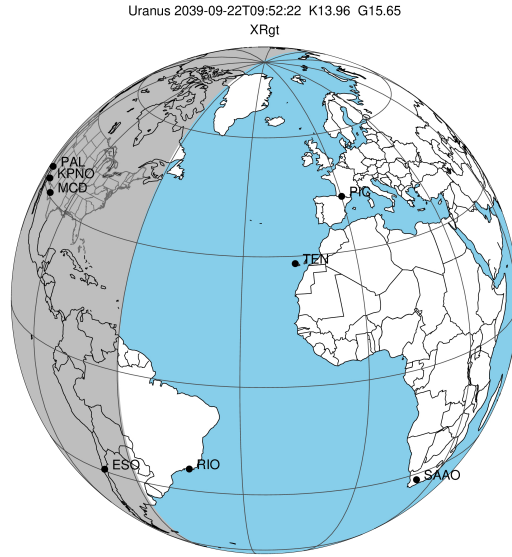


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-22T09:52:22.390  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 675604441631442560  
 2Mass ID (if available) : 08170381+2015341

ICRS Star Coord at Epoch: 08h 17m 03.80740s +20:15:34.07814s

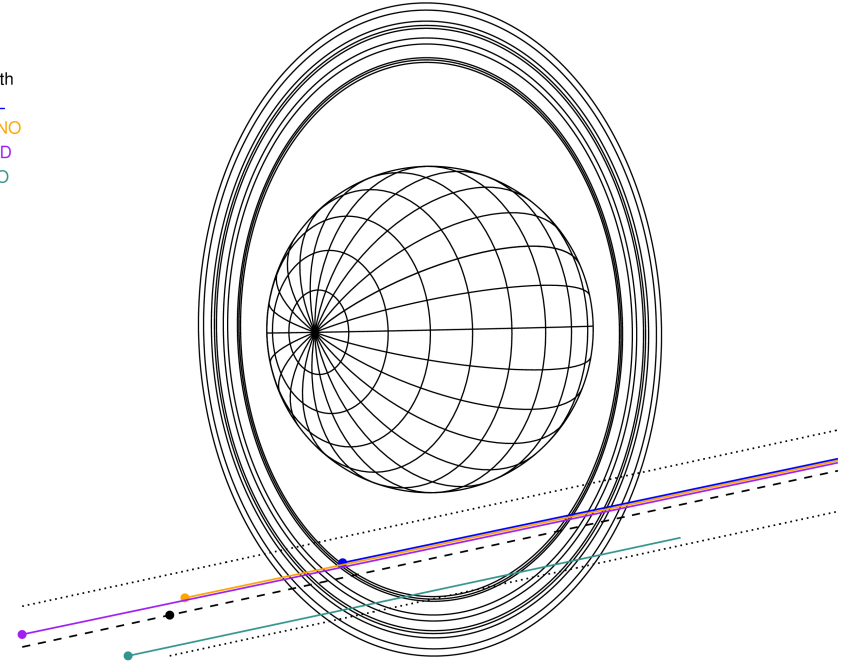
RUWE (>1.4 is poor) : 0.98  
 K magnitude : 13.963  
 G magnitude : 15.647  
 RP magnitude : 15.058  
 BP magnitude : 16.073  
 DUPflag : 0  
 Distance (au) : 19.137  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 22.85  
 Sun-Target sep (deg) : 56.84  
 Sun-Moon sep (deg) : 109.96  
 B (ring opening deg) : 45.13  
 PA of pole (deg) : 91.42  
 # 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



2039-09-22T09:52:22.3900 ra: 08 17 03.8074 s: +20 15 34.078 C/A 2.526° PA 12.19 deg v\_sky +22.85 km/s D 19.14 AU  
 Credit: Styled after SORA/Lucky Star

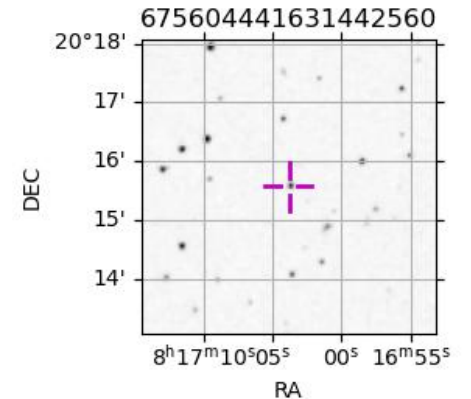
Uranus 2039-09-22T09:52:22 K13.96 G15.65 XRgt

Earth  
 PAL  
 KPNO  
 MCD  
 ESO

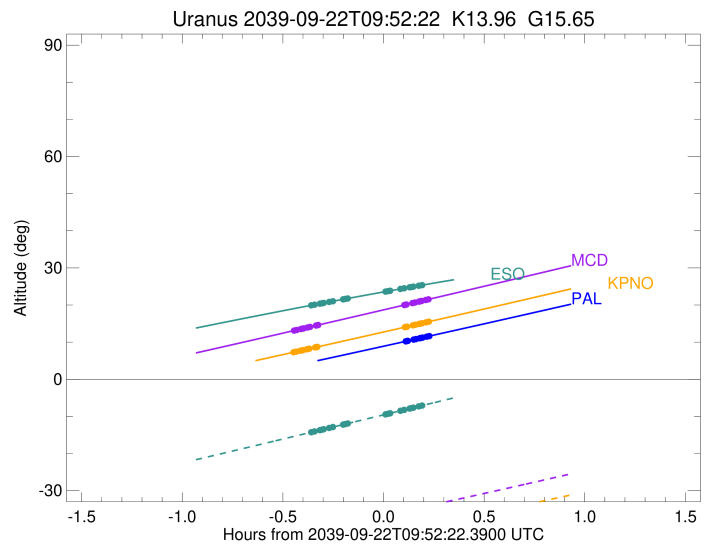
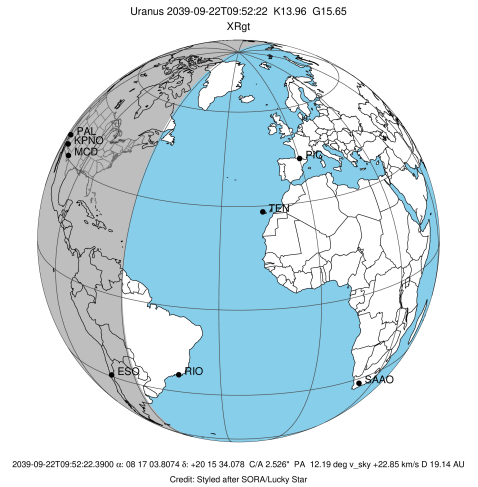


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 22 09:58 - SEP 22 10:05	PnnRne
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	SEP 22 09:25 - SEP 22 10:05	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	SEP 22 09:25 - SEP 22 10:05	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					PnnRnn
ESO	European Southern Obs	-29.3	289.3	+++++		+++++	SEP 22 09:30 - SEP 22 10:03	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 : 2039-09-22T09:47:54.430  
 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 : 675604441631442560  
 2Mass ID (if available) : 08170381+2015341  
 ICRS Star Coord at Epoch: 08h 17m 03.80740s +20:15:34.07814s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 13.963  
 G magnitude : 15.647  
 RP magnitude : 15.058  
 BP magnitude : 16.073  
 DUPflag : 0  
 Distance (au) : 19.137  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 22.85  
 Sun-Target sep (deg) : 56.84  
 Sun-Moon sep (deg) : 109.80  
 B (ring opening deg) : 45.13  
 PA of pole (deg) : 91.42  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.374  
 C/A sky separation (km) : 32946.1  
 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

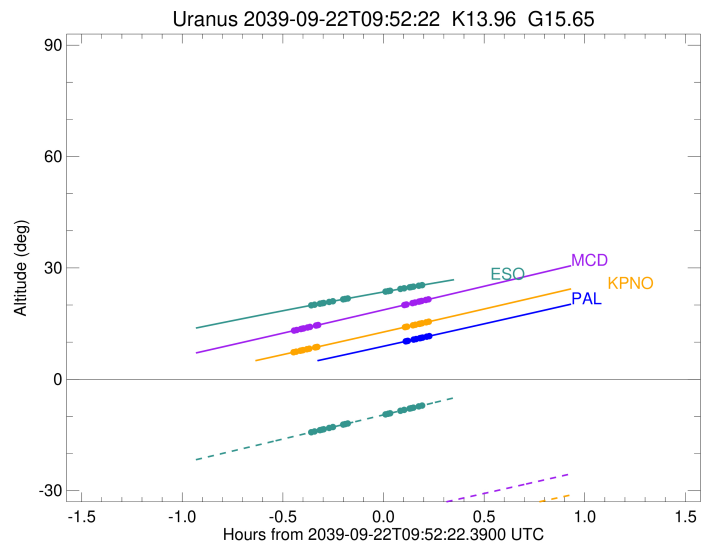
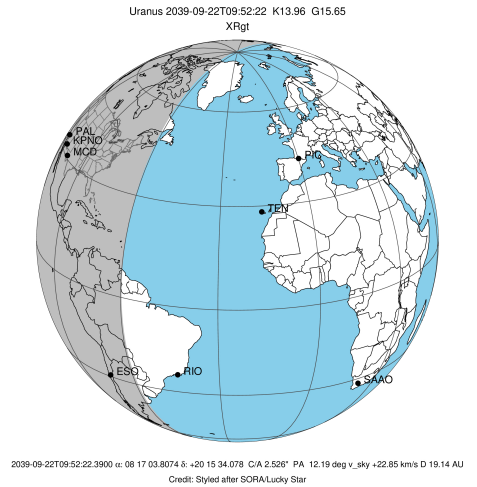


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-09-22T09:25:13.364		3.54x	-48.40	51555.17	-24.49		
lambda	I	2039-09-22T09:26:16.475		3.75x	-48.26	50026.71	-23.94		
delta	I	2039-09-22T09:27:29.638		3.99x	-48.08	48300.35	-23.24		
gamma	I	2039-09-22T09:27:59.020		4.08x	-48.01	47621.95	-22.94		
eta	I	2039-09-22T09:28:18.546		4.15x	-47.97	47176.12	-22.73		
beta	I	2039-09-22T09:29:26.832		4.37x	-47.81	45648.55	-21.96		
alpha	I	2039-09-22T09:30:11.577		4.51x	-47.70	44685.89	-21.41		
4	I	2039-09-22T09:31:51.635		4.84x	-47.46	42612.88	-20.06		
5	I	2039-09-22T09:32:07.975		4.89x	-47.42	42280.16	-19.76		
6	I	2039-09-22T09:32:30.064		4.97x	-47.37	41845.24	-19.41		

No planet occultations

6	E	2039-09-22T09:58:58.597		10.21	-43.27	41799.10	19.36		
5	E	2039-09-22T09:59:15.231		10.27	-43.23	42181.48	19.71		
4	E	2039-09-22T09:59:37.105		10.34	-43.17	42597.73	20.01		
alpha	E	2039-09-22T10:01:20.265		10.69	-42.88	44724.21	21.36		
beta	E	2039-09-22T10:02:04.544		10.83	-42.76	45676.01	21.89		
eta	E	2039-09-22T10:03:11.760		11.06	-42.58	47176.12	22.66		
gamma	E	2039-09-22T10:03:31.676		11.13	-42.52	47629.47	22.87		
delta	E	2039-09-22T10:04:00.824		11.22	-42.44	48300.35	23.16		
lambda	E	2039-09-22T10:05:14.234		11.47	-42.24	50026.71	23.86		
epsilon	E	2039-09-22T10:05:58.480		11.62	-42.11	51090.89	24.40		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-22T09:47:53.500  
 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 : 675604441631442560  
 2Mass ID (if available) : 08170381+2015341  
 ICRS Star Coord at Epoch: 08h 17m 03.80740s +20:15:34.07814s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 13.963  
 G magnitude : 15.647  
 RP magnitude : 15.058  
 BP magnitude : 16.073  
 DUPflag : 0  
 Distance (au) : 19.137  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 22.85  
 Sun-Target sep (deg) : 56.84  
 Sun-Moon sep (deg) : 109.86  
 B (ring opening deg) : 45.13  
 PA of pole (deg) : 91.42  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.396  
 C/A sky separation (km) : 33250.2  
 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

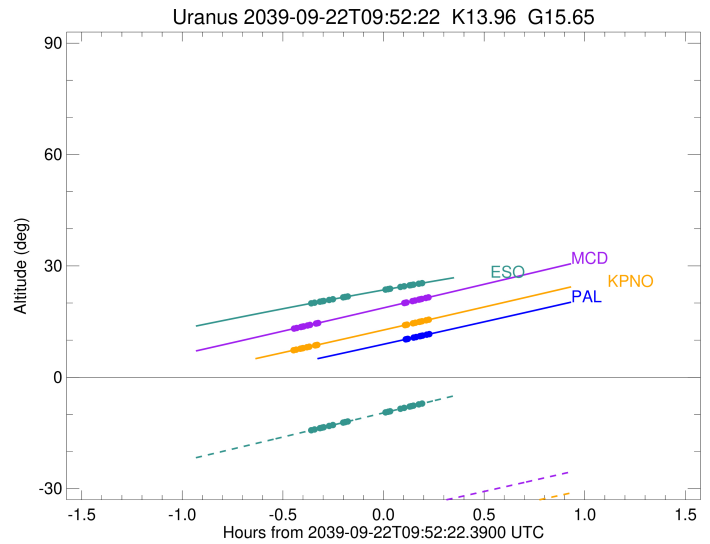
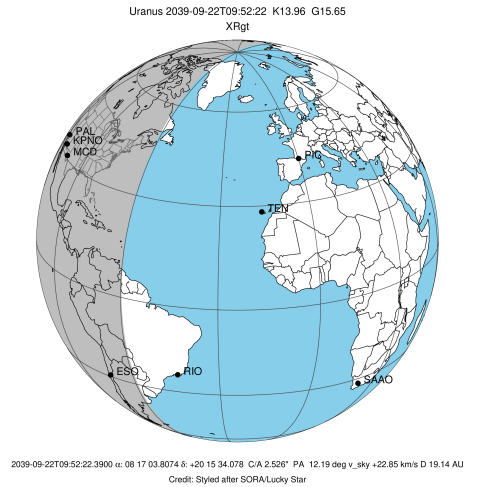


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-09-22T09:25:17.072		7.23	-46.20	51555.24	-24.29		
lambda	I	2039-09-22T09:26:20.729		7.44	-46.03	50026.71	-23.73		
delta	I	2039-09-22T09:27:34.588		7.69	-45.83	48300.35	-23.01		
gamma	I	2039-09-22T09:28:04.271		7.79	-45.75	47621.98	-22.70		
eta	I	2039-09-22T09:28:24.007		7.86	-45.70	47176.12	-22.48		
beta	I	2039-09-22T09:29:33.076		8.09	-45.51	45648.71	-21.69		
alpha	I	2039-09-22T09:30:18.386		8.24	-45.39	44685.99	-21.13		
4	I	2039-09-22T09:31:59.907		8.58	-45.11	42613.09	-19.73		
5	I	2039-09-22T09:32:16.572		8.64	-45.06	42279.37	-19.43		
6	I	2039-09-22T09:32:39.060		8.71	-45.00	41844.73	-19.07		

No planet occultations

6	E	2039-09-22T09:58:44.580		14.04	-40.50	41799.33	19.02		
5	E	2039-09-22T09:59:01.576		14.09	-40.45	42182.18	19.38		
4	E	2039-09-22T09:59:23.796		14.17	-40.39	42598.16	19.69		
alpha	E	2039-09-22T10:01:08.431		14.53	-40.07	44723.87	21.07		
beta	E	2039-09-22T10:01:53.277		14.68	-39.94	45675.88	21.63		
eta	E	2039-09-22T10:03:01.276		14.92	-39.73	47176.12	22.41		
gamma	E	2039-09-22T10:03:21.404		14.99	-39.67	47629.43	22.63		
delta	E	2039-09-22T10:03:50.853		15.09	-39.58	48300.35	22.93		
lambda	E	2039-09-22T10:05:04.963		15.34	-39.36	50026.71	23.64		
epsilon	E	2039-09-22T10:05:49.725		15.50	-39.22	51093.98	24.20		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-22T09:47:57.330  
 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 : 675604441631442560  
 2Mass ID (if available) : 08170381+2015341  
 ICRS Star Coord at Epoch: 08h 17m 03.80740s +20:15:34.07814s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 13.963  
 G magnitude : 15.647  
 RP magnitude : 15.058  
 BP magnitude : 16.073  
 DUPflag : 0  
 Distance (au) : 19.137  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 22.85  
 Sun-Target sep (deg) : 56.84  
 Sun-Moon sep (deg) : 109.95  
 B (ring opening deg) : 45.13  
 PA of pole (deg) : 91.42  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.421  
 C/A sky separation (km) : 33607.7  
 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

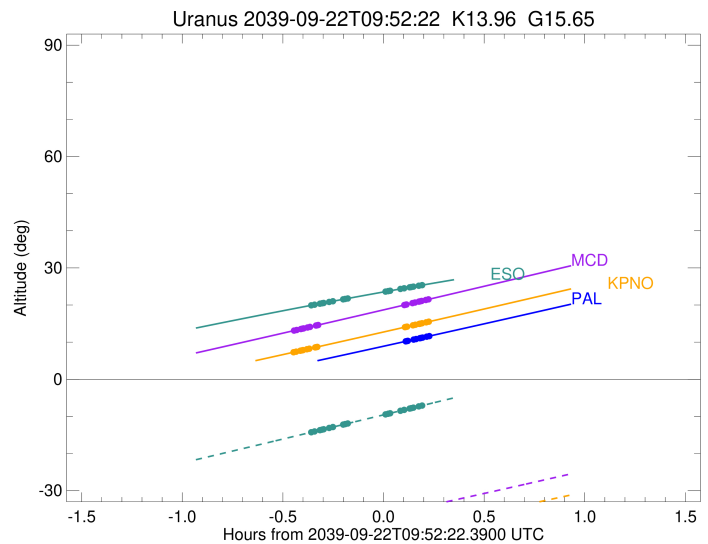
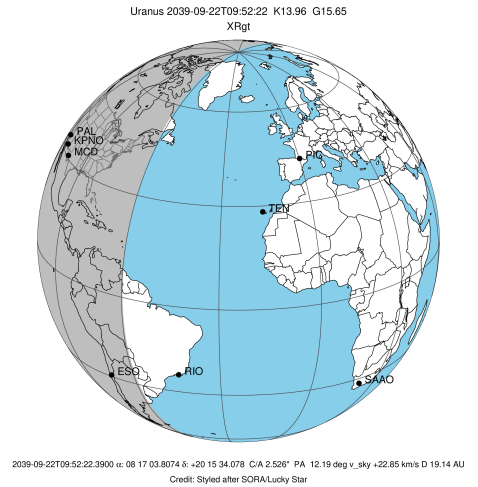


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-09-22T09:25:25.765		13.05	-41.73	51555.28	-24.04		
lambda	I	2039-09-22T09:26:30.116		13.28	-41.53	50026.71	-23.46		
delta	I	2039-09-22T09:27:44.859		13.54	-41.31	48300.35	-22.72		
gamma	I	2039-09-22T09:28:14.923		13.64	-41.21	47622.01	-22.40		
eta	I	2039-09-22T09:28:34.926		13.71	-41.15	47176.12	-22.18		
beta	I	2039-09-22T09:29:44.988		13.95	-40.94	45648.90	-21.36		
alpha	I	2039-09-22T09:30:31.017		14.11	-40.80	44686.11	-20.79		
4	I	2039-09-22T09:32:14.403		14.47	-40.48	42613.33	-19.34		
5	I	2039-09-22T09:32:31.481		14.53	-40.43	42278.39	-19.02		
6	I	2039-09-22T09:32:54.479		14.61	-40.36	41844.10	-18.65		

No planet occultations

6	E	2039-09-22T09:58:32.661		19.99	-35.48	41799.61	18.61		
5	E	2039-09-22T09:58:50.120		20.05	-35.42	42183.02	18.98		
4	E	2039-09-22T09:59:12.779		20.13	-35.35	42598.65	19.29		
alpha	E	2039-09-22T10:00:59.291		20.51	-35.00	44723.47	20.73		
beta	E	2039-09-22T10:01:44.855		20.67	-34.85	45675.73	21.30		
eta	E	2039-09-22T10:02:53.844		20.91	-34.63	47176.12	22.11		
gamma	E	2039-09-22T10:03:14.239		20.98	-34.56	47629.38	22.33		
delta	E	2039-09-22T10:03:44.070		21.09	-34.46	48300.35	22.65		
lambda	E	2039-09-22T10:04:59.064		21.35	-34.22	50026.71	23.38		
epsilon	E	2039-09-22T10:05:44.470		21.51	-34.07	51097.60	23.95		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-22T09:50:04.990  
 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 : 675604441631442560  
 2Mass ID (if available) : 08170381+2015341  
 ICRS Star Coord at Epoch: 08h 17m 03.80740s +20:15:34.07814s  
 RUWE (>1.4 is poor) : 0.98  
 K magnitude : 13.963  
 G magnitude : 15.647  
 RP magnitude : 15.058  
 BP magnitude : 16.073  
 DUPflag : 0  
 Distance (au) : 19.137  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 22.85  
 Sun-Target sep (deg) : 56.84  
 Sun-Moon sep (deg) : 110.16  
 B (ring opening deg) : 45.13  
 PA of pole (deg) : 91.42  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.890  
 C/A sky separation (km) : 40109.7  
 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	2039-09-22T09:30:30.141		19.86	-14.34	51548.61	-19.53		
lambda	I	2039-09-22T09:31:49.923		20.09	-14.06	50026.71	-18.57		
delta	I	2039-09-22T09:33:26.281		20.37	-13.71	48300.35	-17.24		
gamma	I	2039-09-22T09:34:06.264		20.48	-13.56	47622.83	-16.65		
eta	I	2039-09-22T09:34:33.439		20.56	-13.47	47176.12	-16.23		
beta	I	2039-09-22T09:36:12.065		20.84	-13.11	45653.31	-14.62		
alpha	I	2039-09-22T09:37:21.052		21.03	-12.86	44690.01	-13.41		
4	I	2039-09-22T09:40:18.527		21.53	-12.22	42616.52	-9.89		
5	I	2039-09-22T09:40:56.561		21.63	-12.08	42252.48	-9.00		
6	I	2039-09-22T09:41:46.841		21.77	-11.90	41828.34	-7.94		

No planet occultations

6	E	2039-09-22T09:52:54.556		23.61	-9.48	41809.23	7.93		
5	E	2039-09-22T09:53:38.636		23.72	-9.32	42206.88	9.00		
4	E	2039-09-22T09:54:22.537		23.84	-9.16	42608.87	9.88		
alpha	E	2039-09-22T09:57:23.176		24.33	-8.50	44714.38	13.39		
beta	E	2039-09-22T09:58:31.654		24.51	-8.25	45671.85	14.60		
eta	E	2039-09-22T10:00:09.146		24.77	-7.90	47176.12	16.20		
gamma	E	2039-09-22T10:00:36.703		24.84	-7.80	47628.37	16.62		
delta	E	2039-09-22T10:01:16.429		24.94	-7.65	48300.35	17.21		
lambda	E	2039-09-22T10:02:52.986		25.20	-7.30	50026.71	18.53		
epsilon	E	2039-09-22T10:03:53.553		25.36	-7.08	51172.23	19.49		