

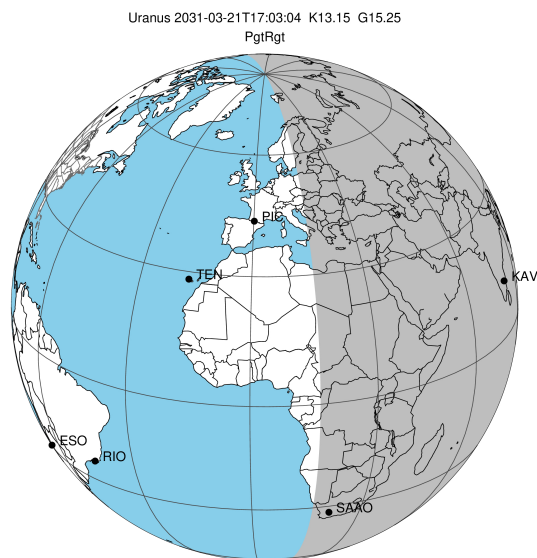
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-03-21T17:03:04.450
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3415770349296796928
 2Mass ID (if available) : 05103840+2303210

Uranus 2031-03-21T17:03:04 K13.15 G15.25 PgtRgt

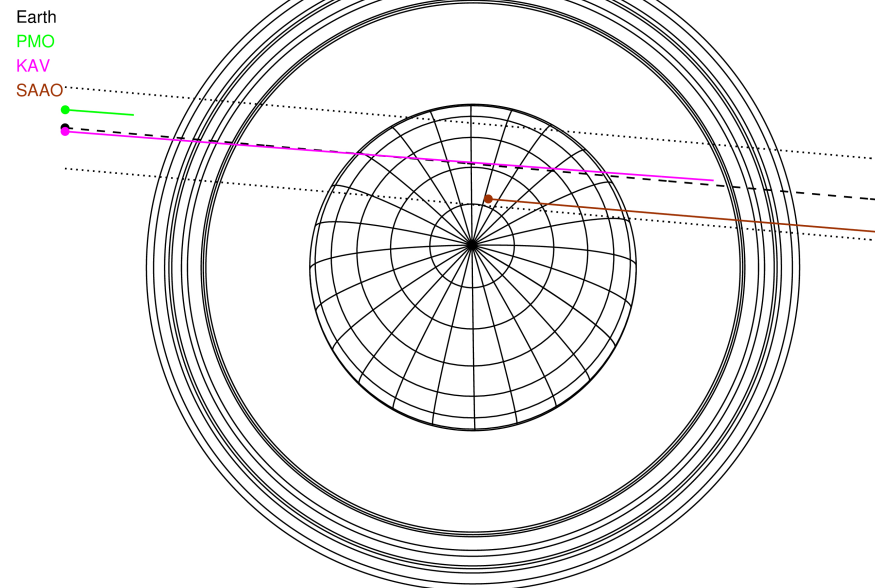
ICRS Star Coord at Epoch: 05h 10m 38.41446s +23:03:20.84052s

RUWE (>1.4 is poor) : 1.07
 K magnitude : 13.149
 G magnitude : 15.254
 RP magnitude : 14.570
 BP magnitude : 15.762
 DUPflag : 0
 Distance (au) : 19.315
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 12.41
 Sun-Target sep (deg) : 78.21
 Sun-Moon sep (deg) : 96.66
 B (ring opening deg) : 82.11
 PA of pole (deg) : 2.45

#	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

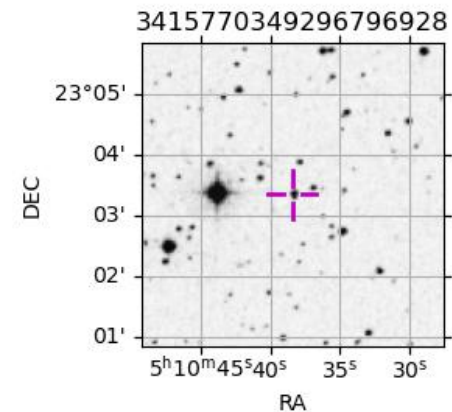


2031-03-21T17:03:04.4500 ex: 05 10 38.4145 s: +23 03 20.841 C/A 1.159" PA 174.95 deg v_sky +12.41 km/s D 19.32 AU
 Credit: Styled after SORA/Lucky Star



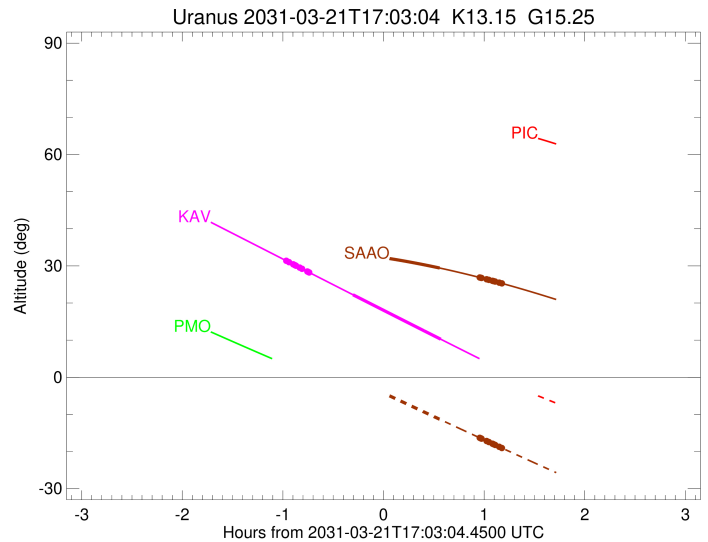
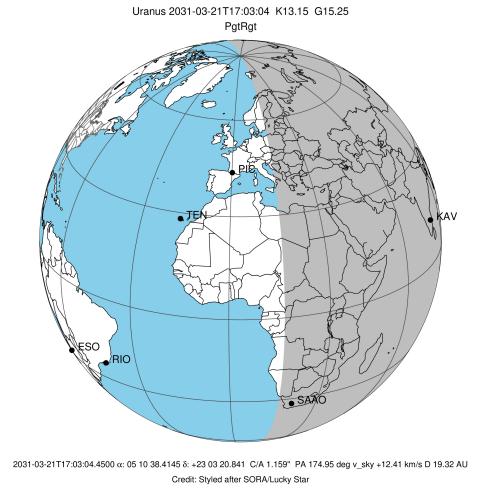
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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					PnnRnn
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					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +		MAR 21 16:05 - MAR 21 17:37	PieRin
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					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8		+	+++++	MAR 21 17:36 - MAR 21 18:13	PneRne
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



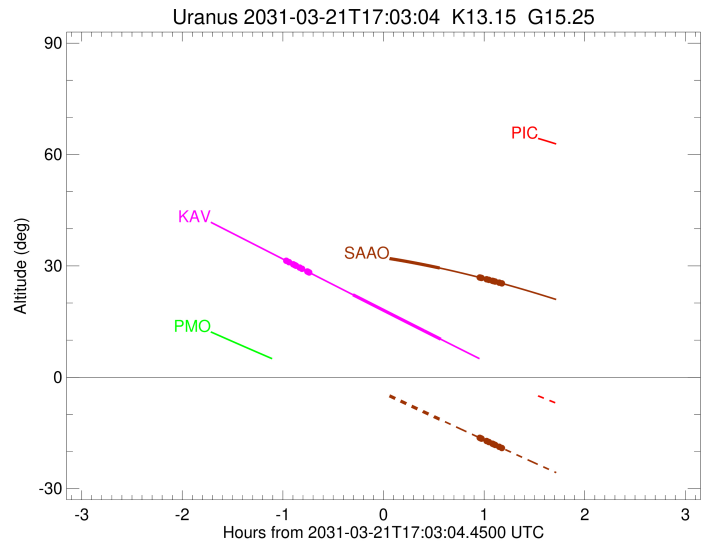
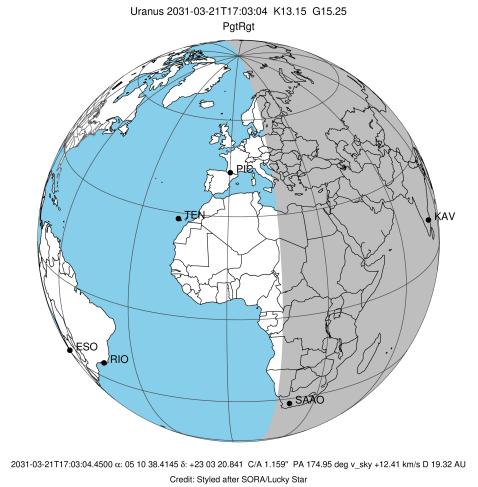
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target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-03-21T17:10:59.790
Event type           : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code        : KAV
Location              : Kavalur Observatory
Latitude (deg)       : 12.57556
E. Longitude (deg)   : 78.83167
Altitude (km)        : 0.722
Gaia source ID       : 3415770349296796928
2Mass ID (if available) : 05103840+2303210
ICRS Star Coord at Epoch: 05h 10m 38.41446s +23:03:20.84052s
RUWE (>1.4 is poor) : 1.07
K magnitude           : 13.149
G magnitude           : 15.254
RP magnitude          : 14.570
BP magnitude          : 15.762
DUPflag              : 0
Distance (au)        : 19.316
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : 12.41
Sun-Target sep (deg) : 78.21
Sun-Moon sep (deg)   : 96.84
B (ring opening deg) : 82.11
PA of pole (deg)     : 2.45
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.170
C/A sky separation (km) : 16386.9
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_itrf93_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	2031-03-21T16:05:36.151		31.27	-46.83	50823.84	-11.48		
lambda	I	2031-03-21T16:06:45.530		31.00	-47.10	50026.71	-11.48		
delta	I	2031-03-21T16:09:16.219		30.42	-47.69	48300.35	-11.43		
gamma	I	2031-03-21T16:10:15.683		30.20	-47.93	47621.11	-11.41		
eta	I	2031-03-21T16:10:54.698		30.05	-48.08	47176.12	-11.40		
beta	I	2031-03-21T16:13:06.153		29.54	-48.60	45681.13	-11.35		
alpha	I	2031-03-21T16:14:30.457		29.22	-48.93	44726.23	-11.32		
4	I	2031-03-21T16:17:39.185		28.49	-49.67	42596.61	-11.23		
5	I	2031-03-21T16:18:04.638		28.40	-49.77	42315.18	-11.22		
6	I	2031-03-21T16:18:44.822		28.24	-49.92	41862.02	-11.19		
Uranus	I	2031-03-21T16:44:55.486		22.22	-56.01	25244.33		5.78	6.05
Uranus	E	2031-03-21T17:37:11.050		10.26	-67.46	25379.74		4.34	4.55
6	E	2031-03-21T18:02:45.347		4.46x	-72.29	41795.14	11.40		
5	E	2031-03-21T18:03:19.173		4.33x	-72.39	42181.70	11.43		
4	E	2031-03-21T18:03:53.934		4.20x	-72.49	42580.26	11.45		
alpha	E	2031-03-21T18:07:01.414		3.50x	-73.00	44735.54	11.55		
beta	E	2031-03-21T18:08:20.030		3.20x	-73.21	45644.99	11.59		
eta	E	2031-03-21T18:10:31.805		2.71x	-73.56	47176.12	11.65		
gamma	E	2031-03-21T18:11:10.687		2.56x	-73.66	47629.36	11.66		
delta	E	2031-03-21T18:12:08.147		2.35x	-73.80	48300.35	11.69		
lambda	E	2031-03-21T18:14:35.458		1.79x	-74.16	50026.71	11.75		
epsilon	E	2031-03-21T18:16:19.689		1.40x	-74.41	51253.20	11.75		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-03-21T17:04:41.120
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 3415770349296796928
 2Mass ID (if available) : 05103840+2303210
 ICRS Star Coord at Epoch: 05h 10m 38.41446s +23:03:20.84052s
 RUWE (>1.4 is poor) : 1.07
 K magnitude : 13.149
 G magnitude : 15.254
 RP magnitude : 14.570
 BP magnitude : 15.762
 DUPflag : 0
 Distance (au) : 19.316
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 12.41
 Sun-Target sep (deg) : 78.21
 Sun-Moon sep (deg) : 97.14
 B (ring opening deg) : 82.11
 PA of pole (deg) : 2.45
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.778
 C/A sky separation (km) : 10903.9
 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



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	2031-03-21T15:55:53.976		34.70	9.95x	50849.59	-11.70		
lambda	I	2031-03-21T15:57:04.252		34.70	9.71x	50026.71	-11.70		
delta	I	2031-03-21T15:59:31.879		34.68	9.19x	48300.35	-11.68		
gamma	I	2031-03-21T16:00:30.025		34.68	8.99x	47621.28	-11.67		
eta	I	2031-03-21T16:01:08.166		34.67	8.85x	47176.12	-11.67		
beta	I	2031-03-21T16:03:16.418		34.65	8.40x	45681.23	-11.65		
alpha	I	2031-03-21T16:04:38.836		34.64	8.11x	44722.31	-11.63		
4	I	2031-03-21T16:07:42.172		34.60	7.47x	42591.74	-11.60		
5	I	2031-03-21T16:08:06.392		34.59	7.38x	42314.12	-11.59		
6	I	2031-03-21T16:08:44.900		34.58	7.25x	41866.21	-11.58		
Uranus	I	2031-03-21T16:32:55.105		33.90	2.14x	25385.08		4.28	4.48
Uranus	E	2031-03-21T17:36:33.804		29.43	-11.31	25502.80		2.42	2.54
6	E	2031-03-21T18:00:23.148		26.89	-16.30	41796.50	11.66		
5	E	2031-03-21T18:00:55.440		26.82	-16.41	42173.35	11.68		
4	E	2031-03-21T18:01:29.656		26.76	-16.53	42573.59	11.69		
alpha	E	2031-03-21T18:04:34.019		26.40	-17.17	44731.24	11.73		
beta	E	2031-03-21T18:05:51.759		26.24	-17.44	45643.50	11.74		
eta	E	2031-03-21T18:08:02.124		25.98	-17.89	47176.12	11.77		
gamma	E	2031-03-21T18:08:40.670		25.91	-18.02	47629.91	11.78		
delta	E	2031-03-21T18:09:37.577		25.79	-18.22	48300.35	11.79		
lambda	E	2031-03-21T18:12:03.888		25.49	-18.73	50026.71	11.81		
epsilon	E	2031-03-21T18:13:51.674		25.27	-19.10	51300.79	11.81		