

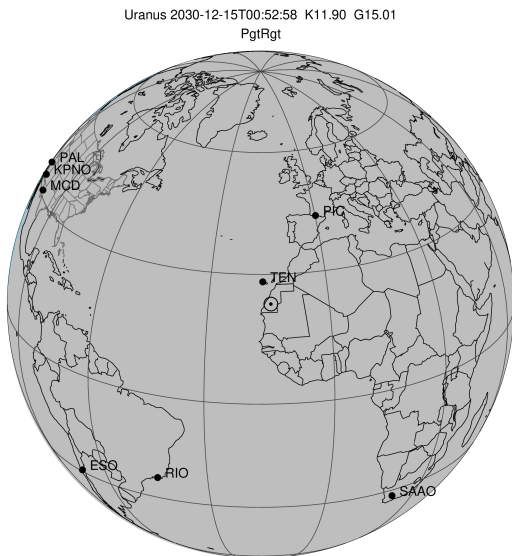
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:52:58.710  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393

Uranus 2030-12-15T00:52:58 K11.90 G15.01 PgtRgt

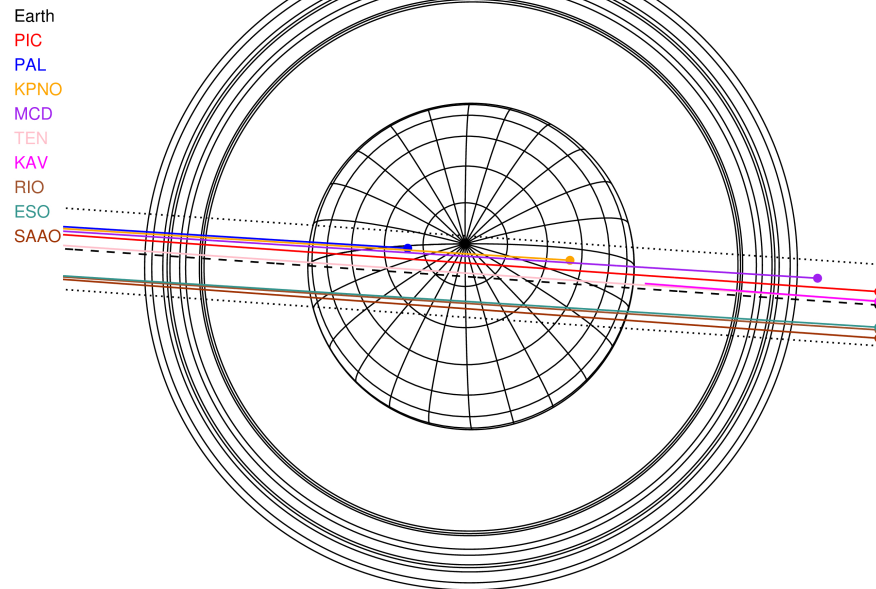
ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s

RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 58.04  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64

#	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

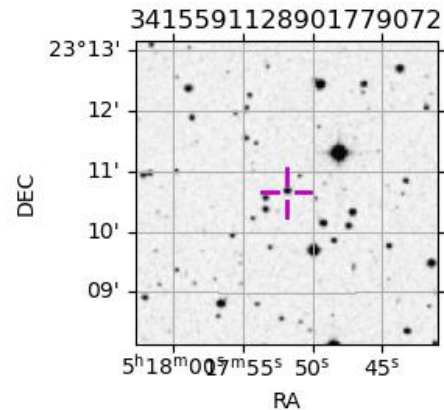


2030-12-15T00:52:58.7100 ra: 05 17 51.8343 s: +23 10 38.880 C/A 0.118° PA 356.04 deg v\_sky -23.42 km/s D 18.17 AU  
 Credit: Styled after SORA/Lucky Star

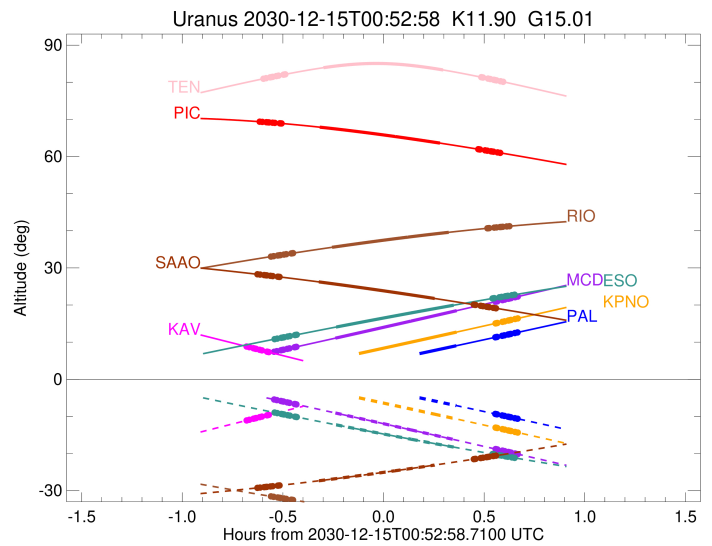
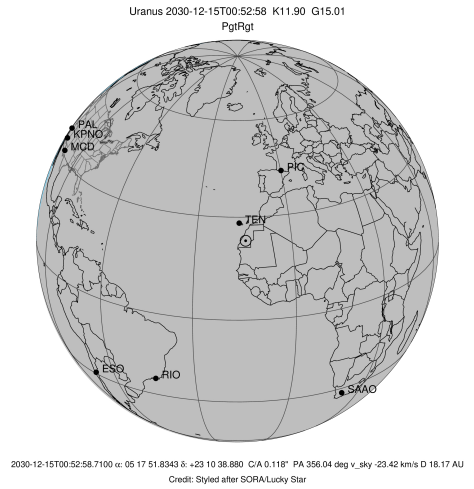


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++	+ +	+++++	DEC 15 00:16 - DEC 15 01:28	PieRie
PAL	Palomar Mt (200")	33.4	243.1		+	+++++	DEC 15 01:14 - DEC 15 01:33	PneRne
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4		+	+++++	DEC 15 01:14 - DEC 15 01:33	PneRne
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	DEC 15 00:20 - DEC 15 01:33	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++	+ +	+++++	DEC 15 00:17 - DEC 15 01:28	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++			DEC 15 00:12 - DEC 15 00:18	PnnRin
RIO	Rio de Janeiro	-22.9	316.8	+++++	+ +	+++++	DEC 15 00:19 - DEC 15 01:30	PieRie
ESO	European Southern Obs	-29.3	289.3	+++++	+ +	+++++	DEC 15 00:20 - DEC 15 01:32	PieRie
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++	+ +	+++++	DEC 15 00:15 - DEC 15 01:26	PieRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

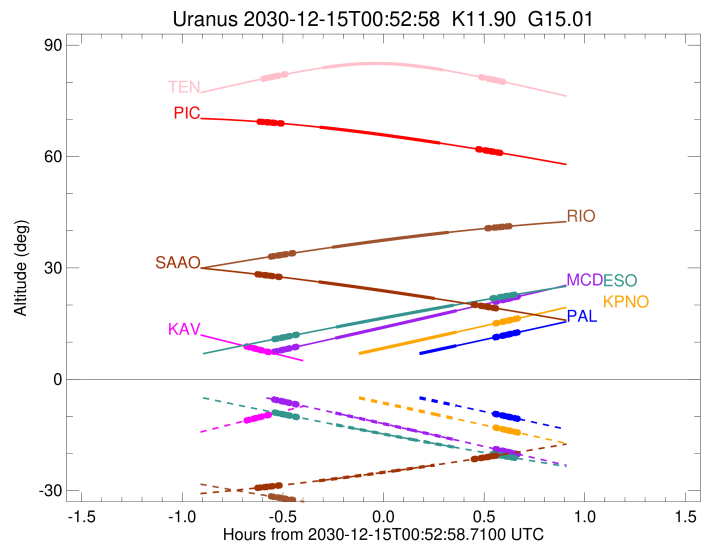
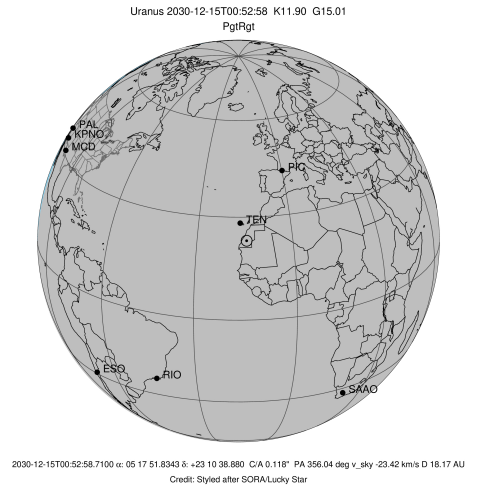


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:51:54.480  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393  
 ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s  
 RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 58.66  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.037  
 C/A sky separation (km) : 484.8  
 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



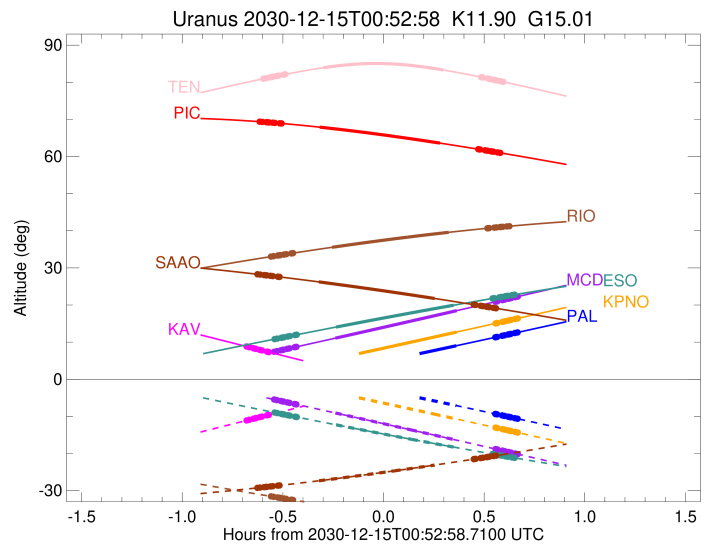
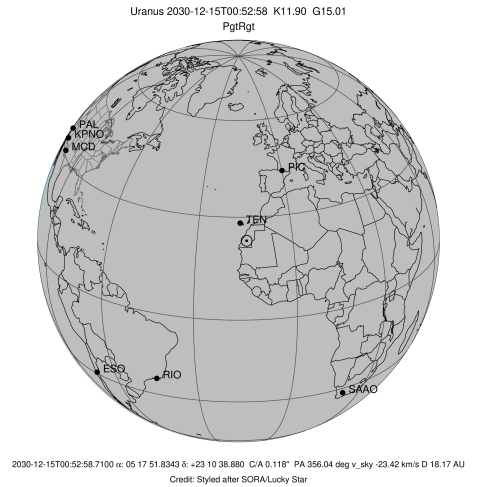
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-12-15T00:16:21.065		69.37	-69.98	50747.33	-23.78		
lambda	I	2030-12-15T00:16:51.372		69.33	-69.96	50026.71	-23.78		
delta	I	2030-12-15T00:18:03.979		69.25	-69.90	48300.35	-23.78		
gamma	I	2030-12-15T00:18:32.534		69.21	-69.87	47621.40	-23.78		
eta	I	2030-12-15T00:18:51.262		69.19	-69.86	47176.12	-23.78		
beta	I	2030-12-15T00:19:54.257		69.12	-69.80	45678.20	-23.78		
alpha	I	2030-12-15T00:20:35.526		69.06	-69.76	44696.70	-23.77		
4	I	2030-12-15T00:22:06.646		68.95	-69.67	42531.91	-23.77		
5	I	2030-12-15T00:22:19.853		68.93	-69.66	42215.54	-23.77		
6	I	2030-12-15T00:22:34.911		68.91	-69.65	41860.83	-23.77		
Uranus	I	2030-12-15T00:34:00.887		67.91	-68.84	25505.29		-2.48	-2.60
Uranus	E	2030-12-15T01:09:47.825		63.62	-65.02	25491.57		2.78	2.91
6	E	2030-12-15T01:21:12.636		61.98	-63.48	41812.69	23.75		
5	E	2030-12-15T01:21:31.290		61.93	-63.44	42252.23	23.75		
4	E	2030-12-15T01:21:46.247		61.90	-63.41	42609.97	23.75		
alpha	E	2030-12-15T01:23:15.989		61.67	-63.19	44739.68	23.75		
beta	E	2030-12-15T01:23:54.045		61.58	-63.10	45643.84	23.75		
eta	E	2030-12-15T01:24:58.556		61.42	-62.95	47176.12	23.75		
gamma	E	2030-12-15T01:25:17.717		61.37	-62.91	47631.18	23.75		
delta	E	2030-12-15T01:25:45.893		61.30	-62.84	48300.35	23.75		
lambda	E	2030-12-15T01:26:58.585		61.11	-62.66	50026.71	23.75		
epsilon	E	2030-12-15T01:28:02.830		60.95	-62.51	51552.47	23.75		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:56:33.920  
 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 : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393  
 ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s  
 RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 58.51  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.170  
 C/A sky separation (km) : 2238.7  
 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



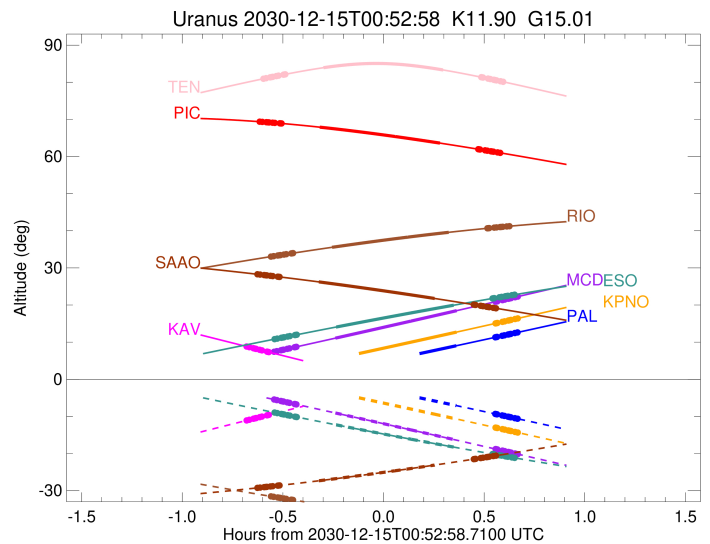
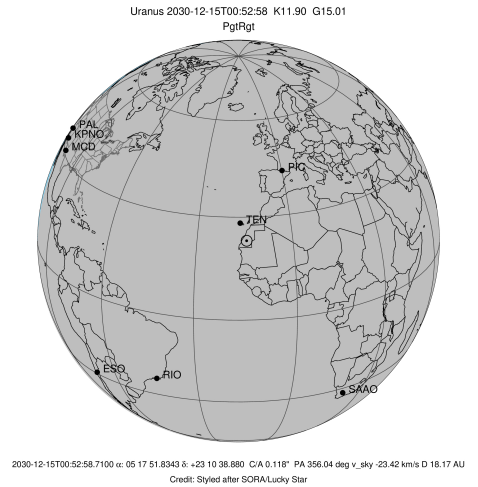
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-12-15T00:20:22.202	-1.26x	3.04x	50749.95	-23.31			
lambda	I	2030-12-15T00:20:53.260	-1.16x	2.95x	50026.71	-23.29			
delta	I	2030-12-15T00:22:07.396	-0.94x	2.73x	48300.35	-23.29			
gamma	I	2030-12-15T00:22:36.548	-0.85x	2.64x	47621.50	-23.29			
eta	I	2030-12-15T00:22:55.675	-0.79x	2.58x	47176.12	-23.29			
beta	I	2030-12-15T00:24:00.017	-0.59x	2.39x	45677.70	-23.29			
alpha	I	2030-12-15T00:24:42.185	-0.46x	2.26x	44695.53	-23.28			
4	I	2030-12-15T00:26:15.206	-0.17x	1.98x	42530.88	-23.28			
5	I	2030-12-15T00:26:28.821	-0.13x	1.94x	42211.79	-23.28			
6	I	2030-12-15T00:26:44.089	-0.09x	1.89x	41859.07	-23.28			
Uranus	I	2030-12-15T00:38:24.205	2.09x	-0.25x	25528.08			-1.88	-1.97
Uranus	E	2030-12-15T01:14:39.608	9.03	-7.09	25466.85			3.25	3.41
6	E	2030-12-15T01:26:16.717	11.30	-9.33	41811.49	23.38			
5	E	2030-12-15T01:26:35.613	11.36	-9.40	42249.52	23.38			
4	E	2030-12-15T01:26:50.877	11.41	-9.45	42609.14	23.38			
alpha	E	2030-12-15T01:28:22.013	11.71	-9.74	44738.82	23.39			
beta	E	2030-12-15T01:29:00.672	11.84	-9.87	45643.53	23.39			
eta	E	2030-12-15T01:30:06.173	12.05	-10.08	47176.12	23.40			
gamma	E	2030-12-15T01:30:25.625	12.12	-10.14	47631.24	23.40			
delta	E	2030-12-15T01:30:54.220	12.21	-10.24	48300.35	23.40			
lambda	E	2030-12-15T01:32:07.990	12.45	-10.47	50026.71	23.40			
epsilon	E	2030-12-15T01:33:13.225	12.67	-10.69	51553.61	23.41			

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:56:40.590  
 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 : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393  
 ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s  
 RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 58.57  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.147  
 C/A sky separation (km) : 1938.2  
 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\_itrfr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



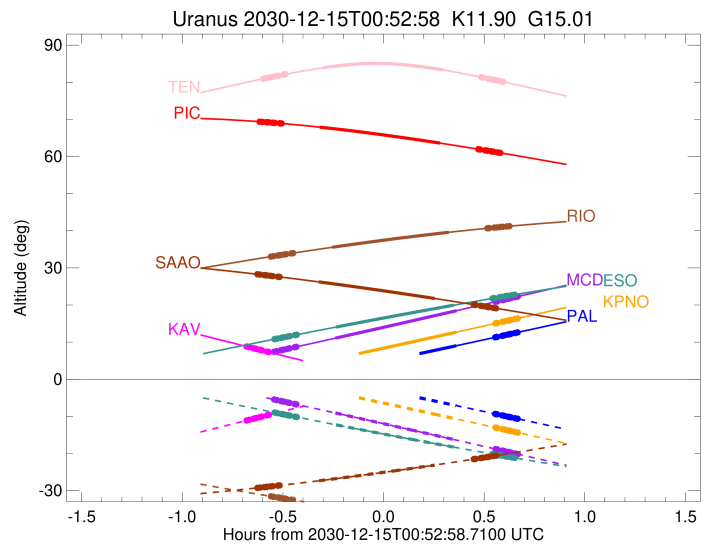
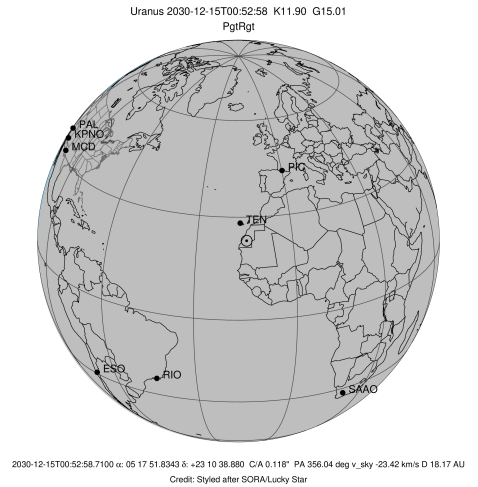
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-12-15T00:20:31.592		2.06x	-0.20x	50749.54	-23.33		
lambda	I	2030-12-15T00:21:02.581		2.16x	-0.29x	50026.71	-23.33		
delta	I	2030-12-15T00:22:16.592		2.40x	-0.53x	48300.35	-23.33		
gamma	I	2030-12-15T00:22:45.696		2.49x	-0.62x	47621.48	-23.33		
eta	I	2030-12-15T00:23:04.789		2.55x	-0.68x	47176.12	-23.33		
beta	I	2030-12-15T00:24:09.017		2.76x	-0.88x	45677.77	-23.33		
alpha	I	2030-12-15T00:24:51.108		2.89x	-1.01x	44695.69	-23.32		
4	I	2030-12-15T00:26:23.968		3.19x	-1.31x	42531.02	-23.33		
5	I	2030-12-15T00:26:37.539		3.23x	-1.35x	42212.33	-23.32		
6	I	2030-12-15T00:26:52.795		3.28x	-1.40x	41859.33	-23.32		
Uranus	I	2030-12-15T00:38:31.561		5.54	-3.62x	25524.98		-1.97	-2.07
Uranus	E	2030-12-15T01:14:45.901		12.71	-10.71	25471.94		3.16	3.31
6	E	2030-12-15T01:26:21.415		15.05	-13.02	41811.75	23.43		
5	E	2030-12-15T01:26:40.286		15.11	-13.08	42250.10	23.42		
4	E	2030-12-15T01:26:55.506		15.16	-13.13	42609.32	23.43		
alpha	E	2030-12-15T01:28:26.470		15.47	-13.44	44739.00	23.43		
beta	E	2030-12-15T01:29:05.053		15.60	-13.56	45643.59	23.44		
eta	E	2030-12-15T01:30:10.430		15.82	-13.78	47176.12	23.44		
gamma	E	2030-12-15T01:30:29.846		15.88	-13.85	47631.23	23.44		
delta	E	2030-12-15T01:30:58.390		15.98	-13.94	48300.35	23.44		
lambda	E	2030-12-15T01:32:12.026		16.23	-14.19	50026.71	23.45		
epsilon	E	2030-12-15T01:33:17.134		16.45	-14.41	51553.38	23.45		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:56:44.680  
 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 : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393  
 ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s  
 RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 58.65  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.117  
 C/A sky separation (km) : 1546.5  
 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



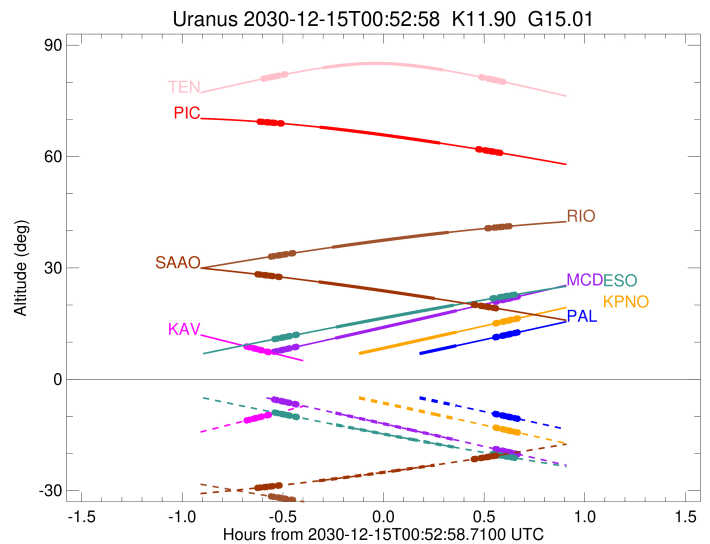
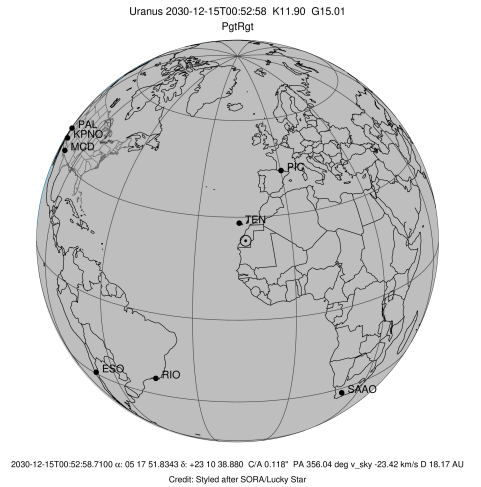
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-12-15T00:20:40.031		7.47	-5.51	50749.04	-23.38		
lambda	I	2030-12-15T00:21:10.922		7.57	-5.61	50026.71	-23.38		
delta	I	2030-12-15T00:22:24.750		7.82	-5.86	48300.35	-23.38		
gamma	I	2030-12-15T00:22:53.782		7.91	-5.95	47621.46	-23.38		
eta	I	2030-12-15T00:23:12.827		7.98	-6.02	47176.12	-23.38		
beta	I	2030-12-15T00:24:16.890		8.19	-6.23	45677.87	-23.38		
alpha	I	2030-12-15T00:24:58.868		8.33	-6.36	44695.90	-23.38		
4	I	2030-12-15T00:26:31.493		8.64	-6.67	42531.21	-23.39		
5	I	2030-12-15T00:26:45.005		8.68	-6.71	42213.03	-23.38		
6	I	2030-12-15T00:27:00.242		8.73	-6.76	41859.66	-23.39		
Uranus	I	2030-12-15T00:38:37.122		11.07	-9.08	25520.70		-2.09	-2.19
Uranus	E	2030-12-15T01:14:48.971		18.49	-16.42	25478.35		3.04	3.19
6	E	2030-12-15T01:26:22.332		20.89	-18.79	41812.08	23.49		
5	E	2030-12-15T01:26:41.168		20.95	-18.86	42250.85	23.49		
4	E	2030-12-15T01:26:56.327		21.00	-18.91	42609.56	23.49		
alpha	E	2030-12-15T01:28:27.053		21.32	-19.22	44739.25	23.49		
beta	E	2030-12-15T01:29:05.529		21.45	-19.36	45643.68	23.50		
eta	E	2030-12-15T01:30:10.735		21.68	-19.58	47176.12	23.50		
gamma	E	2030-12-15T01:30:30.100		21.75	-19.65	47631.21	23.50		
delta	E	2030-12-15T01:30:58.572		21.85	-19.75	48300.35	23.50		
lambda	E	2030-12-15T01:32:12.021		22.10	-20.00	50026.71	23.51		
epsilon	E	2030-12-15T01:33:16.952		22.33	-20.22	51553.06	23.51		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:52:54.900  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : 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 : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393  
 ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s  
 RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 58.82  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.083  
 C/A sky separation (km) : 1088.9  
 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



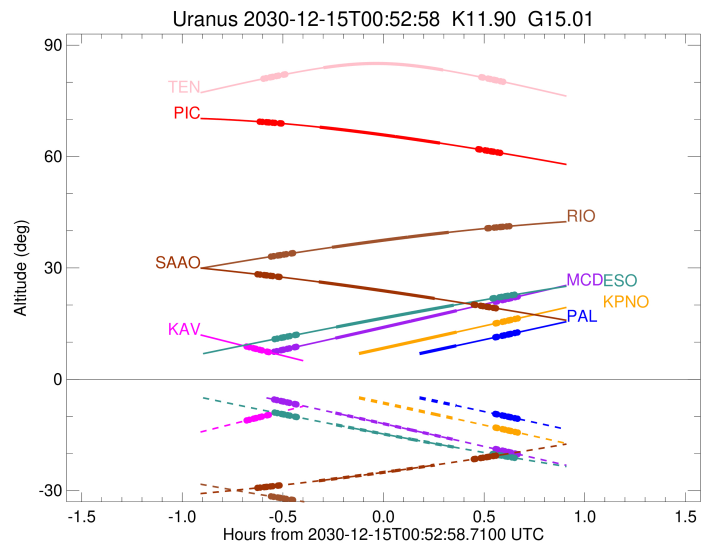
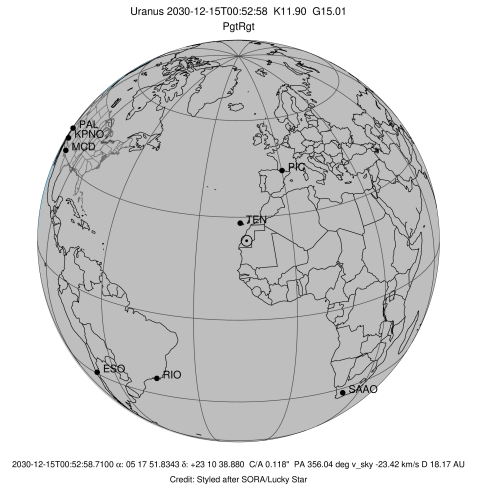
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2030-12-15T00:17:28.894		81.01	-79.08	50745.88	-23.84		
lambda	I	2030-12-15T00:17:59.064		81.11	-79.18	50026.71	-23.84		
delta	I	2030-12-15T00:19:11.488		81.33	-79.43	48300.35	-23.84		
gamma	I	2030-12-15T00:19:39.974		81.42	-79.52	47621.34	-23.84		
eta	I	2030-12-15T00:19:58.652		81.48	-79.58	47176.12	-23.84		
beta	I	2030-12-15T00:21:01.473		81.67	-79.79	45678.54	-23.84		
alpha	I	2030-12-15T00:21:42.612		81.79	-79.92	44697.58	-23.84		
4	I	2030-12-15T00:23:13.510		82.06	-80.22	42532.74	-23.83		
5	I	2030-12-15T00:23:26.593		82.10	-80.26	42218.33	-23.83		
6	I	2030-12-15T00:23:41.691		82.15	-80.31	41862.09	-23.84		
Uranus	I	2030-12-15T00:35:06.461		83.94	-82.42	25483.34		-2.95	-3.08
Uranus	E	2030-12-15T01:10:44.583		83.32	-84.64	25513.47		2.28	2.39
6	E	2030-12-15T01:22:06.748		81.38	-83.17	41814.09	23.84		
5	E	2030-12-15T01:22:25.389		81.32	-83.12	42255.30	23.84		
4	E	2030-12-15T01:22:40.210		81.28	-83.08	42610.86	23.84		
alpha	E	2030-12-15T01:24:09.623		81.00	-82.84	44740.65	23.84		
beta	E	2030-12-15T01:24:47.516		80.88	-82.74	45644.22	23.84		
eta	E	2030-12-15T01:25:51.774		80.67	-82.56	47176.12	23.84		
gamma	E	2030-12-15T01:26:10.861		80.61	-82.50	47631.11	23.84		
delta	E	2030-12-15T01:26:38.936		80.52	-82.42	48300.35	23.84		
lambda	E	2030-12-15T01:27:51.355		80.29	-82.21	50026.71	23.84		
epsilon	E	2030-12-15T01:28:55.283		80.08	-82.03	51550.68	23.84		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:48:30.390  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393  
 ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s  
 RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 57.56  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.043  
 C/A sky separation (km) : 570.8  
 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	2030-12-15T00:12:28.009		8.75	-11.02	50745.93	-23.49		
lambda	I	2030-12-15T00:12:58.634		8.64	-10.91	50026.71	-23.48		
delta	I	2030-12-15T00:14:12.148		8.36	-10.63	48300.35	-23.48		
gamma	I	2030-12-15T00:14:41.066		8.25	-10.52	47621.34	-23.48		
eta	I	2030-12-15T00:15:00.028		8.18	-10.45	47176.12	-23.48		
beta	I	2030-12-15T00:16:03.806		7.94	-10.21	45678.52	-23.48		
alpha	I	2030-12-15T00:16:45.577		7.78	-10.05	44697.51	-23.48		
4	I	2030-12-15T00:18:17.874		7.43	-9.70	42532.66	-23.47		
5	I	2030-12-15T00:18:31.169		7.38	-9.65	42218.07	-23.47		
6	I	2030-12-15T00:18:46.493		7.32	-9.59	41861.97	-23.47		
Uranus	I	2030-12-15T00:30:22.092		4.70x	-6.97	25487.75		-2.86	-2.99
Uranus	E	2030-12-15T01:06:41.070		-3.44x	1.17x	25503.99		2.51	2.63
6	E	2030-12-15T01:18:17.054		-6.01x	3.75x	41813.35	23.35		
5	E	2030-12-15T01:18:36.053		-6.08x	3.82x	42253.69	23.35		
4	E	2030-12-15T01:18:51.225		-6.14x	3.87x	42610.40	23.35		
alpha	E	2030-12-15T01:20:22.501		-6.47x	4.21x	44740.13	23.35		
beta	E	2030-12-15T01:21:01.199		-6.62x	4.35x	45644.01	23.35		
eta	E	2030-12-15T01:22:06.814		-6.86x	4.59x	47176.12	23.35		
gamma	E	2030-12-15T01:22:26.305		-6.93x	4.66x	47631.15	23.35		
delta	E	2030-12-15T01:22:54.969		-7.03x	4.77x	48300.35	23.35		
lambda	E	2030-12-15T01:24:08.922		-7.31x	5.04x	50026.71	23.34		
epsilon	E	2030-12-15T01:25:14.254		-7.55x	5.28x	51551.75	23.34		

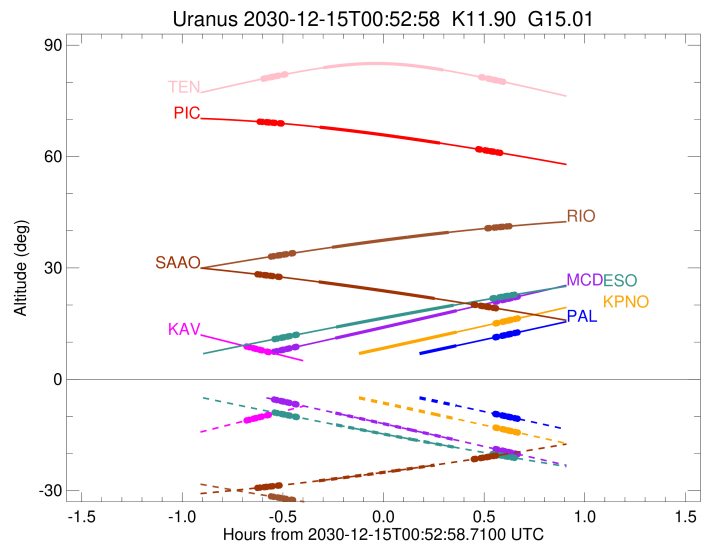
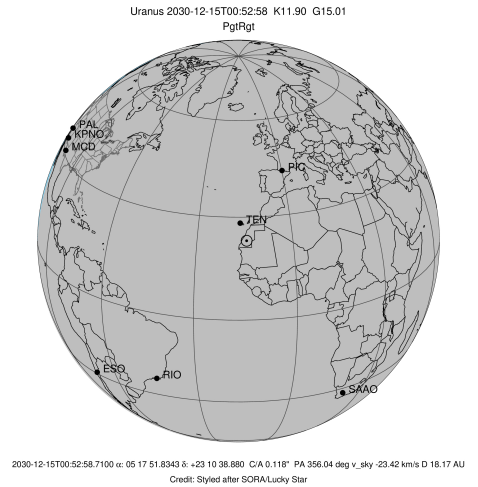
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:54:58.420  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393  
 ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s  
 RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 58.70  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.441  
 C/A sky separation (km) : 5809.2  
 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\_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	2030-12-15T00:19:43.551		33.09	-31.59	50743.58	-23.63		
lambda	I	2030-12-15T00:20:13.897		33.16	-31.67	50026.71	-23.62		
delta	I	2030-12-15T00:21:26.999		33.34	-31.85	48300.35	-23.61		
gamma	I	2030-12-15T00:21:55.769		33.40	-31.92	47621.17	-23.61		
eta	I	2030-12-15T00:22:14.624		33.45	-31.97	47176.12	-23.60		
beta	I	2030-12-15T00:23:18.041		33.60	-32.12	45679.47	-23.59		
alpha	I	2030-12-15T00:23:59.527		33.70	-32.22	44700.46	-23.58		
4	I	2030-12-15T00:25:31.458		33.91	-32.45	42535.58	-23.56		
5	I	2030-12-15T00:25:44.423		33.94	-32.48	42227.07	-23.56		
6	I	2030-12-15T00:25:59.954		33.98	-32.52	41865.77	-23.56		
Uranus	I	2030-12-15T00:37:39.264		35.55	-34.17	25397.87		-4.31	-4.52
Uranus	E	2030-12-15T01:12:23.680		39.58	-38.48	25554.07		0.75	0.79
6	E	2030-12-15T01:23:56.247		40.67	-39.68	41818.42	23.61		
5	E	2030-12-15T01:24:15.213		40.70	-39.71	42264.18	23.61		
4	E	2030-12-15T01:24:29.929		40.72	-39.73	42613.13	23.61		
alpha	E	2030-12-15T01:26:00.145		40.85	-39.88	44743.34	23.64		
beta	E	2030-12-15T01:26:38.302		40.91	-39.94	45645.48	23.64		
eta	E	2030-12-15T01:27:43.018		41.00	-40.04	47176.12	23.66		
gamma	E	2030-12-15T01:28:02.239		41.02	-40.07	47630.86	23.66		
delta	E	2030-12-15T01:28:30.532		41.06	-40.12	48300.35	23.67		
lambda	E	2030-12-15T01:29:43.459		41.16	-40.23	50026.71	23.68		
epsilon	E	2030-12-15T01:30:47.477		41.25	-40.33	51542.93	23.68		

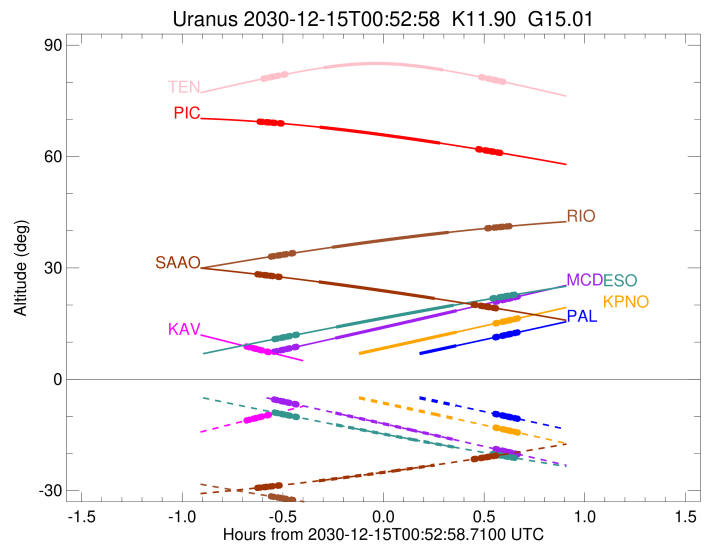
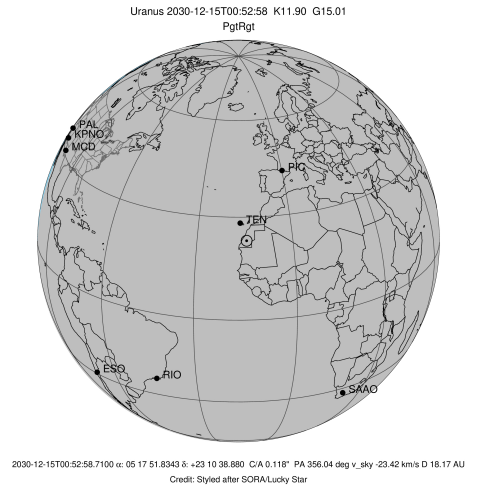


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:56:18.180  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393  
 ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s  
 RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 58.59  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.418  
 C/A sky separation (km) : 5506.1  
 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	2030-12-15T00:20:47.999		10.86	-9.02	50743.64	-23.48		
lambda	I	2030-12-15T00:21:18.536		10.95	-9.12	50026.71	-23.48		
delta	I	2030-12-15T00:22:32.087		11.18	-9.34	48300.35	-23.47		
gamma	I	2030-12-15T00:23:01.031		11.26	-9.43	47621.18	-23.46		
eta	I	2030-12-15T00:23:20.001		11.32	-9.48	47176.12	-23.46		
beta	I	2030-12-15T00:24:23.803		11.51	-9.68	45679.40	-23.45		
alpha	I	2030-12-15T00:25:05.543		11.64	-9.80	44700.22	-23.44		
4	I	2030-12-15T00:26:38.011		11.91	-10.08	42535.33	-23.43		
5	I	2030-12-15T00:26:51.073		11.95	-10.12	42226.35	-23.43		
6	I	2030-12-15T00:27:06.672		12.00	-10.17	41865.48	-23.42		
Uranus	I	2030-12-15T00:38:49.247		14.06	-12.27	25405.16		-4.21	-4.41
Uranus	E	2030-12-15T01:13:52.396		19.94	-18.26	25552.92		0.83	0.87
6	E	2030-12-15T01:25:27.581		21.77	-20.14	41818.22	23.50		
5	E	2030-12-15T01:25:46.623		21.82	-20.19	42263.78	23.51		
4	E	2030-12-15T01:26:01.414		21.86	-20.23	42613.04	23.51		
alpha	E	2030-12-15T01:27:32.019		22.09	-20.47	44743.23	23.53		
beta	E	2030-12-15T01:28:10.344		22.19	-20.57	45645.42	23.54		
eta	E	2030-12-15T01:29:15.346		22.35	-20.74	47176.12	23.55		
gamma	E	2030-12-15T01:29:34.652		22.40	-20.79	47630.87	23.56		
delta	E	2030-12-15T01:30:03.069		22.47	-20.86	48300.35	23.56		
lambda	E	2030-12-15T01:31:16.317		22.66	-21.05	50026.71	23.57		
epsilon	E	2030-12-15T01:32:20.634		22.82	-21.22	51543.32	23.58		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2030-12-15T00:50:53.730  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : 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 : 3415591128901779072  
 2Mass ID (if available) : 05175185+2310393  
 ICRS Star Coord at Epoch: 05h 17m 51.83431s +23:10:38.87991s  
 RUWE (>1.4 is poor) : 17.61  
 K magnitude : 11.903  
 G magnitude : 15.009  
 RP magnitude : 13.963  
 BP magnitude : 15.680  
 DUPflag : 0  
 Distance (au) : 18.171  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.42  
 Sun-Target sep (deg) : 177.68  
 Sun-Moon sep (deg) : 58.10  
 B (ring opening deg) : 81.74  
 PA of pole (deg) : 14.64  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.504  
 C/A sky separation (km) : 6648.0  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl1.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	2030-12-15T00:15:41.000		28.25	-29.23	50743.52	-23.58		
lambda	I	2030-12-15T00:16:11.404		28.20	-29.18	50026.71	-23.57		
delta	I	2030-12-15T00:17:24.664		28.07	-29.06	48300.35	-23.56		
gamma	I	2030-12-15T00:17:53.502		28.02	-29.01	47621.13	-23.55		
eta	I	2030-12-15T00:18:12.402		27.98	-28.98	47176.12	-23.54		
beta	I	2030-12-15T00:19:15.974		27.87	-28.87	45679.68	-23.53		
alpha	I	2030-12-15T00:19:57.551		27.79	-28.80	44701.22	-23.52		
4	I	2030-12-15T00:21:29.770		27.63	-28.65	42536.35	-23.49		
5	I	2030-12-15T00:21:42.714		27.60	-28.63	42229.27	-23.49		
6	I	2030-12-15T00:21:58.364		27.57	-28.60	41866.63	-23.48		
Uranus	I	2030-12-15T00:33:42.429		26.23	-27.35	25375.89		-4.60	-4.82
Uranus	E	2030-12-15T01:08:13.683		21.76	-23.11	25556.52		0.53	0.56
6	E	2030-12-15T01:19:52.884		20.10	-21.52	41818.94	23.42		
5	E	2030-12-15T01:20:12.015		20.05	-21.48	42265.16	23.43		
4	E	2030-12-15T01:20:26.819		20.02	-21.44	42613.35	23.43		
alpha	E	2030-12-15T01:21:57.739		19.80	-21.23	44743.61	23.45		
beta	E	2030-12-15T01:22:36.184		19.70	-21.14	45645.63	23.46		
eta	E	2030-12-15T01:23:41.388		19.54	-20.98	47176.12	23.48		
gamma	E	2030-12-15T01:24:00.753		19.49	-20.94	47630.83	23.48		
delta	E	2030-12-15T01:24:29.261		19.42	-20.87	48300.35	23.49		
lambda	E	2030-12-15T01:25:42.734		19.24	-20.70	50026.71	23.50		
epsilon	E	2030-12-15T01:26:47.186		19.08	-20.54	51541.97	23.51		