

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-09T09:45:52.590
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3377546308595879808
 2Mass ID (if available) : 06183738+2338220

Uranus 2033-12-09T09:45:52 K13.90 G16.17 PgtRgt

ICRS Star Coord at Epoch: 06h 18m 37.38795s +23:38:21.97458s

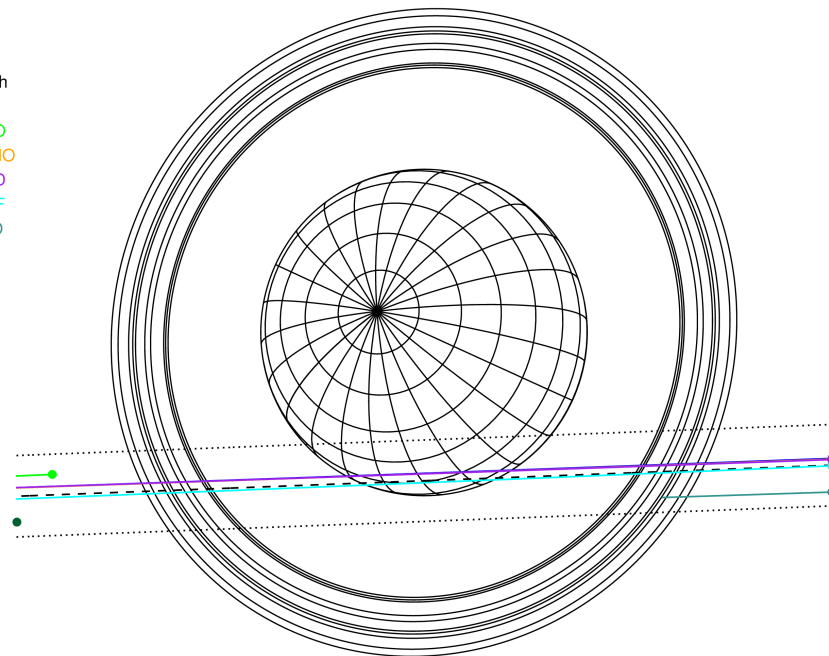
RUWE (>1.4 is poor) : 1.74
 K magnitude : 13.896
 G magnitude : 16.173
 RP magnitude : 15.389
 BP magnitude : 16.720
 DUPflag : 0
 Distance (au) : 18.013
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.07
 Sun-Target sep (deg) : 162.89
 Sun-Moon sep (deg) : 24.09
 B (ring opening deg) : 71.61
 PA of pole (deg) : 65.75

Uranus 2033-12-09T09:45:52 K13.90 G16.17
 PgtRgt



2033-12-09T09:45:52.5900 α: 06 18 37.3879 s δ: +23 38 21.975 C/A 1.768° PA 2.18 deg v_sky -22.07 km/s D 18.01 AU
 Credit: Styled after SORA/Lucky Star

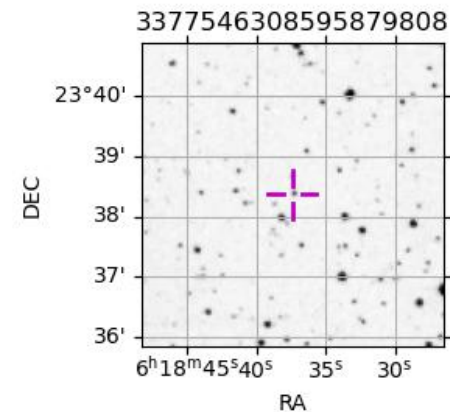
Earth
 PAL
 PMO
 KPNO
 MCD
 IRTF
 ESO
 AAT



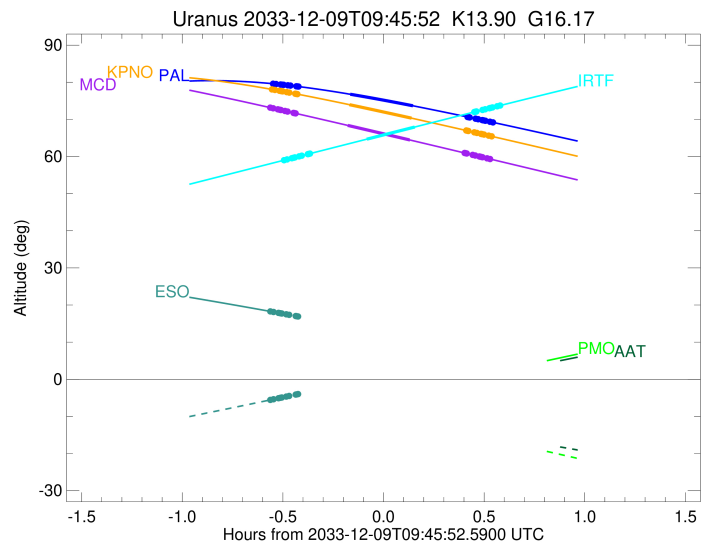
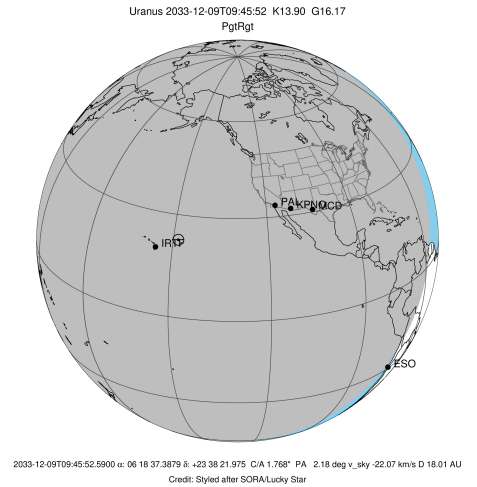
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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	+++++	+ +	+++++	DEC 09 09:13 - DEC 09 10:18	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	DEC 09 09:12 - DEC 09 10:18	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	DEC 09 09:12 - DEC 09 10:17	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	DEC 09 09:16 - DEC 09 10:20	PieRie
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European Southern Obs	-29.3	289.3	+++			DEC 09 09:12 - DEC 09 09:14	PnnRin
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

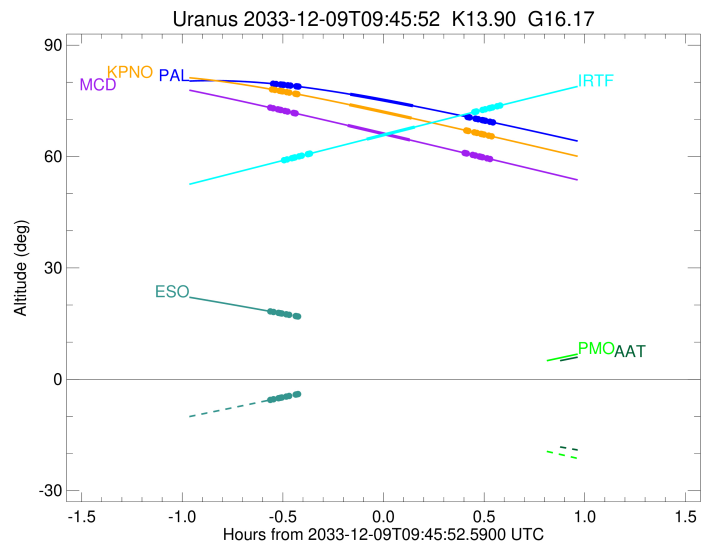
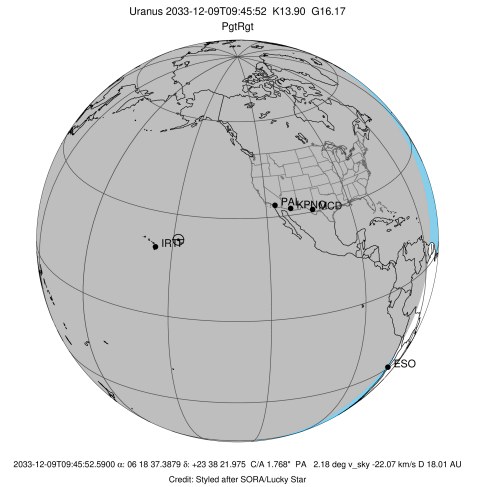


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-09T09:45:03.860
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3377546308595879808
 2Mass ID (if available) : 06183738+2338220
 ICRS Star Coord at Epoch: 06h 18m 37.38795s +23:38:21.97458s
 RUWE (>1.4 is poor) : 1.74
 K magnitude : 13.896
 G magnitude : 16.173
 RP magnitude : 15.389
 BP magnitude : 16.720
 DUPflag : 0
 Distance (au) : 18.013
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.07
 Sun-Target sep (deg) : 162.89
 Sun-Moon sep (deg) : 24.36
 B (ring opening deg) : 71.61
 PA of pole (deg) : 65.75
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.687
 C/A sky separation (km) : 22039.9
 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



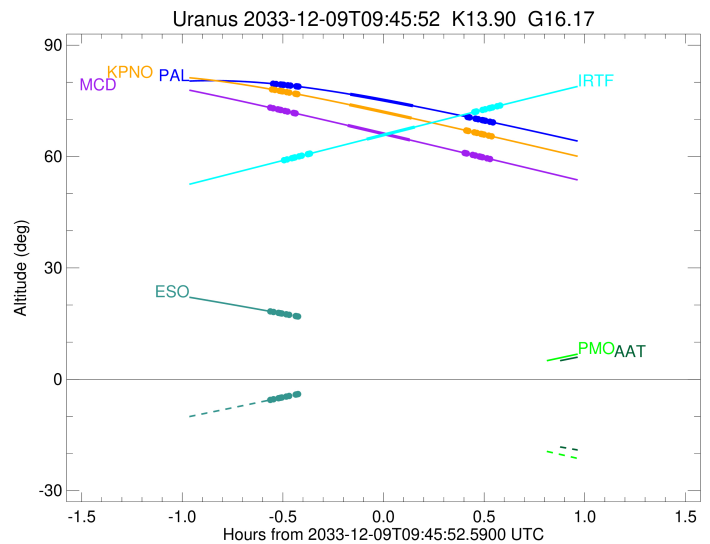
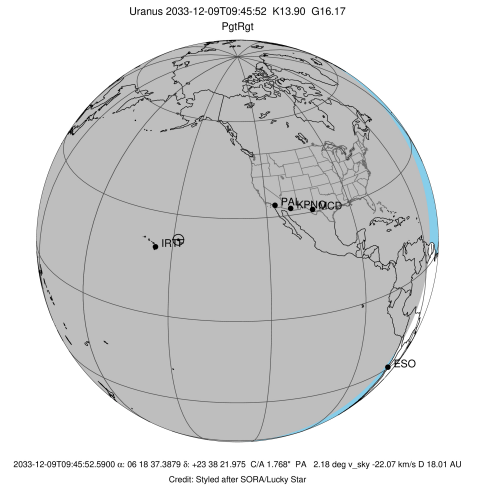
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-09T09:13:06.065		79.60	-67.04	50976.62	-21.14		
lambda	I	2033-12-09T09:13:51.264		79.53	-66.90	50026.71	-20.97		
delta	I	2033-12-09T09:15:13.966		79.40	-66.63	48300.35	-20.78		
gamma	I	2033-12-09T09:15:46.363		79.35	-66.52	47628.48	-20.70		
eta	I	2033-12-09T09:16:08.248		79.32	-66.45	47176.12	-20.64		
beta	I	2033-12-09T09:17:21.330		79.19	-66.21	45673.42	-20.44		
alpha	I	2033-12-09T09:18:09.358		79.11	-66.05	44699.88	-20.29		
4	I	2033-12-09T09:19:57.003		78.92	-65.70	42527.47	-19.95		
5	I	2033-12-09T09:20:08.163		78.89	-65.66	42297.79	-19.91		
6	I	2033-12-09T09:20:32.158		78.85	-65.58	41823.90	-19.80		
Uranus	I	2033-12-09T09:35:59.510		76.77	-62.48	25199.08		-15.04	-15.72
Uranus	E	2033-12-09T09:54:40.397		73.67	-58.67	25556.21		1.30	1.36
6	E	2033-12-09T10:10:54.551		70.66	-55.31	41806.66	19.79		
5	E	2033-12-09T10:11:16.914		70.59	-55.23	42251.43	19.90		
4	E	2033-12-09T10:11:33.982		70.54	-55.17	42601.56	19.94		
alpha	E	2033-12-09T10:13:18.586		70.20	-54.81	44703.47	20.28		
beta	E	2033-12-09T10:14:04.668		70.06	-54.65	45641.16	20.43		
eta	E	2033-12-09T10:15:19.425		69.82	-54.39	47176.12	20.63		
gamma	E	2033-12-09T10:15:41.350		69.75	-54.32	47629.00	20.69		
delta	E	2033-12-09T10:16:13.744		69.64	-54.21	48300.35	20.76		
lambda	E	2033-12-09T10:17:36.503		69.37	-53.92	50026.71	20.95		
epsilon	E	2033-12-09T10:18:48.624		69.14	-53.67	51543.32	21.12		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-09T09:44:42.120
 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 : 3377546308595879808
 2Mass ID (if available) : 06183738+2338220
 ICRS Star Coord at Epoch: 06h 18m 37.38795s +23:38:21.97458s
 RUWE (>1.4 is poor) : 1.74
 K magnitude : 13.896
 G magnitude : 16.173
 RP magnitude : 15.389
 BP magnitude : 16.720
 DUPflag : 0
 Distance (au) : 18.013
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.07
 Sun-Target sep (deg) : 162.89
 Sun-Moon sep (deg) : 24.28
 B (ring opening deg) : 71.61
 PA of pole (deg) : 65.75
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.693
 C/A sky separation (km) : 22119.5
 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	2033-12-09T09:12:45.969		78.06	-63.25	50977.48	-21.12		
lambda	I	2033-12-09T09:13:31.245		77.93	-63.09	50026.71	-20.95		
delta	I	2033-12-09T09:14:54.019		77.71	-62.80	48300.35	-20.76		
gamma	I	2033-12-09T09:15:26.446		77.62	-62.69	47628.49	-20.68		
eta	I	2033-12-09T09:15:48.353		77.56	-62.61	47176.12	-20.62		
beta	I	2033-12-09T09:17:01.512		77.35	-62.36	45673.38	-20.42		
alpha	I	2033-12-09T09:17:49.596		77.22	-62.19	44699.81	-20.27		
4	I	2033-12-09T09:19:37.368		76.91	-61.82	42527.50	-19.92		
5	I	2033-12-09T09:19:48.540		76.88	-61.78	42297.93	-19.89		
6	I	2033-12-09T09:20:12.582		76.81	-61.70	41823.79	-19.77		
Uranus	I	2033-12-09T09:35:43.825		73.97	-58.44	25202.49		-14.96	-15.64
Uranus	E	2033-12-09T09:54:12.728		70.34	-54.54	25556.62		1.20	1.25
6	E	2033-12-09T10:10:31.133		67.02	-51.09	41806.61	19.75		
5	E	2033-12-09T10:10:53.544		66.94	-51.01	42251.56	19.87		
4	E	2033-12-09T10:11:10.633		66.89	-50.95	42601.51	19.91		
alpha	E	2033-12-09T10:12:55.406		66.52	-50.58	44703.43	20.25		
beta	E	2033-12-09T10:13:41.559		66.37	-50.41	45641.17	20.40		
eta	E	2033-12-09T10:14:56.423		66.11	-50.15	47176.12	20.60		
gamma	E	2033-12-09T10:15:18.378		66.03	-50.07	47629.01	20.66		
delta	E	2033-12-09T10:15:50.816		65.92	-49.95	48300.35	20.74		
lambda	E	2033-12-09T10:17:13.682		65.63	-49.66	50026.71	20.93		
epsilon	E	2033-12-09T10:18:25.897		65.38	-49.41	51543.43	21.10		

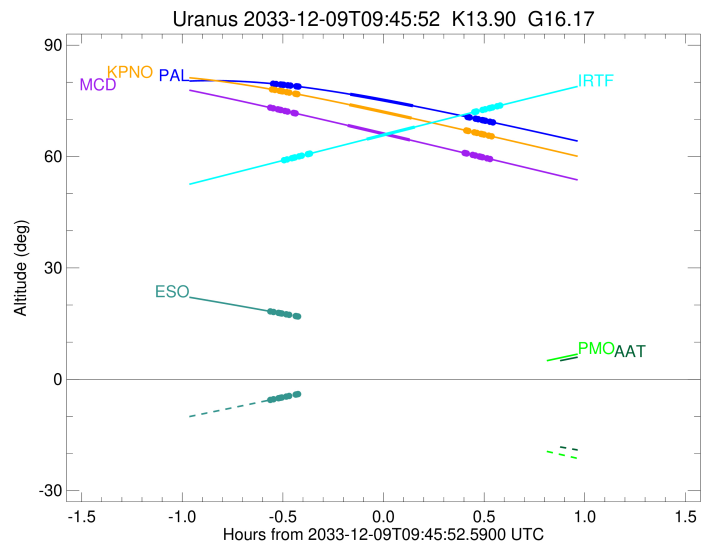
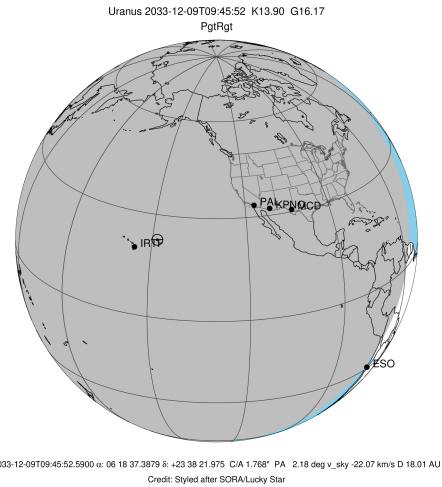
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-09T09:44:11.850
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : MCD
 Location : McDonald Obs. 2.7m
 Latitude (deg) : 30.67158
 E. Longitude (deg) : 255.97844
 Altitude (km) : 2.075
 Gaia source ID : 3377546308595879808
 2Mass ID (if available) : 06183738+2338220
 ICRS Star Coord at Epoch: 06h 18m 37.38795s +23:38:21.97458s
 RUWE (>1.4 is poor) : 1.74
 K magnitude : 13.896
 G magnitude : 16.173
 RP magnitude : 15.389
 BP magnitude : 16.720
 DUPflag : 0
 Distance (au) : 18.013
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.07
 Sun-Target sep (deg) : 162.89
 Sun-Moon sep (deg) : 24.17
 B (ring opening deg) : 71.61
 PA of pole (deg) : 65.75
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.694
 C/A sky separation (km) : 22126.2
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-09T09:12:14.878		73.15	-57.13	50977.83	-21.11		
lambda	I	2033-12-09T09:13:00.187		72.99	-56.97	50026.71	-20.94		
delta	I	2033-12-09T09:14:22.993		72.71	-56.67	48300.35	-20.75		
gamma	I	2033-12-09T09:14:55.433		72.60	-56.55	47628.49	-20.67		
eta	I	2033-12-09T09:15:17.349		72.53	-56.48	47176.12	-20.61		
beta	I	2033-12-09T09:16:30.539		72.28	-56.21	45673.37	-20.41		
alpha	I	2033-12-09T09:17:18.644		72.11	-56.04	44699.78	-20.26		
4	I	2033-12-09T09:19:06.463		71.74	-55.66	42527.51	-19.91		
5	I	2033-12-09T09:19:17.639		71.71	-55.62	42297.98	-19.88		
6	I	2033-12-09T09:19:41.697		71.62	-55.53	41823.75	-19.76		
Uranus	I	2033-12-09T09:35:13.705		68.38	-52.19	25203.16		-14.95	-15.62
Uranus	E	2033-12-09T09:53:42.325		64.47	-48.21	25556.60		1.20	1.26
6	E	2033-12-09T10:10:01.793		60.97	-44.70	41806.63	19.73		
5	E	2033-12-09T10:10:24.222		60.89	-44.62	42251.51	19.85		
4	E	2033-12-09T10:10:41.331		60.83	-44.56	42601.53	19.89		
alpha	E	2033-12-09T10:12:26.205		60.45	-44.18	44703.45	20.23		
beta	E	2033-12-09T10:13:12.403		60.29	-44.01	45641.17	20.38		
eta	E	2033-12-09T10:14:27.340		60.02	-43.75	47176.12	20.58		
gamma	E	2033-12-09T10:14:49.316		59.94	-43.67	47629.01	20.64		
delta	E	2033-12-09T10:15:21.786		59.82	-43.55	48300.35	20.72		
lambda	E	2033-12-09T10:16:44.734		59.52	-43.25	50026.71	20.91		
epsilon	E	2033-12-09T10:17:57.018		59.26	-43.00	51543.37	21.08		

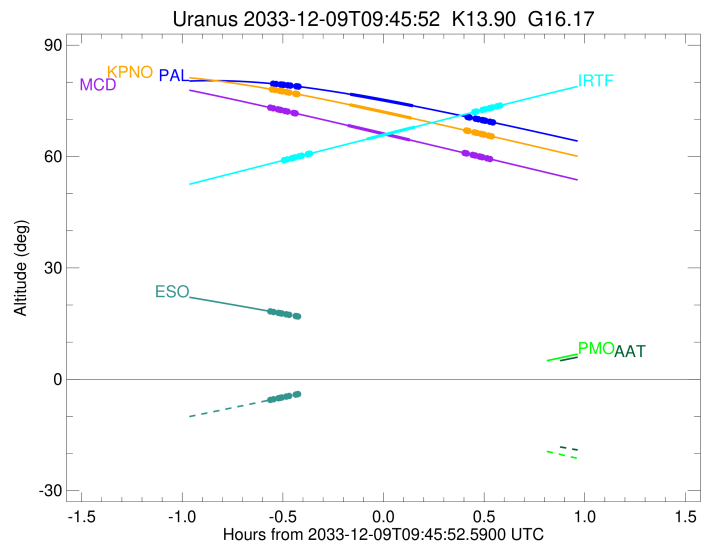
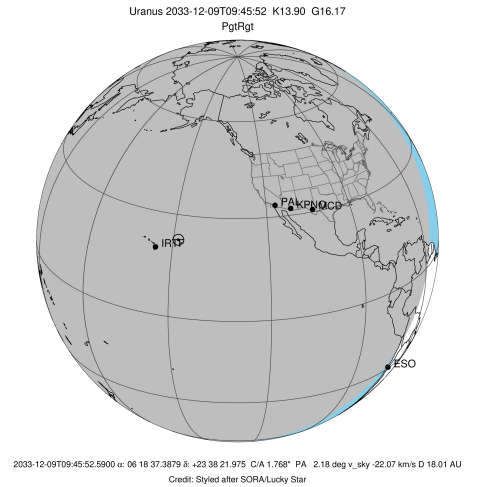
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target                : Uranus
target radius (km)    : 25559.00
C/A epoch             : 2033-12-09T09:47:45.410
Event type            : PgtRgt
: Ring occs: geocentric, topocentric
Observer code         : IRTF
Location               : Mauna Kea/IRTF
Latitude (deg)        : 19.82622
E. Longitude (deg)    : 204.52800
Altitude (km)         : 4.168
Gaia source ID        : 3377546308595879808
2Mass ID (if available) : 06183738+2338220
ICRS Star Coord at Epoch: 06h 18m 37.38795s +23:38:21.97458s
RUWE (>1.4 is poor)  : 1.74
K magnitude           : 13.896
G magnitude           : 16.173
RP magnitude          : 15.389
BP magnitude          : 16.720
DUPflag               : 0
Distance (au)         : 18.013
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -22.07
Sun-Target sep (deg)  : 162.89
Sun-Moon sep (deg)    : 24.80
B (ring opening deg)  : 71.61
PA of pole (deg)      : 65.75
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.800
C/A sky separation (km) : 23511.0
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.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	2033-12-09T09:16:22.072		59.05	-76.16	50986.94	-20.78		
lambda	I	2033-12-09T09:17:08.585		59.22	-76.34	50026.71	-20.59		
delta	I	2033-12-09T09:18:32.877		59.55	-76.65	48300.35	-20.37		
gamma	I	2033-12-09T09:19:05.928		59.67	-76.78	47628.63	-20.28		
eta	I	2033-12-09T09:19:28.280		59.76	-76.86	47176.12	-20.21		
beta	I	2033-12-09T09:20:43.004		60.05	-77.14	45672.89	-19.98		
alpha	I	2033-12-09T09:21:32.192		60.23	-77.33	44698.92	-19.81		
4	I	2033-12-09T09:23:22.547		60.66	-77.74	42527.93	-19.41		
5	I	2033-12-09T09:23:33.984		60.70	-77.78	42299.62	-19.37		
6	I	2033-12-09T09:23:58.846		60.80	-77.88	41822.38	-19.24		
Uranus	I	2033-12-09T09:40:53.747		64.68	-81.62	25263.39		-13.57	-14.19
Uranus	E	2033-12-09T09:55:11.432		67.95	-84.55	25556.99		-1.10	-1.15
6	E	2033-12-09T10:12:54.901		71.99	-86.83	41805.30	19.28		
5	E	2033-12-09T10:13:18.104		72.08	-86.84	42255.07	19.41		
4	E	2033-12-09T10:13:35.371		72.14	-86.84	42599.98	19.45		
alpha	E	2033-12-09T10:15:22.410		72.55	-86.83	44702.16	19.86		
beta	E	2033-12-09T10:16:09.511		72.72	-86.81	45641.27	20.02		
eta	E	2033-12-09T10:17:25.691		73.01	-86.76	47176.12	20.26		
gamma	E	2033-12-09T10:17:48.016		73.09	-86.74	47629.18	20.33		
delta	E	2033-12-09T10:18:20.959		73.22	-86.70	48300.35	20.42		
lambda	E	2033-12-09T10:19:45.038		73.54	-86.60	50026.71	20.64		
epsilon	E	2033-12-09T10:20:58.361		73.81	-86.48	51546.68	20.83		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-12-09T09:42:18.870
 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 : 3377546308595879808
 2Mass ID (if available) : 06183738+2338220
 ICRS Star Coord at Epoch: 06h 18m 37.38795s +23:38:21.97458s
 RUWE (>1.4 is poor) : 1.74
 K magnitude : 13.896
 G magnitude : 16.173
 RP magnitude : 15.389
 BP magnitude : 16.720
 DUPflag : 0
 Distance (au) : 18.013
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.07
 Sun-Target sep (deg) : 162.89
 Sun-Moon sep (deg) : 23.40
 B (ring opening deg) : 71.61
 PA of pole (deg) : 65.75
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.068
 C/A sky separation (km) : 27017.2
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-09T09:12:15.241		18.26	-5.54	51020.45	-19.77		
lambda	I	2033-12-09T09:13:05.962		18.12	-5.38	50026.71	-19.51		
delta	I	2033-12-09T09:14:35.127		17.88	-5.10	48300.35	-19.21		
gamma	I	2033-12-09T09:15:10.194		17.78	-4.99x	47629.07	-19.08		
eta	I	2033-12-09T09:15:33.994		17.72	-4.91x	47176.12	-18.99		
beta	I	2033-12-09T09:16:53.862		17.50	-4.66x	45671.16	-18.66		
alpha	I	2033-12-09T09:17:46.704		17.35	-4.49x	44696.12	-18.42		
4	I	2033-12-09T09:19:45.716		17.02	-4.11x	42529.71	-17.85		
5	I	2033-12-09T09:19:58.098		16.99	-4.07x	42304.61	-17.79		
6	I	2033-12-09T09:20:25.767		16.91	-3.99x	41817.87	-17.61		

No planet occultations

6	E	2033-12-09T10:05:50.418		8.96	4.91x	41802.70	17.56		
5	E	2033-12-09T10:06:16.419		8.88	5.00x	42262.46	17.74		
4	E	2033-12-09T10:06:34.779		8.82	5.06x	42596.51	17.80		
alpha	E	2033-12-09T10:08:31.125		8.47	5.45x	44699.62	18.37		
beta	E	2033-12-09T10:09:22.084		8.31	5.62x	45641.59	18.60		
eta	E	2033-12-09T10:10:43.865		8.06	5.89x	47176.12	18.92		
gamma	E	2033-12-09T10:11:07.770		7.99	5.97x	47629.53	19.01		
delta	E	2033-12-09T10:11:42.935		7.88	6.09x	48300.35	19.14		
lambda	E	2033-12-09T10:13:12.421		7.60	6.39x	50026.71	19.44		
epsilon	E	2033-12-09T10:14:30.379		7.36	6.65x	51551.58	19.69		