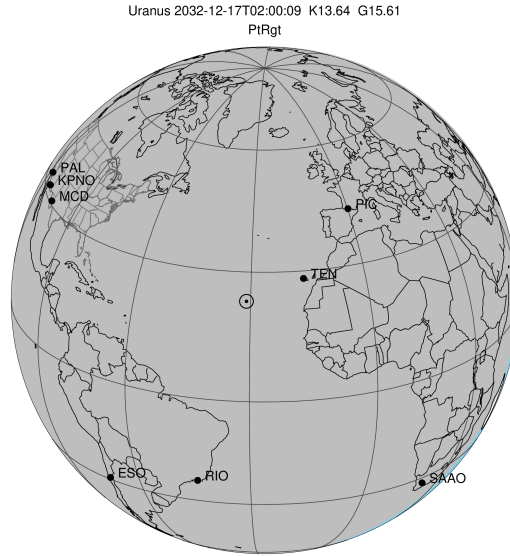


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-17T02:00:09.270  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3424832146175990656  
 2Mass ID (if available) : 05570363+2339013

ICRS Star Coord at Epoch: 05h 57m 03.63288s +23:39:01.20744s

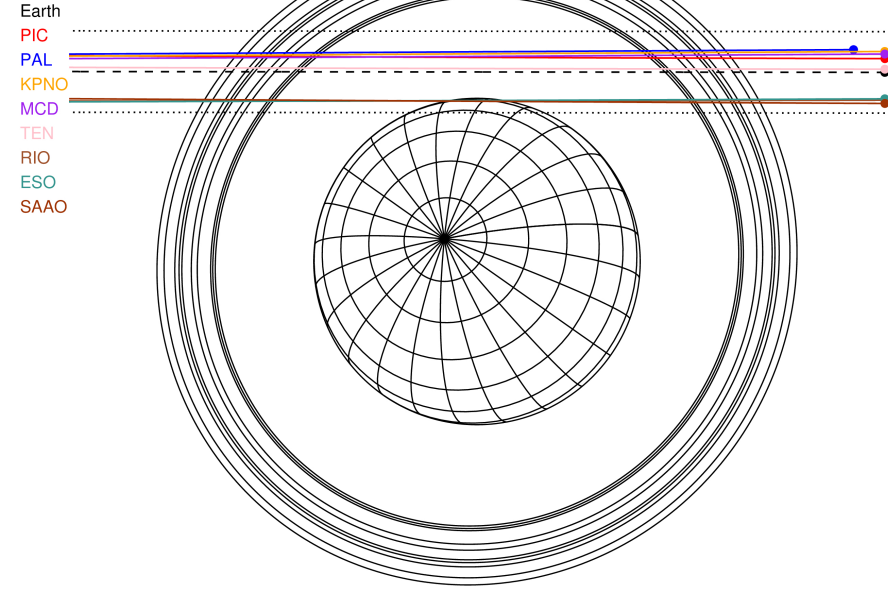
RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.641  
 G magnitude : 15.612  
 RP magnitude : 14.919  
 BP magnitude : 16.119  
 DUPflag : 0  
 Distance (au) : 18.038  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.33  
 Sun-Target sep (deg) : 175.89  
 Sun-Moon sep (deg) : 4.82  
 B (ring opening deg) : 75.91  
 PA of pole (deg) : 55.19

#	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



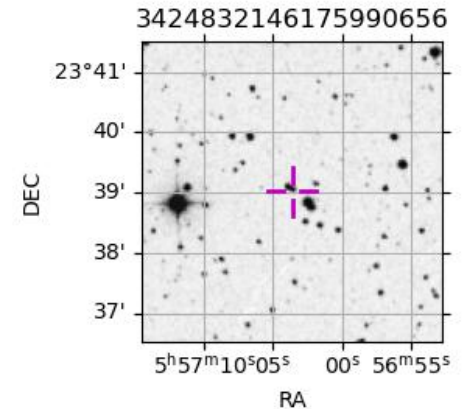
2032-12-17T02:00:09.2700 ex: 05 57 03.63288 s: +23 39 01.207 C/A 2.276" PA 179.94 deg v\_sky -23.33 km/s D 18.04 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2032-12-17T02:00:09 K13.64 G15.61 PtRgt

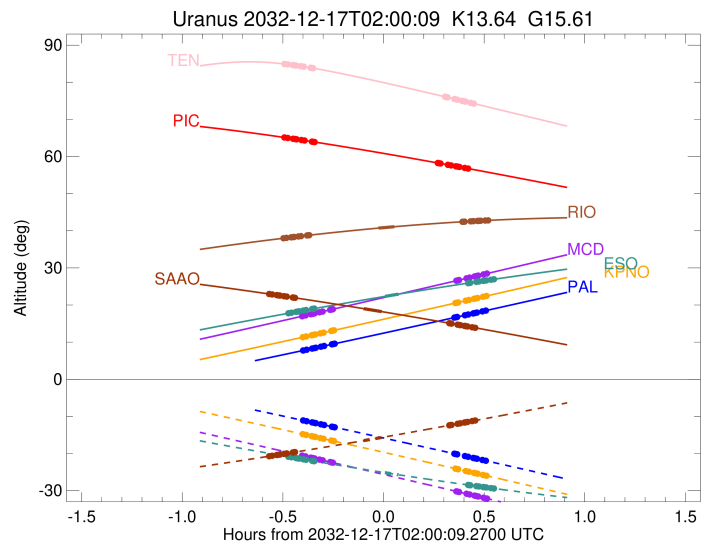
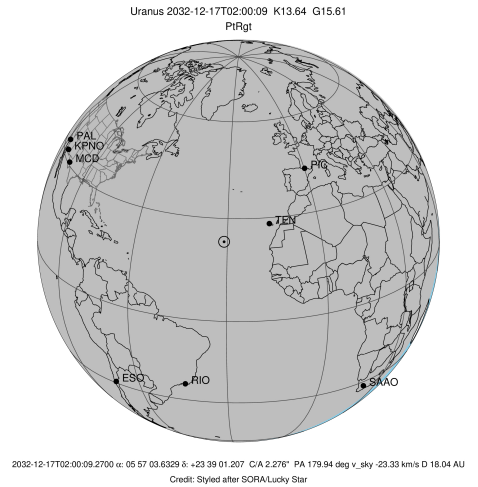


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	DEC 17 01:30 - DEC 17 02:25	PnnRie
PAL	Palomar Mt (200")	33.4	243.1	+++++		+++++	DEC 17 01:35 - DEC 17 02:30	PnnRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	DEC 17 01:35 - DEC 17 02:31	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	DEC 17 01:35 - DEC 17 02:31	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++		+++++	DEC 17 01:30 - DEC 17 02:27	PnnRie
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	+++++	+ +	+++++	DEC 17 01:30 - DEC 17 02:31	PieRie
ESO	European Southern Obs	-29.3	289.3	+++++	+ +	+++++	DEC 17 01:31 - DEC 17 02:33	PieRie
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++	+ +	+++++	DEC 17 01:25 - DEC 17 02:27	PieRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-17T01:58:37.140  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : 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 : 3424832146175990656  
 2Mass ID (if available) : 05570363+2339013  
 ICRS Star Coord at Epoch: 05h 57m 03.63288s +23:39:01.20744s  
 RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.641  
 G magnitude : 15.612  
 RP magnitude : 14.919  
 BP magnitude : 16.119  
 DUPflag : 0  
 Distance (au) : 18.038  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.33  
 Sun-Target sep (deg) : 175.89  
 Sun-Moon sep (deg) : 5.32  
 B (ring opening deg) : 75.91  
 PA of pole (deg) : 55.19  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.443  
 C/A sky separation (km) : 31965.7  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 ura111.bsp  
 IAU\_URANUS\_for\_RINGFIT.tpc  
 vgr2.ura111.bsp  
 ura161.bsp  
 vgr2.ura161.bsp  
 peph.ura160.bsp  
 earthstns\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

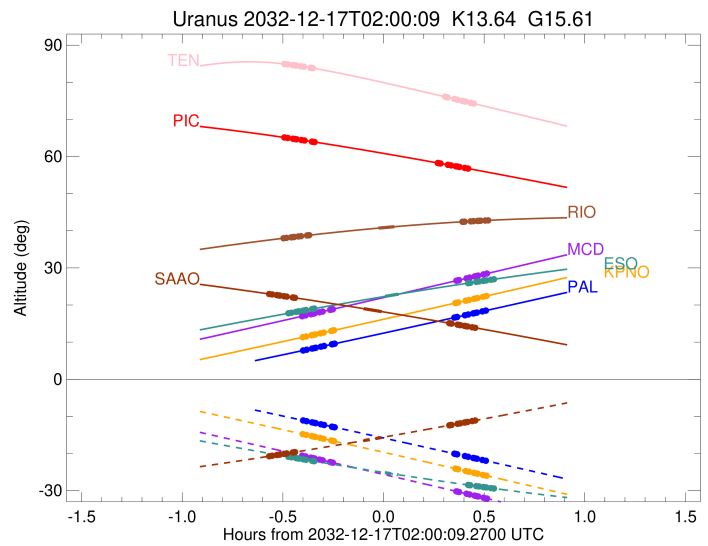
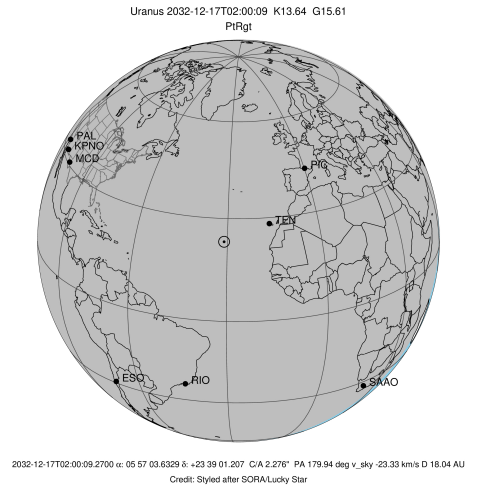


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-17T01:30:24.032		65.16	-62.42	51389.87	-18.89		
lambda	I	2032-12-17T01:31:37.224		65.00	-62.24	50026.71	-18.45		
delta	I	2032-12-17T01:33:12.019		64.79	-62.01	48300.35	-17.96		
gamma	I	2032-12-17T01:33:49.537		64.70	-61.92	47630.23	-17.76		
eta	I	2032-12-17T01:34:15.217		64.64	-61.85	47176.12	-17.61		
beta	I	2032-12-17T01:35:41.499		64.45	-61.64	45678.97	-17.08		
alpha	I	2032-12-17T01:36:36.389		64.32	-61.50	44751.49	-16.72		
4	I	2032-12-17T01:38:50.784		64.01	-61.16	42567.88	-15.72		
5	I	2032-12-17T01:39:07.028		63.97	-61.12	42314.88	-15.61		
6	I	2032-12-17T01:39:39.169		63.90	-61.04	41816.80	-15.36		

No planet occultations

6	E	2032-12-17T02:16:23.383		58.25	-55.08	41869.89	15.35		
5	E	2032-12-17T02:16:47.955		58.19	-55.02	42255.89	15.60		
4	E	2032-12-17T02:17:04.644		58.14	-54.97	42526.08	15.70		
alpha	E	2032-12-17T02:19:19.736		57.77	-54.58	44712.02	16.70		
beta	E	2032-12-17T02:20:15.615		57.62	-54.43	45651.91	17.06		
eta	E	2032-12-17T02:21:43.538		57.37	-54.17	47176.12	17.59		
gamma	E	2032-12-17T02:22:08.812		57.30	-54.10	47622.43	17.73		
delta	E	2032-12-17T02:22:46.819		57.20	-53.99	48300.35	17.94		
lambda	E	2032-12-17T02:24:21.745		56.93	-53.72	50026.71	18.42		
epsilon	E	2032-12-17T02:25:36.381		56.73	-53.51	51414.97	18.86		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-17T02:04:07.610  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3424832146175990656  
 2Mass ID (if available) : 05570363+2339013  
 ICRS Star Coord at Epoch: 05h 57m 03.63288s +23:39:01.20744s  
 RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.641  
 G magnitude : 15.612  
 RP magnitude : 14.919  
 BP magnitude : 16.119  
 DUPflag : 0  
 Distance (au) : 18.038  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.33  
 Sun-Target sep (deg) : 175.89  
 Sun-Moon sep (deg) : 5.13  
 B (ring opening deg) : 75.91  
 PA of pole (deg) : 55.19  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.510  
 C/A sky separation (km) : 32839.3  
 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\_itrfr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

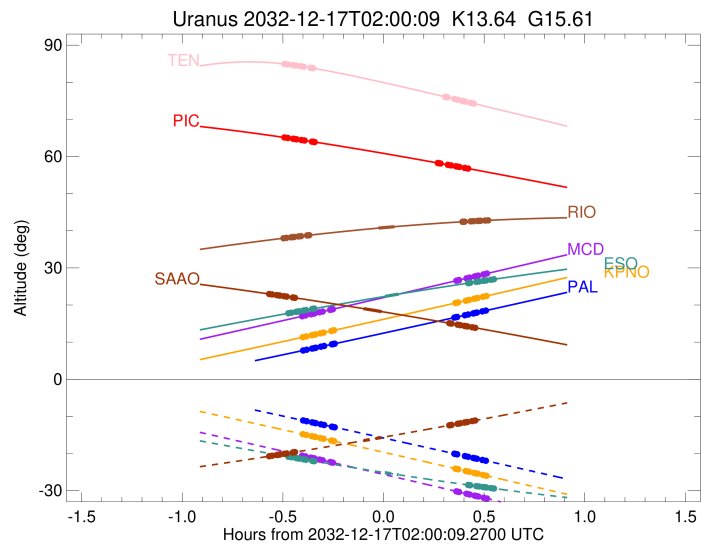
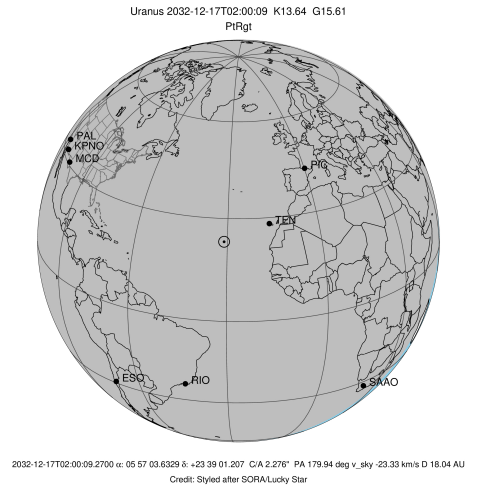


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-17T01:35:58.477		7.71	-11.05	51399.96	-18.25		
lambda	I	2032-12-17T01:37:14.866		7.96	-11.30	50026.71	-17.79		
delta	I	2032-12-17T01:38:53.288		8.27	-11.62	48300.35	-17.28		
gamma	I	2032-12-17T01:39:32.324		8.40	-11.75	47630.11	-17.06		
eta	I	2032-12-17T01:39:59.058		8.49	-11.83	47176.12	-16.90		
beta	I	2032-12-17T01:41:29.114		8.78	-12.13	45678.62	-16.34		
alpha	I	2032-12-17T01:42:26.550		8.96	-12.32	44751.17	-15.96		
4	I	2032-12-17T01:44:48.023		9.42	-12.78	42566.01	-14.88		
5	I	2032-12-17T01:45:05.009		9.48	-12.83	42315.13	-14.77		
6	I	2032-12-17T01:45:38.956		9.59	-12.95	41818.42	-14.50		

No planet occultations

6	E	2032-12-17T02:21:18.913		16.62	-20.06	41869.20	14.53		
5	E	2032-12-17T02:21:45.016		16.71	-20.15	42257.75	14.81		
4	E	2032-12-17T02:22:02.457		16.77	-20.21	42526.18	14.92		
alpha	E	2032-12-17T02:24:24.033		17.24	-20.68	44712.69	16.01		
beta	E	2032-12-17T02:25:22.239		17.43	-20.88	45652.25	16.39		
eta	E	2032-12-17T02:26:53.545		17.74	-21.19	47176.12	16.96		
gamma	E	2032-12-17T02:27:19.740		17.83	-21.27	47622.49	17.12		
delta	E	2032-12-17T02:27:59.081		17.96	-21.41	48300.35	17.34		
lambda	E	2032-12-17T02:29:37.133		18.29	-21.74	50026.71	17.86		
epsilon	E	2032-12-17T02:30:54.261		18.54	-22.00	51418.98	18.33		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-17T02:04:09.920  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 3424832146175990656  
 2Mass ID (if available) : 05570363+2339013  
 ICRS Star Coord at Epoch: 05h 57m 03.63288s +23:39:01.20744s  
 RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.641  
 G magnitude : 15.612  
 RP magnitude : 14.919  
 BP magnitude : 16.119  
 DUPflag : 0  
 Distance (au) : 18.038  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.33  
 Sun-Target sep (deg) : 175.89  
 Sun-Moon sep (deg) : 5.09  
 B (ring opening deg) : 75.91  
 PA of pole (deg) : 55.19  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.486  
 C/A sky separation (km) : 32520.1  
 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\_itrfr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



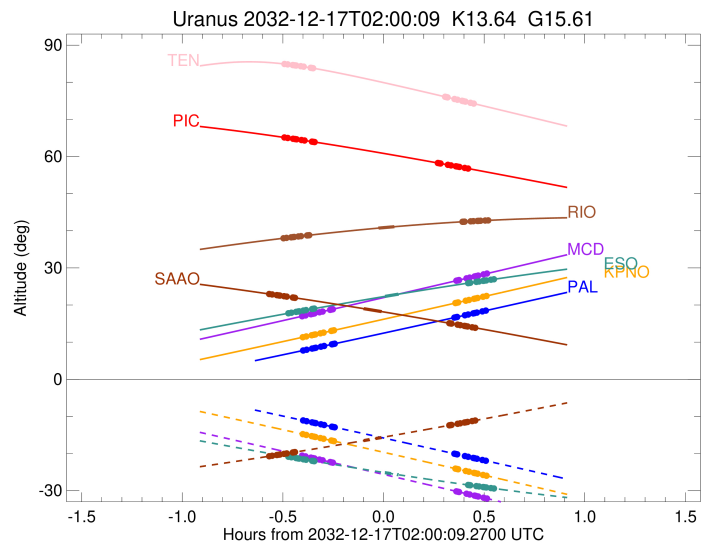
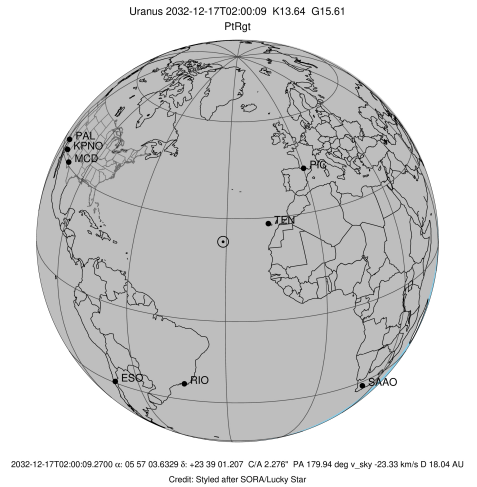
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-17T01:35:52.632		11.29	-14.74	51397.37	-18.40		
lambda	I	2032-12-17T01:37:08.216		11.54	-14.99	50026.71	-17.96		
delta	I	2032-12-17T01:38:45.700		11.86	-15.32	48300.35	-17.45		
gamma	I	2032-12-17T01:39:24.332		11.99	-15.45	47630.14	-17.24		
eta	I	2032-12-17T01:39:50.782		12.08	-15.54	47176.12	-17.09		
beta	I	2032-12-17T01:41:19.797		12.37	-15.84	45678.72	-16.54		
alpha	I	2032-12-17T01:42:16.510		12.56	-16.03	44751.26	-16.17		
4	I	2032-12-17T01:44:35.890		13.03	-16.50	42566.55	-15.12		
5	I	2032-12-17T01:44:52.647		13.08	-16.56	42315.07	-15.02		
6	I	2032-12-17T01:45:26.038		13.19	-16.67	41817.95	-14.75		

No planet occultations

6	E	2032-12-17T02:21:37.278		20.54	-24.08	41869.54	14.79		
5	E	2032-12-17T02:22:02.841		20.62	-24.16	42256.81	15.06		
4	E	2032-12-17T02:22:20.060		20.68	-24.22	42526.12	15.17		
alpha	E	2032-12-17T02:24:39.536		21.16	-24.70	44712.33	16.22		
beta	E	2032-12-17T02:25:37.015		21.36	-24.90	45652.06	16.60		
eta	E	2032-12-17T02:27:07.276		21.67	-25.21	47176.12	17.15		
gamma	E	2032-12-17T02:27:33.188		21.75	-25.30	47622.46	17.30		
delta	E	2032-12-17T02:28:12.123		21.89	-25.44	48300.35	17.52		
lambda	E	2032-12-17T02:29:49.235		22.22	-25.77	50026.71	18.03		
epsilon	E	2032-12-17T02:31:05.552		22.48	-26.04	51416.48	18.48		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2032-12-17T02:04:07.570
Event type           : PtRgt
: Uranus occs: topocentric, not geocentric
: Ring occs: geocentric, topocentric
Observer code        : MCD
Location              : McDonald Obs. 2.7m
Latitude (deg)       : 30.67158
E. Longitude (deg)   : 255.97844
Altitude (km)        : 2.075
Gaia source ID       : 3424832146175990656
2Mass ID (if available) : 05570363+2339013
ICRS Star Coord at Epoch: 05h 57m 03.63288s +23:39:01.20744s
RUWE (>1.4 is poor) : 1.02
K magnitude          : 13.641
G magnitude          : 15.612
RP magnitude         : 14.919
BP magnitude         : 16.119
DUPflag              : 0
Distance (au)        : 18.038
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -23.33
Sun-Target sep (deg) : 175.89
Sun-Moon sep (deg)   : 5.04
B (ring opening deg) : 75.91
PA of pole (deg)     : 55.19
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.455
C/A sky separation (km) : 32118.4
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
  
```



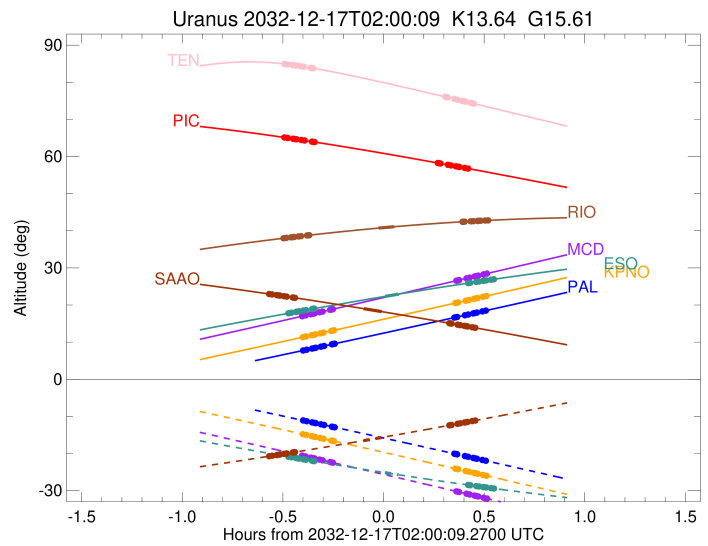
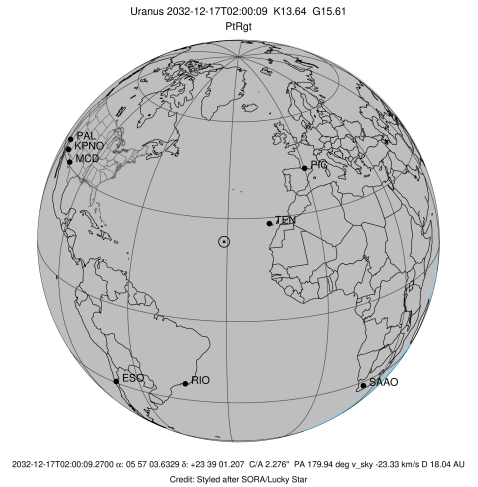
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-17T01:35:40.875		16.94	-20.52	51394.07	-18.60		
lambda	I	2032-12-17T01:36:55.446		17.19	-20.78	50026.71	-18.16		
delta	I	2032-12-17T01:38:31.756		17.52	-21.11	48300.35	-17.68		
gamma	I	2032-12-17T01:39:09.886		17.65	-21.24	47630.19	-17.47		
eta	I	2032-12-17T01:39:35.984		17.74	-21.33	47176.12	-17.32		
beta	I	2032-12-17T01:41:03.712		18.04	-21.64	45678.84	-16.80		
alpha	I	2032-12-17T01:41:59.536		18.24	-21.83	44751.38	-16.44		
4	I	2032-12-17T01:44:16.366		18.71	-22.30	42567.22	-15.43		
5	I	2032-12-17T01:44:32.849		18.76	-22.36	42314.98	-15.33		
6	I	2032-12-17T01:45:05.569		18.88	-22.47	41817.36	-15.08		

No planet occultations

6	E	2032-12-17T02:21:54.164		26.56	-30.20	41869.97	15.12		
5	E	2032-12-17T02:22:19.081		26.64	-30.29	42255.65	15.37		
4	E	2032-12-17T02:22:36.032		26.70	-30.35	42526.07	15.47		
alpha	E	2032-12-17T02:24:52.962		27.18	-30.83	44711.89	16.49		
beta	E	2032-12-17T02:25:49.550		27.38	-31.03	45651.84	16.85		
eta	E	2032-12-17T02:27:18.525		27.69	-31.34	47176.12	17.39		
gamma	E	2032-12-17T02:27:44.087		27.78	-31.43	47622.42	17.53		
delta	E	2032-12-17T02:28:22.521		27.92	-31.57	48300.35	17.74		
lambda	E	2032-12-17T02:29:58.464		28.26	-31.91	50026.71	18.24		
epsilon	E	2032-12-17T02:31:13.774		28.52	-32.18	51413.39	18.68		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2032-12-17T01:59:26.470
Event type           : PtRgt
: Uranus occs: topocentric, not geocentric
: 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       : 3424832146175990656
2Mass ID (if available) : 05570363+2339013
ICRS Star Coord at Epoch: 05h 57m 03.63288s +23:39:01.20744s
RUWE (>1.4 is poor) : 1.02
K magnitude           : 13.641
G magnitude           : 15.612
RP magnitude          : 14.919
BP magnitude          : 16.119
DUPflag              : 0
Distance (au)         : 18.038
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -23.33
Sun-Target sep (deg)  : 175.89
Sun-Moon sep (deg)   : 5.03
B (ring opening deg) : 75.91
PA of pole (deg)     : 55.19
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.310
C/A sky separation (km) : 30215.9
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
  
```

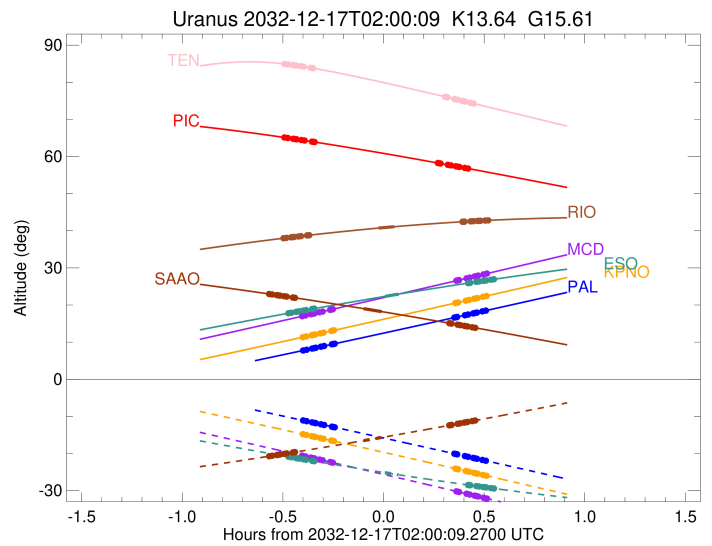
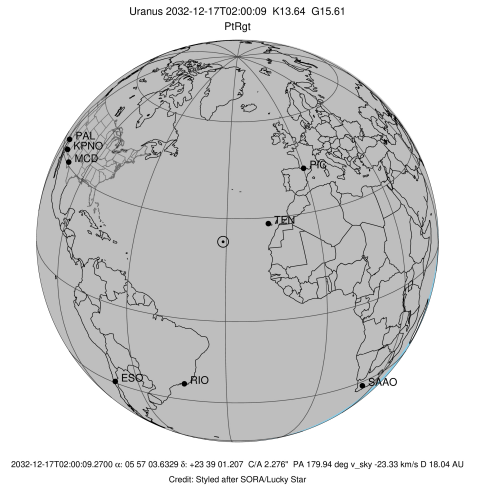


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2032-12-17T01:30:26.643		84.95	-82.03	51375.95	-19.60		
lambda	I	2032-12-17T01:31:36.342		84.82	-81.82	50026.71	-19.21		
delta	I	2032-12-17T01:33:07.186		84.64	-81.54	48300.35	-18.79		
gamma	I	2032-12-17T01:33:43.009		84.57	-81.43	47630.40	-18.61		
eta	I	2032-12-17T01:34:07.500		84.52	-81.36	47176.12	-18.49		
beta	I	2032-12-17T01:35:29.439		84.33	-81.10	45679.43	-18.03		
alpha	I	2032-12-17T01:36:21.337		84.21	-80.93	44751.87	-17.73		
4	I	2032-12-17T01:38:27.185		83.90	-80.53	42570.60	-16.88		
5	I	2032-12-17T01:38:42.540		83.86	-80.48	42314.26	-16.80		
6	I	2032-12-17T01:39:12.441		83.78	-80.38	41814.52	-16.58		

No planet occultations

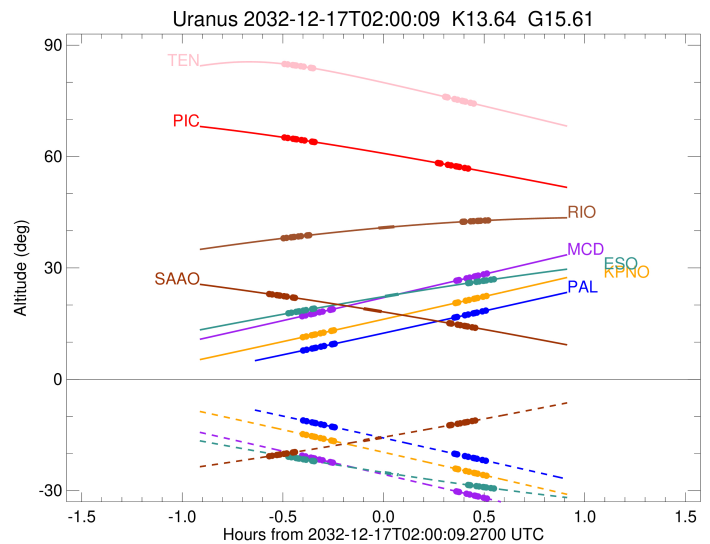
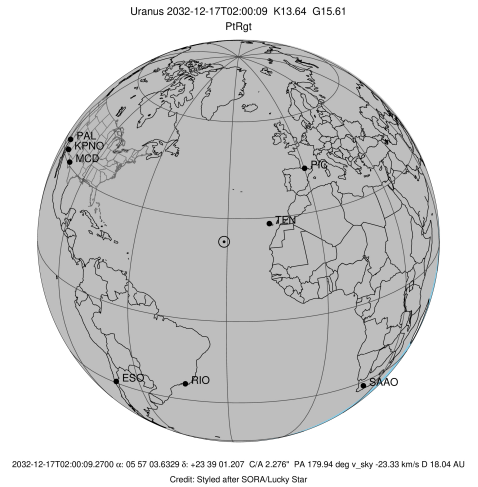
6	E	2032-12-17T02:18:32.979		76.09	-72.16	41871.59	16.58		
5	E	2032-12-17T02:18:55.339		76.01	-72.08	42250.93	16.79		
4	E	2032-12-17T02:19:11.179		75.95	-72.02	42525.94	16.87		
alpha	E	2032-12-17T02:21:17.615		75.50	-71.57	44710.15	17.72		
beta	E	2032-12-17T02:22:10.455		75.31	-71.38	45650.95	18.02		
eta	E	2032-12-17T02:23:33.971		75.02	-71.08	47176.12	18.48		
gamma	E	2032-12-17T02:23:58.037		74.93	-70.99	47622.25	18.60		
delta	E	2032-12-17T02:24:34.320		74.80	-70.86	48300.35	18.78		
lambda	E	2032-12-17T02:26:05.220		74.47	-70.53	50026.71	19.20		
epsilon	E	2032-12-17T02:27:16.249		74.22	-70.27	51401.02	19.59		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-17T02:01:22.000  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : 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 : 3424832146175990656  
 2Mass ID (if available) : 05570363+2339013  
 ICRS Star Coord at Epoch: 05h 57m 03.63288s +23:39:01.20744s  
 RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.641  
 G magnitude : 15.612  
 RP magnitude : 14.919  
 BP magnitude : 16.119  
 DUPflag : 0  
 Distance (au) : 18.038  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.33  
 Sun-Target sep (deg) : 175.89  
 Sun-Moon sep (deg) : 4.16  
 B (ring opening deg) : 75.91  
 PA of pole (deg) : 55.19  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.923  
 C/A sky separation (km) : 25156.4  
 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	2032-12-17T01:30:12.281		37.98	-40.06	51335.64	-21.13		
lambda	I	2032-12-17T01:31:14.739		38.09	-40.16	50026.71	-20.86		
delta	I	2032-12-17T01:32:37.999		38.24	-40.29	48300.35	-20.60		
gamma	I	2032-12-17T01:33:10.590		38.30	-40.34	47630.80	-20.49		
eta	I	2032-12-17T01:33:32.825		38.34	-40.37	47176.12	-20.41		
beta	I	2032-12-17T01:34:46.602		38.47	-40.48	45680.40	-20.13		
alpha	I	2032-12-17T01:35:32.974		38.55	-40.55	44752.41	-19.94		
4	I	2032-12-17T01:37:23.308		38.74	-40.71	42577.68	-19.42		
5	I	2032-12-17T01:37:37.233		38.77	-40.73	42311.28	-19.38		
6	I	2032-12-17T01:38:03.139		38.81	-40.76	41809.04	-19.25		
Uranus	I	2032-12-17T01:58:39.996		40.72	-42.29	25448.99		6.16	6.45
Uranus	E	2032-12-17T02:03:21.040		41.09	-42.57	25314.84		9.24	9.67
6	E	2032-12-17T02:23:43.988		42.43	-43.47	41875.29	19.27		
5	E	2032-12-17T02:24:02.356		42.44	-43.48	42237.83	19.40		
4	E	2032-12-17T02:24:16.879		42.46	-43.49	42526.41	19.44		
alpha	E	2032-12-17T02:26:07.557		42.55	-43.55	44705.34	19.96		
beta	E	2032-12-17T02:26:54.767		42.59	-43.57	45648.56	20.15		
eta	E	2032-12-17T02:28:09.988		42.65	-43.60	47176.12	20.44		
gamma	E	2032-12-17T02:28:31.756		42.67	-43.61	47621.82	20.51		
delta	E	2032-12-17T02:29:04.741		42.70	-43.63	48300.35	20.63		
lambda	E	2032-12-17T02:30:27.886		42.76	-43.66	50026.71	20.89		
epsilon	E	2032-12-17T02:31:31.432		42.81	-43.69	51360.47	21.16		

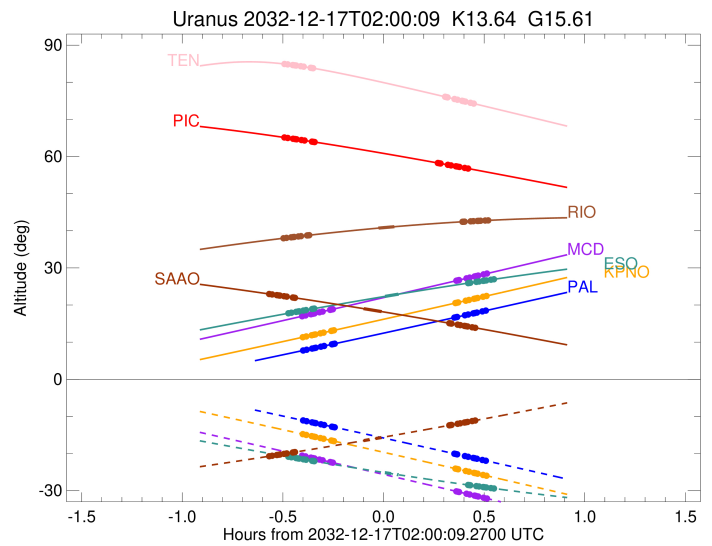
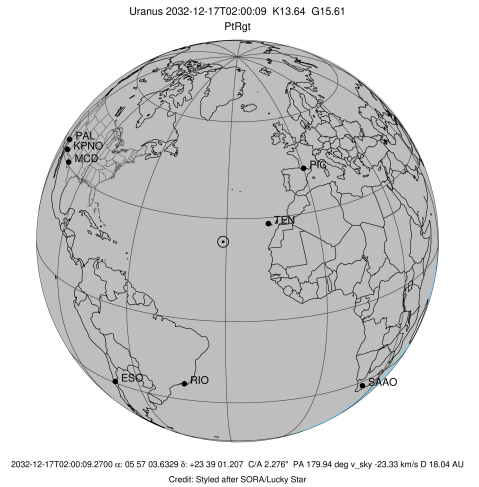
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-17T02:02:58.190  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 3424832146175990656  
 2Mass ID (if available) : 05570363+2339013  
 ICRS Star Coord at Epoch: 05h 57m 03.63288s +23:39:01.20744s  
 RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.641  
 G magnitude : 15.612  
 RP magnitude : 14.919  
 BP magnitude : 16.119  
 DUPflag : 0  
 Distance (au) : 18.038  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.33  
 Sun-Target sep (deg) : 175.89  
 Sun-Moon sep (deg) : 4.06  
 B (ring opening deg) : 75.91  
 PA of pole (deg) : 55.19  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.927  
 C/A sky separation (km) : 25211.3  
 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\_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	2032-12-17T01:31:39.327		17.76	-20.85	51337.01	-20.99		
lambda	I	2032-12-17T01:32:42.270		17.93	-21.01	50026.71	-20.73		
delta	I	2032-12-17T01:34:06.090		18.16	-21.23	48300.35	-20.46		
gamma	I	2032-12-17T01:34:38.902		18.25	-21.31	47630.78	-20.35		
eta	I	2032-12-17T01:35:01.287		18.31	-21.37	47176.12	-20.27		
beta	I	2032-12-17T01:36:15.568		18.51	-21.56	45680.38	-19.99		
alpha	I	2032-12-17T01:37:02.257		18.63	-21.68	44752.40	-19.80		
4	I	2032-12-17T01:38:53.367		18.93	-21.97	42577.49	-19.29		
5	I	2032-12-17T01:39:07.373		18.97	-22.00	42311.38	-19.24		
6	I	2032-12-17T01:39:33.463		19.04	-22.07	41809.17	-19.11		
Uranus	I	2032-12-17T02:00:34.237		22.32	-25.16	25439.80		6.42	6.72
Uranus	E	2032-12-17T02:04:38.782		22.93	-25.73	25323.14		9.08	9.50
6	E	2032-12-17T02:25:24.571		25.90	-28.48	41875.30	19.16		
5	E	2032-12-17T02:25:43.038		25.94	-28.51	42237.75	19.29		
4	E	2032-12-17T02:25:57.648		25.98	-28.55	42526.41	19.33		
alpha	E	2032-12-17T02:27:48.932		26.23	-28.78	44705.30	19.86		
beta	E	2032-12-17T02:28:36.395		26.34	-28.87	45648.54	20.05		
eta	E	2032-12-17T02:29:52.010		26.51	-29.03	47176.12	20.33		
gamma	E	2032-12-17T02:30:13.890		26.56	-29.07	47621.82	20.41		
delta	E	2032-12-17T02:30:47.043		26.63	-29.14	48300.35	20.52		
lambda	E	2032-12-17T02:32:10.605		26.82	-29.31	50026.71	20.79		
epsilon	E	2032-12-17T02:33:14.438		26.96	-29.44	51359.95	21.06		



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2032-12-17T01:57:15.530  
 Event type : PtRgt  
 : Uranus occs: topocentric, not geocentric  
 : 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 : 3424832146175990656  
 2Mass ID (if available) : 05570363+2339013  
 ICRS Star Coord at Epoch: 05h 57m 03.63288s +23:39:01.20744s  
 RUWE (>1.4 is poor) : 1.02  
 K magnitude : 13.641  
 G magnitude : 15.612  
 RP magnitude : 14.919  
 BP magnitude : 16.119  
 DUPflag : 0  
 Distance (au) : 18.038  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.33  
 Sun-Target sep (deg) : 175.89  
 Sun-Moon sep (deg) : 4.45  
 B (ring opening deg) : 75.91  
 PA of pole (deg) : 55.19  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.918  
 C/A sky separation (km) : 25094.5  
 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	2032-12-17T01:25:55.862		22.99	-20.75	51332.61	-21.08		
lambda	I	2032-12-17T01:26:58.338		22.85	-20.60	50026.71	-20.81		
delta	I	2032-12-17T01:28:21.816		22.66	-20.40	48300.35	-20.55		
gamma	I	2032-12-17T01:28:54.491		22.59	-20.33	47630.82	-20.43		
eta	I	2032-12-17T01:29:16.786		22.54	-20.27	47176.12	-20.36		
beta	I	2032-12-17T01:30:30.753		22.38	-20.09	45680.45	-20.07		
alpha	I	2032-12-17T01:31:17.250		22.27	-19.98	44752.42	-19.89		
4	I	2032-12-17T01:33:07.847		22.02	-19.71	42578.07	-19.37		
5	I	2032-12-17T01:33:21.843		21.99	-19.68	42311.06	-19.33		
6	I	2032-12-17T01:33:47.814		21.93	-19.62	41808.76	-19.20		
Uranus	I	2032-12-17T01:54:13.523		19.03	-16.53	25459.78		5.85	6.13
Uranus	E	2032-12-17T01:59:34.683		18.23	-15.69	25308.60		9.36	9.80
6	E	2032-12-17T02:19:48.924		15.10	-12.40	41875.20	19.15		
5	E	2032-12-17T02:20:07.428		15.05	-12.35	42238.19	19.28		
4	E	2032-12-17T02:20:22.016		15.01	-12.31	42526.38	19.32		
alpha	E	2032-12-17T02:22:13.403		14.71	-12.00	44705.49	19.84		
beta	E	2032-12-17T02:23:00.918		14.58	-11.87	45648.63	20.02		
eta	E	2032-12-17T02:24:16.640		14.38	-11.66	47176.12	20.30		
gamma	E	2032-12-17T02:24:38.559		14.32	-11.60	47621.83	20.37		
delta	E	2032-12-17T02:25:11.771		14.23	-11.50	48300.35	20.49		
lambda	E	2032-12-17T02:26:35.502		14.01	-11.27	50026.71	20.75		
epsilon	E	2032-12-17T02:27:39.591		13.83	-11.09	51362.22	21.01		