

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-13T07:57:20.340
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427644108507075584
 2Mass ID (if available) : 05452266+2331280

ICRS Star Coord at Epoch: 05h 45m 22.66528s +23:31:27.82011s

RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.940
 G magnitude : 18.969
 RP magnitude : 17.821
 BP magnitude : 20.341
 DUPflag : 0
 Distance (au) : 19.196
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 9.85
 Sun-Target sep (deg) : 83.26
 Sun-Moon sep (deg) : 44.36
 B (ring opening deg) : 78.08
 PA of pole (deg) : 47.18

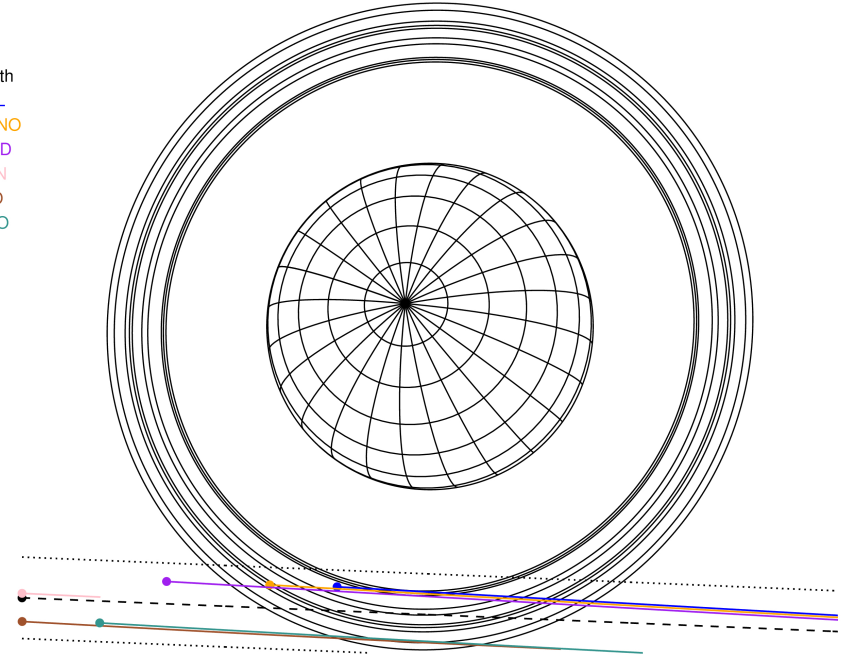
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2031-09-13T07:57:20.3400 ra: 05 45 22.6653 s: +23 31 27.820 C/A 3.236° PA 357.63 deg v_sky + 9.85 km/s D 19.20 AU
 Credit: Styled after SORA/Lucky Star

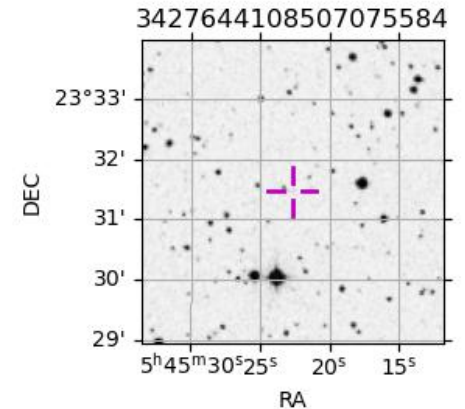
Uranus 2031-09-13T07:57:20 K14.94 G18.97 XRgt

Earth
 PAL
 KPNO
 MCD
 TEN
 RIO
 ESO

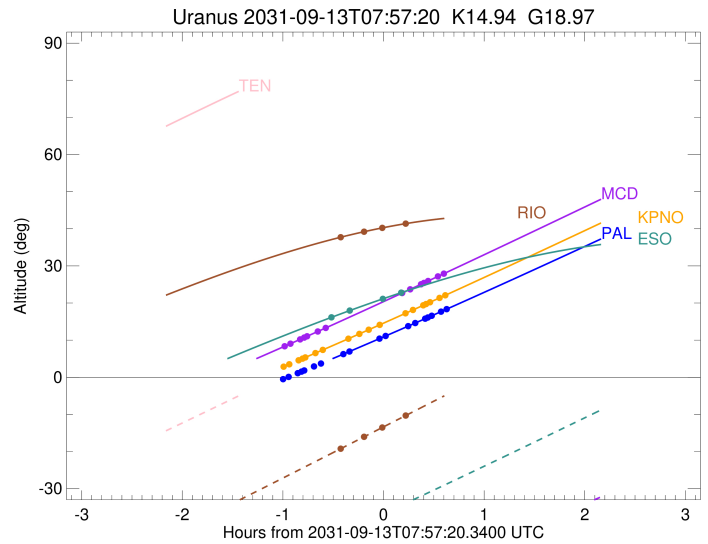
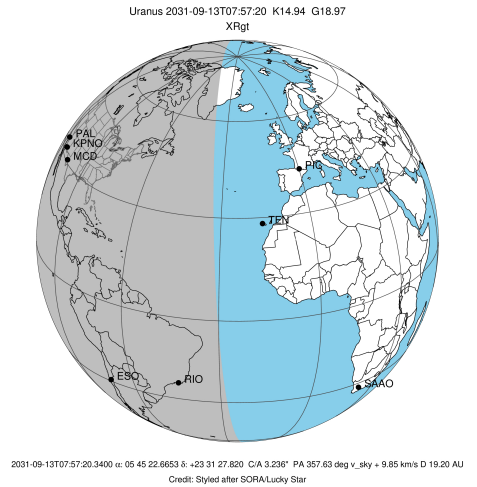


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1		++	+++++++	SEP 13 07:33 - SEP 13 08:34	PnnRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++++	SEP 13 07:09 - SEP 13 08:33	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++++	SEP 13 06:57 - SEP 13 08:32	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
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	++		++	SEP 13 07:30 - SEP 13 08:10	PnnRie
ESO	European Southern Obs	-29.3	289.3	++		++	SEP 13 07:25 - SEP 13 08:07	PnnRie
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-13T07:47:28.730
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3427644108507075584
 2Mass ID (if available) : 05452266+2331280
 ICRS Star Coord at Epoch: 05h 45m 22.66528s +23:31:27.82011s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.940
 G magnitude : 18.969
 RP magnitude : 17.821
 BP magnitude : 20.341
 DUPflag : 0
 Distance (au) : 19.196
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 9.85
 Sun-Target sep (deg) : 83.26
 Sun-Moon sep (deg) : 45.05
 B (ring opening deg) : 78.08
 PA of pole (deg) : 47.18
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.983
 C/A sky separation (km) : 41525.9
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

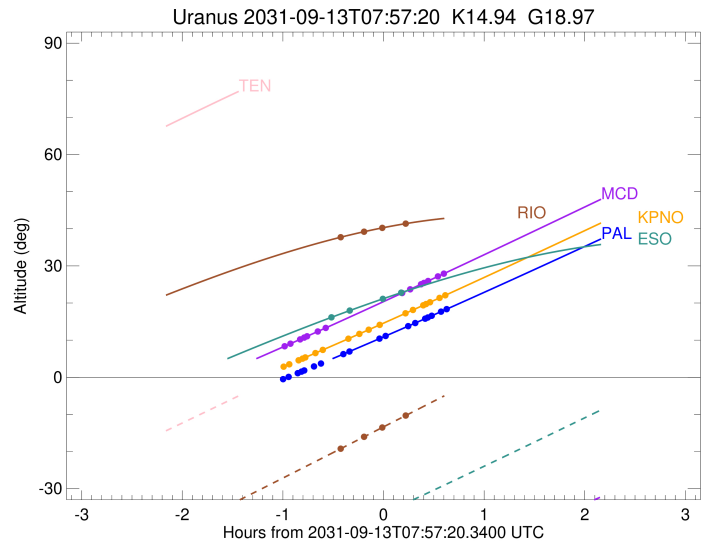
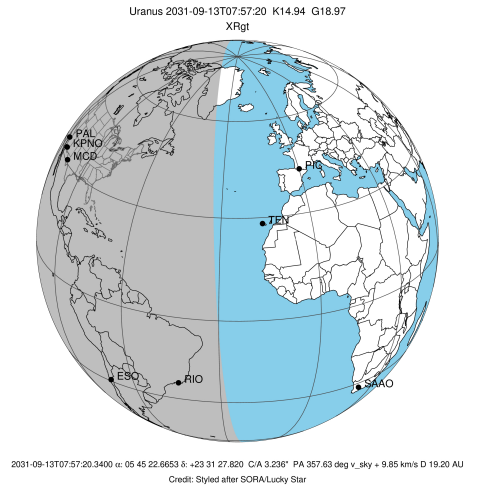


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-09-13T06:56:45.342	-0.64x	-51.37	51415.17	-5.82			
lambda	I	2031-09-13T07:00:48.801	0.11x	-51.63	50026.71	-5.53			
delta	I	2031-09-13T07:06:15.527	1.11x	-51.95	48300.35	-5.03			
gamma	I	2031-09-13T07:08:31.706	1.54x	-52.07	47630.66	-4.81			
eta	I	2031-09-13T07:10:07.934	1.84x	-52.16	47176.12	-4.64			
beta	I	2031-09-13T07:15:57.202	2.93x	-52.42	45663.61	-4.01			
alpha	I	2031-09-13T07:20:15.928	3.74x	-52.59	44691.77	-3.50			
4	I	2031-09-13T07:33:20.387	6.23	-52.92	42594.02	-1.79			
5	I	2031-09-13T07:36:18.578	6.80	-52.96	42315.05	-1.39			

No planet occultations

5	E	2031-09-13T07:55:40.089	10.55	-52.89	42313.58	1.38			
4	E	2031-09-13T07:58:31.617	11.11	-52.83	42578.89	1.78			
alpha	E	2031-09-13T08:11:48.516	13.72	-52.40	44684.65	3.46			
beta	E	2031-09-13T08:16:08.892	14.58	-52.21	45648.34	3.95			
eta	E	2031-09-13T08:22:07.044	15.77	-51.90	47176.12	4.57			
gamma	E	2031-09-13T08:23:44.896	16.10	-51.80	47631.18	4.73			
delta	E	2031-09-13T08:26:03.219	16.56	-51.66	48300.35	4.94			
lambda	E	2031-09-13T08:31:35.896	17.67	-51.30	50026.71	5.43			
epsilon	E	2031-09-13T08:34:23.004	18.23	-51.10	50951.98	5.70			

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-13T07:47:14.670
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : KPNO
 Location : Kitt Peak Natl Obs
 Latitude (deg) : 31.96333
 E. Longitude (deg) : 248.40000
 Altitude (km) : 2.120
 Gaia source ID : 3427644108507075584
 2Mass ID (if available) : 05452266+2331280
 ICRS Star Coord at Epoch: 05h 45m 22.66528s +23:31:27.82011s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.940
 G magnitude : 18.969
 RP magnitude : 17.821
 BP magnitude : 20.341
 DUPflag : 0
 Distance (au) : 19.196
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 9.85
 Sun-Target sep (deg) : 83.26
 Sun-Moon sep (deg) : 45.09
 B (ring opening deg) : 78.08
 PA of pole (deg) : 47.18
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.005
 C/A sky separation (km) : 41834.8
 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

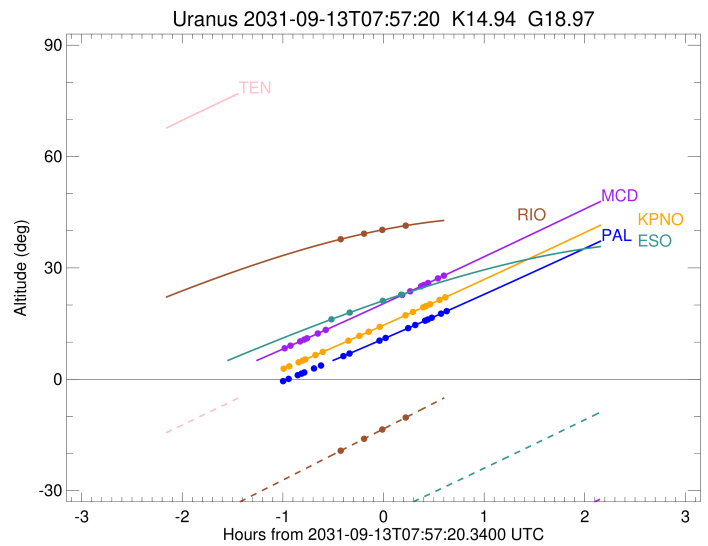
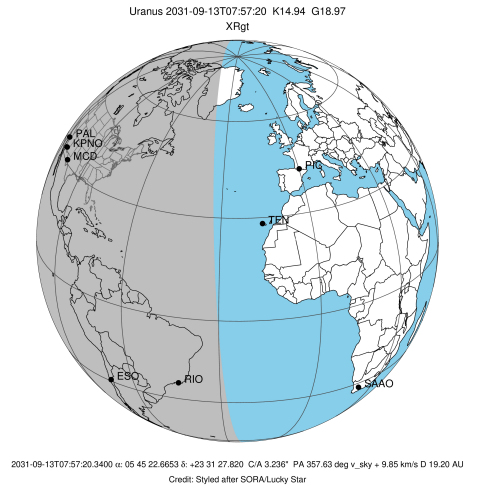


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-09-13T06:57:04.086		2.71x	-53.87	51412.09	-5.71		
lambda	I	2031-09-13T07:01:11.901		3.50x	-54.02	50026.71	-5.41		
delta	I	2031-09-13T07:06:46.553		4.58x	-54.18	48300.35	-4.90		
gamma	I	2031-09-13T07:09:06.636		5.03	-54.24	47630.70	-4.66		
eta	I	2031-09-13T07:10:45.914		5.35	-54.27	47176.12	-4.49		
beta	I	2031-09-13T07:16:48.881		6.53	-54.35	45663.28	-3.83		
alpha	I	2031-09-13T07:21:21.644		7.42	-54.38	44691.36	-3.29		
4	I	2031-09-13T07:36:20.636		10.37	-54.23	42592.18	-1.32		
5	I	2031-09-13T07:41:04.146		11.31	-54.11	42316.74	-0.67		

No planet occultations

5	E	2031-09-13T07:50:23.475		13.17	-53.77	42315.95	0.67		
4	E	2031-09-13T07:55:00.315		14.10	-53.56	42581.00	1.31		
alpha	E	2031-09-13T08:10:11.961		17.17	-52.63	44684.62	3.26		
beta	E	2031-09-13T08:14:46.470		18.11	-52.28	45648.62	3.78		
eta	E	2031-09-13T08:20:58.492		19.37	-51.77	47176.12	4.43		
gamma	E	2031-09-13T08:22:39.441		19.72	-51.62	47631.21	4.59		
delta	E	2031-09-13T08:25:01.737		20.20	-51.41	48300.35	4.81		
lambda	E	2031-09-13T08:30:42.524		21.37	-50.87	50026.71	5.31		
epsilon	E	2031-09-13T08:33:33.811		21.96	-50.59	50955.89	5.60		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-13T07:47:08.880
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : MCD
 Location : McDonald Obs. 2.7m
 Latitude (deg) : 30.67158
 E. Longitude (deg) : 255.97844
 Altitude (km) : 2.075
 Gaia source ID : 3427644108507075584
 2Mass ID (if available) : 05452266+2331280
 ICRS Star Coord at Epoch: 05h 45m 22.66528s +23:31:27.82011s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.940
 G magnitude : 18.969
 RP magnitude : 17.821
 BP magnitude : 20.341
 DUPflag : 0
 Distance (au) : 19.196
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 9.85
 Sun-Target sep (deg) : 83.26
 Sun-Moon sep (deg) : 45.15
 B (ring opening deg) : 78.08
 PA of pole (deg) : 47.18
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.034
 C/A sky separation (km) : 42234.7
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

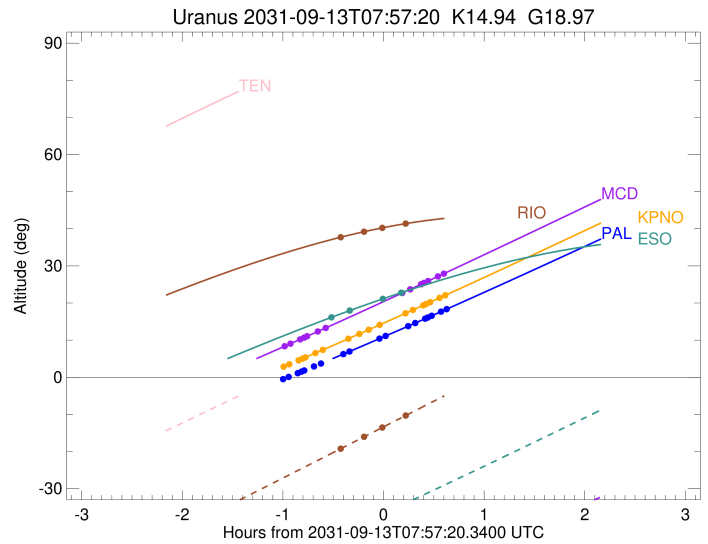
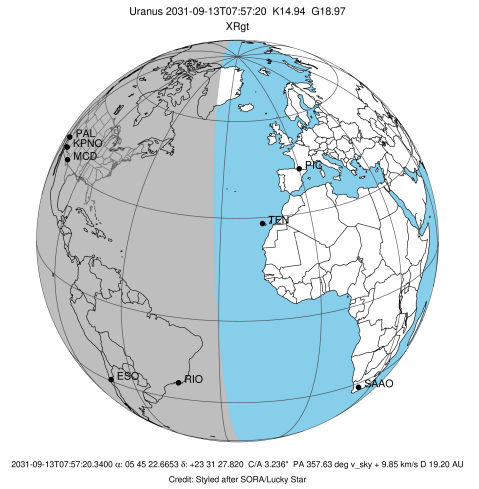


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-09-13T06:57:40.138		8.21	-55.64	51407.90	-5.56		
lambda	I	2031-09-13T07:01:54.181		9.06	-55.58	50026.71	-5.25		
delta	I	2031-09-13T07:07:40.249		10.21	-55.46	48300.35	-4.71		
gamma	I	2031-09-13T07:10:06.018		10.70	-55.40	47630.75	-4.47		
eta	I	2031-09-13T07:11:49.770		11.05	-55.35	47176.12	-4.29		
beta	I	2031-09-13T07:18:13.323		12.34	-55.11	45662.81	-3.58		
alpha	I	2031-09-13T07:23:08.281		13.34	-54.88	44690.80	-3.00		

No planet occultations

alpha	E	2031-09-13T08:08:09.902		22.63	-51.17	44684.61	2.97		
beta	E	2031-09-13T08:13:06.687		23.66	-50.61	45649.00	3.54		
eta	E	2031-09-13T08:19:39.452		25.03	-49.82	47176.12	4.23		
gamma	E	2031-09-13T08:21:24.916		25.40	-49.60	47631.24	4.40		
delta	E	2031-09-13T08:23:52.958		25.92	-49.28	48300.35	4.64		
lambda	E	2031-09-13T08:29:45.318		27.16	-48.51	50026.71	5.15		
epsilon	E	2031-09-13T08:32:42.473		27.78	-48.11	50960.98	5.45		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-13T07:53:03.740
 Event type : XRgt
 : No Uranus occs
 : 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 : 3427644108507075584
 2Mass ID (if available) : 05452266+2331280
 ICRS Star Coord at Epoch: 05h 45m 22.66528s +23:31:27.82011s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.940
 G magnitude : 18.969
 RP magnitude : 17.821
 BP magnitude : 20.341
 DUPflag : 0
 Distance (au) : 19.196
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 9.85
 Sun-Target sep (deg) : 83.26
 Sun-Moon sep (deg) : 44.92
 B (ring opening deg) : 78.08
 PA of pole (deg) : 47.18
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.554
 C/A sky separation (km) : 49487.2
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

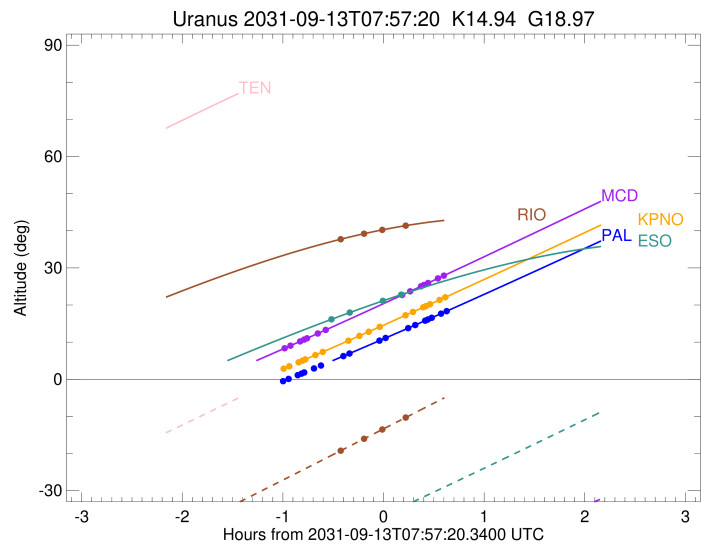
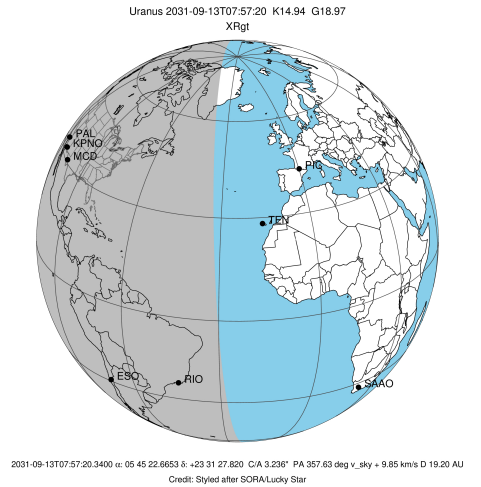


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-09-13T07:30:56.502		37.62	-19.45	51275.87	-2.10		
lambda	I	2031-09-13T07:46:10.991		39.25	-15.94	50026.71	-0.55		

No planet occultations

lambda	E	2031-09-13T07:56:11.082		40.20	-13.63	50026.71	0.55		
epsilon	E	2031-09-13T08:10:03.198		41.35	-10.43	51098.54	2.09		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-09-13T07:48:54.000
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : ESO
 Location : European Southern Obs. (3.6m)
 Latitude (deg) : -29.26097
 E. Longitude (deg) : 289.26831
 Altitude (km) : 2.400
 Gaia source ID : 3427644108507075584
 2Mass ID (if available) : 05452266+2331280
 ICRS Star Coord at Epoch: 05h 45m 22.66528s +23:31:27.82011s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 14.940
 G magnitude : 18.969
 RP magnitude : 17.821
 BP magnitude : 20.341
 DUPflag : 0
 Distance (au) : 19.196
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 9.85
 Sun-Target sep (deg) : 83.26
 Sun-Moon sep (deg) : 44.95
 B (ring opening deg) : 78.08
 PA of pole (deg) : 47.18
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.538
 C/A sky separation (km) : 49261.2
 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_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	2031-09-13T07:25:26.297		16.00	-43.18	51285.74	-2.33		
lambda	I	2031-09-13T07:37:25.429		18.00	-40.78	50026.71	-1.09		

No planet occultations

lambda	E	2031-09-13T07:56:43.397		21.09	-36.82	50026.71	1.09		
epsilon	E	2031-09-13T08:07:23.071		22.72	-34.60	51092.85	2.31		