

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-09T20:43:20.590
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3412524831489234944
 2Mass ID (if available) : 04591782+2244137

ICRS Star Coord at Epoch: 04h 59m 17.82847s +22:44:13.74428s

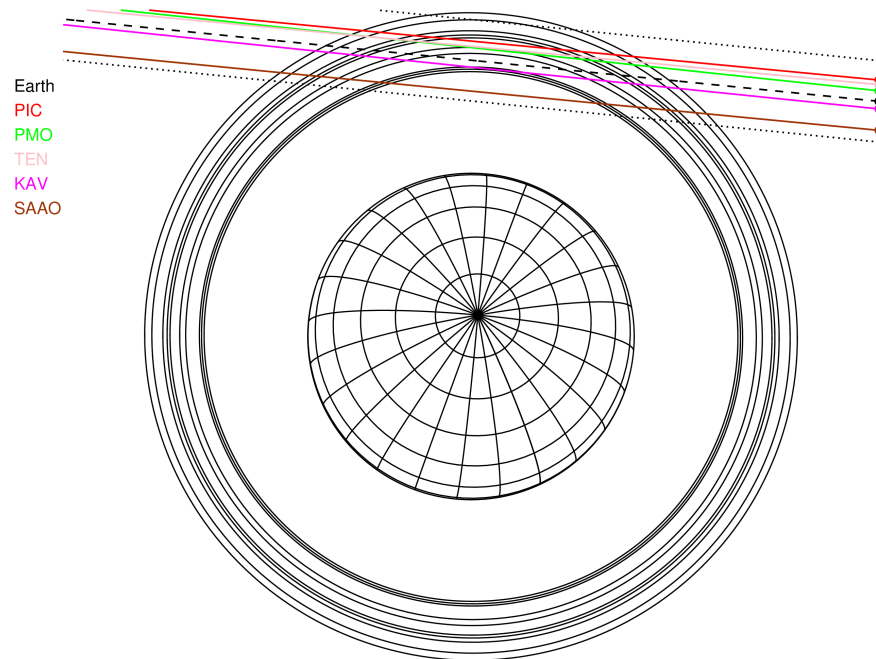
RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.905
 G magnitude : 16.409
 RP magnitude : 15.657
 BP magnitude : 17.012
 DUPflag : 0
 Distance (au) : 18.240
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.45
 Sun-Target sep (deg) : 178.38
 Sun-Moon sep (deg) : 122.19
 B (ring opening deg) : 82.08
 PA of pole (deg) : -17.70

#	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



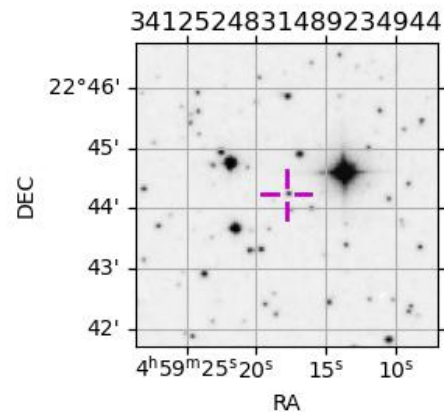
2029-12-09T20:43:20.5900 ra: 04 59 17.8285 s: +22 44 13.744 C/A 3.260° PA 174.25 deg v_sky -23.45 km/s D 18.24 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2029-12-09T20:43:20 K13.90 G16.41 XRgt

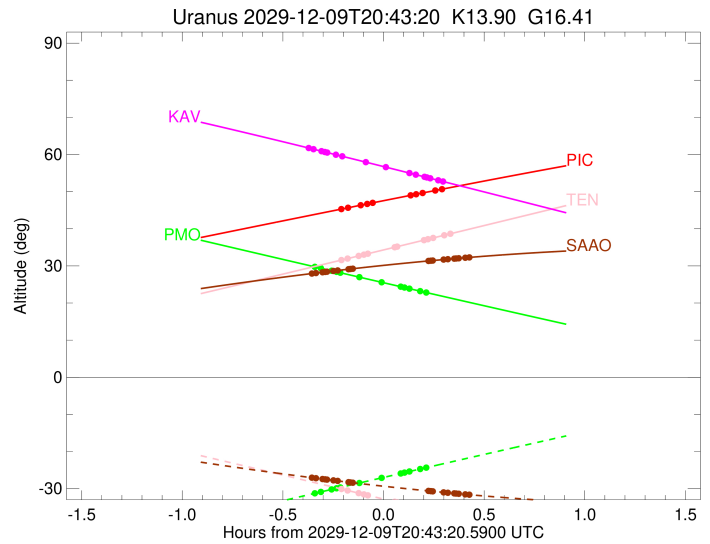
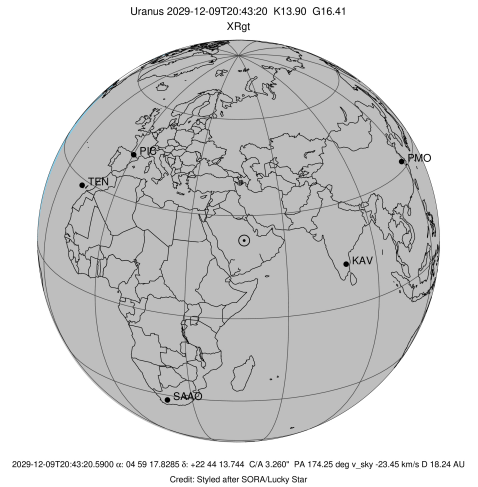


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	DEC 09 20:30 - DEC 09 21:00	PnnRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++		+++++	DEC 09 20:22 - DEC 09 20:56	PnnRie
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	+++++		+++++	DEC 09 20:30 - DEC 09 21:03	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	DEC 09 20:20 - DEC 09 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	+++++		+++++	DEC 09 20:21 - DEC 09 21:08	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-09T20:45:39.050
 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 : 3412524831489234944
 2Mass ID (if available) : 04591782+2244137
 ICRS Star Coord at Epoch: 04h 59m 17.82847s +22:44:13.74428s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.905
 G magnitude : 16.409
 RP magnitude : 15.657
 BP magnitude : 17.012
 DUPflag : 0
 Distance (au) : 18.240
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.45
 Sun-Target sep (deg) : 178.38
 Sun-Moon sep (deg) : 123.05
 B (ring opening deg) : 82.08
 PA of pole (deg) : -17.70
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.482
 C/A sky separation (km) : 46060.2
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl1.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

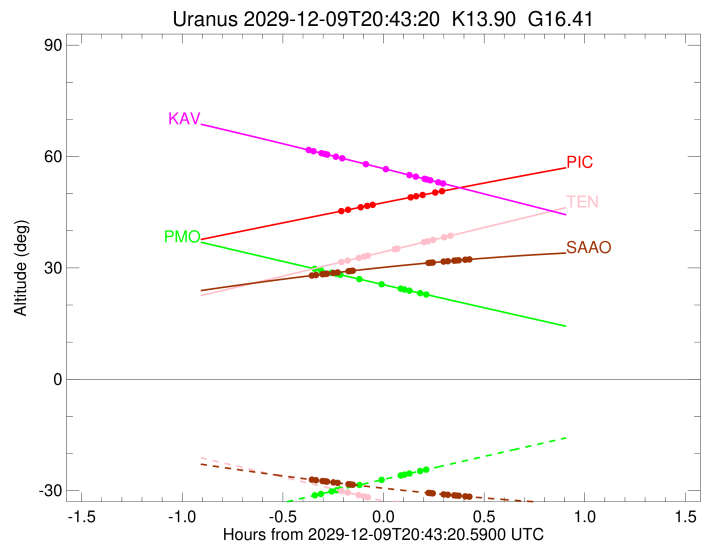
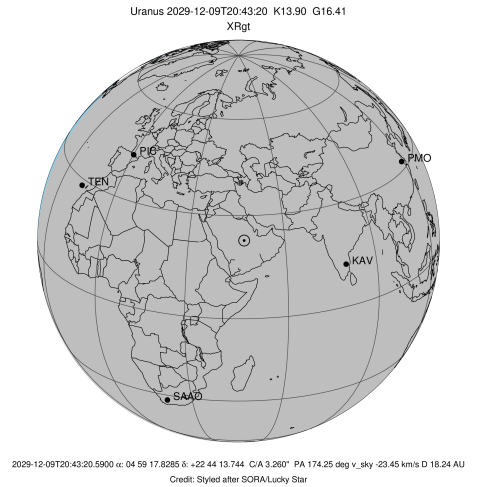


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-09T20:30:15.086		45.21	-44.02	51472.50	-10.05		
lambda	I	2029-12-09T20:32:47.970		45.67	-44.48	50026.71	-8.74		
delta	I	2029-12-09T20:36:35.312		46.35	-45.17	48300.35	-6.41		
gamma	I	2029-12-09T20:38:33.014		46.70	-45.52	47621.63	-5.11		
eta	I	2029-12-09T20:40:10.717		47.00	-45.81	47176.12	-4.00		

No planet occultations

eta	E	2029-12-09T20:51:22.842		49.00	-47.82	47176.12	4.00		
gamma	E	2029-12-09T20:53:00.784		49.29	-48.11	47623.15	5.12		
delta	E	2029-12-09T20:54:58.100		49.64	-48.46	48300.35	6.42		
lambda	E	2029-12-09T20:58:45.208		50.31	-49.14	50026.71	8.75		
epsilon	E	2029-12-09T21:00:47.482		50.66	-49.50	51167.37	10.07		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-09T20:39:20.860
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 3412524831489234944
 2Mass ID (if available) : 04591782+2244137
 ICRS Star Coord at Epoch: 04h 59m 17.82847s +22:44:13.74428s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.905
 G magnitude : 16.409
 RP magnitude : 15.657
 BP magnitude : 17.012
 DUPflag : 0
 Distance (au) : 18.240
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.45
 Sun-Target sep (deg) : 178.38
 Sun-Moon sep (deg) : 122.12
 B (ring opening deg) : 82.08
 PA of pole (deg) : -17.70
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.402
 C/A sky separation (km) : 45003.5
 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

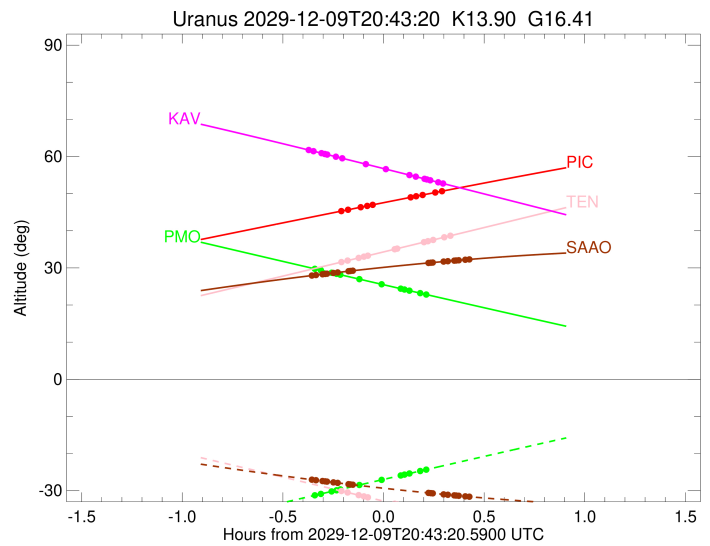
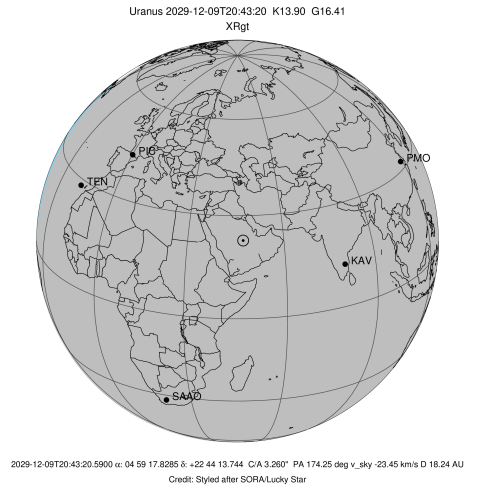


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-09T20:22:22.650		29.85	-31.36	51486.05	-11.02		
lambda	I	2029-12-09T20:24:41.501		29.37	-30.88	50026.71	-9.89		
delta	I	2029-12-09T20:27:54.008		28.70	-30.21	48300.35	-8.01		
gamma	I	2029-12-09T20:29:23.956		28.38	-29.89	47621.40	-7.08		
eta	I	2029-12-09T20:30:30.241		28.15	-29.66	47176.12	-6.36		
beta	I	2029-12-09T20:36:23.250		26.92	-28.44	45644.26	-2.25		

No planet occultations

beta	E	2029-12-09T20:42:32.318		25.64	-27.15	45642.50	2.25		
eta	E	2029-12-09T20:48:26.367		24.41	-25.93	47176.12	6.35		
gamma	E	2029-12-09T20:49:33.035		24.18	-25.70	47623.48	7.07		
delta	E	2029-12-09T20:51:02.825		23.87	-25.39	48300.35	8.00		
lambda	E	2029-12-09T20:54:15.687		23.20	-24.72	50026.71	9.87		
epsilon	E	2029-12-09T20:56:04.427		22.83	-24.35	51152.65	11.00		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-09T20:46:55.340
 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 : 3412524831489234944
 2Mass ID (if available) : 04591782+2244137
 ICRS Star Coord at Epoch: 04h 59m 17.82847s +22:44:13.74428s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.905
 G magnitude : 16.409
 RP magnitude : 15.657
 BP magnitude : 17.012
 DUPflag : 0
 Distance (au) : 18.240
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.45
 Sun-Target sep (deg) : 178.38
 Sun-Moon sep (deg) : 123.05
 B (ring opening deg) : 82.08
 PA of pole (deg) : -17.70
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.420
 C/A sky separation (km) : 45242.5
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl1.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

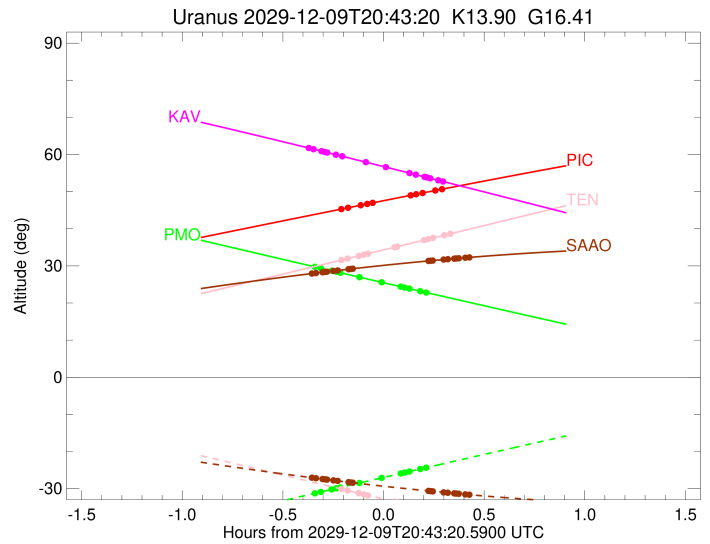
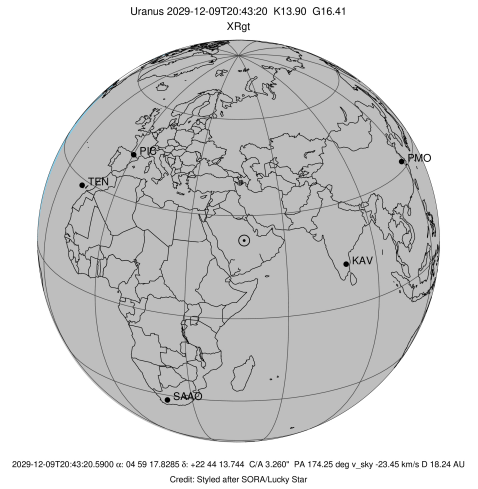


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-09T20:30:18.241		31.46	-30.00	51480.85	-10.80		
lambda	I	2029-12-09T20:32:39.734		31.97	-30.50	50026.71	-9.64		
delta	I	2029-12-09T20:35:58.651		32.70	-31.22	48300.35	-7.68		
gamma	I	2029-12-09T20:37:33.070		33.04	-31.56	47621.46	-6.69		
eta	I	2029-12-09T20:38:43.722		33.29	-31.82	47176.12	-5.91		
beta	I	2029-12-09T20:45:52.653		34.85	-33.37	45681.01	0.38		

No planet occultations

beta	E	2029-12-09T20:48:26.016		35.41	-33.92	45680.03	-0.33		
eta	E	2029-12-09T20:55:22.114		36.93	-35.43	47176.12	5.92		
gamma	E	2029-12-09T20:56:32.978		37.18	-35.68	47623.46	6.70		
delta	E	2029-12-09T20:58:06.966		37.53	-36.03	48300.35	7.70		
lambda	E	2029-12-09T21:01:25.537		38.25	-36.75	50026.71	9.66		
epsilon	E	2029-12-09T21:03:16.241		38.65	-37.15	51151.84	10.83		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-09T20:40:56.800
 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 : 3412524831489234944
 2Mass ID (if available) : 04591782+2244137
 ICRS Star Coord at Epoch: 04h 59m 17.82847s +22:44:13.74428s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.905
 G magnitude : 16.409
 RP magnitude : 15.657
 BP magnitude : 17.012
 DUPflag : 0
 Distance (au) : 18.240
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.45
 Sun-Target sep (deg) : 178.38
 Sun-Moon sep (deg) : 122.59
 B (ring opening deg) : 82.08
 PA of pole (deg) : -17.70
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.173
 C/A sky separation (km) : 41969.0
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

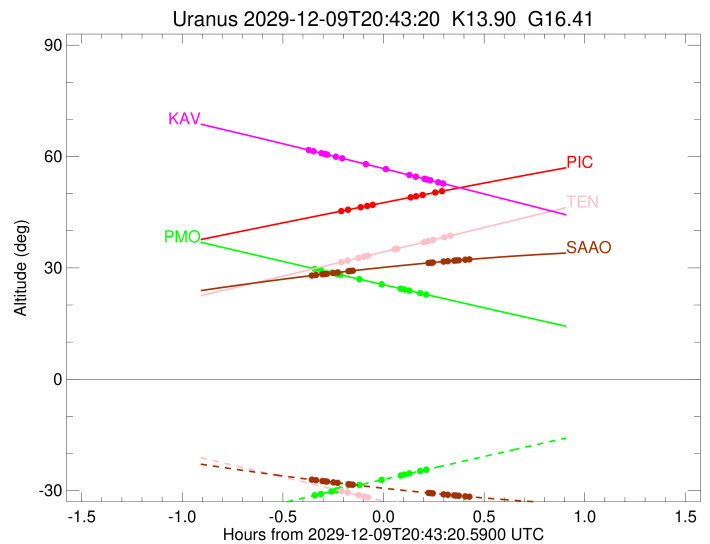
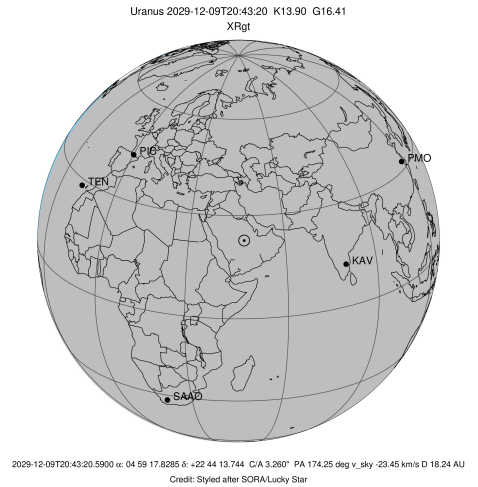


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-09T20:20:36.806		61.85	-63.34	51509.36	-13.51		
lambda	I	2029-12-09T20:22:29.611		61.43	-62.93	50026.71	-12.69		
delta	I	2029-12-09T20:24:52.417		60.90	-62.41	48300.35	-11.46		
gamma	I	2029-12-09T20:25:53.165		60.68	-62.19	47621.12	-10.90		
eta	I	2029-12-09T20:26:34.761		60.52	-62.03	47176.12	-10.50		
beta	I	2029-12-09T20:29:12.331		59.94	-61.46	45647.95	-8.87		
alpha	I	2029-12-09T20:31:03.512		59.52	-61.05	44729.83	-7.66		
4	I	2029-12-09T20:38:21.923		57.88	-59.43	42551.40	-2.14		

No planet occultations

4	E	2029-12-09T20:43:42.156		56.68	-58.23	42544.45	2.14		
alpha	E	2029-12-09T20:51:06.265		55.01	-56.57	44746.92	7.66		
beta	E	2029-12-09T20:52:54.514		54.60	-56.17	45641.14	8.86		
eta	E	2029-12-09T20:55:32.994		54.00	-55.57	47176.12	10.48		
gamma	E	2029-12-09T20:56:14.936		53.84	-55.41	47624.30	10.88		
delta	E	2029-12-09T20:57:15.473		53.61	-55.19	48300.35	11.45		
lambda	E	2029-12-09T20:59:38.492		53.06	-54.65	50026.71	12.67		
epsilon	E	2029-12-09T21:01:01.367		52.75	-54.34	51104.49	13.48		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-12-09T20:45:22.090
 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 : 3412524831489234944
 2Mass ID (if available) : 04591782+2244137
 ICRS Star Coord at Epoch: 04h 59m 17.82847s +22:44:13.74428s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.905
 G magnitude : 16.409
 RP magnitude : 15.657
 BP magnitude : 17.012
 DUPflag : 0
 Distance (au) : 18.240
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.45
 Sun-Target sep (deg) : 178.38
 Sun-Moon sep (deg) : 122.78
 B (ring opening deg) : 82.08
 PA of pole (deg) : -17.70
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.892
 C/A sky separation (km) : 38252.7
 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_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	2029-12-09T20:21:36.032		27.90	-27.01	51528.22	-15.70		
lambda	I	2029-12-09T20:23:13.240		28.08	-27.19	50026.71	-15.13		
delta	I	2029-12-09T20:25:10.532		28.29	-27.41	48300.35	-14.29		
gamma	I	2029-12-09T20:25:58.676		28.38	-27.51	47620.98	-13.93		
eta	I	2029-12-09T20:26:30.917		28.43	-27.57	47176.12	-13.67		
beta	I	2029-12-09T20:28:26.611		28.64	-27.78	45650.78	-12.68		
alpha	I	2029-12-09T20:29:41.787		28.77	-27.92	44723.39	-12.02		
4	I	2029-12-09T20:32:57.542		29.11	-28.27	42565.94	-9.98		
5	I	2029-12-09T20:33:29.014		29.17	-28.33	42250.82	-9.62		
6	I	2029-12-09T20:34:11.936		29.24	-28.41	41854.78	-9.15		

No planet occultations

6	E	2029-12-09T20:56:41.294		31.33	-30.61	41822.17	9.15		
5	E	2029-12-09T20:57:21.318		31.39	-30.67	42187.59	9.63		
4	E	2029-12-09T20:57:55.992		31.43	-30.72	42533.56	9.99		
alpha	E	2029-12-09T21:01:17.012		31.70	-31.01	44750.15	12.03		
beta	E	2029-12-09T21:02:29.093		31.80	-31.11	45641.14	12.70		
eta	E	2029-12-09T21:04:25.378		31.95	-31.27	47176.12	13.69		
gamma	E	2029-12-09T21:04:57.874		31.99	-31.32	47625.10	13.94		
delta	E	2029-12-09T21:05:45.662		32.05	-31.38	48300.35	14.31		
lambda	E	2029-12-09T21:07:42.794		32.20	-31.54	50026.71	15.15		
epsilon	E	2029-12-09T21:08:49.635		32.28	-31.63	51054.17	15.73		