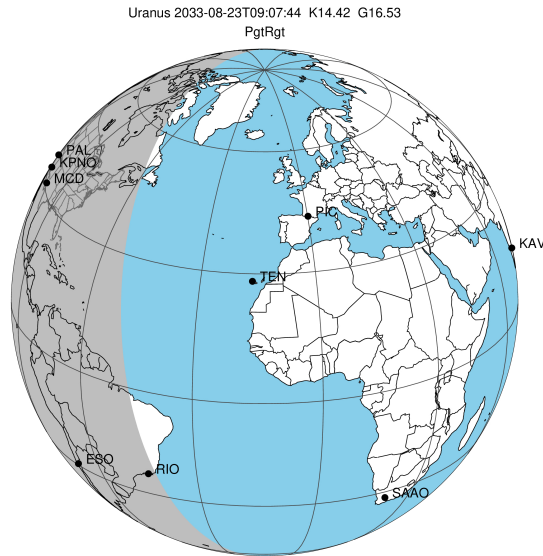


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-23T09:07:44.750  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3377537134544740096  
 2Mass ID (if available) : 06200751+2335298

ICRS Star Coord at Epoch: 06h 20m 07.50460s +23:35:29.73209s

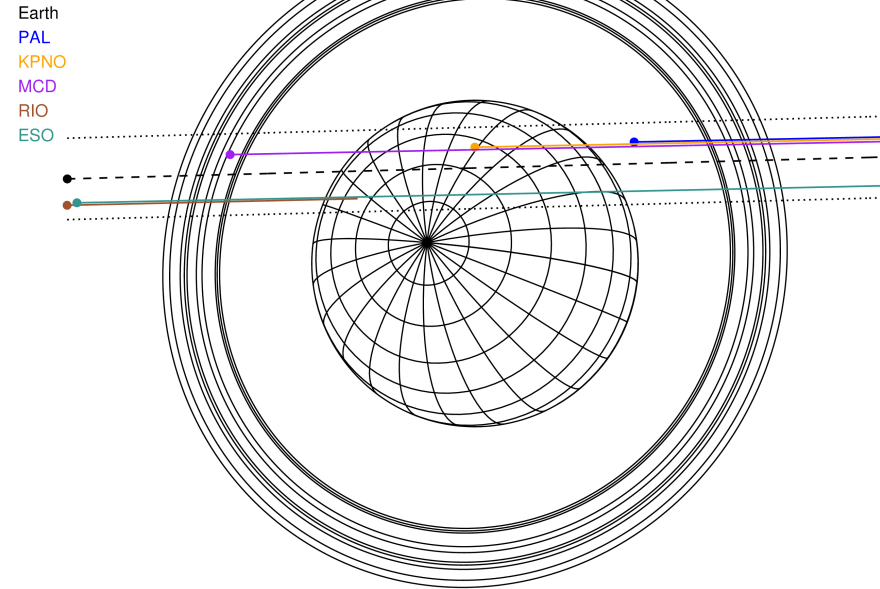
RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.418  
 G magnitude : 16.526  
 RP magnitude : 15.829  
 BP magnitude : 17.046  
 DUPflag : 0  
 Distance (au) : 19.530  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.27  
 Sun-Target sep (deg) : 55.49  
 Sun-Moon sep (deg) : 38.44  
 B (ring opening deg) : 71.31  
 PA of pole (deg) : 66.45

#	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



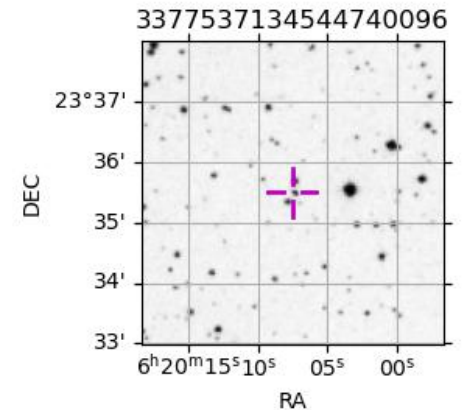
2033-08-23T09:07:44.7500 ex: 06 20 07.5046 8: +23 35 29.732 C/A 1.0611 PA 181.54 deg v\_sky +23.27 km/s D 19.53 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2033-08-23T09:07:44 K14.42 G16.53 PgtRgt

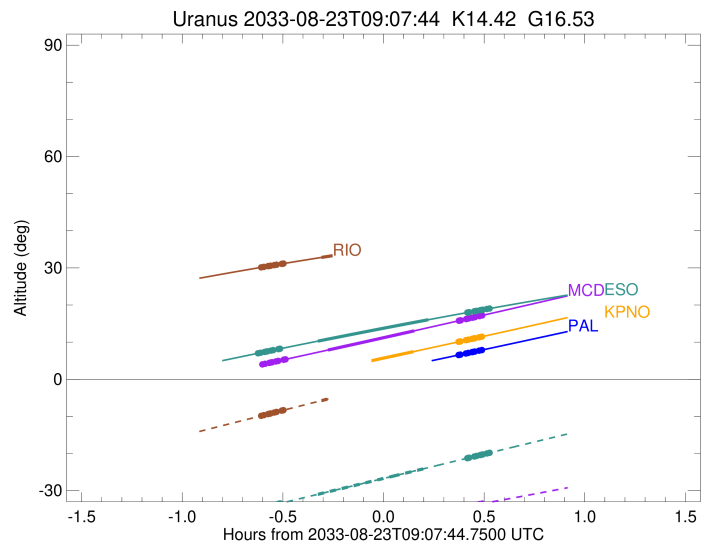
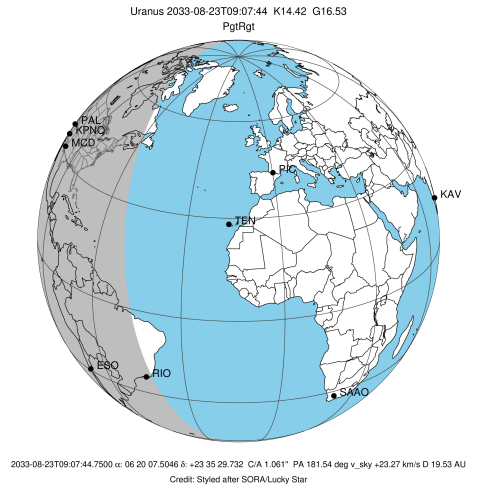


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 23 09:30 - AUG 23 09:37	PnnRne
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4		+	+++++	AUG 23 09:16 - AUG 23 09:37	PneRne
MCD	McDonald Obs. 2.7m	30.7	256.0	+++	+	+++++	AUG 23 08:37 - AUG 23 09:37	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
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	+++++	+		AUG 23 08:31 - AUG 23 08:49	PinRin
ESO	European Southern Obs	-29.3	289.3	+++++	+	+++++	AUG 23 08:30 - AUG 23 09:39	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

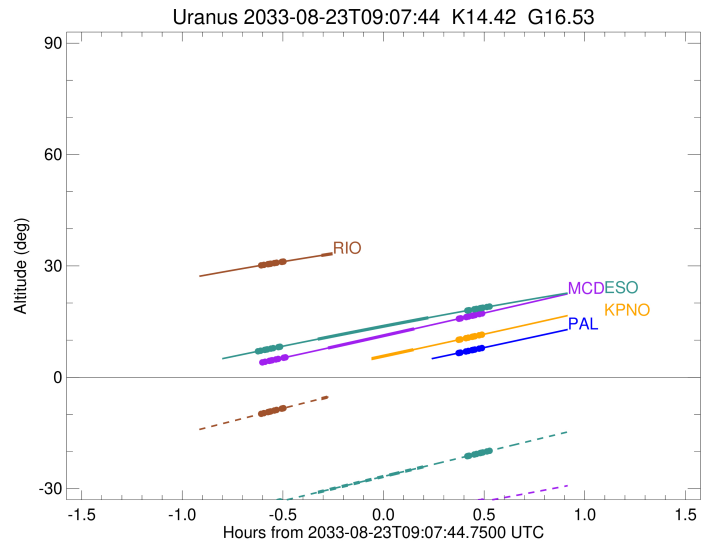
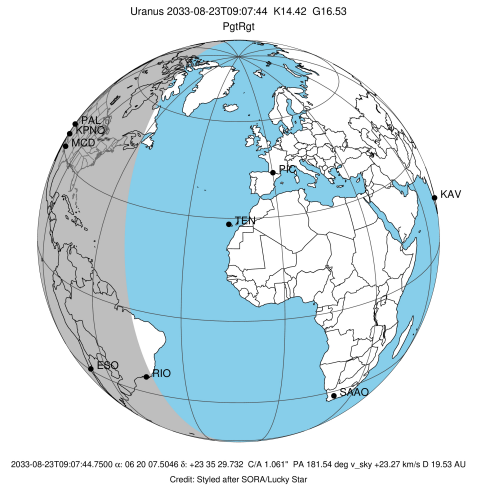


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-23T09:04:03.230  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3377537134544740096  
 2Mass ID (if available) : 06200751+2335298  
 ICRS Star Coord at Epoch: 06h 20m 07.50460s +23:35:29.73209s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.418  
 G magnitude : 16.526  
 RP magnitude : 15.829  
 BP magnitude : 17.046  
 DUPflag : 0  
 Distance (au) : 19.530  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.27  
 Sun-Target sep (deg) : 55.49  
 Sun-Moon sep (deg) : 39.11  
 B (ring opening deg) : 71.31  
 PA of pole (deg) : 66.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.308  
 C/A sky separation (km) : 18522.3  
 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



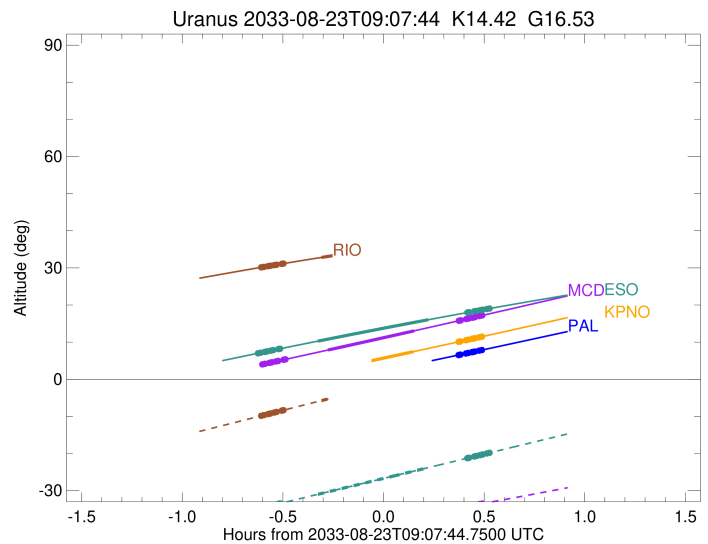
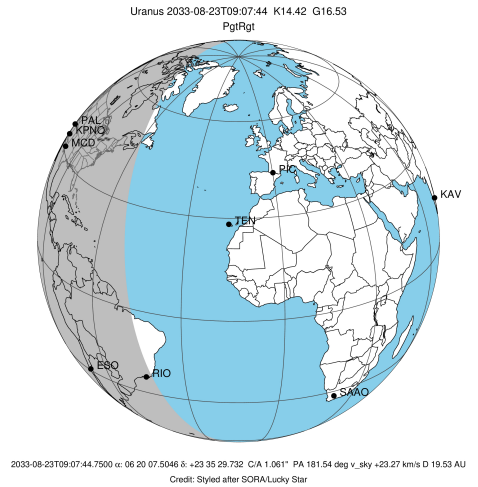
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-08-23T08:32:08.812	-4.22x	-44.43	51177.81	-22.88			
lambda	I	2033-08-23T08:32:59.379	-4.07x	-44.38	50026.71	-22.72			
delta	I	2033-08-23T08:34:15.586	-3.84x	-44.31	48300.35	-22.58			
gamma	I	2033-08-23T08:34:45.424	-3.75x	-44.29	47627.34	-22.53			
eta	I	2033-08-23T08:35:05.473	-3.69x	-44.27	47176.12	-22.49			
beta	I	2033-08-23T08:36:12.227	-3.49x	-44.21	45680.99	-22.34			
alpha	I	2033-08-23T08:36:54.489	-3.37x	-44.17	44733.86	-22.24			
4	I	2033-08-23T08:38:32.740	-3.07x	-44.07	42571.37	-21.99			
5	I	2033-08-23T08:38:50.386	-3.02x	-44.05	42164.50	-21.95			
6	I	2033-08-23T08:39:03.291	-2.98x	-44.04	41878.33	-21.90			
Uranus	I	2033-08-23T08:51:57.922	-0.63x	-43.16	25110.73			17.18	17.94
Uranus	E	2033-08-23T09:16:33.944	3.95x	-41.01	25503.38			-5.90	-6.18
6	E	2033-08-23T09:30:06.331	6.53	-39.57	41821.13	21.81			
5	E	2033-08-23T09:30:28.445	6.60	-39.53	42308.31	21.86			
4	E	2033-08-23T09:30:38.573	6.63	-39.51	42535.40	21.89			
alpha	E	2033-08-23T09:32:16.527	6.94	-39.32	44685.58	22.14			
beta	E	2033-08-23T09:32:59.643	7.08	-39.24	45645.61	22.24			
eta	E	2033-08-23T09:34:08.288	7.30	-39.11	47176.12	22.38			
gamma	E	2033-08-23T09:34:28.520	7.37	-39.07	47629.28	22.42			
delta	E	2033-08-23T09:34:58.419	7.46	-39.01	48300.35	22.47			
lambda	E	2033-08-23T09:36:15.011	7.71	-38.86	50026.71	22.60			
epsilon	E	2033-08-23T09:37:15.570	7.90	-38.74	51398.52	22.76			

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-23T09:03:55.860  
 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 : 3377537134544740096  
 2Mass ID (if available) : 06200751+2335298  
 ICRS Star Coord at Epoch: 06h 20m 07.50460s +23:35:29.73209s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.418  
 G magnitude : 16.526  
 RP magnitude : 15.829  
 BP magnitude : 17.046  
 DUPflag : 0  
 Distance (au) : 19.530  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.27  
 Sun-Target sep (deg) : 55.49  
 Sun-Moon sep (deg) : 39.16  
 B (ring opening deg) : 71.31  
 PA of pole (deg) : 66.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.286  
 C/A sky separation (km) : 18212.6  
 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\_itrf93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



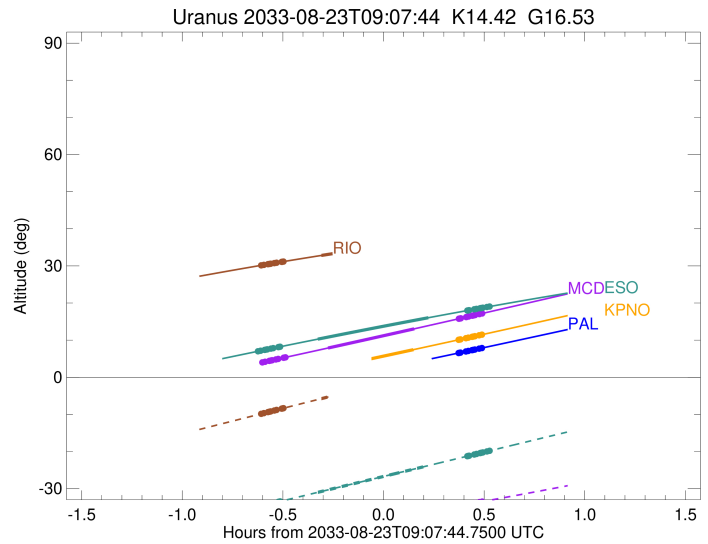
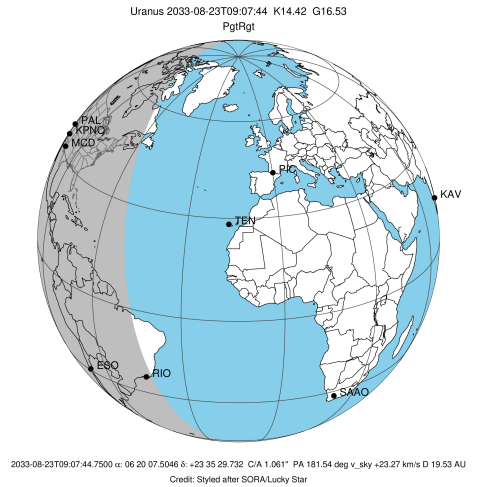
Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-08-23T08:31:53.415	-1.14x	-44.38	51175.25	-22.90		
lambda	I	2033-08-23T08:32:43.805	-0.98x	-44.31	50026.71	-22.75		
delta	I	2033-08-23T08:33:59.899	-0.74x	-44.21	48300.35	-22.62		
gamma	I	2033-08-23T08:34:29.690	-0.65x	-44.17	47627.30	-22.56		
eta	I	2033-08-23T08:34:49.703	-0.59x	-44.14	47176.12	-22.53		
beta	I	2033-08-23T08:35:56.332	-0.38x	-44.05	45681.01	-22.39		
alpha	I	2033-08-23T08:36:38.495	-0.25x	-43.99	44734.09	-22.28		
4	I	2033-08-23T08:38:16.509	0.06x	-43.85	42571.73	-22.04		
5	I	2033-08-23T08:38:34.139	0.12x	-43.83	42164.20	-22.01		
6	I	2033-08-23T08:38:46.997	0.16x	-43.81	41878.24	-21.96		
Uranus	I	2033-08-23T08:51:35.697	2.59x	-42.62	25104.38		17.31	18.08
Uranus	E	2033-08-23T09:16:41.106	7.44	-39.82	25497.54		-6.21	-6.50
6	E	2033-08-23T09:30:07.049	10.09	-38.10	41820.79	21.87		
5	E	2033-08-23T09:30:29.133	10.16	-38.05	42308.59	21.91		
4	E	2033-08-23T09:30:39.227	10.19	-38.03	42535.63	21.95		
alpha	E	2033-08-23T09:32:16.959	10.52	-37.81	44685.64	22.18		
beta	E	2033-08-23T09:32:59.984	10.66	-37.71	45645.51	22.28		
eta	E	2033-08-23T09:34:08.517	10.89	-37.55	47176.12	22.41		
gamma	E	2033-08-23T09:34:28.717	10.95	-37.51	47629.24	22.45		
delta	E	2033-08-23T09:34:58.573	11.05	-37.44	48300.35	22.50		
lambda	E	2033-08-23T09:36:15.067	11.31	-37.27	50026.71	22.63		
epsilon	E	2033-08-23T09:37:15.465	11.51	-37.13	51396.38	22.78		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-23T09:03:50.280  
 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 : 3377537134544740096  
 2Mass ID (if available) : 06200751+2335298  
 ICRS Star Coord at Epoch: 06h 20m 07.50460s +23:35:29.73209s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.418  
 G magnitude : 16.526  
 RP magnitude : 15.829  
 BP magnitude : 17.046  
 DUPflag : 0  
 Distance (au) : 19.530  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.27  
 Sun-Target sep (deg) : 55.49  
 Sun-Moon sep (deg) : 39.22  
 B (ring opening deg) : 71.31  
 PA of pole (deg) : 66.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.258  
 C/A sky separation (km) : 17812.9  
 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



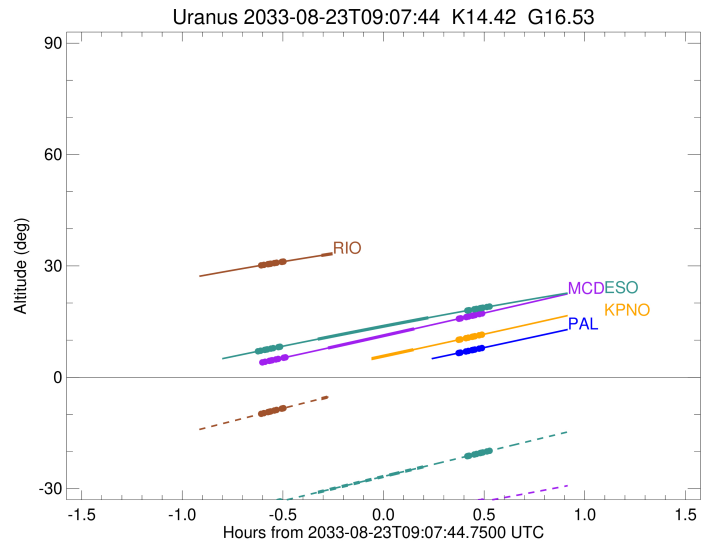
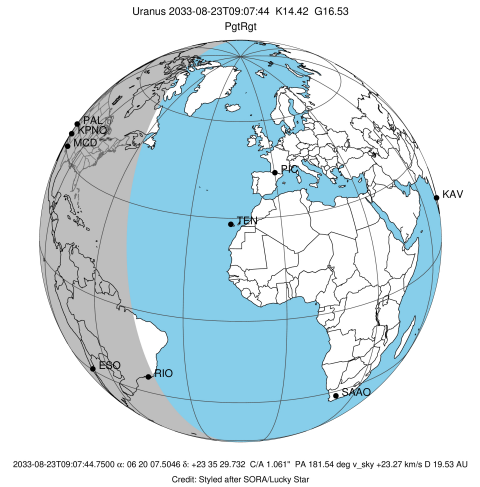
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-08-23T08:31:36.880		4.01x	-42.63	51171.92	-22.93		
lambda	I	2033-08-23T08:32:27.063		4.17x	-42.53	50026.71	-22.78		
delta	I	2033-08-23T08:33:43.048		4.42x	-42.39	48300.35	-22.66		
gamma	I	2033-08-23T08:34:12.793		4.52x	-42.33	47627.26	-22.60		
eta	I	2033-08-23T08:34:32.769		4.58x	-42.29	47176.12	-22.57		
beta	I	2033-08-23T08:35:39.268		4.80x	-42.16	45681.04	-22.43		
alpha	I	2033-08-23T08:36:21.327		4.94x	-42.08	44734.38	-22.34		
4	I	2033-08-23T08:37:59.083		5.26	-41.89	42572.20	-22.11		
5	I	2033-08-23T08:38:16.703		5.32	-41.85	42163.81	-22.07		
6	I	2033-08-23T08:38:29.507		5.36	-41.83	41878.12	-22.03		
Uranus	I	2033-08-23T08:51:11.298		7.87	-40.24	25096.63		17.46	18.24
Uranus	E	2033-08-23T09:16:53.906		13.05	-36.64	25489.85		-6.59	-6.90
6	E	2033-08-23T09:30:12.262		15.76	-34.60	41820.37	21.93		
5	E	2033-08-23T09:30:34.316		15.84	-34.54	42308.92	21.97		
4	E	2033-08-23T09:30:44.371		15.87	-34.51	42535.93	22.01		
alpha	E	2033-08-23T09:32:21.863		16.20	-34.26	44685.73	22.23		
beta	E	2033-08-23T09:33:04.788		16.35	-34.14	45645.39	22.32		
eta	E	2033-08-23T09:34:13.206		16.58	-33.96	47176.12	22.45		
gamma	E	2033-08-23T09:34:33.372		16.65	-33.91	47629.20	22.49		
delta	E	2033-08-23T09:35:03.187		16.76	-33.83	48300.35	22.54		
lambda	E	2033-08-23T09:36:19.584		17.02	-33.62	50026.71	22.66		
epsilon	E	2033-08-23T09:37:19.800		17.22	-33.46	51393.64	22.80		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-23T09:05:44.270  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : 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 : 3377537134544740096  
 2Mass ID (if available) : 06200751+2335298  
 ICRS Star Coord at Epoch: 06h 20m 07.50460s +23:35:29.73209s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.418  
 G magnitude : 16.526  
 RP magnitude : 15.829  
 BP magnitude : 17.046  
 DUPflag : 0  
 Distance (au) : 19.530  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.27  
 Sun-Target sep (deg) : 55.49  
 Sun-Moon sep (deg) : 39.03  
 B (ring opening deg) : 71.31  
 PA of pole (deg) : 66.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.747  
 C/A sky separation (km) : 10575.5  
 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\_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	2033-08-23T08:31:19.041	30.16	-9.84	51110.46	-23.51		
lambda	I	2033-08-23T08:32:05.245	30.28	-9.66	50026.71	-23.44		
delta	I	2033-08-23T08:33:18.951	30.46	-9.38	48300.35	-23.40		
gamma	I	2033-08-23T08:33:47.763	30.54	-9.27	47626.39	-23.38		
eta	I	2033-08-23T08:34:07.025	30.59	-9.20	47176.12	-23.37		
beta	I	2033-08-23T08:35:11.107	30.75	-8.96	45681.22	-23.33		
alpha	I	2033-08-23T08:35:51.288	30.85	-8.80	44739.38	-23.29		
4	I	2033-08-23T08:37:24.610	31.09	-8.45	42580.55	-23.22		
5	I	2033-08-23T08:37:42.042	31.13	-8.38	42158.19	-23.20		
6	I	2033-08-23T08:37:54.054	31.16	-8.34	41875.21	-23.19		
Uranus	I	2033-08-23T08:49:13.991	32.82	-5.76	25033.81		18.69	19.51
Uranus	E	2033-08-23T09:22:29.876	37.16	1.76x	25334.25		-11.99	-12.54
6	E	2033-08-23T09:34:11.040	38.47	4.38x	41813.58	23.12		
5	E	2033-08-23T09:34:32.435	38.51	4.46x	42313.33	23.13		
4	E	2033-08-23T09:34:41.897	38.52	4.50x	42541.55	23.15		
alpha	E	2033-08-23T09:36:14.857	38.69	4.85x	44687.64	23.21		
beta	E	2033-08-23T09:36:55.821	38.76	5.00x	45643.56	23.25		
eta	E	2033-08-23T09:38:01.729	38.87	5.24x	47176.12	23.29		
gamma	E	2033-08-23T09:38:21.146	38.90	5.32x	47628.47	23.30		
delta	E	2033-08-23T09:38:49.970	38.95	5.42x	48300.35	23.32		
lambda	E	2033-08-23T09:40:03.940	39.08	5.70x	50026.71	23.36		
epsilon	E	2033-08-23T09:41:00.316	39.17	5.91x	51344.35	23.42		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-23T09:04:29.350  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : 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 : 3377537134544740096  
 2Mass ID (if available) : 06200751+2335298  
 ICRS Star Coord at Epoch: 06h 20m 07.50460s +23:35:29.73209s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 14.418  
 G magnitude : 16.526  
 RP magnitude : 15.829  
 BP magnitude : 17.046  
 DUPflag : 0  
 Distance (au) : 19.530  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.27  
 Sun-Target sep (deg) : 55.49  
 Sun-Moon sep (deg) : 39.03  
 B (ring opening deg) : 71.31  
 PA of pole (deg) : 66.45  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.762  
 C/A sky separation (km) : 10794.4  
 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	2033-08-23T08:30:21.010		7.01	-34.87	51113.09	-23.66		
lambda	I	2033-08-23T08:31:07.024		7.15	-34.70	50026.71	-23.60		
delta	I	2033-08-23T08:32:20.256		7.38	-34.44	48300.35	-23.55		
gamma	I	2033-08-23T08:32:48.884		7.46	-34.34	47626.43	-23.53		
eta	I	2033-08-23T08:33:08.026		7.52	-34.27	47176.12	-23.52		
beta	I	2033-08-23T08:34:11.707		7.72	-34.04	45681.23	-23.47		
alpha	I	2033-08-23T08:34:51.649		7.84	-33.89	44739.18	-23.43		
4	I	2033-08-23T08:36:24.411		8.13	-33.55	42580.22	-23.36		
5	I	2033-08-23T08:36:41.714		8.18	-33.49	42158.36	-23.34		
6	I	2033-08-23T08:36:53.658		8.22	-33.45	41875.35	-23.33		
Uranus	I	2033-08-23T08:48:10.331		10.27	-30.99	25033.91		18.69	19.51
Uranus	E	2033-08-23T09:21:04.212		16.03	-23.81	25337.87		-11.89	-12.44
6	E	2033-08-23T09:32:43.036		17.97	-21.26	41813.68	23.23		
5	E	2033-08-23T09:33:04.326		18.03	-21.18	42313.28	23.24		
4	E	2033-08-23T09:33:13.744		18.05	-21.15	42541.45	23.25		
alpha	E	2033-08-23T09:34:46.269		18.31	-20.81	44687.61	23.33		
beta	E	2033-08-23T09:35:27.041		18.42	-20.66	45643.58	23.36		
eta	E	2033-08-23T09:36:32.631		18.60	-20.43	47176.12	23.40		
gamma	E	2033-08-23T09:36:51.955		18.65	-20.36	47628.48	23.42		
delta	E	2033-08-23T09:37:20.638		18.73	-20.25	48300.35	23.43		
lambda	E	2033-08-23T09:38:34.247		18.92	-19.98	50026.71	23.47		
epsilon	E	2033-08-23T09:39:30.374		19.08	-19.78	51345.02	23.54		