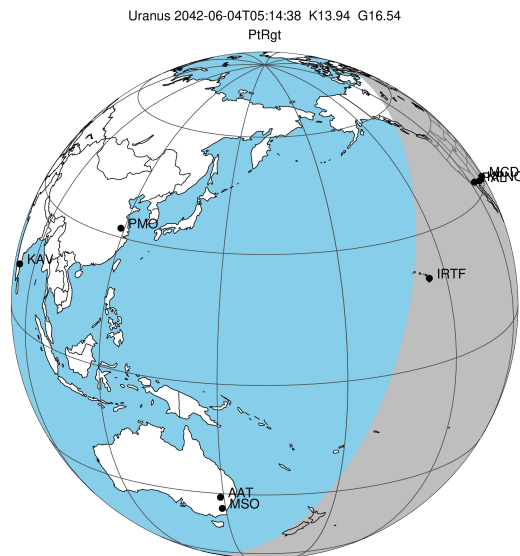


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2042-06-04T05:14:38.720  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 660180625659733888  
 2Mass ID (if available) : 08464589+1835450

Uranus 2042-06-04T05:14:38 K13.94 G16.54 PtRgt

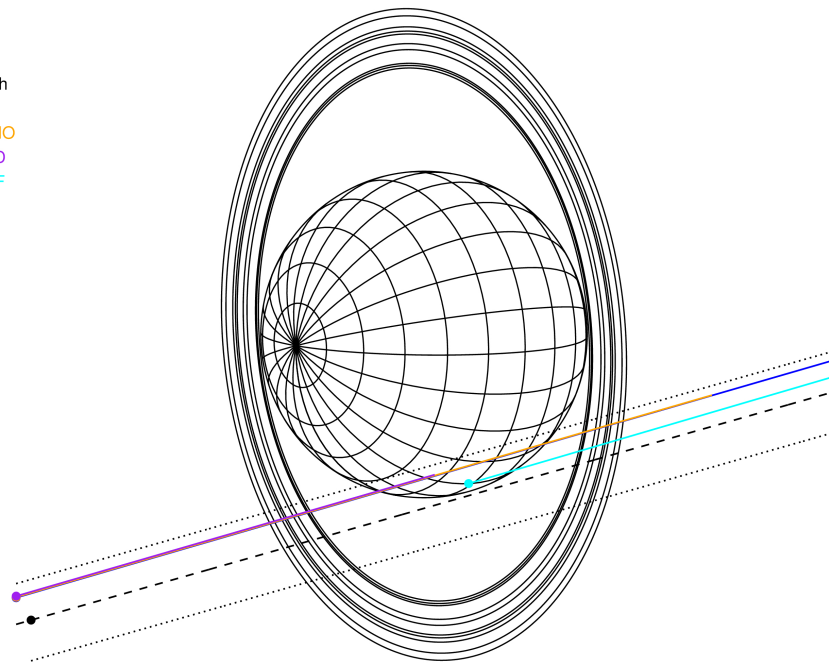
ICRS Star Coord at Epoch: 08h 46m 45.85279s +18:35:44.70764s

RUWE (>1.4 is poor) : 1.07  
 K magnitude : 13.936  
 G magnitude : 16.541  
 RP magnitude : 15.713  
 BP magnitude : 17.298  
 DUPflag : 0  
 Distance (au) : 19.018  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.28  
 Sun-Target sep (deg) : 55.92  
 Sun-Moon sep (deg) : 128.17  
 B (ring opening deg) : 38.04  
 PA of pole (deg) : 95.02



2042-06-04T05:14:38.720000: 08 46 45.85279 s: +18 35 44.708 C/A 1.889° PA 15.88 deg v\_sky +23.28 km/s D 19.02 AU  
 Credit: Styled after SORA/Lucky Star

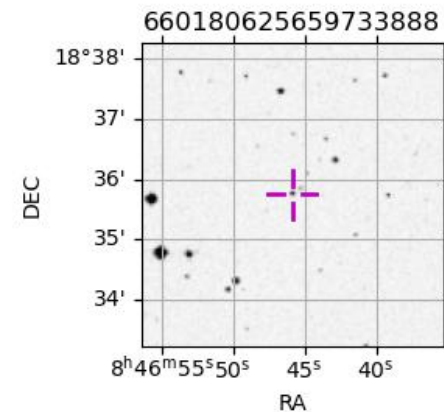
Earth  
 PAL  
 KPNO  
 MCD  
 IRTF



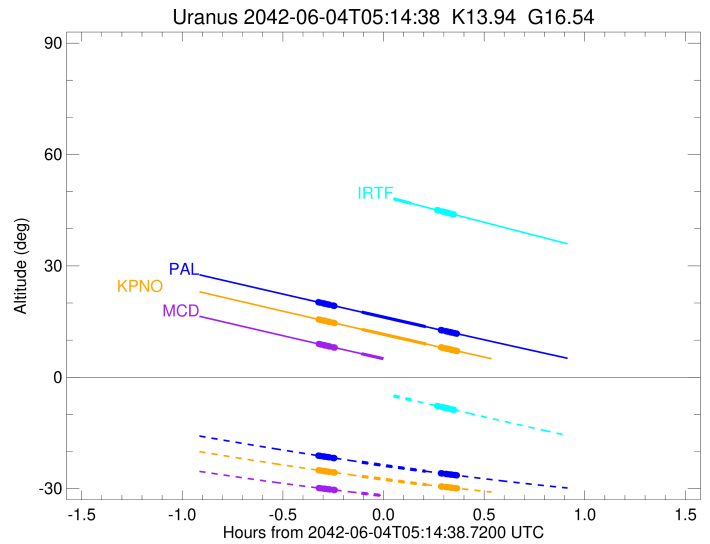
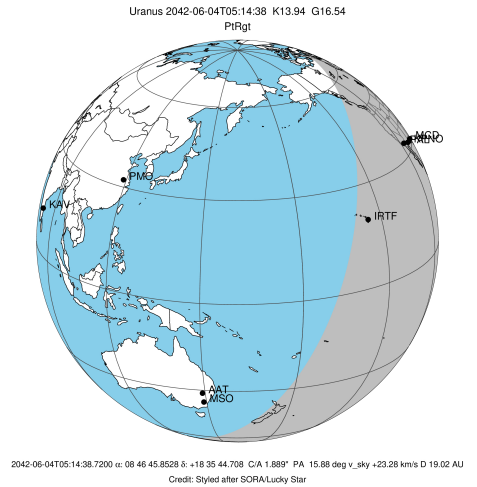
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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	+++++	+ +	+++++	JUN 04 04:55 - JUN 04 05:36	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	JUN 04 04:55 - JUN 04 05:36	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+		JUN 04 04:55 - JUN 04 05:08	PinRin
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5		+	+++++	JUN 04 05:23 - JUN 04 05:35	PneRne
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

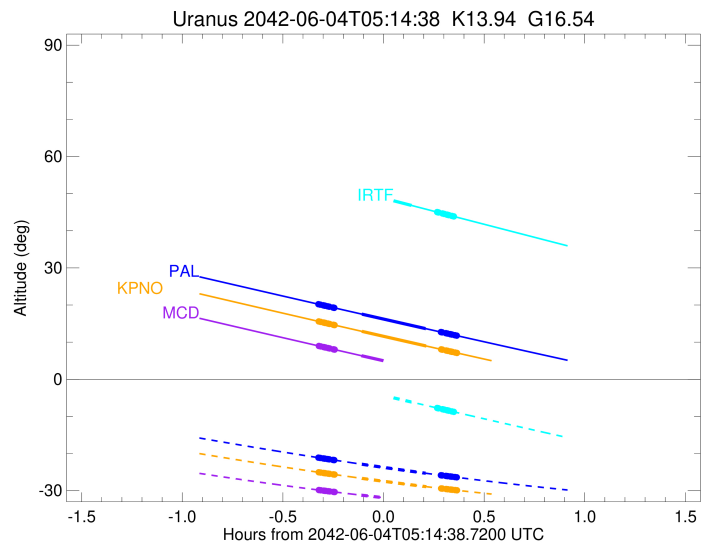
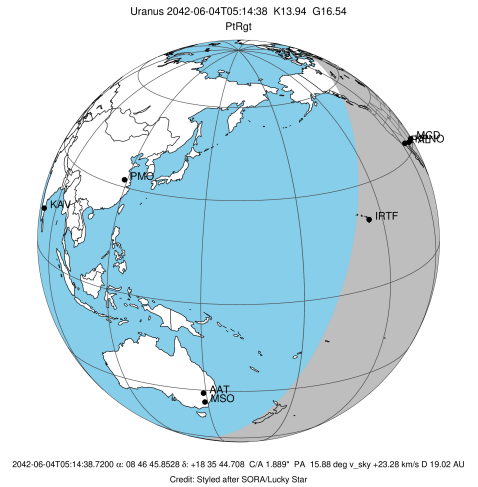


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2042-06-04T05:17:45.630  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 660180625659733888  
 2Mass ID (if available) : 08464589+1835450  
 ICRS Star Coord at Epoch: 08h 46m 45.85279s +18:35:44.70764s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 13.936  
 G magnitude : 16.541  
 RP magnitude : 15.713  
 BP magnitude : 17.298  
 DUPflag : 0  
 Distance (au) : 19.019  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.28  
 Sun-Target sep (deg) : 55.92  
 Sun-Moon sep (deg) : 128.73  
 B (ring opening deg) : 38.04  
 PA of pole (deg) : 95.02  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.576  
 C/A sky separation (km) : 21739.7  
 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



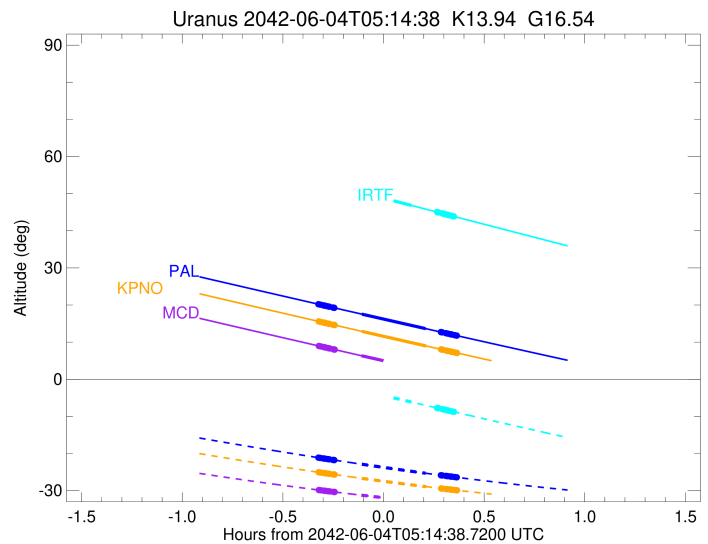
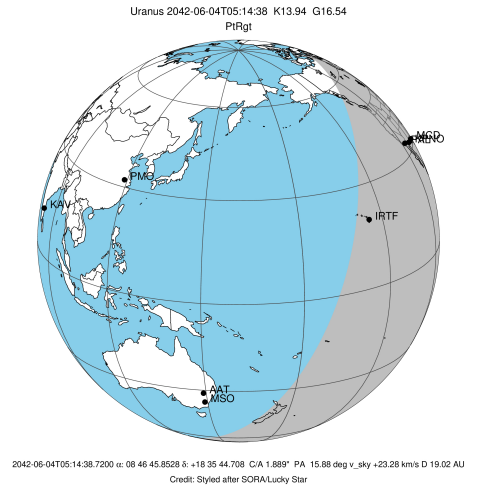
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2042-06-04T04:55:13.166		20.22	-21.11	51209.56	-33.50		
lambda	I	2042-06-04T04:55:48.437		20.10	-21.20	50026.71	-33.44		
delta	I	2042-06-04T04:56:40.277		19.92	-21.32	48300.35	-33.15		
gamma	I	2042-06-04T04:57:00.637		19.85	-21.36	47626.60	-33.03		
eta	I	2042-06-04T04:57:14.293		19.81	-21.40	47176.12	-32.94		
beta	I	2042-06-04T04:57:59.975		19.65	-21.50	45680.75	-32.64		
alpha	I	2042-06-04T04:58:30.892		19.54	-21.57	44684.70	-32.43		
4	I	2042-06-04T04:59:36.297		19.32	-21.72	42576.43	-31.93		
5	I	2042-06-04T04:59:44.944		19.29	-21.74	42252.67	-31.80		
6	I	2042-06-04T05:00:00.567		19.23	-21.78	41803.15	-31.71		
Uranus	I	2042-06-04T05:08:10.106		17.55	-22.88	25531.75		15.97	16.68
Uranus	E	2042-06-04T05:27:14.569		13.64	-25.32	25457.33		-32.17	-33.37
6	E	2042-06-04T05:31:44.318		12.72	-25.85	41875.14	31.79		
5	E	2042-06-04T05:31:59.783		12.67	-25.89	42296.46	31.88		
4	E	2042-06-04T05:32:08.023		12.64	-25.90	42608.67	32.01		
alpha	E	2042-06-04T05:33:14.613		12.41	-26.03	44738.02	32.52		
beta	E	2042-06-04T05:33:42.597		12.32	-26.09	45646.98	32.74		
eta	E	2042-06-04T05:34:29.235		12.16	-26.18	47176.12	33.04		
gamma	E	2042-06-04T05:34:42.966		12.12	-26.20	47630.43	33.13		
delta	E	2042-06-04T05:35:03.147		12.05	-26.24	48300.35	33.26		
lambda	E	2042-06-04T05:35:54.823		11.87	-26.34	50026.71	33.55		
epsilon	E	2042-06-04T05:36:17.724		11.79	-26.39	50796.54	33.61		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2042-06-04T05:17:49.910  
 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 : 660180625659733888  
 2Mass ID (if available) : 08464589+1835450  
 ICRS Star Coord at Epoch: 08h 46m 45.85279s +18:35:44.70764s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 13.936  
 G magnitude : 16.541  
 RP magnitude : 15.713  
 BP magnitude : 17.298  
 DUPflag : 0  
 Distance (au) : 19.019  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.28  
 Sun-Target sep (deg) : 55.92  
 Sun-Moon sep (deg) : 128.68  
 B (ring opening deg) : 38.04  
 PA of pole (deg) : 95.02  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.571  
 C/A sky separation (km) : 21676.5  
 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



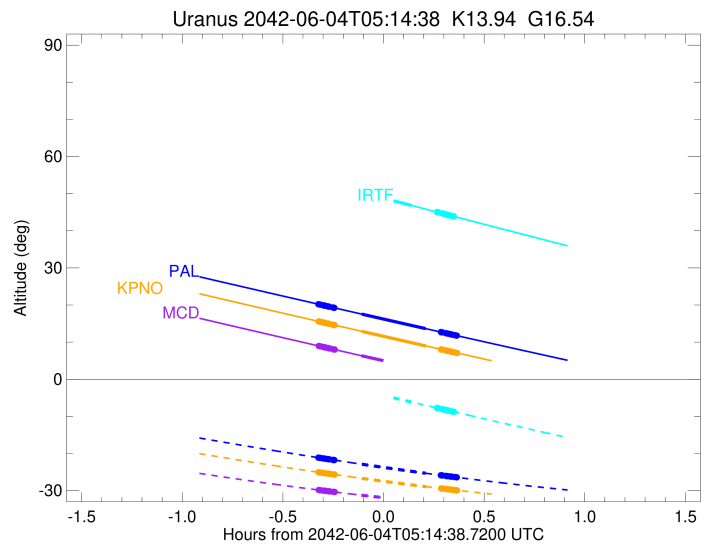
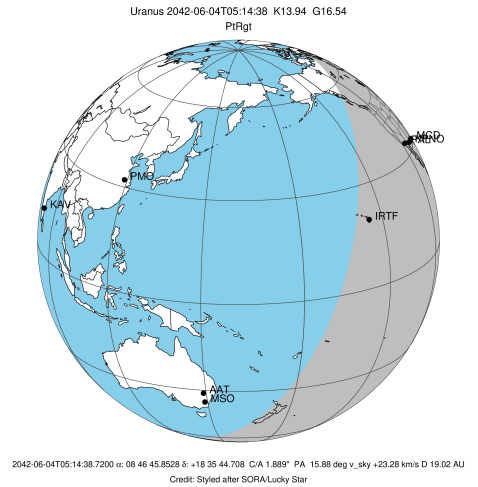
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2042-06-04T04:55:19.184		15.58	-25.05	51210.20	-33.57		
lambda	I	2042-06-04T04:55:54.396		15.46	-25.13	50026.71	-33.52		
delta	I	2042-06-04T04:56:46.120		15.28	-25.24	48300.35	-33.23		
gamma	I	2042-06-04T04:57:06.433		15.21	-25.29	47626.59	-33.11		
eta	I	2042-06-04T04:57:20.057		15.16	-25.32	47176.12	-33.02		
beta	I	2042-06-04T04:58:05.632		15.00	-25.42	45680.76	-32.72		
alpha	I	2042-06-04T04:58:36.474		14.90	-25.48	44684.70	-32.51		
4	I	2042-06-04T04:59:41.718		14.67	-25.62	42576.34	-32.01		
5	I	2042-06-04T04:59:50.340		14.64	-25.64	42252.51	-31.88		
6	I	2042-06-04T05:00:05.924		14.59	-25.67	41803.10	-31.79		
Uranus	I	2042-06-04T05:08:10.937		12.91	-26.69	25531.02		16.18	16.91
Uranus	E	2042-06-04T05:27:22.333		8.96	-28.93	25456.37		-32.34	-33.54
6	E	2042-06-04T05:31:48.875		8.06	-29.41	41875.17	31.88		
5	E	2042-06-04T05:32:04.299		8.00	-29.44	42296.38	31.97		
4	E	2042-06-04T05:32:12.515		7.98	-29.45	42608.62	32.09		
alpha	E	2042-06-04T05:33:18.937		7.75	-29.57	44738.05	32.60		
beta	E	2042-06-04T05:33:46.851		7.66	-29.62	45646.96	32.82		
eta	E	2042-06-04T05:34:33.377		7.50	-29.70	47176.12	33.12		
gamma	E	2042-06-04T05:34:47.075		7.45	-29.72	47630.42	33.21		
delta	E	2042-06-04T05:35:07.210		7.38	-29.76	48300.35	33.33		
lambda	E	2042-06-04T05:35:58.767		7.21	-29.85	50026.71	33.63		
epsilon	E	2042-06-04T05:36:21.624		7.13	-29.89	50796.79	33.69		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2042-06-04T05:17:49.930  
 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 : 660180625659733888  
 2Mass ID (if available) : 08464589+1835450  
 ICRS Star Coord at Epoch: 08h 46m 45.85279s +18:35:44.70764s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 13.936  
 G magnitude : 16.541  
 RP magnitude : 15.713  
 BP magnitude : 17.298  
 DUPflag : 0  
 Distance (au) : 19.019  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.28  
 Sun-Target sep (deg) : 55.92  
 Sun-Moon sep (deg) : 128.60  
 B (ring opening deg) : 38.04  
 PA of pole (deg) : 95.02  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.563  
 C/A sky separation (km) : 21555.1  
 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	2042-06-04T04:55:21.613		8.97	-29.84	51211.42	-33.69		
lambda	I	2042-06-04T04:55:56.737		8.85	-29.91	50026.71	-33.64		
delta	I	2042-06-04T04:56:48.272		8.67	-30.00	48300.35	-33.35		
gamma	I	2042-06-04T04:57:08.510		8.60	-30.04	47626.57	-33.23		
eta	I	2042-06-04T04:57:22.082		8.56	-30.07	47176.12	-33.15		
beta	I	2042-06-04T04:58:07.479		8.40	-30.15	45680.78	-32.85		
alpha	I	2042-06-04T04:58:38.200		8.29	-30.21	44684.69	-32.64		
4	I	2042-06-04T04:59:43.180		8.07	-30.33	42576.18	-32.15		
5	I	2042-06-04T04:59:51.762		8.04	-30.35	42252.22	-32.02		
6	I	2042-06-04T05:00:07.281		7.99	-30.37	41803.00	-31.93		
Uranus	I	2042-06-04T05:08:04.080		6.35	-31.23	25529.61		16.60	17.34
Uranus	E	2042-06-04T05:27:29.295		2.38x	-33.09	25454.54		-32.66	-33.87
6	E	2042-06-04T05:31:49.994		1.50x	-33.46	41875.23	32.02		
5	E	2042-06-04T05:32:05.350		1.45x	-33.49	42296.22	32.11		
4	E	2042-06-04T05:32:13.528		1.42x	-33.50	42608.55	32.23		
alpha	E	2042-06-04T05:33:19.678		1.20x	-33.59	44738.13	32.73		
beta	E	2042-06-04T05:33:47.478		1.10x	-33.63	45646.92	32.95		
eta	E	2042-06-04T05:34:33.826		0.95x	-33.69	47176.12	33.22		
gamma	E	2042-06-04T05:34:47.472		0.90x	-33.71	47630.42	33.34		
delta	E	2042-06-04T05:35:07.531		0.83x	-33.74	48300.35	33.46		
lambda	E	2042-06-04T05:35:58.900		0.66x	-33.81	50026.71	33.75		
epsilon	E	2042-06-04T05:36:21.690		0.58x	-33.84	50797.25	33.81		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2042-06-04T05:17:32.330  
 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 : 660180625659733888  
 2Mass ID (if available) : 08464589+1835450  
 ICRS Star Coord at Epoch: 08h 46m 45.85279s +18:35:44.70764s  
 RUWE (>1.4 is poor) : 1.07  
 K magnitude : 13.936  
 G magnitude : 16.541  
 RP magnitude : 15.713  
 BP magnitude : 17.298  
 DUPflag : 0  
 Distance (au) : 19.019  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.28  
 Sun-Target sep (deg) : 55.92  
 Sun-Moon sep (deg) : 129.05  
 B (ring opening deg) : 38.04  
 PA of pole (deg) : 95.02  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.767  
 C/A sky separation (km) : 24369.4  
 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	2042-06-04T04:55:06.753	53.38	-0.20x	51185.33	-32.12		
lambda	I	2042-06-04T04:55:42.794	53.24	-0.33x	50026.71	-32.03		
delta	I	2042-06-04T04:56:37.002	53.02	-0.52x	48300.35	-31.66		
gamma	I	2042-06-04T04:56:58.327	52.94	-0.60x	47626.94	-31.50		
eta	I	2042-06-04T04:57:12.665	52.88	-0.65x	47176.12	-31.39		
beta	I	2042-06-04T04:58:00.693	52.70	-0.82x	45680.40	-30.99		
alpha	I	2042-06-04T04:58:33.260	52.57	-0.94x	44684.97	-30.72		
4	I	2042-06-04T04:59:42.379	52.30	-1.18x	42579.84	-30.05		
5	I	2042-06-04T04:59:51.646	52.26	-1.22x	42258.64	-29.91		
6	I	2042-06-04T05:00:08.191	52.20	-1.28x	41805.24	-29.77		
Uranus	I	2042-06-04T05:11:57.671	49.42	-3.80x	25556.38		4.90	5.13
Uranus	E	2042-06-04T05:22:59.837	46.83	-6.13	25508.22		-22.07	-23.01
6	E	2042-06-04T05:30:37.096	45.04	-7.73	41873.59	29.83		
5	E	2042-06-04T05:30:53.584	44.98	-7.79	42300.12	29.97		
4	E	2042-06-04T05:31:02.436	44.94	-7.82	42610.44	30.12		
alpha	E	2042-06-04T05:32:12.870	44.67	-8.07	44736.07	30.79		
beta	E	2042-06-04T05:32:42.458	44.55	-8.17	45647.96	31.07		
eta	E	2042-06-04T05:33:31.479	44.36	-8.34	47176.12	31.47		
gamma	E	2042-06-04T05:33:45.897	44.30	-8.39	47630.62	31.58		
delta	E	2042-06-04T05:34:07.051	44.22	-8.46	48300.35	31.74		
lambda	E	2042-06-04T05:35:01.112	44.01	-8.65	50026.71	32.12		
epsilon	E	2042-06-04T05:35:24.683	43.92	-8.73	50785.62	32.21		