



CLIC ACCELERATING STRUCTURES

- Average gradient 100 MV/m (150 MV/m achieved)
- High frequency, room temperature, travelling wave structures

Total number of accelerating structures in future CLIC ~ 140000 !

Current limitation is **RF BREAKDOWN**

(max. rate for CLIC $<10^{-7}$ bd/pulse/m)

CERN 12 GHZ TEST STAND (X-BOX 1)

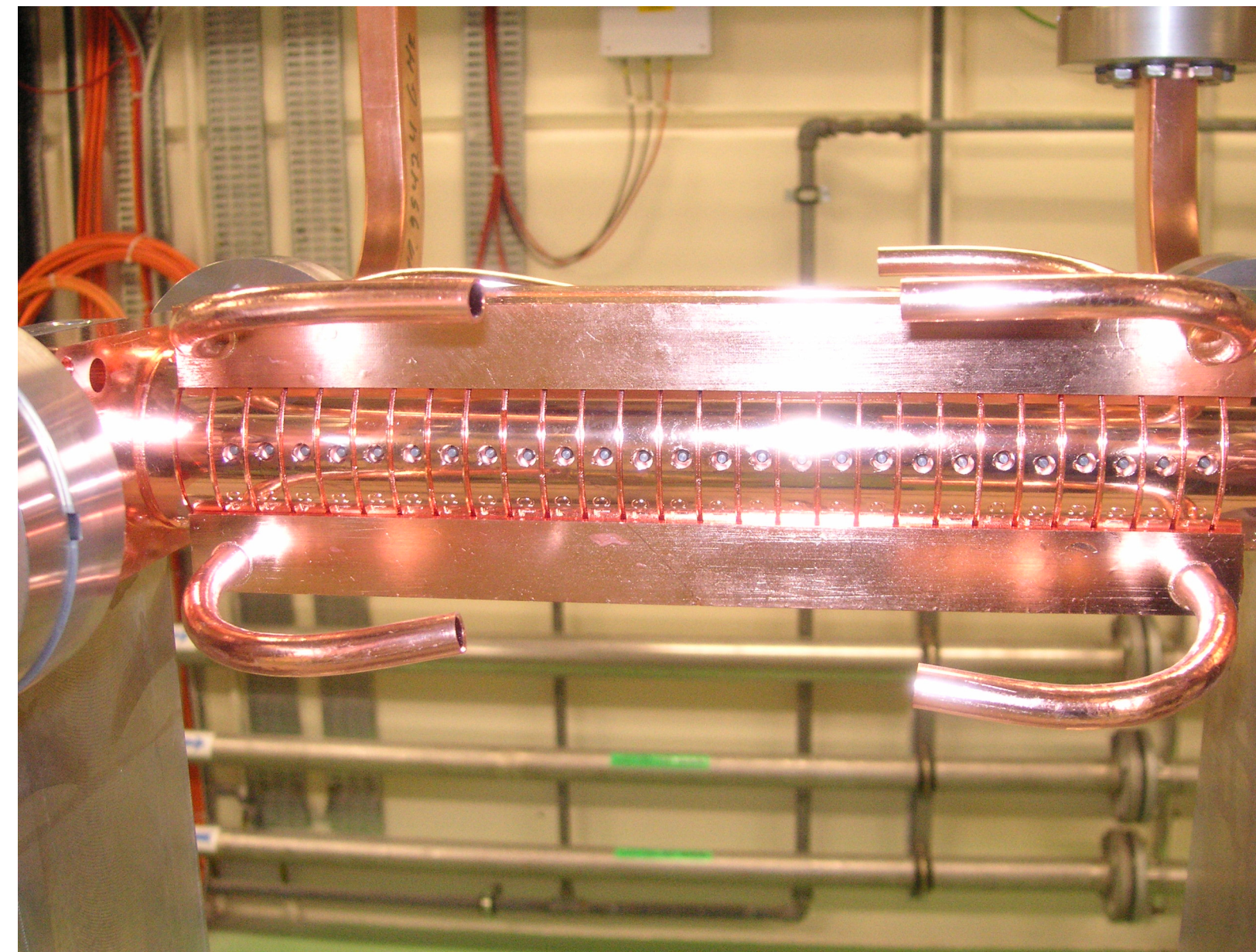
Most effective way to collect high statistic data on BD physics

RF TESTS PLANNED:

- Conditioning of the structures
- Measurement of the breakdown rates at different power levels
- Measurement of dark current and light emissions directly relevant to breakdown physics
- Measurement of dynamic vacuum due to breakdowns and dark currents



RF frequency: 11.9942 GHz
 Peak RF power: 50 MW --> pulse comp. --> 140 MW
 RF pulse length: 1500 ns--> pulse comp. --> 250 ns
 Pulse rep. rate: 50 Hz



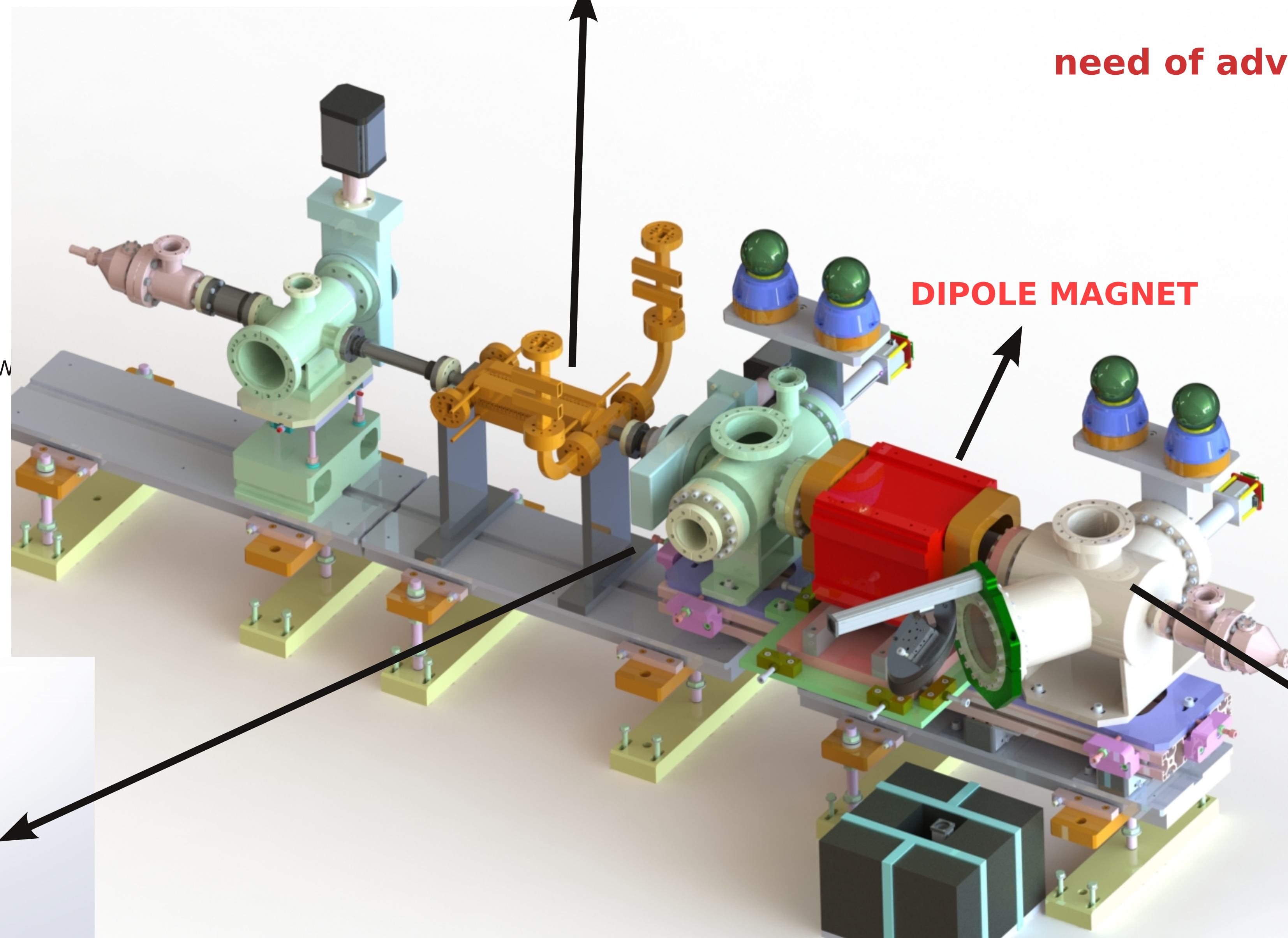
STRUCTURE UNDER TEST

RF BREAKDOWN

(RF initiated surface plasma process)
depends on more than peak E field, interesting to study:

- BD appearance pattern and breakdown rate evolution in time
- Relation between BDs and the field gradient
- Comparison of BD rate among different structures
- Relationship between BD rate and pulse width or pulse heating
- Dark current
- Electron (ion) currents and light emissions during BDs
- Memory effect
- Plasma formation mechanism during RF breakdown

need of advanced instrumentation



DIPOLE MAGNET

READOUT CHAMBER

PEPPER-POT/COLLIMATOR CHAMBER

SPECTROMETER FOR DARK AND BREAKDOWN CURRENTS

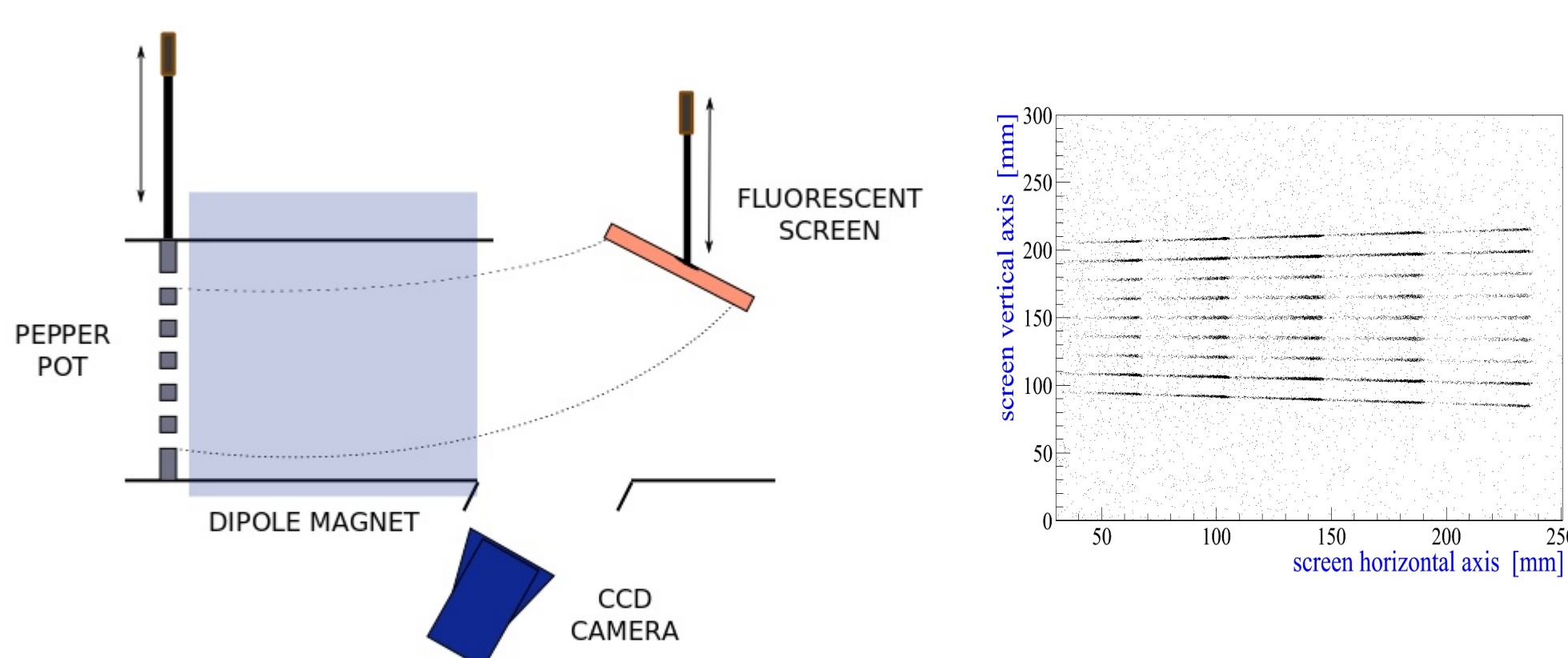
Spatial and energy distributions of the emitted electrons ?

Idea => pepper-pot with an external magnetic spectrometer

Fast (single shot) measurement of the dark and BD currents phase-space together with energy determination

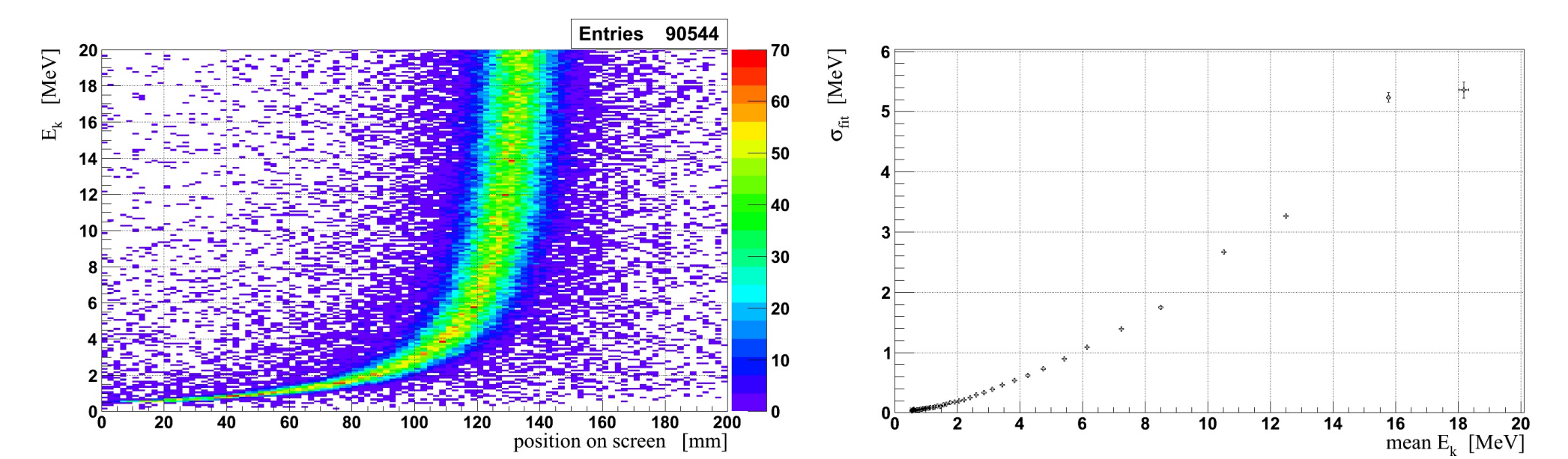
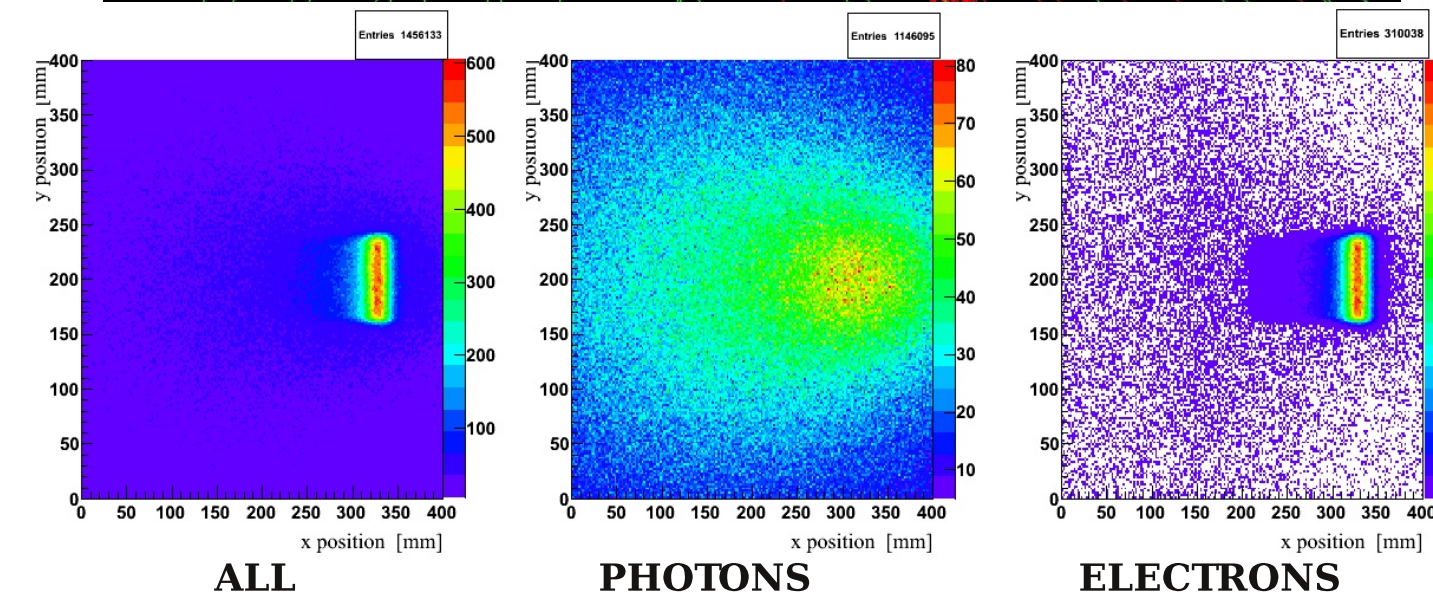
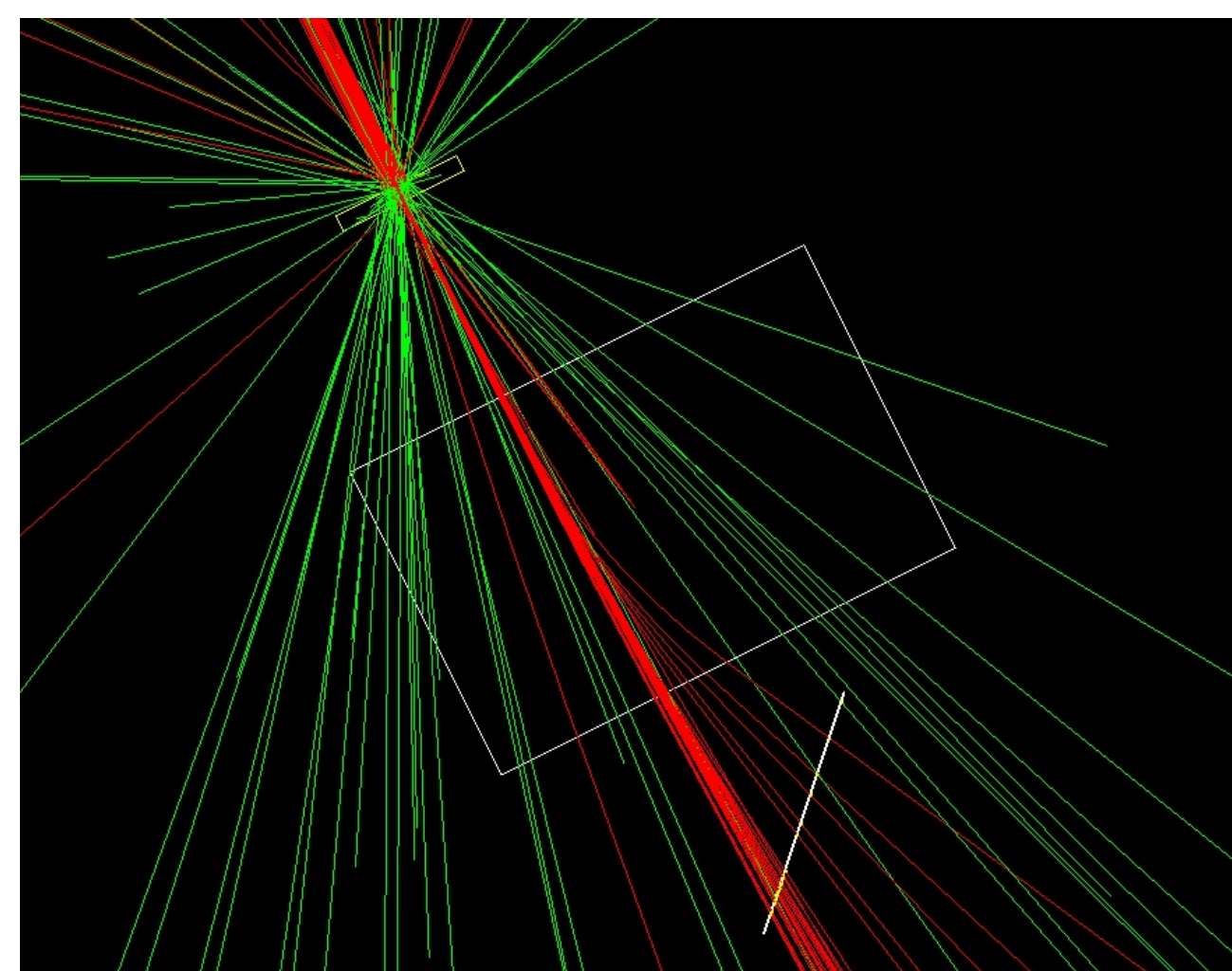
- 5 mm tungsten plate on a stepper motor controlled linear actuator
- Two separated patterns can be used for collimation
- Fully retractable
- Electrically isolated to use as a Faraday cup

- 100x50x5 mm YAG:Ce screen on a stepper motor controlled linear actuator
- 30 degrees angle w.r.t. the beam axis
- Fully retractable
- Optical line to the 2M pixel, 50fps camera



THE CONCEPT OF PEPPER-POT SPECTROMETER

GEANT4 SIMULATION WITH SLIT



ENERGY RESOLUTION WITH SLIT

Maximum electron energy <20MeV
 Collimator acceptance 1% (for 0.5 mm slit)
 Maximum divergence angle 20 mrad
 Full energy coverage with magnetic field scan