2/23/ 2018

Mott scattering of electrons produced from a LG laser

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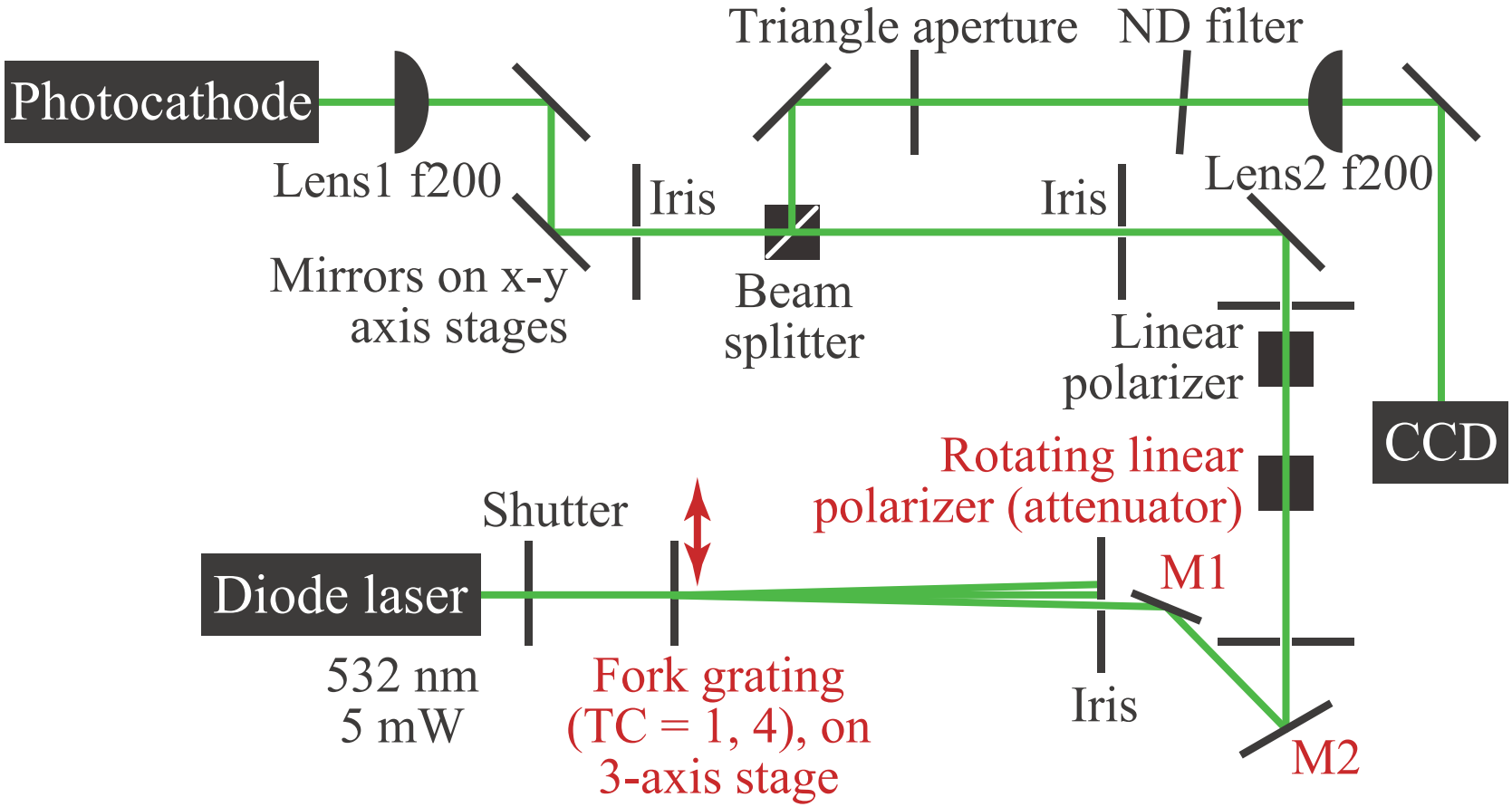
Experimental set-up



Beam splitter to lens1 = 370 mm, Lens1 to photocathode = 235 mm.
Beam splitter to lens2 = 365 mm, Lens2 to CCD = 230 mm.

Measurement procedure

1. Measure the laser profile and diffraction pattern by CCD camera.
2. Measure the cathode and target current.

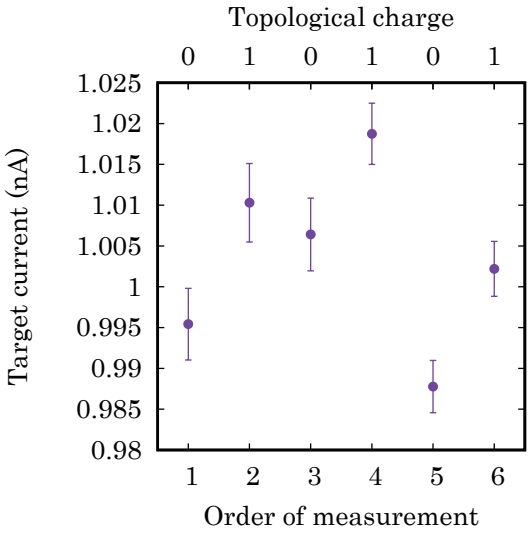
   Adjust an attenuator so as to obtain target current of 1 nA.
3. Turn off target vias voltage and turn on 20 kV high voltage to target.
4. Measure the total counts of two CEM detectors for each retarding voltage of 150, 200, 250, 300, and 350 V, respectively.

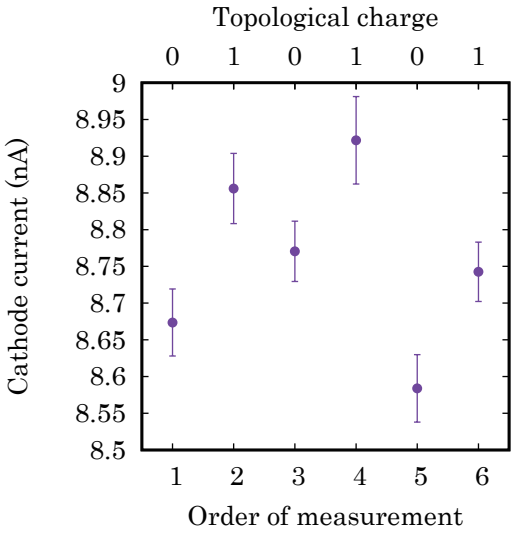
   Measure five times and calculate mean value and standard diviation for each retarding voltage.
5. Turn off high voltage and turn on vias voltage to target.
6. Measure the cathode and target current.

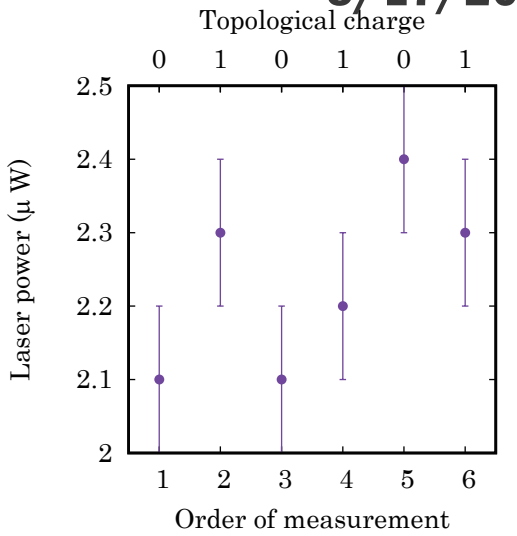
   Calculate mean target current.
7. Change the position of a grating and repeat 1-6.

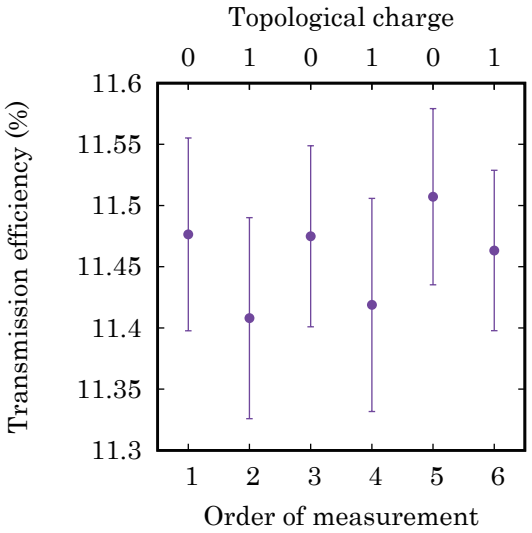
CEM counts for repeatable measurement

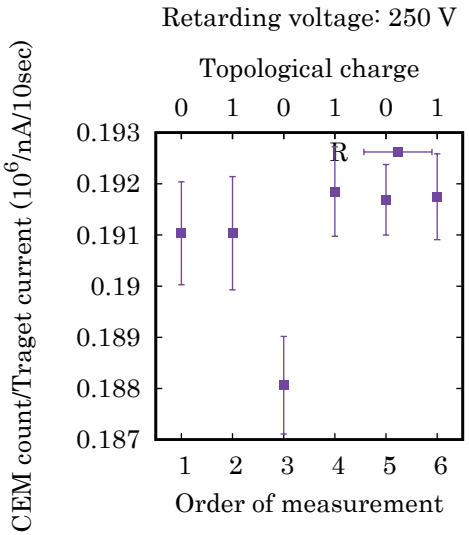
8/17/2017





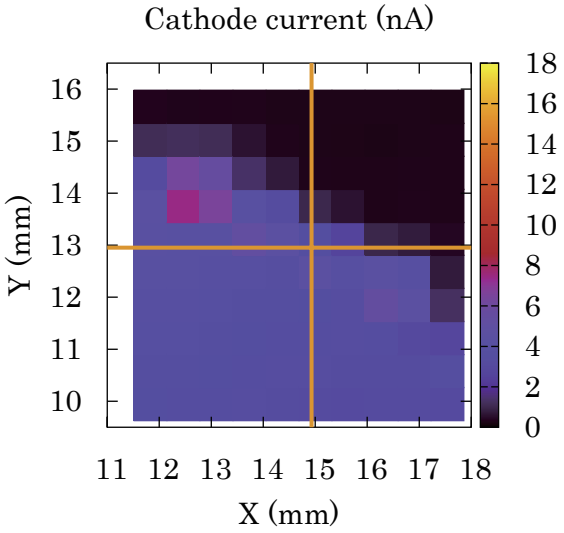


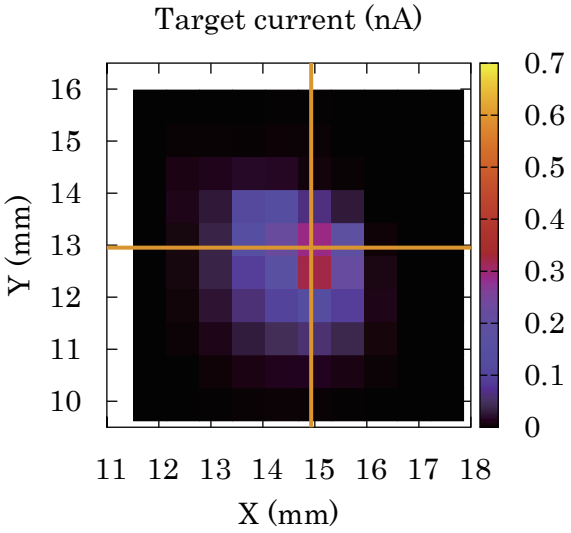


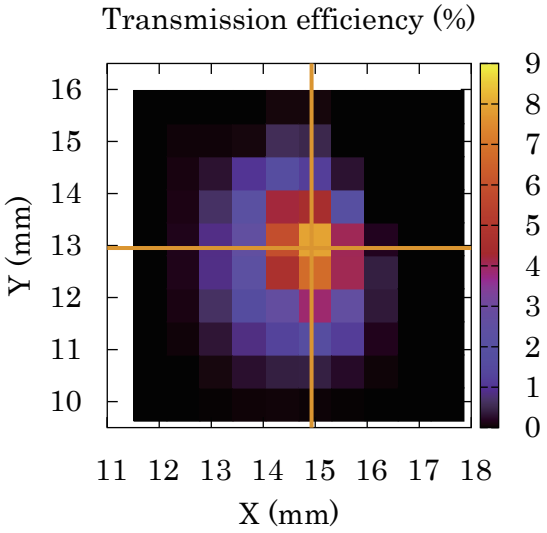


Almost constant cathode and target current.
There is no dependence between the TC and CEM counts.

Cathode current and transmission eff. map

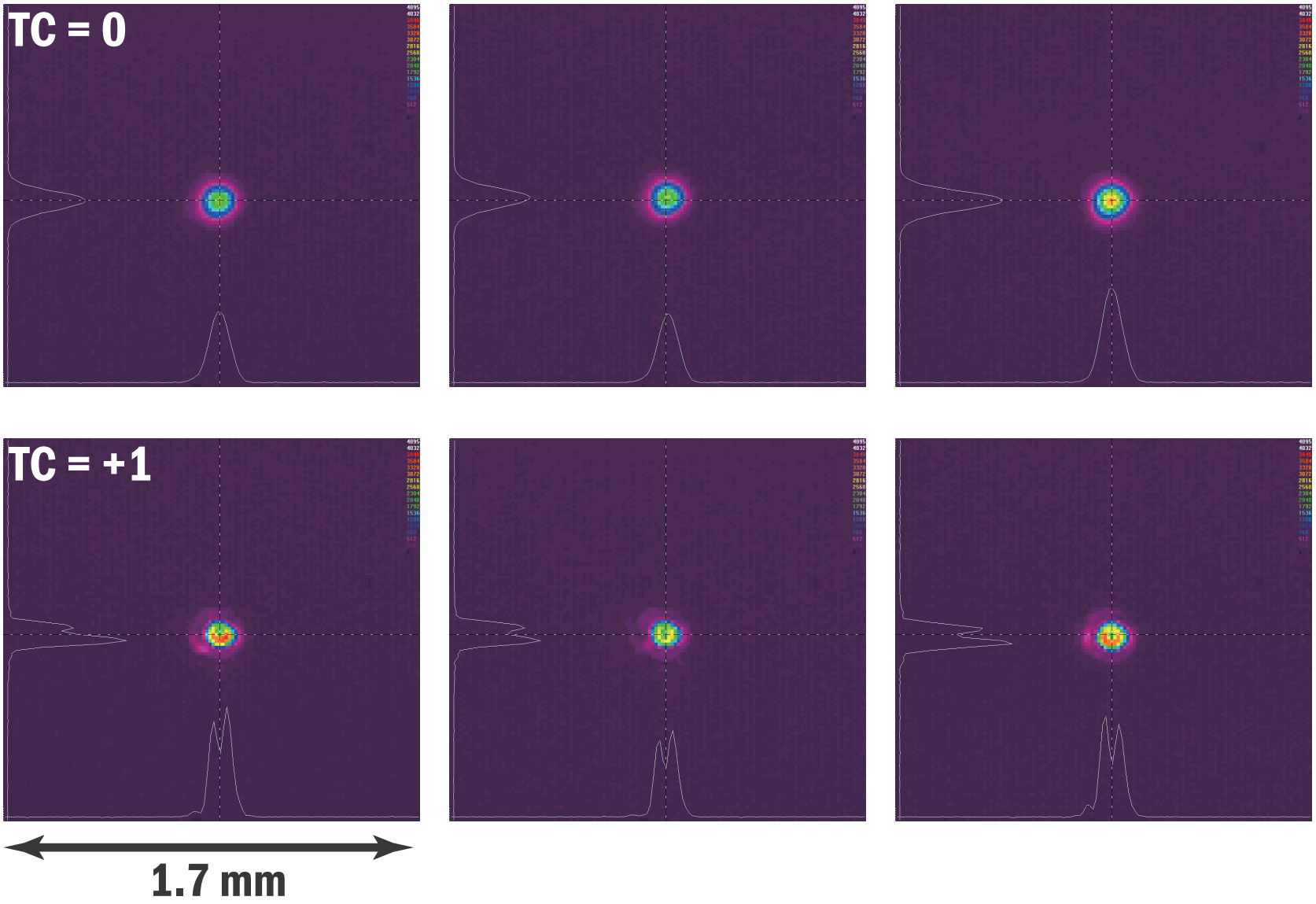






2 mirror stage is set at
(X, Y)
= (0.5878, 0.5099) inch
= (14.9, 13.0) mm

Laser profiles



CEM counts for TC = 4

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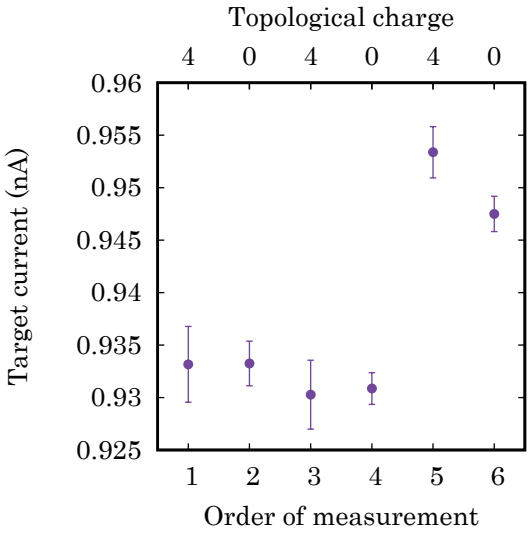
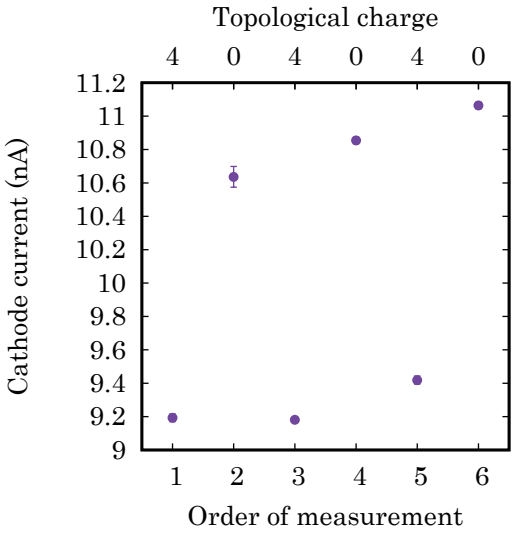
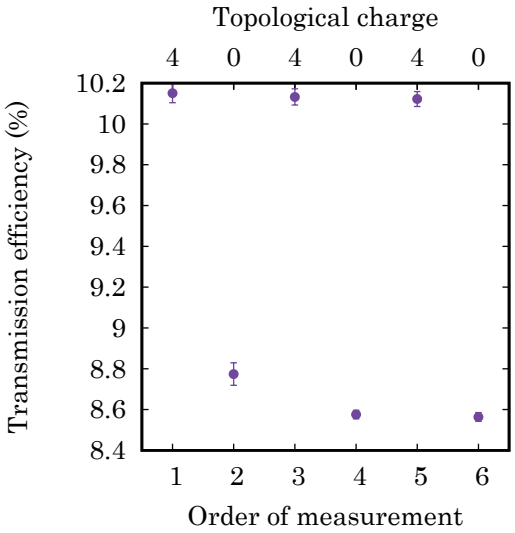
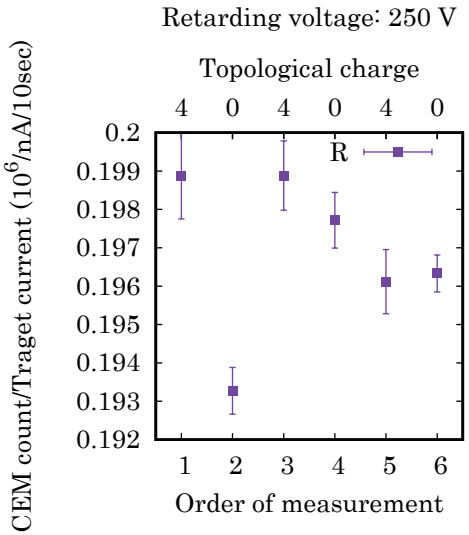


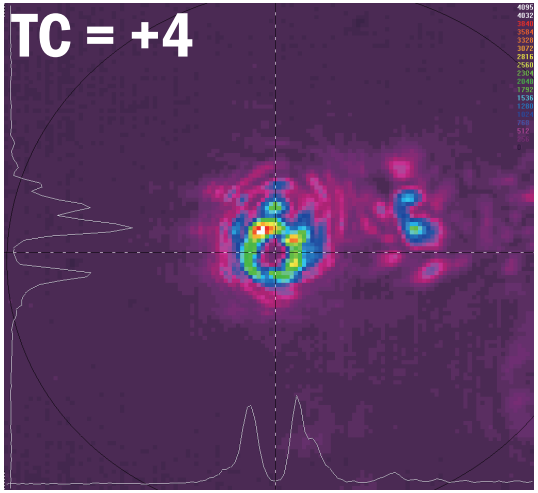


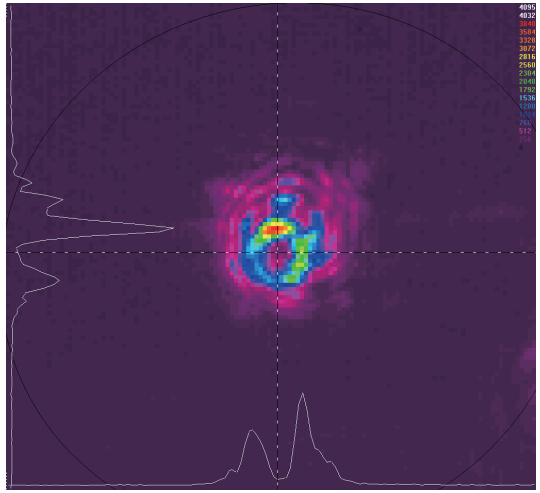


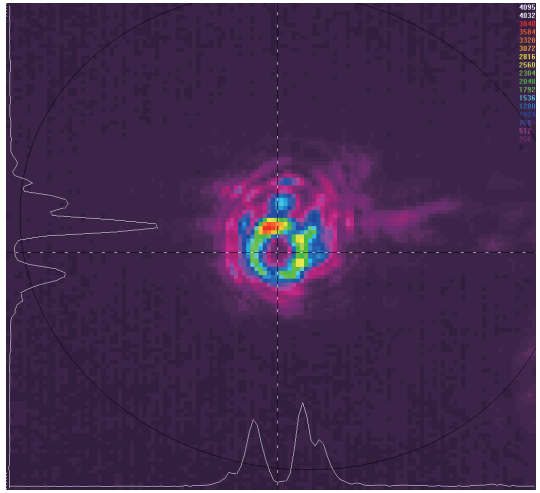


Almost constant target current, but trans. eff. differs in 1.5 %.
There is no dependence between the TC and CEM counts.

Laser profiles

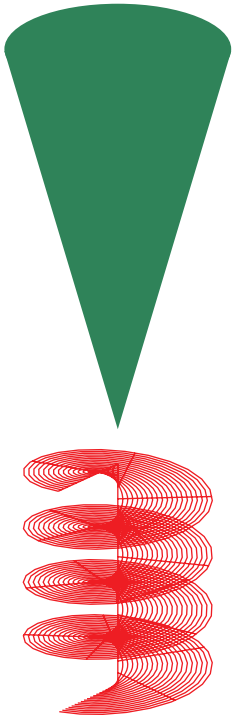






1.7 mm

How to observe an OAM effect?



Photocathode

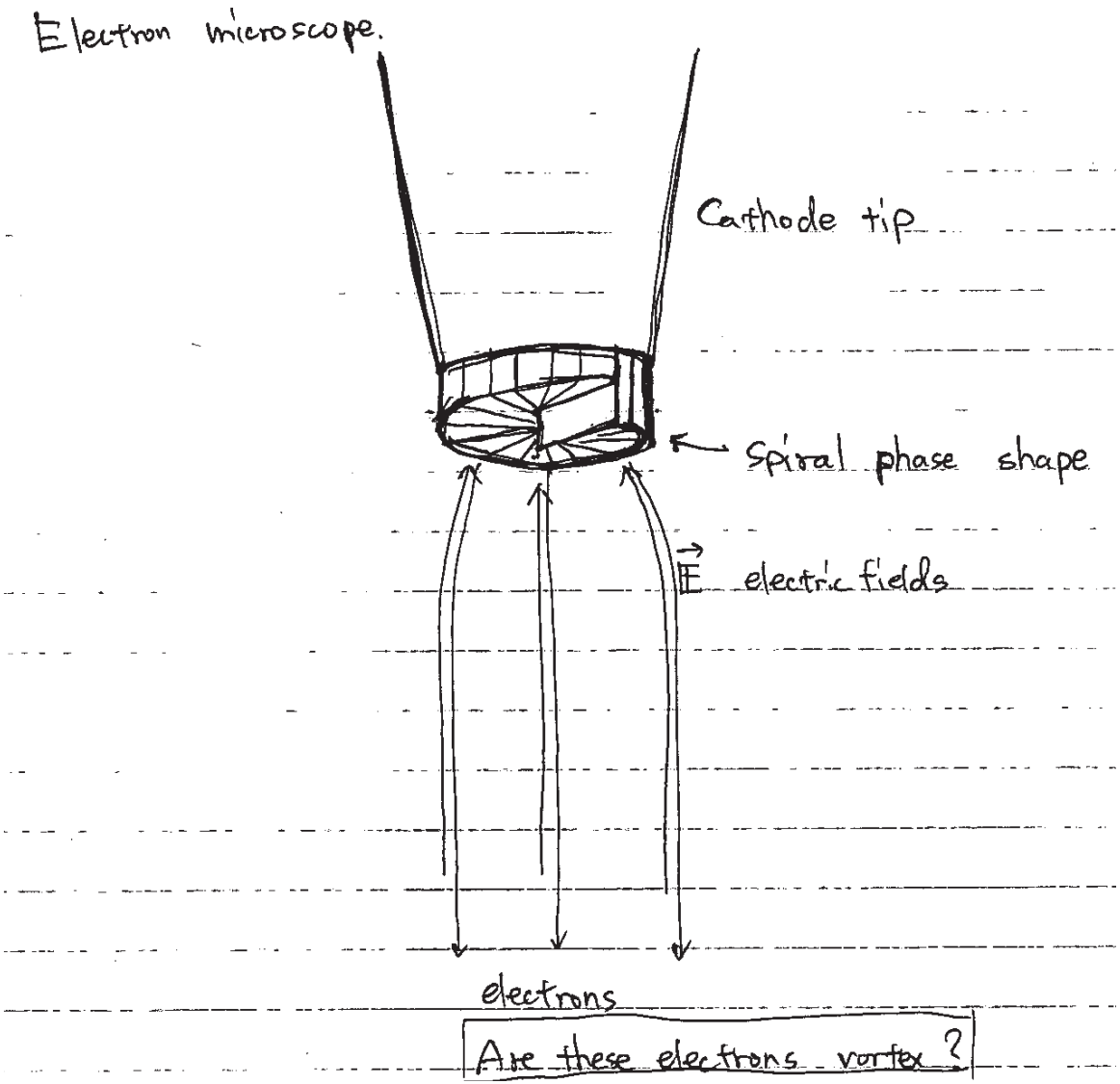
LG laser

Try to use a needle type photocathode?

An azimuthal component of Poynting vector of LG laser is proportional to m/kr.
m: OAM value,
k: wavenumber,
r: distance from the center axis

A photoelectric effect only occurs near center axis of a LG laser.

Another way to generate an electron vortex?



Field emission from a spiral phase shape cathode.