

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-30T12:45:31.690
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427623561383489920
 2Mass ID (if available) : 05440114+2330463

ICRS Star Coord at Epoch: 05h 44m 01.14291s +23:30:46.29007s

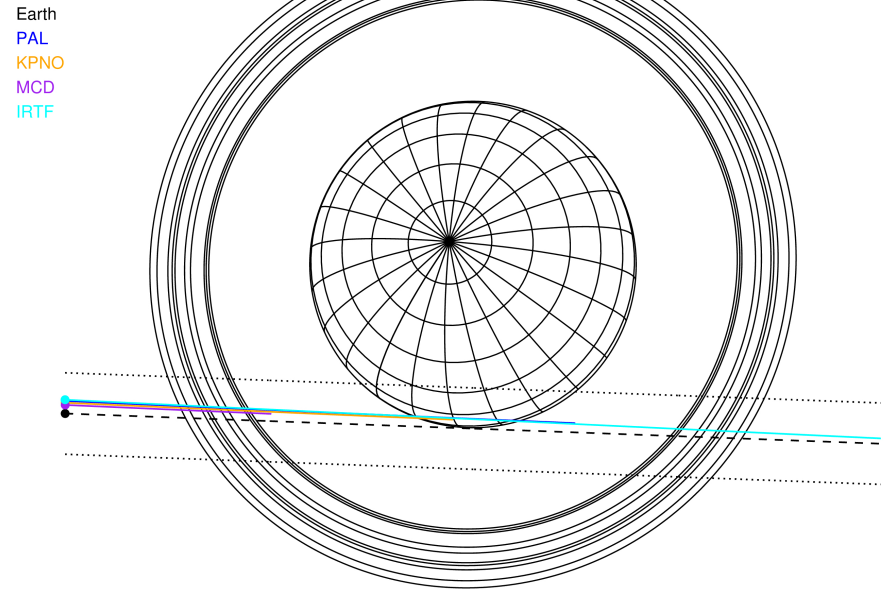
RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.521
 G magnitude : 17.780
 RP magnitude : 16.825
 BP magnitude : 18.734
 DUPflag : 0
 Distance (au) : 19.425
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 16.43
 Sun-Target sep (deg) : 70.19
 Sun-Moon sep (deg) : 135.44
 B (ring opening deg) : 78.31
 PA of pole (deg) : 46.06

#	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



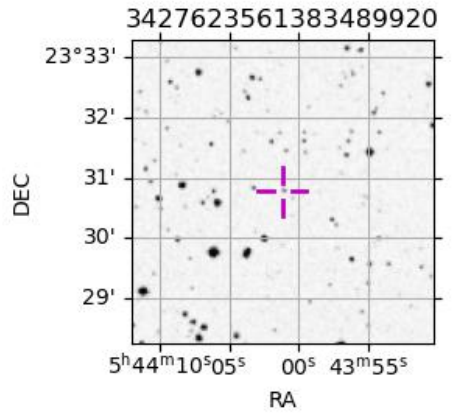
2031-08-30T12:45:31.6900 cc: 05 44 01.1429 s: +23 30 46.290 C/A 1.819° PA 357.88 deg v_sky +16.43 km/s D 19.43 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2031-08-30T12:45:31 K14.52 G17.78 PtRgt

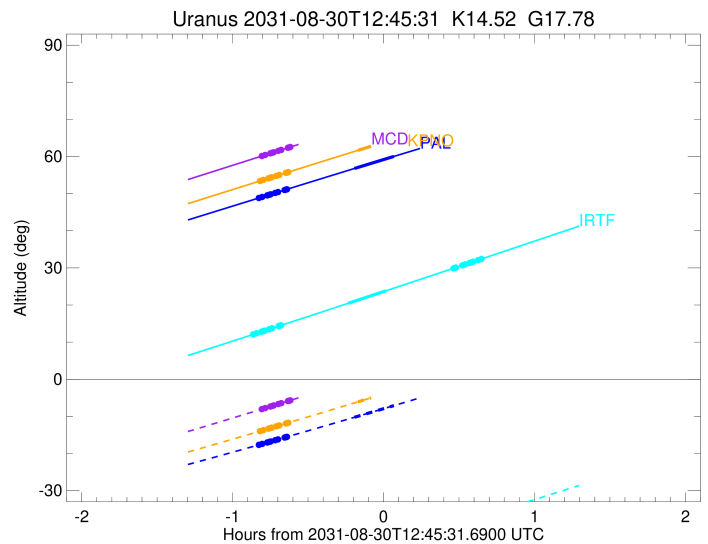
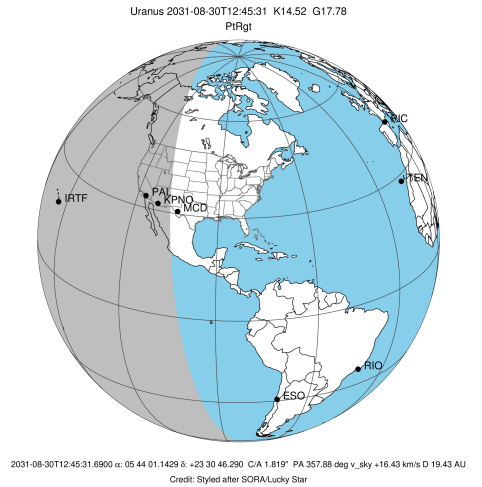


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	+++++	+ +		AUG 30 11:55 - AUG 30 12:49	PieRin
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+		AUG 30 11:56 - AUG 30 12:35	PinRin
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++			AUG 30 11:56 - AUG 30 12:08	PnnRin
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	AUG 30 11:53 - AUG 30 13:24	PieRie
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					PnnRnn
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

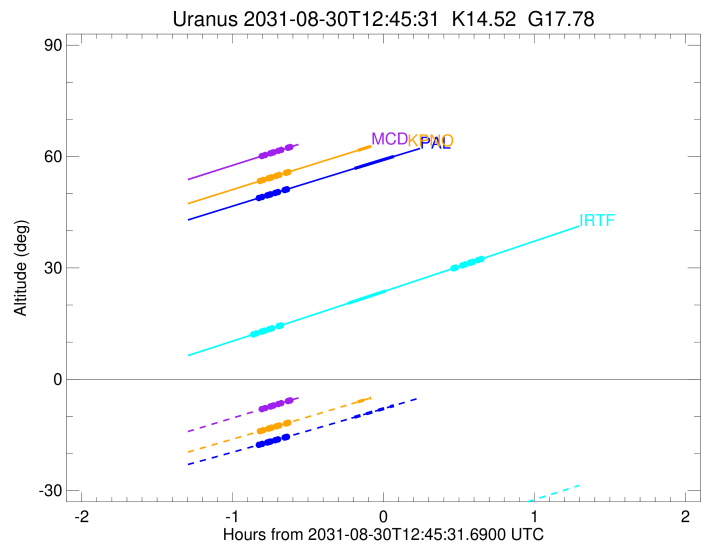
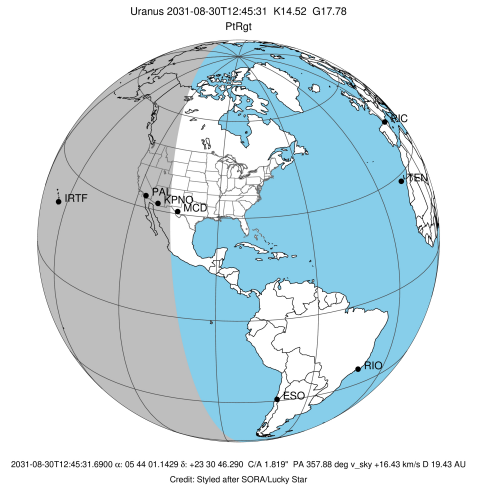


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-30T12:42:23.160
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3427623561383489920
 2Mass ID (if available) : 05440114+2330463
 ICRS Star Coord at Epoch: 05h 44m 01.14291s +23:30:46.29007s
 RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.521
 G magnitude : 17.780
 RP magnitude : 16.825
 BP magnitude : 18.734
 DUPflag : 0
 Distance (au) : 19.425
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 16.43
 Sun-Target sep (deg) : 70.19
 Sun-Moon sep (deg) : 136.39
 B (ring opening deg) : 78.31
 PA of pole (deg) : 46.06
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.714
 C/A sky separation (km) : 24146.9
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



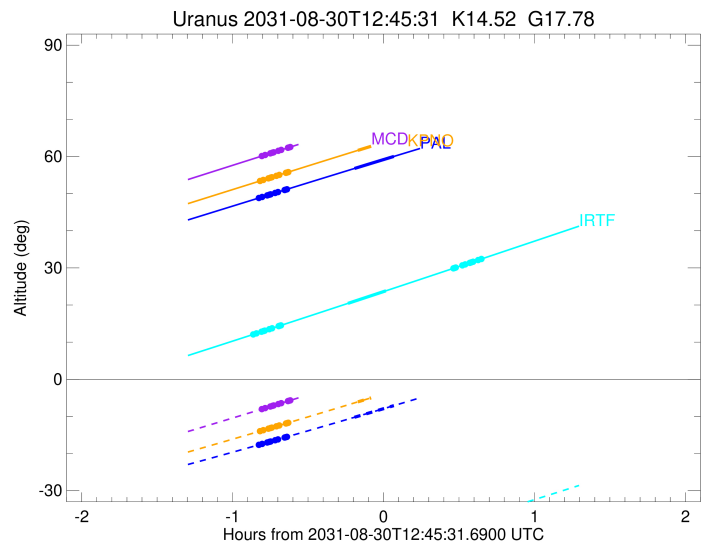
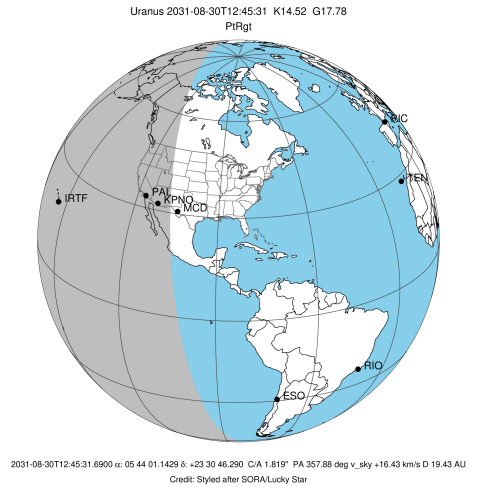
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-08-30T11:55:38.997		48.76	-17.73	51449.09	-14.37		
lambda	I	2031-08-30T11:57:18.109		49.11	-17.41	50026.71	-14.29		
delta	I	2031-08-30T11:59:19.622		49.54	-17.02	48300.35	-14.12		
gamma	I	2031-08-30T12:00:07.181		49.70	-16.87	47630.33	-14.05		
eta	I	2031-08-30T12:00:39.559		49.82	-16.77	47176.12	-14.00		
beta	I	2031-08-30T12:02:28.117		50.19	-16.42	45665.49	-13.82		
alpha	I	2031-08-30T12:03:38.684		50.44	-16.19	44693.92	-13.70		
4	I	2031-08-30T12:06:13.229		50.98	-15.69	42599.27	-13.40		
5	I	2031-08-30T12:06:34.419		51.05	-15.63	42313.13	-13.36		
6	I	2031-08-30T12:07:10.024		51.18	-15.51	41841.77	-13.30		
Uranus	I	2031-08-30T12:34:00.035		56.78	-10.24	25471.44		-4.52	-4.74
Uranus	E	2031-08-30T12:49:40.626		60.03	-7.10	25153.52		-9.87	-10.32
6	E	2031-08-30T13:16:42.034		65.55	-1.61x	41875.80	13.22		
5	E	2031-08-30T13:17:08.950		65.64	-1.51x	42226.10	13.28		
4	E	2031-08-30T13:17:31.984		65.72	-1.43x	42528.19	13.32		
alpha	E	2031-08-30T13:20:13.436		66.26	-0.88x	44707.09	13.61		
beta	E	2031-08-30T13:21:21.907		66.48	-0.65x	45641.56	13.73		
eta	E	2031-08-30T13:23:12.947		66.85	-0.27x	47176.12	13.91		
gamma	E	2031-08-30T13:23:45.334		66.96	-0.16x	47627.34	13.96		
delta	E	2031-08-30T13:24:33.441		67.12	0.01x	48300.35	14.02		
lambda	E	2031-08-30T13:26:35.834		67.52	0.43x	50026.71	14.18		
epsilon	E	2031-08-30T13:27:27.203		67.69	0.60x	50756.91	14.26		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-30T12:42:46.890
 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 : 3427623561383489920
 2Mass ID (if available) : 05440114+2330463
 ICRS Star Coord at Epoch: 05h 44m 01.14291s +23:30:46.29007s
 RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.521
 G magnitude : 17.780
 RP magnitude : 16.825
 BP magnitude : 18.734
 DUPflag : 0
 Distance (au) : 19.425
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 16.43
 Sun-Target sep (deg) : 70.19
 Sun-Moon sep (deg) : 136.37
 B (ring opening deg) : 78.31
 PA of pole (deg) : 46.06
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.733
 C/A sky separation (km) : 24412.2
 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



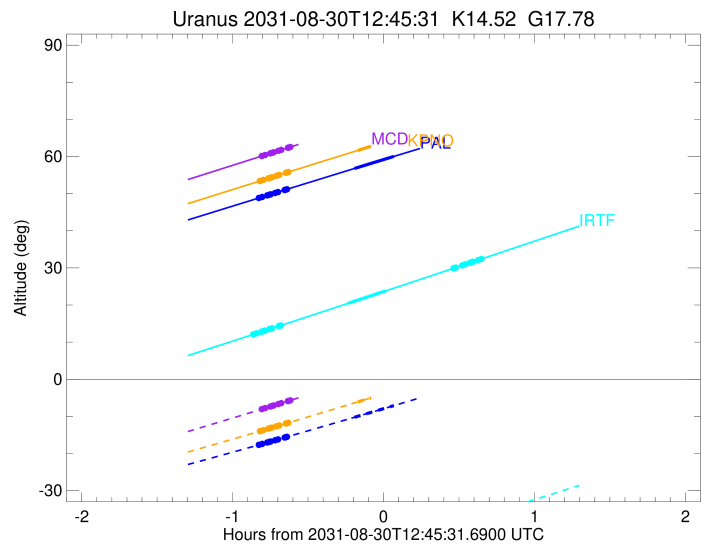
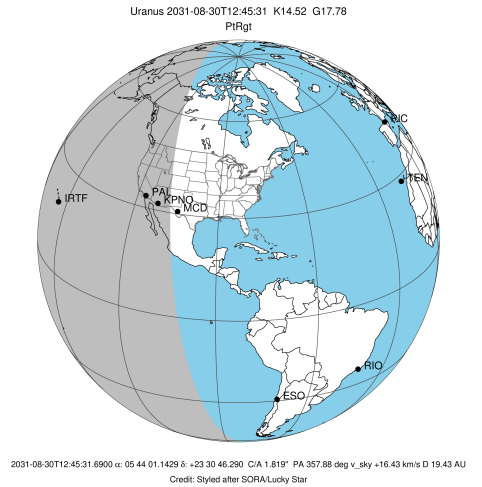
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-08-30T11:56:06.451		53.35	-14.04	51447.30	-14.30		
lambda	I	2031-08-30T11:57:45.959		53.70	-13.71	50026.71	-14.21		
delta	I	2031-08-30T11:59:48.146		54.13	-13.30	48300.35	-14.04		
gamma	I	2031-08-30T12:00:35.978		54.30	-13.14	47630.36	-13.97		
eta	I	2031-08-30T12:01:08.549		54.42	-13.03	47176.12	-13.92		
beta	I	2031-08-30T12:02:57.785		54.81	-12.67	45665.34	-13.74		
alpha	I	2031-08-30T12:04:08.810		55.06	-12.43	44693.74	-13.61		
4	I	2031-08-30T12:06:44.436		55.61	-11.91	42598.97	-13.30		
5	I	2031-08-30T12:07:05.754		55.68	-11.84	42313.28	-13.26		
6	I	2031-08-30T12:07:41.601		55.81	-11.72	41842.13	-13.20		
Uranus	I	2031-08-30T12:35:18.486		61.65	-6.09	25455.58		-4.92	-5.15
Uranus	E	2031-08-30T12:49:08.718		64.55	-3.24x	25172.27		-9.63	-10.07
6	E	2031-08-30T13:16:56.550		70.25	2.56x	41875.93	13.13		
5	E	2031-08-30T13:17:23.681		70.34	2.66x	42226.67	13.19		
4	E	2031-08-30T13:17:46.845		70.42	2.74x	42528.29	13.23		
alpha	E	2031-08-30T13:20:29.301		70.96	3.31x	44706.88	13.53		
beta	E	2031-08-30T13:21:38.189		71.19	3.55x	45641.53	13.66		
eta	E	2031-08-30T13:23:29.843		71.55	3.94x	47176.12	13.83		
gamma	E	2031-08-30T13:24:02.403		71.66	4.05x	47627.37	13.88		
delta	E	2031-08-30T13:24:50.755		71.82	4.22x	48300.35	13.95		
lambda	E	2031-08-30T13:26:53.747		72.22	4.66x	50026.71	14.12		
epsilon	E	2031-08-30T13:27:45.392		72.39	4.84x	50757.46	14.20		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-30T12:43:26.590
 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 : 3427623561383489920
 2Mass ID (if available) : 05440114+2330463
 ICRS Star Coord at Epoch: 05h 44m 01.14291s +23:30:46.29007s
 RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.521
 G magnitude : 17.780
 RP magnitude : 16.825
 BP magnitude : 18.734
 DUPflag : 0
 Distance (au) : 19.425
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 16.43
 Sun-Target sep (deg) : 70.19
 Sun-Moon sep (deg) : 136.33
 B (ring opening deg) : 78.31
 PA of pole (deg) : 46.06
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.753
 C/A sky separation (km) : 24696.6
 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	2031-08-30T11:56:49.672		60.06	-8.11	51445.24	-14.21		
lambda	I	2031-08-30T11:58:29.637		60.42	-7.76	50026.71	-14.13		
delta	I	2031-08-30T12:00:32.599		60.86	-7.34	48300.35	-13.95		
gamma	I	2031-08-30T12:01:20.745		61.03	-7.17	47630.38	-13.88		
eta	I	2031-08-30T12:01:53.537		61.15	-7.06	47176.12	-13.83		
beta	I	2031-08-30T12:03:43.548		61.54	-6.68	45665.18	-13.64		
alpha	I	2031-08-30T12:04:55.098		61.80	-6.43	44693.54	-13.51		
4	I	2031-08-30T12:07:31.956		62.36	-5.88	42598.64	-13.19		
5	I	2031-08-30T12:07:53.420		62.44	-5.81	42313.44	-13.15		
6	I	2031-08-30T12:08:29.544		62.56	-5.68	41842.53	-13.08		
Uranus	I	2031-08-30T12:37:07.893		68.65	0.35x	25434.15		-5.41	-5.67
Uranus	E	2031-08-30T12:48:37.699		71.04	2.79x	25196.37		-9.31	-9.75
6	E	2031-08-30T13:17:26.193		76.79	8.95x	41876.06	13.03		
5	E	2031-08-30T13:17:53.559		76.88	9.05x	42227.25	13.10		
4	E	2031-08-30T13:18:16.866		76.95	9.13x	42528.39	13.13		
alpha	E	2031-08-30T13:21:00.423		77.46	9.71x	44706.67	13.44		
beta	E	2031-08-30T13:22:09.763		77.67	9.96x	45641.51	13.57		
eta	E	2031-08-30T13:24:02.086		78.02	10.36x	47176.12	13.76		
gamma	E	2031-08-30T13:24:34.834		78.11	10.48x	47627.40	13.81		
delta	E	2031-08-30T13:25:23.451		78.26	10.65x	48300.35	13.88		
lambda	E	2031-08-30T13:27:27.088		78.63	11.10x	50026.71	14.05		
epsilon	E	2031-08-30T13:28:19.030		78.78	11.28x	50758.03	14.13		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-30T12:39:28.440
 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 : 3427623561383489920
 2Mass ID (if available) : 05440114+2330463
 ICRS Star Coord at Epoch: 05h 44m 01.14291s +23:30:46.29007s
 RUWE (>1.4 is poor) : 0.97
 K magnitude : 14.521
 G magnitude : 17.780
 RP magnitude : 16.825
 BP magnitude : 18.734
 DUPflag : 0
 Distance (au) : 19.425
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 16.43
 Sun-Target sep (deg) : 70.19
 Sun-Moon sep (deg) : 136.38
 B (ring opening deg) : 78.31
 PA of pole (deg) : 46.06
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.718
 C/A sky separation (km) : 24198.6
 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	2031-08-30T11:53:24.607		12.01	-53.65	51449.84	-14.58		
lambda	I	2031-08-30T11:55:02.367		12.37	-53.40	50026.71	-14.49		
delta	I	2031-08-30T11:57:02.176		12.81	-53.09	48300.35	-14.32		
gamma	I	2031-08-30T11:57:49.073		12.98	-52.97	47630.32	-14.25		
eta	I	2031-08-30T11:58:21.001		13.10	-52.89	47176.12	-14.20		
beta	I	2031-08-30T12:00:08.059		13.49	-52.61	45665.54	-14.02		
alpha	I	2031-08-30T12:01:17.660		13.75	-52.42	44693.98	-13.89		
4	I	2031-08-30T12:03:50.115		14.31	-52.02	42599.35	-13.58		
5	I	2031-08-30T12:04:11.030		14.39	-51.96	42313.08	-13.54		
6	I	2031-08-30T12:04:46.166		14.52	-51.86	41841.67	-13.47		
Uranus	I	2031-08-30T12:31:21.517		20.44	-47.27	25470.54		-4.55	-4.76
Uranus	E	2031-08-30T12:46:30.673		23.83	-44.43	25159.14		-9.79	-10.25
6	E	2031-08-30T13:13:20.719		29.89	-39.13	41875.91	13.35		
5	E	2031-08-30T13:13:47.393		29.99	-39.04	42226.59	13.42		
4	E	2031-08-30T13:14:10.177		30.07	-38.97	42528.28	13.45		
alpha	E	2031-08-30T13:16:50.014		30.68	-38.42	44706.89	13.75		
beta	E	2031-08-30T13:17:57.826		30.93	-38.19	45641.54	13.87		
eta	E	2031-08-30T13:19:47.779		31.35	-37.82	47176.12	14.05		
gamma	E	2031-08-30T13:20:19.852		31.47	-37.71	47627.37	14.09		
delta	E	2031-08-30T13:21:07.488		31.65	-37.54	48300.35	14.16		
lambda	E	2031-08-30T13:23:08.693		32.11	-37.13	50026.71	14.32		
epsilon	E	2031-08-30T13:23:59.608		32.30	-36.95	50757.53	14.40		