ILCDR08
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Plan of measuring cloud density in the solenoid field and in the quadrupole field

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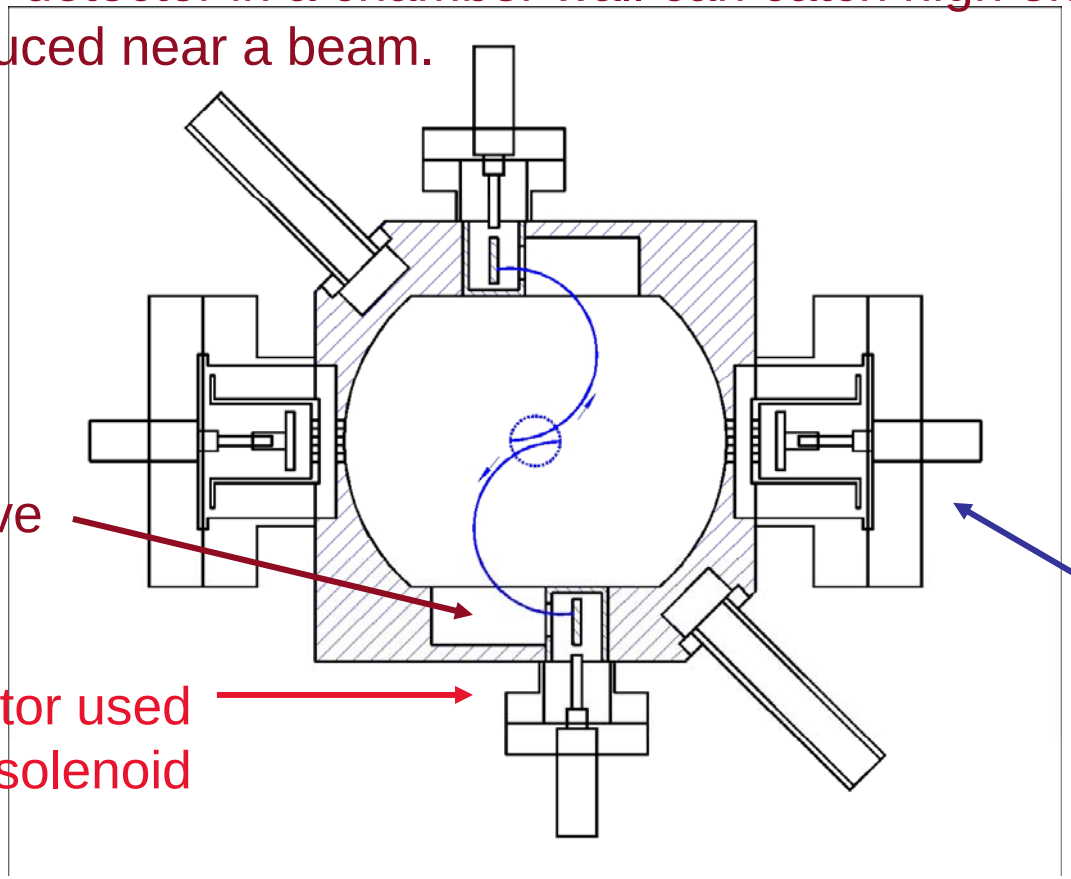
Contents

Density measurement with solenoid field (1)

The Point

- Given a solenoid field and the position of detection, the energy of measured electrons is automatically selected (=the volume is automatically defined).
- The detector in a chamber wall can catch high energy electrons produced near a beam.



Vacuum chamber design

Groove

Monitor used with solenoid field

Monitor used without solenoid field

Density measurement with solenoid field (2)

Simulation to check the idea (Fukuma)

Parameters

Bunch size

σ_x = 0.434mm

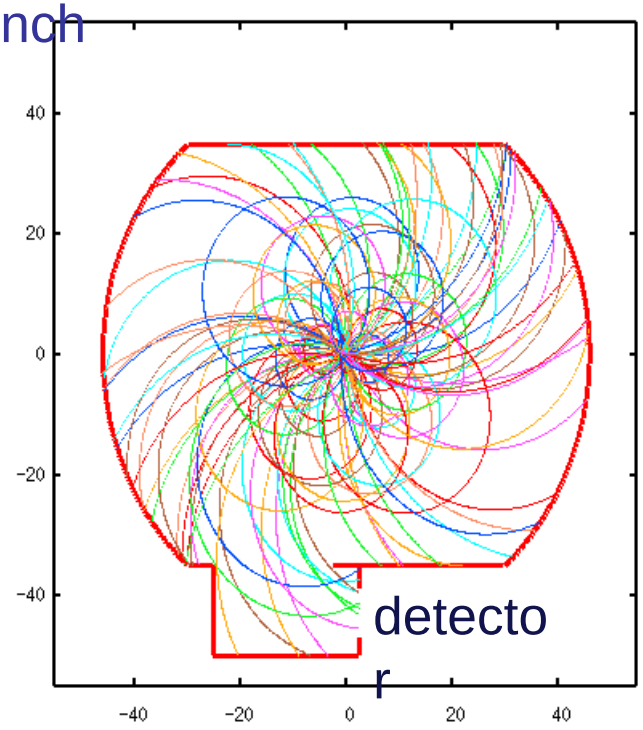
σ_y = 0.061mm

σ_z = 6mm

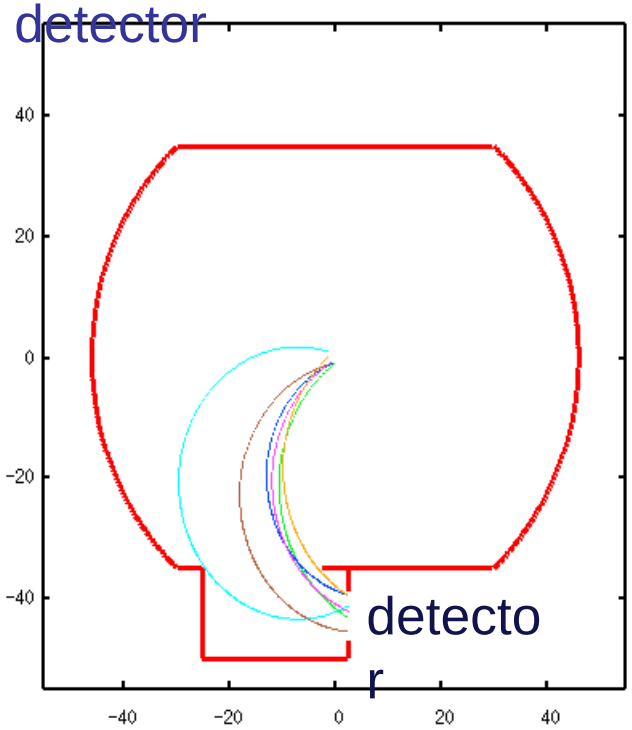
Number of positron in a bunch = 7.5×10^{10} (1.2mA)

Solenoid field = 50 Gauss

Orbits of kicked electrons near a bunch



Orbits that reach the detector

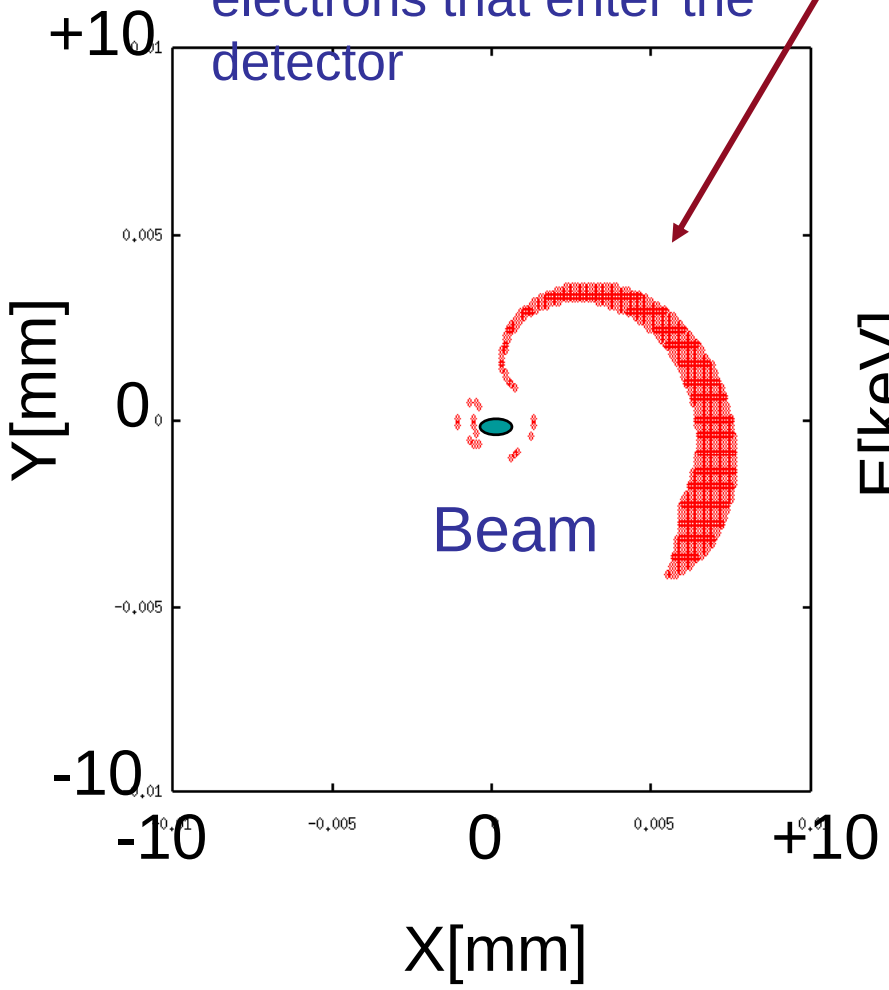


Density measurement with solenoid field (3)

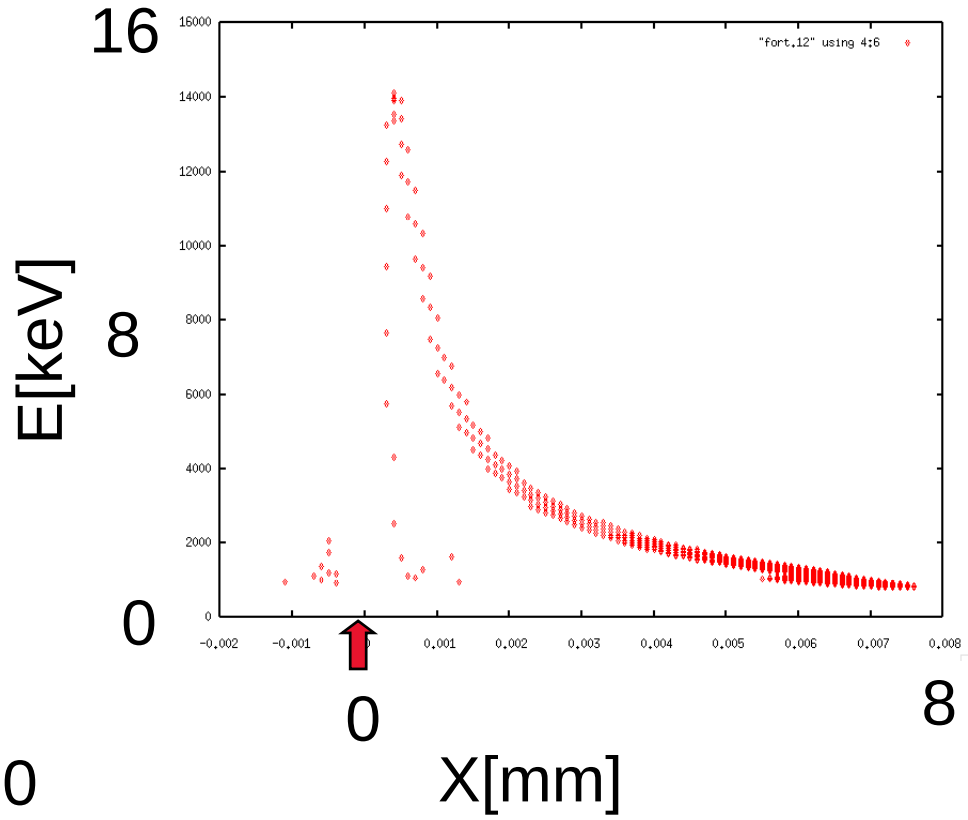
Simulation by Fukuma

Only these electrons reach the detector.

Starting points of electrons that enter the detector



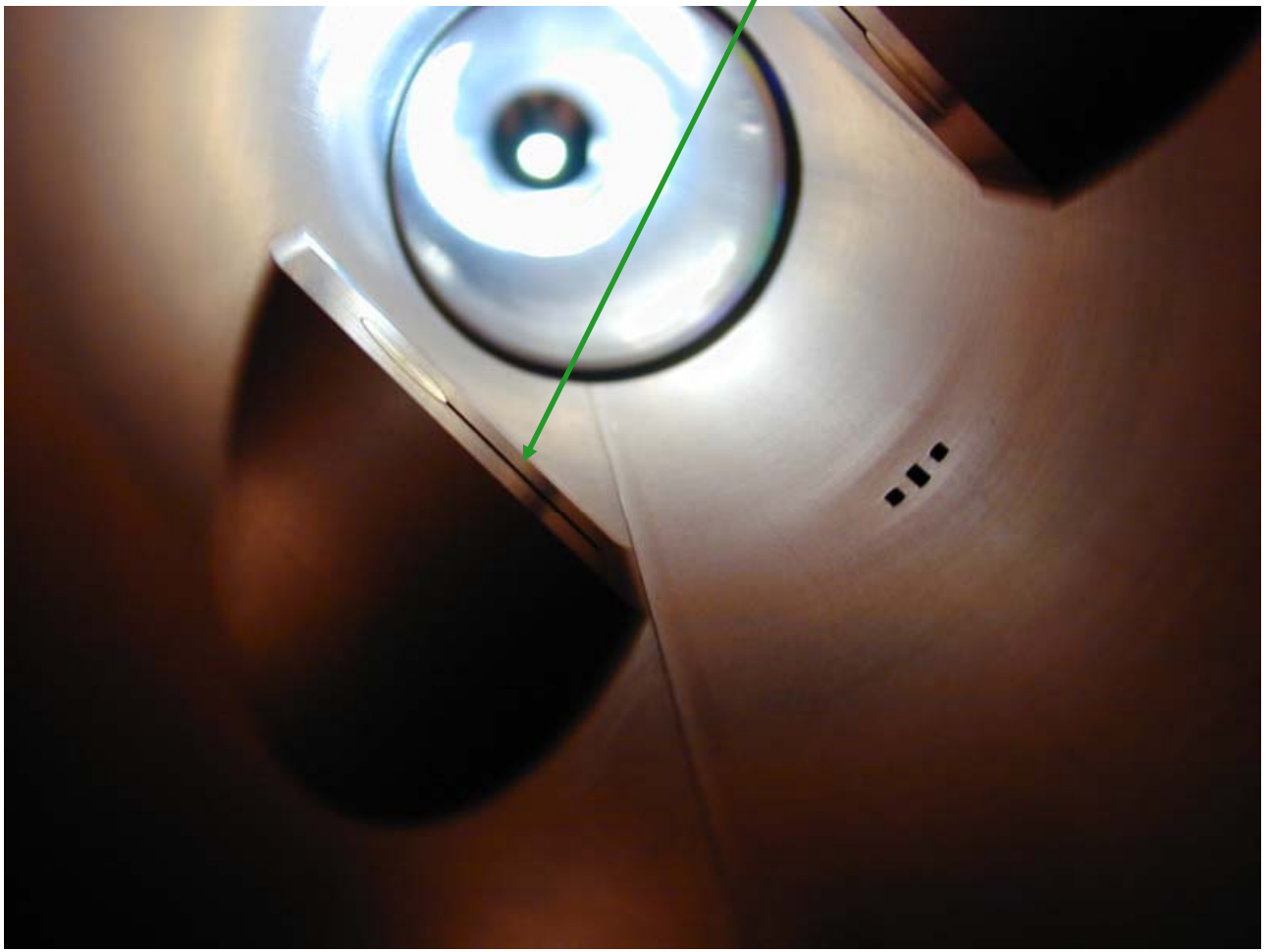
Energy range



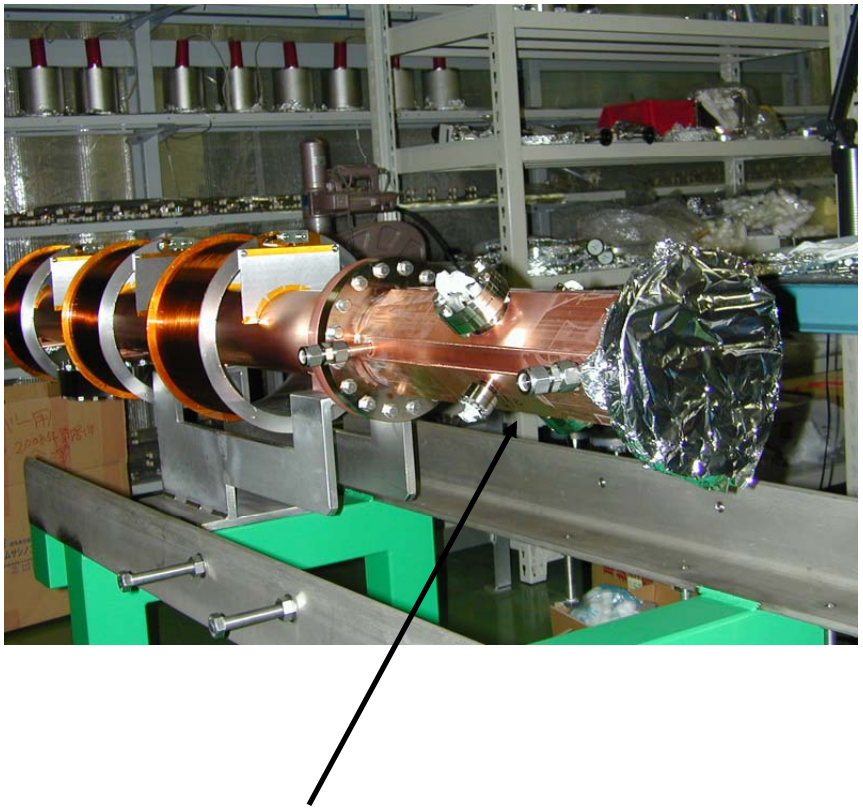
Density measurement with solenoid field (4)

Inside of the chamber

groove



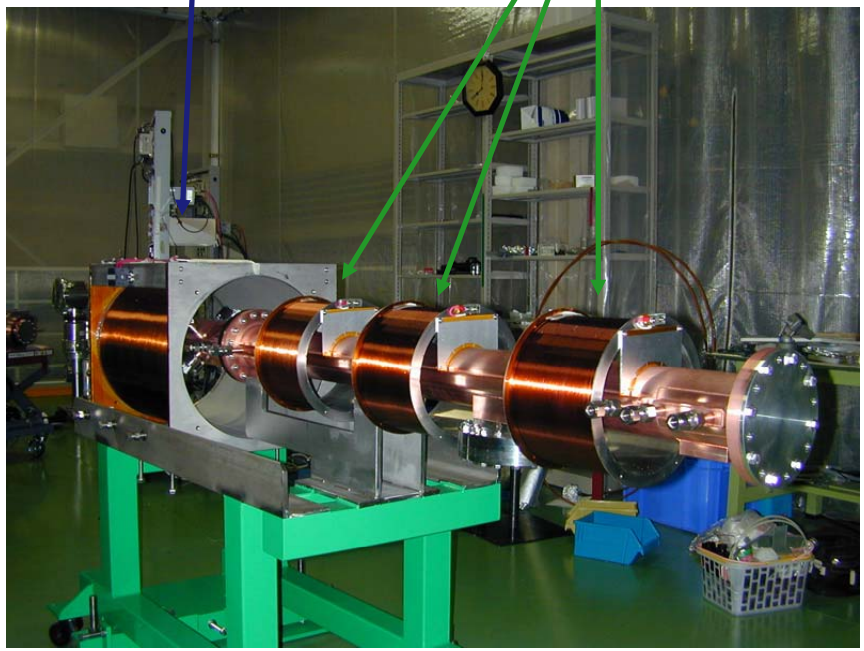
Density measurement with solenoid field (5)



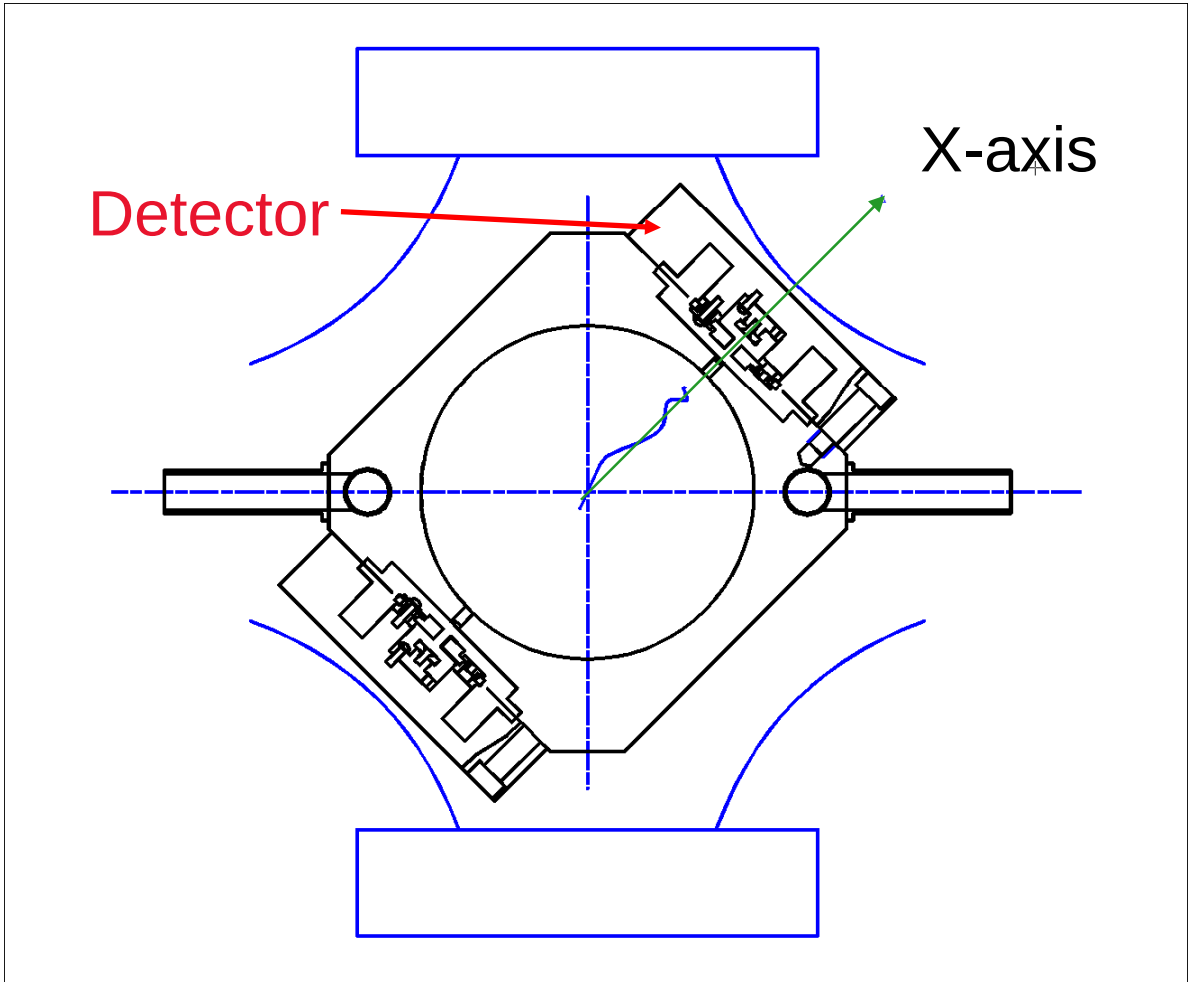
Chamber with detectors

Main Solenoid

Compensation Solenoids



Density measurement in a quadrupole magnet (1)



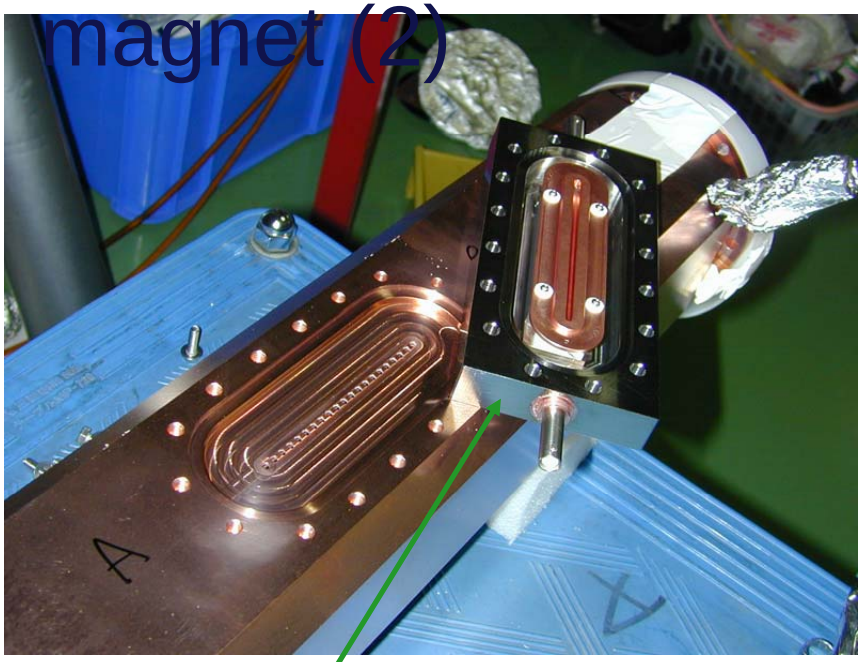
Electrons accelerated by a bunch along X-axis reach the detector.

Electrons accelerated with small angle to X-axis moves spirally around X-axis losing their energy along X-axis to the spiral motion.

Electrons with sufficient energy and direction close to X-axis reach the detector.

With the help of simulation detector current is converted into the density near

Density measurement in a quadrupole magnet (2)



Detector

Whole view

Summary

- By catching electrons interacted with a bunch, it will be possible to estimate the electron cloud density near the bunch in a magnetic field.
- The trial of measuring cloud density in the solenoid field and in the quadrupole field will be carried out this November at KEKB LER.

Thank
You!