s +23:04:55.79204s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 13.212
 G magnitude : 15.284
 RP magnitude : 14.590
 BP magnitude : 15.811
 DUPflag : 0
 Distance (au) : 18.364
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -17.13
 Sun-Target sep (deg) : 141.93
 Sun-Moon sep (deg) : 145.37
 B (ring opening deg) : 82.06
 PA of pole (deg) : 5.22
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.734
 C/A sky separation (km) : 36410.3
 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_itrf93_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	2031-01-17T20:05:15.122		34.68	-24.52	50747.15	-12.11		
lambda	I	2031-01-17T20:06:15.185		34.67	-24.66	50026.71	-11.90		
delta	I	2031-01-17T20:08:43.490		34.66	-25.00	48300.35	-11.38		
gamma	I	2031-01-17T20:09:43.797		34.65	-25.14	47621.12	-11.15		
eta	I	2031-01-17T20:10:23.997		34.65	-25.24	47176.12	-10.99		
beta	I	2031-01-17T20:12:43.709		34.63	-25.56	45680.43	-10.41		
alpha	I	2031-01-17T20:14:19.151		34.61	-25.77	44706.43	-9.97		
4	I	2031-01-17T20:18:08.706		34.55	-26.29	42547.55	-8.81		
5	I	2031-01-17T20:18:41.544		34.55	-26.36	42257.78	-8.62		
6	I	2031-01-17T20:19:27.096		34.53	-26.46	41876.18	-8.38		

No planet occultations

6	E	2031-01-17T20:57:27.533		33.14	-31.02	41844.16	8.38		
5	E	2031-01-17T20:58:08.296		33.10	-31.09	42181.06	8.61		
4	E	2031-01-17T20:58:47.004		33.07	-31.16	42525.95	8.80		
alpha	E	2031-01-17T21:02:37.282		32.84	-31.56	44684.61	9.96		
beta	E	2031-01-17T21:04:13.229		32.75	-31.72	45661.53	10.39		
eta	E	2031-01-17T21:06:34.913		32.60	-31.96	47176.12	10.98		
gamma	E	2031-01-17T21:07:15.658		32.55	-32.03	47626.56	11.13		
delta	E	2031-01-17T21:08:15.565		32.49	-32.12	48300.35	11.36		
lambda	E	2031-01-17T21:10:44.102		32.32	-32.36	50026.71	11.88		
epsilon	E	2031-01-17T21:12:20.239		32.21	-32.51	51183.47	12.09		