

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-12-31T16:26:15.450
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 673940021545959552
 2Mass ID (if available) : 07561247+2118431

ICRS Star Coord at Epoch: 07h 56m 12.44705s +21:18:42.49877s

RUWE (>1.4 is poor) : 1.05
 K magnitude : 13.790
 G magnitude : 17.041
 RP magnitude : 16.014
 BP magnitude : 18.129
 DUPflag : 0
 Distance (au) : 17.706
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.91
 Sun-Target sep (deg) : 162.64
 Sun-Moon sep (deg) : 125.73
 B (ring opening deg) : 50.00
 PA of pole (deg) : 88.41

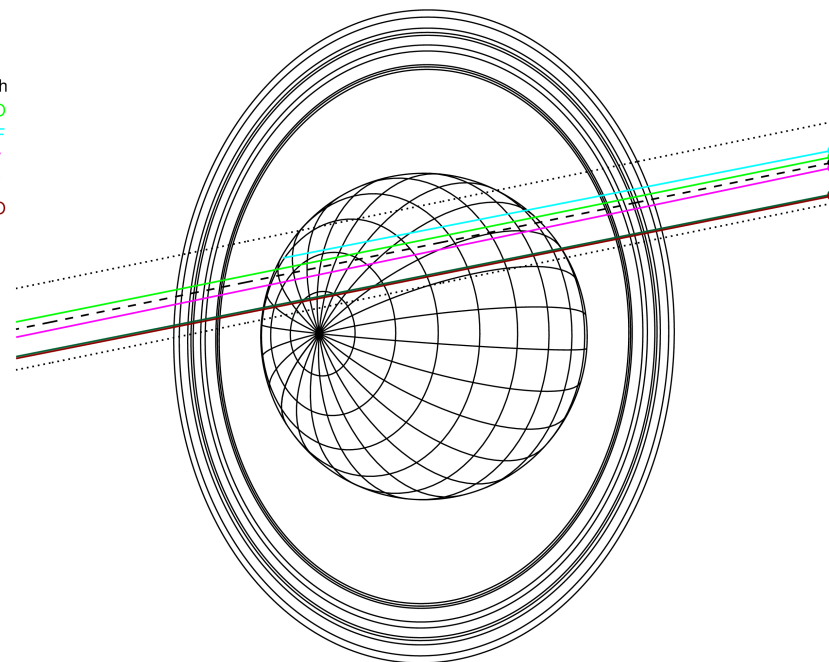
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2038-12-31T16:26:15.4500 ra: 07 56 12.44705 ra: +21 18 42.499 C/A 1.092 PA 191.54 deg v_sky -21.91 km/s D 17.71 AU
 Credit: Styled after SORA/Lucky Star

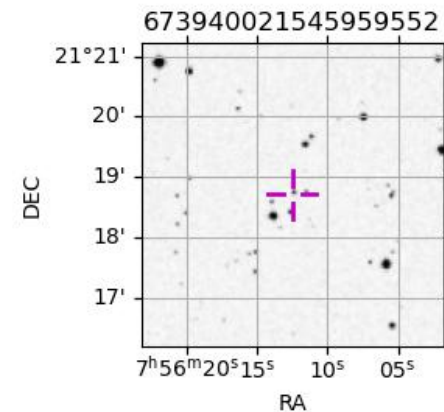
Uranus 2038-12-31T16:26:15 K13.79 G17.04 PgtRgt

Earth
 PMO
 IRTF
 KAV
 AAT
 MSO

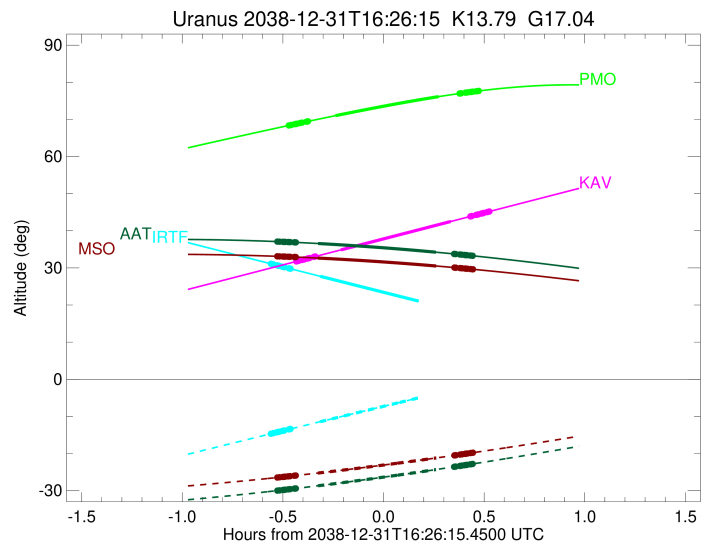
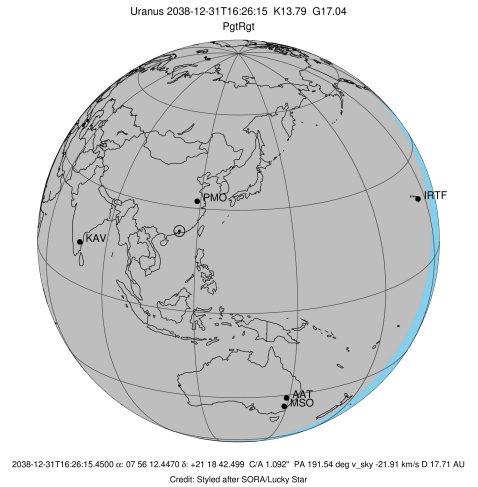


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+ +	+++++	DEC 31 15:58 - DEC 31 16:54	PieRie
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
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 31 15:52 - DEC 31 16:36	PieRin
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	DEC 31 16:00 - DEC 31 16:57	PieRie
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 31 15:54 - DEC 31 16:52	PieRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+ +	+++++	DEC 31 15:54 - DEC 31 16:53	PieRie

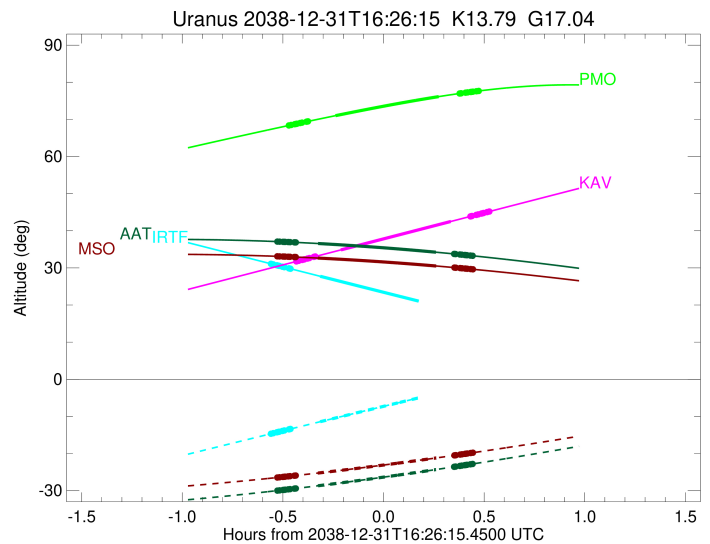
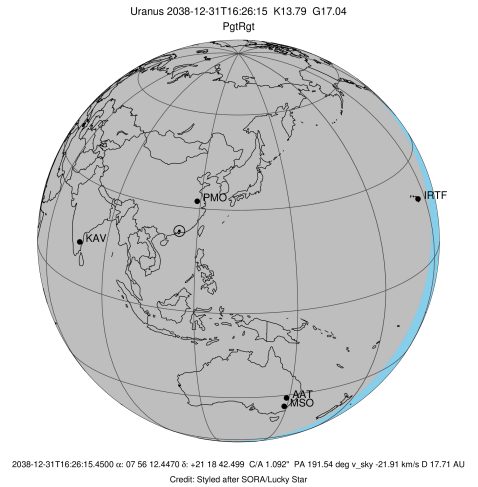


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-12-31T16:27:23.000
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 673940021545959552
 2Mass ID (if available) : 07561247+2118431
 ICRS Star Coord at Epoch: 07h 56m 12.44705s +21:18:42.49877s
 RUWE (>1.4 is poor) : 1.05
 K magnitude : 13.790
 G magnitude : 17.041
 RP magnitude : 16.014
 BP magnitude : 18.129
 DUPflag : 0
 Distance (au) : 17.706
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.91
 Sun-Target sep (deg) : 162.64
 Sun-Moon sep (deg) : 126.57
 B (ring opening deg) : 50.00
 PA of pole (deg) : 88.41
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.156
 C/A sky separation (km) : 14848.7
 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_itrff93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



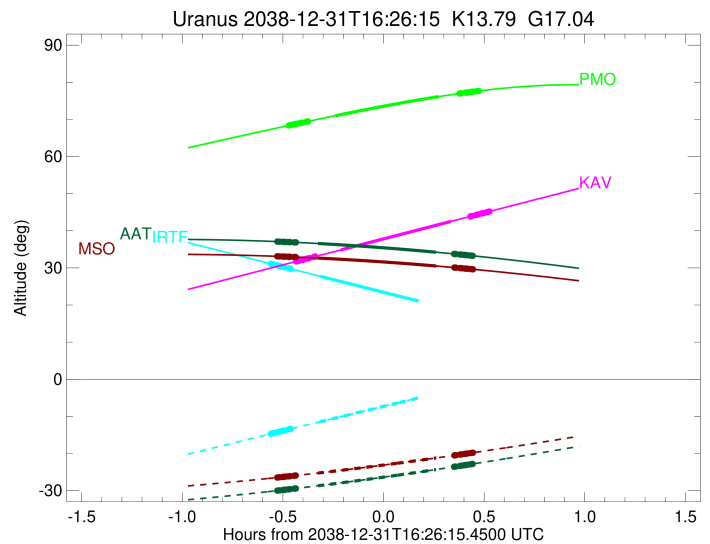
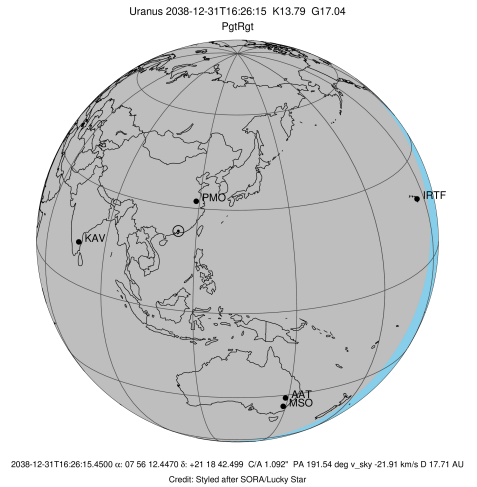
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-12-31T15:58:17.202		68.42	-80.92	50773.59	-27.46		
lambda	I	2038-12-31T15:58:44.398		68.51	-80.94	50026.71	-27.44		
delta	I	2038-12-31T15:59:47.416		68.71	-80.99	48300.35	-27.34		
gamma	I	2038-12-31T16:00:12.167		68.79	-81.00	47624.07	-27.30		
eta	I	2038-12-31T16:00:28.583		68.85	-81.01	47176.12	-27.27		
beta	I	2038-12-31T16:01:25.017		69.03	-81.05	45642.56	-27.17		
alpha	I	2038-12-31T16:01:59.812		69.14	-81.07	44688.28	-27.10		
4	I	2038-12-31T16:03:18.941		69.39	-81.11	42567.26	-26.92		
5	I	2038-12-31T16:03:34.148		69.44	-81.11	42156.87	-26.90		
6	I	2038-12-31T16:03:45.717		69.47	-81.12	41815.82	-26.84		
Uranus	I	2038-12-31T16:11:58.155		71.01	-81.11	25408.76		-25.05	-26.08
Uranus	E	2038-12-31T16:42:39.814		76.13	-78.26	25268.08		36.28	37.55
6	E	2038-12-31T16:48:58.993		76.99	-77.29	41877.75	26.86		
5	E	2038-12-31T16:49:12.472		77.02	-77.26	42305.31	26.92		
4	E	2038-12-31T16:49:21.707		77.04	-77.23	42544.30	26.94		
alpha	E	2038-12-31T16:50:44.160		77.21	-77.01	44751.64	27.12		
beta	E	2038-12-31T16:51:18.119		77.28	-76.92	45680.44	27.20		
eta	E	2038-12-31T16:52:13.127		77.39	-76.77	47176.12	27.30		
gamma	E	2038-12-31T16:52:29.566		77.42	-76.72	47625.12	27.33		
delta	E	2038-12-31T16:52:54.254		77.47	-76.66	48300.35	27.37		
lambda	E	2038-12-31T16:53:57.210		77.59	-76.48	50026.71	27.47		
epsilon	E	2038-12-31T16:54:46.054		77.68	-76.34	51370.27	27.49		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-12-31T16:22:08.210
 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 : 673940021545959552
 2Mass ID (if available) : 07561247+2118431
 ICRS Star Coord at Epoch: 07h 56m 12.44705s +21:18:42.49877s
 RUWE (>1.4 is poor) : 1.05
 K magnitude : 13.790
 G magnitude : 17.041
 RP magnitude : 16.014
 BP magnitude : 18.129
 DUPflag : 0
 Distance (au) : 17.706
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.91
 Sun-Target sep (deg) : 162.64
 Sun-Moon sep (deg) : 125.56
 B (ring opening deg) : 50.00
 PA of pole (deg) : 88.41
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.270
 C/A sky separation (km) : 16310.7
 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



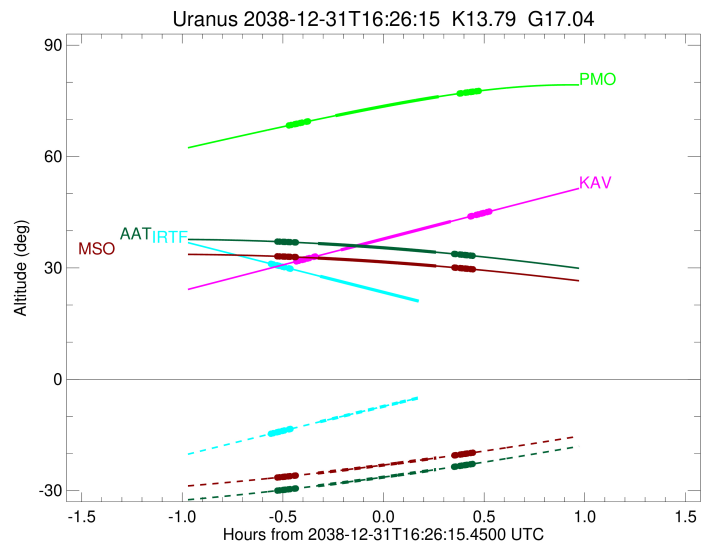
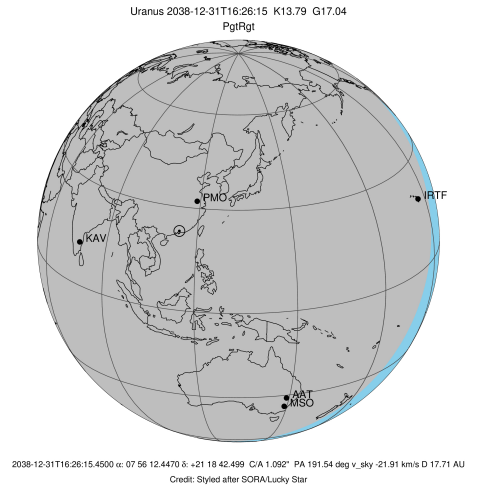
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-12-31T15:52:56.833		31.05	-14.62	50769.83	-26.95		
lambda	I	2038-12-31T15:53:24.409		30.95	-14.52	50026.71	-26.92		
delta	I	2038-12-31T15:54:28.674		30.70	-14.28	48300.35	-26.80		
gamma	I	2038-12-31T15:54:53.937		30.60	-14.19	47623.94	-26.75		
eta	I	2038-12-31T15:55:10.689		30.54	-14.13	47176.12	-26.71		
beta	I	2038-12-31T15:56:08.322		30.32	-13.92	45642.80	-26.59		
alpha	I	2038-12-31T15:56:43.888		30.18	-13.79	44688.76	-26.50		
4	I	2038-12-31T15:58:04.929		29.87	-13.49	42565.80	-26.28		
5	I	2038-12-31T15:58:20.414		29.81	-13.43	42157.50	-26.25		
6	I	2038-12-31T15:58:32.335		29.77	-13.39	41817.05	-26.18		
Uranus	I	2038-12-31T16:07:22.740		27.74	-11.43	25430.94		-23.00	-23.97
Uranus	E	2038-12-31T16:36:46.256		21.05	-5.01	25288.53		34.77	36.01
6	E	2038-12-31T16:43:35.570		19.50	-3.53x	41878.26	26.09		
5	E	2038-12-31T16:43:49.355		19.45	-3.48x	42303.64	26.15		
4	E	2038-12-31T16:43:58.884		19.41	-3.44x	42542.81	26.18		
alpha	E	2038-12-31T16:45:23.703		19.09	-3.14x	44751.32	26.39		
beta	E	2038-12-31T16:45:58.609		18.96	-3.01x	45680.21	26.48		
eta	E	2038-12-31T16:46:55.086		18.75	-2.81x	47176.12	26.60		
gamma	E	2038-12-31T16:47:11.946		18.68	-2.75x	47624.93	26.64		
delta	E	2038-12-31T16:47:37.278		18.59	-2.66x	48300.35	26.69		
lambda	E	2038-12-31T16:48:41.823		18.34	-2.43x	50026.71	26.80		
epsilon	E	2038-12-31T16:49:31.428		18.16	-2.25x	51358.41	26.82		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-12-31T16:29:59.180
 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 : 673940021545959552
 2Mass ID (if available) : 07561247+2118431
 ICRS Star Coord at Epoch: 07h 56m 12.44705s +21:18:42.49877s
 RUWE (>1.4 is poor) : 1.05
 K magnitude : 13.790
 G magnitude : 17.041
 RP magnitude : 16.014
 BP magnitude : 18.129
 DUPflag : 0
 Distance (au) : 17.706
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.91
 Sun-Target sep (deg) : 162.64
 Sun-Moon sep (deg) : 126.63
 B (ring opening deg) : 50.00
 PA of pole (deg) : 88.41
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.998
 C/A sky separation (km) : 12819.9
 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	2038-12-31T16:00:30.831		31.80	-48.98	50779.61	-27.62		
lambda	I	2038-12-31T16:00:58.077		31.91	-49.08	50026.71	-27.62		
delta	I	2038-12-31T16:02:00.662		32.15	-49.32	48300.35	-27.55		
gamma	I	2038-12-31T16:02:25.217		32.25	-49.42	47624.27	-27.52		
eta	I	2038-12-31T16:02:41.509		32.31	-49.48	47176.12	-27.50		
beta	I	2038-12-31T16:03:37.468		32.53	-49.69	45642.25	-27.43		
alpha	I	2038-12-31T16:04:11.939		32.66	-49.82	44687.64	-27.37		
4	I	2038-12-31T16:05:30.136		32.97	-50.12	42569.37	-27.24		
5	I	2038-12-31T16:05:45.289		33.03	-50.18	42156.11	-27.23		
6	I	2038-12-31T16:05:56.630		33.07	-50.22	41814.10	-27.18		
Uranus	I	2038-12-31T16:13:32.415		34.85	-51.94	25378.27		-27.70	-28.81
Uranus	E	2038-12-31T16:46:17.912		42.50	-59.31	25246.20		37.88	39.16
6	E	2038-12-31T16:52:12.644		43.88	-60.62	41876.97	27.27		
5	E	2038-12-31T16:52:26.051		43.93	-60.67	42307.34	27.32		
4	E	2038-12-31T16:52:35.128		43.97	-60.71	42546.34	27.34		
alpha	E	2038-12-31T16:53:56.418		44.28	-61.00	44751.97	27.47		
beta	E	2038-12-31T16:54:29.937		44.42	-61.13	45680.70	27.53		
eta	E	2038-12-31T16:55:24.308		44.63	-61.33	47176.12	27.60		
gamma	E	2038-12-31T16:55:40.577		44.69	-61.39	47625.38	27.62		
delta	E	2038-12-31T16:56:04.997		44.78	-61.48	48300.35	27.66		
lambda	E	2038-12-31T16:57:07.333		45.03	-61.70	50026.71	27.73		
epsilon	E	2038-12-31T16:57:56.286		45.22	-61.88	51385.60	27.74		

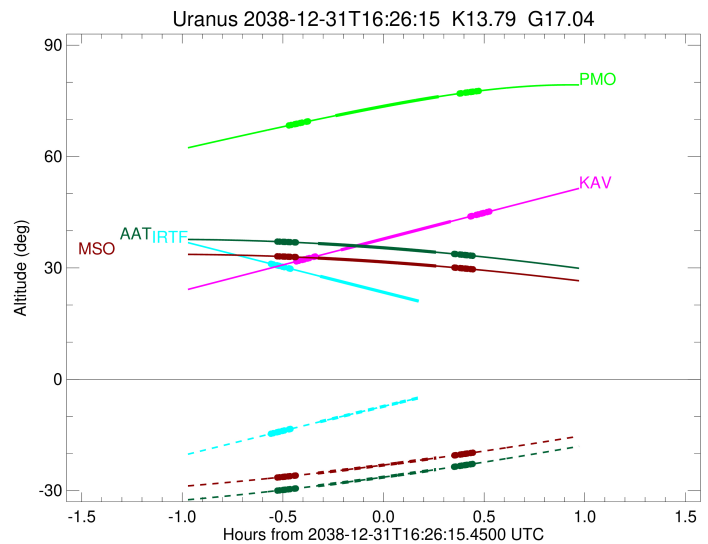
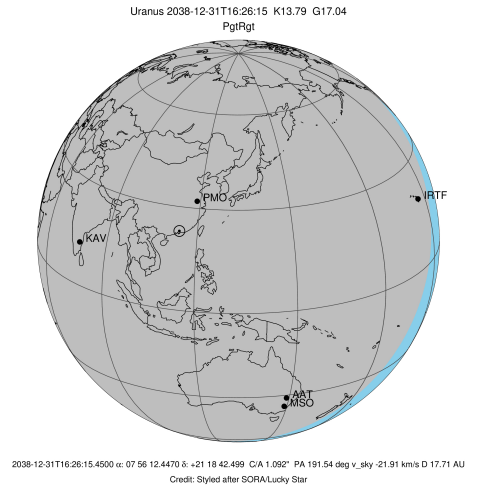
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-12-31T16:24:20.900
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : AAT
 Location : Siding Spring (AAT)
 Latitude (deg) : -31.27703
 E. Longitude (deg) : 149.06608
 Altitude (km) : 1.164
 Gaia source ID : 673940021545959552
 2Mass ID (if available) : 07561247+2118431
 ICRS Star Coord at Epoch: 07h 56m 12.44705s +21:18:42.49877s
 RUWE (>1.4 is poor) : 1.05
 K magnitude : 13.790
 G magnitude : 17.041
 RP magnitude : 16.014
 BP magnitude : 18.129
 DUPflag : 0
 Distance (au) : 17.706
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.91
 Sun-Target sep (deg) : 162.64
 Sun-Moon sep (deg) : 126.00
 B (ring opening deg) : 50.00
 PA of pole (deg) : 88.41
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.727
 C/A sky separation (km) : 9334.0
 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	2038-12-31T15:54:49.982		37.08	-29.97	50793.68	-28.27		
lambda	I	2038-12-31T15:55:17.104		37.06	-29.92	50026.71	-28.27		
delta	I	2038-12-31T15:56:18.210		37.02	-29.82	48300.35	-28.23		
gamma	I	2038-12-31T15:56:42.150		37.01	-29.78	47624.69	-28.21		
eta	I	2038-12-31T15:56:58.051		37.00	-29.75	47176.12	-28.20		
beta	I	2038-12-31T15:57:52.599		36.96	-29.65	45641.73	-28.17		
alpha	I	2038-12-31T15:58:26.169		36.94	-29.59	44686.53	-28.13		
4	I	2038-12-31T15:59:42.029		36.89	-29.46	42573.57	-28.07		
5	I	2038-12-31T15:59:56.969		36.88	-29.43	42155.12	-28.07		
6	I	2038-12-31T16:00:07.822		36.87	-29.41	41810.85	-28.02		
Uranus	I	2038-12-31T16:06:44.442		36.57	-28.69	25324.91		-32.00	-33.20
Uranus	E	2038-12-31T16:41:52.923		34.23	-24.33	25224.80		39.42	40.72
6	E	2038-12-31T16:47:20.629		33.76	-23.58	41875.61	27.99		
5	E	2038-12-31T16:47:33.892		33.74	-23.55	42309.90	28.04		
4	E	2038-12-31T16:47:42.722		33.73	-23.53	42549.43	28.04		
alpha	E	2038-12-31T16:49:01.987		33.61	-23.34	44752.29	28.10		
beta	E	2038-12-31T16:49:34.736		33.56	-23.27	45680.98	28.14		
eta	E	2038-12-31T16:50:27.960		33.48	-23.14	47176.12	28.17		
gamma	E	2038-12-31T16:50:43.917		33.46	-23.11	47625.74	28.18		
delta	E	2038-12-31T16:51:07.845		33.42	-23.05	48300.35	28.20		
lambda	E	2038-12-31T16:52:09.022		33.33	-22.91	50026.71	28.24		
epsilon	E	2038-12-31T16:52:57.855		33.25	-22.79	51406.36	28.23		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2038-12-31T16:24:21.810
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       : 673940021545959552
2Mass ID (if available) : 07561247+2118431
ICRS Star Coord at Epoch: 07h 56m 12.44705s +21:18:42.49877s
RUWE (>1.4 is poor) : 1.05
K magnitude           : 13.790
G magnitude          : 17.041
RP magnitude         : 16.014
BP magnitude         : 18.129
DUPflag              : 0
Distance (au)        : 17.706
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -21.91
Sun-Target sep (deg) : 162.64
Sun-Moon sep (deg)   : 125.96
B (ring opening deg) : 50.00
PA of pole (deg)     : 88.41
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.706
C/A sky separation (km) : 9061.1
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	2038-12-31T15:54:48.777		33.11	-26.45	50794.72	-28.27		
lambda	I	2038-12-31T15:55:15.928		33.09	-26.40	50026.71	-28.28		
delta	I	2038-12-31T15:56:17.016		33.06	-26.31	48300.35	-28.24		
gamma	I	2038-12-31T15:56:40.946		33.05	-26.27	47624.72	-28.23		
eta	I	2038-12-31T15:56:56.842		33.04	-26.24	47176.12	-28.22		
beta	I	2038-12-31T15:57:51.367		33.00	-26.15	45641.70	-28.18		
alpha	I	2038-12-31T15:58:24.922		32.98	-26.10	44686.46	-28.15		
4	I	2038-12-31T15:59:40.725		32.94	-25.97	42573.86	-28.09		
5	I	2038-12-31T15:59:55.670		32.93	-25.95	42155.08	-28.09		
6	I	2038-12-31T16:00:06.506		32.92	-25.93	41810.62	-28.04		
Uranus	I	2038-12-31T16:06:39.949		32.65	-25.27	25321.35		-32.28	-33.48
Uranus	E	2038-12-31T16:41:59.354		30.51	-21.19	25223.63		39.51	40.81
6	E	2038-12-31T16:47:25.835		30.08	-20.50	41875.48	28.02		
5	E	2038-12-31T16:47:39.106		30.07	-20.47	42310.10	28.06		
4	E	2038-12-31T16:47:47.928		30.05	-20.45	42549.70	28.06		
alpha	E	2038-12-31T16:49:07.131		29.95	-20.28	44752.31	28.12		
beta	E	2038-12-31T16:49:39.859		29.90	-20.21	45681.00	28.15		
eta	E	2038-12-31T16:50:33.056		29.83	-20.09	47176.12	28.19		
gamma	E	2038-12-31T16:50:49.006		29.80	-20.06	47625.78	28.20		
delta	E	2038-12-31T16:51:12.924		29.77	-20.01	48300.35	28.21		
lambda	E	2038-12-31T16:52:14.078		29.68	-19.87	50026.71	28.25		
epsilon	E	2038-12-31T16:53:02.959		29.62	-19.76	51408.14	28.24		