

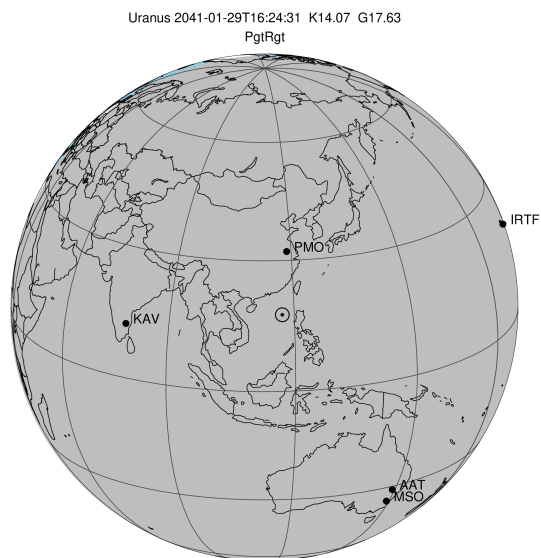
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2041-01-29T16:24:31.580
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 662925835613168000
 2Mass ID (if available) : 08311131+1934070

Uranus 2041-01-29T16:24:31 K14.07 G17.63 PgtRgt

ICRS Star Coord at Epoch: 08h 31m 11.31204s +19:34:06.32171s

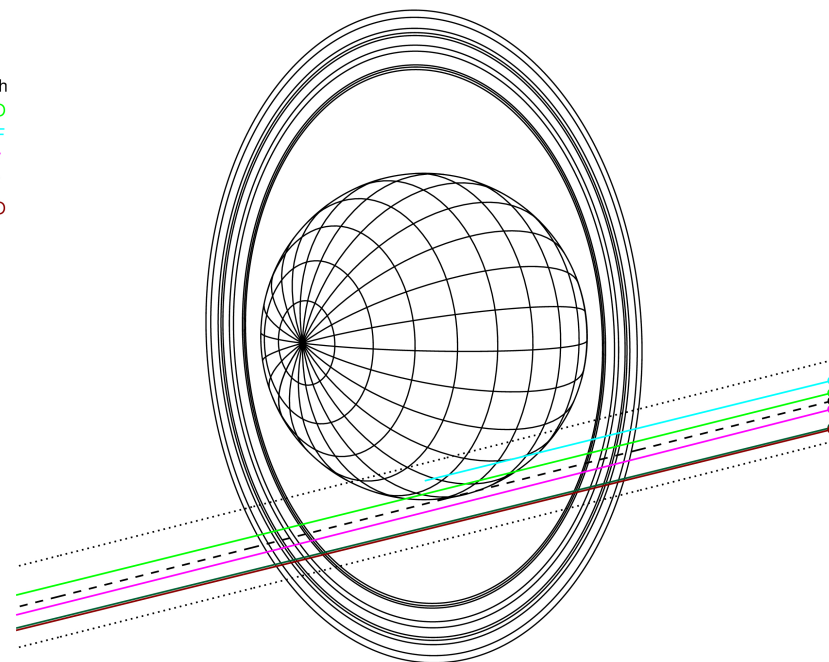
RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.072
 G magnitude : 17.626
 RP magnitude : 16.479
 BP magnitude : 18.947
 DUPflag : 0
 Distance (au) : 17.552
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.14
 Sun-Target sep (deg) : 175.66
 Sun-Moon sep (deg) : 148.11
 B (ring opening deg) : 41.78
 PA of pole (deg) : 93.15

#	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



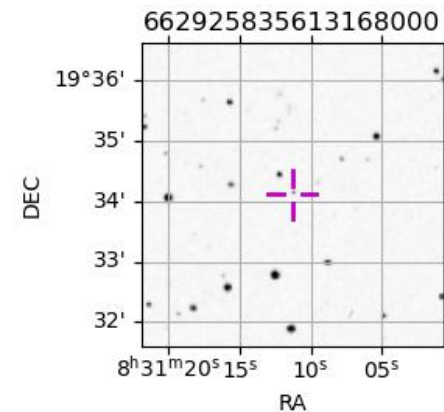
2041-01-29T16:24:31.5800 α: 08 31 11.3120 s δ: +19 34 06.322 C/A 1.991° PA 14.19 deg v_sky -23.14 km/s D 17.55 AU
 Credit: Styled after SORA/Lucky Star

Earth
 PMO
 IRTF
 KAV
 AAT
 MSO

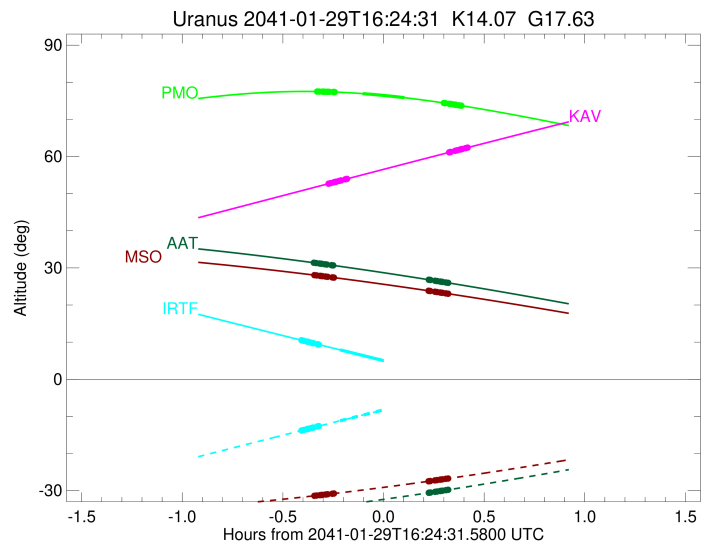
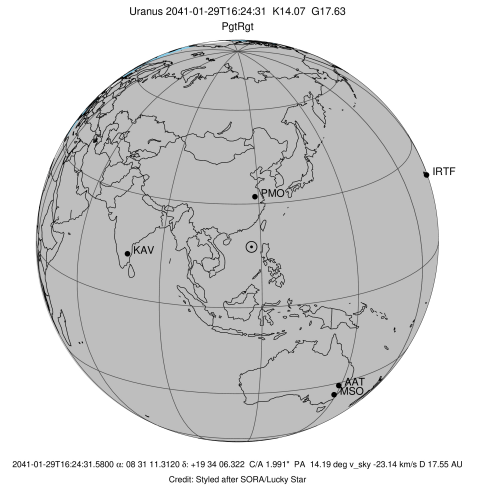


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	+++++	+ +	+++++	JAN 29 16:04 - JAN 29 16:47	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	+++++	+	+++++	JAN 29 16:00 - JAN 29 16:11	PinRin
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	JAN 29 16:08 - JAN 29 16:49	PnnRie
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	+++++		+++++	JAN 29 16:03 - JAN 29 16:44	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++		+++++	JAN 29 16:04 - JAN 29 16:43	PnnRie



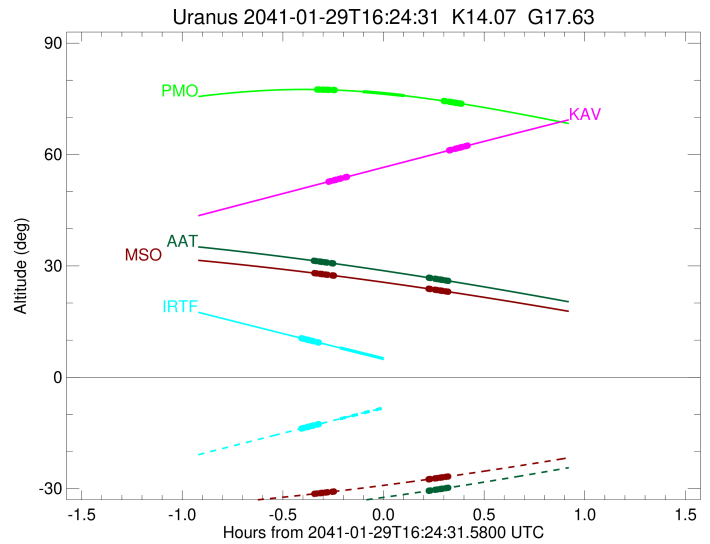
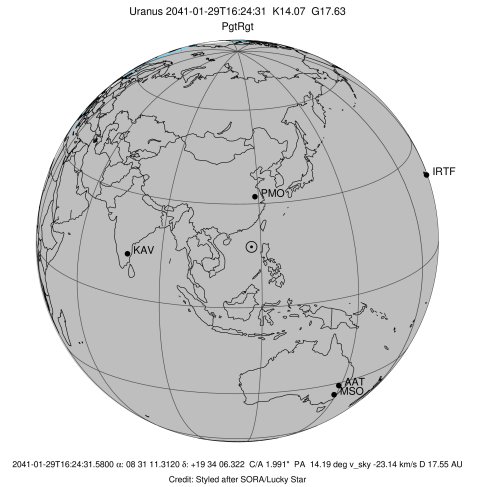
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2041-01-29T16:24:28.180
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 662925835613168000
 2Mass ID (if available) : 08311131+1934070
 ICRS Star Coord at Epoch: 08h 31m 11.31204s +19:34:06.32171s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.072
 G magnitude : 17.626
 RP magnitude : 16.479
 BP magnitude : 18.947
 DUPflag : 0
 Distance (au) : 17.552
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.14
 Sun-Target sep (deg) : 175.66
 Sun-Moon sep (deg) : 148.63
 B (ring opening deg) : 41.78
 PA of pole (deg) : 93.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.883
 C/A sky separation (km) : 23973.2
 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



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

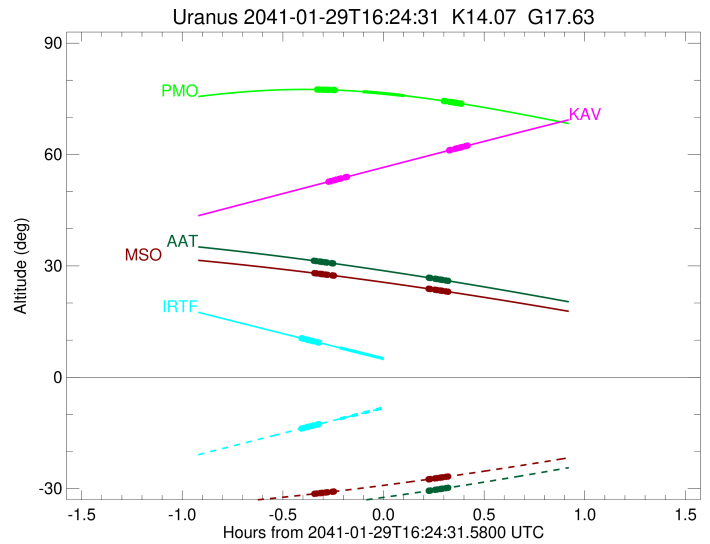
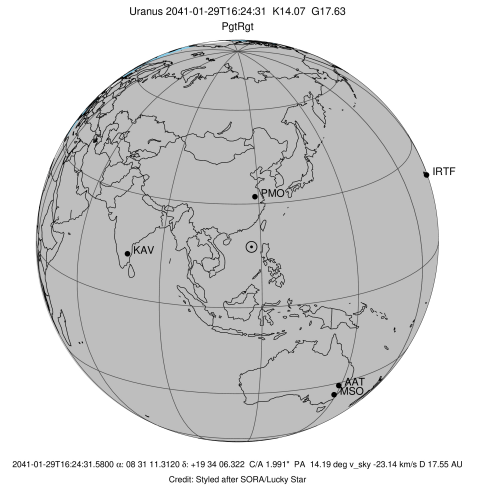
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2041-01-29T16:04:57.887		77.51	-75.52	50780.26	-30.76		
lambda	I	2041-01-29T16:05:22.481		77.50	-75.54	50026.71	-30.57		
delta	I	2041-01-29T16:06:19.269		77.48	-75.58	48300.35	-30.23		
gamma	I	2041-01-29T16:06:41.799		77.47	-75.59	47620.99	-30.08		
eta	I	2041-01-29T16:06:56.613		77.47	-75.60	47176.12	-29.98		
beta	I	2041-01-29T16:07:47.032		77.44	-75.63	45674.78	-29.62		
alpha	I	2041-01-29T16:08:19.243		77.43	-75.65	44731.85	-29.37		
4	I	2041-01-29T16:09:33.635		77.39	-75.69	42538.95	-28.69		
5	I	2041-01-29T16:09:44.638		77.38	-75.69	42229.61	-28.59		
6	I	2041-01-29T16:09:59.283		77.38	-75.70	41818.39	-28.43		
Uranus	I	2041-01-29T16:18:19.611		76.94	-75.81	25491.06		-22.34	-23.29
Uranus	E	2041-01-29T16:30:44.323		75.86	-75.51	25551.90		7.05	7.38
6	E	2041-01-29T16:42:30.460		74.43	-74.75	41807.46	28.42		
5	E	2041-01-29T16:42:40.747		74.41	-74.73	42161.61	28.58		
4	E	2041-01-29T16:42:55.556		74.37	-74.71	42552.84	28.68		
alpha	E	2041-01-29T16:44:08.323		74.21	-74.61	44684.62	29.36		
beta	E	2041-01-29T16:44:42.115		74.13	-74.56	45668.40	29.61		
eta	E	2041-01-29T16:45:32.641		74.01	-74.48	47176.12	29.97		
gamma	E	2041-01-29T16:45:47.737		73.98	-74.46	47629.32	30.07		
delta	E	2041-01-29T16:46:09.999		73.92	-74.43	48300.35	30.21		
lambda	E	2041-01-29T16:47:06.809		73.79	-74.34	50026.71	30.56		
epsilon	E	2041-01-29T16:47:54.612		73.67	-74.26	51493.74	30.75		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2041-01-29T16:20:47.910
 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 : 662925835613168000
 2Mass ID (if available) : 08311131+1934070
 ICRS Star Coord at Epoch: 08h 31m 11.31204s +19:34:06.32171s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.072
 G magnitude : 17.626
 RP magnitude : 16.479
 BP magnitude : 18.947
 DUPflag : 0
 Distance (au) : 17.552
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.14
 Sun-Target sep (deg) : 175.66
 Sun-Moon sep (deg) : 148.82
 B (ring opening deg) : 41.78
 PA of pole (deg) : 93.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.726
 C/A sky separation (km) : 21973.0
 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	2041-01-29T16:00:17.980		10.46	-13.76	50773.30	-30.96		
lambda	I	2041-01-29T16:00:42.169		10.37	-13.66	50026.71	-30.81		
delta	I	2041-01-29T16:01:38.457		10.16	-13.45	48300.35	-30.53		
gamma	I	2041-01-29T16:02:00.754		10.08	-13.36	47620.97	-30.41		
eta	I	2041-01-29T16:02:15.401		10.02	-13.31	47176.12	-30.33		
beta	I	2041-01-29T16:03:05.199		9.84	-13.12	45674.02	-30.04		
alpha	I	2041-01-29T16:03:36.883		9.72	-13.00	44733.45	-29.83		
4	I	2041-01-29T16:04:49.888		9.44	-12.72	42540.77	-29.28		
5	I	2041-01-29T16:05:00.655		9.40	-12.68	42234.14	-29.21		
6	I	2041-01-29T16:05:14.911		9.35	-12.63	41820.60	-29.08		
Uranus	I	2041-01-29T16:11:32.466		7.93	-11.19	25446.86		-29.28	-30.42
Uranus	E	2041-01-29T16:30:10.756		3.76x	-6.97	25528.66		14.70	15.37
6	E	2041-01-29T16:39:39.834		1.66x	-4.83x	41809.29	29.00		
5	E	2041-01-29T16:39:49.882		1.62x	-4.79x	42163.60	29.13		
4	E	2041-01-29T16:40:04.475		1.56x	-4.74x	42555.24	29.20		
alpha	E	2041-01-29T16:41:15.973		1.30x	-4.47x	44684.71	29.75		
beta	E	2041-01-29T16:41:49.337		1.18x	-4.35x	45667.42	29.95		
eta	E	2041-01-29T16:42:39.395		0.99x	-4.16x	47176.12	30.23		
gamma	E	2041-01-29T16:42:54.373		0.94x	-4.10x	47629.53	30.31		
delta	E	2041-01-29T16:43:16.461		0.86x	-4.02x	48300.35	30.43		
lambda	E	2041-01-29T16:44:12.942		0.65x	-3.81x	50026.71	30.70		
epsilon	E	2041-01-29T16:45:00.864		0.47x	-3.63x	51503.04	30.85		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2041-01-29T16:26:51.650
 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 : 662925835613168000
 2Mass ID (if available) : 08311131+1934070
 ICRS Star Coord at Epoch: 08h 31m 11.31204s +19:34:06.32171s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.072
 G magnitude : 17.626
 RP magnitude : 16.479
 BP magnitude : 18.947
 DUPflag : 0
 Distance (au) : 17.552
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.14
 Sun-Target sep (deg) : 175.66
 Sun-Moon sep (deg) : 148.13
 B (ring opening deg) : 41.78
 PA of pole (deg) : 93.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.099
 C/A sky separation (km) : 26718.4
 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_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

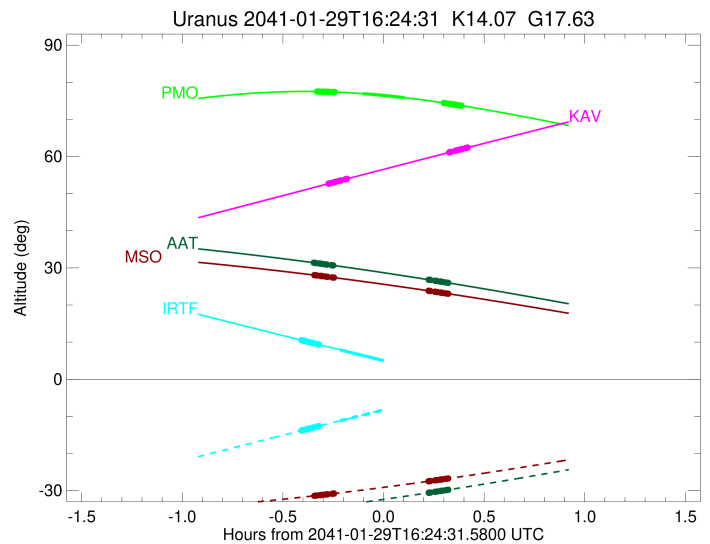
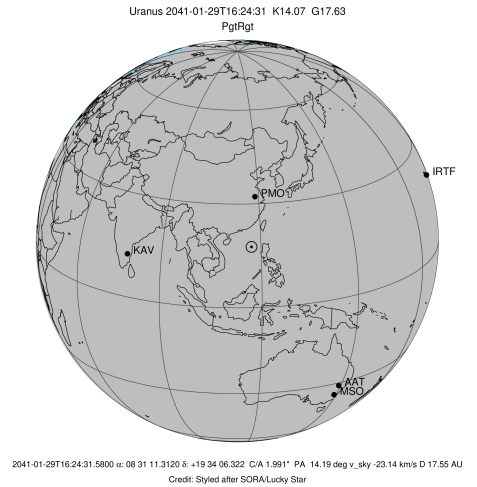
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2041-01-29T16:08:21.595		52.74	-48.86	50791.07	-29.63		
lambda	I	2041-01-29T16:08:47.532		52.84	-48.97	50026.71	-29.38		
delta	I	2041-01-29T16:09:46.729		53.07	-49.20	48300.35	-28.94		
gamma	I	2041-01-29T16:10:10.280		53.17	-49.30	47621.04	-28.75		
eta	I	2041-01-29T16:10:25.791		53.23	-49.36	47176.12	-28.62		
beta	I	2041-01-29T16:11:18.690		53.43	-49.57	45675.80	-28.16		
alpha	I	2041-01-29T16:11:52.711		53.57	-49.70	44729.53	-27.82		
4	I	2041-01-29T16:13:11.646		53.88	-50.02	42536.53	-26.94		
5	I	2041-01-29T16:13:23.397		53.92	-50.06	42223.21	-26.80		
6	I	2041-01-29T16:13:39.121		53.99	-50.12	41815.35	-26.61		

No planet occultations

6	E	2041-01-29T16:44:06.290		61.12	-57.37	41804.94	26.64		
5	E	2041-01-29T16:44:17.370		61.17	-57.41	42159.11	26.84		
4	E	2041-01-29T16:44:33.007		61.23	-57.47	42549.40	26.98		
alpha	E	2041-01-29T16:45:50.245		61.53	-57.78	44684.67	27.86		
beta	E	2041-01-29T16:46:25.806		61.67	-57.92	45669.81	28.20		
eta	E	2041-01-29T16:47:18.694		61.87	-58.13	47176.12	28.67		
gamma	E	2041-01-29T16:47:34.456		61.93	-58.19	47629.00	28.80		
delta	E	2041-01-29T16:47:57.692		62.02	-58.28	48300.35	28.99		
lambda	E	2041-01-29T16:48:56.788		62.25	-58.52	50026.71	29.43		
epsilon	E	2041-01-29T16:49:45.845		62.44	-58.71	51478.90	29.68		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2041-01-29T16:21:38.300
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       : 662925835613168000
2Mass ID (if available) : 08311131+1934070
ICRS Star Coord at Epoch: 08h 31m 11.31204s +19:34:06.32171s
RUWE (>1.4 is poor) : 1.02
K magnitude           : 14.072
G magnitude           : 17.626
RP magnitude          : 16.479
BP magnitude          : 18.947
DUPflag              : 0
Distance (au)        : 17.552
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -23.14
Sun-Target sep (deg) : 175.66
Sun-Moon sep (deg)   : 148.97
B (ring opening deg) : 41.78
PA of pole (deg)     : 93.15
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.287
C/A sky separation (km) : 29108.1
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural11.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
  
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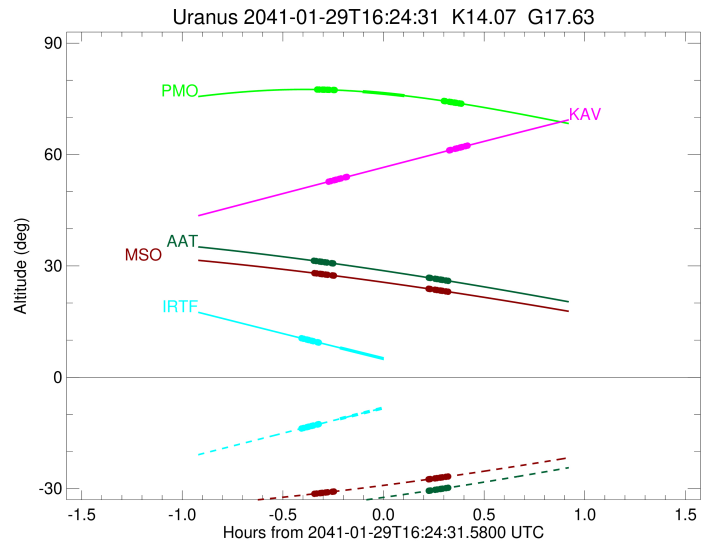
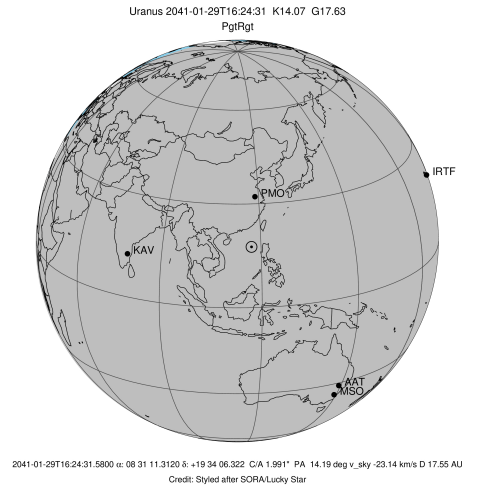


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2041-01-29T16:03:57.889		31.36	-34.82	50803.22	-28.50		
lambda	I	2041-01-29T16:04:25.319		31.31	-34.77	50026.71	-28.19		
delta	I	2041-01-29T16:05:27.140		31.18	-34.66	48300.35	-27.65		
gamma	I	2041-01-29T16:05:51.812		31.13	-34.61	47621.11	-27.41		
eta	I	2041-01-29T16:06:08.094		31.10	-34.58	47176.12	-27.25		
beta	I	2041-01-29T16:07:03.764		30.98	-34.47	45676.73	-26.67		
alpha	I	2041-01-29T16:07:39.830		30.91	-34.41	44727.15	-26.25		
4	I	2041-01-29T16:09:04.005		30.73	-34.24	42534.33	-25.15		
5	I	2041-01-29T16:09:16.648		30.71	-34.22	42216.87	-24.96		
6	I	2041-01-29T16:09:33.610		30.67	-34.19	41812.44	-24.73		

No planet occultations

6	E	2041-01-29T16:38:00.736		26.82	-30.58	41802.99	24.70		
5	E	2041-01-29T16:38:12.831		26.79	-30.55	42157.43	24.93		
4	E	2041-01-29T16:38:29.509		26.75	-30.51	42546.62	25.12		
alpha	E	2041-01-29T16:39:52.238		26.55	-30.32	44684.86	26.21		
beta	E	2041-01-29T16:40:29.968		26.46	-30.24	45670.93	26.63		
eta	E	2041-01-29T16:41:25.789		26.32	-30.11	47176.12	27.21		
gamma	E	2041-01-29T16:41:42.374		26.28	-30.07	47628.72	27.37		
delta	E	2041-01-29T16:42:06.809		26.22	-30.01	48300.35	27.60		
lambda	E	2041-01-29T16:43:08.734		26.07	-29.87	50026.71	28.15		
epsilon	E	2041-01-29T16:43:59.502		25.94	-29.75	51466.04	28.45		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2041-01-29T16:21:41.050
 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 : 662925835613168000
 2Mass ID (if available) : 08311131+1934070
 ICRS Star Coord at Epoch: 08h 31m 11.31204s +19:34:06.32171s
 RUWE (>1.4 is poor) : 1.02
 K magnitude : 14.072
 G magnitude : 17.626
 RP magnitude : 16.479
 BP magnitude : 18.947
 DUPflag : 0
 Distance (au) : 17.552
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.14
 Sun-Target sep (deg) : 175.66
 Sun-Moon sep (deg) : 148.94
 B (ring opening deg) : 41.78
 PA of pole (deg) : 93.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.311
 C/A sky separation (km) : 29422.6
 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	2041-01-29T16:04:08.056		28.03	-31.37	50804.81	-28.33		
lambda	I	2041-01-29T16:04:35.715		27.98	-31.32	50026.71	-28.01		
delta	I	2041-01-29T16:05:37.953		27.86	-31.21	48300.35	-27.45		
gamma	I	2041-01-29T16:06:02.804		27.81	-31.17	47621.12	-27.21		
eta	I	2041-01-29T16:06:19.208		27.78	-31.14	47176.12	-27.04		
beta	I	2041-01-29T16:07:15.321		27.67	-31.04	45676.84	-26.45		
alpha	I	2041-01-29T16:07:51.711		27.60	-30.98	44726.85	-26.01		
4	I	2041-01-29T16:09:16.726		27.44	-30.83	42534.06	-24.88		
5	I	2041-01-29T16:09:29.514		27.41	-30.81	42216.05	-24.69		
6	I	2041-01-29T16:09:46.672		27.38	-30.78	41812.08	-24.44		

No planet occultations

6	E	2041-01-29T16:37:56.471		23.84	-27.48	41802.71	24.42		
5	E	2041-01-29T16:38:08.727		23.81	-27.46	42157.22	24.66		
4	E	2041-01-29T16:38:25.564		23.78	-27.42	42546.22	24.85		
alpha	E	2041-01-29T16:39:49.134		23.59	-27.25	44684.91	25.98		
beta	E	2041-01-29T16:40:27.190		23.50	-27.17	45671.10	26.41		
eta	E	2041-01-29T16:41:23.447		23.37	-27.04	47176.12	27.00		
gamma	E	2041-01-29T16:41:40.155		23.34	-27.01	47628.68	27.17		
delta	E	2041-01-29T16:42:04.766		23.28	-26.96	48300.35	27.41		
lambda	E	2041-01-29T16:43:07.104		23.14	-26.82	50026.71	27.97		
epsilon	E	2041-01-29T16:43:58.111		23.02	-26.71	51464.04	28.28		