

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-12-17T14:08:40.420  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 663673847117789952  
 2Mass ID (if available) : 08182788+2014096

Uranus 2039-12-17T14:08:40 K13.18 G14.75 PgtRgt

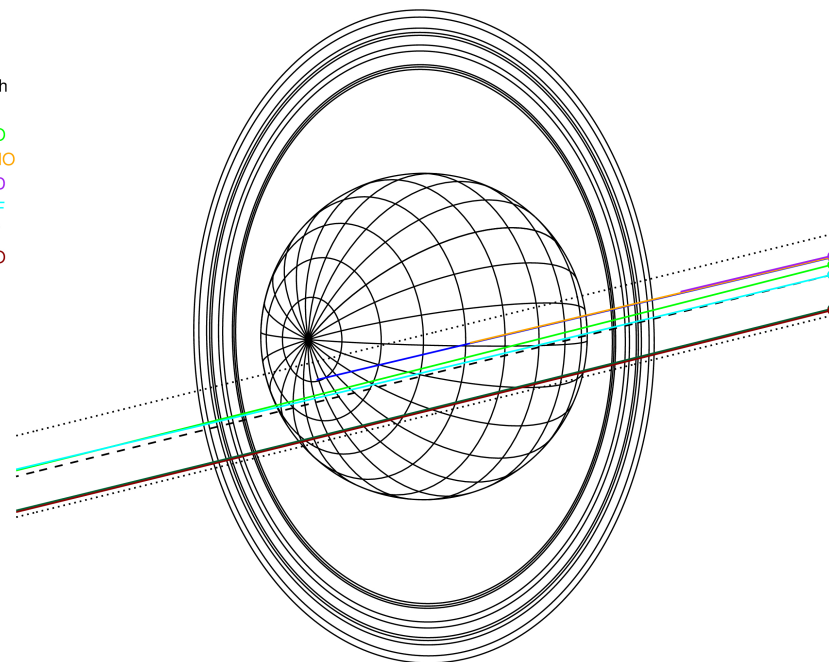
ICRS Star Coord at Epoch: 08h 18m 27.84537s +20:14:09.60747s

RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.176  
 G magnitude : 14.746  
 RP magnitude : 14.218  
 BP magnitude : 15.108  
 DUPflag : 0  
 Distance (au) : 17.801  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.16  
 Sun-Target sep (deg) : 142.72  
 Sun-Moon sep (deg) : 169.28  
 B (ring opening deg) : 44.80  
 PA of pole (deg) : 91.55



2039-12-17T14:08:40.4200 α: 08 18 27.8454 δ: +20 14 09.607 C/A 0.449° PA 13.89 deg v\_sky -17.16 km/s D 17.80 AU  
 Credit: Styled after SORA/Lucky Star

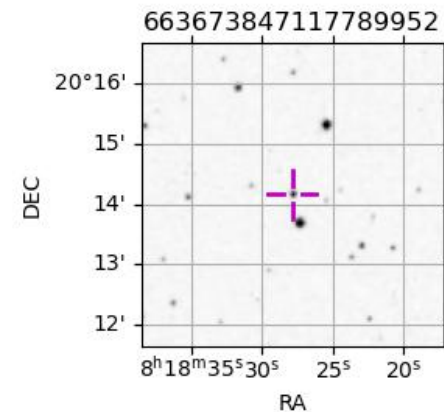
Earth  
 PAL  
 PMO  
 KPNO  
 MCD  
 IRTF  
 AAT  
 MSO



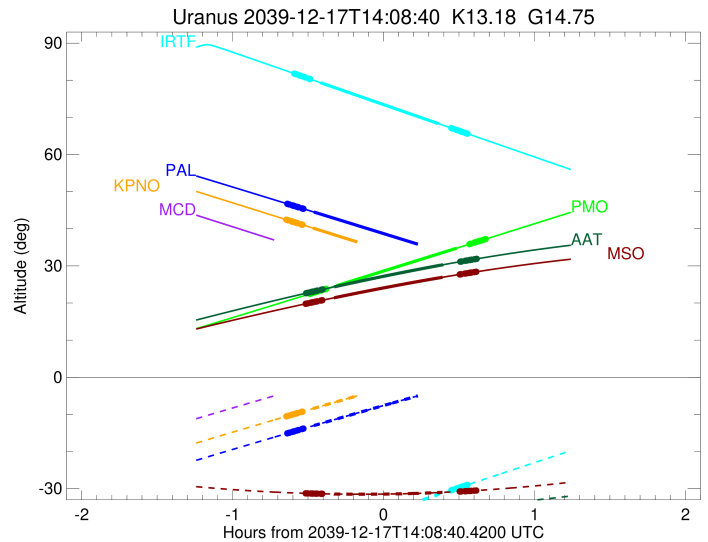
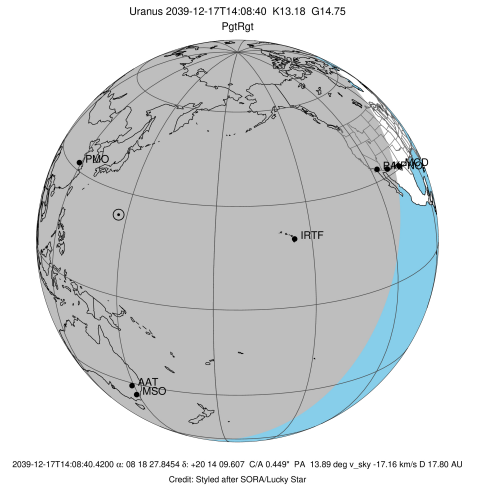
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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 17 13:30 - DEC 17 13:40	PinRin
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+	+++++	DEC 17 13:39 - DEC 17 14:49	PieRie
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+		DEC 17 13:29 - DEC 17 13:40	PinRin
MCD	McDonald Obs. 2.7m	30.7	256.0					PnnRnn
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+	+++++	DEC 17 13:32 - DEC 17 14:41	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					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1	+++++	+	+++++	DEC 17 13:37 - DEC 17 14:45	PieRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+	+++++	DEC 17 13:37 - DEC 17 14:45	PieRie

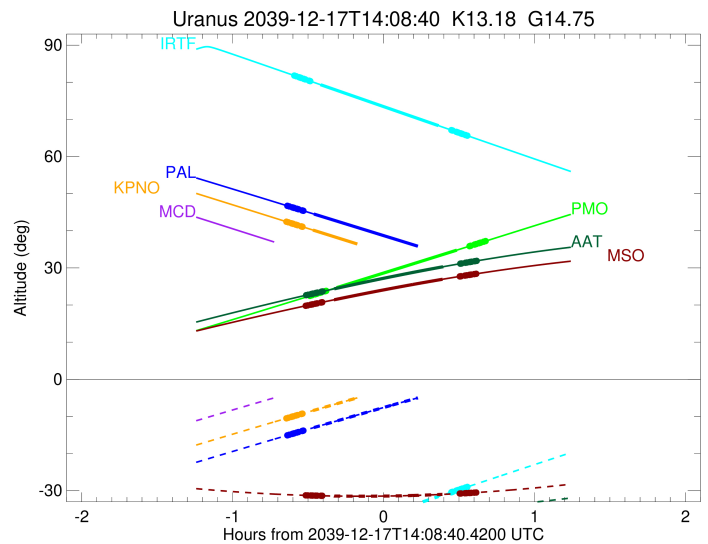
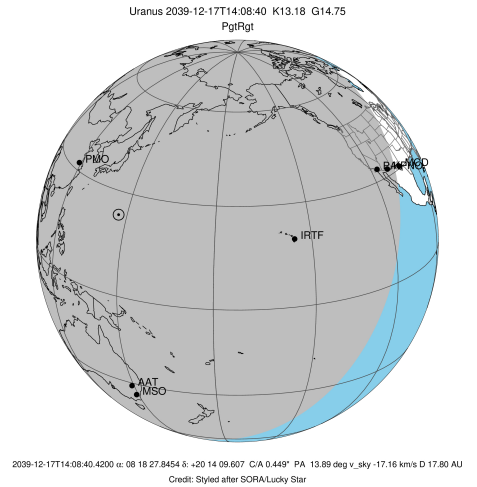


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-12-17T14:05:05.580  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 663673847117789952  
 2Mass ID (if available) : 08182788+2014096  
 ICRS Star Coord at Epoch: 08h 18m 27.84537s +20:14:09.60747s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.176  
 G magnitude : 14.746  
 RP magnitude : 14.218  
 BP magnitude : 15.108  
 DUPflag : 0  
 Distance (au) : 17.801  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.16  
 Sun-Target sep (deg) : 142.72  
 Sun-Moon sep (deg) : 169.82  
 B (ring opening deg) : 44.80  
 PA of pole (deg) : 91.55  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.210  
 C/A sky separation (km) : 2717.2  
 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	2039-12-17T13:30:12.399		46.77	-15.15	51533.17	-24.37		
lambda	I	2039-12-17T13:31:14.235		46.55	-14.94	50026.71	-24.36		
delta	I	2039-12-17T13:32:25.113		46.31	-14.71	48300.35	-24.35		
gamma	I	2039-12-17T13:32:53.000		46.21	-14.62	47621.22	-24.35		
eta	I	2039-12-17T13:33:11.279		46.15	-14.56	47176.12	-24.35		
beta	I	2039-12-17T13:34:14.483		45.93	-14.35	45641.21	-24.35		
alpha	I	2039-12-17T13:34:52.749		45.79	-14.22	44693.77	-24.34		
4	I	2039-12-17T13:36:20.721		45.49	-13.93	42547.79	-24.32		
5	I	2039-12-17T13:36:32.003		45.45	-13.89	42287.44	-24.33		
6	I	2039-12-17T13:36:49.261		45.39	-13.84	41872.34	-24.33		
Uranus	I	2039-12-17T13:40:58.098		44.52	-13.02	25272.51		-44.92	-46.24
Uranus	E	2039-12-17T14:29:16.923		34.39	-3.69x	25296.89		42.45	43.76
6	E	2039-12-17T14:33:54.879		33.42	-2.82x	41799.33	24.23		
5	E	2039-12-17T14:34:10.119		33.36	-2.77x	42175.15	24.23		
4	E	2039-12-17T14:34:27.917		33.30	-2.72x	42589.51	24.22		
alpha	E	2039-12-17T14:35:56.784		32.99	-2.44x	44745.88	24.23		
beta	E	2039-12-17T14:36:34.693		32.86	-2.32x	45680.65	24.24		
eta	E	2039-12-17T14:37:36.547		32.64	-2.13x	47176.12	24.24		
gamma	E	2039-12-17T14:37:55.315		32.58	-2.07x	47631.10	24.24		
delta	E	2039-12-17T14:38:22.921		32.48	-1.98x	48300.35	24.24		
lambda	E	2039-12-17T14:39:34.130		32.23	-1.76x	50026.71	24.24		
epsilon	E	2039-12-17T14:40:05.234		32.12	-1.67x	50780.83	24.25		

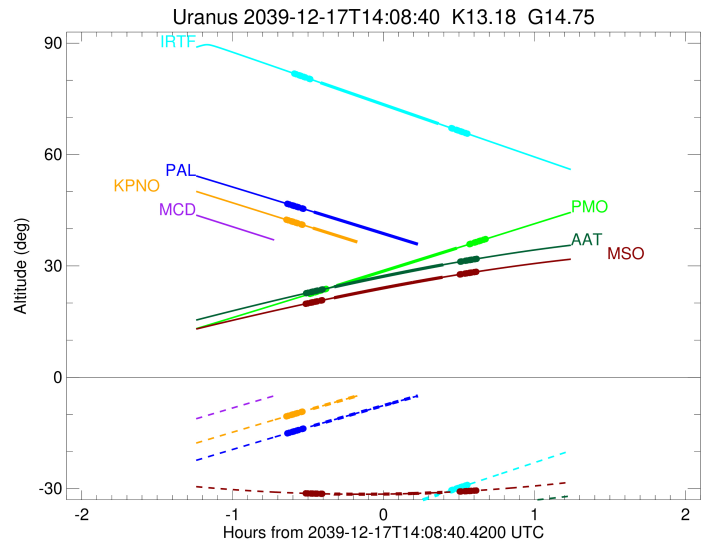
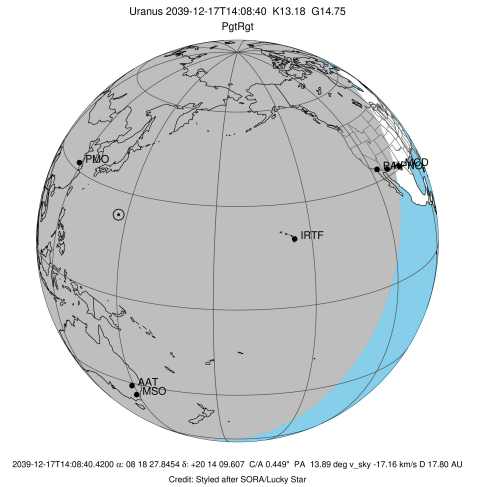
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-12-17T14:13:54.680  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 663673847117789952  
 2Mass ID (if available) : 08182788+2014096  
 ICRS Star Coord at Epoch: 08h 18m 27.84537s +20:14:09.60747s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.176  
 G magnitude : 14.746  
 RP magnitude : 14.218  
 BP magnitude : 15.108  
 DUPflag : 0  
 Distance (au) : 17.801  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.16  
 Sun-Target sep (deg) : 142.72  
 Sun-Moon sep (deg) : 168.51  
 B (ring opening deg) : 44.80  
 PA of pole (deg) : 91.55  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.372  
 C/A sky separation (km) : 4802.5  
 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	2039-12-17T13:39:11.945		22.41	-57.68	51537.08	-24.11		
lambda	I	2039-12-17T13:40:14.619		22.63	-57.90	50026.71	-24.10		
delta	I	2039-12-17T13:41:26.273		22.88	-58.15	48300.35	-24.09		
gamma	I	2039-12-17T13:41:54.468		22.98	-58.25	47621.16	-24.09		
eta	I	2039-12-17T13:42:12.945		23.04	-58.31	47176.12	-24.09		
beta	I	2039-12-17T13:43:16.850		23.26	-58.54	45641.13	-24.08		
alpha	I	2039-12-17T13:43:55.504		23.40	-58.67	44694.65	-24.07		
4	I	2039-12-17T13:45:24.532		23.71	-58.98	42546.27	-24.05		
5	I	2039-12-17T13:45:35.941		23.75	-59.02	42284.96	-24.05		
6	I	2039-12-17T13:45:53.477		23.81	-59.09	41871.34	-24.05		
Uranus	I	2039-12-17T13:50:01.974		24.68	-59.96	25270.02		-45.18	-46.49
Uranus	E	2039-12-17T14:37:46.682		34.78	-69.79	25315.18		40.59	41.90
6	E	2039-12-17T14:42:49.298		35.85	-70.79	41798.24	24.20		
5	E	2039-12-17T14:43:04.275		35.90	-70.84	42172.07	24.20		
4	E	2039-12-17T14:43:22.164		35.97	-70.90	42587.02	24.19		
alpha	E	2039-12-17T14:44:51.306		36.28	-71.19	44746.98	24.22		
beta	E	2039-12-17T14:45:29.182		36.42	-71.32	45680.35	24.23		
eta	E	2039-12-17T14:46:31.051		36.63	-71.52	47176.12	24.25		
gamma	E	2039-12-17T14:46:49.810		36.70	-71.58	47630.97	24.25		
delta	E	2039-12-17T14:47:17.412		36.80	-71.67	48300.35	24.25		
lambda	E	2039-12-17T14:48:28.574		37.05	-71.90	50026.71	24.27		
epsilon	E	2039-12-17T14:49:00.025		37.16	-72.00	50789.95	24.28		

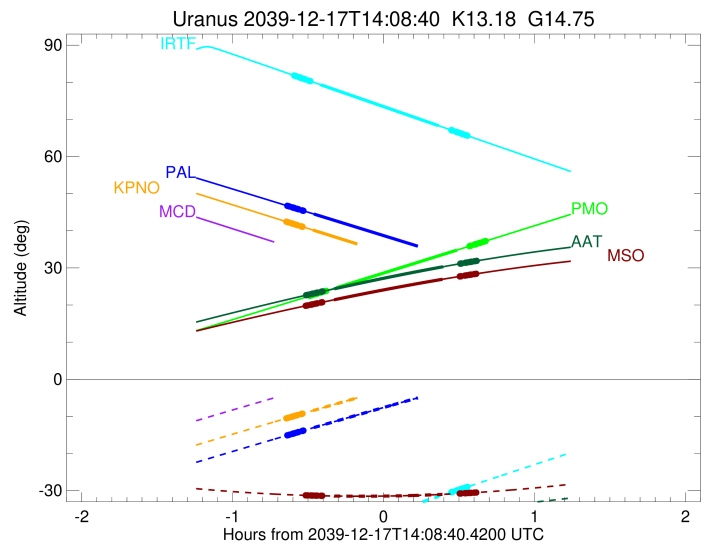
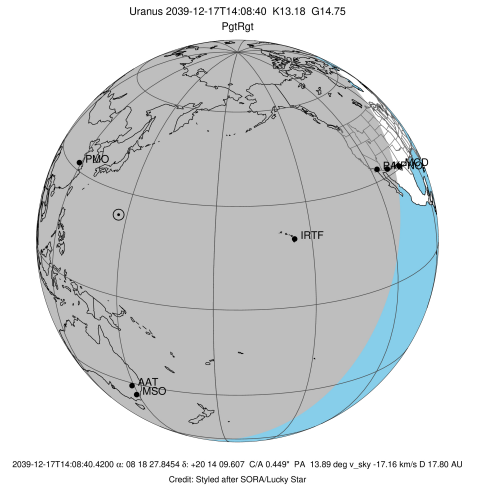
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2039-12-17T14:04:46.990
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       : 663673847117789952
2Mass ID (if available) : 08182788+2014096
ICRS Star Coord at Epoch: 08h 18m 27.84537s +20:14:09.60747s
RUWE (>1.4 is poor) : 1.00
K magnitude          : 13.176
G magnitude          : 14.746
RP magnitude         : 14.218
BP magnitude         : 15.108
DUPflag             : 0
Distance (au)        : 17.801
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -17.16
Sun-Target sep (deg) : 142.72
Sun-Moon sep (deg)   : 169.85
B (ring opening deg) : 44.80
PA of pole (deg)     : 91.55
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.204
C/A sky separation (km) : 2632.8
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	2039-12-17T13:29:49.987	42.50	-10.57	51532.96	-24.34		
lambda	I	2039-12-17T13:30:51.895	42.28	-10.37	50026.71	-24.33		
delta	I	2039-12-17T13:32:02.865	42.02	-10.14	48300.35	-24.32		
gamma	I	2039-12-17T13:32:30.788	41.92	-10.04	47621.22	-24.32		
eta	I	2039-12-17T13:32:49.091	41.86	-9.98	47176.12	-24.32		
beta	I	2039-12-17T13:33:52.377	41.63	-9.77	45641.21	-24.32		
alpha	I	2039-12-17T13:34:30.694	41.50	-9.65	44693.72	-24.30		
4	I	2039-12-17T13:35:58.777	41.19	-9.36	42547.87	-24.29		
5	I	2039-12-17T13:36:10.074	41.15	-9.32	42287.55	-24.30		
6	I	2039-12-17T13:36:27.350	41.08	-9.26	41872.39	-24.30		
Uranus	I	2039-12-17T13:40:36.740	40.20	-8.45	25272.70		-44.91	-46.22
Uranus	E	2039-12-17T14:29:01.258	29.91	0.85x	25296.32		42.51	43.82
6	E	2039-12-17T14:33:38.924	28.93	1.71x	41799.37	24.19		
5	E	2039-12-17T14:33:54.199	28.87	1.75x	42175.26	24.19		
4	E	2039-12-17T14:34:12.024	28.81	1.81x	42589.59	24.16		
alpha	E	2039-12-17T14:35:41.031	28.50	2.08x	44745.84	24.19		
beta	E	2039-12-17T14:36:19.005	28.36	2.20x	45680.66	24.20		
eta	E	2039-12-17T14:37:20.962	28.14	2.39x	47176.12	24.20		
gamma	E	2039-12-17T14:37:39.762	28.08	2.45x	47631.10	24.20		
delta	E	2039-12-17T14:38:07.415	27.98	2.54x	48300.35	24.20		
lambda	E	2039-12-17T14:39:18.744	27.73	2.76x	50026.71	24.20		
epsilon	E	2039-12-17T14:39:49.890	27.62	2.85x	50780.54	24.21		

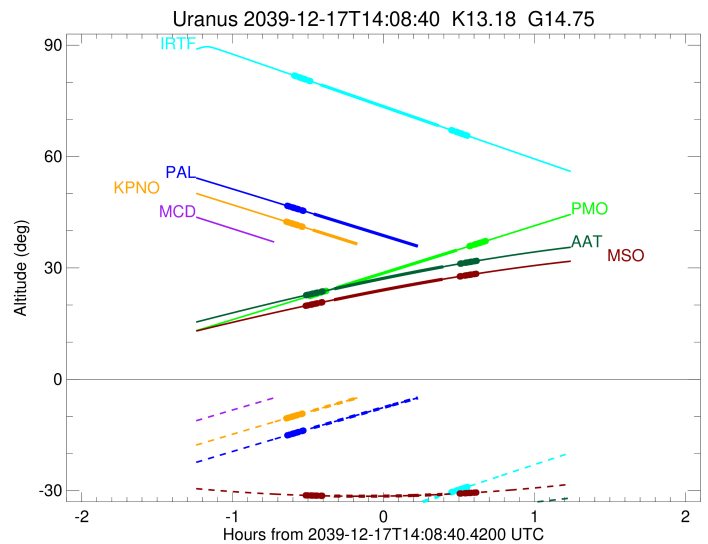
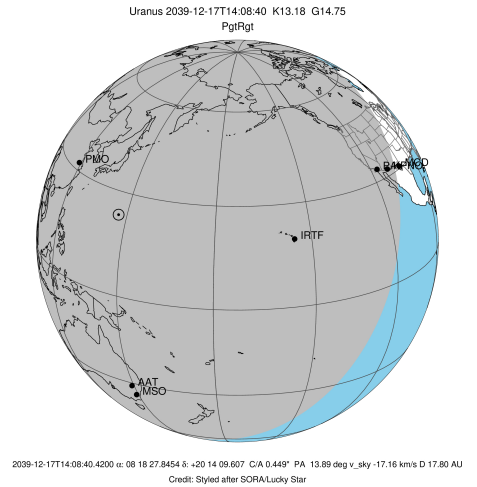
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-12-17T14:07:03.390  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : IRTF  
 Location : Mauna Kea/IRTF  
 Latitude (deg) : 19.82622  
 E. Longitude (deg) : 204.52800  
 Altitude (km) : 4.168  
 Gaia source ID : 663673847117789952  
 2Mass ID (if available) : 08182788+2014096  
 ICRS Star Coord at Epoch: 08h 18m 27.84537s +20:14:09.60747s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.176  
 G magnitude : 14.746  
 RP magnitude : 14.218  
 BP magnitude : 15.108  
 DUPflag : 0  
 Distance (au) : 17.801  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.16  
 Sun-Target sep (deg) : 142.72  
 Sun-Moon sep (deg) : 169.70  
 B (ring opening deg) : 44.80  
 PA of pole (deg) : 91.55  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.424  
 C/A sky separation (km) : 5471.2  
 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	2039-12-17T13:32:58.044		81.87	-44.69	51539.70	-24.51		
lambda	I	2039-12-17T13:33:59.807		81.62	-44.45	50026.71	-24.49		
delta	I	2039-12-17T13:35:10.312		81.35	-44.19	48300.35	-24.48		
gamma	I	2039-12-17T13:35:38.061		81.24	-44.08	47621.13	-24.47		
eta	I	2039-12-17T13:35:56.245		81.17	-44.01	47176.12	-24.47		
beta	I	2039-12-17T13:36:59.151		80.92	-43.77	45641.09	-24.46		
alpha	I	2039-12-17T13:37:37.185		80.77	-43.63	44695.24	-24.44		
4	I	2039-12-17T13:39:04.904		80.43	-43.29	42545.33	-24.42		
5	I	2039-12-17T13:39:16.143		80.38	-43.25	42283.36	-24.42		
6	I	2039-12-17T13:39:33.469		80.32	-43.18	41870.68	-24.42		
Uranus	I	2039-12-17T13:43:38.072		79.36	-42.25	25269.81		-45.20	-46.51
Uranus	E	2039-12-17T14:30:32.417		68.32	-31.59	25318.15		40.29	41.59
6	E	2039-12-17T14:35:36.587		67.13	-30.45	41798.12	24.39		
5	E	2039-12-17T14:35:51.417		67.07	-30.39	42171.73	24.39		
4	E	2039-12-17T14:36:09.172		67.00	-30.32	42586.73	24.38		
alpha	E	2039-12-17T14:37:37.637		66.65	-29.99	44747.09	24.41		
beta	E	2039-12-17T14:38:15.213		66.51	-29.85	45680.32	24.43		
eta	E	2039-12-17T14:39:16.601		66.26	-29.62	47176.12	24.44		
gamma	E	2039-12-17T14:39:35.214		66.19	-29.55	47630.96	24.44		
delta	E	2039-12-17T14:40:02.602		66.08	-29.44	48300.35	24.44		
lambda	E	2039-12-17T14:41:13.215		65.81	-29.18	50026.71	24.45		
epsilon	E	2039-12-17T14:41:44.456		65.69	-29.06	50790.72	24.47		



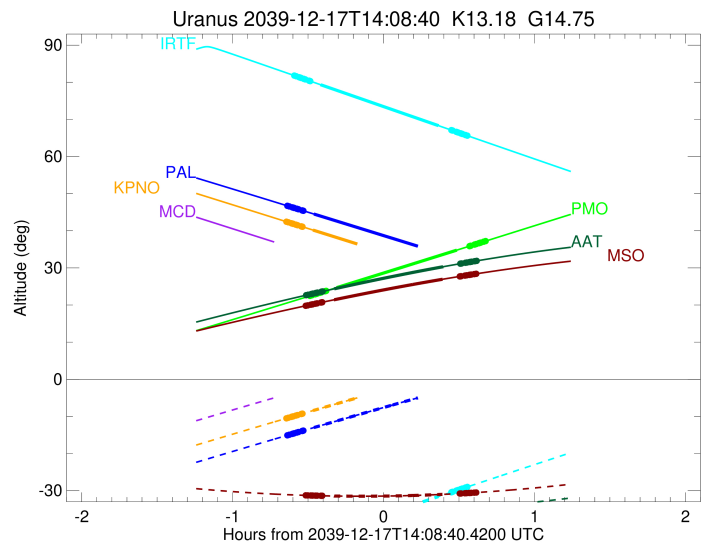
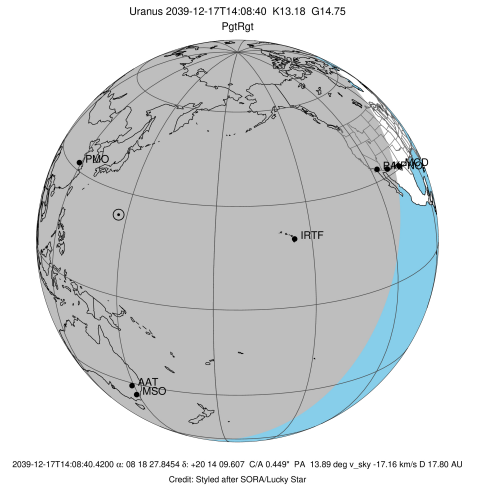
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-12-17T14:10:42.510  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 663673847117789952  
 2Mass ID (if available) : 08182788+2014096  
 ICRS Star Coord at Epoch: 08h 18m 27.84537s +20:14:09.60747s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.176  
 G magnitude : 14.746  
 RP magnitude : 14.218  
 BP magnitude : 15.108  
 DUPflag : 0  
 Distance (au) : 17.801  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.16  
 Sun-Target sep (deg) : 142.72  
 Sun-Moon sep (deg) : 169.21  
 B (ring opening deg) : 44.80  
 PA of pole (deg) : 91.55  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.867  
 C/A sky separation (km) : 11199.7  
 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



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-12-17T13:37:39.627	22.61	-35.28	51549.50	-23.86		
lambda	I	2039-12-17T13:38:43.516	22.78	-35.31	50026.71	-23.82		
delta	I	2039-12-17T13:39:56.070	22.96	-35.33	48300.35	-23.77		
gamma	I	2039-12-17T13:40:24.661	23.04	-35.34	47621.01	-23.75		
eta	I	2039-12-17T13:40:43.397	23.09	-35.35	47176.12	-23.74		
beta	I	2039-12-17T13:41:48.287	23.25	-35.37	45641.09	-23.69		
alpha	I	2039-12-17T13:42:27.462	23.35	-35.38	44698.53	-23.65		
4	I	2039-12-17T13:43:58.477	23.59	-35.41	42540.62	-23.56		
5	I	2039-12-17T13:44:10.154	23.61	-35.41	42274.34	-23.55		
6	I	2039-12-17T13:44:28.378	23.66	-35.42	41866.82	-23.54		
Uranus	I	2039-12-17T13:49:04.600	24.36	-35.48	25286.24		-43.53	-44.85
Uranus	E	2039-12-17T14:32:24.630	30.32	-34.98	25380.71		33.73	34.96
6	E	2039-12-17T14:39:09.684	31.13	-34.72	41796.11	23.63		
5	E	2039-12-17T14:39:24.342	31.16	-34.71	42165.23	23.65		
4	E	2039-12-17T14:39:42.730	31.20	-34.70	42580.41	23.65		
alpha	E	2039-12-17T14:41:14.247	31.38	-34.64	44749.33	23.75		
beta	E	2039-12-17T14:41:52.745	31.45	-34.61	45679.34	23.79		
eta	E	2039-12-17T14:42:55.740	31.58	-34.56	47176.12	23.84		
gamma	E	2039-12-17T14:43:14.795	31.61	-34.55	47630.60	23.86		
delta	E	2039-12-17T14:43:42.856	31.67	-34.53	48300.35	23.88		
lambda	E	2039-12-17T14:44:55.079	31.80	-34.47	50026.71	23.93		
epsilon	E	2039-12-17T14:45:28.061	31.87	-34.45	50816.24	23.97		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-12-17T14:10:30.490  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MSO  
 Location : Mt. Stromlo Observatory  
 Latitude (deg) : -35.32000  
 E. Longitude (deg) : 149.00833  
 Altitude (km) : 0.770  
 Gaia source ID : 663673847117789952  
 2Mass ID (if available) : 08182788+2014096  
 ICRS Star Coord at Epoch: 08h 18m 27.84537s +20:14:09.60747s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.176  
 G magnitude : 14.746  
 RP magnitude : 14.218  
 BP magnitude : 15.108  
 DUPflag : 0  
 Distance (au) : 17.801  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -17.16  
 Sun-Target sep (deg) : 142.72  
 Sun-Moon sep (deg) : 169.24  
 B (ring opening deg) : 44.80  
 PA of pole (deg) : 91.55  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.886  
 C/A sky separation (km) : 11439.0  
 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	2039-12-17T13:37:29.684		19.75	-31.26	51549.82	-23.81		
lambda	I	2039-12-17T13:38:33.710		19.91	-31.29	50026.71	-23.77		
delta	I	2039-12-17T13:39:46.409		20.09	-31.31	48300.35	-23.72		
gamma	I	2039-12-17T13:40:15.058		20.16	-31.32	47621.00	-23.70		
eta	I	2039-12-17T13:40:33.834		20.20	-31.33	47176.12	-23.69		
beta	I	2039-12-17T13:41:38.863		20.36	-31.35	45641.10	-23.64		
alpha	I	2039-12-17T13:42:18.122		20.45	-31.36	44698.68	-23.60		
4	I	2039-12-17T13:43:49.363		20.67	-31.38	42540.43	-23.50		
5	I	2039-12-17T13:44:01.071		20.70	-31.38	42273.92	-23.49		
6	I	2039-12-17T13:44:19.350		20.74	-31.39	41866.64	-23.48		
Uranus	I	2039-12-17T13:48:58.259		21.40	-31.45	25287.68		-43.39	-44.70
Uranus	E	2039-12-17T14:32:07.127		26.93	-31.01	25383.67		33.41	34.63
6	E	2039-12-17T14:38:57.864		27.70	-30.78	41796.04	23.57		
5	E	2039-12-17T14:39:12.537		27.73	-30.77	42164.99	23.58		
4	E	2039-12-17T14:39:30.973		27.76	-30.76	42580.15	23.59		
alpha	E	2039-12-17T14:41:02.737		27.93	-30.70	44749.41	23.70		
beta	E	2039-12-17T14:41:41.323		28.00	-30.67	45679.29	23.74		
eta	E	2039-12-17T14:42:44.465		28.11	-30.63	47176.12	23.79		
gamma	E	2039-12-17T14:43:03.562		28.15	-30.62	47630.58	23.80		
delta	E	2039-12-17T14:43:31.686		28.20	-30.60	48300.35	23.83		
lambda	E	2039-12-17T14:44:44.064		28.32	-30.55	50026.71	23.88		
epsilon	E	2039-12-17T14:45:17.162		28.38	-30.53	50817.37	23.92		