

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-03T01:49:42.320
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427625245010716160
 2Mass ID (if available) : 05441909+2331564

ICRS Star Coord at Epoch: 05h 44m 19.11345s +23:31:56.37621s

RUWE (>1.4 is poor) : 1.08
 K magnitude : 14.864
 G magnitude : 18.119
 RP magnitude : 17.167
 BP magnitude : 19.078
 DUPflag : 0
 Distance (au) : 18.397
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.18
 Sun-Target sep (deg) : 133.59
 Sun-Moon sep (deg) : 4.11
 B (ring opening deg) : 78.25
 PA of pole (deg) : 46.25

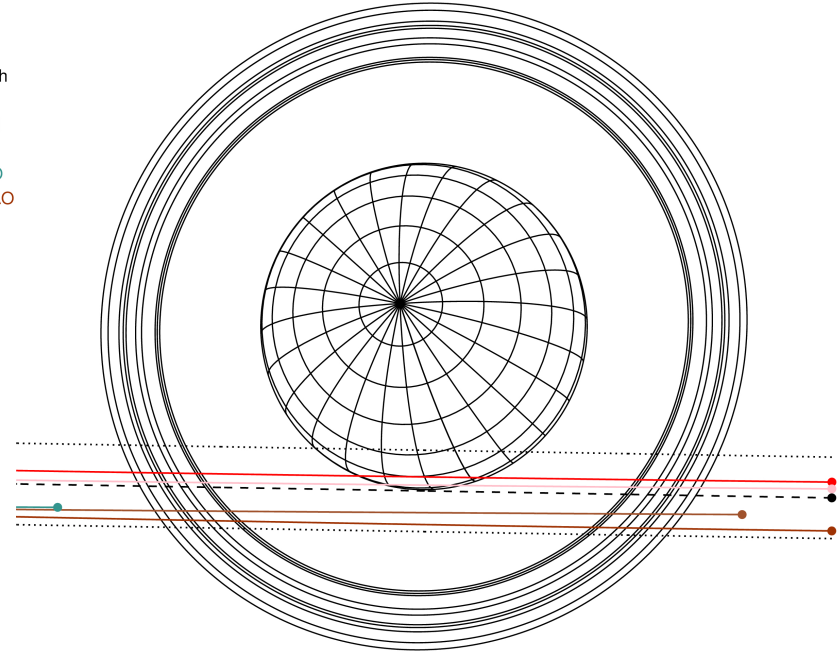
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2031-11-03T01:49:42.3200 cr: 05 44 19.1134 s: +23 31 56.376 C/A 1.922 PA 359.02 deg v_sky -14.18 km/s D 18.40 AU
 Credit: Styled after SORA/Lucky Star

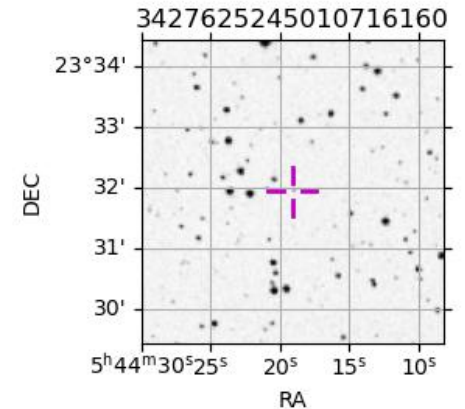
Uranus 2031-11-03T01:49:42 K14.86 G18.12 PtRgt

Earth
 PIC
 TEN
 RIO
 ESO
 SAAO

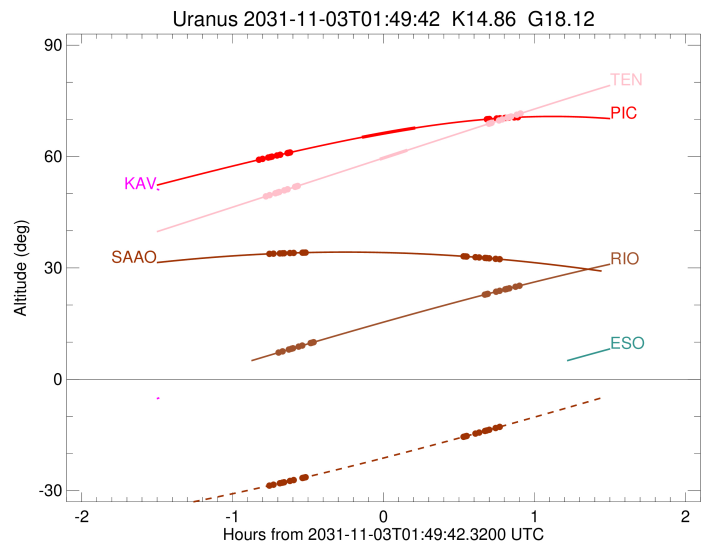
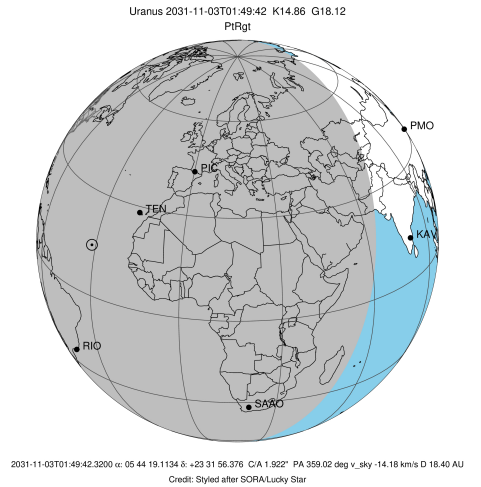


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OCode
PIC	Pic du Midi	42.9	0.1	+++++	+ +	+++++	NOV 03 01:00 - NOV 03 02:43	PieRie
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	+++++	+ +	+++++	NOV 03 01:02 - NOV 03 02:44	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+++++		+++++	NOV 03 01:07 - NOV 03 02:44	PnnRie
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	+++++		+++++	NOV 03 01:04 - NOV 03 02:36	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

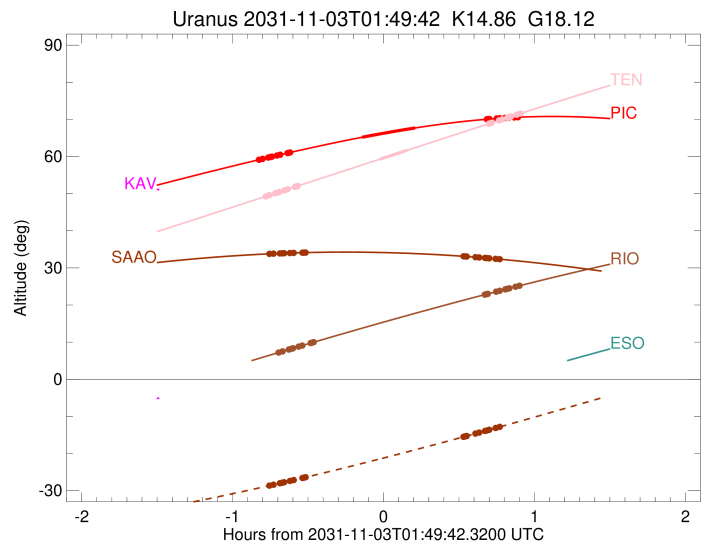
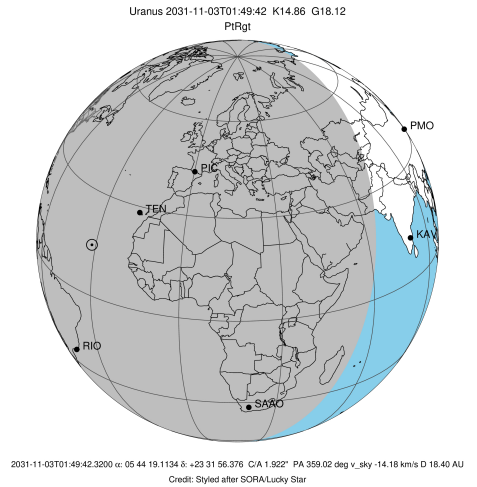


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-03T01:51:08.960
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3427625245010716160
 2Mass ID (if available) : 05441909+2331564
 ICRS Star Coord at Epoch: 05h 44m 19.11345s +23:31:56.37621s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 14.864
 G magnitude : 18.119
 RP magnitude : 17.167
 BP magnitude : 19.078
 DUPflag : 0
 Distance (au) : 18.397
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.18
 Sun-Target sep (deg) : 133.59
 Sun-Moon sep (deg) : 4.32
 B (ring opening deg) : 78.25
 PA of pole (deg) : 46.25
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.765
 C/A sky separation (km) : 23555.4
 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_itrfr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



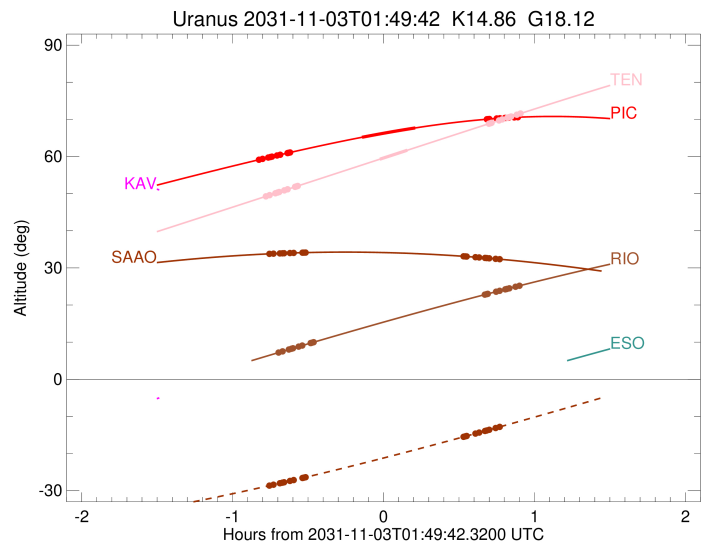
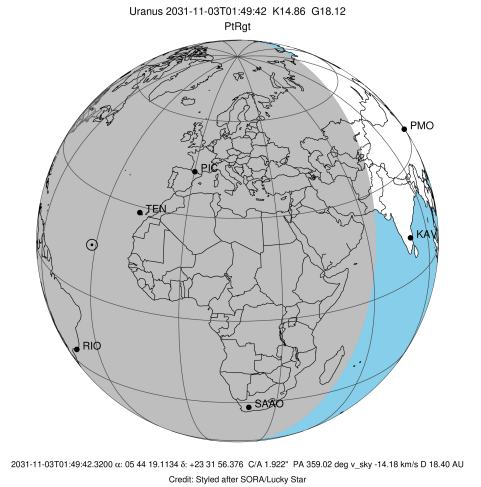
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-03T01:00:07.200		59.13	-57.64	51217.77	-13.00		
lambda	I	2031-11-03T01:01:39.508		59.38	-57.47	50026.71	-12.86		
delta	I	2031-11-03T01:03:54.450		59.73	-57.22	48300.35	-12.72		
gamma	I	2031-11-03T01:04:47.191		59.87	-57.12	47630.76	-12.67		
eta	I	2031-11-03T01:05:23.140		59.97	-57.05	47176.12	-12.63		
beta	I	2031-11-03T01:07:23.132		60.28	-56.82	45669.81	-12.49		
alpha	I	2031-11-03T01:08:40.470		60.49	-56.67	44705.85	-12.39		
4	I	2031-11-03T01:11:31.236		60.93	-56.33	42616.50	-12.13		
5	I	2031-11-03T01:12:00.388		61.00	-56.27	42257.81	-12.07		
6	I	2031-11-03T01:12:37.902		61.10	-56.20	41800.16	-12.02		
Uranus	I	2031-11-03T01:41:09.170		65.19	-52.41	25108.60		-10.48	-10.96
Uranus	E	2031-11-03T02:02:20.324		67.71	-49.24	25488.29		-4.09	-4.28
6	E	2031-11-03T02:30:46.240		70.04	-44.66	41831.01	12.07		
5	E	2031-11-03T02:31:12.803		70.07	-44.58	42155.13	12.12		
4	E	2031-11-03T02:31:45.634		70.10	-44.49	42551.78	12.18		
alpha	E	2031-11-03T02:34:44.395		70.25	-43.99	44752.35	12.44		
beta	E	2031-11-03T02:35:58.108		70.31	-43.79	45673.23	12.54		
eta	E	2031-11-03T02:37:57.273		70.40	-43.45	47176.12	12.68		
gamma	E	2031-11-03T02:38:32.339		70.42	-43.35	47621.56	12.72		
delta	E	2031-11-03T02:39:25.564		70.46	-43.20	48300.35	12.78		
lambda	E	2031-11-03T02:41:39.877		70.54	-42.83	50026.71	12.92		
epsilon	E	2031-11-03T02:43:28.361		70.60	-42.52	51434.15	13.06		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-03T01:53:04.180
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : 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 : 3427625245010716160
 2Mass ID (if available) : 05441909+2331564
 ICRS Star Coord at Epoch: 05h 44m 19.11345s +23:31:56.37621s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 14.864
 G magnitude : 18.119
 RP magnitude : 17.167
 BP magnitude : 19.078
 DUPflag : 0
 Distance (au) : 18.397
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.18
 Sun-Target sep (deg) : 133.59
 Sun-Moon sep (deg) : 4.02
 B (ring opening deg) : 78.25
 PA of pole (deg) : 46.25
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.862
 C/A sky separation (km) : 24839.7
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ural11.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ural11.bsp
 ural61.bsp
 vgr2.ural61.bsp
 peph.ural60.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	2031-11-03T01:02:52.321		49.26	-76.45	51227.90	-12.79		
lambda	I	2031-11-03T01:04:26.989		49.61	-76.36	50026.71	-12.64		
delta	I	2031-11-03T01:06:44.387		50.11	-76.22	48300.35	-12.49		
gamma	I	2031-11-03T01:07:38.155		50.31	-76.16	47630.68	-12.42		
eta	I	2031-11-03T01:08:14.815		50.44	-76.11	47176.12	-12.38		
beta	I	2031-11-03T01:10:17.291		50.89	-75.96	45670.35	-12.22		
alpha	I	2031-11-03T01:11:36.341		51.18	-75.85	44706.84	-12.11		
4	I	2031-11-03T01:14:31.461		51.83	-75.59	42616.39	-11.82		
5	I	2031-11-03T01:15:01.579		51.94	-75.55	42255.15	-11.75		
6	I	2031-11-03T01:15:39.998		52.08	-75.49	41799.46	-11.69		
Uranus	I	2031-11-03T01:48:12.324		59.27	-71.06	25198.27		-9.34	-9.77
Uranus	E	2031-11-03T01:59:11.650		61.70	-69.16	25406.32		-6.02	-6.31
6	E	2031-11-03T02:31:35.418		68.84	-62.95	41829.26	11.77		
5	E	2031-11-03T02:32:02.818		68.94	-62.85	42154.91	11.83		
4	E	2031-11-03T02:32:36.583		69.06	-62.74	42553.46	11.90		
alpha	E	2031-11-03T02:35:39.140		69.73	-62.12	44752.41	12.19		
beta	E	2031-11-03T02:36:54.338		70.00	-61.87	45673.81	12.31		
eta	E	2031-11-03T02:38:55.583		70.44	-61.46	47176.12	12.47		
gamma	E	2031-11-03T02:39:31.239		70.57	-61.33	47621.65	12.52		
delta	E	2031-11-03T02:40:25.309		70.77	-61.15	48300.35	12.59		
lambda	E	2031-11-03T02:42:41.599		71.27	-60.68	50026.71	12.74		
epsilon	E	2031-11-03T02:44:32.232		71.67	-60.30	51443.29	12.90		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-03T01:55:18.960
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Observer code : RIO
 Location : Rio de Janeiro
 Latitude (deg) : -22.89506
 E. Longitude (deg) : 316.77708
 Altitude (km) : 0.033
 Gaia source ID : 3427625245010716160
 2Mass ID (if available) : 05441909+2331564
 ICRS Star Coord at Epoch: 05h 44m 19.11345s +23:31:56.37621s
 RUWE (>1.4 is poor) : 1.08
 K magnitude : 14.864
 G magnitude : 18.119
 RP magnitude : 17.167
 BP magnitude : 19.078
 DUPflag : 0
 Distance (au) : 18.397
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -14.18
 Sun-Target sep (deg) : 133.59
 Sun-Moon sep (deg) : 3.31
 B (ring opening deg) : 78.25
 PA of pole (deg) : 46.25
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.185
 C/A sky separation (km) : 29154.8
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



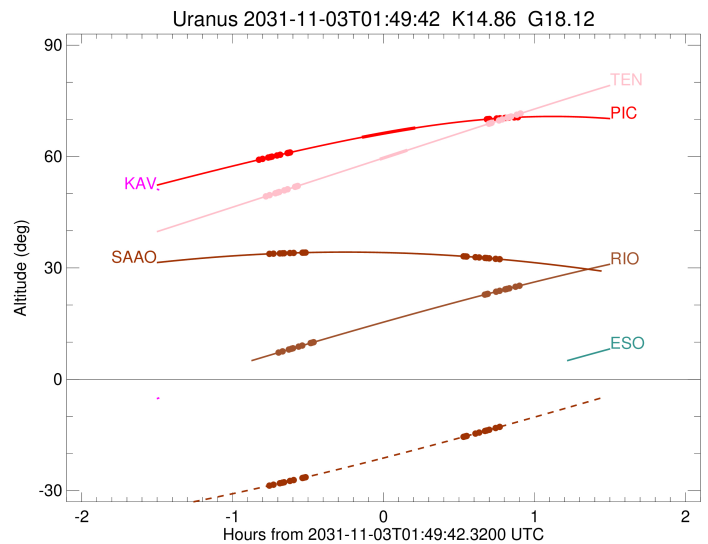
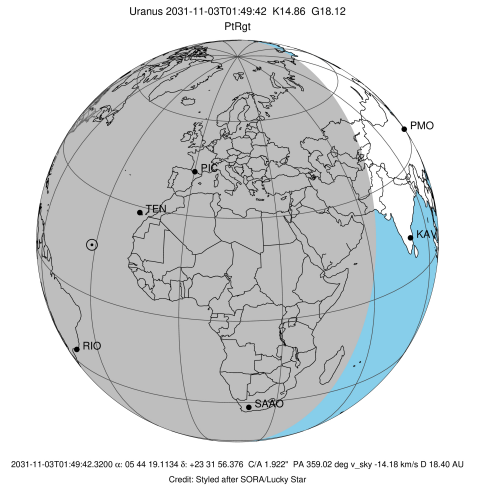
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-03T01:07:51.442		7.17	-46.52	51266.05	-11.90		
lambda	I	2031-11-03T01:09:36.775		7.52	-46.73	50026.71	-11.69		
delta	I	2031-11-03T01:12:05.824		8.02	-47.02	48300.35	-11.47		
gamma	I	2031-11-03T01:13:04.488		8.22	-47.14	47630.34	-11.37		
eta	I	2031-11-03T01:13:44.544		8.35	-47.21	47176.12	-11.31		
beta	I	2031-11-03T01:15:58.998		8.80	-47.47	45672.35	-11.07		
alpha	I	2031-11-03T01:17:26.359		9.09	-47.63	44710.73	-10.90		
4	I	2031-11-03T01:20:42.893		9.74	-47.99	42615.49	-10.47		
5	I	2031-11-03T01:21:17.723		9.86	-48.06	42244.73	-10.37		
6	I	2031-11-03T01:22:00.700		10.00	-48.13	41797.19	-10.27		

No planet occultations

6	E	2031-11-03T02:29:55.828		22.79	-52.25	41823.42	10.36		
5	E	2031-11-03T02:30:27.625		22.88	-52.26	42155.18	10.46		
4	E	2031-11-03T02:31:06.164		23.00	-52.26	42559.37	10.56		
alpha	E	2031-11-03T02:34:29.478		23.59	-52.28	44752.28	11.01		
beta	E	2031-11-03T02:35:52.692		23.83	-52.28	45675.64	11.18		
eta	E	2031-11-03T02:38:05.407		24.22	-52.28	47176.12	11.43		
gamma	E	2031-11-03T02:38:44.304		24.33	-52.28	47621.98	11.50		
delta	E	2031-11-03T02:39:43.049		24.50	-52.27	48300.35	11.60		
lambda	E	2031-11-03T02:42:10.394		24.92	-52.26	50026.71	11.83		
epsilon	E	2031-11-03T02:44:11.550		25.26	-52.23	51470.94	12.05		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-11-03T01:49:23.360
Event type           : PtRgt
: Uranus occs: topocentric, not geocentric
: 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       : 3427625245010716160
2Mass ID (if available) : 05441909+2331564
ICRS Star Coord at Epoch: 05h 44m 19.11345s +23:31:56.37621s
RUWE (>1.4 is poor) : 1.08
K magnitude          : 14.864
G magnitude          : 18.119
RP magnitude         : 17.167
BP magnitude         : 19.078
DUPflag             : 0
Distance (au)        : 18.397
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -14.18
Sun-Target sep (deg) : 133.59
Sun-Moon sep (deg)   : 3.61
B (ring opening deg) : 78.25
PA of pole (deg)     : 46.25
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.324
C/A sky separation (km) : 31013.8
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural11.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_itrf93_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	2031-11-03T01:04:10.609	33.78	-28.68	51287.36	-11.71		
lambda	I	2031-11-03T01:05:59.669	33.84	-28.40	50026.71	-11.47		
delta	I	2031-11-03T01:08:31.963	33.91	-28.01	48300.35	-11.20		
gamma	I	2031-11-03T01:09:32.127	33.93	-27.85	47630.12	-11.08		
eta	I	2031-11-03T01:10:13.246	33.95	-27.74	47176.12	-11.00		
beta	I	2031-11-03T01:12:31.715	34.00	-27.38	45673.41	-10.71		
alpha	I	2031-11-03T01:14:02.075	34.04	-27.15	44712.96	-10.51		
4	I	2031-11-03T01:17:27.440	34.10	-26.60	42614.66	-9.97		
5	I	2031-11-03T01:18:04.480	34.11	-26.50	42238.79	-9.85		
6	I	2031-11-03T01:18:49.349	34.13	-26.38	41796.23	-9.74		

No planet occultations

6	E	2031-11-03T02:21:28.430	33.13	-15.52	41821.25	9.74		
5	E	2031-11-03T02:22:02.547	33.10	-15.41	42155.69	9.86		
4	E	2031-11-03T02:22:43.513	33.07	-15.29	42561.66	9.98		
alpha	E	2031-11-03T02:26:17.246	32.89	-14.63	44752.09	10.51		
beta	E	2031-11-03T02:27:44.283	32.81	-14.36	45676.24	10.72		
eta	E	2031-11-03T02:30:02.313	32.69	-13.93	47176.12	11.01		
gamma	E	2031-11-03T02:30:42.670	32.65	-13.80	47622.11	11.09		
delta	E	2031-11-03T02:31:43.497	32.59	-13.61	48300.35	11.21		
lambda	E	2031-11-03T02:34:15.634	32.44	-13.14	50026.71	11.48		
epsilon	E	2031-11-03T02:36:21.015	32.32	-12.74	51479.22	11.73		