

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-15T05:52:50.880
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3428371572887497344
 2Mass ID (if available) : 05424490+2331347

Uranus 2031-11-15T05:52:50 K14.73 G17.40 PtRgt

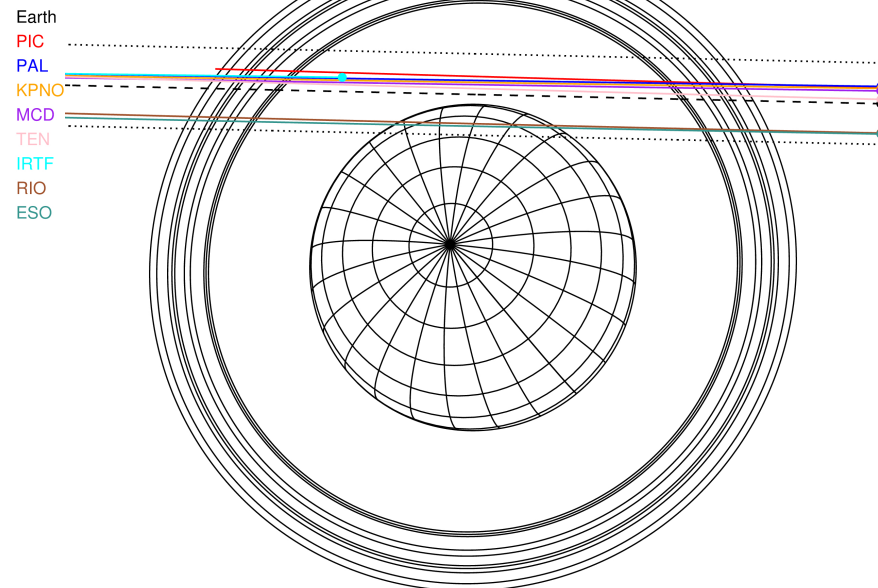
ICRS Star Coord at Epoch: 05h 42m 44.91488s +23:31:34.36052s

RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.732
 G magnitude : 17.404
 RP magnitude : 16.574
 BP magnitude : 18.110
 DUPflag : 0
 Distance (au) : 18.263
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.41
 Sun-Target sep (deg) : 146.17
 Sun-Moon sep (deg) : 150.93
 B (ring opening deg) : 78.51
 PA of pole (deg) : 44.89

#	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

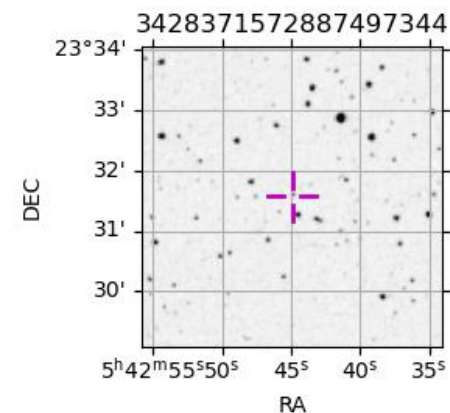


2031-11-15T05:52:50.8800 ra: 05 42 44.91488 ra: +23 31 34.361 C/A 2.052° PA 178.70 deg v_sky -18.41 km/s D 18.26 AU
 Credit: Styled after SORA/Lucky Star

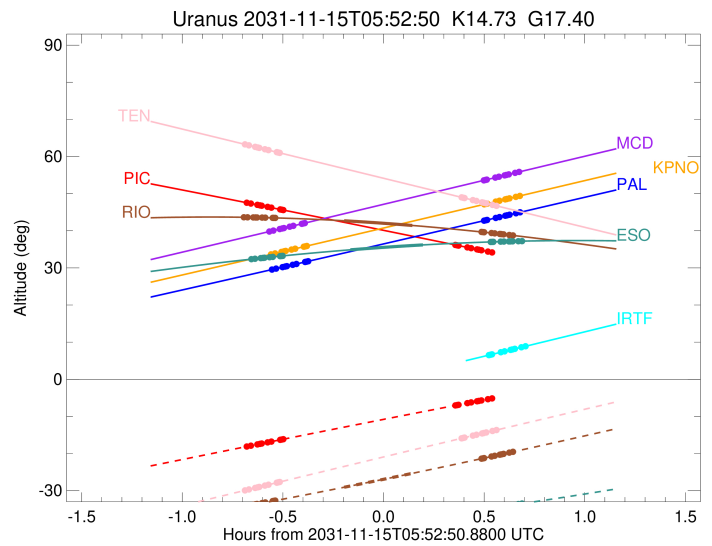
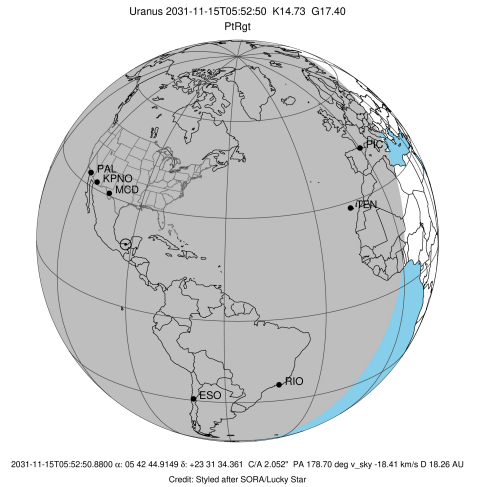


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	NOV 15 05:12 - NOV 15 06:24	PnnRie
PAL	Palomar Mt (200")	33.4	243.1	+++++		+++++	NOV 15 05:19 - NOV 15 06:33	PnnRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	NOV 15 05:19 - NOV 15 06:33	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	NOV 15 05:19 - NOV 15 06:33	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++		+++++	NOV 15 05:11 - NOV 15 06:26	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5			+++++	NOV 15 06:24 - NOV 15 06:34	PnnRne
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+++++	+ +	+++++	NOV 15 05:11 - NOV 15 06:31	PieRie
ESO	European Southern Obs	-29.3	289.3	+++++	+ +	+++++	NOV 15 05:13 - NOV 15 06:33	PieRie
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 : 2031-11-15T05:49:09.210
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : 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 : 3428371572887497344
 2Mass ID (if available) : 05424490+2331347
 ICRS Star Coord at Epoch: 05h 42m 44.91488s +23:31:34.36052s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.732
 G magnitude : 17.404
 RP magnitude : 16.574
 BP magnitude : 18.110
 DUPflag : 0
 Distance (au) : 18.263
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.41
 Sun-Target sep (deg) : 146.17
 Sun-Moon sep (deg) : 151.78
 B (ring opening deg) : 78.51
 PA of pole (deg) : 44.89
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.259
 C/A sky separation (km) : 29920.9
 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_itrff93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

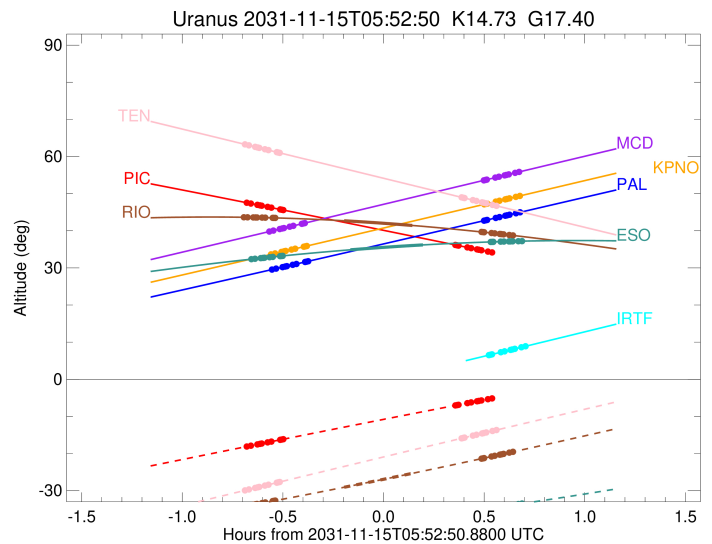
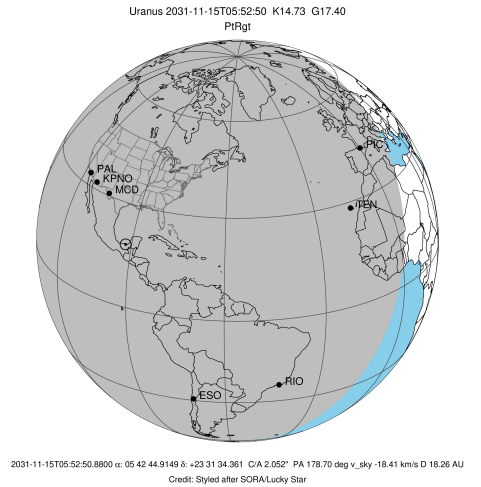


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-15T05:12:21.381		47.51	-18.07	50905.09	-15.09		
lambda	I	2031-11-15T05:13:19.594		47.33	-17.90	50026.71	-15.01		
delta	I	2031-11-15T05:15:15.785		46.98	-17.54	48300.35	-14.70		
gamma	I	2031-11-15T05:16:01.515		46.84	-17.41	47631.39	-14.56		
eta	I	2031-11-15T05:16:32.885		46.75	-17.31	47176.12	-14.46		
beta	I	2031-11-15T05:18:19.389		46.43	-16.99	45653.66	-14.11		
alpha	I	2031-11-15T05:19:28.465		46.22	-16.78	44686.80	-13.87		
4	I	2031-11-15T05:22:01.825		45.76	-16.32	42603.99	-13.26		
5	I	2031-11-15T05:22:24.339		45.69	-16.25	42306.61	-13.19		
6	I	2031-11-15T05:23:00.951		45.58	-16.14	41826.84	-13.03		

No planet occultations

6	E	2031-11-15T06:14:19.290		36.17	-7.04	41877.96	12.99		
5	E	2031-11-15T06:14:48.845		36.08	-6.95	42272.72	13.15		
4	E	2031-11-15T06:15:09.072		36.02	-6.89	42540.24	13.22		
alpha	E	2031-11-15T06:17:49.580		35.53	-6.43	44709.22	13.83		
beta	E	2031-11-15T06:18:56.365		35.32	-6.24	45643.54	14.07		
eta	E	2031-11-15T06:20:43.967		34.99	-5.93	47176.12	14.41		
gamma	E	2031-11-15T06:21:14.934		34.90	-5.84	47623.91	14.51		
delta	E	2031-11-15T06:22:01.346		34.76	-5.71	48300.35	14.64		
lambda	E	2031-11-15T06:23:57.979		34.40	-5.37	50026.71	14.96		
epsilon	E	2031-11-15T06:24:56.557		34.22	-5.20	50907.13	15.03		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-15T05:57:10.360
 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 : 3428371572887497344
 2Mass ID (if available) : 05424490+2331347
 ICRS Star Coord at Epoch: 05h 42m 44.91488s +23:31:34.36052s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.732
 G magnitude : 17.404
 RP magnitude : 16.574
 BP magnitude : 18.110
 DUPflag : 0
 Distance (au) : 18.263
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.41
 Sun-Target sep (deg) : 146.17
 Sun-Moon sep (deg) : 150.60
 B (ring opening deg) : 78.51
 PA of pole (deg) : 44.89
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.212
 C/A sky separation (km) : 29300.6
 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

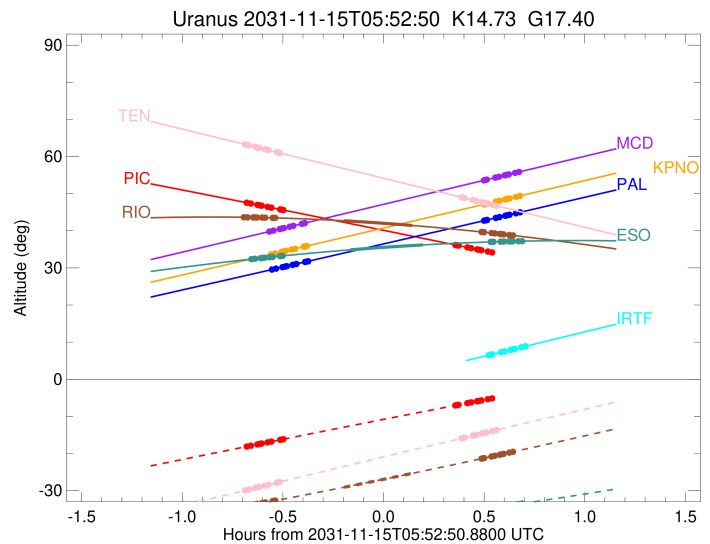
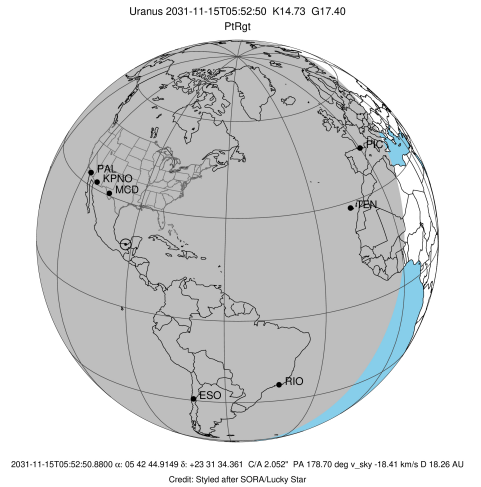


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-15T05:19:52.541		29.61	-57.02	50905.74	-15.17		
lambda	I	2031-11-15T05:20:50.475		29.81	-57.21	50026.71	-15.10		
delta	I	2031-11-15T05:22:45.888		30.21	-57.59	48300.35	-14.81		
gamma	I	2031-11-15T05:23:31.257		30.36	-57.74	47631.40	-14.68		
eta	I	2031-11-15T05:24:02.361		30.47	-57.84	47176.12	-14.59		
beta	I	2031-11-15T05:25:47.829		30.83	-58.19	45653.75	-14.26		
alpha	I	2031-11-15T05:26:56.126		31.07	-58.41	44686.87	-14.04		
4	I	2031-11-15T05:29:27.360		31.59	-58.91	42604.22	-13.47		
5	I	2031-11-15T05:29:49.561		31.67	-58.98	42306.33	-13.41		
6	I	2031-11-15T05:30:25.559		31.79	-59.10	41826.50	-13.26		

No planet occultations

6	E	2031-11-15T06:22:52.229		42.73	-68.64	41878.35	13.32		
5	E	2031-11-15T06:23:20.837		42.83	-68.72	42270.32	13.47		
4	E	2031-11-15T06:23:40.715		42.90	-68.77	42539.15	13.54		
alpha	E	2031-11-15T06:26:17.849		43.45	-69.19	44710.26	14.12		
beta	E	2031-11-15T06:27:23.250		43.68	-69.36	45643.85	14.34		
eta	E	2031-11-15T06:29:08.810		44.05	-69.63	47176.12	14.68		
gamma	E	2031-11-15T06:29:39.213		44.16	-69.71	47623.77	14.77		
delta	E	2031-11-15T06:30:24.822		44.32	-69.83	48300.35	14.90		
lambda	E	2031-11-15T06:32:19.507		44.72	-70.12	50026.71	15.20		
epsilon	E	2031-11-15T06:33:17.752		44.92	-70.26	50916.37	15.27		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-15T05:56:59.440
 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 : 3428371572887497344
 2Mass ID (if available) : 05424490+2331347
 ICRS Star Coord at Epoch: 05h 42m 44.91488s +23:31:34.36052s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.732
 G magnitude : 17.404
 RP magnitude : 16.574
 BP magnitude : 18.110
 DUPflag : 0
 Distance (au) : 18.263
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.41
 Sun-Target sep (deg) : 146.17
 Sun-Moon sep (deg) : 150.65
 B (ring opening deg) : 78.51
 PA of pole (deg) : 44.89
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.189
 C/A sky separation (km) : 28995.7
 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

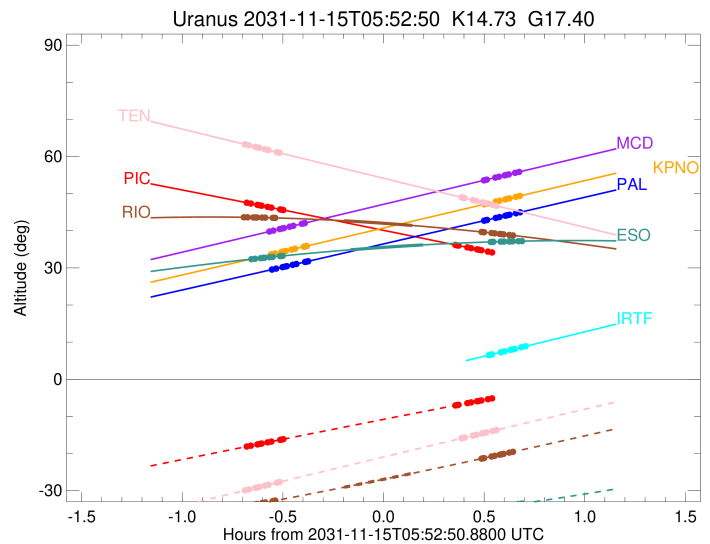
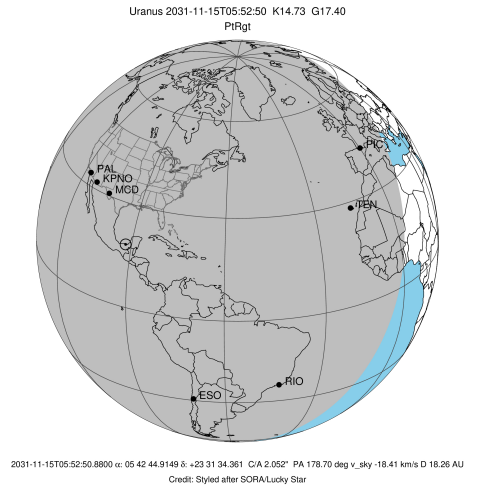


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-15T05:19:34.376		33.70	-61.60	50908.23	-15.28		
lambda	I	2031-11-15T05:20:32.049		33.90	-61.79	50026.71	-15.22		
delta	I	2031-11-15T05:22:26.568		34.30	-62.17	48300.35	-14.93		
gamma	I	2031-11-15T05:23:11.563		34.46	-62.32	47631.41	-14.80		
eta	I	2031-11-15T05:23:42.405		34.57	-62.42	47176.12	-14.72		
beta	I	2031-11-15T05:25:26.919		34.94	-62.76	45653.92	-14.40		
alpha	I	2031-11-15T05:26:34.564		35.18	-62.98	44686.98	-14.18		
4	I	2031-11-15T05:29:04.176		35.70	-63.47	42604.53	-13.63		
5	I	2031-11-15T05:29:26.182		35.78	-63.54	42305.95	-13.57		
6	I	2031-11-15T05:30:01.750		35.90	-63.65	41826.07	-13.42		

No planet occultations

6	E	2031-11-15T06:22:55.029		47.13	-72.82	41878.45	13.48		
5	E	2031-11-15T06:23:23.236		47.23	-72.88	42269.61	13.63		
4	E	2031-11-15T06:23:42.925		47.30	-72.93	42538.84	13.69		
alpha	E	2031-11-15T06:26:18.455		47.86	-73.29	44710.55	14.25		
beta	E	2031-11-15T06:27:23.225		48.09	-73.43	45643.94	14.48		
eta	E	2031-11-15T06:29:07.856		48.46	-73.66	47176.12	14.80		
gamma	E	2031-11-15T06:29:38.006		48.57	-73.73	47623.74	14.89		
delta	E	2031-11-15T06:30:23.252		48.73	-73.83	48300.35	15.02		
lambda	E	2031-11-15T06:32:17.072		49.13	-74.06	50026.71	15.31		
epsilon	E	2031-11-15T06:33:15.058		49.34	-74.18	50918.73	15.38		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-15T05:56:37.340
 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 : 3428371572887497344
 2Mass ID (if available) : 05424490+2331347
 ICRS Star Coord at Epoch: 05h 42m 44.91488s +23:31:34.36052s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.732
 G magnitude : 17.404
 RP magnitude : 16.574
 BP magnitude : 18.110
 DUPflag : 0
 Distance (au) : 18.263
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.41
 Sun-Target sep (deg) : 146.17
 Sun-Moon sep (deg) : 150.74
 B (ring opening deg) : 78.51
 PA of pole (deg) : 44.89
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.162
 C/A sky separation (km) : 28637.1
 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

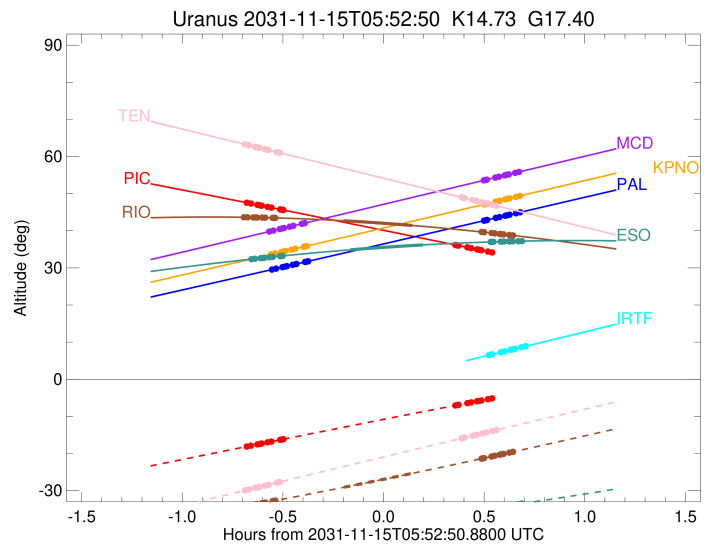
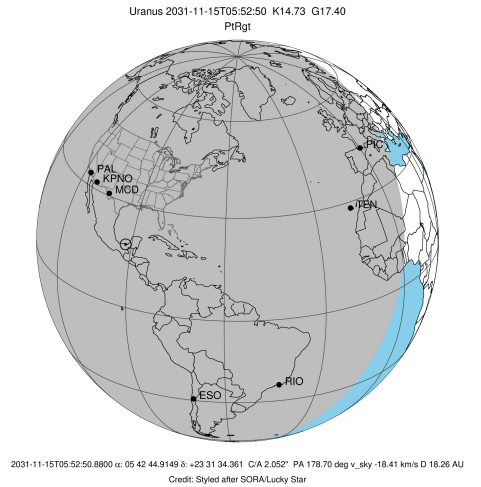


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-15T05:19:04.714		39.85	-67.93	50911.23	-15.42		
lambda	I	2031-11-15T05:20:02.075		40.06	-68.11	50026.71	-15.35		
delta	I	2031-11-15T05:21:55.530		40.47	-68.47	48300.35	-15.07		
gamma	I	2031-11-15T05:22:40.083		40.62	-68.61	47631.42	-14.95		
eta	I	2031-11-15T05:23:10.615		40.73	-68.70	47176.12	-14.87		
beta	I	2031-11-15T05:24:54.005		41.10	-69.02	45654.12	-14.56		
alpha	I	2031-11-15T05:26:00.885		41.34	-69.23	44687.12	-14.35		
4	I	2031-11-15T05:28:28.608		41.87	-69.68	42604.91	-13.81		
5	I	2031-11-15T05:28:50.389		41.95	-69.75	42305.48	-13.75		
6	I	2031-11-15T05:29:25.459		42.08	-69.85	41825.55	-13.61		

No planet occultations

6	E	2031-11-15T06:22:48.268		53.59	-77.28	41878.57	13.67		
5	E	2031-11-15T06:23:16.018		53.69	-77.31	42268.79	13.82		
4	E	2031-11-15T06:23:35.492		53.76	-77.34	42538.50	13.88		
alpha	E	2031-11-15T06:26:09.175		54.32	-77.50	44710.88	14.42		
beta	E	2031-11-15T06:27:13.219		54.55	-77.56	45644.04	14.63		
eta	E	2031-11-15T06:28:56.774		54.92	-77.65	47176.12	14.95		
gamma	E	2031-11-15T06:29:26.629		55.03	-77.68	47623.70	15.04		
delta	E	2031-11-15T06:30:11.454		55.19	-77.71	48300.35	15.16		
lambda	E	2031-11-15T06:32:04.268		55.59	-77.78	50026.71	15.44		
epsilon	E	2031-11-15T06:33:01.945		55.80	-77.82	50921.41	15.51		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-15T05:49:30.460
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : 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 : 3428371572887497344
 2Mass ID (if available) : 05424490+2331347
 ICRS Star Coord at Epoch: 05h 42m 44.91488s +23:31:34.36052s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.732
 G magnitude : 17.404
 RP magnitude : 16.574
 BP magnitude : 18.110
 DUPflag : 0
 Distance (au) : 18.263
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.41
 Sun-Target sep (deg) : 146.17
 Sun-Moon sep (deg) : 151.80
 B (ring opening deg) : 78.51
 PA of pole (deg) : 44.89
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.116
 C/A sky separation (km) : 28031.3
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



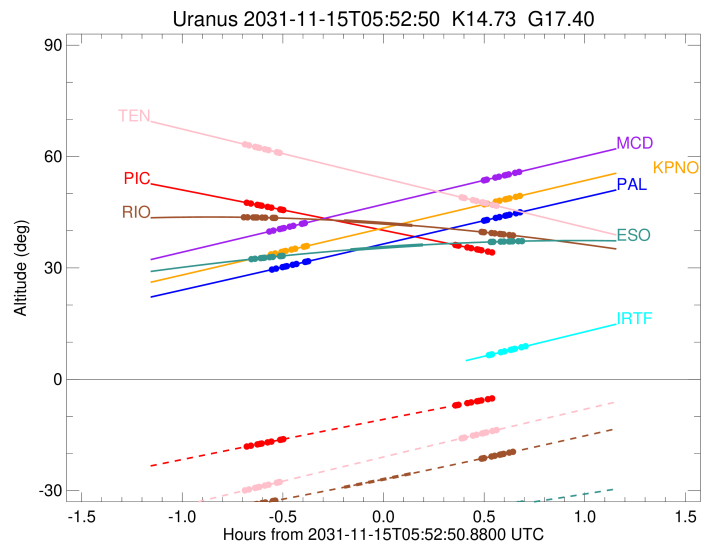
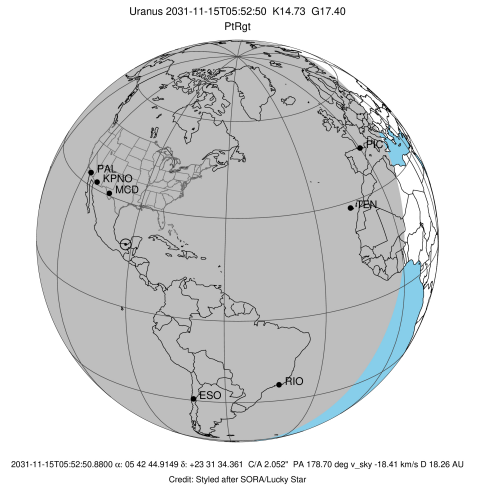
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-15T05:11:47.839		63.22	-29.88	50919.87	-15.69		
lambda	I	2031-11-15T05:12:44.731		63.01	-29.68	50026.71	-15.63		
delta	I	2031-11-15T05:14:36.101		62.60	-29.27	48300.35	-15.36		
gamma	I	2031-11-15T05:15:19.802		62.44	-29.11	47631.46	-15.25		
eta	I	2031-11-15T05:15:49.743		62.33	-29.00	47176.12	-15.17		
beta	I	2031-11-15T05:17:31.013		61.96	-28.63	45654.67	-14.87		
alpha	I	2031-11-15T05:18:36.486		61.72	-28.39	44687.51	-14.66		
4	I	2031-11-15T05:21:00.801		61.19	-27.87	42605.83	-14.15		
5	I	2031-11-15T05:21:22.236		61.11	-27.79	42304.25	-14.10		
6	I	2031-11-15T05:21:56.423		60.98	-27.66	41824.27	-13.96		

No planet occultations

6	E	2031-11-15T06:16:10.856		49.00	-15.90	41878.65	13.93		
5	E	2031-11-15T06:16:38.057		48.90	-15.80	42268.19	14.06		
4	E	2031-11-15T06:16:57.227		48.83	-15.73	42538.24	14.12		
alpha	E	2031-11-15T06:19:28.568		48.27	-15.19	44711.09	14.62		
beta	E	2031-11-15T06:20:31.747		48.04	-14.96	45644.10	14.82		
eta	E	2031-11-15T06:22:14.059		47.66	-14.60	47176.12	15.12		
gamma	E	2031-11-15T06:22:43.586		47.56	-14.49	47623.67	15.20		
delta	E	2031-11-15T06:23:27.944		47.39	-14.33	48300.35	15.31		
lambda	E	2031-11-15T06:25:19.696		46.98	-13.93	50026.71	15.58		
epsilon	E	2031-11-15T06:26:16.954		46.77	-13.73	50922.43	15.64		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-15T05:58:26.650
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : 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 : 3428371572887497344
 2Mass ID (if available) : 05424490+2331347
 ICRS Star Coord at Epoch: 05h 42m 44.91488s +23:31:34.36052s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.732
 G magnitude : 17.404
 RP magnitude : 16.574
 BP magnitude : 18.110
 DUPflag : 0
 Distance (au) : 18.263
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.41
 Sun-Target sep (deg) : 146.17
 Sun-Moon sep (deg) : 150.14
 B (ring opening deg) : 78.51
 PA of pole (deg) : 44.89
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.228
 C/A sky separation (km) : 29508.5
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



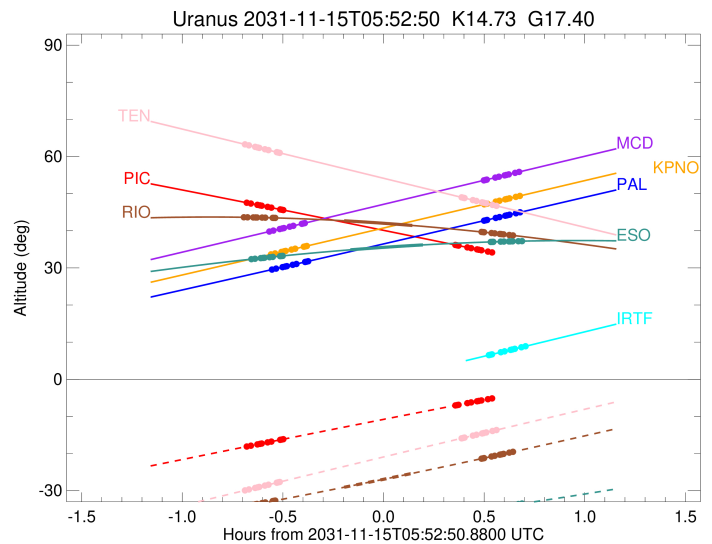
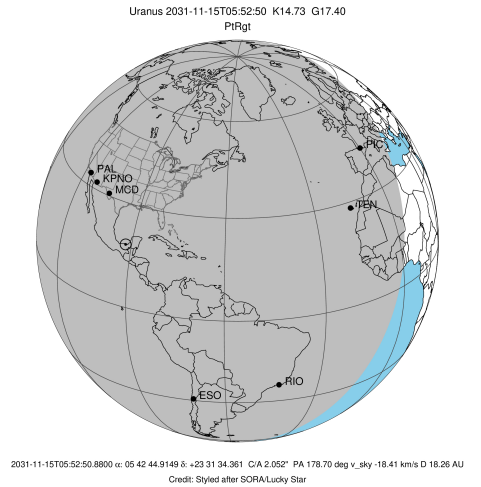
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-15T05:20:43.798	-7.05x	-23.04	50903.60	-14.89			
lambda	I	2031-11-15T05:21:42.689	-6.85x	-23.26	50026.71	-14.82			
delta	I	2031-11-15T05:23:40.329	-6.44x	-23.72	48300.35	-14.52			
gamma	I	2031-11-15T05:24:26.587	-6.28x	-23.89	47631.39	-14.40			
eta	I	2031-11-15T05:24:58.306	-6.17x	-24.01	47176.12	-14.31			
beta	I	2031-11-15T05:26:45.904	-5.79x	-24.43	45653.61	-13.98			
alpha	I	2031-11-15T05:27:55.602	-5.55x	-24.70	44686.77	-13.75			
4	I	2031-11-15T05:30:30.070	-5.01x	-25.29	42603.95	-13.18			
5	I	2031-11-15T05:30:52.705	-4.93x	-25.38	42306.65	-13.12			
6	I	2031-11-15T05:31:29.502	-4.80x	-25.52	41826.86	-12.97			

No planet occultations

6	E	2031-11-15T06:24:18.446	6.51	-37.76	41878.29	13.05			
5	E	2031-11-15T06:24:47.683	6.62	-37.87	42270.66	13.20			
4	E	2031-11-15T06:25:07.951	6.69	-37.95	42539.31	13.27			
alpha	E	2031-11-15T06:27:48.183	7.27	-38.57	44710.13	13.85			
beta	E	2031-11-15T06:28:54.833	7.52	-38.83	45643.81	14.08			
eta	E	2031-11-15T06:30:42.346	7.91	-39.25	47176.12	14.42			
gamma	E	2031-11-15T06:31:13.300	8.02	-39.37	47623.79	14.51			
delta	E	2031-11-15T06:31:59.723	8.19	-39.55	48300.35	14.64			
lambda	E	2031-11-15T06:33:56.415	8.61	-40.00	50026.71	14.94			
epsilon	E	2031-11-15T06:34:55.597	8.83	-40.23	50915.46	15.02			

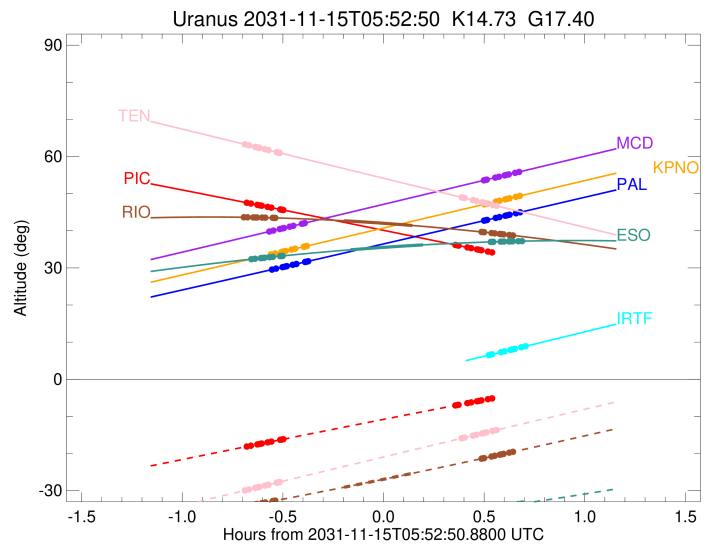
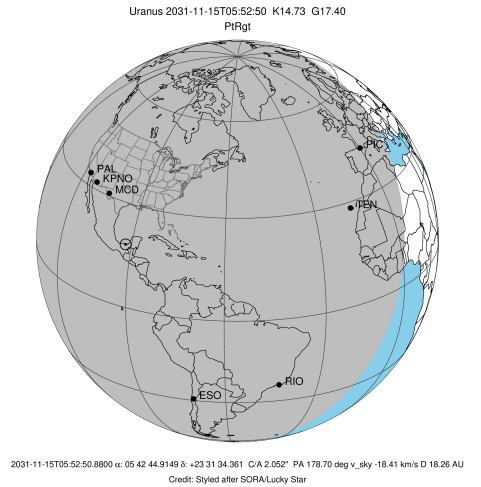
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-11-15T05:51:43.680
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      : 3428371572887497344
2Mass ID (if available) : 05424490+2331347
ICRS Star Coord at Epoch: 05h 42m 44.91488s +23:31:34.36052s
RUWE (>1.4 is poor) : 1.02
K magnitude         : 14.732
G magnitude         : 17.404
RP magnitude        : 16.574
BP magnitude        : 18.110
DUPflag            : 0
Distance (au)       : 18.263
f0 (km)            : 0.000
g0 (km)            : 0.000
skyplane vel. (km/s) : -18.41
Sun-Target sep (deg) : 146.17
Sun-Moon sep (deg)  : 151.38
B (ring opening deg) : 78.51
PA of pole (deg)    : 44.89
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.700
C/A sky separation (km) : 22516.5
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.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	2031-11-15T05:11:24.457		43.64	-34.22	50962.56	-16.97		
lambda	I	2031-11-15T05:12:19.532		43.63	-34.07	50026.71	-16.95		
delta	I	2031-11-15T05:14:01.852		43.60	-33.79	48300.35	-16.79		
gamma	I	2031-11-15T05:14:41.765		43.59	-33.67	47631.56	-16.72		
eta	I	2031-11-15T05:15:09.039		43.58	-33.60	47176.12	-16.67		
beta	I	2031-11-15T05:16:40.569		43.55	-33.34	45657.45	-16.50		
alpha	I	2031-11-15T05:17:39.406		43.53	-33.18	44689.88	-16.38		
4	I	2031-11-15T05:19:47.415		43.48	-32.82	42610.06	-16.09		
5	I	2031-11-15T05:20:07.104		43.48	-32.76	42296.81	-16.06		
6	I	2031-11-15T05:20:36.880		43.46	-32.68	41817.82	-15.98		
Uranus	I	2031-11-15T05:41:06.320		42.69	-29.09	25516.68		3.08	3.23
Uranus	E	2031-11-15T06:01:28.034		41.43	-25.34	25061.91		10.77	11.27
6	E	2031-11-15T06:22:07.077		39.68	-21.38	41879.68	15.97		
5	E	2031-11-15T06:22:29.930		39.64	-21.31	42255.44	16.05		
4	E	2031-11-15T06:22:47.374		39.62	-21.25	42533.54	16.08		
alpha	E	2031-11-15T06:25:02.009		39.40	-20.81	44716.30	16.37		
beta	E	2031-11-15T06:25:58.437		39.30	-20.62	45645.89	16.49		
eta	E	2031-11-15T06:27:30.738		39.15	-20.32	47176.12	16.66		
gamma	E	2031-11-15T06:27:57.523		39.10	-20.23	47623.04	16.71		
delta	E	2031-11-15T06:28:37.974		39.04	-20.10	48300.35	16.78		
lambda	E	2031-11-15T06:30:20.368		38.86	-19.76	50026.71	16.94		
epsilon	E	2031-11-15T06:31:15.798		38.77	-19.58	50967.88	16.96		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-15T05:54:13.420
 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 : 3428371572887497344
 2Mass ID (if available) : 05424490+2331347
 ICRS Star Coord at Epoch: 05h 42m 44.91488s +23:31:34.36052s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.732
 G magnitude : 17.404
 RP magnitude : 16.574
 BP magnitude : 18.110
 DUPflag : 0
 Distance (au) : 18.263
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.41
 Sun-Target sep (deg) : 146.17
 Sun-Moon sep (deg) : 150.97
 B (ring opening deg) : 78.51
 PA of pole (deg) : 44.89
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.670
 C/A sky separation (km) : 22120.1
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl1.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	2031-11-15T05:13:38.410		32.37	-41.19	50964.28	-16.99		
lambda	I	2031-11-15T05:14:33.523		32.46	-41.13	50026.71	-16.97		
delta	I	2031-11-15T05:16:15.688		32.63	-41.04	48300.35	-16.82		
gamma	I	2031-11-15T05:16:55.526		32.69	-41.00	47631.56	-16.76		
eta	I	2031-11-15T05:17:22.745		32.73	-40.97	47176.12	-16.71		
beta	I	2031-11-15T05:18:54.050		32.88	-40.88	45657.58	-16.54		
alpha	I	2031-11-15T05:19:52.720		32.97	-40.82	44689.99	-16.43		
4	I	2031-11-15T05:22:00.280		33.16	-40.68	42610.22	-16.15		
5	I	2031-11-15T05:22:19.927		33.19	-40.66	42296.44	-16.13		
6	I	2031-11-15T05:22:49.567		33.24	-40.63	41817.54	-16.05		
Uranus	I	2031-11-15T05:42:56.078		34.87	-39.10	25524.87		2.77	2.90
Uranus	E	2031-11-15T06:04:38.279		36.20	-36.99	25049.04		10.92	11.42
6	E	2031-11-15T06:24:52.019		36.99	-34.66	41879.71	16.08		
5	E	2031-11-15T06:25:14.634		37.00	-34.61	42254.26	16.16		
4	E	2031-11-15T06:25:32.019		37.01	-34.57	42533.16	16.19		
alpha	E	2031-11-15T06:27:45.836		37.07	-34.30	44716.79	16.47		
beta	E	2031-11-15T06:28:41.912		37.09	-34.18	45646.08	16.58		
eta	E	2031-11-15T06:30:13.687		37.13	-33.98	47176.12	16.75		
gamma	E	2031-11-15T06:30:40.325		37.14	-33.93	47622.99	16.80		
delta	E	2031-11-15T06:31:20.568		37.16	-33.84	48300.35	16.86		
lambda	E	2031-11-15T06:33:02.456		37.19	-33.62	50026.71	17.02		
epsilon	E	2031-11-15T06:33:57.897		37.21	-33.50	50972.54	17.04		