

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T22:15:40.830
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3415395205375892864
 2Mass ID (if available) : 05101832+2302438

Uranus 2031-02-04T22:15:40 K10.87 G12.12 PgtRgt

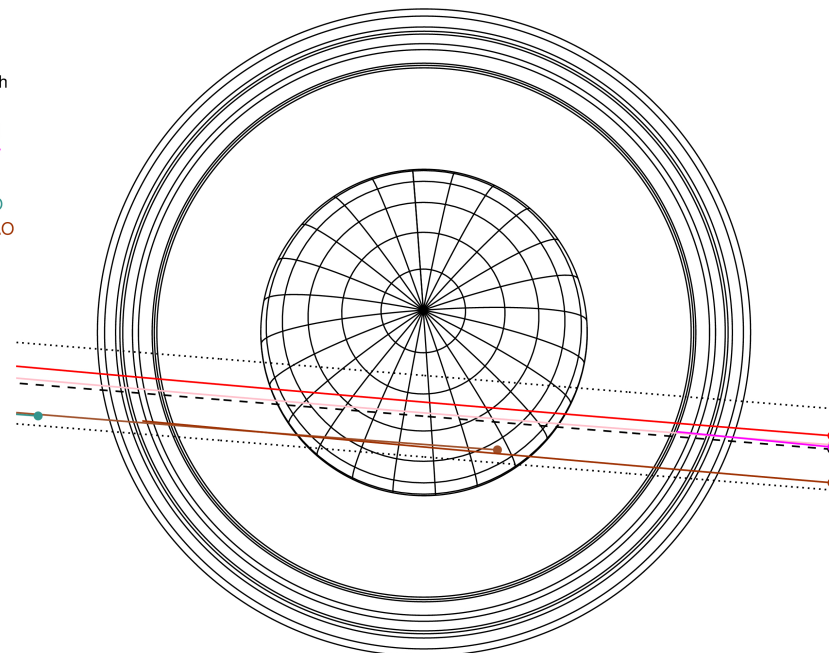
ICRS Star Coord at Epoch: 05h 10m 18.32780s +23:02:43.69898s

RUWE (>1.4 is poor) : 1.38
 K magnitude : 10.872
 G magnitude : 12.120
 RP magnitude : 11.690
 BP magnitude : 12.387
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.94
 Sun-Target sep (deg) : 123.12
 Sun-Moon sep (deg) : 27.97
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.87



2031-02-04T22:15:40.8300 α: 05 10 18.3278 δ: +23 02 43.699 C/A 0.963° PA 355.36 deg v_sky - 9.94 km/s D 18.59 AU
 Credit: Styled after SORA/Lucky Star

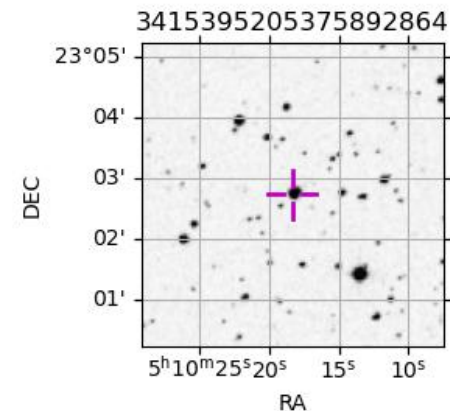
Earth
 PIC
 TEN
 KAV
 RIO
 ESO
 SAAO



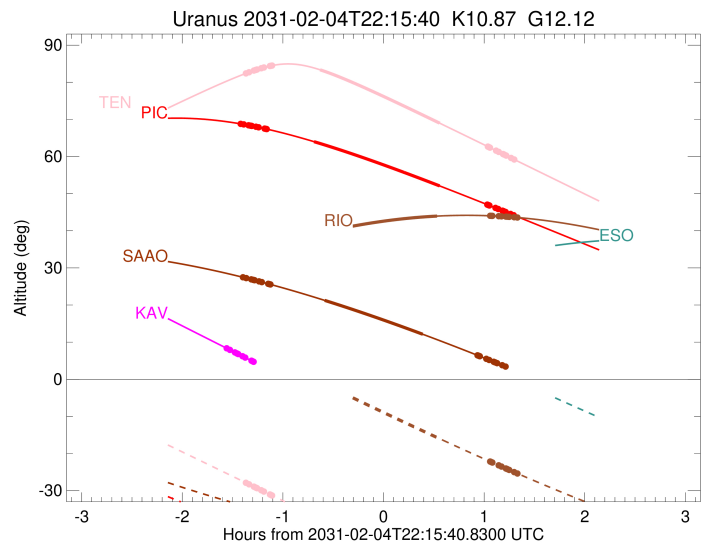
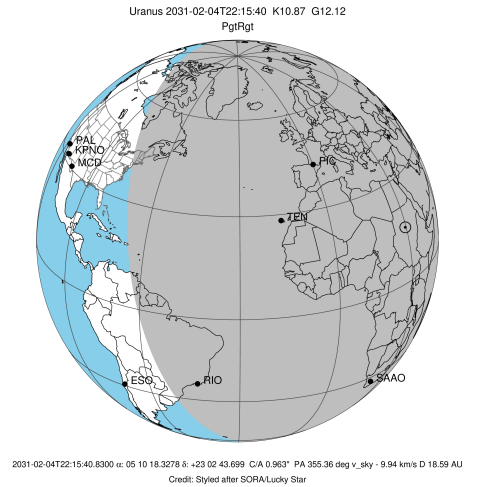
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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	+++++++	+ +	+++++++	FEB 04 20:50 - FEB 04 23:33	PieRie
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	+++++++	+ +	+++++++	FEB 04 20:53 - FEB 04 23:34	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++++			FEB 04 20:42 - FEB 04 20:56	PnnRin
RIO	Rio de Janeiro	-22.9	316.8		+	+++++++	FEB 04 22:47 - FEB 04 23:36	PneRne
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	+++++++	+ +	+++++	FEB 04 20:51 - FEB 04 23:18	PieRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

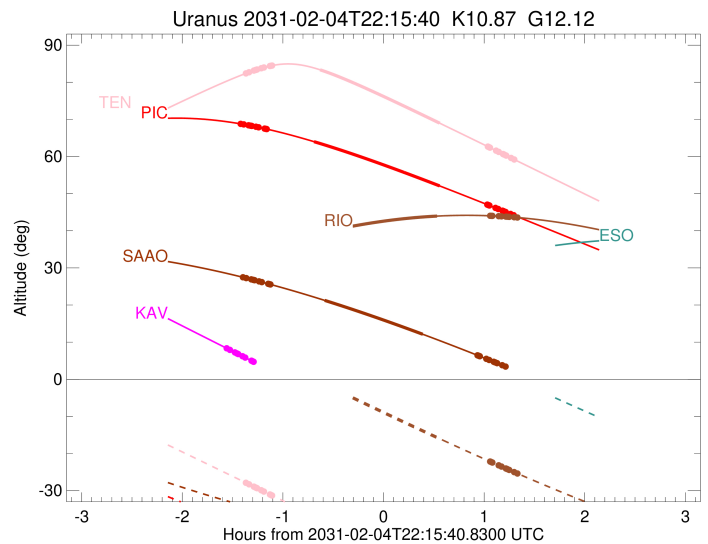
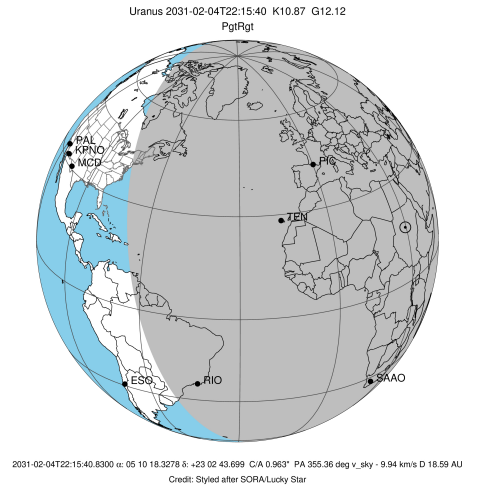


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T22:11:33.090
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 3415395205375892864
 2Mass ID (if available) : 05101832+2302438
 ICRS Star Coord at Epoch: 05h 10m 18.32780s +23:02:43.69898s
 RUWE (>1.4 is poor) : 1.38
 K magnitude : 10.872
 G magnitude : 12.120
 RP magnitude : 11.690
 BP magnitude : 12.387
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.94
 Sun-Target sep (deg) : 123.12
 Sun-Moon sep (deg) : 28.05
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.87
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.806
 C/A sky separation (km) : 10866.9
 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



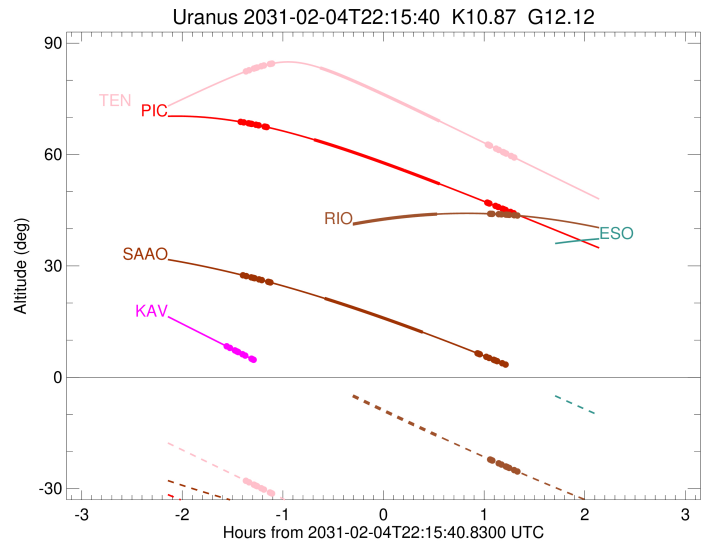
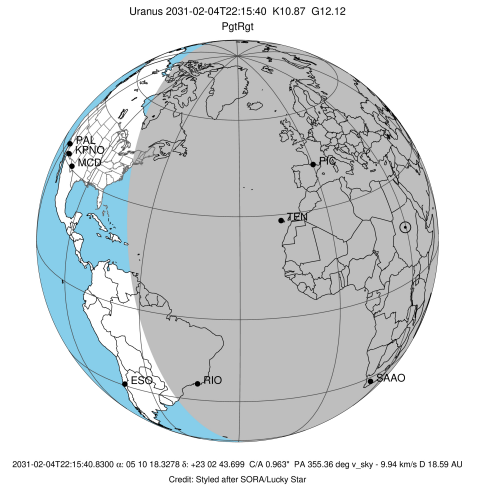
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-02-04T20:50:42.699		68.79	-39.45	51046.65	-10.07		
lambda	I	2031-02-04T20:52:24.208		68.65	-39.75	50026.71	-10.04		
delta	I	2031-02-04T20:55:16.289		68.41	-40.26	48300.35	-10.02		
gamma	I	2031-02-04T20:56:23.657		68.31	-40.45	47625.46	-10.01		
eta	I	2031-02-04T20:57:08.543		68.25	-40.58	47176.12	-10.01		
beta	I	2031-02-04T20:59:40.006		68.02	-41.03	45661.83	-9.99		
alpha	I	2031-02-04T21:01:11.160		67.88	-41.29	44752.41	-9.97		
4	I	2031-02-04T21:04:45.644		67.53	-41.91	42616.57	-9.94		
5	I	2031-02-04T21:05:18.890		67.47	-42.01	42286.13	-9.93		
6	I	2031-02-04T21:06:04.891		67.39	-42.14	41827.71	-9.92		
Uranus	I	2031-02-04T21:34:14.313		64.01	-46.91	25393.29		-4.17	-4.36
Uranus	E	2031-02-04T22:49:11.622		52.08	-57.83	25499.87		-2.48	-2.60
6	E	2031-02-04T23:17:31.789		47.05	-60.77	41824.75	9.80		
5	E	2031-02-04T23:18:06.118		46.95	-60.81	42159.98	9.80		
4	E	2031-02-04T23:18:43.967		46.83	-60.87	42531.69	9.81		
alpha	E	2031-02-04T23:22:23.636		46.17	-61.17	44689.09	9.84		
beta	E	2031-02-04T23:24:01.379		45.88	-61.30	45651.29	9.85		
eta	E	2031-02-04T23:26:36.084		45.41	-61.50	47176.12	9.86		
gamma	E	2031-02-04T23:27:22.018		45.27	-61.56	47629.31	9.87		
delta	E	2031-02-04T23:28:29.995		45.07	-61.64	48300.35	9.87		
lambda	E	2031-02-04T23:31:24.692		44.54	-61.84	50026.71	9.89		
epsilon	E	2031-02-04T23:33:43.524		44.12	-61.99	51400.35	9.91		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T22:13:23.360
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 3415395205375892864
 2Mass ID (if available) : 05101832+2302438
 ICRS Star Coord at Epoch: 05h 10m 18.32780s +23:02:43.69898s
 RUWE (>1.4 is poor) : 1.38
 K magnitude : 10.872
 G magnitude : 12.120
 RP magnitude : 11.690
 BP magnitude : 12.387
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.94
 Sun-Target sep (deg) : 123.12
 Sun-Moon sep (deg) : 28.22
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.87
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.931
 C/A sky separation (km) : 12547.5
 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



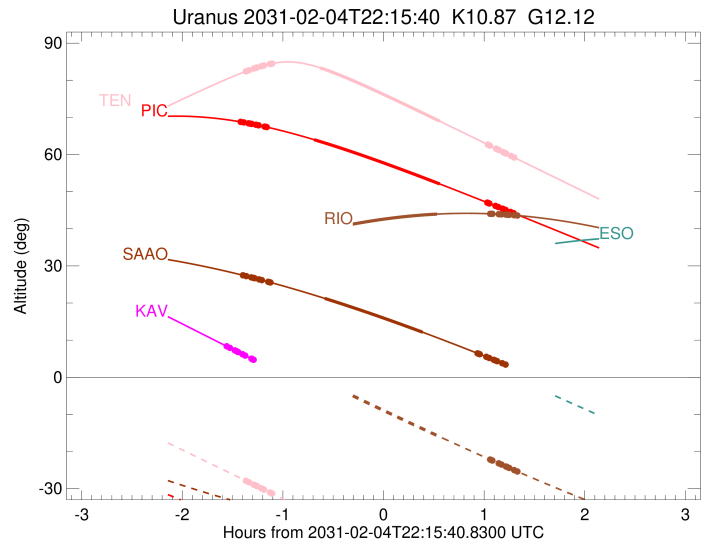
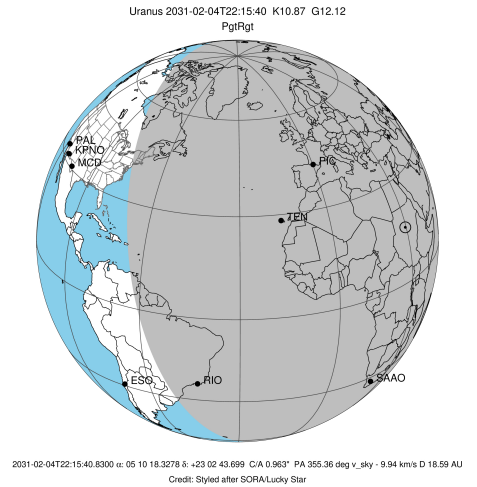
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-02-04T20:53:49.478		82.43	-27.93	51058.49	-10.06		
lambda	I	2031-02-04T20:55:32.368		82.71	-28.30	50026.71	-10.02		
delta	I	2031-02-04T20:58:24.859		83.17	-28.94	48300.35	-10.00		
gamma	I	2031-02-04T20:59:32.398		83.33	-29.18	47625.63	-9.99		
eta	I	2031-02-04T21:00:17.434		83.44	-29.35	47176.12	-9.98		
beta	I	2031-02-04T21:02:49.471		83.79	-29.91	45661.14	-9.95		
alpha	I	2031-02-04T21:04:20.905		83.99	-30.24	44752.43	-9.93		
4	I	2031-02-04T21:07:56.373		84.39	-31.03	42616.53	-9.89		
5	I	2031-02-04T21:08:30.014		84.44	-31.16	42283.74	-9.88		
6	I	2031-02-04T21:09:16.180		84.51	-31.32	41826.12	-9.87		
Uranus	I	2031-02-04T21:37:52.908		83.36	-37.63	25354.57		-4.63	-4.85
Uranus	E	2031-02-04T22:49:11.581		68.98	-53.25	25469.44		-3.06	-3.20
6	E	2031-02-04T23:17:52.648		62.68	-59.38	41822.92	9.78		
5	E	2031-02-04T23:18:27.119		62.55	-59.50	42158.78	9.79		
4	E	2031-02-04T23:19:05.199		62.41	-59.64	42532.72	9.80		
alpha	E	2031-02-04T23:22:44.853		61.61	-60.41	44689.83	9.84		
beta	E	2031-02-04T23:24:22.354		61.25	-60.75	45650.57	9.86		
eta	E	2031-02-04T23:26:56.893		60.68	-61.29	47176.12	9.88		
gamma	E	2031-02-04T23:27:42.751		60.51	-61.44	47629.48	9.89		
delta	E	2031-02-04T23:28:50.557		60.26	-61.68	48300.35	9.90		
lambda	E	2031-02-04T23:31:44.769		59.62	-62.28	50026.71	9.92		
epsilon	E	2031-02-04T23:34:04.303		59.10	-62.76	51411.99	9.95		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T22:05:49.650
 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 : 3415395205375892864
 2Mass ID (if available) : 05101832+2302438
 ICRS Star Coord at Epoch: 05h 10m 18.32780s +23:02:43.69898s
 RUWE (>1.4 is poor) : 1.38
 K magnitude : 10.872
 G magnitude : 12.120
 RP magnitude : 11.690
 BP magnitude : 12.387
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.94
 Sun-Target sep (deg) : 123.12
 Sun-Moon sep (deg) : 27.16
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.87
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.857
 C/A sky separation (km) : 11548.4
 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_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	2031-02-04T20:42:22.204		8.30	-64.62	51058.42	-9.76		
lambda	I	2031-02-04T20:44:08.162		7.90	-64.19	50026.71	-9.73		
delta	I	2031-02-04T20:47:05.846		7.23	-63.48	48300.35	-9.70		
gamma	I	2031-02-04T20:48:15.430		6.97	-63.21	47625.62	-9.69		
eta	I	2031-02-04T20:49:01.831		6.79	-63.02	47176.12	-9.68		
beta	I	2031-02-04T20:51:38.488		6.20	-62.40	45661.20	-9.66		
alpha	I	2031-02-04T20:53:12.719		5.84	-62.02	44752.43	-9.64		
4	I	2031-02-04T20:56:54.775		5.01	-61.13	42616.54	-9.59		
5	I	2031-02-04T20:57:29.412		4.88x	-60.99	42284.08	-9.58		
6	I	2031-02-04T20:58:17.001		4.70x	-60.80	41826.35	-9.57		
Uranus	I	2031-02-04T21:27:39.921		-1.90x	-53.75	25368.95		-4.47	-4.68
Uranus	E	2031-02-04T22:44:33.399		-18.70x	-35.29	25493.72		-2.61	-2.73
6	E	2031-02-04T23:14:30.561		-24.95x	-28.13	41824.54	9.29		
5	E	2031-02-04T23:15:06.767		-25.07x	-27.98	42159.84	9.30		
4	E	2031-02-04T23:15:46.694		-25.21x	-27.82	42531.80	9.31		
alpha	E	2031-02-04T23:19:38.256		-26.00x	-26.90	44689.16	9.33		
beta	E	2031-02-04T23:21:21.265		-26.35x	-26.49	45651.22	9.34		
eta	E	2031-02-04T23:24:04.324		-26.90x	-25.84	47176.12	9.36		
gamma	E	2031-02-04T23:24:52.736		-27.06x	-25.65	47629.33	9.36		
delta	E	2031-02-04T23:26:04.373		-27.30x	-25.36	48300.35	9.37		
lambda	E	2031-02-04T23:29:08.477		-27.92x	-24.63	50026.71	9.38		
epsilon	E	2031-02-04T23:31:34.858		-28.41x	-24.05	51401.10	9.41		

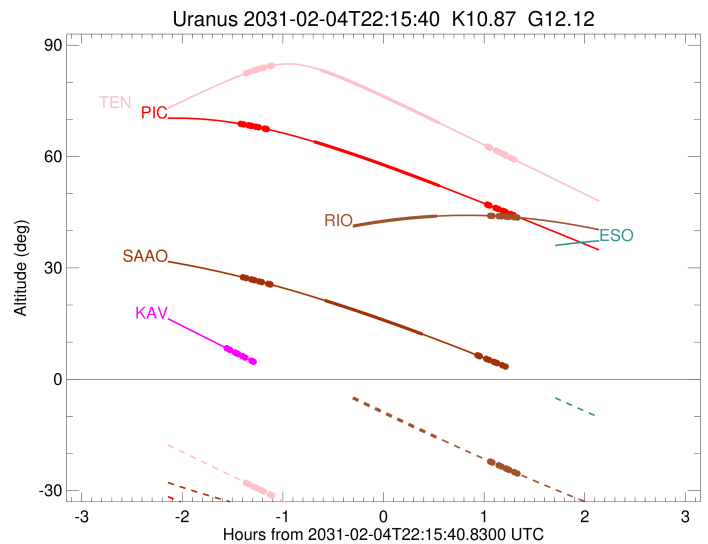
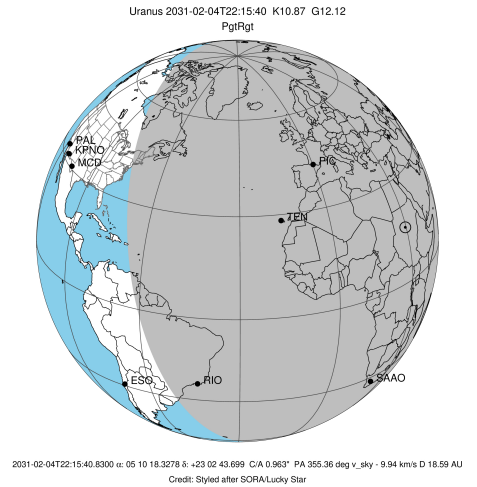
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-02-04T22:18:06.010
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : RIO
 Location : Rio de Janeiro
 Latitude (deg) : -22.89506
 E. Longitude (deg) : 316.77708
 Altitude (km) : 0.033
 Gaia source ID : 3415395205375892864
 2Mass ID (if available) : 05101832+2302438
 ICRS Star Coord at Epoch: 05h 10m 18.32780s +23:02:43.69898s
 RUWE (>1.4 is poor) : 1.38
 K magnitude : 10.872
 G magnitude : 12.120
 RP magnitude : 11.690
 BP magnitude : 12.387
 DUPflag : 0
 Distance (au) : 18.589
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -9.94
 Sun-Target sep (deg) : 123.12
 Sun-Moon sep (deg) : 28.40
 B (ring opening deg) : 82.13
 PA of pole (deg) : 1.87
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.297
 C/A sky separation (km) : 17483.0
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-02-04T21:00:50.141		35.01	7.48x	51096.47	-9.70		
lambda	I	2031-02-04T21:02:40.870		35.26	7.06x	50026.71	-9.65		
delta	I	2031-02-04T21:05:40.260		35.65	6.40x	48300.35	-9.60		
gamma	I	2031-02-04T21:06:50.569		35.81	6.14x	47626.18	-9.58		
eta	I	2031-02-04T21:07:37.591		35.91	5.96x	47176.12	-9.56		
beta	I	2031-02-04T21:10:16.633		36.25	5.37x	45658.95	-9.51		
alpha	I	2031-02-04T21:11:52.157		36.45	5.02x	44752.21	-9.48		
4	I	2031-02-04T21:15:38.524		36.92	4.18x	42615.99	-9.39		
5	I	2031-02-04T21:16:14.689		36.99	4.04x	42275.77	-9.37		
6	I	2031-02-04T21:17:03.048		37.09	3.87x	41821.24	-9.35		
Uranus	I	2031-02-04T21:48:48.514		40.50	-3.12x	25217.14		-6.02	-6.31
Uranus	E	2031-02-04T22:47:39.663		43.96	-15.70	25342.11		-4.78	-5.00
6	E	2031-02-04T23:19:13.597		44.04	-22.16	41817.65	9.36		
5	E	2031-02-04T23:19:50.015		44.03	-22.28	42156.14	9.38		
4	E	2031-02-04T23:20:30.304		44.01	-22.41	42536.22	9.40		
alpha	E	2031-02-04T23:24:18.675		43.93	-23.17	44692.32	9.49		
beta	E	2031-02-04T23:25:59.198		43.89	-23.50	45648.55	9.53		
eta	E	2031-02-04T23:28:39.093		43.81	-24.03	47176.12	9.58		
gamma	E	2031-02-04T23:29:26.437		43.79	-24.19	47629.96	9.59		
delta	E	2031-02-04T23:30:36.241		43.75	-24.42	48300.35	9.61		
lambda	E	2031-02-04T23:33:35.343		43.65	-25.00	50026.71	9.66		
epsilon	E	2031-02-04T23:36:01.750		43.56	-25.48	51444.14	9.72		


```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-02-04T22:09:38.400
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       : 3415395205375892864
2Mass ID (if available) : 05101832+2302438
ICRS Star Coord at Epoch: 05h 10m 18.32780s +23:02:43.69898s
RUWE (>1.4 is poor) : 1.38
K magnitude           : 10.872
G magnitude           : 12.120
RP magnitude          : 11.690
BP magnitude          : 12.387
DUPflag              : 0
Distance (au)         : 18.589
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -9.94
Sun-Target sep (deg) : 123.12
Sun-Moon sep (deg)   : 27.54
B (ring opening deg) : 82.13
PA of pole (deg)     : 1.87
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.325
C/A sky separation (km) : 17857.1
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural11.bsp
ural161.bsp
vgr2.ural161.bsp
peph.ural160.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	2031-02-04T20:51:58.646		27.46	-33.97	51106.17	-9.66		
lambda	I	2031-02-04T20:53:50.874		27.25	-34.20	50026.71	-9.60		
delta	I	2031-02-04T20:56:51.174		26.91	-34.56	48300.35	-9.55		
gamma	I	2031-02-04T20:58:01.865		26.77	-34.70	47626.31	-9.52		
eta	I	2031-02-04T20:58:49.178		26.68	-34.79	47176.12	-9.51		
beta	I	2031-02-04T21:01:29.286		26.37	-35.09	45658.45	-9.45		
alpha	I	2031-02-04T21:03:05.437		26.18	-35.28	44752.10	-9.41		
4	I	2031-02-04T21:06:53.587		25.72	-35.70	42615.79	-9.31		
5	I	2031-02-04T21:07:30.216		25.64	-35.77	42273.95	-9.29		
6	I	2031-02-04T21:08:18.917		25.54	-35.85	41820.22	-9.27		
Uranus	I	2031-02-04T21:40:38.252		21.24	-38.89	25196.01		-6.21	-6.50
Uranus	E	2031-02-04T22:39:06.317		12.12	-41.66	25339.41		-4.81	-5.03
6	E	2031-02-04T23:11:41.362		6.46	-41.48	41817.86	9.09		
5	E	2031-02-04T23:12:18.831		6.35	-41.46	42156.23	9.11		
4	E	2031-02-04T23:13:00.282		6.22	-41.45	42536.05	9.13		
alpha	E	2031-02-04T23:16:55.369		5.52	-41.34	44692.19	9.22		
beta	E	2031-02-04T23:18:38.880		5.21	-41.28	45648.65	9.25		
eta	E	2031-02-04T23:21:23.490		4.71x	-41.19	47176.12	9.30		
gamma	E	2031-02-04T23:22:12.233		4.56x	-41.16	47629.93	9.32		
delta	E	2031-02-04T23:23:24.112		4.35x	-41.11	48300.35	9.34		
lambda	E	2031-02-04T23:26:28.551		3.78x	-40.99	50026.71	9.38		
epsilon	E	2031-02-04T23:28:59.118		3.32x	-40.88	51442.01	9.44		