

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-23T04:54:51.630  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3425573247075578496  
 2Mass ID (if available) : 06160525+2339344

ICRS Star Coord at Epoch: 06h 16m 05.26536s +23:39:34.30598s

RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.219  
 G magnitude : 16.574  
 RP magnitude : 15.800  
 BP magnitude : 17.209  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 177.49  
 Sun-Moon sep (deg) : 164.63  
 B (ring opening deg) : 72.12  
 PA of pole (deg) : 64.70

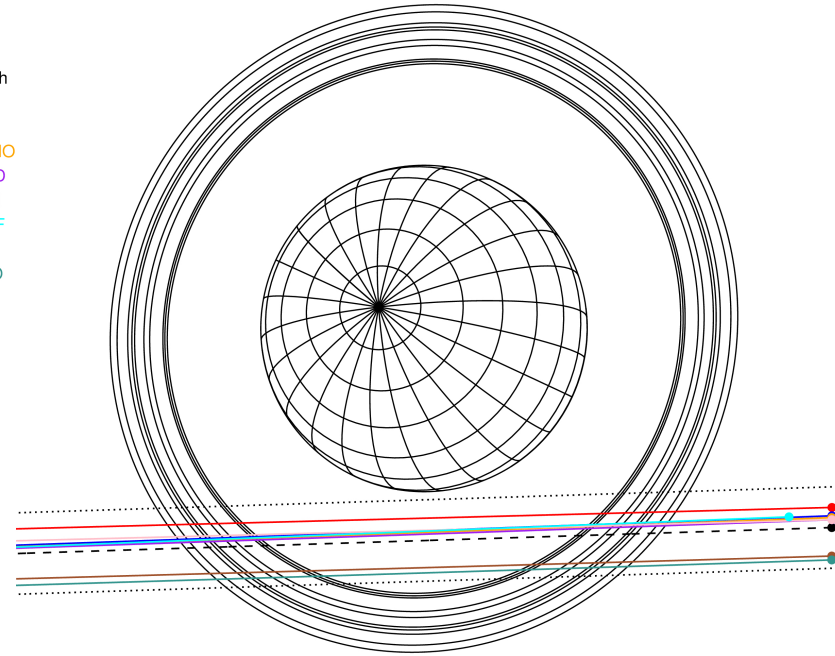
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2033-12-23T04:54:51.6300 a: 06 16 05.2654 & +23 39 34.306 C/A 2.539" PA 1.83 deg v\_sky -23.38 km/s D 17.97 AU  
 Credit: Styled after SORA/Lucky Star

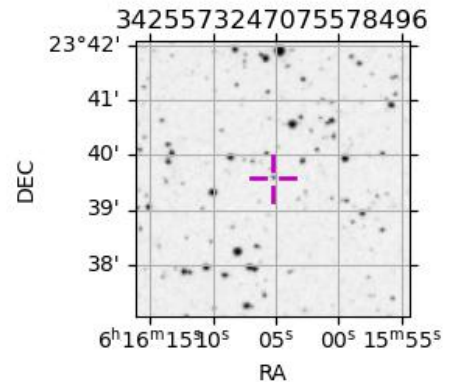
Uranus 2033-12-23T04:54:51 K14.22 G16.57 XRgt

Earth  
 PIC  
 PAL  
 KPNO  
 MCD  
 TEN  
 IRTF  
 RIO  
 ESO

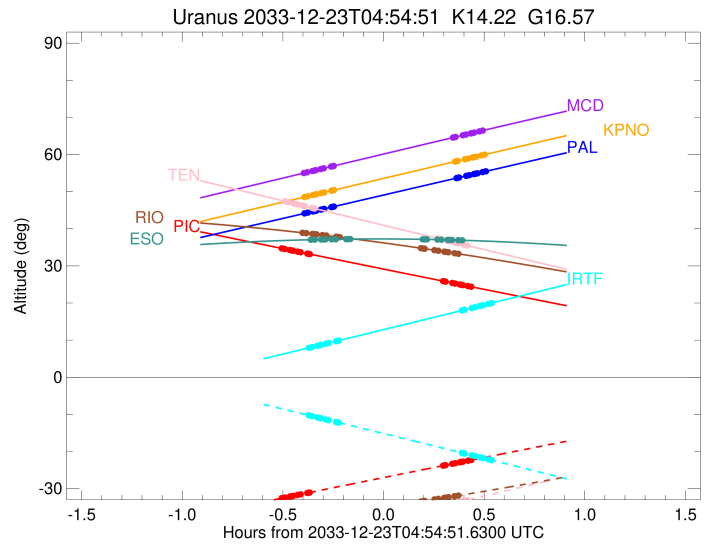
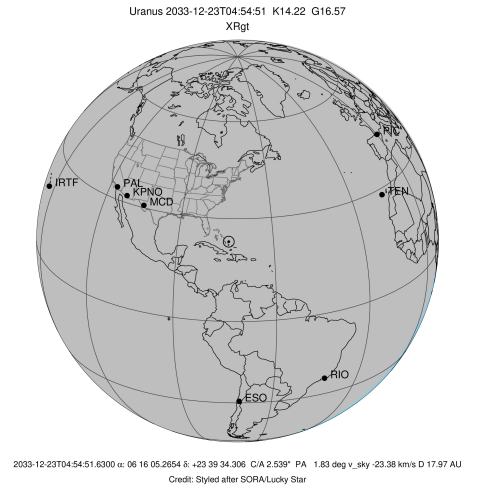


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	DEC 23 04:24 - DEC 23 05:21	PnnRie
PAL	Palomar Mt (200")	33.4	243.1	+++++		+++++	DEC 23 04:31 - DEC 23 05:25	PnnRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	DEC 23 04:31 - DEC 23 05:25	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	DEC 23 04:31 - DEC 23 05:24	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++		+++++	DEC 23 04:25 - DEC 23 05:20	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	DEC 23 04:32 - DEC 23 05:27	PnnRie
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+++++		+++++	DEC 23 04:30 - DEC 23 05:17	PnnRie
ESO	European Southern Obs	-29.3	289.3	+++++		+++++	DEC 23 04:33 - DEC 23 05:18	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 : 2033-12-23T04:51:55.220  
 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 : 3425573247075578496  
 2Mass ID (if available) : 06160525+2339344  
 ICRS Star Coord at Epoch: 06h 16m 05.26536s +23:39:34.30598s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.219  
 G magnitude : 16.574  
 RP magnitude : 15.800  
 BP magnitude : 17.209  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 177.49  
 Sun-Moon sep (deg) : 164.33  
 B (ring opening deg) : 72.12  
 PA of pole (deg) : 64.70  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.279  
 C/A sky separation (km) : 29701.8  
 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

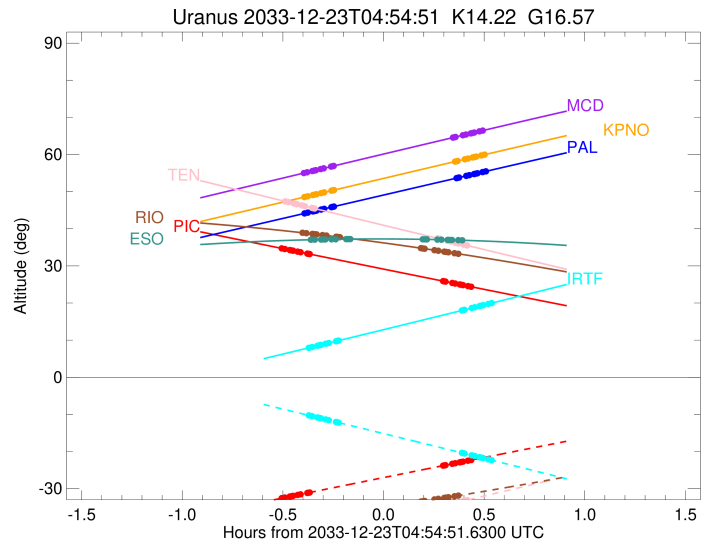
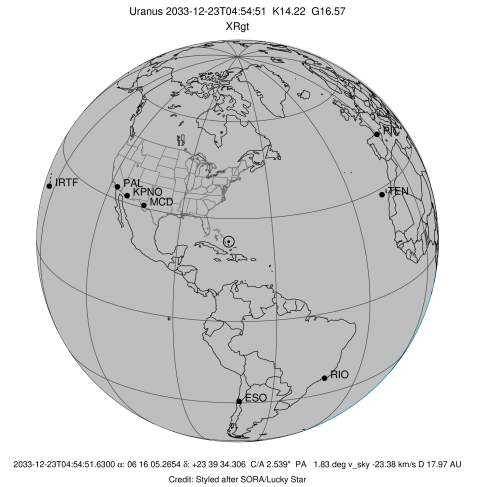


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-23T04:24:29.718		34.72	-32.57	51176.87	-19.94		
lambda	I	2033-12-23T04:25:28.075		34.54	-32.39	50026.71	-19.59		
delta	I	2033-12-23T04:26:57.129		34.27	-32.12	48300.35	-19.18		
gamma	I	2033-12-23T04:27:32.192		34.16	-32.02	47630.88	-19.01		
eta	I	2033-12-23T04:27:56.195		34.09	-31.94	47176.12	-18.88		
beta	I	2033-12-23T04:29:17.333		33.84	-31.69	45660.25	-18.44		
alpha	I	2033-12-23T04:30:10.831		33.67	-31.53	44685.61	-18.13		
4	I	2033-12-23T04:32:10.958		33.31	-31.16	42551.63	-17.37		
5	I	2033-12-23T04:32:24.017		33.27	-31.13	42313.46	-17.24		
6	I	2033-12-23T04:32:54.184		33.17	-31.03	41797.21	-17.02		

No planet occultations

6	E	2033-12-23T05:12:36.496		25.91	-23.81	41821.80	16.98		
5	E	2033-12-23T05:12:59.649		25.84	-23.74	42218.56	17.20		
4	E	2033-12-23T05:13:22.233		25.77	-23.67	42612.28	17.33		
alpha	E	2033-12-23T05:15:21.010		25.41	-23.32	44713.68	18.08		
beta	E	2033-12-23T05:16:11.803		25.25	-23.16	45641.39	18.39		
eta	E	2033-12-23T05:17:34.263		25.00	-22.92	47176.12	18.83		
gamma	E	2033-12-23T05:17:58.177		24.93	-22.85	47627.89	18.95		
delta	E	2033-12-23T05:18:33.501		24.83	-22.74	48300.35	19.12		
lambda	E	2033-12-23T05:20:02.828		24.56	-22.47	50026.71	19.52		
epsilon	E	2033-12-23T05:21:18.845		24.33	-22.24	51522.81	19.88		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-23T04:57:29.560  
 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 : 3425573247075578496  
 2Mass ID (if available) : 06160525+2339344  
 ICRS Star Coord at Epoch: 06h 16m 05.26536s +23:39:34.30598s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.219  
 G magnitude : 16.574  
 RP magnitude : 15.800  
 BP magnitude : 17.209  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 177.49  
 Sun-Moon sep (deg) : 165.41  
 B (ring opening deg) : 72.12  
 PA of pole (deg) : 64.70  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.428  
 C/A sky separation (km) : 31648.3  
 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

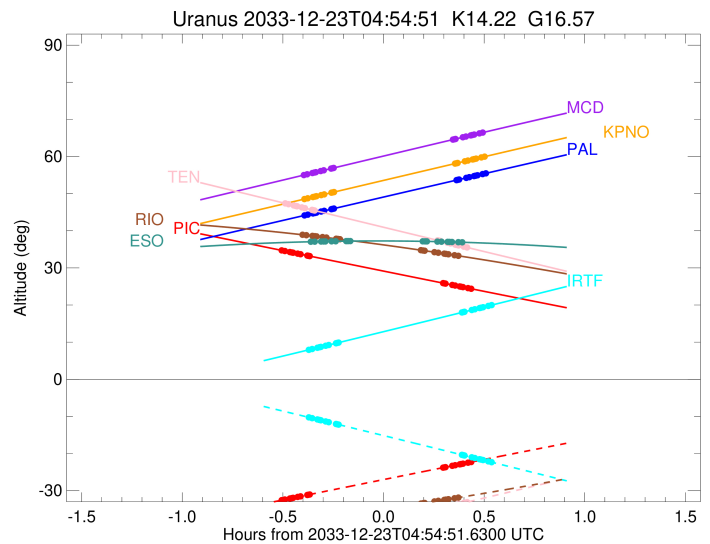
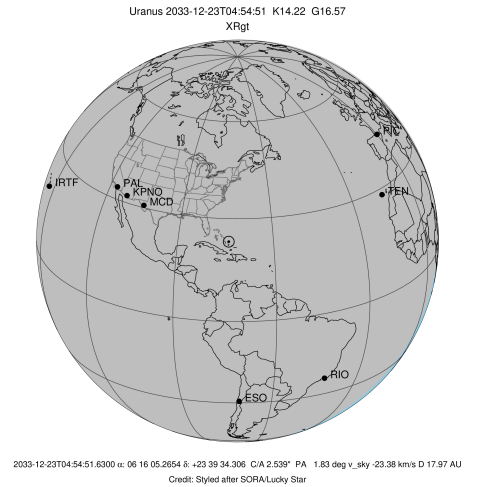


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-23T04:31:16.937		44.14	-46.34	51192.51	-19.31		
lambda	I	2033-12-23T04:32:18.166		44.35	-46.56	50026.71	-18.89		
delta	I	2033-12-23T04:33:50.696		44.67	-46.88	48300.35	-18.41		
gamma	I	2033-12-23T04:34:27.249		44.80	-47.01	47630.99	-18.21		
eta	I	2033-12-23T04:34:52.330		44.89	-47.09	47176.12	-18.06		
beta	I	2033-12-23T04:36:17.456		45.19	-47.39	45659.26	-17.53		
alpha	I	2033-12-23T04:37:13.815		45.38	-47.59	44685.23	-17.16		
4	I	2033-12-23T04:39:21.300		45.83	-48.03	42554.05	-16.23		
5	I	2033-12-23T04:39:35.566		45.88	-48.08	42312.32	-16.08		
6	I	2033-12-23T04:40:07.960		45.99	-48.19	41796.42	-15.81		

No planet occultations

6	E	2033-12-23T05:16:36.178		53.64	-55.80	41818.69	15.84		
5	E	2033-12-23T05:17:01.547		53.73	-55.89	42224.74	16.11		
4	E	2033-12-23T05:17:25.225		53.81	-55.97	42610.67	16.27		
alpha	E	2033-12-23T05:19:30.786		54.25	-56.40	44711.32	17.20		
beta	E	2033-12-23T05:20:24.193		54.43	-56.59	45641.18	17.57		
eta	E	2033-12-23T05:21:50.220		54.73	-56.89	47176.12	18.11		
gamma	E	2033-12-23T05:22:15.086		54.82	-56.97	47628.21	18.26		
delta	E	2033-12-23T05:22:51.701		54.95	-57.10	48300.35	18.46		
lambda	E	2033-12-23T05:24:23.990		55.27	-57.42	50026.71	18.94		
epsilon	E	2033-12-23T05:25:42.628		55.54	-57.69	51531.36	19.36		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-23T04:57:16.640  
 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 : 3425573247075578496  
 2Mass ID (if available) : 06160525+2339344  
 ICRS Star Coord at Epoch: 06h 16m 05.26536s +23:39:34.30598s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.219  
 G magnitude : 16.574  
 RP magnitude : 15.800  
 BP magnitude : 17.209  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 177.49  
 Sun-Moon sep (deg) : 165.36  
 B (ring opening deg) : 72.12  
 PA of pole (deg) : 64.70  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.448  
 C/A sky separation (km) : 31913.1  
 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\_itrff93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

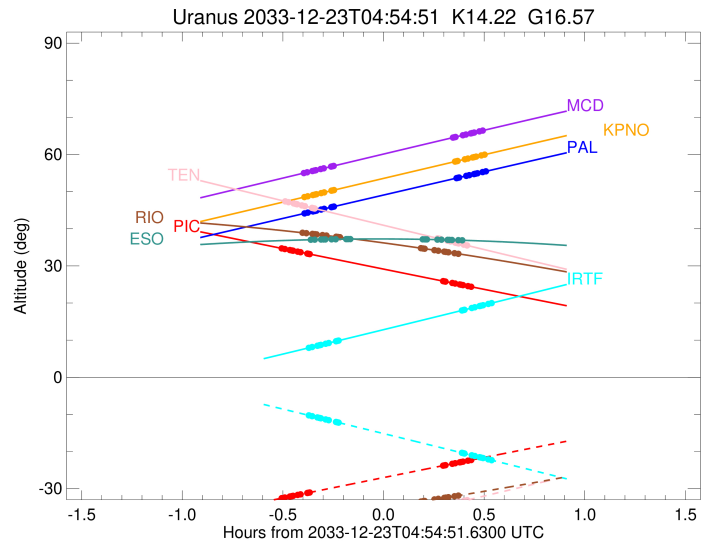
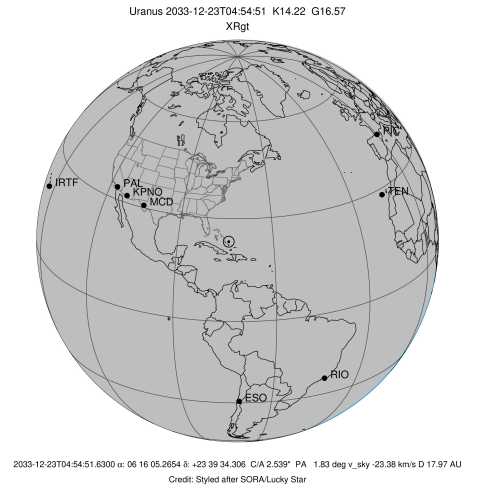


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-23T04:31:14.963		48.54	-50.79	51195.36	-19.23		
lambda	I	2033-12-23T04:32:16.605		48.76	-51.01	50026.71	-18.81		
delta	I	2033-12-23T04:33:49.590		49.09	-51.33	48300.35	-18.32		
gamma	I	2033-12-23T04:34:26.343		49.22	-51.46	47631.01	-18.11		
eta	I	2033-12-23T04:34:51.570		49.31	-51.55	47176.12	-17.96		
beta	I	2033-12-23T04:36:17.250		49.61	-51.86	45659.09	-17.41		
alpha	I	2033-12-23T04:37:14.012		49.81	-52.06	44685.18	-17.03		
4	I	2033-12-23T04:39:22.564		50.27	-52.51	42554.46	-16.08		
5	I	2033-12-23T04:39:37.023		50.32	-52.56	42312.10	-15.92		
6	I	2033-12-23T04:40:09.751		50.44	-52.68	41796.30	-15.64		

No planet occultations

6	E	2033-12-23T05:16:09.358		58.09	-60.29	41818.32	15.67		
5	E	2033-12-23T05:16:35.069		58.18	-60.38	42225.48	15.95		
4	E	2033-12-23T05:16:58.936		58.27	-60.46	42610.47	16.11		
alpha	E	2033-12-23T05:19:05.593		58.72	-60.91	44711.05	17.06		
beta	E	2033-12-23T05:19:59.413		58.91	-61.10	45641.17	17.45		
eta	E	2033-12-23T05:21:26.009		59.21	-61.40	47176.12	18.00		
gamma	E	2033-12-23T05:21:51.027		59.30	-61.49	47628.24	18.15		
delta	E	2033-12-23T05:22:27.848		59.43	-61.61	48300.35	18.36		
lambda	E	2033-12-23T05:24:00.612		59.76	-61.94	50026.71	18.85		
epsilon	E	2033-12-23T05:25:19.648		60.03	-62.21	51532.21	19.28		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-23T04:56:54.370  
 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 : 3425573247075578496  
 2Mass ID (if available) : 06160525+2339344  
 ICRS Star Coord at Epoch: 06h 16m 05.26536s +23:39:34.30598s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.219  
 G magnitude : 16.574  
 RP magnitude : 15.800  
 BP magnitude : 17.209  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 177.49  
 Sun-Moon sep (deg) : 165.29  
 B (ring opening deg) : 72.12  
 PA of pole (deg) : 64.70  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.470  
 C/A sky separation (km) : 32198.1  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

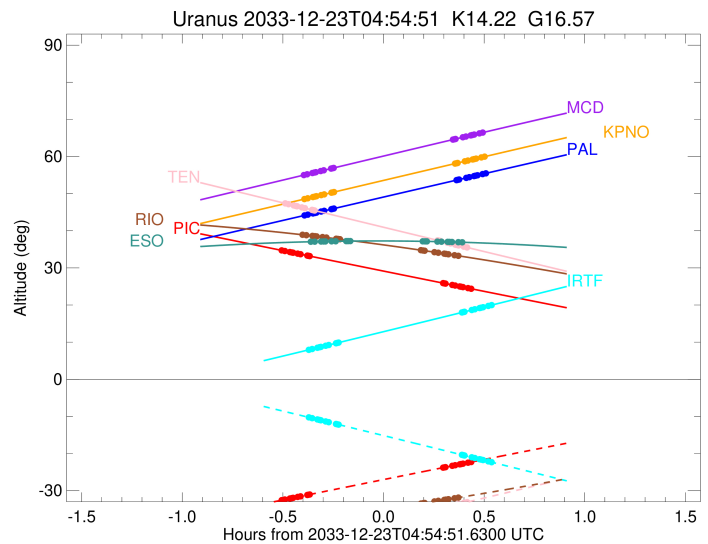
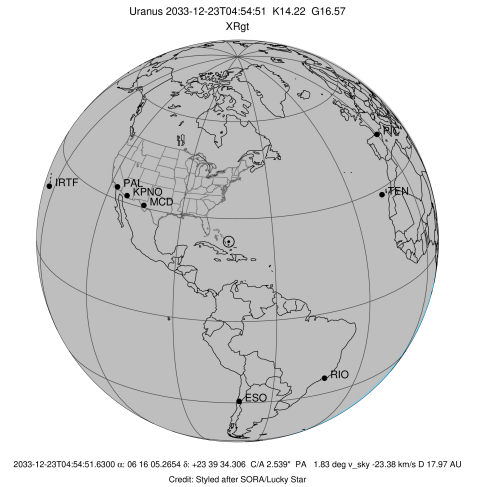


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-23T04:31:04.849		55.00	-57.28	51198.52	-19.15		
lambda	I	2033-12-23T04:32:06.936		55.22	-57.51	50026.71	-18.72		
delta	I	2033-12-23T04:33:40.405		55.56	-57.84	48300.35	-18.21		
gamma	I	2033-12-23T04:34:17.371		55.69	-57.97	47631.03	-18.00		
eta	I	2033-12-23T04:34:42.754		55.78	-58.06	47176.12	-17.84		
beta	I	2033-12-23T04:36:09.031		56.09	-58.37	45658.89	-17.28		
alpha	I	2033-12-23T04:37:06.230		56.30	-58.58	44685.11	-16.89		
4	I	2033-12-23T04:39:15.953		56.77	-59.04	42554.93	-15.91		
5	I	2033-12-23T04:39:30.626		56.82	-59.09	42311.85	-15.74		
6	I	2033-12-23T04:40:03.722		56.94	-59.21	41796.17	-15.46		

No planet occultations

6	E	2033-12-23T05:15:31.669		64.56	-66.77	41817.94	15.48		
5	E	2033-12-23T05:15:57.760		64.65	-66.86	42226.27	15.77		
4	E	2033-12-23T05:16:21.838		64.73	-66.94	42610.25	15.93		
alpha	E	2033-12-23T05:18:29.711		65.19	-67.39	44710.76	16.92		
beta	E	2033-12-23T05:19:23.985		65.38	-67.58	45641.15	17.31		
eta	E	2033-12-23T05:20:51.205		65.69	-67.89	47176.12	17.88		
gamma	E	2033-12-23T05:21:16.388		65.78	-67.98	47628.28	18.03		
delta	E	2033-12-23T05:21:53.436		65.91	-68.11	48300.35	18.25		
lambda	E	2033-12-23T05:23:26.717		66.24	-68.43	50026.71	18.76		
epsilon	E	2033-12-23T05:24:46.182		66.52	-68.71	51533.07	19.19		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-23T04:51:47.550  
 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 : 3425573247075578496  
 2Mass ID (if available) : 06160525+2339344  
 ICRS Star Coord at Epoch: 06h 16m 05.26536s +23:39:34.30598s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.219  
 G magnitude : 16.574  
 RP magnitude : 15.800  
 BP magnitude : 17.209  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 177.49  
 Sun-Moon sep (deg) : 164.26  
 B (ring opening deg) : 72.12  
 PA of pole (deg) : 64.70  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.425  
 C/A sky separation (km) : 31607.8  
 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



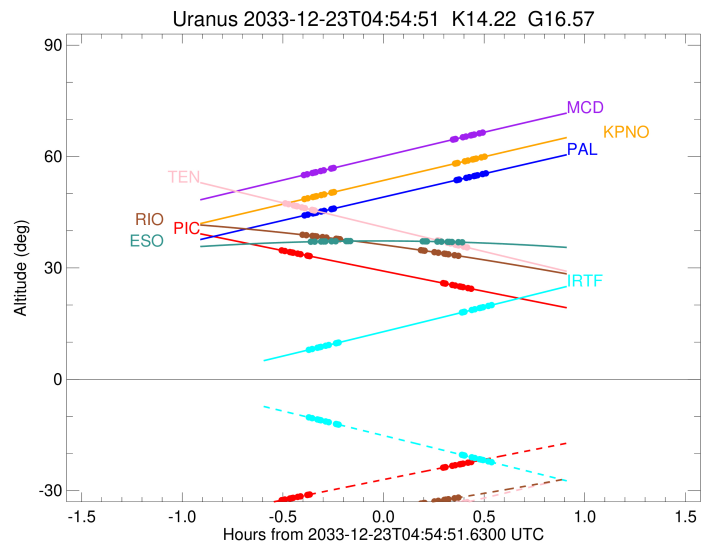
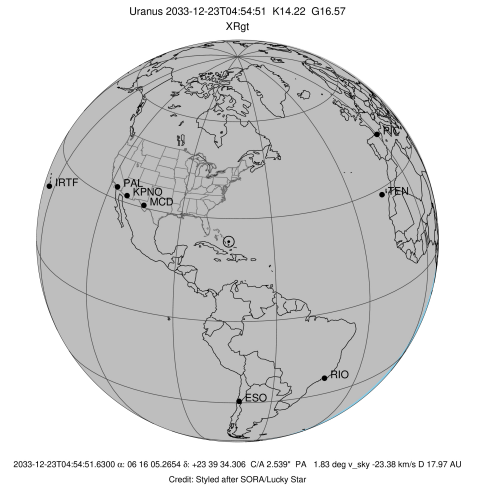
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-23T04:25:32.381		47.39	-44.92	51195.94	-19.36		
lambda	I	2033-12-23T04:26:33.625		47.17	-44.70	50026.71	-18.94		
delta	I	2033-12-23T04:28:05.913		46.83	-44.36	48300.35	-18.46		
gamma	I	2033-12-23T04:28:42.370		46.70	-44.23	47631.01	-18.26		
eta	I	2033-12-23T04:29:07.386		46.60	-44.13	47176.12	-18.11		
beta	I	2033-12-23T04:30:32.298		46.29	-43.82	45659.09	-17.58		
alpha	I	2033-12-23T04:31:28.501		46.09	-43.62	44685.18	-17.21		
4	I	2033-12-23T04:33:35.605		45.62	-43.16	42554.38	-16.28		
5	I	2033-12-23T04:33:49.869		45.57	-43.10	42312.15	-16.12		
6	I	2033-12-23T04:34:22.165		45.45	-42.99	41796.33	-15.86		

No planet occultations

6	E	2033-12-23T05:10:58.747		37.43	-35.01	41819.13	15.83		
5	E	2033-12-23T05:11:24.056		37.34	-34.91	42223.82	16.09		
4	E	2033-12-23T05:11:47.828		37.25	-34.83	42610.93	16.24		
alpha	E	2033-12-23T05:13:53.614		36.79	-34.37	44711.70	17.16		
beta	E	2033-12-23T05:14:47.112		36.60	-34.18	45641.21	17.53		
eta	E	2033-12-23T05:16:13.346		36.29	-33.87	47176.12	18.06		
gamma	E	2033-12-23T05:16:38.275		36.20	-33.78	47628.15	18.21		
delta	E	2033-12-23T05:17:14.993		36.06	-33.65	48300.35	18.41		
lambda	E	2033-12-23T05:18:47.558		35.73	-33.31	50026.71	18.88		
epsilon	E	2033-12-23T05:20:06.372		35.44	-33.03	51529.81	19.30		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2033-12-23T04:58:59.110
Event type          : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code       : IRTF
Location            : Mauna Kea/IRTF
Latitude (deg)      : 19.82622
E. Longitude (deg)  : 204.52800
Altitude (km)       : 4.168
Gaia source ID      : 3425573247075578496
2Mass ID (if available) : 06160525+2339344
ICRS Star Coord at Epoch: 06h 16m 05.26536s +23:39:34.30598s
RUWE (>1.4 is poor) : 0.97
K magnitude          : 14.219
G magnitude          : 16.574
RP magnitude         : 15.800
BP magnitude         : 17.209
DUPflag             : 0
Distance (au)       : 17.971
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -23.38
Sun-Target sep (deg) : 177.49
Sun-Moon sep (deg)  : 165.57
B (ring opening deg) : 72.12
PA of pole (deg)    : 64.70
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.434
C/A sky separation (km) : 31723.1
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall11.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
    
```

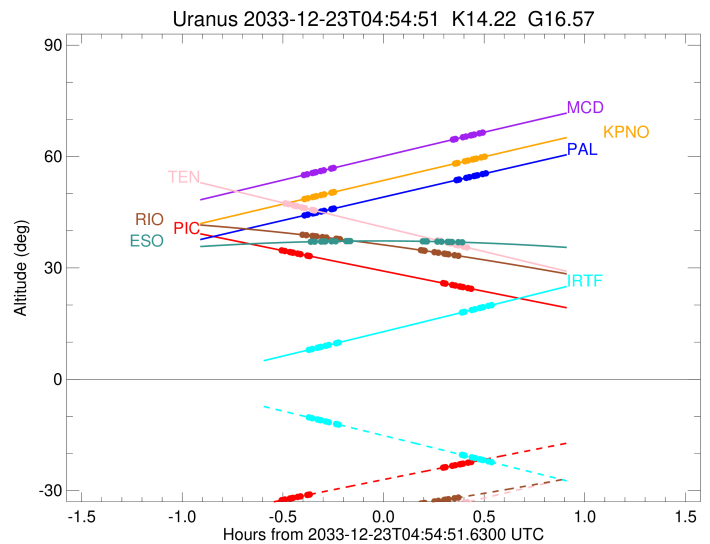
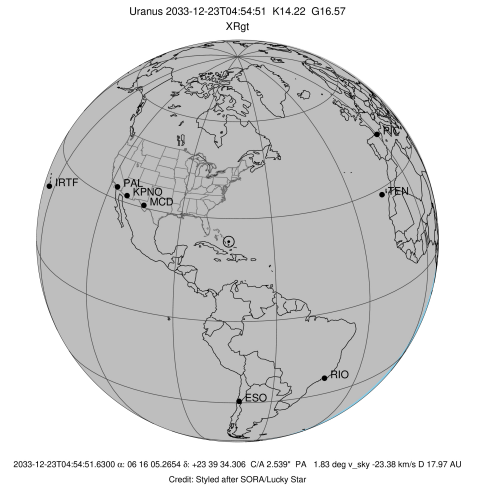


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-23T04:32:34.135		7.92	-10.26	51192.18	-19.08		
lambda	I	2033-12-23T04:33:36.067		8.15	-10.48	50026.71	-18.67		
delta	I	2033-12-23T04:35:09.700		8.49	-10.82	48300.35	-18.19		
gamma	I	2033-12-23T04:35:46.694		8.63	-10.96	47630.99	-17.99		
eta	I	2033-12-23T04:36:12.079		8.72	-11.05	47176.12	-17.85		
beta	I	2033-12-23T04:37:38.251		9.03	-11.37	45659.26	-17.32		
alpha	I	2033-12-23T04:38:35.315		9.24	-11.58	44685.23	-16.95		
4	I	2033-12-23T04:40:44.441		9.71	-12.05	42554.05	-16.02		
5	I	2033-12-23T04:40:58.895		9.77	-12.10	42312.32	-15.87		
6	I	2033-12-23T04:41:31.722		9.89	-12.22	41796.41	-15.60		

No planet occultations

6	E	2033-12-23T05:18:12.588		17.99	-20.35	41818.45	15.65		
5	E	2033-12-23T05:18:38.313		18.09	-20.45	42225.22	15.92		
4	E	2033-12-23T05:19:02.244		18.18	-20.54	42610.54	16.07		
alpha	E	2033-12-23T05:21:09.258		18.65	-21.01	44711.13	17.01		
beta	E	2033-12-23T05:22:03.271		18.85	-21.21	45641.17	17.38		
eta	E	2033-12-23T05:23:30.235		19.17	-21.53	47176.12	17.92		
gamma	E	2033-12-23T05:23:55.369		19.27	-21.63	47628.23	18.06		
delta	E	2033-12-23T05:24:32.368		19.41	-21.77	48300.35	18.27		
lambda	E	2033-12-23T05:26:05.613		19.75	-22.11	50026.71	18.75		
epsilon	E	2033-12-23T05:27:25.083		20.05	-22.41	51532.06	19.17		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-23T04:52:55.180  
 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 : 3425573247075578496  
 2Mass ID (if available) : 06160525+2339344  
 ICRS Star Coord at Epoch: 06h 16m 05.26536s +23:39:34.30598s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.219  
 G magnitude : 16.574  
 RP magnitude : 15.800  
 BP magnitude : 17.209  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 177.49  
 Sun-Moon sep (deg) : 164.18  
 B (ring opening deg) : 72.12  
 PA of pole (deg) : 64.70  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.873  
 C/A sky separation (km) : 37446.0  
 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\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



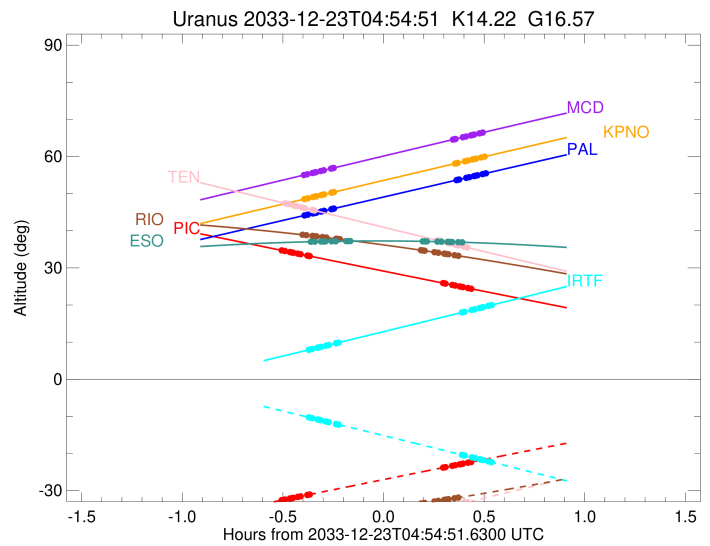
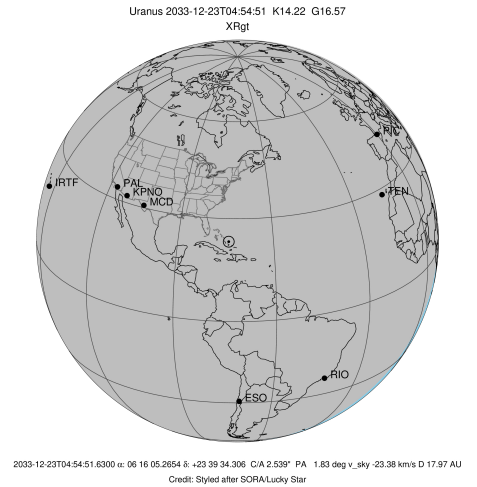
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-23T04:30:37.522		38.93	-37.96	51257.60	-16.83		
lambda	I	2033-12-23T04:31:52.402		38.81	-37.82	50026.71	-16.18		
delta	I	2033-12-23T04:33:41.764		38.62	-37.61	48300.35	-15.37		
gamma	I	2033-12-23T04:34:25.771		38.54	-37.53	47631.36	-15.03		
eta	I	2033-12-23T04:34:56.323		38.49	-37.47	47176.12	-14.77		
beta	I	2033-12-23T04:36:42.484		38.30	-37.26	45655.16	-13.83		
alpha	I	2033-12-23T04:37:54.649		38.17	-37.12	44684.63	-13.16		
4	I	2033-12-23T04:40:47.090		37.85	-36.78	42565.04	-11.36		
5	I	2033-12-23T04:41:09.765		37.81	-36.73	42304.28	-11.04		
6	I	2033-12-23T04:41:57.139		37.72	-36.64	41794.75	-10.51		

No planet occultations

6	E	2033-12-23T05:05:56.753		34.79	-33.49	41809.72	10.50		
5	E	2033-12-23T05:06:37.144		34.70	-33.40	42244.15	11.03		
4	E	2033-12-23T05:07:09.349		34.63	-33.32	42604.34	11.35		
alpha	E	2033-12-23T05:10:00.402		34.24	-32.92	44704.75	13.15		
beta	E	2033-12-23T05:11:09.768		34.09	-32.75	45641.12	13.82		
eta	E	2033-12-23T05:12:57.162		33.84	-32.49	47176.12	14.76		
gamma	E	2033-12-23T05:13:27.599		33.77	-32.42	47629.03	15.01		
delta	E	2033-12-23T05:14:11.822		33.67	-32.31	48300.35	15.35		
lambda	E	2033-12-23T05:16:01.343		33.42	-32.05	50026.71	16.16		
epsilon	E	2033-12-23T05:17:33.677		33.20	-31.82	51547.41	16.80		



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-23T04:54:43.070  
 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 : 3425573247075578496  
 2Mass ID (if available) : 06160525+2339344  
 ICRS Star Coord at Epoch: 06h 16m 05.26536s +23:39:34.30598s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 14.219  
 G magnitude : 16.574  
 RP magnitude : 15.800  
 BP magnitude : 17.209  
 DUPflag : 0  
 Distance (au) : 17.971  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 177.49  
 Sun-Moon sep (deg) : 164.49  
 B (ring opening deg) : 72.12  
 PA of pole (deg) : 64.70  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.936  
 C/A sky separation (km) : 38264.4  
 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	2033-12-23T04:33:05.055		37.04	-37.44	51265.82	-16.39		
lambda	I	2033-12-23T04:34:22.615		37.07	-37.45	50026.71	-15.70		
delta	I	2033-12-23T04:36:15.658		37.11	-37.47	48300.35	-14.83		
gamma	I	2033-12-23T04:37:01.349		37.12	-37.47	47631.40	-14.45		
eta	I	2033-12-23T04:37:33.156		37.13	-37.47	47176.12	-14.18		
beta	I	2033-12-23T04:39:24.332		37.16	-37.48	45654.58	-13.15		
alpha	I	2033-12-23T04:40:40.509		37.18	-37.48	44684.68	-12.40		
4	I	2033-12-23T04:43:45.859		37.21	-37.48	42566.91	-10.38		
5	I	2033-12-23T04:44:11.196		37.22	-37.48	42302.47	-10.02		
6	I	2033-12-23T04:45:03.589		37.23	-37.48	41794.77	-9.40		

No planet occultations

6	E	2033-12-23T05:06:28.914		37.16	-37.15	41808.06	9.40		
5	E	2033-12-23T05:07:14.312		37.15	-37.13	42248.06	10.02		
4	E	2033-12-23T05:07:49.158		37.14	-37.12	42602.83	10.38		
alpha	E	2033-12-23T05:10:52.937		37.08	-37.02	44703.55	12.41		
beta	E	2033-12-23T05:12:06.232		37.06	-36.98	45641.19	13.15		
eta	E	2033-12-23T05:13:58.509		37.01	-36.92	47176.12	14.18		
gamma	E	2033-12-23T05:14:30.161		37.00	-36.90	47629.18	14.45		
delta	E	2033-12-23T05:15:16.004		36.98	-36.88	48300.35	14.83		
lambda	E	2033-12-23T05:17:09.042		36.93	-36.81	50026.71	15.70		
epsilon	E	2033-12-23T05:18:43.994		36.89	-36.74	51549.44	16.39		