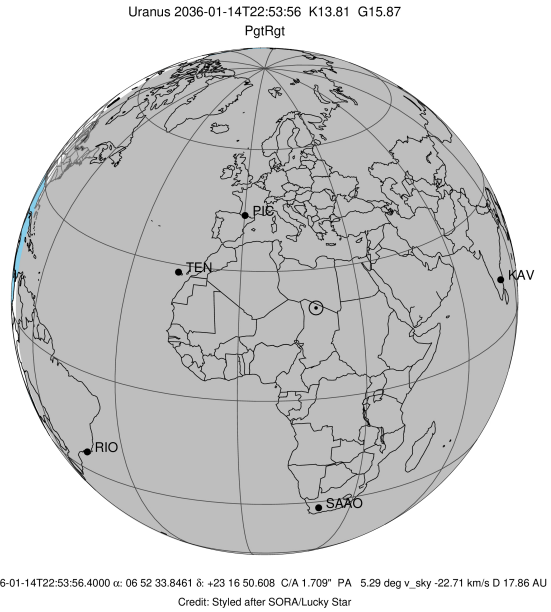
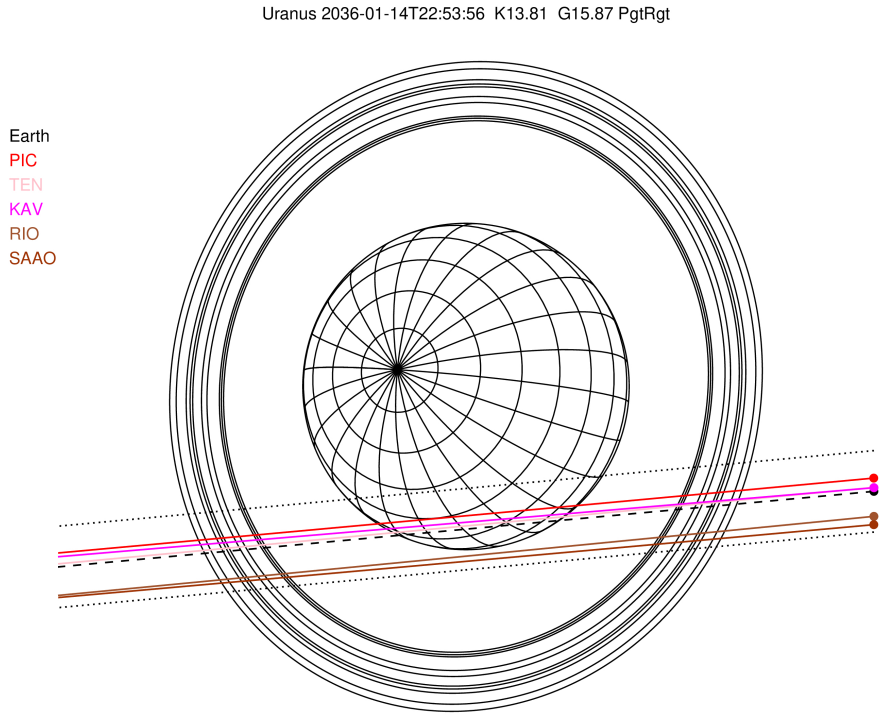
Stellar occultation prediction by rfrench@wellesley.edu Sun Jun 25 01:46:35 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2036-01-14T22:53:56.400
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Gaia source ID : 3380317112255318400
2Mass ID (if available) : 06523384+2316507

ICRS Star Coord at Epoch: 06h 52m 33.84615s +23:16:50.60797s
RUWE (>1.4 is poor) : 1.01
K magnitude : 13.813
G magnitude : 15.872
RP magnitude : 15.189
BP magnitude : 16.409
DUPflag : 0
Distance (au) : 17.860
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -22.71
Sun-Target sep (deg) : 168.20
Sun-Moon sep (deg) : 32.87
B (ring opening deg) : 64.35
PA of pole (deg) : 76.25

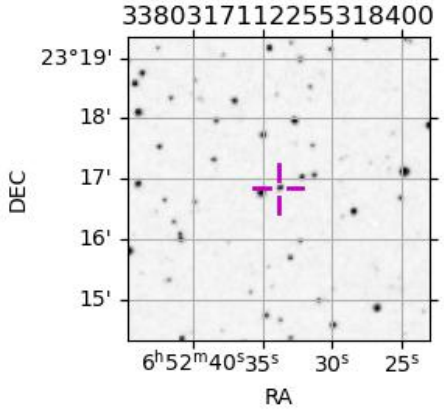
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon





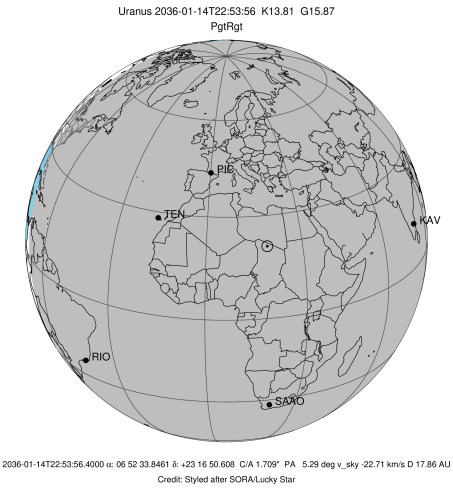
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

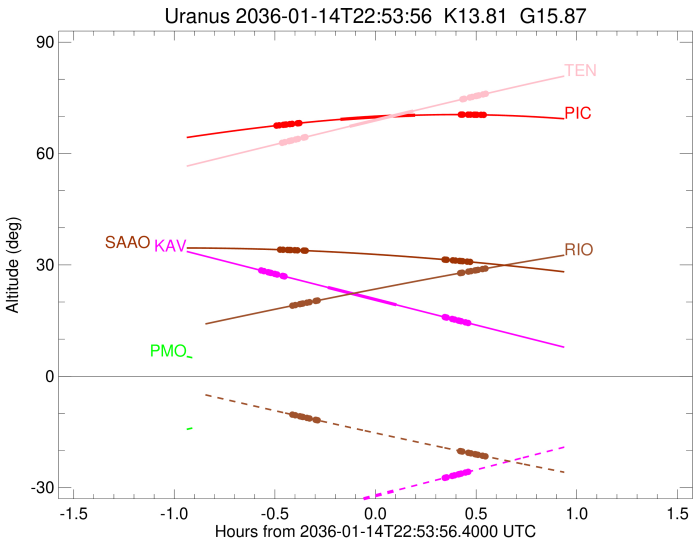
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	++++++++++	+ +	++++++++++	JAN 14 22:24 - JAN 14 23:26	PieRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald Obs. 2.7m	30.7	256.0					PnnRnn
TEN	Teide Obs./Tenerife	28.3	343.5	++++++++++	+ +	++++++++++	JAN 14 22:26 - JAN 14 23:27	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	++++++++++	+ +	++++++++++	JAN 14 22:20 - JAN 14 23:21	PieRie
RIO	Rio de Janeiro	-22.9	316.8	++++++++++		++++++++++	JAN 14 22:29 - JAN 14 23:26	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	++++++++++		++++++++++	JAN 14 22:25 - JAN 14 23:22	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



Uranus_2036-01-14T22_53_56.4000_PIC.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:16:41 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2036-01-14T22:54:27.300
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: 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 : 3380317112255318400
2Mass ID (if available) : 06523384+2316507
ICRS Star Coord at Epoch: 06h 52m 33.84615s +23:16:50.60797s
RUWE (>1.4 is poor) : 1.01
K magnitude : 13.813
G magnitude : 15.872
RP magnitude : 15.189
BP magnitude : 16.409
DUPflag : 0
Distance (au) : 17.860
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -22.71
Sun-Target sep (deg) : 168.20
Sun-Moon sep (deg) : 33.51
B (ring opening deg) : 64.35
PA of pole (deg) : 76.25
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.557
C/A sky separation (km) : 20162.9
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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



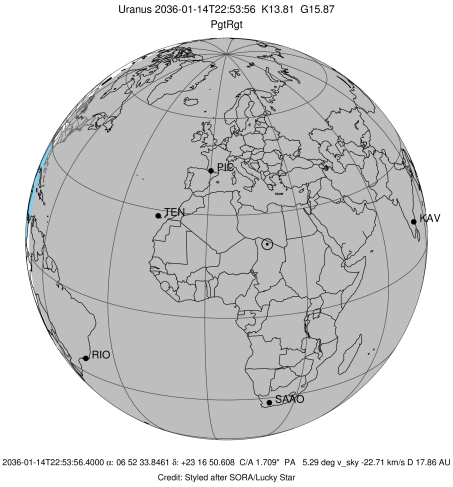


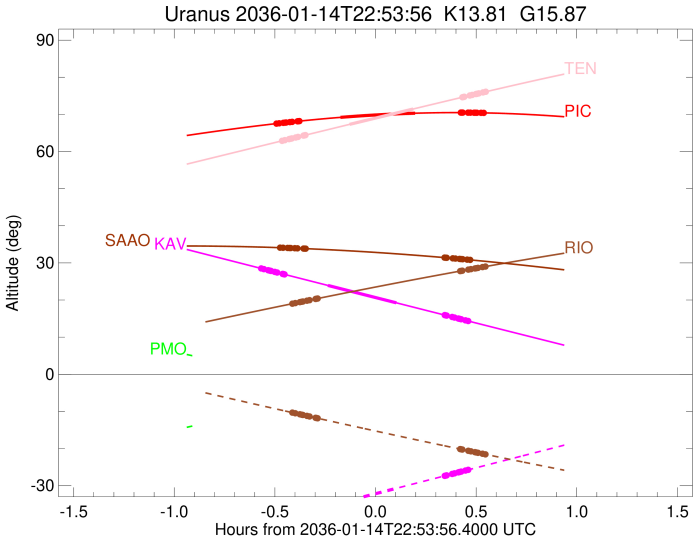
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2036-01-14T22:24:40.973		67.55	-59.49	50791.43	-23.21		
lambda	I	2036-01-14T22:25:14.023		67.61	-59.57	50026.71	-23.10		
delta	I	2036-01-14T22:26:29.013		67.74	-59.75	48300.35	-22.94		
gamma	I	2036-01-14T22:26:58.673		67.79	-59.82	47621.13	-22.86		
eta	I	2036-01-14T22:27:18.157		67.82	-59.87	47176.12	-22.82		
beta	I	2036-01-14T22:28:25.724		67.93	-60.03	45641.61	-22.64		
alpha	I	2036-01-14T22:29:05.023		67.99	-60.13	44752.34	-22.52		
4	I	2036-01-14T22:30:40.747		68.14	-60.36	42612.71	-22.21		
5	I	2036-01-14T22:31:01.763		68.18	-60.41	42163.42	-22.16		
6	I	2036-01-14T22:31:15.093		68.20	-60.44	41856.74	-22.08		
Uranus	I	2036-01-14T22:43:29.163		69.21	-62.12	25229.93		-21.02	-21.92
Uranus	E	2036-01-14T23:05:45.349		70.32	-64.82	25508.47		8.01	8.39
6	E	2036-01-14T23:19:20.435		70.49	-66.17	41794.88	22.09		
5	E	2036-01-14T23:19:42.874		70.48	-66.20	42303.94	22.17		
4	E	2036-01-14T23:19:53.609		70.48	-66.22	42533.35	22.21		
alpha	E	2036-01-14T23:21:30.094		70.47	-66.36	44700.63	22.53		
beta	E	2036-01-14T23:22:13.056		70.47	-66.42	45669.20	22.64		
eta	E	2036-01-14T23:23:19.404		70.46	-66.51	47176.12	22.82		
gamma	E	2036-01-14T23:23:39.298		70.45	-66.54	47630.58	22.87		
delta	E	2036-01-14T23:24:08.539		70.45	-66.58	48300.35	22.94		
lambda	E	2036-01-14T23:25:23.514		70.43	-66.68	50026.71	23.11		
epsilon	E	2036-01-14T23:26:28.553		70.41	-66.77	51534.01	23.22		

Uranus_2036-01-14T22_53_56.4000_TEN.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:27:26 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2036-01-14T22:55:31.850
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: 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 : 3380317112255318400
2Mass ID (if available) : 06523384+2316507
ICRS Star Coord at Epoch: 06h 52m 33.84615s +23:16:50.60797s
RUWE (>1.4 is poor) : 1.01
K magnitude : 13.813
G magnitude : 15.872
RP magnitude : 15.189
BP magnitude : 16.409
DUPflag : 0
Distance (au) : 17.860
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -22.71
Sun-Target sep (deg) : 168.20
Sun-Moon sep (deg) : 33.70
B (ring opening deg) : 64.35
PA of pole (deg) : 76.25
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.678
C/A sky separation (km) : 21742.2
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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



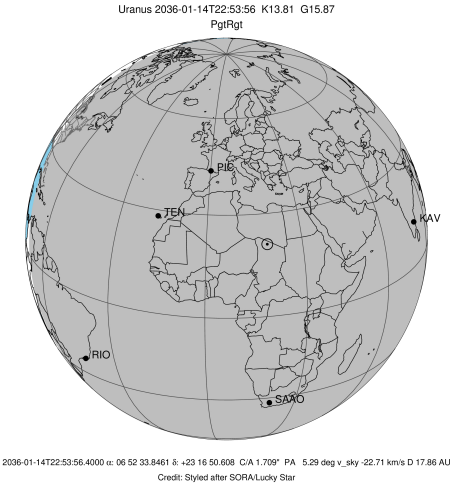


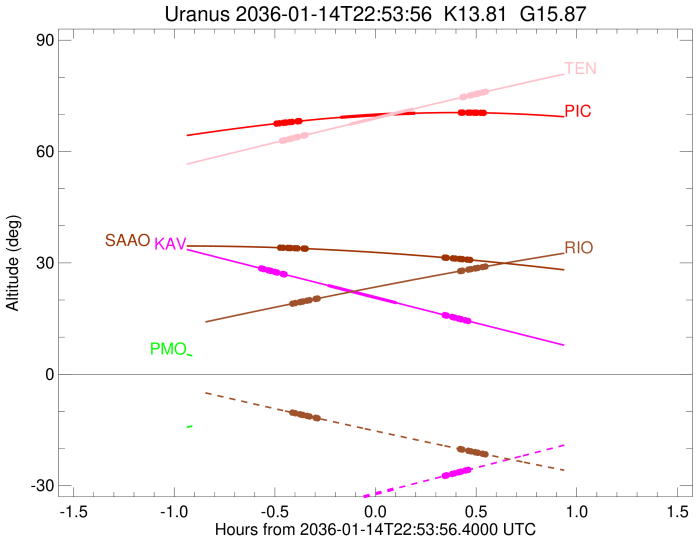
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2036-01-14T22:26:21.035		62.94	-51.28	50797.85	-22.85		
lambda	I	2036-01-14T22:26:54.868		63.07	-51.40	50026.71	-22.75		
delta	I	2036-01-14T22:28:11.072		63.35	-51.68	48300.35	-22.55		
gamma	I	2036-01-14T22:28:41.242		63.46	-51.79	47621.18	-22.47		
eta	I	2036-01-14T22:29:01.075		63.53	-51.87	47176.12	-22.41		
beta	I	2036-01-14T22:30:09.920		63.79	-52.12	45641.44	-22.20		
alpha	I	2036-01-14T22:30:49.997		63.93	-52.27	44752.41	-22.06		
4	I	2036-01-14T22:32:27.918		64.29	-52.63	42611.92	-21.69		
5	I	2036-01-14T22:32:49.317		64.37	-52.70	42165.00	-21.63		
6	I	2036-01-14T22:33:03.157		64.42	-52.75	41855.11	-21.54		
Uranus	I	2036-01-14T22:46:13.236		67.32	-55.65	25278.71		-19.30	-20.15
Uranus	E	2036-01-14T23:05:11.877		71.47	-59.82	25536.01		5.39	5.65
6	E	2036-01-14T23:19:49.314		74.62	-63.02	41794.77	21.57		
5	E	2036-01-14T23:20:12.231		74.70	-63.10	42302.00	21.66		
4	E	2036-01-14T23:20:23.319		74.74	-63.14	42534.51	21.72		
alpha	E	2036-01-14T23:22:01.855		75.09	-63.50	44701.87	22.09		
beta	E	2036-01-14T23:22:45.547		75.24	-63.66	45668.44	22.23		
eta	E	2036-01-14T23:23:53.096		75.48	-63.91	47176.12	22.44		
gamma	E	2036-01-14T23:24:13.313		75.55	-63.98	47630.45	22.50		
delta	E	2036-01-14T23:24:43.027		75.66	-64.09	48300.35	22.59		
lambda	E	2036-01-14T23:25:59.117		75.93	-64.36	50026.71	22.79		
epsilon	E	2036-01-14T23:27:04.821		76.16	-64.60	51529.10	22.91		

Uranus_2036-01-14T22_53_56.4000_KAV.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:31:39 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2036-01-14T22:49:46.970
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: 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 : 3380317112255318400
2Mass ID (if available) : 06523384+2316507
ICRS Star Coord at Epoch: 06h 52m 33.84615s +23:16:50.60797s
RUWE (>1.4 is poor) : 1.01
K magnitude : 13.813
G magnitude : 15.872
RP magnitude : 15.189
BP magnitude : 16.409
DUPflag : 0
Distance (au) : 17.860
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -22.71
Sun-Target sep (deg) : 168.20
Sun-Moon sep (deg) : 32.28
B (ring opening deg) : 64.35
PA of pole (deg) : 76.25
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.636
C/A sky separation (km) : 21188.4
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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



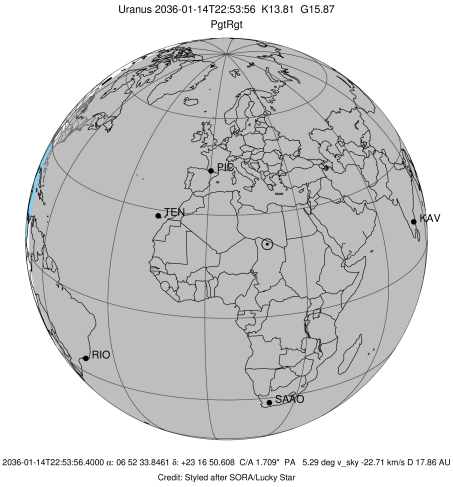


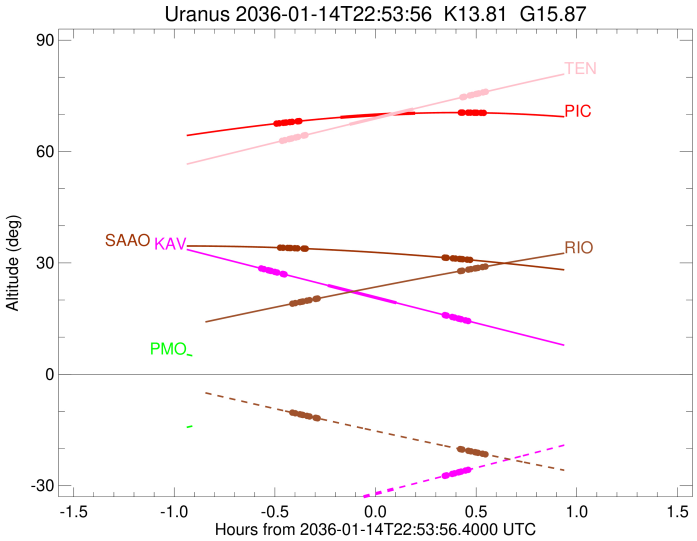
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2036-01-14T22:20:07.275		28.45	-40.05	50797.08	-22.85		
lambda	I	2036-01-14T22:20:41.113		28.32	-39.92	50026.71	-22.73		
delta	I	2036-01-14T22:21:57.384		28.02	-39.62	48300.35	-22.54		
gamma	I	2036-01-14T22:22:27.571		27.91	-39.50	47621.18	-22.46		
eta	I	2036-01-14T22:22:47.412		27.83	-39.43	47176.12	-22.40		
beta	I	2036-01-14T22:23:56.264		27.57	-39.16	45641.46	-22.20		
alpha	I	2036-01-14T22:24:36.332		27.41	-39.00	44752.40	-22.08		
4	I	2036-01-14T22:26:14.152		27.04	-38.62	42612.06	-21.72		
5	I	2036-01-14T22:26:35.541		26.96	-38.54	42164.72	-21.67		
6	I	2036-01-14T22:26:49.326		26.90	-38.49	41855.40	-21.58		
Uranus	I	2036-01-14T22:39:44.688		23.93	-35.48	25264.15		-19.83	-20.69
Uranus	E	2036-01-14T23:00:10.524		19.24	-30.72	25525.01		6.56	6.87
6	E	2036-01-14T23:14:32.699		15.95	-27.38	41794.81	21.49		
5	E	2036-01-14T23:14:55.726		15.86	-27.29	42303.02	21.58		
4	E	2036-01-14T23:15:06.800		15.82	-27.24	42533.90	21.63		
alpha	E	2036-01-14T23:16:45.787		15.44	-26.86	44701.21	21.98		
beta	E	2036-01-14T23:17:29.768		15.28	-26.69	45668.85	22.10		
eta	E	2036-01-14T23:18:37.715		15.02	-26.43	47176.12	22.30		
gamma	E	2036-01-14T23:18:58.068		14.94	-26.35	47630.52	22.35		
delta	E	2036-01-14T23:19:27.983		14.83	-26.23	48300.35	22.43		
lambda	E	2036-01-14T23:20:44.634		14.53	-25.94	50026.71	22.61		
epsilon	E	2036-01-14T23:21:50.986		14.28	-25.68	51531.92	22.73		

Uranus_2036-01-14T22_53_56.4000_RIO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:33:46 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2036-01-14T22:56:48.900
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: 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 : 3380317112255318400
2Mass ID (if available) : 06523384+2316507
ICRS Star Coord at Epoch: 06h 52m 33.84615s +23:16:50.60797s
RUWE (>1.4 is poor) : 1.01
K magnitude : 13.813
G magnitude : 15.872
RP magnitude : 15.189
BP magnitude : 16.409
DUPflag : 0
Distance (au) : 17.860
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -22.71
Sun-Target sep (deg) : 168.20
Sun-Moon sep (deg) : 33.62
B (ring opening deg) : 64.35
PA of pole (deg) : 76.25
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.042
C/A sky separation (km) : 26447.7
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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





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

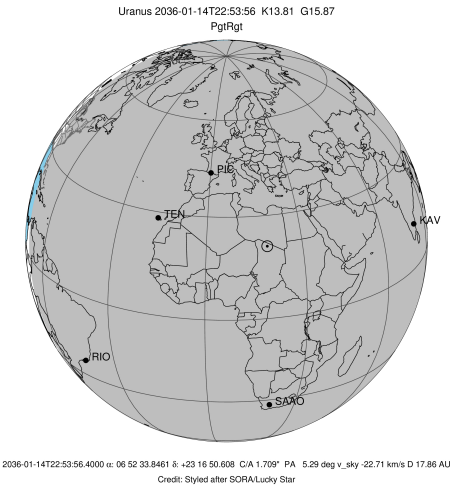
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2036-01-14T22:29:25.014		19.06	-10.38	50820.59	-21.50		
lambda	I	2036-01-14T22:30:02.165		19.18	-10.51	50026.71	-21.30		
delta	I	2036-01-14T22:31:23.789		19.43	-10.79	48300.35	-20.99		
gamma	I	2036-01-14T22:31:56.234		19.53	-10.89	47621.39	-20.86		
eta	I	2036-01-14T22:32:17.628		19.60	-10.97	47176.12	-20.77		
beta	I	2036-01-14T22:33:32.173		19.82	-11.22	45641.11	-20.43		
alpha	I	2036-01-14T22:34:15.784		19.96	-11.36	44752.29	-20.22		
4	I	2036-01-14T22:36:03.559		20.29	-11.73	42608.89	-19.62		
5	I	2036-01-14T22:36:26.718		20.36	-11.80	42170.93	-19.52		
6	I	2036-01-14T22:36:42.790		20.41	-11.86	41849.65	-19.38		

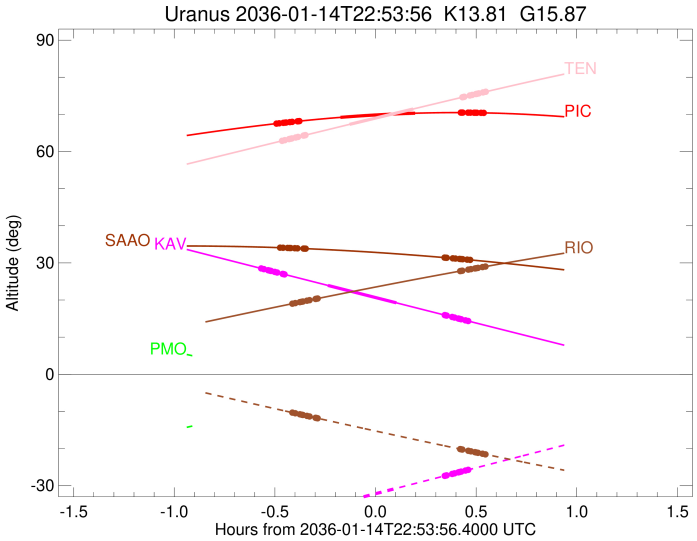
No planet occultations

6	E	2036-01-14T23:19:08.949	27.79	-20.15	41795.01	19.42		
5	E	2036-01-14T23:19:34.111	27.86	-20.23	42295.11	19.57		
4	E	2036-01-14T23:19:46.802	27.89	-20.27	42538.56	19.67		
alpha	E	2036-01-14T23:21:34.928	28.19	-20.61	44705.84	20.27		
beta	E	2036-01-14T23:22:22.129	28.31	-20.76	45666.02	20.49		
eta	E	2036-01-14T23:23:35.261	28.51	-20.98	47176.12	20.83		
gamma	E	2036-01-14T23:23:57.003	28.57	-21.05	47630.03	20.92		
delta	E	2036-01-14T23:24:28.938	28.66	-21.15	48300.35	21.06		
lambda	E	2036-01-14T23:25:50.306	28.87	-21.41	50026.71	21.37		
epsilon	E	2036-01-14T23:26:59.371	29.06	-21.62	51511.24	21.57		

Uranus_2036-01-14T22_53_56.4000_SAAO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:40:17 2023

```
target                  : Uranus
target radius (km)      :  25559.00
C/A epoch               : 2036-01-14T22:52:40.010
Event type              : PgtRgt
: Uranus occs: geocentric, topocentric
: 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          : 3380317112255318400
2Mass ID (if available) : 06523384+2316507
ICRS Star Coord at Epoch: 06h 52m 33.84615s +23:16:50.60797s
RUWE (>1.4 is poor)     :   1.01
K magnitude             : 13.813
G magnitude             : 15.872
RP magnitude            : 15.189
BP magnitude            : 16.409
DUPflag                 : 0
Distance (au)           : 17.860
f0 (km)                 :       0.000
g0 (km)                 :       0.000
skyplane vel. (km/s)    : -22.71
Sun-Target sep (deg)    :  168.20
Sun-Moon sep (deg)      :   32.91
B (ring opening deg)    :   64.35
PA of pole (deg)        :   76.25
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (")  :   2.106
C/A sky separation (km) :  27276.1
NAIF SPICE kernels      : RAJobs_U111+rgf15.spk
URKALLv1.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
```





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	2036-01-14T22:25:45.461		34.09	-36.34	50826.85	-21.37		
lambda	I	2036-01-14T22:26:23.140		34.07	-36.35	50026.71	-21.16		
delta	I	2036-01-14T22:27:45.362		34.03	-36.38	48300.35	-20.82		
gamma	I	2036-01-14T22:28:18.077		34.01	-36.39	47621.45	-20.68		
eta	I	2036-01-14T22:28:39.665		34.00	-36.40	47176.12	-20.58		
beta	I	2036-01-14T22:29:54.955		33.96	-36.42	45641.08	-20.21		
alpha	I	2036-01-14T22:30:39.064		33.93	-36.43	44752.18	-19.98		
4	I	2036-01-14T22:32:28.360		33.86	-36.46	42608.06	-19.32		
5	I	2036-01-14T22:32:51.734		33.85	-36.46	42172.52	-19.21		
6	I	2036-01-14T22:33:08.252		33.84	-36.47	41848.32	-19.06		

No planet occultations

6	E	2036-01-14T23:14:28.857	31.43	-36.12	41795.11	19.04		
5	E	2036-01-14T23:14:54.474	31.40	-36.11	42294.10	19.20		
4	E	2036-01-14T23:15:07.475	31.38	-36.10	42539.14	19.30		
alpha	E	2036-01-14T23:16:57.473	31.24	-36.04	44706.36	19.96		
beta	E	2036-01-14T23:17:45.353	31.17	-36.01	45665.72	20.19		
eta	E	2036-01-14T23:18:59.520	31.07	-35.97	47176.12	20.56		
gamma	E	2036-01-14T23:19:21.544	31.04	-35.96	47629.98	20.66		
delta	E	2036-01-14T23:19:53.882	31.00	-35.94	48300.35	20.80		
lambda	E	2036-01-14T23:21:16.198	30.89	-35.89	50026.71	21.14		
epsilon	E	2036-01-14T23:22:25.889	30.79	-35.84	51508.99	21.35		