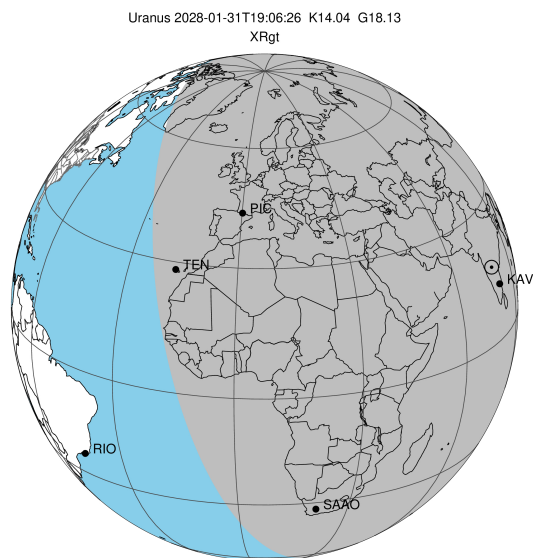


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-01-31T19:06:26.600
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 52391797783061888
 2Mass ID (if available) : 04144874+2109330

ICRS Star Coord at Epoch: 04h 14m 48.76788s +21:09:32.78606s

RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.045
 G magnitude : 18.129
 RP magnitude : 16.975
 BP magnitude : 19.432
 DUPflag : 0
 Distance (au) : 18.921
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -6.05
 Sun-Target sep (deg) : 114.56
 Sun-Moon sep (deg) : 58.77
 B (ring opening deg) : 75.76
 PA of pole (deg) : -67.41

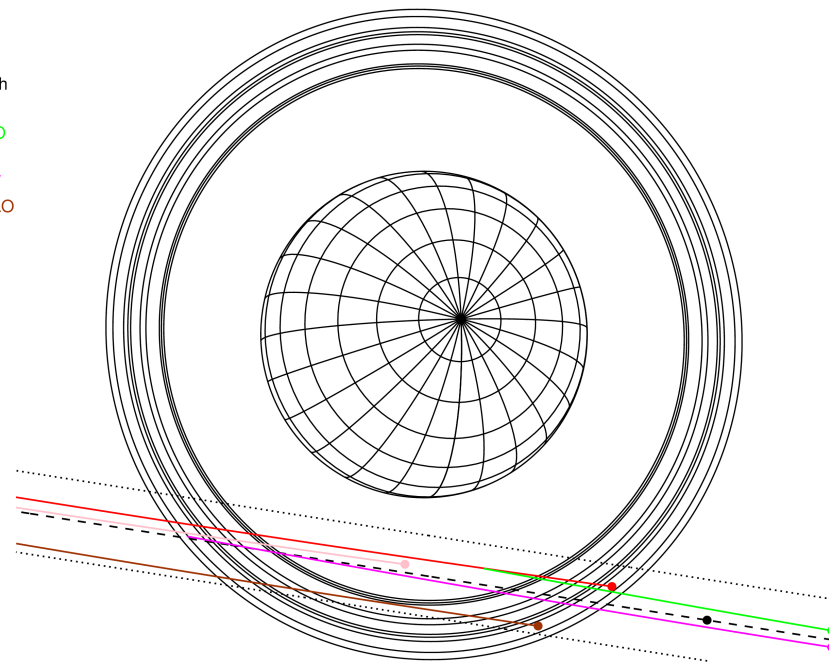
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2028-01-31T19:06:26.6000 α: 04 14 48.7679 β: +21 09 32.786 C/A 2.712° PA 351.05 deg v_sky - 6.06 km/s D 18.92 AU
 Credit: Styled after SORA/Lucky Star

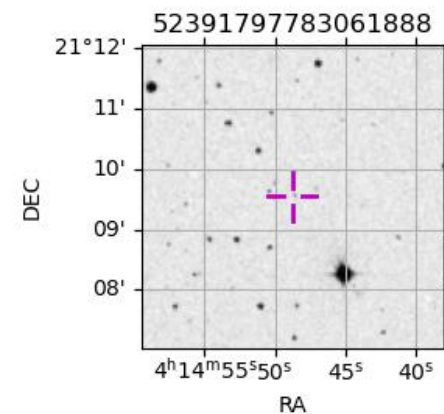
Uranus 2028-01-31T19:06:26 K14.04 G18.13 XRgt

Earth
 PIC
 PMO
 TEN
 KAV
 SAAO

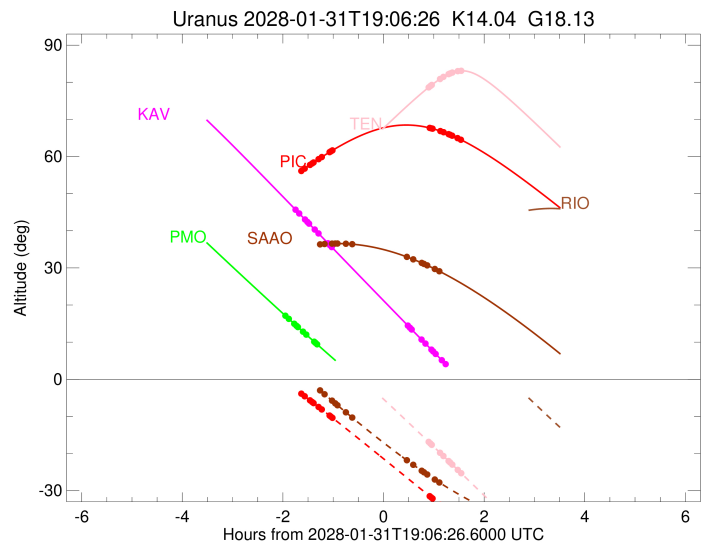
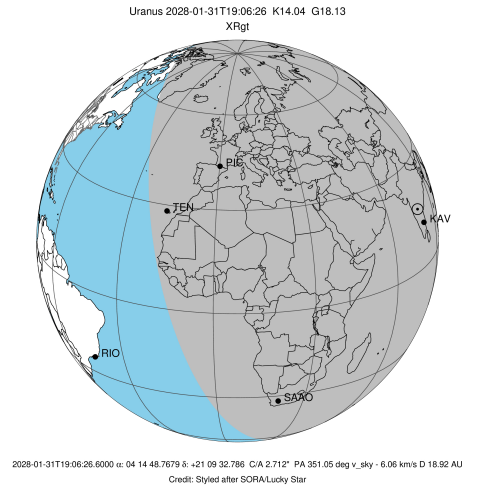


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	JAN 31 17:38 - JAN 31 20:39	PnnRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++			JAN 31 17:10 - JAN 31 17:47	PnnRin
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 31 20:00 - JAN 31 20:40	PnnRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	JAN 31 17:22 - JAN 31 20:15	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 31 18:05 - JAN 31 20:14	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-01-31T19:05:59.510
 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 : 52391797783061888
 2Mass ID (if available) : 04144874+2109330
 ICRS Star Coord at Epoch: 04h 14m 48.76788s +21:09:32.78606s
 RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.045
 G magnitude : 18.129
 RP magnitude : 16.975
 BP magnitude : 19.432
 DUPflag : 0
 Distance (au) : 18.921
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -6.05
 Sun-Target sep (deg) : 114.56
 Sun-Moon sep (deg) : 59.46
 B (ring opening deg) : 75.76
 PA of pole (deg) : -67.41
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.542
 C/A sky separation (km) : 34888.5
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

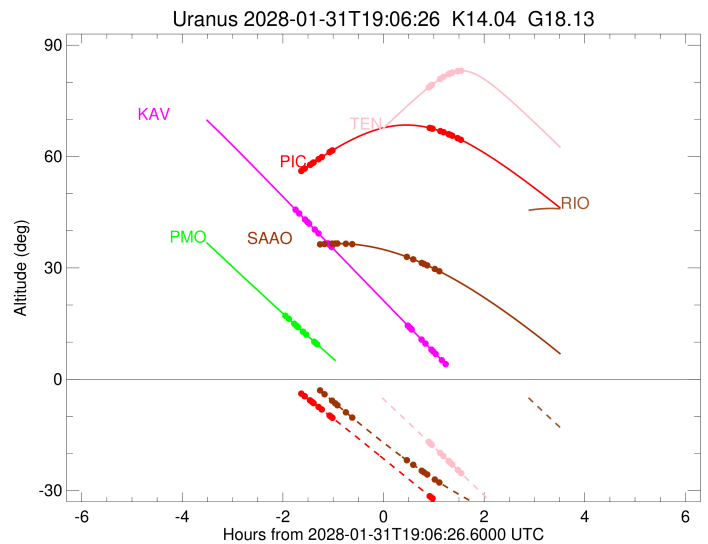
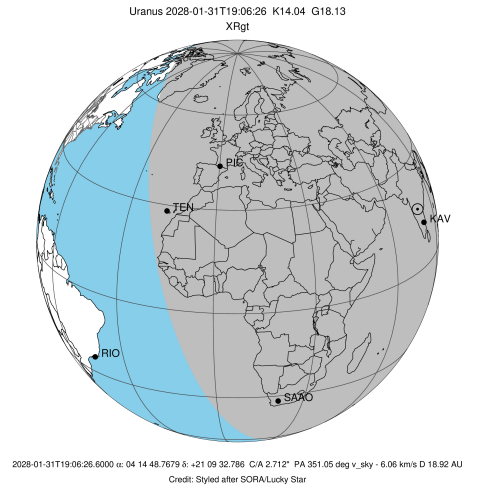


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-01-31T17:29:30.172		56.28	-4.07x	50862.63	-4.72		
lambda	I	2028-01-31T17:32:29.703		56.76	-4.59x	50026.71	-4.62		
delta	I	2028-01-31T17:38:50.110		57.75	-5.69	48300.35	-4.45		
gamma	I	2028-01-31T17:41:23.862		58.14	-6.13	47621.09	-4.38		
eta	I	2028-01-31T17:43:06.000		58.41	-6.43	47176.12	-4.33		
beta	I	2028-01-31T17:49:00.124		59.29	-7.46	45674.44	-4.15		
alpha	I	2028-01-31T17:53:01.492		59.89	-8.17	44689.14	-4.01		
4	I	2028-01-31T18:02:06.933		61.18	-9.78	42593.21	-3.66		
5	I	2028-01-31T18:03:26.595		61.36	-10.01	42303.94	-3.61		
6	I	2028-01-31T18:05:25.499		61.63	-10.37	41878.21	-3.53		

No planet occultations

6	E	2028-01-31T20:01:35.548		67.70	-31.51	41864.14	3.52		
5	E	2028-01-31T20:03:16.217		67.61	-31.81	42223.01	3.60		
4	E	2028-01-31T20:04:42.436		67.52	-32.08	42542.13	3.65		
alpha	E	2028-01-31T20:14:05.651		66.87	-33.79	44695.25	4.00		
beta	E	2028-01-31T20:18:00.402		66.56	-34.50	45648.69	4.13		
eta	E	2028-01-31T20:24:01.824		66.03	-35.59	47176.12	4.32		
gamma	E	2028-01-31T20:25:45.092		65.87	-35.90	47624.65	4.37		
delta	E	2028-01-31T20:28:18.519		65.62	-36.36	48300.35	4.44		
lambda	E	2028-01-31T20:34:40.206		64.97	-37.51	50026.71	4.60		
epsilon	E	2028-01-31T20:39:46.361		64.41	-38.43	51454.62	4.70		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-01-31T18:53:20.600
 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 : 52391797783061888
 2Mass ID (if available) : 04144874+2109330
 ICRS Star Coord at Epoch: 04h 14m 48.76788s +21:09:32.78606s
 RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.045
 G magnitude : 18.129
 RP magnitude : 16.975
 BP magnitude : 19.432
 DUPflag : 0
 Distance (au) : 18.921
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -6.05
 Sun-Target sep (deg) : 114.56
 Sun-Moon sep (deg) : 59.07
 B (ring opening deg) : 75.76
 PA of pole (deg) : -67.41
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.505
 C/A sky separation (km) : 34371.9
 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

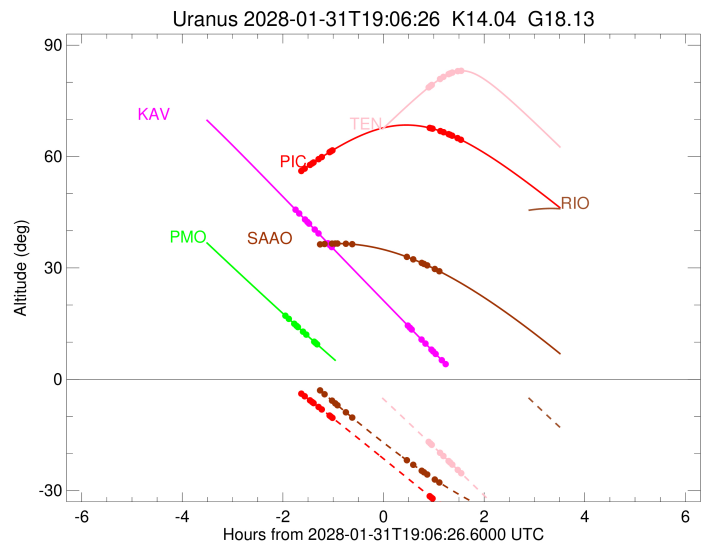
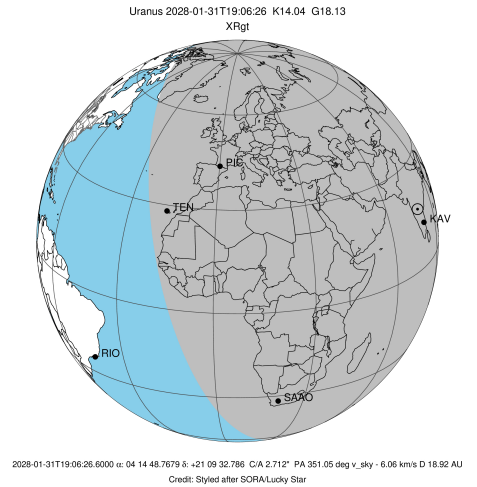


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-01-31T17:10:29.708		16.90	-71.26	50869.50	-4.62		
lambda	I	2028-01-31T17:13:34.428		16.27	-70.81	50026.71	-4.53		
delta	I	2028-01-31T17:20:02.825		14.94	-69.82	48300.35	-4.36		
gamma	I	2028-01-31T17:22:39.844		14.40	-69.41	47621.07	-4.29		
eta	I	2028-01-31T17:24:24.142		14.05	-69.13	47176.12	-4.24		
beta	I	2028-01-31T17:30:25.771		12.82	-68.13	45674.13	-4.06		
alpha	I	2028-01-31T17:34:32.075		11.99	-67.43	44688.82	-3.93		
4	I	2028-01-31T17:43:47.668		10.12	-65.79	42592.55	-3.60		
5	I	2028-01-31T17:45:08.570		9.85	-65.55	42303.27	-3.55		
6	I	2028-01-31T17:47:09.120		9.44	-65.18	41878.38	-3.48		

No planet occultations

6	E	2028-01-31T19:55:21.074	-14.63x	-39.07	41862.31	3.34			
5	E	2028-01-31T19:57:06.260	-14.92x	-38.70	42218.76	3.41			
4	E	2028-01-31T19:58:38.194	-15.18x	-38.38	42540.32	3.45			
alpha	E	2028-01-31T20:08:37.825	-16.85x	-36.26	44696.52	3.75			
beta	E	2028-01-31T20:12:48.244	-17.53x	-35.37	45647.93	3.86			
eta	E	2028-01-31T20:19:16.258	-18.58x	-34.00	47176.12	4.02			
gamma	E	2028-01-31T20:21:07.397	-18.87x	-33.60	47624.89	4.06			
delta	E	2028-01-31T20:23:52.576	-19.31x	-33.02	48300.35	4.12			
lambda	E	2028-01-31T20:30:44.621	-20.38x	-31.56	50026.71	4.26			
epsilon	E	2028-01-31T20:36:18.726	-21.24x	-30.38	51466.39	4.34			

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-01-31T19:10:09.170
 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 : 52391797783061888
 2Mass ID (if available) : 04144874+2109330
 ICRS Star Coord at Epoch: 04h 14m 48.76788s +21:09:32.78606s
 RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.045
 G magnitude : 18.129
 RP magnitude : 16.975
 BP magnitude : 19.432
 DUPflag : 0
 Distance (au) : 18.921
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -6.05
 Sun-Target sep (deg) : 114.56
 Sun-Moon sep (deg) : 59.33
 B (ring opening deg) : 75.76
 PA of pole (deg) : -67.41
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.628
 C/A sky separation (km) : 36059.9
 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

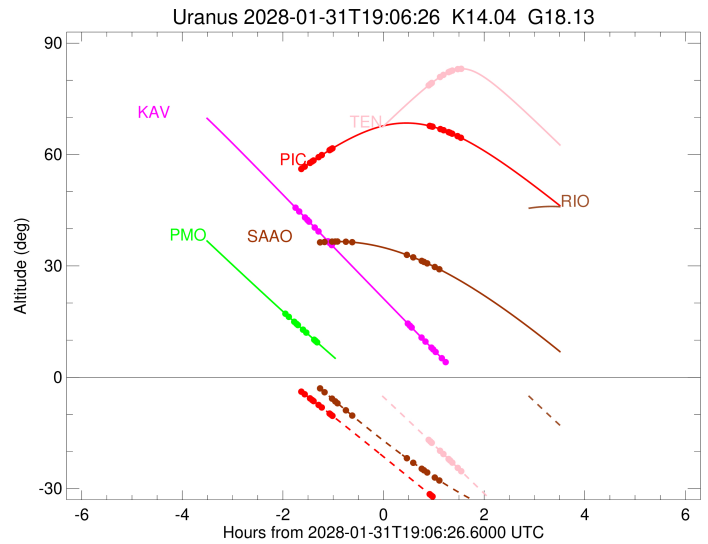
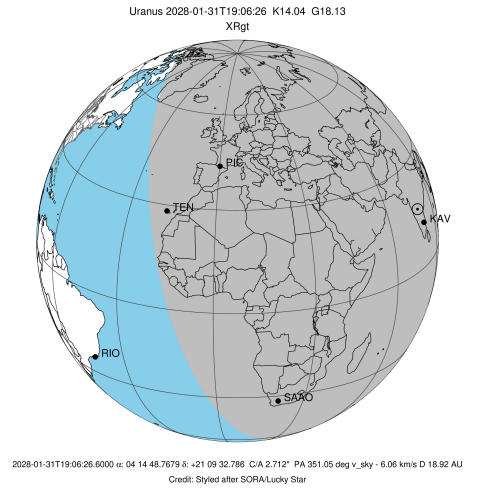


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-01-31T17:36:41.955		47.92	12.93x	50870.00	-4.56		
lambda	I	2028-01-31T17:39:49.501		48.61	12.32x	50026.71	-4.46		
delta	I	2028-01-31T17:46:24.791		50.06	11.03x	48300.35	-4.27		
gamma	I	2028-01-31T17:49:05.176		50.65	10.51x	47621.06	-4.20		
eta	I	2028-01-31T17:50:51.930		51.05	10.15x	47176.12	-4.14		
beta	I	2028-01-31T17:57:03.821		52.42	8.92x	45673.91	-3.93		
alpha	I	2028-01-31T18:01:18.987		53.36	8.07x	44688.53	-3.78		
4	I	2028-01-31T18:11:02.832		55.51	6.12x	42591.44	-3.39		
5	I	2028-01-31T18:12:29.021		55.82	5.83x	42302.01	-3.32		
6	I	2028-01-31T18:14:37.951		56.30	5.39x	41878.70	-3.23		

No planet occultations

6	E	2028-01-31T20:00:23.497		78.64	-16.88	41866.11	3.25		
5	E	2028-01-31T20:02:13.379		78.97	-17.27	42227.75	3.35		
4	E	2028-01-31T20:03:45.159		79.24	-17.61	42544.20	3.41		
alpha	E	2028-01-31T20:13:41.185		80.86	-19.76	44694.02	3.81		
beta	E	2028-01-31T20:17:47.292		81.44	-20.65	45649.48	3.97		
eta	E	2028-01-31T20:24:02.317		82.20	-22.01	47176.12	4.18		
gamma	E	2028-01-31T20:25:48.945		82.38	-22.40	47624.43	4.23		
delta	E	2028-01-31T20:28:27.112		82.61	-22.98	48300.35	4.31		
lambda	E	2028-01-31T20:34:58.709		83.00	-24.40	50026.71	4.50		
epsilon	E	2028-01-31T20:40:08.945		83.10	-25.53	51443.82	4.61		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-01-31T18:52:35.690
 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 : 52391797783061888
 2Mass ID (if available) : 04144874+2109330
 ICRS Star Coord at Epoch: 04h 14m 48.76788s +21:09:32.78606s
 RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.045
 G magnitude : 18.129
 RP magnitude : 16.975
 BP magnitude : 19.432
 DUPflag : 0
 Distance (au) : 18.921
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -6.05
 Sun-Target sep (deg) : 114.56
 Sun-Moon sep (deg) : 59.48
 B (ring opening deg) : 75.76
 PA of pole (deg) : -67.41
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.750
 C/A sky separation (km) : 37736.8
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

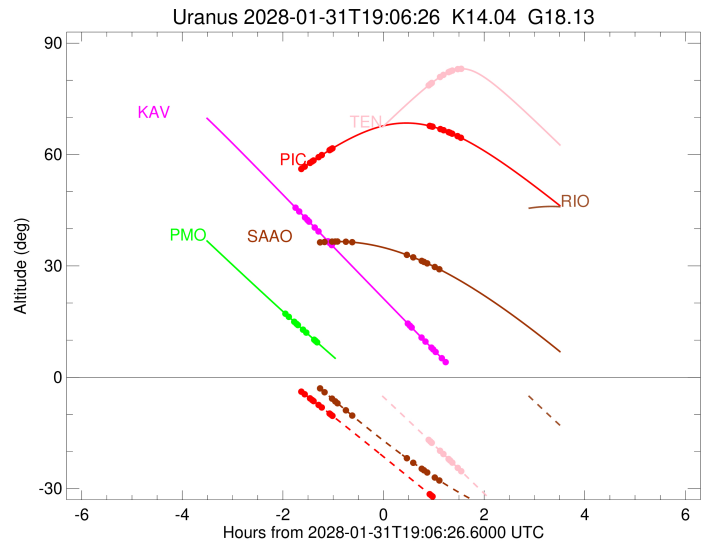
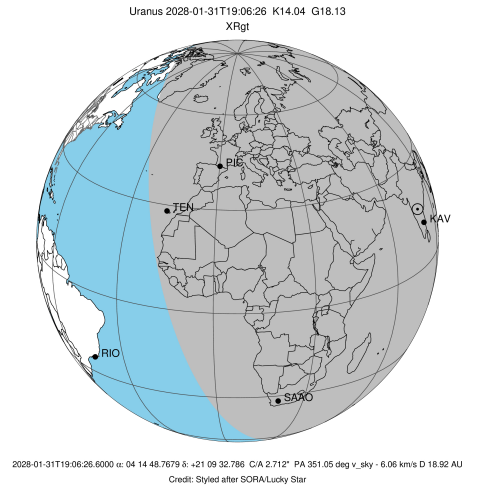


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-01-31T17:22:33.987		45.44	-66.44	50895.84	-4.36		
lambda	I	2028-01-31T17:25:56.970		44.65	-67.24	50026.71	-4.23		
delta	I	2028-01-31T17:32:56.013		43.02	-68.88	48300.35	-4.01		
gamma	I	2028-01-31T17:35:47.736		42.35	-69.55	47620.98	-3.91		
eta	I	2028-01-31T17:37:42.617		41.91	-70.00	47176.12	-3.84		
beta	I	2028-01-31T17:44:27.722		40.33	-71.58	45672.27	-3.58		
alpha	I	2028-01-31T17:49:10.206		39.23	-72.67	44687.02	-3.39		
4	I	2028-01-31T18:00:17.933		36.63	-75.23	42586.41	-2.88		
5	I	2028-01-31T18:01:59.432		36.23	-75.61	42296.06	-2.80		
6	I	2028-01-31T18:04:31.811		35.64	-76.19	41879.55	-2.68		

No planet occultations

6	E	2028-01-31T19:35:35.702		14.44	-79.72	41867.76	2.60		
5	E	2028-01-31T19:37:53.316		13.90	-79.23	42231.80	2.72		
4	E	2028-01-31T19:39:45.065		13.47	-78.83	42545.97	2.79		
alpha	E	2028-01-31T19:51:35.000		10.74	-76.20	44693.25	3.26		
beta	E	2028-01-31T19:56:21.534		9.64	-75.12	45649.95	3.43		
eta	E	2028-01-31T20:03:31.965		7.99	-73.47	47176.12	3.66		
gamma	E	2028-01-31T20:05:33.405		7.53	-73.00	47624.32	3.72		
delta	E	2028-01-31T20:08:32.977		6.84	-72.31	48300.35	3.81		
lambda	E	2028-01-31T20:15:54.769		5.15	-70.60	50026.71	4.00		
epsilon	E	2028-01-31T20:21:41.785		3.83x	-69.24	51440.44	4.12		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-01-31T19:04:42.230
 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 : 52391797783061888
 2Mass ID (if available) : 04144874+2109330
 ICRS Star Coord at Epoch: 04h 14m 48.76788s +21:09:32.78606s
 RUWE (>1.4 is poor) : 0.98
 K magnitude : 14.045
 G magnitude : 18.129
 RP magnitude : 16.975
 BP magnitude : 19.432
 DUPflag : 0
 Distance (au) : 18.921
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -6.05
 Sun-Target sep (deg) : 114.56
 Sun-Moon sep (deg) : 59.28
 B (ring opening deg) : 75.76
 PA of pole (deg) : -67.41
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.096
 C/A sky separation (km) : 42492.5
 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_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	2028-01-31T17:51:51.019		36.36	-3.20x	50939.52	-3.60		
lambda	I	2028-01-31T17:56:13.565		36.44	-4.05x	50026.71	-3.39		
delta	I	2028-01-31T18:05:10.154		36.54	-5.78	48300.35	-3.03		
gamma	I	2028-01-31T18:09:00.371		36.56	-6.51	47620.97	-2.87		
eta	I	2028-01-31T18:11:38.784		36.56	-7.02	47176.12	-2.75		
beta	I	2028-01-31T18:21:38.639		36.51	-8.91	45668.53	-2.27		
alpha	I	2028-01-31T18:29:35.106		36.38	-10.40	44684.93	-1.86		

No planet occultations

alpha	E	2028-01-31T19:33:52.252		33.00	-21.73	44687.86	1.84		
beta	E	2028-01-31T19:41:45.036		32.32	-23.01	45654.56	2.25		
eta	E	2028-01-31T19:51:56.725		31.36	-24.63	47176.12	2.72		
gamma	E	2028-01-31T19:54:37.641		31.09	-25.05	47623.30	2.84		
delta	E	2028-01-31T19:58:29.634		30.69	-25.64	48300.35	3.00		
lambda	E	2028-01-31T20:07:32.993		29.72	-27.00	50026.71	3.35		
epsilon	E	2028-01-31T20:14:05.204		28.98	-27.95	51385.86	3.54		