

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-07-23T09:10:09.550
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 57157635230835712
 2Mass ID (if available) : 03360088+1903282

ICRS Star Coord at Epoch: 03h 36m 00.89187s +19:03:28.26049s

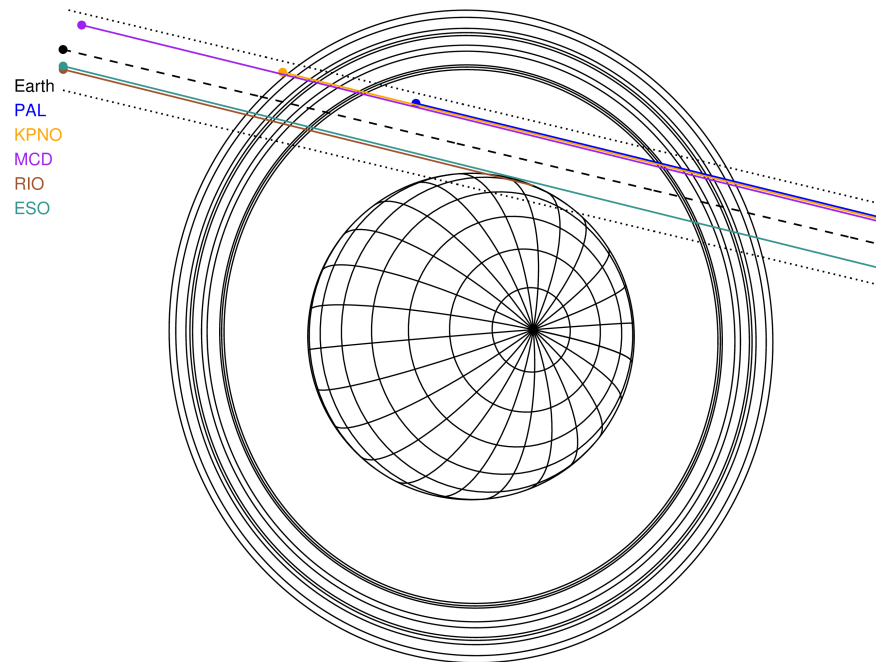
RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.734
 G magnitude : 16.548
 RP magnitude : 15.937
 BP magnitude : 16.997
 DUPflag : 0
 Distance (au) : 19.997
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 19.20
 Sun-Target sep (deg) : 64.42
 Sun-Moon sep (deg) : 89.15
 B (ring opening deg) : 67.41
 PA of pole (deg) : -83.72

#	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



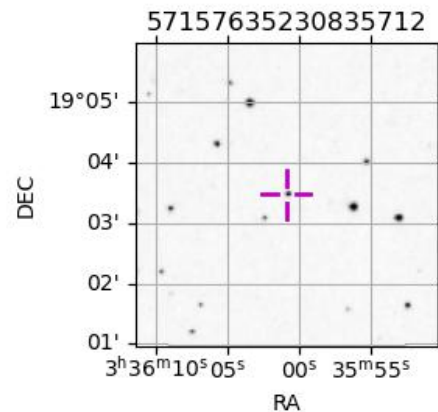
2024-07-23T09:10:09.5500 ex: 03 36 00.89187 s +19 03 28.260 C/A 1.994" PA 166.58 deg v_sky +19.20 km/s D 20.00 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2024-07-23T09:10:09 K14.73 G16.55 PtRgt

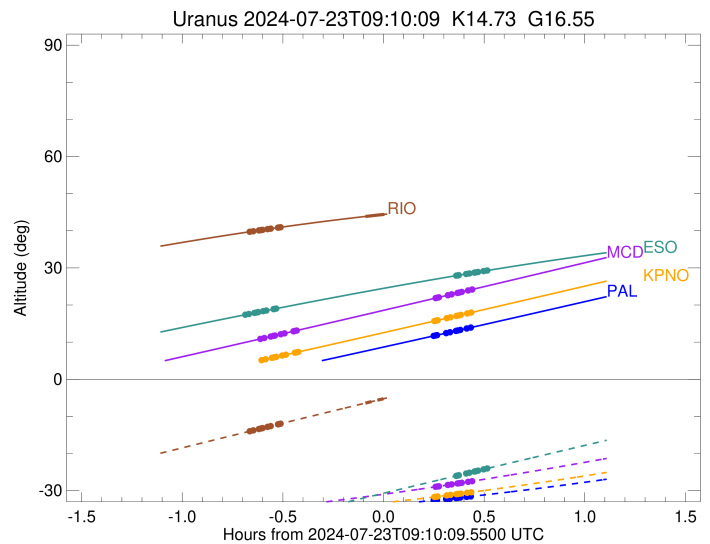
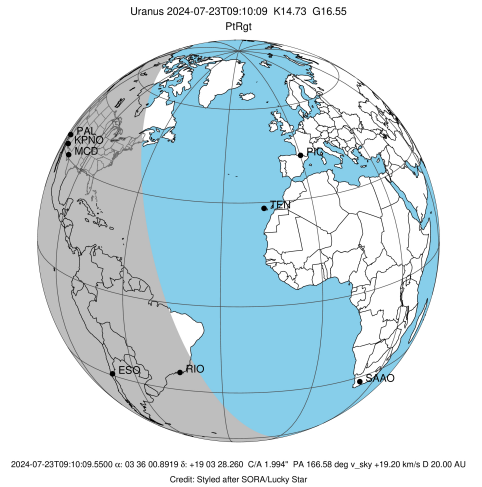


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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			+++++	JUL 23 09:25 - JUL 23 09:35	PnnRne
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	JUL 23 08:33 - JUL 23 09:35	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	JUL 23 08:33 - JUL 23 09:36	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	+++++	+ +		JUL 23 08:30 - JUL 23 09:10	PieRin
ESO	European Southern Obs	-29.3	289.3	+++++		+++++	JUL 23 08:28 - JUL 23 09:40	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 : 2024-07-23T09:06:30.950
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : 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 : 57157635230835712
 2Mass ID (if available) : 03360088+1903282
 ICRS Star Coord at Epoch: 03h 36m 00.89187s +19:03:28.26049s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.734
 G magnitude : 16.548
 RP magnitude : 15.937
 BP magnitude : 16.997
 DUPflag : 0
 Distance (au) : 19.997
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 19.20
 Sun-Target sep (deg) : 64.42
 Sun-Moon sep (deg) : 89.29
 B (ring opening deg) : 67.41
 PA of pole (deg) : -83.72
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.304
 C/A sky separation (km) : 33413.7
 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

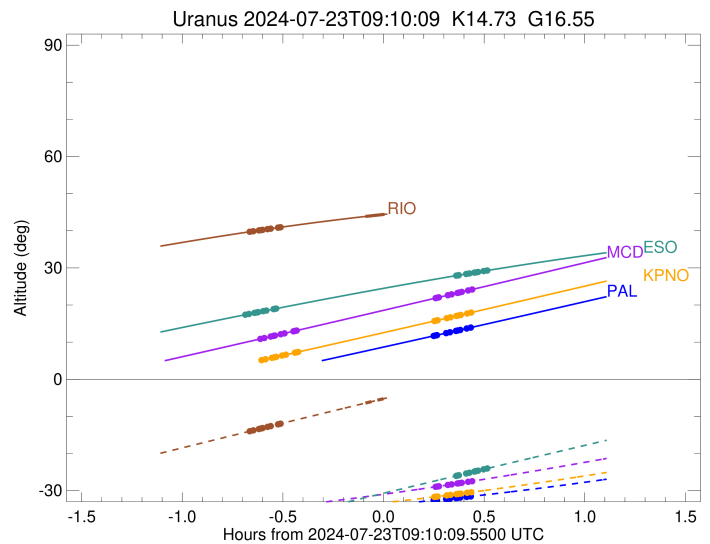
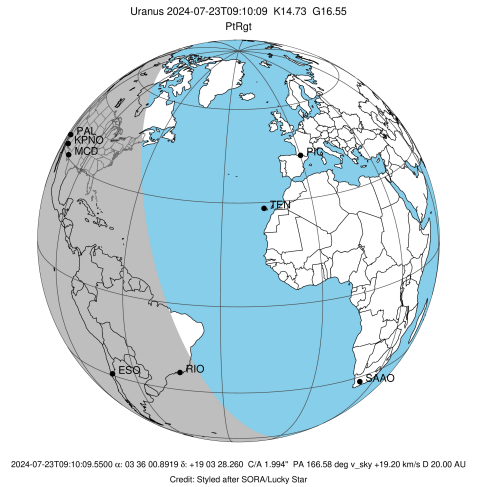


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2024-07-23T08:34:09.801	1.56x	-36.03	51147.12	-15.48			
lambda	I	2024-07-23T08:35:22.318	1.79x	-35.98	50026.71	-15.31			
delta	I	2024-07-23T08:37:16.814	2.16x	-35.89	48300.35	-14.84			
gamma	I	2024-07-23T08:38:02.671	2.31x	-35.86	47624.63	-14.63			
eta	I	2024-07-23T08:38:33.472	2.41x	-35.83	47176.12	-14.49			
beta	I	2024-07-23T08:40:20.883	2.76x	-35.75	45647.28	-13.96			
alpha	I	2024-07-23T08:41:26.272	2.98x	-35.69	44745.97	-13.61			
4	I	2024-07-23T08:44:14.088	3.53x	-35.55	42539.09	-12.61			
5	I	2024-07-23T08:44:31.850	3.58x	-35.54	42313.99	-12.50			
6	I	2024-07-23T08:45:13.383	3.72x	-35.50	41799.59	-12.24			

No planet occultations

6	E	2024-07-23T09:25:05.498	11.68	-32.62	41844.75	12.19			
5	E	2024-07-23T09:25:38.540	11.79	-32.57	42242.66	12.44			
4	E	2024-07-23T09:26:01.555	11.87	-32.53	42532.13	12.55			
alpha	E	2024-07-23T09:28:47.462	12.43	-32.28	44702.51	13.54			
beta	E	2024-07-23T09:29:56.440	12.66	-32.17	45645.41	13.89			
eta	E	2024-07-23T09:31:44.673	13.02	-32.00	47176.12	14.41			
gamma	E	2024-07-23T09:32:16.104	13.13	-31.95	47631.32	14.55			
delta	E	2024-07-23T09:33:01.761	13.29	-31.87	48300.35	14.75			
lambda	E	2024-07-23T09:34:56.934	13.68	-31.69	50026.71	15.22			
epsilon	E	2024-07-23T09:35:43.962	13.84	-31.61	50746.56	15.38			

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-07-23T09:06:24.010
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : 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 : 57157635230835712
 2Mass ID (if available) : 03360088+1903282
 ICRS Star Coord at Epoch: 03h 36m 00.89187s +19:03:28.26049s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.734
 G magnitude : 16.548
 RP magnitude : 15.937
 BP magnitude : 16.997
 DUPflag : 0
 Distance (au) : 19.997
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 19.20
 Sun-Target sep (deg) : 64.42
 Sun-Moon sep (deg) : 89.36
 B (ring opening deg) : 67.41
 PA of pole (deg) : -83.72
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.286
 C/A sky separation (km) : 33157.9
 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

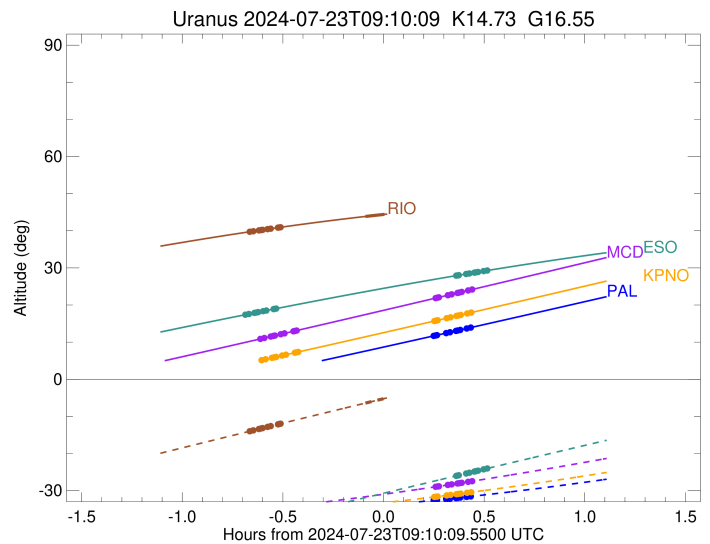
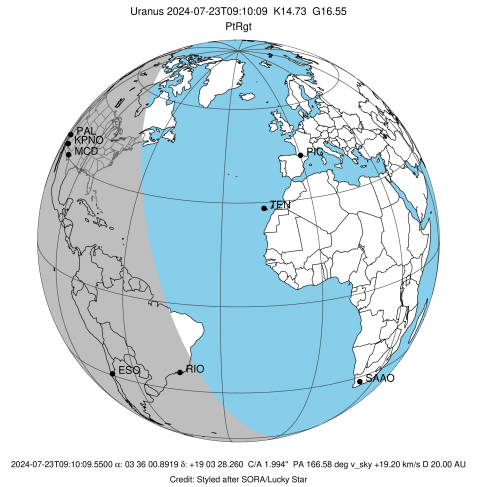


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2024-07-23T08:33:49.046		5.15	-36.26	51149.63	-15.54		
lambda	I	2024-07-23T08:35:01.406		5.40	-36.18	50026.71	-15.38		
delta	I	2024-07-23T08:36:55.327		5.78	-36.05	48300.35	-14.92		
gamma	I	2024-07-23T08:37:40.927		5.93	-36.00	47624.59	-14.72		
eta	I	2024-07-23T08:38:11.539		6.03	-35.96	47176.12	-14.58		
beta	I	2024-07-23T08:39:58.219		6.39	-35.84	45647.40	-14.06		
alpha	I	2024-07-23T08:41:03.099		6.61	-35.76	44746.14	-13.72		
4	I	2024-07-23T08:43:49.307		7.17	-35.56	42539.39	-12.75		
5	I	2024-07-23T08:44:06.879		7.23	-35.54	42314.12	-12.64		
6	I	2024-07-23T08:44:47.950		7.37	-35.49	41799.39	-12.39		

No planet occultations

6	E	2024-07-23T09:25:17.966		15.68	-31.70	41845.21	12.33		
5	E	2024-07-23T09:25:50.526		15.79	-31.64	42241.81	12.58		
4	E	2024-07-23T09:26:13.366		15.87	-31.60	42532.37	12.69		
alpha	E	2024-07-23T09:28:57.675		16.44	-31.29	44702.23	13.65		
beta	E	2024-07-23T09:30:06.158		16.68	-31.16	45645.52	13.99		
eta	E	2024-07-23T09:31:53.672		17.05	-30.95	47176.12	14.50		
gamma	E	2024-07-23T09:32:24.919		17.16	-30.89	47631.33	14.64		
delta	E	2024-07-23T09:33:10.323		17.32	-30.80	48300.35	14.83		
lambda	E	2024-07-23T09:35:04.937		17.72	-30.58	50026.71	15.29		
epsilon	E	2024-07-23T09:35:51.788		17.88	-30.49	50746.93	15.44		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-07-23T09:06:20.860
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : 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 : 57157635230835712
 2Mass ID (if available) : 03360088+1903282
 ICRS Star Coord at Epoch: 03h 36m 00.89187s +19:03:28.26049s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.734
 G magnitude : 16.548
 RP magnitude : 15.937
 BP magnitude : 16.997
 DUPflag : 0
 Distance (au) : 19.997
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 19.20
 Sun-Target sep (deg) : 64.42
 Sun-Moon sep (deg) : 89.46
 B (ring opening deg) : 67.41
 PA of pole (deg) : -83.72
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.262
 C/A sky separation (km) : 32814.2
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

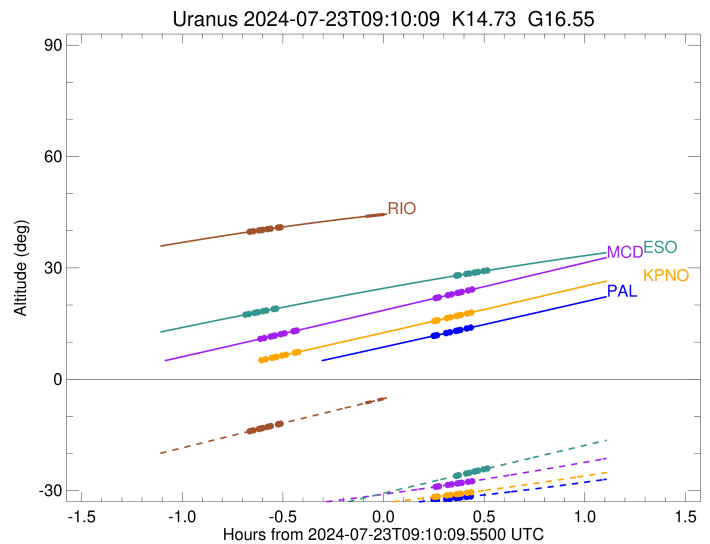
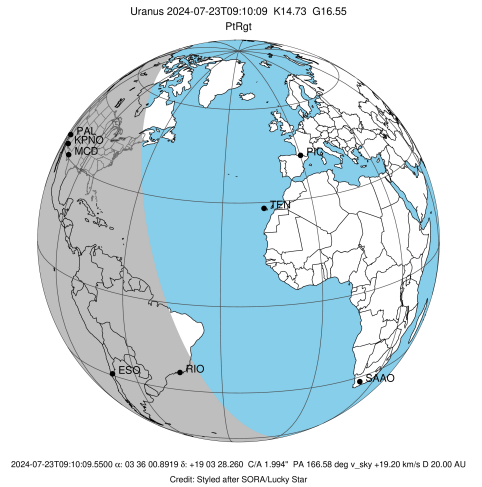


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2024-07-23T08:33:26.930		10.87	-35.04	51152.99	-15.63		
lambda	I	2024-07-23T08:34:39.117		11.12	-34.93	50026.71	-15.47		
delta	I	2024-07-23T08:36:32.329		11.51	-34.74	48300.35	-15.02		
gamma	I	2024-07-23T08:37:17.610		11.67	-34.67	47624.54	-14.83		
eta	I	2024-07-23T08:37:47.990		11.78	-34.62	47176.12	-14.69		
beta	I	2024-07-23T08:39:33.761		12.14	-34.44	45647.55	-14.19		
alpha	I	2024-07-23T08:40:38.009		12.37	-34.33	44746.35	-13.86		
4	I	2024-07-23T08:43:22.214		12.94	-34.05	42539.80	-12.92		
5	I	2024-07-23T08:43:39.551		13.00	-34.02	42314.29	-12.82		
6	I	2024-07-23T08:44:20.050		13.14	-33.95	41799.14	-12.58		

No planet occultations

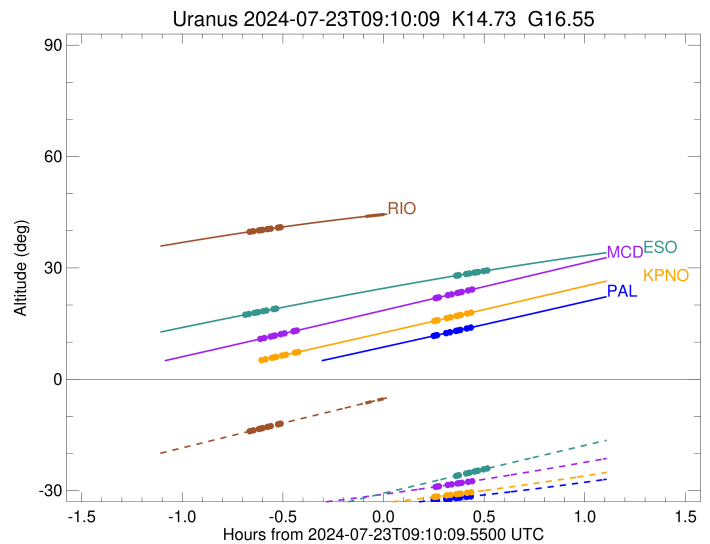
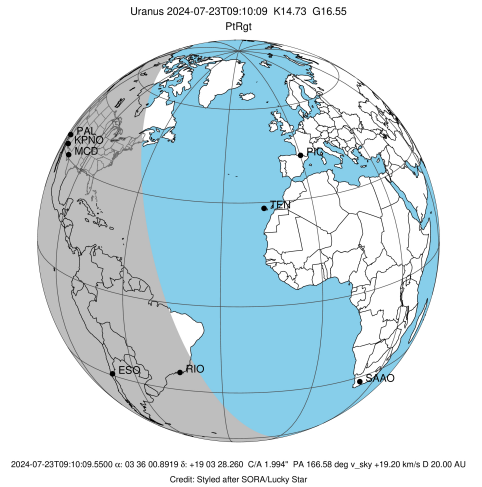
6	E	2024-07-23T09:25:40.752		21.86	-28.97	41845.80	12.52		
5	E	2024-07-23T09:26:12.707		21.97	-28.90	42240.71	12.76		
4	E	2024-07-23T09:26:35.333		22.05	-28.84	42532.69	12.87		
alpha	E	2024-07-23T09:29:17.639		22.63	-28.47	44701.88	13.79		
beta	E	2024-07-23T09:30:25.503		22.87	-28.32	45645.67	14.12		
eta	E	2024-07-23T09:32:12.115		23.25	-28.07	47176.12	14.61		
gamma	E	2024-07-23T09:32:43.132		23.36	-28.00	47631.35	14.74		
delta	E	2024-07-23T09:33:28.220		23.52	-27.90	48300.35	14.93		
lambda	E	2024-07-23T09:35:22.136		23.92	-27.63	50026.71	15.37		
epsilon	E	2024-07-23T09:36:08.770		24.09	-27.52	50747.45	15.52		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-07-23T09:07:52.400
 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 : 57157635230835712
 2Mass ID (if available) : 03360088+1903282
 ICRS Star Coord at Epoch: 03h 36m 00.89187s +19:03:28.26049s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.734
 G magnitude : 16.548
 RP magnitude : 15.937
 BP magnitude : 16.997
 DUPflag : 0
 Distance (au) : 19.997
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 19.20
 Sun-Target sep (deg) : 64.42
 Sun-Moon sep (deg) : 89.85
 B (ring opening deg) : 67.41
 PA of pole (deg) : -83.72
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.744
 C/A sky separation (km) : 25292.5
 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	2024-07-23T08:30:12.883		39.73	-14.02	51226.45	-17.48		
lambda	I	2024-07-23T08:31:21.487		39.88	-13.76	50026.71	-17.42		
delta	I	2024-07-23T08:33:01.253		40.10	-13.39	48300.35	-17.19		
gamma	I	2024-07-23T08:33:40.737		40.19	-13.25	47623.57	-17.09		
eta	I	2024-07-23T08:34:06.966		40.25	-13.15	47176.12	-17.03		
beta	I	2024-07-23T08:35:37.159		40.45	-12.82	45651.07	-16.78		
alpha	I	2024-07-23T08:36:31.169		40.56	-12.62	44749.98	-16.62		
4	I	2024-07-23T08:38:44.885		40.85	-12.13	42548.79	-16.18		
5	I	2024-07-23T08:38:59.105		40.88	-12.08	42314.88	-16.14		
6	I	2024-07-23T08:39:31.413		40.95	-11.96	41795.61	-16.02		
Uranus	I	2024-07-23T09:04:45.486		43.86	-6.42	25536.12		4.65	4.87
Uranus	E	2024-07-23T09:10:25.673		44.42	-5.18	25456.52		9.91	10.37
6	E	2024-07-23T09:34:08.343		46.38	-0.07x	41856.11	15.97		
5	E	2024-07-23T09:34:31.701		46.41	0.02x	42220.60	16.09		
4	E	2024-07-23T09:34:51.263		46.43	0.09x	42539.73	16.13		
alpha	E	2024-07-23T09:37:02.669		46.57	0.56x	44695.68	16.57		
beta	E	2024-07-23T09:38:00.149		46.63	0.76x	45648.81	16.72		
eta	E	2024-07-23T09:39:30.884		46.73	1.08x	47176.12	16.97		
gamma	E	2024-07-23T09:39:57.676		46.76	1.18x	47631.56	17.03		
delta	E	2024-07-23T09:40:36.835		46.79	1.32x	48300.35	17.13		
lambda	E	2024-07-23T09:42:16.977		46.89	1.68x	50026.71	17.35		
epsilon	E	2024-07-23T09:42:59.386		46.93	1.83x	50764.31	17.41		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2024-07-23T09:06:04.380
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : 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 : 57157635230835712
 2Mass ID (if available) : 03360088+1903282
 ICRS Star Coord at Epoch: 03h 36m 00.89187s +19:03:28.26049s
 RUWE (>1.4 is poor) : 1.06
 K magnitude : 14.734
 G magnitude : 16.548
 RP magnitude : 15.937
 BP magnitude : 16.997
 DUPflag : 0
 Distance (au) : 19.997
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 19.20
 Sun-Target sep (deg) : 64.42
 Sun-Moon sep (deg) : 89.56
 B (ring opening deg) : 67.41
 PA of pole (deg) : -83.72
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.777
 C/A sky separation (km) : 25766.4
 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_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	2024-07-23T08:28:54.537		17.38	-39.69	51221.86	-17.51		
lambda	I	2024-07-23T08:30:02.769		17.59	-39.44	50026.71	-17.44		
delta	I	2024-07-23T08:31:42.432		17.89	-39.08	48300.35	-17.20		
gamma	I	2024-07-23T08:32:21.893		18.00	-38.94	47623.62	-17.10		
eta	I	2024-07-23T08:32:48.119		18.08	-38.84	47176.12	-17.03		
beta	I	2024-07-23T08:34:18.351		18.35	-38.51	45650.84	-16.77		
alpha	I	2024-07-23T08:35:12.408		18.51	-38.32	44749.81	-16.60		
4	I	2024-07-23T08:37:26.434		18.91	-37.83	42548.20	-16.13		
5	I	2024-07-23T08:37:40.661		18.95	-37.78	42314.99	-16.09		
6	I	2024-07-23T08:38:13.068		19.05	-37.66	41795.74	-15.97		

No planet occultations

6	E	2024-07-23T09:31:50.093		27.91	-26.03	41855.60	15.89		
5	E	2024-07-23T09:32:13.665		27.97	-25.94	42221.64	16.01		
4	E	2024-07-23T09:32:33.236		28.02	-25.87	42539.31	16.05		
alpha	E	2024-07-23T09:34:45.210		28.36	-25.40	44695.98	16.52		
beta	E	2024-07-23T09:35:42.830		28.50	-25.19	45648.62	16.68		
eta	E	2024-07-23T09:37:13.787		28.73	-24.86	47176.12	16.93		
gamma	E	2024-07-23T09:37:40.629		28.79	-24.77	47631.55	17.00		
delta	E	2024-07-23T09:38:19.852		28.89	-24.63	48300.35	17.10		
lambda	E	2024-07-23T09:40:00.112		29.14	-24.27	50026.71	17.33		
epsilon	E	2024-07-23T09:40:42.482		29.24	-24.12	50763.09	17.40		