

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-31T13:02:10.090
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427623909278215808
 2Mass ID (if available) : 05440845+2330515

Uranus 2031-08-31T13:02:10 K12.63 G14.53 PgtRgt

ICRS Star Coord at Epoch: 05h 44m 08.44391s +23:30:51.33551s

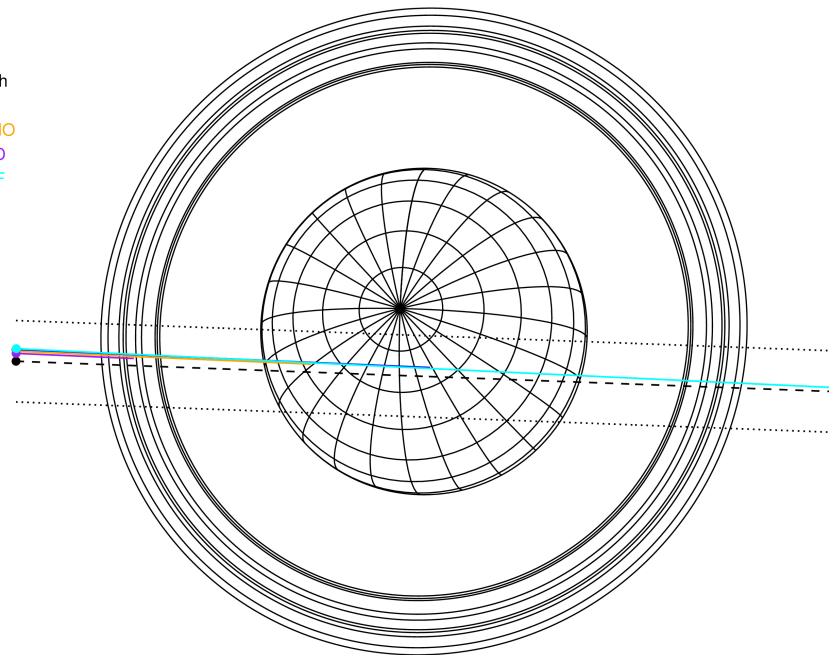
RUWE (>1.4 is poor) : 1.01
 K magnitude : 12.628
 G magnitude : 14.535
 RP magnitude : 13.902
 BP magnitude : 14.995
 DUPflag : 0
 Distance (au) : 19.409
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 15.97
 Sun-Target sep (deg) : 71.14
 Sun-Moon sep (deg) : 120.45
 B (ring opening deg) : 78.29
 PA of pole (deg) : 46.16

#	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



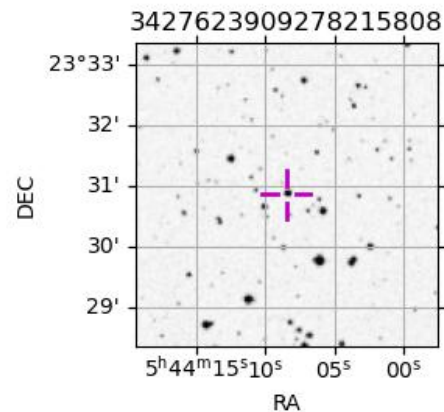
2031-08-31T13:02:10.0900 ex: 05 44 08.4439 s: +23 30 51.336 C/A 0.495° PA 357.88 deg v_sky +15.97 km/s D 19.41 AU
 Credit: Styled after SORA/Lucky Star

Earth
 PAL
 KPNO
 MCD
 IRTF

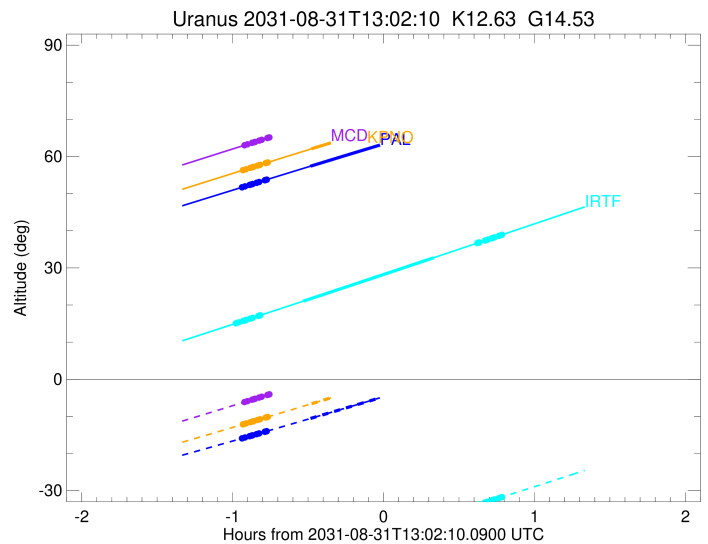
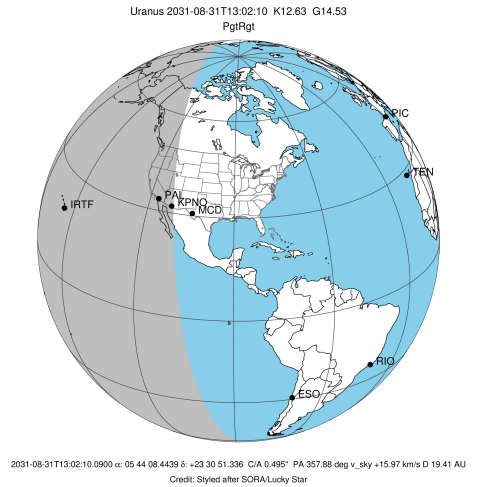


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 31 12:05 - AUG 31 12:33	PinRin
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+		AUG 31 12:05 - AUG 31 12:33	PinRin
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++			AUG 31 12:06 - AUG 31 12:11	PnnRin
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	AUG 31 12:03 - AUG 31 13:48	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

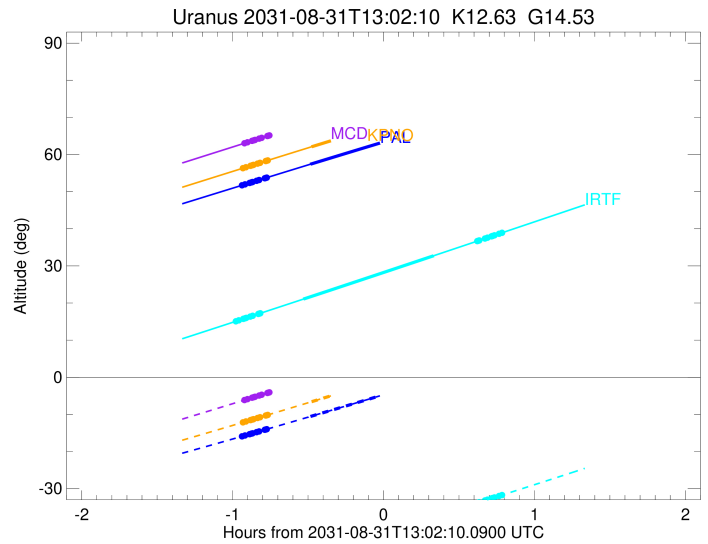
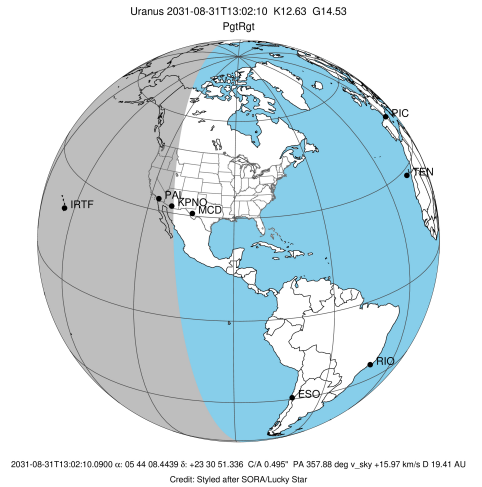


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-31T12:59:29.140
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3427623909278215808
 2Mass ID (if available) : 05440845+2330515
 ICRS Star Coord at Epoch: 05h 44m 08.44391s +23:30:51.33551s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 12.628
 G magnitude : 14.535
 RP magnitude : 13.902
 BP magnitude : 14.995
 DUPflag : 0
 Distance (au) : 19.409
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 15.97
 Sun-Target sep (deg) : 71.14
 Sun-Moon sep (deg) : 121.44
 B (ring opening deg) : 78.29
 PA of pole (deg) : 46.16
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.398
 C/A sky separation (km) : 5600.2
 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



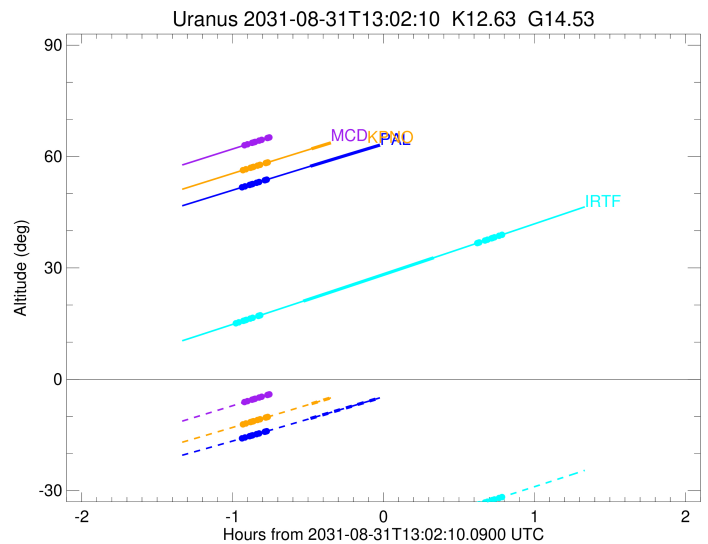
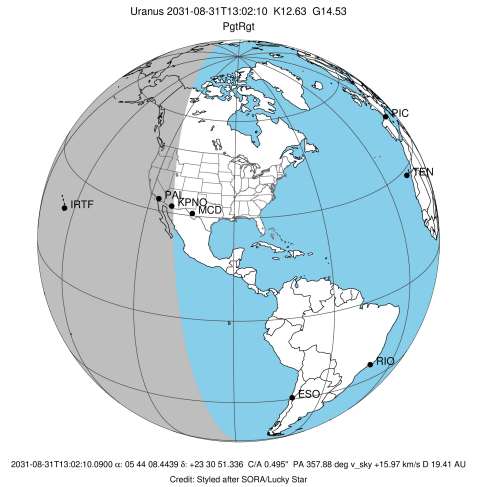
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-08-31T12:05:31.674		51.63	-15.99	51533.41	-15.79		
lambda	I	2031-08-31T12:07:07.110		51.97	-15.68	50026.71	-15.78		
delta	I	2031-08-31T12:08:56.526		52.35	-15.33	48300.35	-15.77		
gamma	I	2031-08-31T12:09:39.131		52.50	-15.19	47628.44	-15.77		
eta	I	2031-08-31T12:10:07.820		52.60	-15.10	47176.12	-15.77		
beta	I	2031-08-31T12:11:43.165		52.93	-14.78	45673.97	-15.75		
alpha	I	2031-08-31T12:12:44.543		53.14	-14.59	44707.75	-15.75		
4	I	2031-08-31T12:14:57.638		53.61	-14.15	42613.30	-15.73		
5	I	2031-08-31T12:15:17.725		53.68	-14.09	42293.27	-15.73		
6	I	2031-08-31T12:15:48.362		53.79	-13.99	41819.60	-15.73		
Uranus	I	2031-08-31T12:33:08.215		57.40	-10.56	25361.94		6.83	7.15
Uranus	E	2031-08-31T13:25:37.461		68.08	0.09x	25122.39		-10.27	-10.75
6	E	2031-08-31T13:43:06.415		71.45	3.70x	41864.59	15.62		
5	E	2031-08-31T13:43:28.053		71.52	3.78x	42193.42	15.63		
4	E	2031-08-31T13:43:49.203		71.58	3.85x	42526.22	15.62		
alpha	E	2031-08-31T13:46:09.551		72.02	4.33x	44720.81	15.64		
beta	E	2031-08-31T13:47:08.712		72.20	4.54x	45644.89	15.64		
eta	E	2031-08-31T13:48:46.624		72.50	4.88x	47176.12	15.65		
gamma	E	2031-08-31T13:49:15.327		72.59	4.98x	47625.29	15.65		
delta	E	2031-08-31T13:49:58.459		72.72	5.13x	48300.35	15.65		
lambda	E	2031-08-31T13:51:48.731		73.05	5.51x	50026.71	15.66		
epsilon	E	2031-08-31T13:52:34.648		73.19	5.67x	50745.75	15.66		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-31T12:59:54.750
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 3427623909278215808
 2Mass ID (if available) : 05440845+2330515
 ICRS Star Coord at Epoch: 05h 44m 08.44391s +23:30:51.33551s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 12.628
 G magnitude : 14.535
 RP magnitude : 13.902
 BP magnitude : 14.995
 DUPflag : 0
 Distance (au) : 19.409
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 15.97
 Sun-Target sep (deg) : 71.14
 Sun-Moon sep (deg) : 121.43
 B (ring opening deg) : 78.29
 PA of pole (deg) : 46.16
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.416
 C/A sky separation (km) : 5852.1
 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



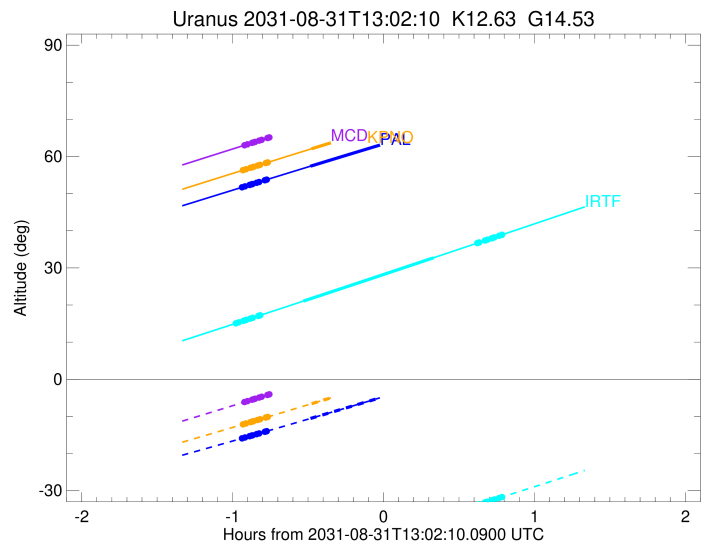
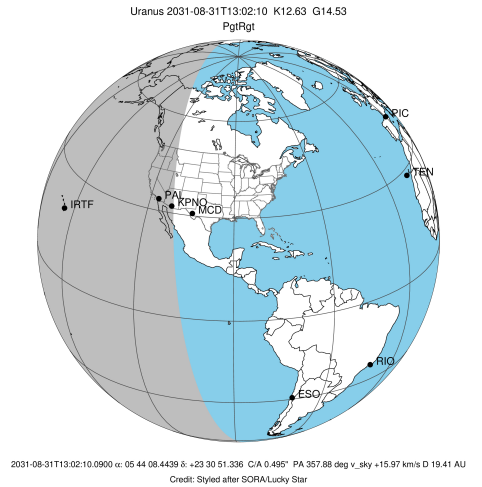
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-08-31T12:05:53.425		56.24	-12.23	51532.66	-15.75		
lambda	I	2031-08-31T12:07:29.046		56.58	-11.90	50026.71	-15.74		
delta	I	2031-08-31T12:09:18.730		56.96	-11.53	48300.35	-15.73		
gamma	I	2031-08-31T12:10:01.439		57.12	-11.39	47628.47	-15.73		
eta	I	2031-08-31T12:10:30.201		57.22	-11.29	47176.12	-15.73		
beta	I	2031-08-31T12:12:05.792		57.55	-10.97	45673.88	-15.71		
alpha	I	2031-08-31T12:13:07.332		57.77	-10.76	44707.54	-15.71		
4	I	2031-08-31T12:15:20.767		58.24	-10.31	42613.18	-15.69		
5	I	2031-08-31T12:15:40.875		58.31	-10.24	42293.64	-15.69		
6	I	2031-08-31T12:16:11.596		58.42	-10.14	41819.87	-15.69		
Uranus	I	2031-08-31T12:33:34.734		62.09	-6.58	25367.75		6.73	7.04
Uranus	E	2031-08-31T13:26:01.096		72.79	4.35x	25117.98		-10.32	-10.80
6	E	2031-08-31T13:43:32.784		76.07	8.05x	41864.76	15.59		
5	E	2031-08-31T13:43:54.475		76.14	8.13x	42193.79	15.60		
4	E	2031-08-31T13:44:15.643		76.20	8.20x	42526.20	15.60		
alpha	E	2031-08-31T13:46:36.239		76.61	8.70x	44720.64	15.61		
beta	E	2031-08-31T13:47:35.513		76.78	8.91x	45644.84	15.61		
eta	E	2031-08-31T13:49:13.597		77.06	9.25x	47176.12	15.62		
gamma	E	2031-08-31T13:49:42.351		77.14	9.35x	47625.32	15.62		
delta	E	2031-08-31T13:50:25.553		77.26	9.51x	48300.35	15.63		
lambda	E	2031-08-31T13:52:16.003		77.57	9.90x	50026.71	15.63		
epsilon	E	2031-08-31T13:53:01.981		77.70	10.06x	50745.57	15.63		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-31T13:00:36.510
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 3427623909278215808
 2Mass ID (if available) : 05440845+2330515
 ICRS Star Coord at Epoch: 05h 44m 08.44391s +23:30:51.33551s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 12.628
 G magnitude : 14.535
 RP magnitude : 13.902
 BP magnitude : 14.995
 DUPflag : 0
 Distance (au) : 19.409
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 15.97
 Sun-Target sep (deg) : 71.14
 Sun-Moon sep (deg) : 121.41
 B (ring opening deg) : 78.29
 PA of pole (deg) : 46.16
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.434
 C/A sky separation (km) : 6114.0
 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	2031-08-31T12:06:30.565		62.96	-6.22	51531.82	-15.70		
lambda	I	2031-08-31T12:08:06.408		63.30	-5.89	50026.71	-15.70		
delta	I	2031-08-31T12:09:56.411		63.69	-5.50	48300.35	-15.69		
gamma	I	2031-08-31T12:10:39.244		63.84	-5.35	47628.51	-15.68		
eta	I	2031-08-31T12:11:08.092		63.94	-5.25	47176.12	-15.68		
beta	I	2031-08-31T12:12:43.973		64.29	-4.92x	45673.77	-15.67		
alpha	I	2031-08-31T12:13:45.703		64.51	-4.70x	44707.31	-15.66		
4	I	2031-08-31T12:15:59.538		64.98	-4.23x	42613.06	-15.64		
5	I	2031-08-31T12:16:19.672		65.05	-4.16x	42294.04	-15.64		
6	I	2031-08-31T12:16:50.491		65.16	-4.05x	41820.16	-15.64		
Uranus	I	2031-08-31T12:34:17.391		68.85	-0.37x	25373.99		6.61	6.93
Uranus	E	2031-08-31T13:26:40.609		79.15	10.82x	25113.65		-10.38	-10.86
6	E	2031-08-31T13:44:15.120		81.76	14.60x	41864.93	15.56		
5	E	2031-08-31T13:44:36.864		81.80	14.68x	42194.14	15.57		
4	E	2031-08-31T13:44:58.052		81.84	14.75x	42526.17	15.57		
alpha	E	2031-08-31T13:47:18.891		82.10	15.26x	44720.48	15.58		
beta	E	2031-08-31T13:48:18.275		82.20	15.47x	45644.78	15.59		
eta	E	2031-08-31T13:49:56.526		82.36	15.83x	47176.12	15.60		
gamma	E	2031-08-31T13:50:25.327		82.40	15.93x	47625.34	15.60		
delta	E	2031-08-31T13:51:08.596		82.46	16.08x	48300.35	15.60		
lambda	E	2031-08-31T13:52:59.216		82.61	16.48x	50026.71	15.61		
epsilon	E	2031-08-31T13:53:45.252		82.66	16.65x	50745.41	15.61		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-08-31T12:56:19.070
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 3427623909278215808
 2Mass ID (if available) : 05440845+2330515
 ICRS Star Coord at Epoch: 05h 44m 08.44391s +23:30:51.33551s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 12.628
 G magnitude : 14.535
 RP magnitude : 13.902
 BP magnitude : 14.995
 DUPflag : 0
 Distance (au) : 19.409
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 15.97
 Sun-Target sep (deg) : 71.14
 Sun-Moon sep (deg) : 121.32
 B (ring opening deg) : 78.29
 PA of pole (deg) : 46.16
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.408
 C/A sky separation (km) : 5745.5
 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	2031-08-31T12:03:05.047		14.99	-52.36	51533.61	-16.01		
lambda	I	2031-08-31T12:04:39.154		15.34	-52.10	50026.71	-16.01		
delta	I	2031-08-31T12:06:27.042		15.74	-51.81	48300.35	-16.00		
gamma	I	2031-08-31T12:07:09.055		15.89	-51.69	47628.44	-15.99		
eta	I	2031-08-31T12:07:37.346		16.00	-51.61	47176.12	-15.99		
beta	I	2031-08-31T12:09:11.374		16.34	-51.35	45673.99	-15.97		
alpha	I	2031-08-31T12:10:11.909		16.57	-51.18	44707.78	-15.97		
4	I	2031-08-31T12:12:23.192		17.05	-50.81	42613.31	-15.95		
5	I	2031-08-31T12:12:43.011		17.13	-50.76	42293.21	-15.95		
6	I	2031-08-31T12:13:13.233		17.24	-50.67	41819.57	-15.94		
Uranus	I	2031-08-31T12:30:19.796		21.06	-47.64	25362.54		6.82	7.14
Uranus	E	2031-08-31T13:22:07.821		32.74	-37.47	25117.18		-10.33	-10.81
6	E	2031-08-31T13:39:27.514		36.68	-33.83	41864.88	15.76		
5	E	2031-08-31T13:39:48.986		36.76	-33.76	42194.03	15.76		
4	E	2031-08-31T13:40:09.918		36.84	-33.68	42526.18	15.76		
alpha	E	2031-08-31T13:42:29.050		37.37	-33.19	44720.52	15.77		
beta	E	2031-08-31T13:43:27.726		37.59	-32.98	45644.79	15.77		
eta	E	2031-08-31T13:45:04.824		37.96	-32.63	47176.12	15.78		
gamma	E	2031-08-31T13:45:33.291		38.07	-32.53	47625.34	15.78		
delta	E	2031-08-31T13:46:16.063		38.23	-32.38	48300.35	15.78		
lambda	E	2031-08-31T13:48:05.428		38.65	-31.99	50026.71	15.79		
epsilon	E	2031-08-31T13:48:50.949		38.82	-31.83	50745.41	15.79		