

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2023-10-06T10:14:23.370  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 56044375415107200  
 2Mass ID (if available) : 03191923+1759394

ICRS Star Coord at Epoch: 03h 19m 19.27373s +17:59:38.03142s

RUWE (>1.4 is poor) : 1.00  
 K magnitude : 14.651  
 G magnitude : 18.491  
 RP magnitude : 17.254  
 BP magnitude : 20.101  
 DUPflag : 0  
 Distance (au) : 18.846  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.60  
 Sun-Target sep (deg) : 140.42  
 Sun-Moon sep (deg) : 48.98  
 B (ring opening deg) : 63.54  
 PA of pole (deg) : -88.00

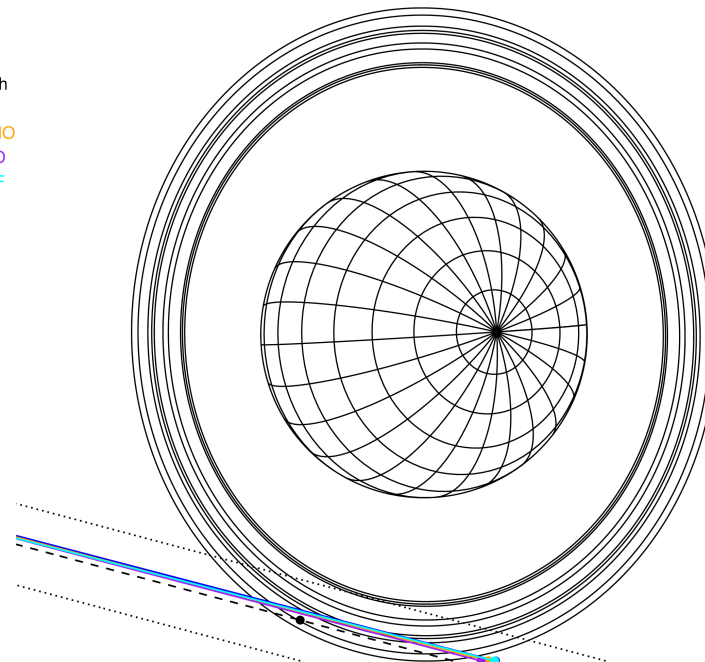
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2023-10-06T10:14:23.3700 ex: 03 19 19.27373 ex: +17 59 38.031 C/A 3.526" PA 345.06 deg v\_sky -16.60 km/s D 18.85 AU  
 Credit: Styled after SORA/Lucky Star

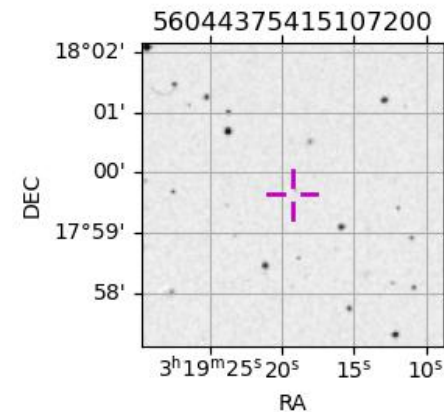
Earth  
 PAL  
 KPNO  
 MCD  
 IRTF

Uranus 2023-10-06T10:14:23 K14.65 G18.49 XRgt



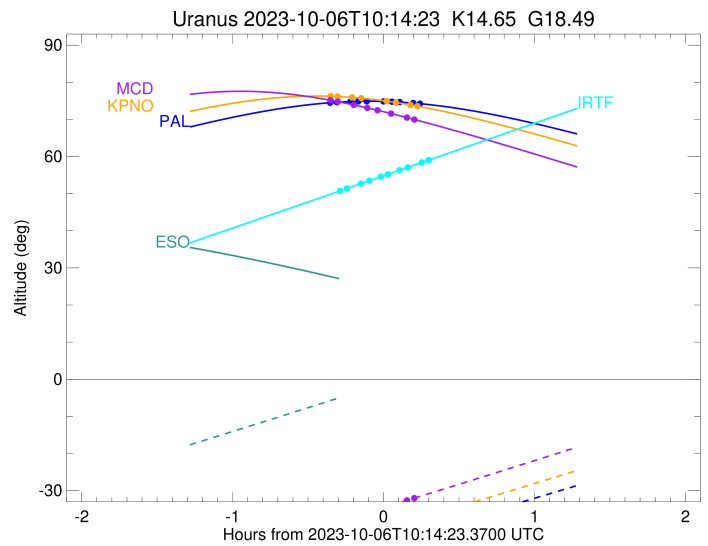
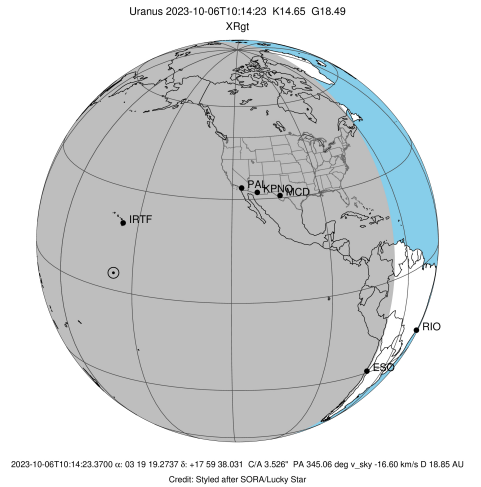
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEncode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1	+++++		+++++	OCT 06 09:53 - OCT 06 10:29	PnnRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	++++		++++	OCT 06 09:53 - OCT 06 10:28	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	++++		++++	OCT 06 09:53 - OCT 06 10:27	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	OCT 06 09:57 - OCT 06 10:32	PnnRie
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            : 2023-10-06T10:13:35.250
Event type           : XRgt
: No Uranus occs
: 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       : 56044375415107200
2Mass ID (if available) : 03191923+1759394
ICRS Star Coord at Epoch: 03h 19m 19.27373s +17:59:38.03142s
RUWE (>1.4 is poor) : 1.00
K magnitude          : 14.651
G magnitude          : 18.491
RP magnitude         : 17.254
BP magnitude         : 20.101
DUPflag             : 0
Distance (au)        : 18.846
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -16.60
Sun-Target sep (deg) : 140.42
Sun-Moon sep (deg)   : 49.59
B (ring opening deg) : 63.54
PA of pole (deg)     : -88.00
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.412
C/A sky separation (km) : 46641.8
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.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
  
```



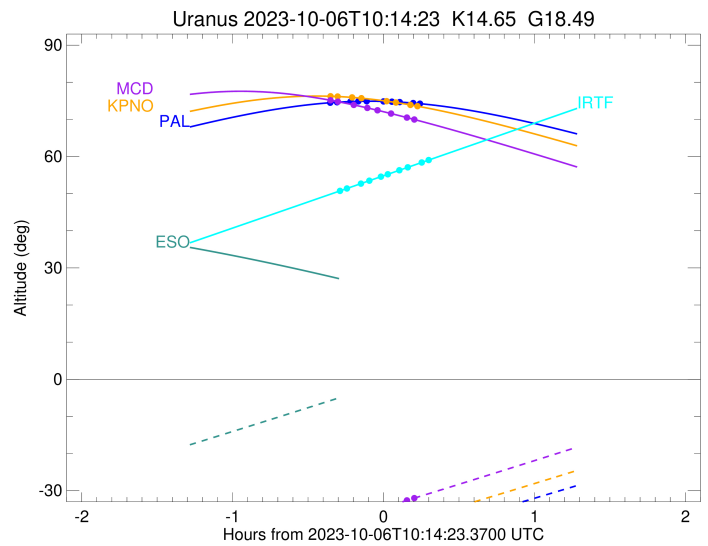
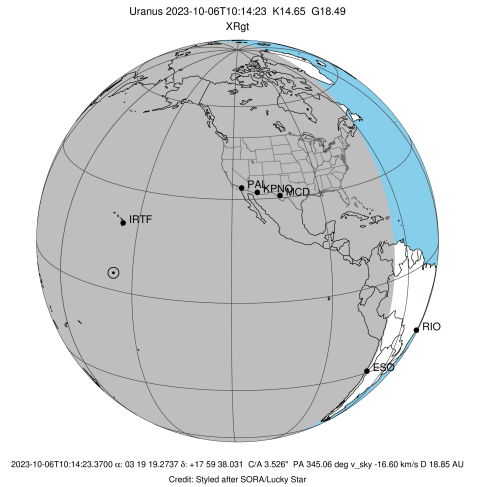
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2023-10-06T09:53:25.838		74.51	-47.40	51066.22	-7.45		
lambda	I	2023-10-06T09:55:57.374		74.63	-46.96	50026.71	-6.40		
delta	I	2023-10-06T10:01:20.084		74.81	-46.01	48300.35	-4.26		
gamma	I	2023-10-06T10:04:25.626		74.87	-45.46	47630.21	-2.95		
eta	I	2023-10-06T10:07:52.914		74.90	-44.84	47176.12	-1.42		

No planet occultations

eta	E	2023-10-06T10:14:13.286		74.85	-43.68	47176.12	1.43		
gamma	E	2023-10-06T10:17:40.849		74.77	-43.04	47631.12	2.95		
delta	E	2023-10-06T10:20:46.033		74.67	-42.47	48300.35	4.27		
lambda	E	2023-10-06T10:26:08.612		74.41	-41.46	50026.71	6.40		
epsilon	E	2023-10-06T10:29:22.487		74.21	-40.85	51381.91	7.45		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2023-10-06T10:13:10.500  
 Event type : XRgt  
 : No Uranus occs  
 : 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 : 56044375415107200  
 2Mass ID (if available) : 03191923+1759394  
 ICRS Star Coord at Epoch: 03h 19m 19.27373s +17:59:38.03142s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 14.651  
 G magnitude : 18.491  
 RP magnitude : 17.254  
 BP magnitude : 20.101  
 DUPflag : 0  
 Distance (au) : 18.846  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.60  
 Sun-Target sep (deg) : 140.42  
 Sun-Moon sep (deg) : 49.55  
 B (ring opening deg) : 63.54  
 PA of pole (deg) : -88.00  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.431  
 C/A sky separation (km) : 46901.6  
 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



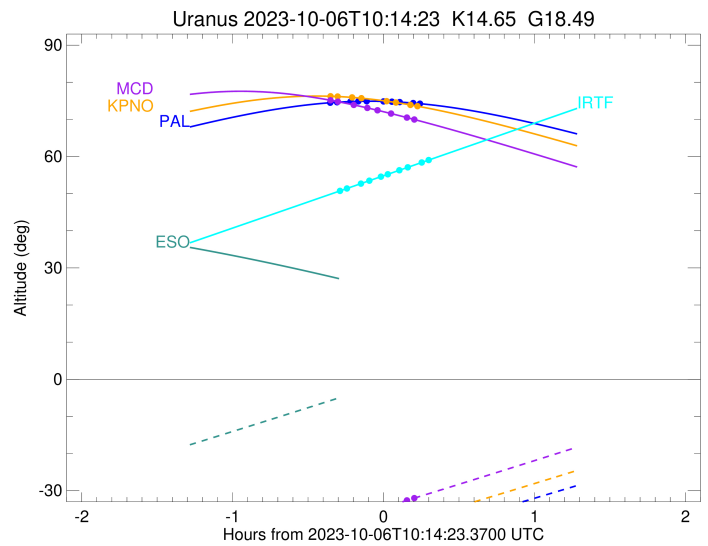
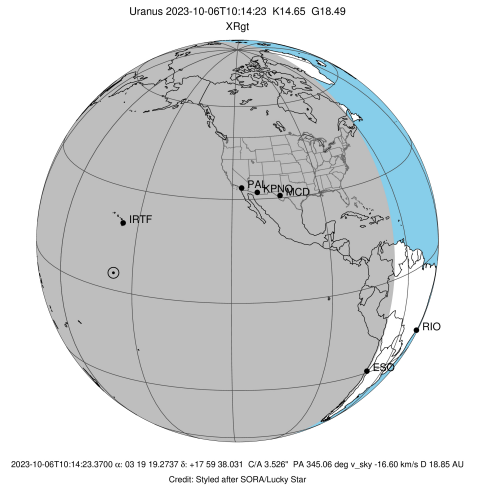
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2023-10-06T09:53:33.414		76.23	-44.26	51071.67	-7.22		
lambda	I	2023-10-06T09:56:11.538		76.16	-43.76	50026.71	-6.12		
delta	I	2023-10-06T10:01:58.197		75.92	-42.66	48300.35	-3.80		
gamma	I	2023-10-06T10:05:41.153		75.71	-41.94	47630.35	-2.20		

No planet occultations

gamma	E	2023-10-06T10:15:33.669		74.92	-40.02	47631.03	2.20		
delta	E	2023-10-06T10:19:16.294		74.56	-39.29	48300.35	3.80		
lambda	E	2023-10-06T10:25:02.892		73.91	-38.15	50026.71	6.12		
epsilon	E	2023-10-06T10:28:23.390		73.50	-37.48	51377.68	7.23		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2023-10-06T10:12:33.450  
 Event type : XRgt  
 : No Uranus occs  
 : 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 : 56044375415107200  
 2Mass ID (if available) : 03191923+1759394  
 ICRS Star Coord at Epoch: 03h 19m 19.27373s +17:59:38.03142s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 14.651  
 G magnitude : 18.491  
 RP magnitude : 17.254  
 BP magnitude : 20.101  
 DUPflag : 0  
 Distance (au) : 18.846  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -16.60  
 Sun-Target sep (deg) : 140.42  
 Sun-Moon sep (deg) : 49.48  
 B (ring opening deg) : 63.54  
 PA of pole (deg) : -88.00  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 3.452  
 C/A sky separation (km) : 47180.2  
 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

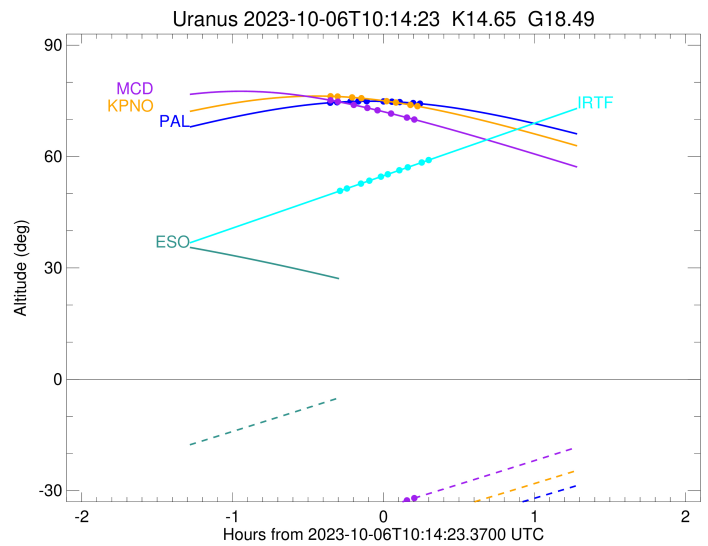
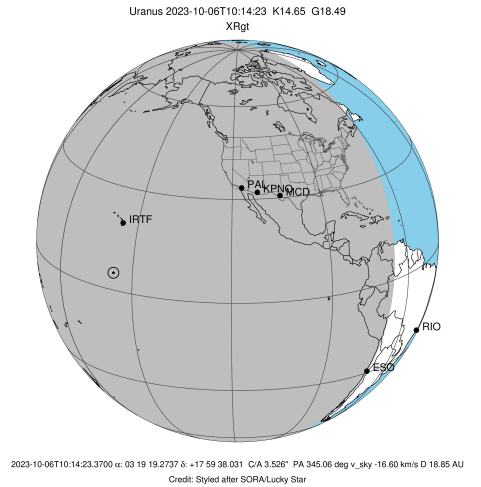
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2023-10-06T09:53:31.955		75.13	-38.83	51077.86	-6.97		
lambda	I	2023-10-06T09:56:18.219		74.77	-38.27	50026.71	-5.80		
delta	I	2023-10-06T10:02:39.051		73.89	-36.98	48300.35	-3.22		
gamma	I	2023-10-06T10:08:10.543		73.07	-35.84	47630.60	-0.80		

No planet occultations

gamma	E	2023-10-06T10:11:47.436		72.50	-35.10	47630.85	0.81		
delta	E	2023-10-06T10:17:18.636		71.59	-33.96	48300.35	3.22		
lambda	E	2023-10-06T10:23:39.511		70.50	-32.64	50026.71	5.80		
epsilon	E	2023-10-06T10:27:08.221		69.88	-31.92	51373.02	6.97		

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target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2023-10-06T10:17:14.960
Event type          : XRgt
: No Uranus occs
: 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      : 56044375415107200
2Mass ID (if available) : 03191923+1759394
ICRS Star Coord at Epoch: 03h 19m 19.27373s +17:59:38.03142s
RUWE (>1.4 is poor) : 1.00
K magnitude          : 14.651
G magnitude          : 18.491
RP magnitude         : 17.254
BP magnitude         : 20.101
DUPflag             : 0
Distance (au)        : 18.846
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -16.60
Sun-Target sep (deg) : 140.42
Sun-Moon sep (deg)   : 49.85
B (ring opening deg) : 63.54
PA of pole (deg)     : -88.00
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.422
C/A sky separation (km) : 46777.4
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
  
```



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2023-10-06T09:57:19.025		50.80	-75.06	51067.32	-7.31		
lambda	I	2023-10-06T09:59:54.042		51.41	-75.18	50026.71	-6.24		
delta	I	2023-10-06T10:05:28.763		52.72	-75.35	48300.35	-4.04		
gamma	I	2023-10-06T10:08:50.144		53.51	-75.39	47630.26	-2.61		
eta	I	2023-10-06T10:13:52.440		54.70	-75.37	47176.23	-0.39		

No planet occultations

eta	E	2023-10-06T10:15:35.600		55.10	-75.33	47176.23	0.39		
gamma	E	2023-10-06T10:20:38.037		56.29	-75.17	47631.07	2.61		
delta	E	2023-10-06T10:23:58.854		57.08	-75.01	48300.35	4.04		
lambda	E	2023-10-06T10:29:32.909		58.39	-74.65	50026.71	6.26		
epsilon	E	2023-10-06T10:32:50.018		59.16	-74.39	51378.49	7.33		