

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T23:11:42.600
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3415398160315795328
 2Mass ID (if available) : 05101813+2302465

ICRS Star Coord at Epoch: 05h 10m 18.13164s +23:02:46.45229s

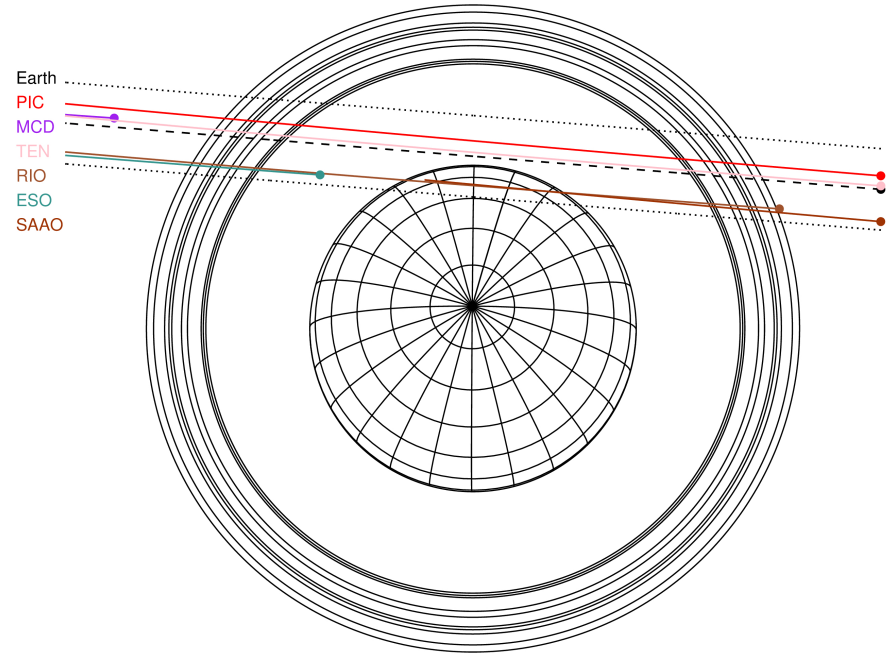
RUWE (>1.4 is poor) : 1.07
 K magnitude : 13.064
 G magnitude : 14.867
 RP magnitude : 14.207
 BP magnitude : 15.250
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.92
 Sun-Target sep (deg) : 123.08
 Sun-Moon sep (deg) : 28.44
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.86

#	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



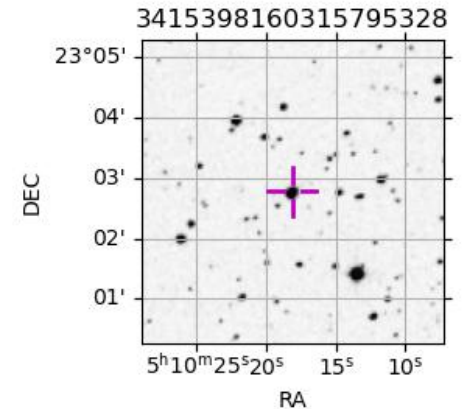
2031-02-04T23:11:42.6000 α: 05 10 18.1316 s: +23 02 46.452 C/A 2.000° PA 175.36 deg v_sky - 9.92 km/s D 18.59 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2031-02-04T23:11:42 K13.06 G14.87 PtRgt

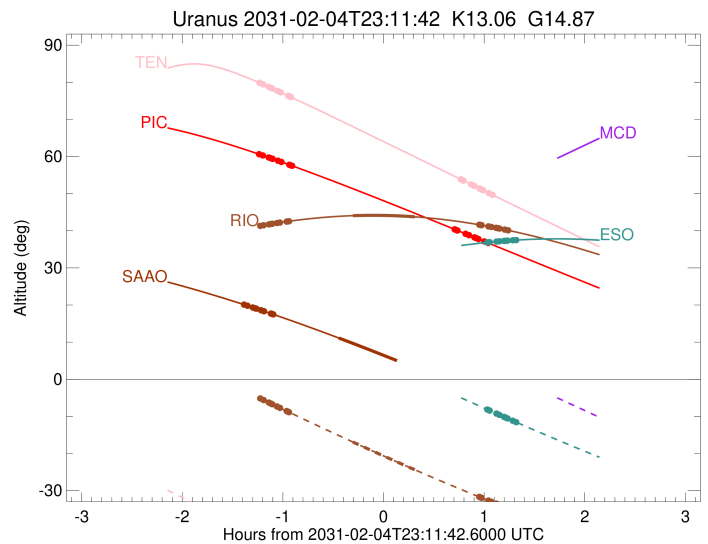
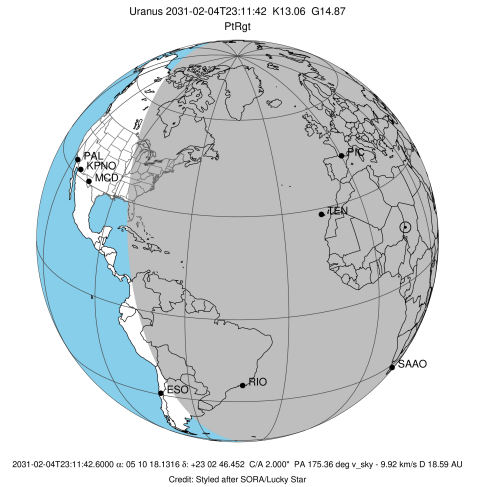


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	FEB 04 21:58 - FEB 05 00:13	PnnRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald Obs. 2.7m	30.7	256.0					PnnRnn
TEN	Teide Obs./Tenerife	28.3	343.5	+++++		+++++	FEB 04 21:58 - FEB 05 00:16	PnnRie
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	+++++	+ +	+++++	FEB 04 21:58 - FEB 05 00:26	PieRie
ESO	European Southern Obs	-29.3	289.3			+++++	FEB 05 00:13 - FEB 05 00:30	PnnRne
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++	+		FEB 04 21:49 - FEB 04 22:45	PinRin
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T23:05:37.710
 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 : 3415398160315795328
 2Mass ID (if available) : 05101813+2302465
 ICRS Star Coord at Epoch: 05h 10m 18.13164s +23:02:46.45229s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 13.064
 G magnitude : 14.867
 RP magnitude : 14.207
 BP magnitude : 15.250
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.92
 Sun-Target sep (deg) : 123.08
 Sun-Moon sep (deg) : 28.37
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.86
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.171
 C/A sky separation (km) : 29275.4
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

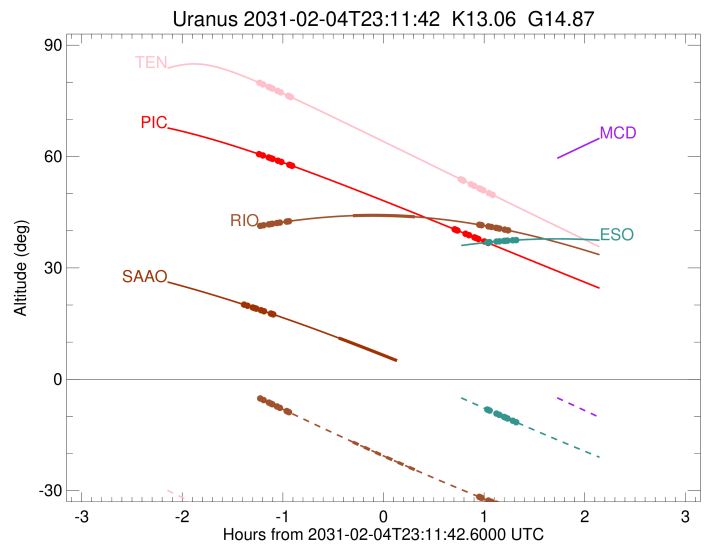
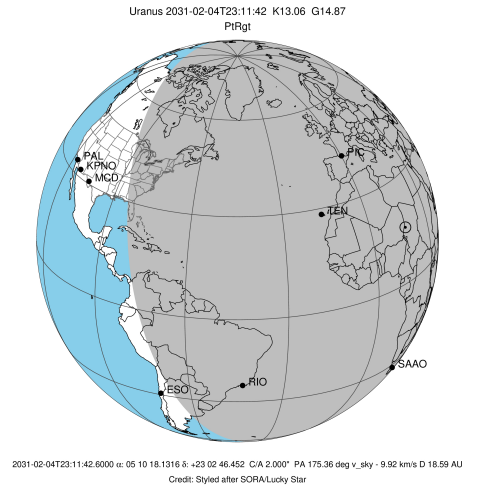


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-02-04T21:58:15.032		60.52	-50.76	50790.44	-8.32		
lambda	I	2031-02-04T21:59:46.903		60.29	-51.00	50026.71	-8.28		
delta	I	2031-02-04T22:03:17.495		59.74	-51.54	48300.35	-8.11		
gamma	I	2031-02-04T22:04:41.514		59.52	-51.75	47621.66	-8.04		
eta	I	2031-02-04T22:05:37.084		59.37	-51.89	47176.12	-7.99		
beta	I	2031-02-04T22:08:46.574		58.87	-52.36	45677.78	-7.82		
alpha	I	2031-02-04T22:10:47.786		58.55	-52.66	44736.94	-7.69		
4	I	2031-02-04T22:15:32.272		57.78	-53.36	42594.98	-7.37		
5	I	2031-02-04T22:16:09.830		57.68	-53.45	42314.33	-7.33		
6	I	2031-02-04T22:17:11.821		57.51	-53.60	41868.24	-7.26		

No planet occultations

6	E	2031-02-04T23:54:09.096		40.38	-62.99	41866.37	7.17		
5	E	2031-02-04T23:54:58.482		40.23	-63.01	42221.53	7.24		
4	E	2031-02-04T23:55:40.817		40.10	-63.04	42531.97	7.28		
alpha	E	2031-02-05T00:00:31.127		39.22	-63.16	44688.05	7.58		
beta	E	2031-02-05T00:02:39.607		38.82	-63.20	45669.65	7.71		
eta	E	2031-02-05T00:05:53.003		38.23	-63.25	47176.12	7.87		
gamma	E	2031-02-05T00:06:49.827		38.06	-63.26	47624.73	7.92		
delta	E	2031-02-05T00:08:14.796		37.80	-63.28	48300.35	7.98		
lambda	E	2031-02-05T00:11:48.871		37.14	-63.30	50026.71	8.14		
epsilon	E	2031-02-05T00:13:57.642		36.74	-63.30	51080.63	8.18		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T23:07:06.400
 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 : 3415398160315795328
 2Mass ID (if available) : 05101813+2302465
 ICRS Star Coord at Epoch: 05h 10m 18.13164s +23:02:46.45229s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 13.064
 G magnitude : 14.867
 RP magnitude : 14.207
 BP magnitude : 15.250
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.92
 Sun-Target sep (deg) : 123.08
 Sun-Moon sep (deg) : 28.50
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.86
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.039
 C/A sky separation (km) : 27489.3
 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

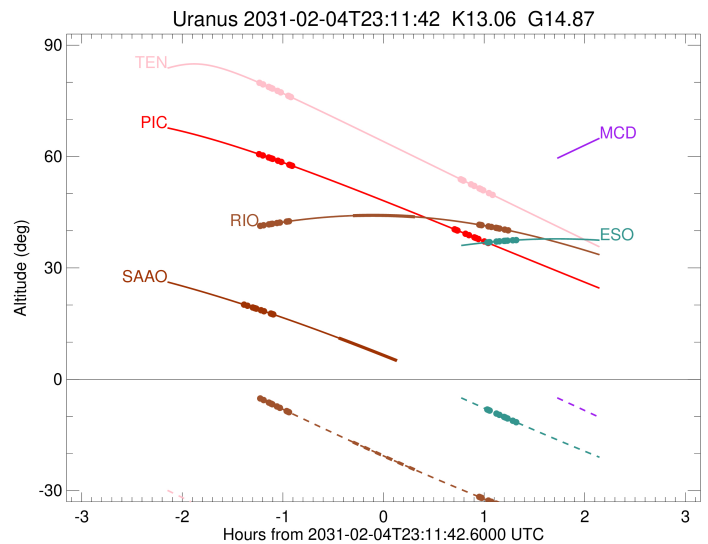
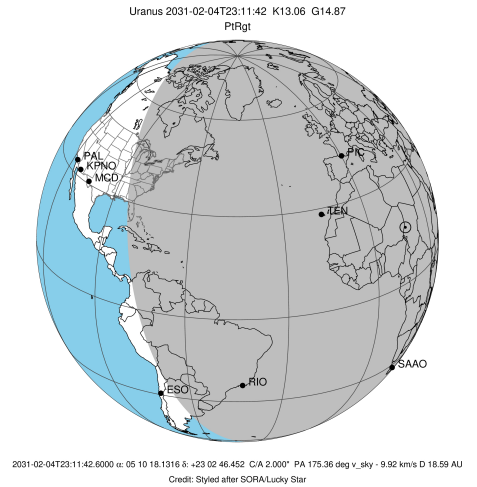


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-02-04T21:58:26.899		79.72	-42.16	50798.20	-8.66		
lambda	I	2031-02-04T21:59:56.096		79.42	-42.48	50026.71	-8.62		
delta	I	2031-02-04T22:03:18.015		78.75	-43.22	48300.35	-8.48		
gamma	I	2031-02-04T22:04:38.347		78.48	-43.52	47621.78	-8.42		
eta	I	2031-02-04T22:05:31.430		78.30	-43.71	47176.12	-8.37		
beta	I	2031-02-04T22:08:31.990		77.68	-44.37	45677.23	-8.23		
alpha	I	2031-02-04T22:10:26.797		77.29	-44.79	44738.32	-8.12		
4	I	2031-02-04T22:14:55.158		76.36	-45.77	42597.03	-7.84		
5	I	2031-02-04T22:15:30.678		76.23	-45.90	42314.88	-7.81		
6	I	2031-02-04T22:16:29.013		76.03	-46.12	41866.57	-7.75		

No planet occultations

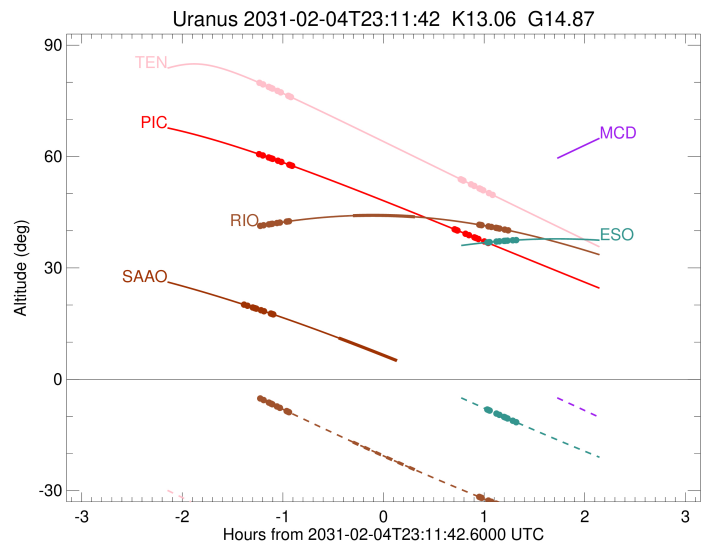
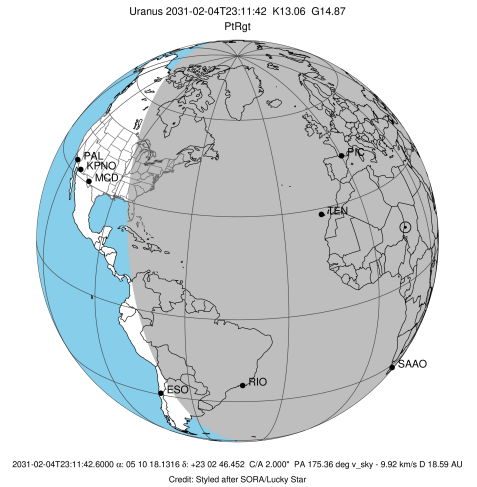
6	E	2031-02-04T23:57:48.704		53.86	-67.53	41864.42	7.67		
5	E	2031-02-04T23:58:34.482		53.69	-67.68	42216.79	7.73		
4	E	2031-02-04T23:59:14.660		53.54	-67.80	42530.70	7.76		
alpha	E	2031-02-05T00:03:48.045		52.53	-68.68	44687.28	8.02		
beta	E	2031-02-05T00:05:49.669		52.09	-69.06	45668.67	8.13		
eta	E	2031-02-05T00:08:53.552		51.41	-69.63	47176.12	8.27		
gamma	E	2031-02-05T00:09:47.711		51.21	-69.80	47624.98	8.31		
delta	E	2031-02-05T00:11:08.722		50.91	-70.05	48300.35	8.37		
lambda	E	2031-02-05T00:14:33.414		50.16	-70.67	50026.71	8.50		
epsilon	E	2031-02-05T00:16:38.959		49.70	-71.04	51098.65	8.53		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T23:12:07.250
 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 : 3415398160315795328
 2Mass ID (if available) : 05101813+2302465
 ICRS Star Coord at Epoch: 05h 10m 18.13164s +23:02:46.45229s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 13.064
 G magnitude : 14.867
 RP magnitude : 14.207
 BP magnitude : 15.250
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.92
 Sun-Target sep (deg) : 123.08
 Sun-Moon sep (deg) : 28.70
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.86
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.655
 C/A sky separation (km) : 22314.9
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ural11.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ural11.bsp
 ural61.bsp
 vgr2.ural61.bsp
 peph.ural60.bsp
 earthstns_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



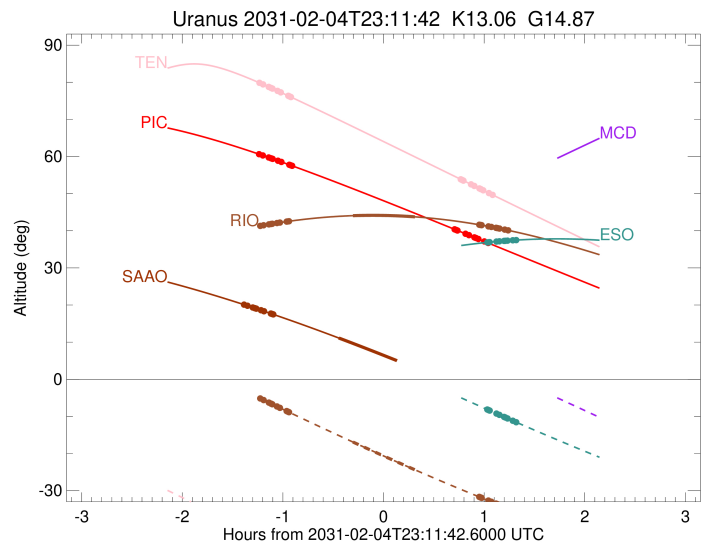
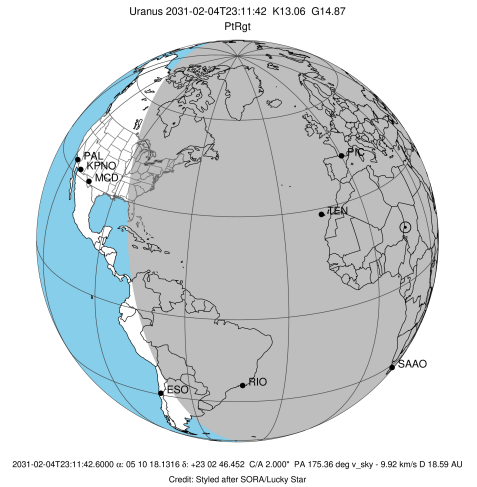
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-02-04T21:58:49.158		41.37	-5.30	50822.82	-9.26		
lambda	I	2031-02-04T22:00:15.060		41.49	-5.61	50026.71	-9.25		
delta	I	2031-02-04T22:03:22.559		41.73	-6.29	48300.35	-9.16		
gamma	I	2031-02-04T22:04:36.713		41.82	-6.56	47622.16	-9.13		
eta	I	2031-02-04T22:05:25.648		41.88	-6.73	47176.12	-9.10		
beta	I	2031-02-04T22:08:11.296		42.08	-7.33	45675.53	-9.01		
alpha	I	2031-02-04T22:09:55.188		42.21	-7.70	44741.82	-8.95		
4	I	2031-02-04T22:13:56.499		42.47	-8.56	42602.15	-8.79		
5	I	2031-02-04T22:14:28.869		42.51	-8.68	42315.15	-8.77		
6	I	2031-02-04T22:15:21.164		42.56	-8.87	41861.68	-8.74		
Uranus	I	2031-02-04T22:53:26.195		44.07	-16.90	25158.00		6.54	6.84
Uranus	E	2031-02-04T23:30:26.876		43.76	-24.39	25053.54		7.37	7.71
6	E	2031-02-05T00:08:50.074		41.62	-31.69	41858.75	8.71		
5	E	2031-02-05T00:09:29.591		41.57	-31.81	42204.54	8.74		
4	E	2031-02-05T00:10:06.373		41.52	-31.92	42528.00	8.76		
alpha	E	2031-02-05T00:14:10.499		41.19	-32.66	44685.68	8.92		
beta	E	2031-02-05T00:16:00.093		41.04	-32.99	45665.93	8.98		
eta	E	2031-02-05T00:18:47.430		40.79	-33.49	47176.12	9.07		
gamma	E	2031-02-05T00:19:36.943		40.72	-33.63	47625.69	9.09		
delta	E	2031-02-05T00:20:51.000		40.61	-33.85	48300.35	9.13		
lambda	E	2031-02-05T00:23:59.258		40.32	-34.40	50026.71	9.21		
epsilon	E	2031-02-05T00:26:00.780		40.13	-34.76	51149.10	9.22		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T23:16:35.250
 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 : 3415398160315795328
 2Mass ID (if available) : 05101813+2302465
 ICRS Star Coord at Epoch: 05h 10m 18.13164s +23:02:46.45229s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 13.064
 G magnitude : 14.867
 RP magnitude : 14.207
 BP magnitude : 15.250
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.92
 Sun-Target sep (deg) : 123.08
 Sun-Moon sep (deg) : 28.96
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.86
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.650
 C/A sky separation (km) : 22247.0
 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	2031-02-04T22:02:32.725		23.25	19.36x	50821.77	-9.16		
lambda	I	2031-02-04T22:03:59.482		23.46	19.05x	50026.71	-9.15		
delta	I	2031-02-04T22:07:09.056		23.93	18.37x	48300.35	-9.06		
gamma	I	2031-02-04T22:08:24.017		24.12	18.10x	47622.15	-9.03		
eta	I	2031-02-04T22:09:13.478		24.24	17.92x	47176.12	-9.01		
beta	I	2031-02-04T22:12:00.874		24.65	17.32x	45675.59	-8.92		
alpha	I	2031-02-04T22:13:45.862		24.90	16.94x	44741.72	-8.86		
4	I	2031-02-04T22:17:49.610		25.48	16.06x	42602.02	-8.70		
5	I	2031-02-04T22:18:22.276		25.56	15.95x	42315.17	-8.69		
6	I	2031-02-04T22:19:15.071		25.68	15.76x	41861.82	-8.65		
Uranus	I	2031-02-04T22:57:33.383		30.61	7.57x	25157.71		6.54	6.85
Uranus	E	2031-02-04T23:35:15.267		34.37	-0.33x	25058.39		7.33	7.67
6	E	2031-02-05T00:13:37.593		36.87	-8.15	41858.43	8.70		
5	E	2031-02-05T00:14:17.104		36.90	-8.29	42203.89	8.73		
4	E	2031-02-05T00:14:53.986		36.93	-8.41	42527.89	8.75		
alpha	E	2031-02-05T00:18:58.299		37.10	-9.22	44685.61	8.91		
beta	E	2031-02-05T00:20:47.950		37.17	-9.59	45665.76	8.98		
eta	E	2031-02-05T00:23:35.390		37.27	-10.14	47176.12	9.06		
gamma	E	2031-02-05T00:24:24.927		37.30	-10.30	47625.73	9.09		
delta	E	2031-02-05T00:25:39.004		37.34	-10.55	48300.35	9.12		
lambda	E	2031-02-05T00:28:47.304		37.44	-11.17	50026.71	9.21		
epsilon	E	2031-02-05T00:30:49.203		37.49	-11.57	51152.53	9.22		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T23:03:41.210
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Observer code : SAAO
 Location : So. Afr. Astro. Obs. (Sutherland)
 Latitude (deg) : -32.37953
 E. Longitude (deg) : 20.81070
 Altitude (km) : 1.768
 Gaia source ID : 3415398160315795328
 2Mass ID (if available) : 05101813+2302465
 ICRS Star Coord at Epoch: 05h 10m 18.13164s +23:02:46.45229s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 13.064
 G magnitude : 14.867
 RP magnitude : 14.207
 BP magnitude : 15.250
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.92
 Sun-Target sep (deg) : 123.08
 Sun-Moon sep (deg) : 27.85
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.86
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.666
 C/A sky separation (km) : 22460.3
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-02-04T21:49:10.284		20.01	-39.53	50825.85	-9.14		
lambda	I	2031-02-04T21:50:37.665		19.80	-39.63	50026.71	-9.13		
delta	I	2031-02-04T21:53:47.765		19.33	-39.84	48300.35	-9.04		
gamma	I	2031-02-04T21:55:02.981		19.14	-39.92	47622.20	-9.00		
eta	I	2031-02-04T21:55:52.636		19.02	-39.98	47176.12	-8.97		
beta	I	2031-02-04T21:58:40.796		18.60	-40.15	45675.37	-8.88		
alpha	I	2031-02-04T22:00:26.259		18.33	-40.25	44742.11	-8.81		
4	I	2031-02-04T22:04:31.491		17.70	-40.48	42602.53	-8.64		
5	I	2031-02-04T22:05:04.469		17.62	-40.51	42315.10	-8.62		
6	I	2031-02-04T22:05:57.686		17.48	-40.56	41861.28	-8.59		
Uranus	I	2031-02-04T22:45:02.432		11.12	-41.72	25159.42		6.52	6.83
Uranus	E	2031-02-04T23:21:58.018		4.61x	-41.17	25043.35		7.44	7.79
6	E	2031-02-05T00:01:51.064		-2.84x	-38.83	41859.42	8.41		
5	E	2031-02-05T00:02:32.070		-2.97x	-38.77	42205.88	8.44		
4	E	2031-02-05T00:03:10.008		-3.09x	-38.72	42528.26	8.46		
alpha	E	2031-02-05T00:07:22.799		-3.90x	-38.37	44685.83	8.61		
beta	E	2031-02-05T00:09:16.325		-4.27x	-38.21	45666.27	8.67		
eta	E	2031-02-05T00:12:09.620		-4.82x	-37.96	47176.12	8.75		
gamma	E	2031-02-05T00:13:00.903		-4.99x	-37.88	47625.60	8.78		
delta	E	2031-02-05T00:14:17.640		-5.24x	-37.76	48300.35	8.81		
lambda	E	2031-02-05T00:17:32.717		-5.87x	-37.46	50026.71	8.89		
epsilon	E	2031-02-05T00:19:37.891		-6.27x	-37.26	51142.17	8.90		