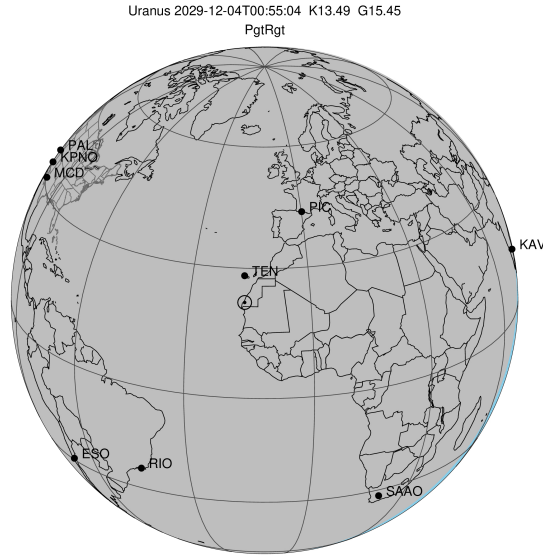


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:55:04.680  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386

ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s

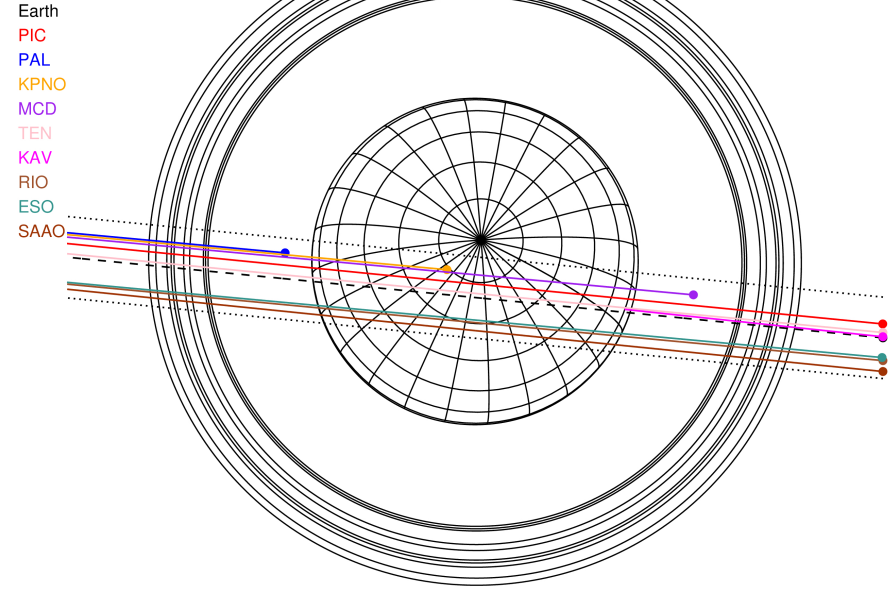
RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 153.13  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84

#	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



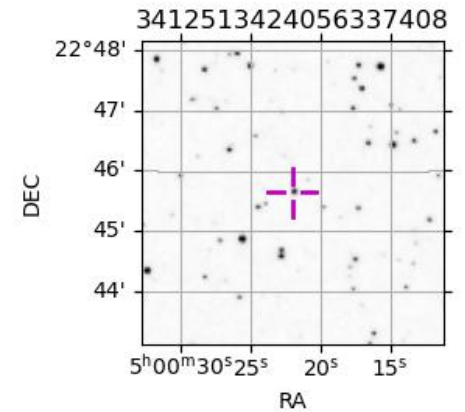
2029-12-04T00:55:04.6800 ra: 05 00 22.0152 s: +22 45 38.644 C/A 0.419° PA 354.36 deg v\_sky -23.38 km/s D 18.24 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2029-12-04T00:55:04 K13.49 G15.45 PgtRgt

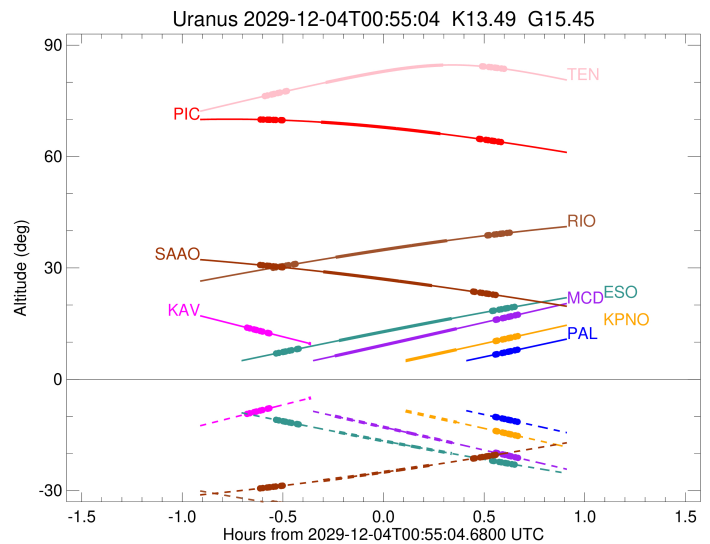
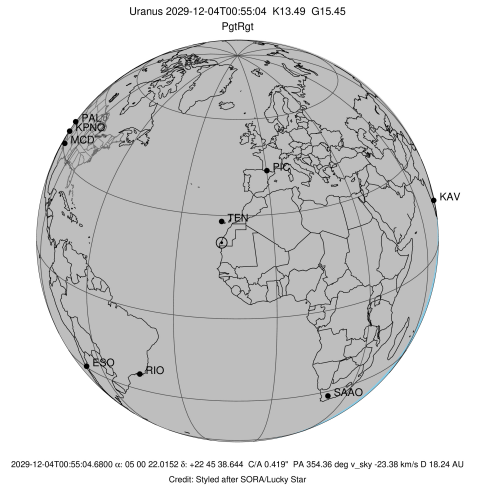


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++	+ +	+++++	DEC 04 00:18 - DEC 04 01:29	PieRie
PAL	Palomar Mt (200")	33.4	243.1			+++++	DEC 04 01:28 - DEC 04 01:34	PnnRne
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4		+	+++++	DEC 04 01:16 - DEC 04 01:34	PneRne
MCD	McDonald Obs. 2.7m	30.7	256.0		+ +	+++++	DEC 04 00:40 - DEC 04 01:34	PieRne
TEN	Teide Obs./Tenerife	28.3	343.5	+++++	+ +	+++++	DEC 04 00:19 - DEC 04 01:30	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++	+		DEC 04 00:14 - DEC 04 00:32	PinRin
RIO	Rio de Janeiro	-22.9	316.8	+++++	+ +	+++++	DEC 04 00:21 - DEC 04 01:32	PieRie
ESO	European Southern Obs	-29.3	289.3	+++++	+ +	+++++	DEC 04 00:22 - DEC 04 01:33	PieRie
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++	+ +	+++++	DEC 04 00:18 - DEC 04 01:28	PieRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

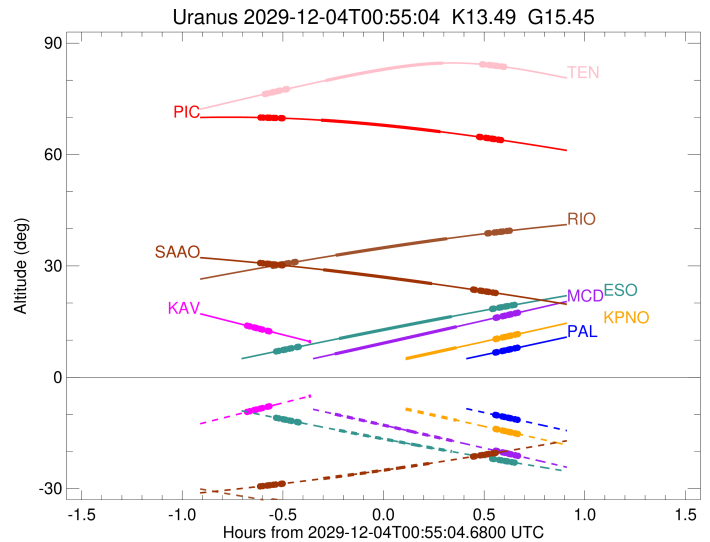
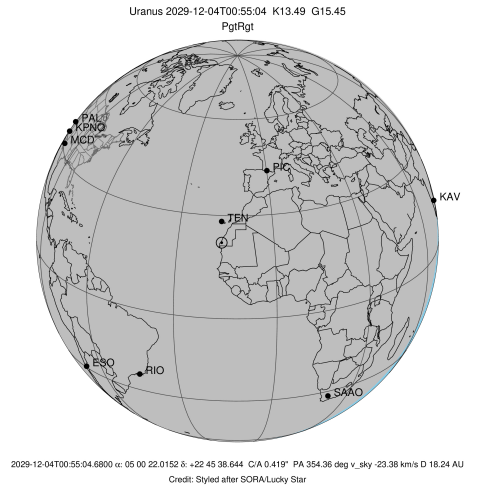


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:54:16.590  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386  
 ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s  
 RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 153.68  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.265  
 C/A sky separation (km) : 3503.5  
 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\_itrfr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



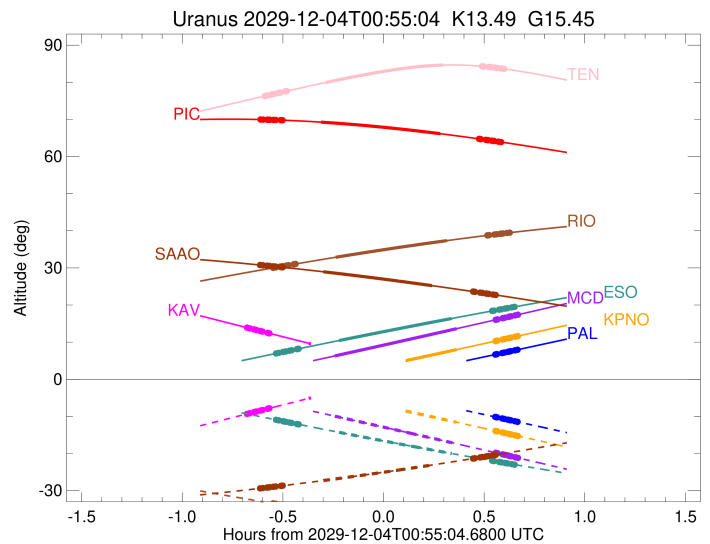
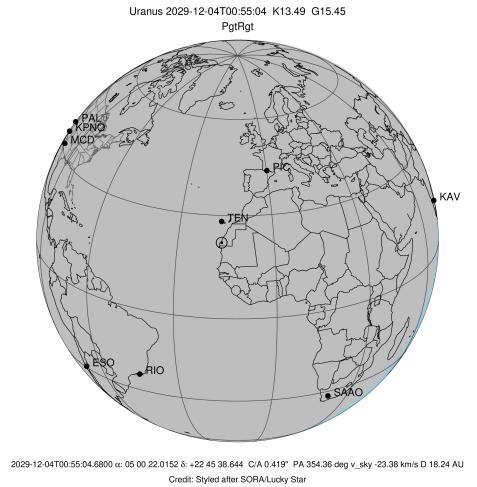
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-04T00:18:09.751		69.97	-68.65	51520.14	-23.65		
lambda	I	2029-12-04T00:19:12.880		69.95	-68.59	50026.71	-23.65		
delta	I	2029-12-04T00:20:25.870		69.92	-68.51	48300.35	-23.65		
gamma	I	2029-12-04T00:20:54.539		69.91	-68.48	47622.36	-23.65		
eta	I	2029-12-04T00:21:13.410		69.90	-68.46	47176.12	-23.65		
beta	I	2029-12-04T00:22:17.202		69.87	-68.39	45667.85	-23.64		
alpha	I	2029-12-04T00:22:58.345		69.85	-68.35	44695.21	-23.64		
4	I	2029-12-04T00:24:26.782		69.81	-68.25	42605.05	-23.63		
5	I	2029-12-04T00:24:39.342		69.80	-68.23	42308.80	-23.63		
6	I	2029-12-04T00:24:57.493		69.79	-68.21	41879.18	-23.63		
Uranus	I	2029-12-04T00:36:28.899		69.26	-67.29	25558.01		0.32	0.34
Uranus	E	2029-12-04T01:12:02.057		66.15	-63.27	25501.82		-2.44	-2.55
6	E	2029-12-04T01:23:31.689		64.76	-61.69	41797.03	23.61		
5	E	2029-12-04T01:23:47.305		64.73	-61.65	42167.38	23.62		
4	E	2029-12-04T01:24:03.249		64.69	-61.61	42542.77	23.62		
alpha	E	2029-12-04T01:25:36.166		64.50	-61.39	44737.69	23.62		
beta	E	2029-12-04T01:26:15.092		64.41	-61.29	45657.38	23.63		
eta	E	2029-12-04T01:27:19.367		64.27	-61.14	47176.12	23.63		
gamma	E	2029-12-04T01:27:38.599		64.23	-61.09	47630.65	23.63		
delta	E	2029-12-04T01:28:06.934		64.17	-61.02	48300.35	23.64		
lambda	E	2029-12-04T01:29:19.968		64.01	-60.85	50026.71	23.64		
epsilon	E	2029-12-04T01:29:50.946		63.94	-60.77	50759.04	23.64		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:58:28.870  
 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 : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386  
 ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s  
 RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 152.40  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.106  
 C/A sky separation (km) : 1401.3  
 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



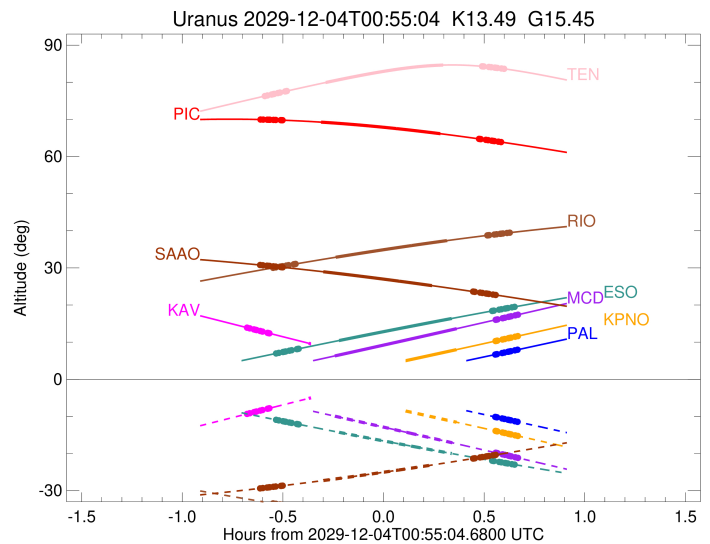
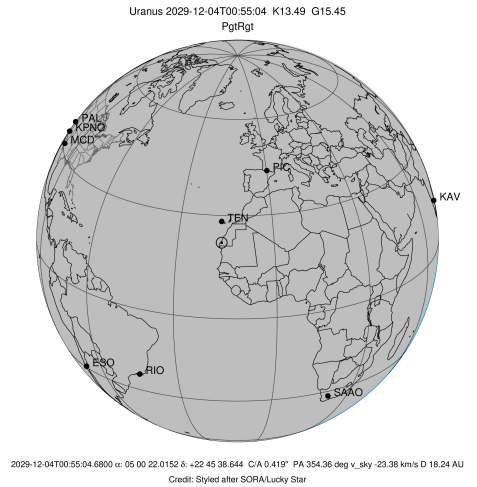
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-04T00:21:33.048	-5.77x	2.58x	51527.41	-23.20			
lambda	I	2029-12-04T00:22:37.740	-5.58x	2.38x	50026.71	-23.20			
delta	I	2029-12-04T00:23:52.157	-5.36x	2.16x	48300.35	-23.20			
gamma	I	2029-12-04T00:24:21.389	-5.27x	2.07x	47622.19	-23.20			
eta	I	2029-12-04T00:24:40.617	-5.22x	2.01x	47176.12	-23.20			
beta	I	2029-12-04T00:25:45.674	-5.02x	1.81x	45666.87	-23.20			
alpha	I	2029-12-04T00:26:27.498	-4.90x	1.68x	44696.53	-23.20			
4	I	2029-12-04T00:27:57.717	-4.63x	1.40x	42603.34	-23.20			
5	I	2029-12-04T00:28:10.526	-4.59x	1.36x	42306.95	-23.20			
6	I	2029-12-04T00:28:28.936	-4.53x	1.31x	41878.73	-23.20			
Uranus	I	2029-12-04T00:40:11.592	-2.41x	-0.88x	25549.19			1.01	1.06
Uranus	E	2029-12-04T01:16:43.709	4.42x	-7.87	25525.78			-1.86	-1.94
6	E	2029-12-04T01:28:21.028	6.66	-10.14	41796.45	23.30			
5	E	2029-12-04T01:28:36.807	6.71	-10.19	42165.53	23.30			
4	E	2029-12-04T01:28:52.976	6.76	-10.25	42541.25	23.30			
alpha	E	2029-12-04T01:30:27.275	7.06	-10.55	44738.83	23.31			
beta	E	2029-12-04T01:31:06.652	7.19	-10.68	45656.58	23.31			
eta	E	2029-12-04T01:32:11.846	7.40	-10.90	47176.12	23.31			
gamma	E	2029-12-04T01:32:31.340	7.46	-10.96	47630.54	23.31			
delta	E	2029-12-04T01:33:00.072	7.56	-11.06	48300.35	23.31			
lambda	E	2029-12-04T01:34:14.119	7.80	-11.30	50026.71	23.32			
epsilon	E	2029-12-04T01:34:45.706	7.90	-11.40	50763.22	23.32			

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:58:37.890  
 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 : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386  
 ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s  
 RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 152.40  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.127  
 C/A sky separation (km) : 1683.8  
 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



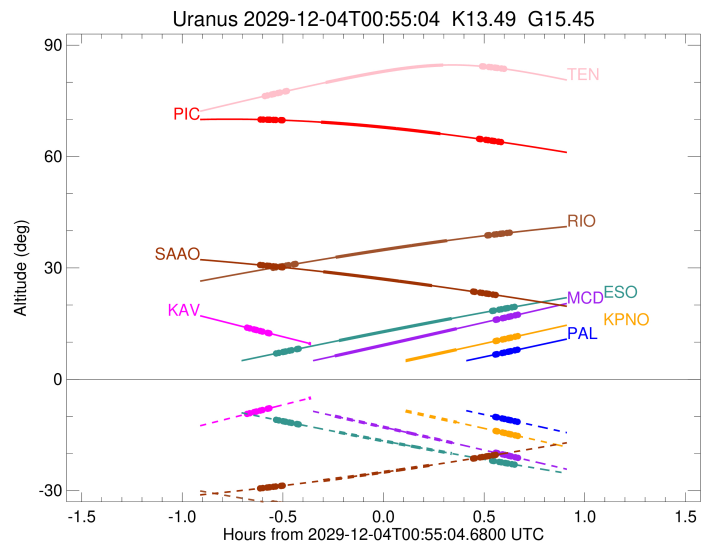
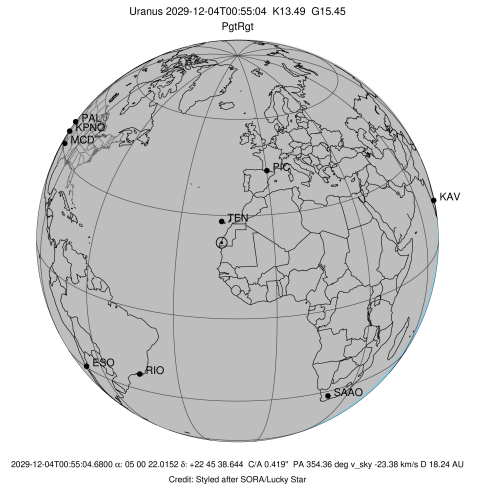
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-04T00:21:45.511	-2.62x	-0.76x	51526.64	-23.22			
lambda	I	2029-12-04T00:22:50.094	-2.42x	-0.97x	50026.71	-23.22			
delta	I	2029-12-04T00:24:04.425	-2.18x	-1.21x	48300.35	-23.23			
gamma	I	2029-12-04T00:24:33.623	-2.09x	-1.30x	47622.21	-23.23			
eta	I	2029-12-04T00:24:52.830	-2.03x	-1.36x	47176.12	-23.23			
beta	I	2029-12-04T00:25:57.808	-1.83x	-1.57x	45666.98	-23.23			
alpha	I	2029-12-04T00:26:39.596	-1.70x	-1.70x	44696.38	-23.23			
4	I	2029-12-04T00:28:09.699	-1.42x	-1.99x	42603.54	-23.23			
5	I	2029-12-04T00:28:22.492	-1.38x	-2.03x	42307.17	-23.23			
6	I	2029-12-04T00:28:40.890	-1.32x	-2.09x	41878.79	-23.23			
Uranus	I	2029-12-04T00:40:22.834	0.90x	-4.36x	25550.75			0.92	0.97
Uranus	E	2029-12-04T01:16:50.256	7.98	-11.57	25522.60			-1.94	-2.04
6	E	2029-12-04T01:28:26.908	10.29	-13.91	41796.54	23.33			
5	E	2029-12-04T01:28:42.675	10.34	-13.96	42165.82	23.33			
4	E	2029-12-04T01:28:58.822	10.39	-14.02	42541.49	23.33			
alpha	E	2029-12-04T01:30:32.983	10.71	-14.34	44738.65	23.34			
beta	E	2029-12-04T01:31:12.322	10.84	-14.47	45656.71	23.34			
eta	E	2029-12-04T01:32:17.426	11.05	-14.69	47176.12	23.34			
gamma	E	2029-12-04T01:32:36.895	11.12	-14.76	47630.56	23.34			
delta	E	2029-12-04T01:33:05.588	11.22	-14.85	48300.35	23.34			
lambda	E	2029-12-04T01:34:19.537	11.46	-15.10	50026.71	23.35			
epsilon	E	2029-12-04T01:34:51.050	11.57	-15.21	50762.49	23.35			

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:58:45.470  
 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 : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386  
 ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s  
 RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 152.42  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.156  
 C/A sky separation (km) : 2057.7  
 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\_itrf93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



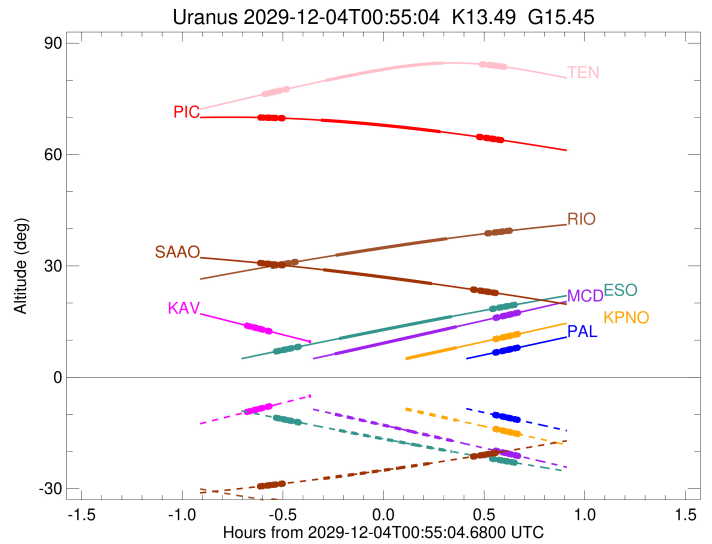
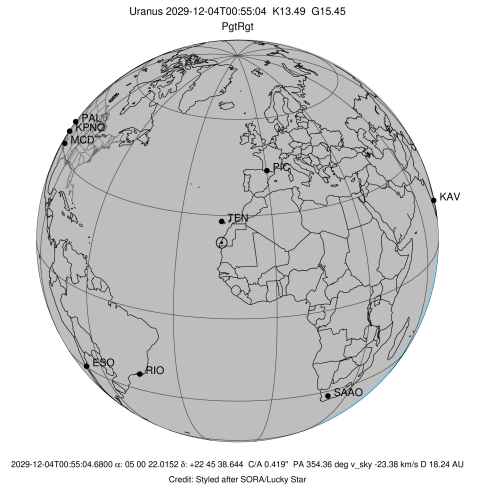
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-04T00:21:58.452		2.62x	-6.20	51525.59	-23.26		
lambda	I	2029-12-04T00:23:02.872		2.83x	-6.42	50026.71	-23.27		
delta	I	2029-12-04T00:24:17.069		3.07x	-6.66	48300.35	-23.27		
gamma	I	2029-12-04T00:24:46.213		3.17x	-6.76	47622.24	-23.27		
eta	I	2029-12-04T00:25:05.386		3.23x	-6.83	47176.12	-23.27		
beta	I	2029-12-04T00:26:10.242		3.44x	-7.04	45667.13	-23.27		
alpha	I	2029-12-04T00:26:51.971		3.58x	-7.18	44696.18	-23.27		
4	I	2029-12-04T00:28:21.896		3.87x	-7.48	42603.81	-23.27		
5	I	2029-12-04T00:28:34.664		3.92x	-7.52	42307.47	-23.27		
6	I	2029-12-04T00:28:53.042		3.98x	-7.59	41878.87	-23.27		
Uranus	I	2029-12-04T00:40:33.904		6.29	-9.94	25552.61		0.81	0.85
Uranus	E	2029-12-04T01:16:54.052		13.63	-17.38	25518.21		-2.06	-2.15
6	E	2029-12-04T01:28:29.727		16.01	-19.79	41796.65	23.37		
5	E	2029-12-04T01:28:45.474		16.07	-19.84	42166.20	23.37		
4	E	2029-12-04T01:29:01.591		16.12	-19.90	42541.81	23.37		
alpha	E	2029-12-04T01:30:35.551		16.45	-20.22	44738.41	23.38		
beta	E	2029-12-04T01:31:14.834		16.58	-20.36	45656.88	23.38		
eta	E	2029-12-04T01:32:19.806		16.80	-20.59	47176.12	23.39		
gamma	E	2029-12-04T01:32:39.238		16.87	-20.65	47630.58	23.39		
delta	E	2029-12-04T01:33:07.875		16.97	-20.75	48300.35	23.39		
lambda	E	2029-12-04T01:34:21.680		17.22	-21.01	50026.71	23.39		
epsilon	E	2029-12-04T01:34:53.092		17.33	-21.12	50761.56	23.39		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:55:22.880  
 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 : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386  
 ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s  
 RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 153.51  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.376  
 C/A sky separation (km) : 4969.1  
 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



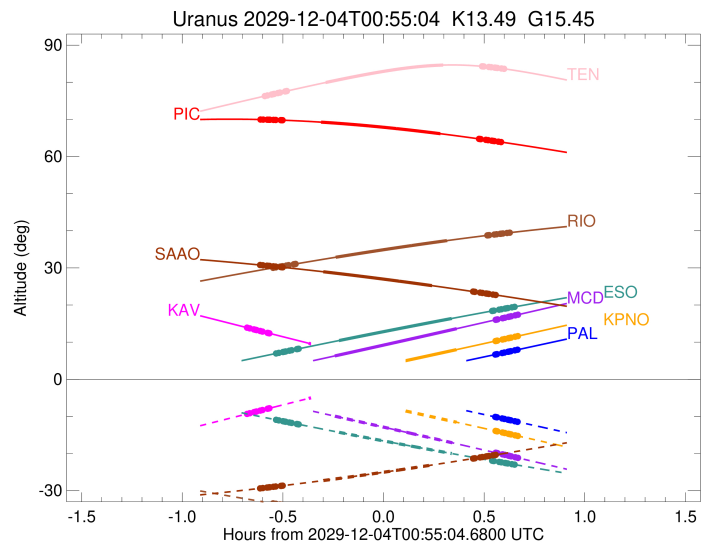
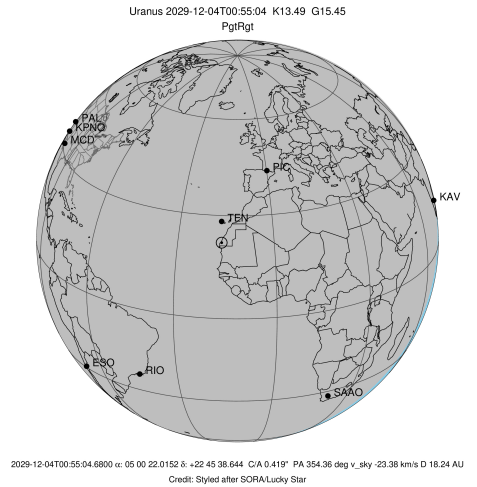
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-12-04T00:19:26.801		76.24	-79.84	51515.55	-23.65		
lambda	I	2029-12-04T00:20:29.753		76.46	-80.03	50026.71	-23.65		
delta	I	2029-12-04T00:21:42.772		76.71	-80.25	48300.35	-23.64		
gamma	I	2029-12-04T00:22:11.451		76.81	-80.34	47622.47	-23.63		
eta	I	2029-12-04T00:22:30.338		76.87	-80.39	47176.12	-23.63		
beta	I	2029-12-04T00:23:34.149		77.09	-80.58	45668.43	-23.62		
alpha	I	2029-12-04T00:24:15.383		77.23	-80.70	44694.45	-23.62		
4	I	2029-12-04T00:25:43.839		77.54	-80.96	42606.02	-23.60		
5	I	2029-12-04T00:25:56.407		77.58	-80.99	42309.81	-23.60		
6	I	2029-12-04T00:26:14.625		77.64	-81.04	41879.39	-23.60		
Uranus	I	2029-12-04T00:37:48.443		79.94	-82.81	25558.86		-0.12	-0.13
Uranus	E	2029-12-04T01:12:53.697		84.64	-83.00	25479.09		-2.88	-3.02
6	E	2029-12-04T01:24:25.844		84.31	-81.31	41797.57	23.61		
5	E	2029-12-04T01:24:41.504		84.29	-81.26	42169.02	23.62		
4	E	2029-12-04T01:24:57.439		84.26	-81.22	42544.09	23.62		
alpha	E	2029-12-04T01:26:30.246		84.12	-80.96	44736.70	23.63		
beta	E	2029-12-04T01:27:09.229		84.06	-80.84	45658.06	23.64		
eta	E	2029-12-04T01:28:13.439		83.95	-80.66	47176.12	23.65		
gamma	E	2029-12-04T01:28:32.662		83.92	-80.60	47630.75	23.65		
delta	E	2029-12-04T01:29:00.972		83.86	-80.52	48300.35	23.65		
lambda	E	2029-12-04T01:30:13.938		83.72	-80.30	50026.71	23.66		
epsilon	E	2029-12-04T01:30:44.745		83.66	-80.21	50755.79	23.66		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:50:36.100  
 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 : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386  
 ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s  
 RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 154.06  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.376  
 C/A sky separation (km) : 4980.4  
 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\_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	2029-12-04T00:14:08.930		13.96	-9.39	51513.72	-23.35		
lambda	I	2029-12-04T00:15:12.604		13.71	-9.15	50026.71	-23.35		
delta	I	2029-12-04T00:16:26.560		13.43	-8.87	48300.35	-23.34		
gamma	I	2029-12-04T00:16:55.608		13.32	-8.76	47622.51	-23.33		
eta	I	2029-12-04T00:17:14.741		13.25	-8.68	47176.12	-23.33		
beta	I	2029-12-04T00:18:19.376		13.00	-8.44	45668.61	-23.32		
alpha	I	2029-12-04T00:19:01.171		12.84	-8.28	44694.21	-23.31		
4	I	2029-12-04T00:20:30.776		12.50	-7.94	42606.32	-23.29		
5	I	2029-12-04T00:20:43.508		12.45	-7.89	42310.10	-23.29		
6	I	2029-12-04T00:21:01.984		12.38	-7.82	41879.44	-23.28		
Uranus	I	2029-12-04T00:32:45.565		9.71	-5.16	25558.61		-0.20	-0.21
Uranus	E	2029-12-04T01:08:24.915		1.62x	2.87x	25482.71		-2.82	-2.95
6	E	2029-12-04T01:20:09.692		-1.02x	5.49x	41797.43	23.17		
5	E	2029-12-04T01:20:25.638		-1.08x	5.55x	42168.61	23.18		
4	E	2029-12-04T01:20:41.879		-1.14x	5.61x	42543.76	23.18		
alpha	E	2029-12-04T01:22:16.482		-1.49x	5.96x	44736.96	23.19		
beta	E	2029-12-04T01:22:56.193		-1.64x	6.11x	45657.88	23.19		
eta	E	2029-12-04T01:24:01.647		-1.88x	6.35x	47176.12	23.20		
gamma	E	2029-12-04T01:24:21.240		-1.96x	6.43x	47630.72	23.20		
delta	E	2029-12-04T01:24:50.098		-2.06x	6.53x	48300.35	23.21		
lambda	E	2029-12-04T01:26:04.481		-2.34x	6.81x	50026.71	23.21		
epsilon	E	2029-12-04T01:26:35.927		-2.46x	6.92x	50756.70	23.21		

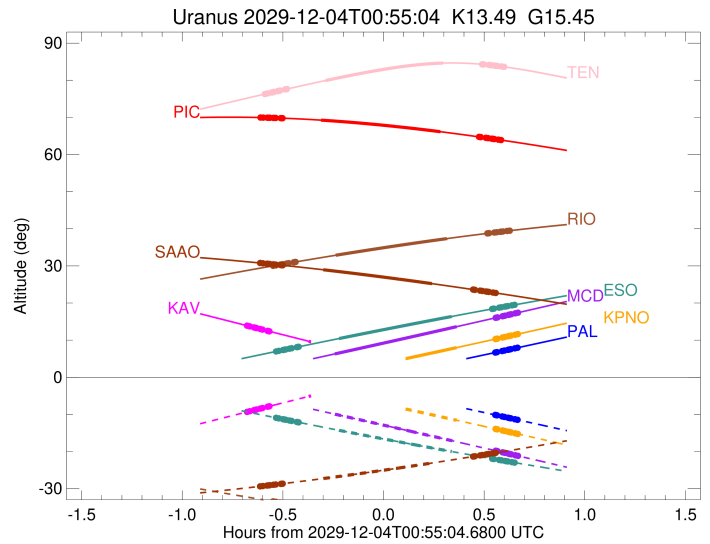
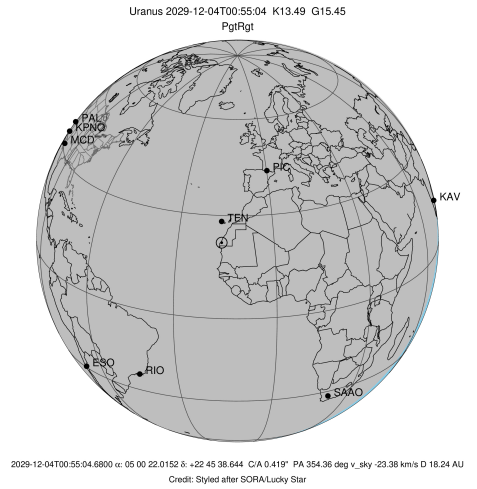
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:57:29.710  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386  
 ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s  
 RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 152.96  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.720  
 C/A sky separation (km) : 9525.4  
 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	2029-12-04T00:21:55.791		29.98	-33.40	51498.69	-23.26		
lambda	I	2029-12-04T00:22:59.070		30.14	-33.56	50026.71	-23.25		
delta	I	2029-12-04T00:24:13.373		30.34	-33.74	48300.35	-23.22		
gamma	I	2029-12-04T00:24:42.562		30.41	-33.81	47622.84	-23.21		
eta	I	2029-12-04T00:25:01.817		30.46	-33.85	47176.12	-23.20		
beta	I	2029-12-04T00:26:06.783		30.63	-34.01	45670.25	-23.16		
alpha	I	2029-12-04T00:26:49.031		30.74	-34.11	44692.15	-23.14		
4	I	2029-12-04T00:28:19.168		30.98	-34.33	42608.93	-23.09		
5	I	2029-12-04T00:28:32.000		31.01	-34.36	42312.50	-23.08		
6	I	2029-12-04T00:28:50.776		31.06	-34.40	41879.74	-23.06		
Uranus	I	2029-12-04T00:40:50.922		32.87	-36.07	25535.77		-1.55	-1.63
Uranus	E	2029-12-04T01:14:01.086		37.35	-40.06	25388.88		-4.22	-4.42
6	E	2029-12-04T01:26:00.284		38.76	-41.25	41799.57	23.12		
5	E	2029-12-04T01:26:16.422		38.79	-41.27	42174.61	23.14		
4	E	2029-12-04T01:26:32.634		38.82	-41.30	42548.34	23.15		
alpha	E	2029-12-04T01:28:06.929		38.99	-41.44	44733.53	23.20		
beta	E	2029-12-04T01:28:46.848		39.06	-41.50	45660.16	23.23		
eta	E	2029-12-04T01:29:52.072		39.18	-41.60	47176.12	23.26		
gamma	E	2029-12-04T01:30:11.624		39.22	-41.63	47631.01	23.27		
delta	E	2029-12-04T01:30:40.376		39.27	-41.67	48300.35	23.29		
lambda	E	2029-12-04T01:31:54.458		39.40	-41.78	50026.71	23.32		
epsilon	E	2029-12-04T01:32:25.390		39.45	-41.83	50748.24	23.33		

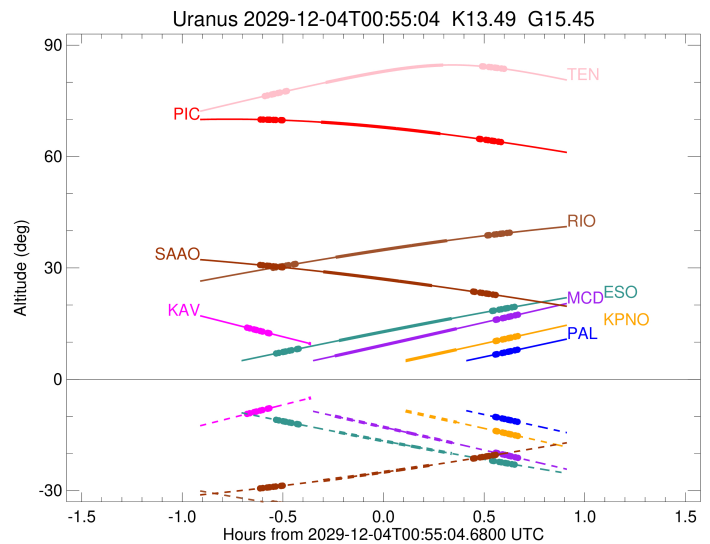
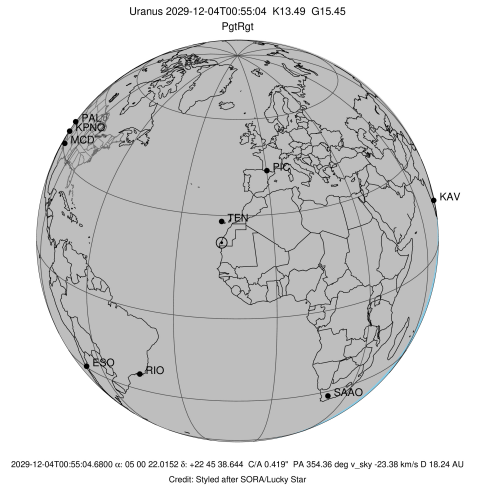


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:58:40.590  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386  
 ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s  
 RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 152.56  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.690  
 C/A sky separation (km) : 9130.9  
 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	2029-12-04T00:22:48.522		6.91	-10.88	51500.57	-23.12		
lambda	I	2029-12-04T00:23:52.252		7.11	-11.07	50026.71	-23.12		
delta	I	2029-12-04T00:25:06.980		7.34	-11.30	48300.35	-23.09		
gamma	I	2029-12-04T00:25:36.334		7.43	-11.39	47622.80	-23.08		
eta	I	2029-12-04T00:25:55.695		7.49	-11.45	47176.12	-23.07		
beta	I	2029-12-04T00:27:01.024		7.70	-11.64	45670.07	-23.04		
alpha	I	2029-12-04T00:27:43.481		7.83	-11.77	44692.38	-23.01		
4	I	2029-12-04T00:29:14.106		8.11	-12.04	42608.65	-22.97		
5	I	2029-12-04T00:29:27.005		8.15	-12.08	42312.27	-22.96		
6	I	2029-12-04T00:29:45.861		8.21	-12.14	41879.72	-22.95		
Uranus	I	2029-12-04T00:41:48.233		10.43	-14.29	25539.73		-1.41	-1.48
Uranus	E	2029-12-04T01:15:25.333		16.37	-20.01	25396.90		-4.12	-4.31
6	E	2029-12-04T01:27:25.879		18.40	-21.94	41799.41	23.04		
5	E	2029-12-04T01:27:42.065		18.44	-21.98	42174.18	23.05		
4	E	2029-12-04T01:27:58.341		18.49	-22.02	42548.03	23.06		
alpha	E	2029-12-04T01:29:33.021		18.75	-22.27	44733.76	23.11		
beta	E	2029-12-04T01:30:13.080		18.86	-22.37	45660.01	23.14		
eta	E	2029-12-04T01:31:18.574		19.04	-22.54	47176.12	23.17		
gamma	E	2029-12-04T01:31:38.204		19.09	-22.60	47631.00	23.18		
delta	E	2029-12-04T01:32:07.076		19.17	-22.67	48300.35	23.19		
lambda	E	2029-12-04T01:33:21.468		19.37	-22.86	50026.71	23.22		
epsilon	E	2029-12-04T01:33:52.548		19.46	-22.94	50748.63	23.23		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2029-12-04T00:53:24.750  
 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 : 3412513424056337408  
 2Mass ID (if available) : 05002201+2245386  
 ICRS Star Coord at Epoch: 05h 00m 22.01521s +22:45:38.64415s  
 RUWE (>1.4 is poor) : 1.16  
 K magnitude : 13.486  
 G magnitude : 15.450  
 RP magnitude : 14.770  
 BP magnitude : 15.926  
 DUPflag : 0  
 Distance (au) : 18.243  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.38  
 Sun-Target sep (deg) : 175.46  
 Sun-Moon sep (deg) : 153.75  
 B (ring opening deg) : 82.13  
 PA of pole (deg) : -15.84  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.814  
 C/A sky separation (km) : 10771.1  
 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	2029-12-04T00:18:03.148		30.80	-29.41	51491.86	-23.18		
lambda	I	2029-12-04T00:19:06.336		30.71	-29.30	50026.71	-23.17		
delta	I	2029-12-04T00:20:20.912		30.59	-29.17	48300.35	-23.13		
gamma	I	2029-12-04T00:20:50.212		30.55	-29.12	47622.98	-23.11		
eta	I	2029-12-04T00:21:09.555		30.52	-29.08	47176.12	-23.10		
beta	I	2029-12-04T00:22:14.788		30.42	-28.97	45670.87	-23.05		
alpha	I	2029-12-04T00:22:57.307		30.35	-28.89	44691.41	-23.02		
4	I	2029-12-04T00:24:27.876		30.21	-28.72	42609.84	-22.95		
5	I	2029-12-04T00:24:40.783		30.19	-28.70	42313.23	-22.94		
6	I	2029-12-04T00:24:59.724		30.16	-28.67	41879.74	-22.92		
Uranus	I	2029-12-04T00:37:09.385		28.96	-27.28	25519.90		-2.01	-2.11
Uranus	E	2029-12-04T01:09:33.384		25.22	-23.10	25363.64		-4.53	-4.74
6	E	2029-12-04T01:21:44.999		23.63	-21.36	41800.05	22.87		
5	E	2029-12-04T01:22:01.346		23.59	-21.32	42175.87	22.89		
4	E	2029-12-04T01:22:17.715		23.56	-21.28	42549.26	22.90		
alpha	E	2029-12-04T01:23:52.912		23.34	-21.05	44732.86	22.97		
beta	E	2029-12-04T01:24:33.273		23.25	-20.95	45660.58	23.00		
eta	E	2029-12-04T01:25:39.103		23.10	-20.79	47176.12	23.05		
gamma	E	2029-12-04T01:25:58.839		23.06	-20.74	47631.06	23.06		
delta	E	2029-12-04T01:26:27.855		22.99	-20.67	48300.35	23.07		
lambda	E	2029-12-04T01:27:42.603		22.82	-20.49	50026.71	23.12		
epsilon	E	2029-12-04T01:28:13.761		22.75	-20.41	50747.19	23.13		