

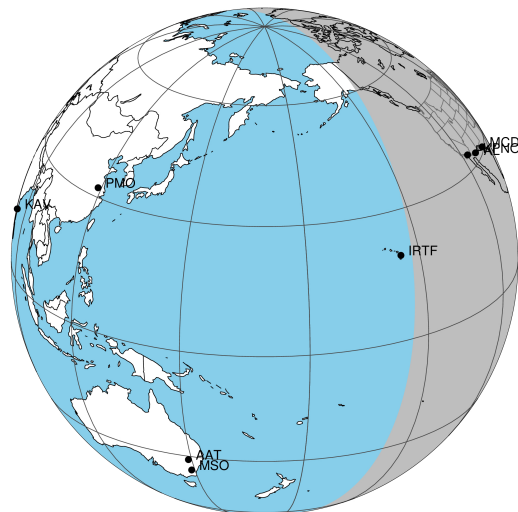
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-04-06T04:20:57.930
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 144910104919140096
 2Mass ID (if available) : 04365330+2203186

Uranus 2029-04-06T04:20:57 K14.56 G16.39 PgtRgt

ICRS Star Coord at Epoch: 04h 36m 53.31048s +22:03:18.51623s

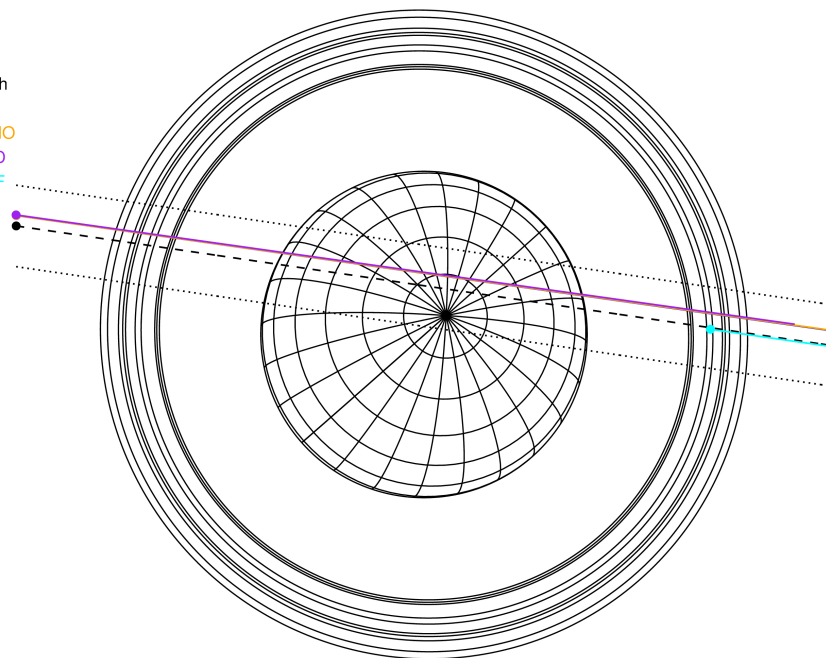
RUWE (>1.4 is poor) : 0.89
 K magnitude : 14.561
 G magnitude : 16.386
 RP magnitude : 15.777
 BP magnitude : 16.811
 DUPflag : 0
 Distance (au) : 19.834
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 23.59
 Sun-Target sep (deg) : 54.56
 Sun-Moon sep (deg) : 140.35
 B (ring opening deg) : 79.70
 PA of pole (deg) : -49.45

Uranus 2029-04-06T04:20:57 K14.56 G16.39
 PgtRgt



2029-04-06T04:20:57.9300 ex: 04 36 53.3105 s: +22 03 18.516 C/A 0.529° PA 171.66 deg v_sky +23.59 km/s D 19.83 AU
 Credit: Styled after SORA/Lucky Star

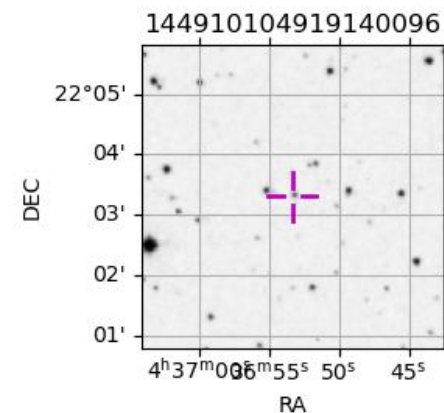
Earth
 PAL
 KPNO
 MCD
 IRTF



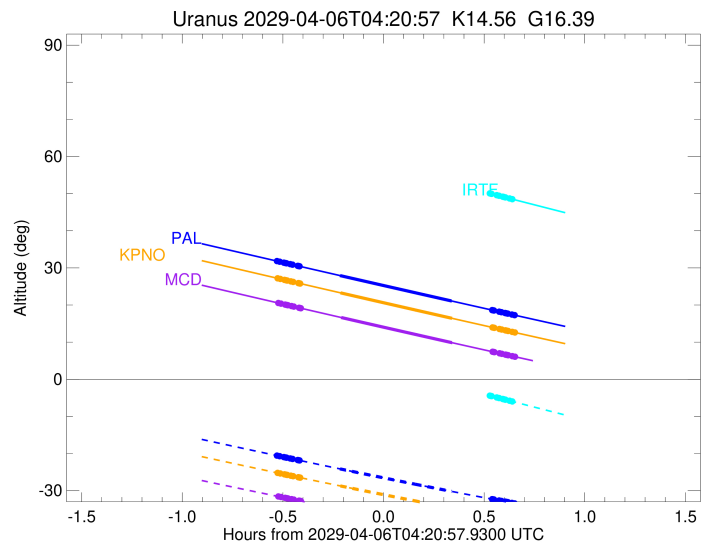
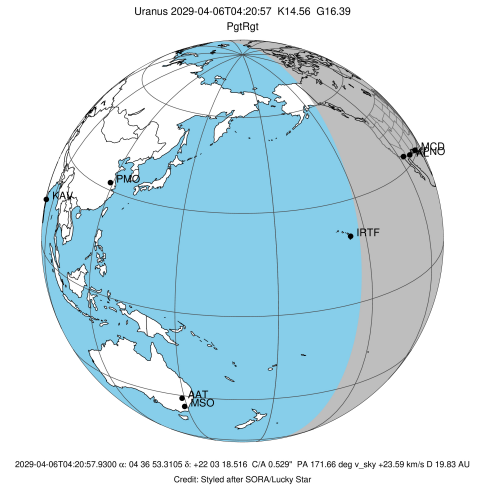
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

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	+++++	+ +	+++++	APR 06 03:49 - APR 06 05:00	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	APR 06 03:49 - APR 06 05:00	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	APR 06 03:49 - APR 06 05:00	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5			+++++	APR 06 04:55 - APR 06 04:59	PnnRne
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					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

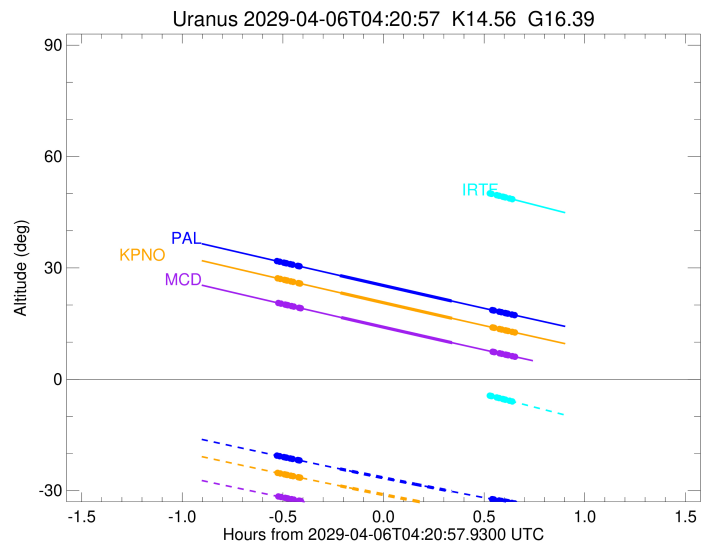
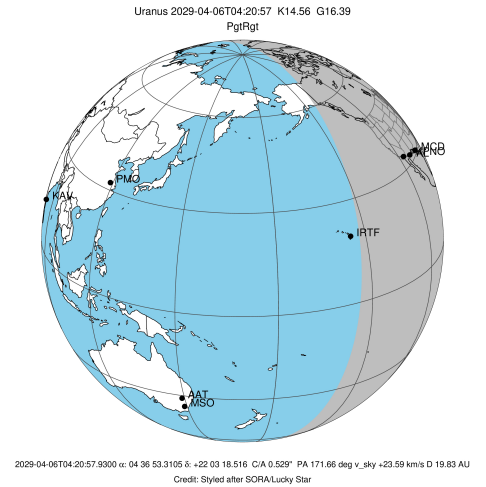


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-04-06T04:24:47.660
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 144910104919140096
 2Mass ID (if available) : 04365330+2203186
 ICRS Star Coord at Epoch: 04h 36m 53.31048s +22:03:18.51623s
 RUWE (>1.4 is poor) : 0.89
 K magnitude : 14.561
 G magnitude : 16.386
 RP magnitude : 15.777
 BP magnitude : 16.811
 DUPflag : 0
 Distance (au) : 19.834
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 23.59
 Sun-Target sep (deg) : 54.56
 Sun-Moon sep (deg) : 140.00
 B (ring opening deg) : 79.70
 PA of pole (deg) : -49.45
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.660
 C/A sky separation (km) : 9491.2
 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



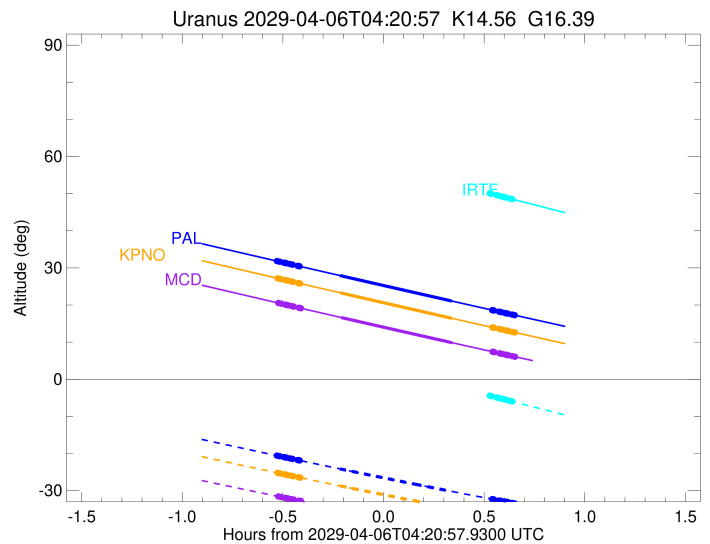
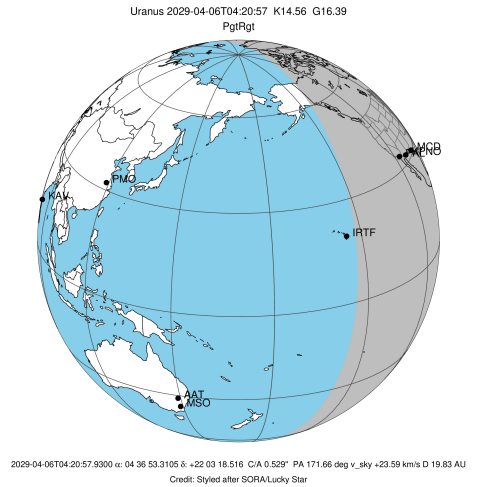
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-04-06T03:49:21.398		31.80	-20.60	50951.37	-23.17		
lambda	I	2029-04-06T03:50:01.368		31.67	-20.73	50026.71	-23.13		
delta	I	2029-04-06T03:51:16.065		31.41	-20.97	48300.35	-23.10		
gamma	I	2029-04-06T03:51:45.036		31.31	-21.06	47631.43	-23.08		
eta	I	2029-04-06T03:52:04.765		31.24	-21.12	47176.12	-23.07		
beta	I	2029-04-06T03:53:09.605		31.01	-21.33	45680.66	-23.04		
alpha	I	2029-04-06T03:53:52.700		30.86	-21.47	44688.33	-23.02		
4	I	2029-04-06T03:55:25.905		30.54	-21.76	42547.43	-22.97		
5	I	2029-04-06T03:55:41.192		30.49	-21.81	42193.97	-22.96		
6	I	2029-04-06T03:55:57.970		30.43	-21.87	41810.63	-22.95		
Uranus	I	2029-04-06T04:07:58.652		27.94	-24.14	25493.59		-3.43	-3.59
Uranus	E	2029-04-06T04:41:17.263		21.09	-30.21	25100.74		9.21	9.64
6	E	2029-04-06T04:53:22.981		18.63	-32.31	41875.80	23.05		
5	E	2029-04-06T04:53:41.822		18.56	-32.36	42302.14	23.07		
4	E	2029-04-06T04:53:54.846		18.52	-32.40	42609.49	23.08		
alpha	E	2029-04-06T04:55:27.224		18.21	-32.66	44739.49	23.13		
beta	E	2029-04-06T04:56:06.342		18.07	-32.77	45645.30	23.16		
eta	E	2029-04-06T04:57:12.366		17.85	-32.96	47176.12	23.20		
gamma	E	2029-04-06T04:57:31.585		17.79	-33.01	47622.00	23.21		
delta	E	2029-04-06T04:58:00.808		17.69	-33.09	48300.35	23.22		
lambda	E	2029-04-06T04:59:15.100		17.44	-33.30	50026.71	23.26		
epsilon	E	2029-04-06T05:00:16.721		17.23	-33.48	51460.55	23.30		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-04-06T04:24:55.900
 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 : 144910104919140096
 2Mass ID (if available) : 04365330+2203186
 ICRS Star Coord at Epoch: 04h 36m 53.31048s +22:03:18.51623s
 RUWE (>1.4 is poor) : 0.89
 K magnitude : 14.561
 G magnitude : 16.386
 RP magnitude : 15.777
 BP magnitude : 16.811
 DUPflag : 0
 Distance (au) : 19.834
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 23.59
 Sun-Target sep (deg) : 54.56
 Sun-Moon sep (deg) : 139.93
 B (ring opening deg) : 79.70
 PA of pole (deg) : -49.45
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.662
 C/A sky separation (km) : 9518.3
 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	2029-04-06T03:49:32.710		27.17	-25.25	50951.40	-23.20		
lambda	I	2029-04-06T03:50:12.634		27.03	-25.38	50026.71	-23.15		
delta	I	2029-04-06T03:51:27.244		26.77	-25.61	48300.35	-23.12		
gamma	I	2029-04-06T03:51:56.180		26.66	-25.71	47631.44	-23.11		
eta	I	2029-04-06T03:52:15.885		26.60	-25.77	47176.12	-23.10		
beta	I	2029-04-06T03:53:20.649		26.37	-25.97	45680.66	-23.07		
alpha	I	2029-04-06T03:54:03.694		26.22	-26.11	44688.33	-23.04		
4	I	2029-04-06T03:55:36.790		25.90	-26.40	42547.44	-23.00		
5	I	2029-04-06T03:55:52.059		25.84	-26.45	42193.99	-22.99		
6	I	2029-04-06T03:56:08.817		25.78	-26.50	41810.63	-22.98		
Uranus	I	2029-04-06T04:08:08.729		23.28	-28.74	25493.84		-3.42	-3.58
Uranus	E	2029-04-06T04:41:23.600		16.42	-34.67	25100.05		9.22	9.65
6	E	2029-04-06T04:53:28.470		13.96	-36.70	41875.82	23.08		
5	E	2029-04-06T04:53:47.288		13.89	-36.75	42302.18	23.10		
4	E	2029-04-06T04:54:00.293		13.85	-36.79	42609.52	23.11		
alpha	E	2029-04-06T04:55:32.548		13.54	-37.04	44739.46	23.16		
beta	E	2029-04-06T04:56:11.614		13.40	-37.15	45645.31	23.19		
eta	E	2029-04-06T04:57:17.549		13.18	-37.33	47176.12	23.23		
gamma	E	2029-04-06T04:57:36.742		13.12	-37.38	47622.00	23.24		
delta	E	2029-04-06T04:58:05.926		13.02	-37.46	48300.35	23.25		
lambda	E	2029-04-06T04:59:20.116		12.77	-37.66	50026.71	23.29		
epsilon	E	2029-04-06T05:00:21.663		12.56	-37.83	51460.79	23.34		

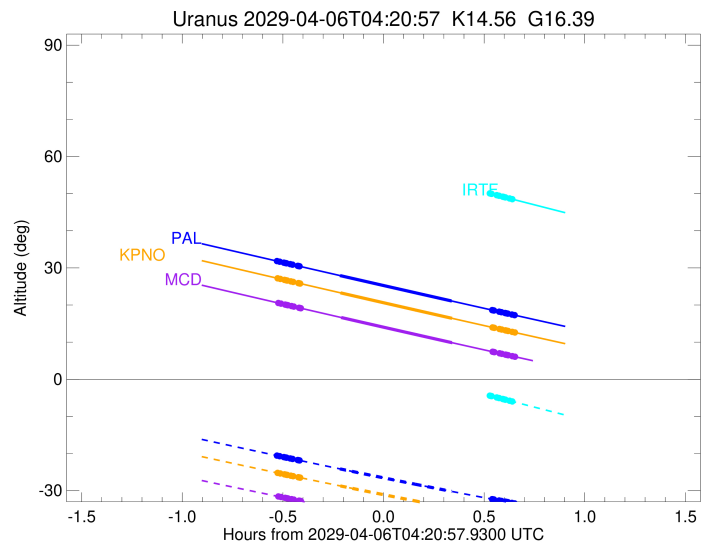
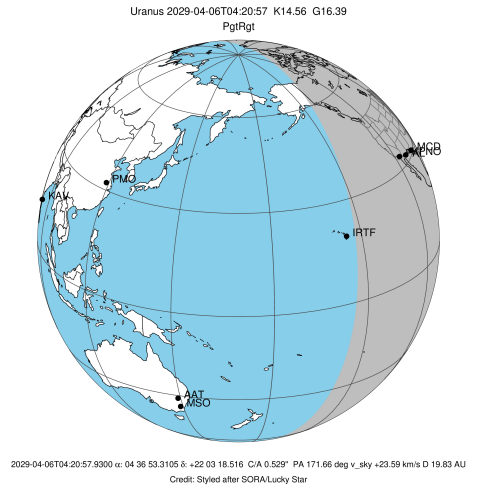
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-04-06T04:25:03.120
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : MCD
 Location : McDonald Obs. 2.7m
 Latitude (deg) : 30.67158
 E. Longitude (deg) : 255.97844
 Altitude (km) : 2.075
 Gaia source ID : 144910104919140096
 2Mass ID (if available) : 04365330+2203186
 ICRS Star Coord at Epoch: 04h 36m 53.31048s +22:03:18.51623s
 RUWE (>1.4 is poor) : 0.89
 K magnitude : 14.561
 G magnitude : 16.386
 RP magnitude : 15.777
 BP magnitude : 16.811
 DUPflag : 0
 Distance (au) : 19.834
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : 23.59
 Sun-Target sep (deg) : 54.56
 Sun-Moon sep (deg) : 139.84
 B (ring opening deg) : 79.70
 PA of pole (deg) : -49.45
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.671
 C/A sky separation (km) : 9648.8
 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	2029-04-06T03:49:45.363		20.51	-31.60	50952.15	-23.24		
lambda	I	2029-04-06T03:50:25.257		20.37	-31.72	50026.71	-23.19		
delta	I	2029-04-06T03:51:39.754		20.11	-31.95	48300.35	-23.16		
gamma	I	2029-04-06T03:52:08.647		20.01	-32.04	47631.44	-23.14		
eta	I	2029-04-06T03:52:28.324		19.94	-32.10	47176.12	-23.14		
beta	I	2029-04-06T03:53:32.993		19.72	-32.29	45680.67	-23.10		
alpha	I	2029-04-06T03:54:15.979		19.57	-32.43	44688.29	-23.08		
4	I	2029-04-06T03:55:48.941		19.25	-32.71	42547.54	-23.03		
5	I	2029-04-06T03:56:04.187		19.19	-32.75	42194.17	-23.02		
6	I	2029-04-06T03:56:20.926		19.13	-32.80	41810.72	-23.01		
Uranus	I	2029-04-06T04:08:20.262		16.64	-34.95	25495.66		-3.37	-3.53
Uranus	E	2029-04-06T04:41:26.275		9.85	-40.51	25097.36		9.25	9.68
6	E	2029-04-06T04:53:30.556		7.41	-42.37	41875.88	23.12		
5	E	2029-04-06T04:53:49.354		7.34	-42.41	42302.34	23.13		
4	E	2029-04-06T04:54:02.336		7.30	-42.45	42609.61	23.14		
alpha	E	2029-04-06T04:55:34.445		6.99	-42.68	44739.37	23.20		
beta	E	2029-04-06T04:56:13.457		6.86	-42.77	45645.35	23.23		
eta	E	2029-04-06T04:57:19.285		6.64	-42.93	47176.12	23.26		
gamma	E	2029-04-06T04:57:38.448		6.58	-42.98	47622.01	23.27		
delta	E	2029-04-06T04:58:07.584		6.48	-43.05	48300.35	23.29		
lambda	E	2029-04-06T04:59:21.651		6.23	-43.23	50026.71	23.33		
epsilon	E	2029-04-06T05:00:23.128		6.03	-43.38	51461.58	23.38		

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target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2029-04-06T04:23:24.520
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       : 144910104919140096
2Mass ID (if available) : 04365330+2203186
ICRS Star Coord at Epoch: 04h 36m 53.31048s +22:03:18.51623s
RUWE (>1.4 is poor) : 0.89
K magnitude          : 14.561
G magnitude           : 16.386
RP magnitude         : 15.777
BP magnitude         : 16.811
DUPflag              : 0
Distance (au)        : 19.834
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : 23.59
Sun-Target sep (deg) : 54.56
Sun-Moon sep (deg)   : 140.46
B (ring opening deg) : 79.70
PA of pole (deg)     : -49.45
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.501
C/A sky separation (km) : 7211.1
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
    
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Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-04-06T03:47:22.535	65.22	10.86x	50936.69	-23.12		
lambda	I	2029-04-06T03:48:01.939	65.06	10.71x	50026.71	-23.09		
delta	I	2029-04-06T03:49:16.733	64.77	10.41x	48300.35	-23.07		
gamma	I	2029-04-06T03:49:45.733	64.66	10.30x	47631.38	-23.07		
eta	I	2029-04-06T03:50:05.473	64.58	10.22x	47176.12	-23.06		
beta	I	2029-04-06T03:51:10.343	64.33	9.97x	45680.40	-23.04		
alpha	I	2029-04-06T03:51:53.383	64.17	9.80x	44689.12	-23.03		
4	I	2029-04-06T03:53:26.635	63.81	9.43x	42545.47	-23.00		
5	I	2029-04-06T03:53:41.947	63.75	9.37x	42190.45	-23.00		
6	I	2029-04-06T03:53:58.641	63.68	9.31x	41808.92	-22.99		
Uranus	I	2029-04-06T04:05:52.693	60.92	6.52x	25456.84		-4.29	-4.49
Uranus	E	2029-04-06T04:40:41.472	52.84	-1.63x	25148.26		8.71	9.11
6	E	2029-04-06T04:52:40.197	50.07	-4.42x	41874.67	23.07		
5	E	2029-04-06T04:52:58.923	50.00	-4.49x	42299.44	23.07		
4	E	2029-04-06T04:53:12.022	49.95	-4.54x	42608.01	23.08		
alpha	E	2029-04-06T04:54:44.560	49.59	-4.90x	44740.94	23.11		
beta	E	2029-04-06T04:55:23.639	49.44	-5.05	45644.65	23.13		
eta	E	2029-04-06T04:56:29.809	49.18	-5.31	47176.12	23.15		
gamma	E	2029-04-06T04:56:49.062	49.11	-5.38	47621.84	23.15		
delta	E	2029-04-06T04:57:18.363	49.00	-5.50	48300.35	23.16		
lambda	E	2029-04-06T04:58:32.866	48.71	-5.79	50026.71	23.18		
epsilon	E	2029-04-06T04:59:34.133	48.47	-6.02	51447.49	23.22		