**2D Faraday cup image reconstruction. By G4 and ROOT.**

The FC: X(horizontal) – 7 channels (from 0 to 6);
Y(vertical) – 10 channels (from 0 to 9);

Each channel 6x6x75 mm^3. Separation is 1.4 mm.

Beam has sigma=0.5 deg (RMS Y/X ~ 5mm on the FC surface). It was straight, no bending.
Efficiency of each channel 100%, no crosstalk simulated.

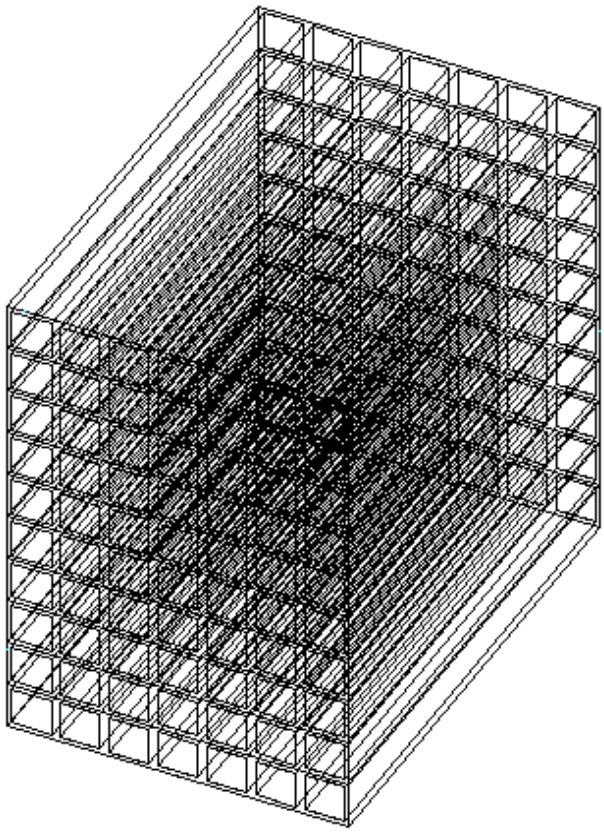

Fig. 1. The Faraday cup.

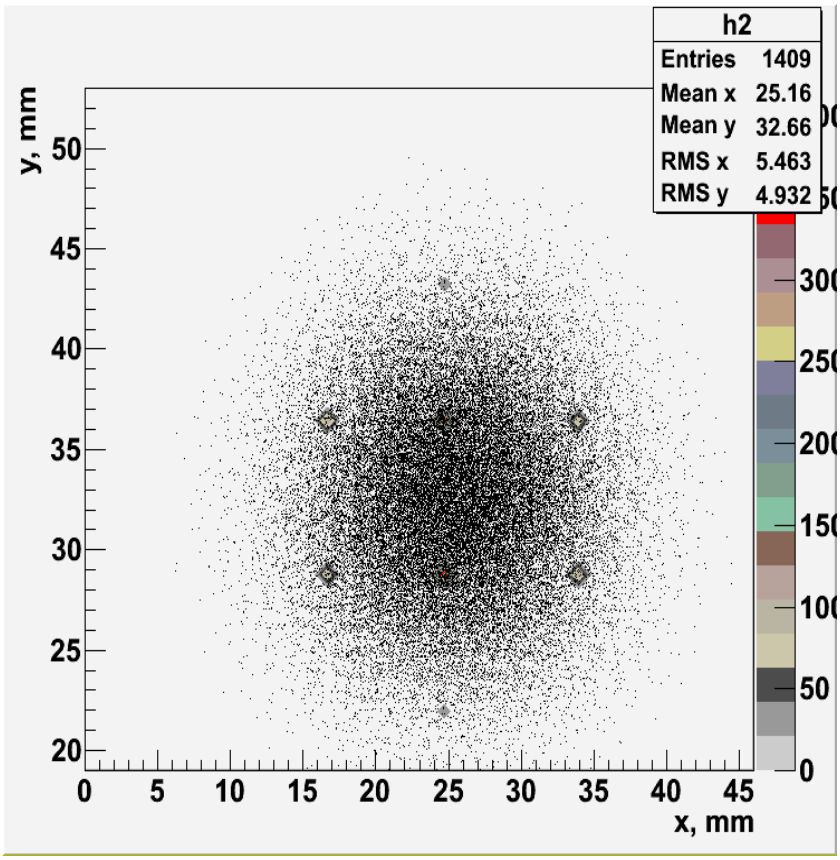


Fig. 2. Just an example of XY-gauss fit.

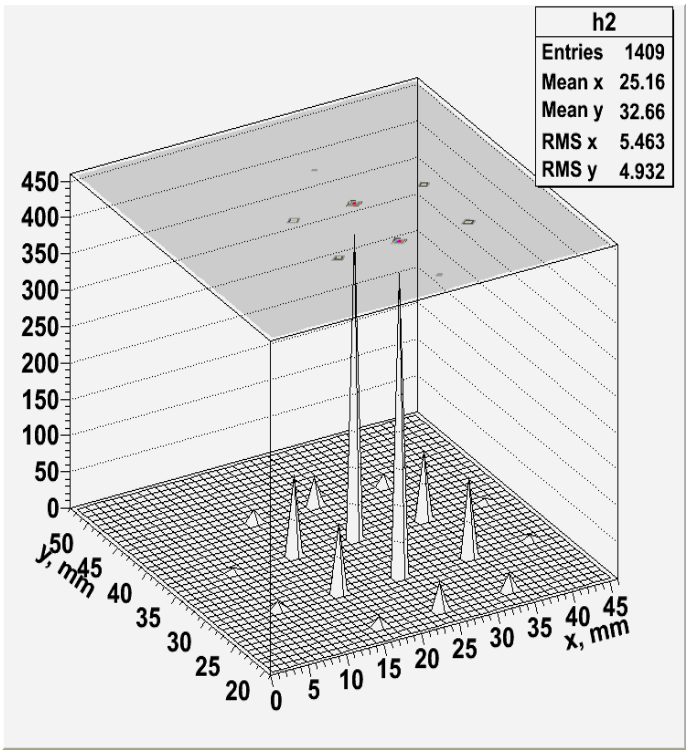


Fig. 3. Same as in Fig. 2. in 3D mode.

As next step, we simulated the ability of the FC to restore the position of Y-centroid of the beam. The source (its center) of electrons was moved along the surface of the FC in the range 0 – 45 mm and the position of the Y-center of the beam on the surface of the FC was reconstructed by Gaussian fit. The result can be seen in Fig. 4.

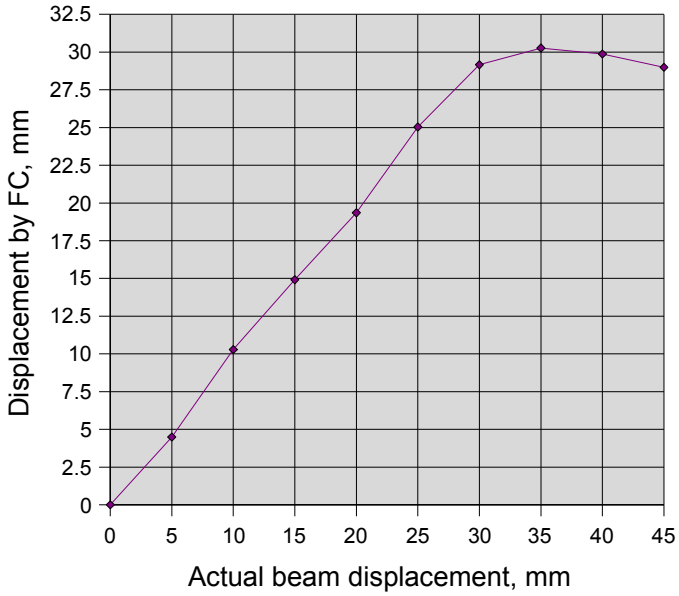


Fig. 4. Displacement of Y-centroid defined by FC vs. the actual beam center displacement.

It can be concluded that:

- our FC can reconstruct the position of the beam right only in the case when most part of the beam hits the surface of the FC such that the reconstruction algorithm works well.
- in order to get rid of this effect, we need to increase the number of channels (best case) or change the spacing in between the channels, or increase the size of the channels.
- it'd be nice to reduce the IAC accelerator beam spot.

Current size of the FC is Y/2=36.5mm, X/2=25.2mm.

According to the calibration done by view screen (Fig. 5),

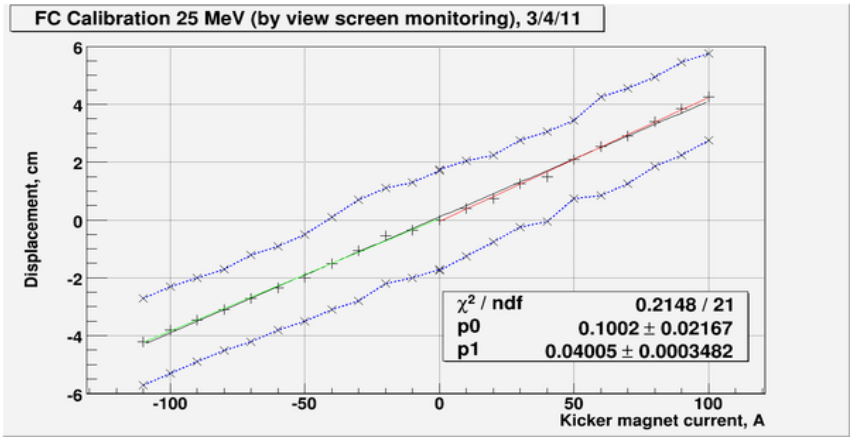


Fig. 5. Calibration of FC done by view screen.

in order to be able to measure the beam position bent by ~ 5 cm (needed for 25 MeV beam) we need to add to the current FC  Y/2=36.5mm another four more raws of bricks. We will have the total Y/2 = 36.5+7.4*4=66mm. We will need 8 more ADCs totaling in 30 + 8 =38 ADC.

The beam spot seen by the screen was about 3.4 cm. Let's suppose that $2\sigma$ = 3.4/2 = 1.7 cm, so when the beam hits the edge of improved FC, more than half of the beam will be detected what is enough to reconstruct the Y-centroid correctly.