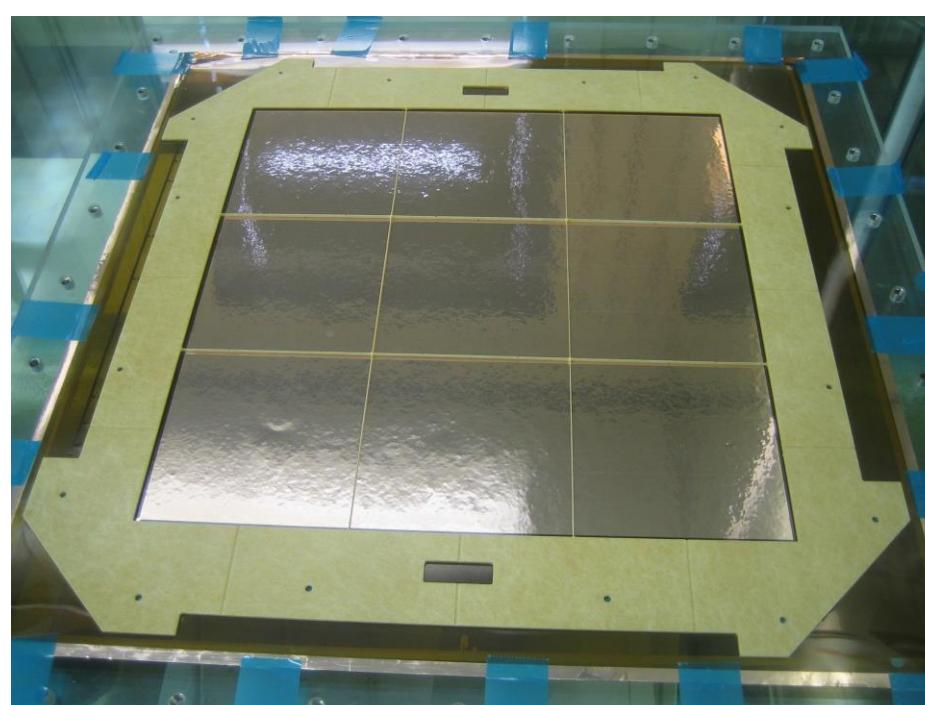
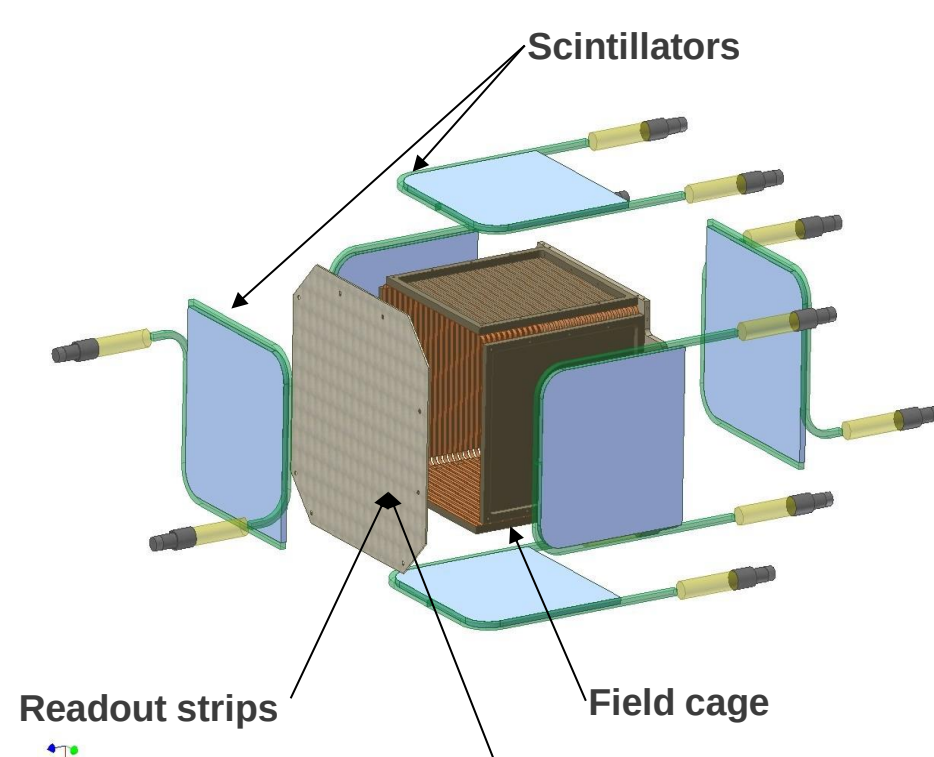
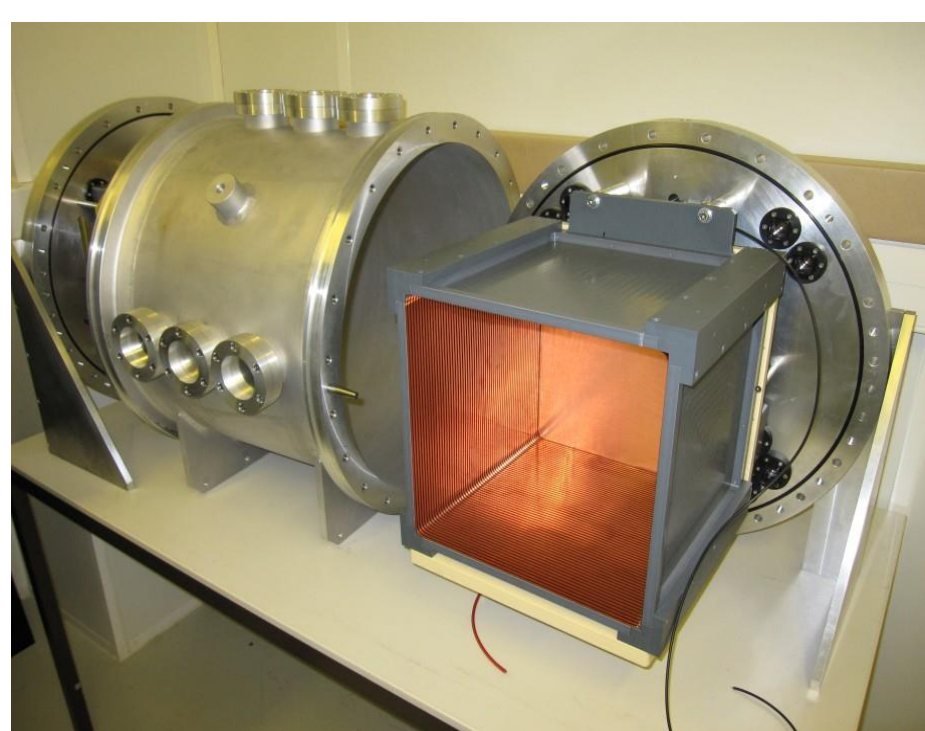


The HARPO (Hermetic Argon Polarimeter) project

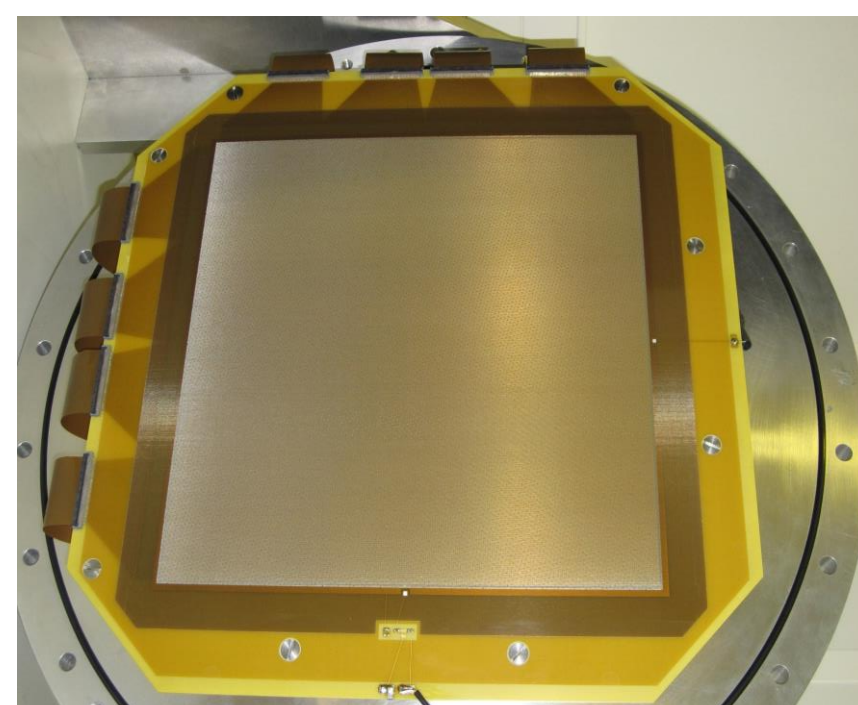
- The TPC technology is used as a high angular resolution polarimeter telescope in the MeV-GeV range
- A prototype has been built to demonstrate the concept

The HARPO Detector Prototype

- 30 cm cubic TPC
- Amplification made by Micromegas+2GEM
- Gas: Ar/iC₄H₁₀ 95/5 up to 5bar
- 2x288 strips readout (X&Y), ~0.5mm wide
- Readout electronics based on AFTER chips (511 time bins up to 100 MHz)
- Trigger: 6 scintillators in coincidence



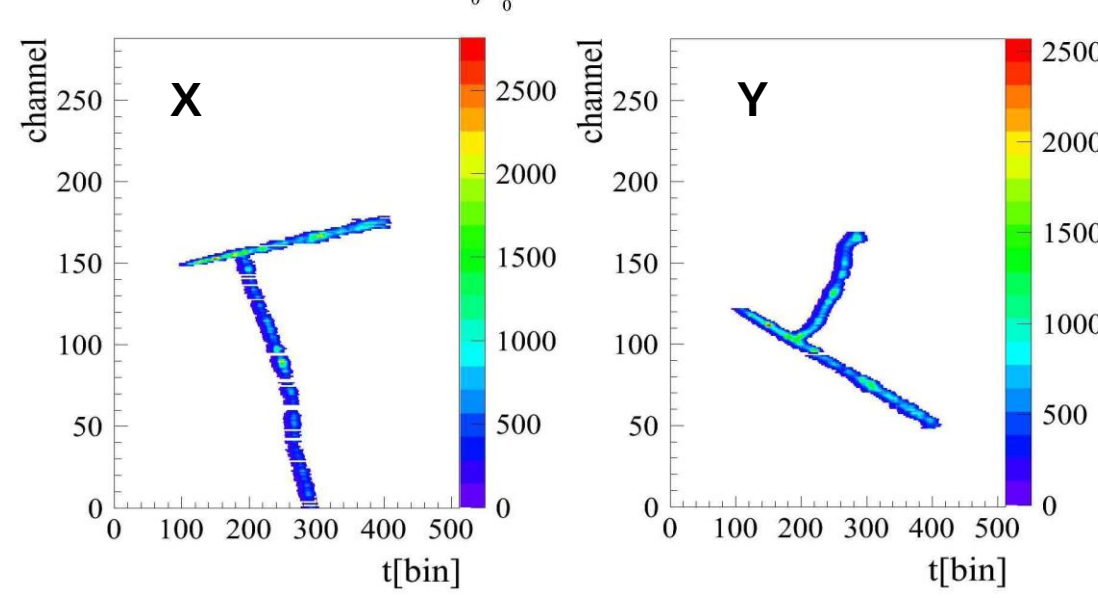
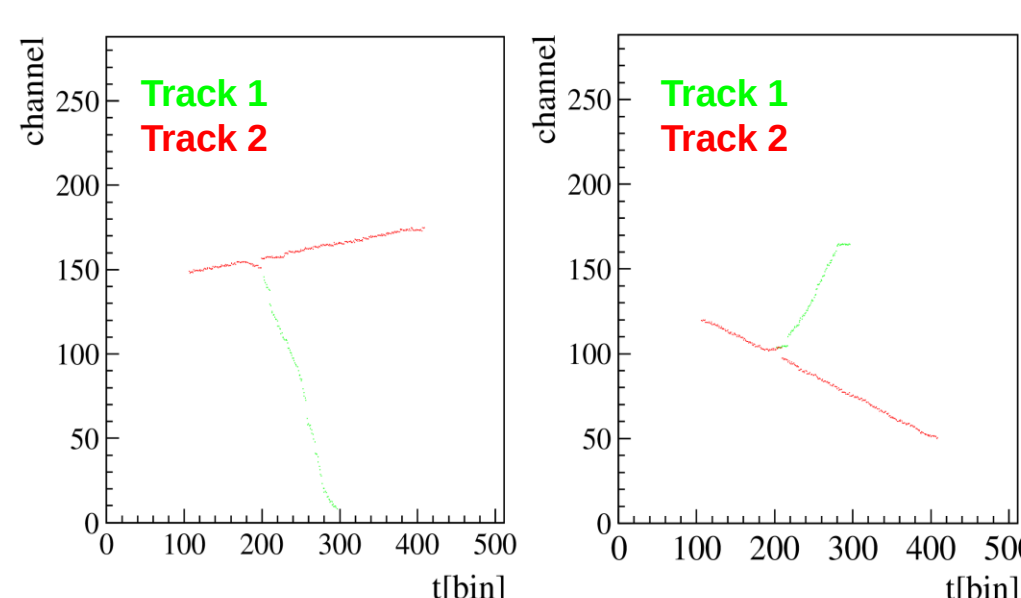
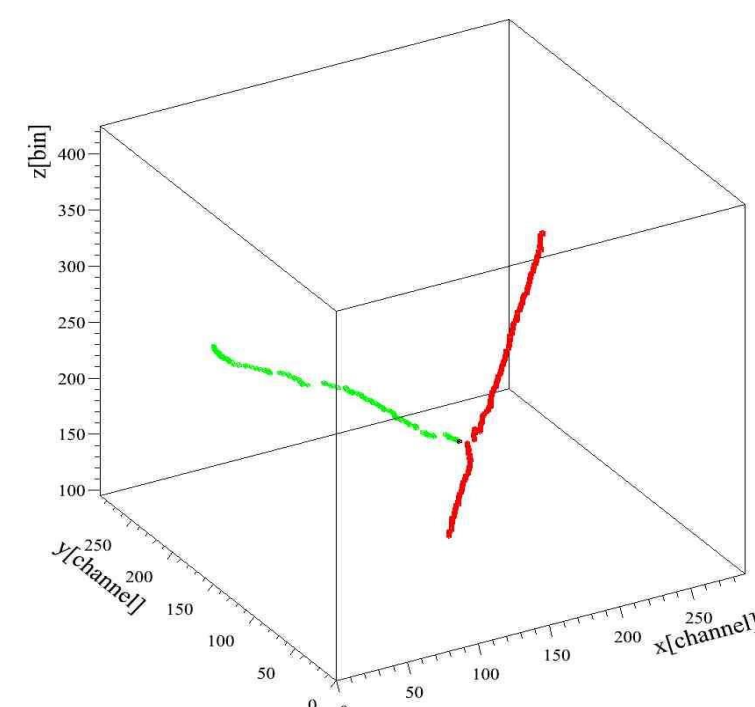
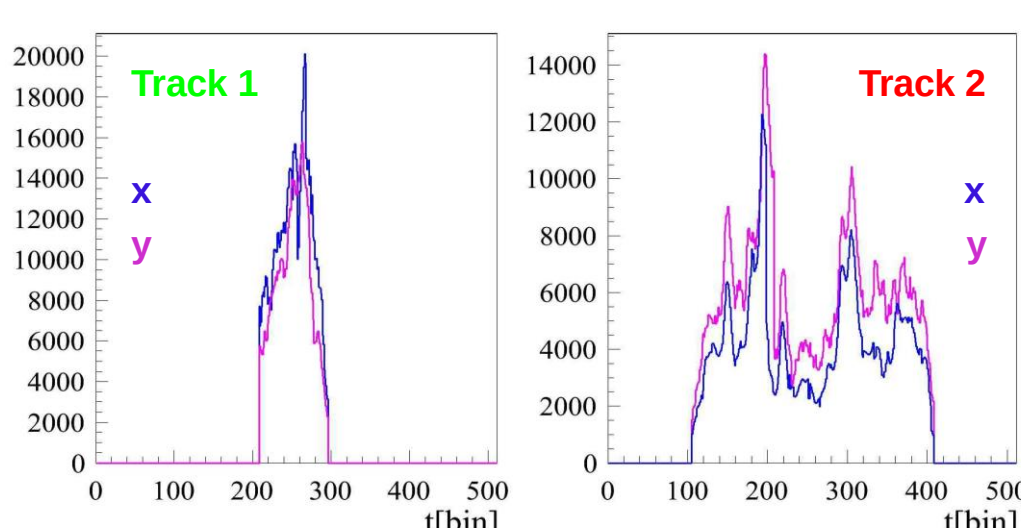
GEM
(Gas Electron Multiplier)



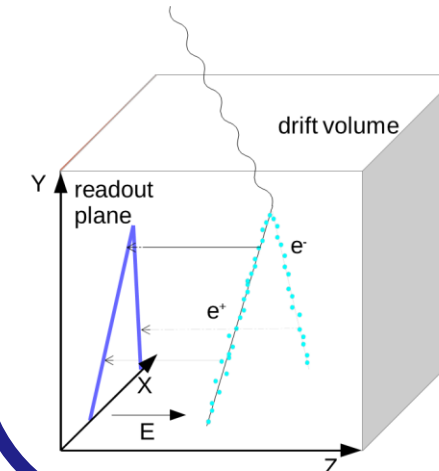
Micromegas
(Micro-Mesh Gaseous Structure)

Reconstruction and track matching

- Cosmic-ray event leaving a lower energy electron (δ -ray)



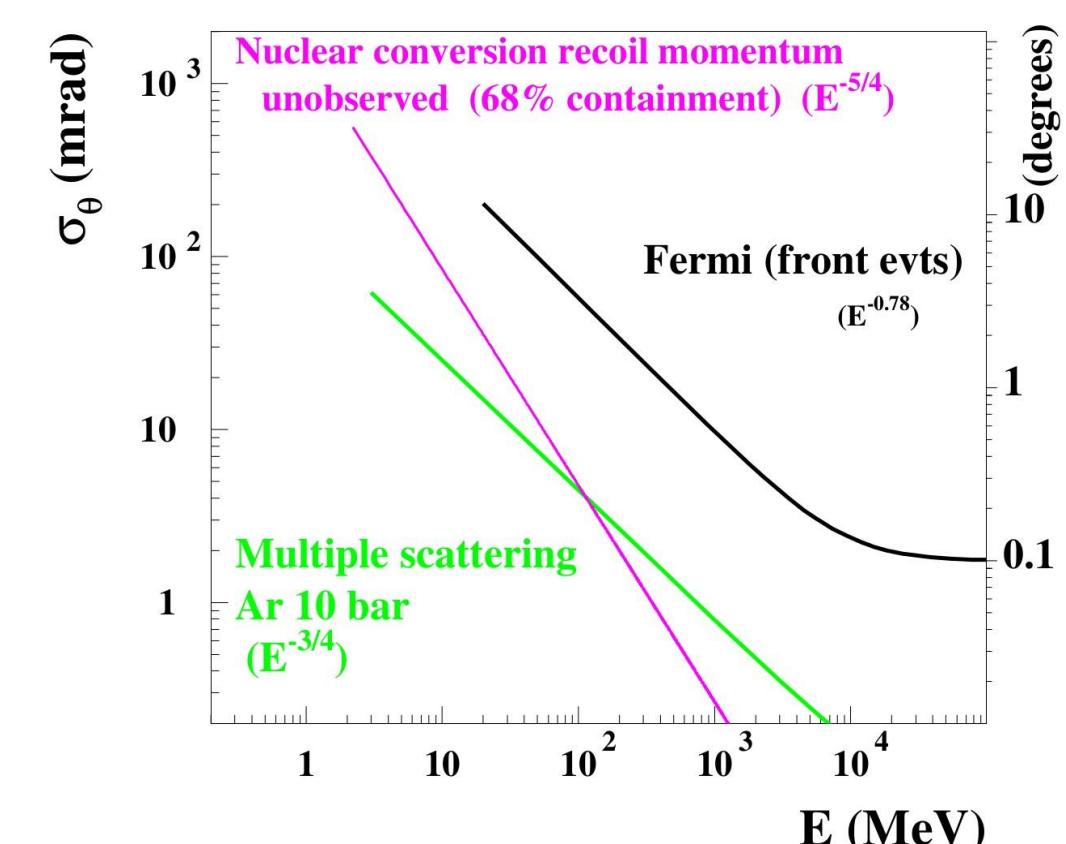
TPC (Time Projection Chamber) in space



- γ are converted in the gas and produced e- which drift along the E field and are amplified and measured on the x-y readout plane
- The time gives a measure of the z coordinate

Expected performance

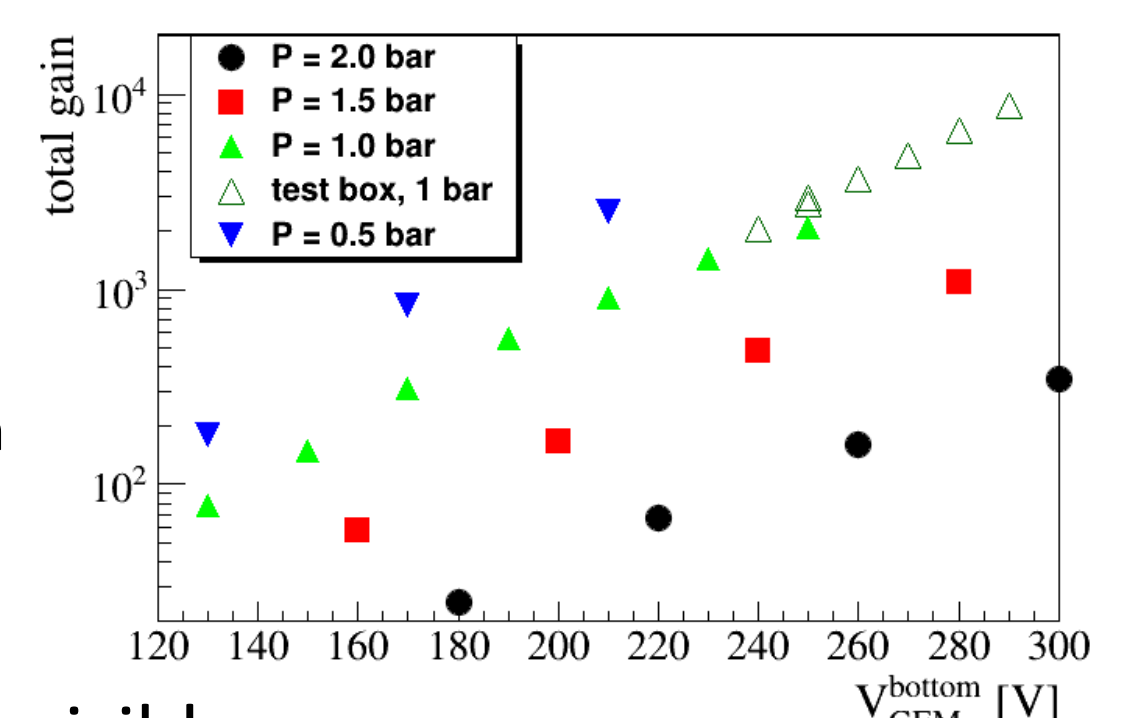
- Angular resolution:
 - limited by multiple scattering above 100MeV
 - limited by the unknown recoil nucleus momentum below 100MeV
 - only multiple scattering for triplet conversion, but very low efficiency
- Up to 1 order of magnitude better than Fermi!



Gain studies

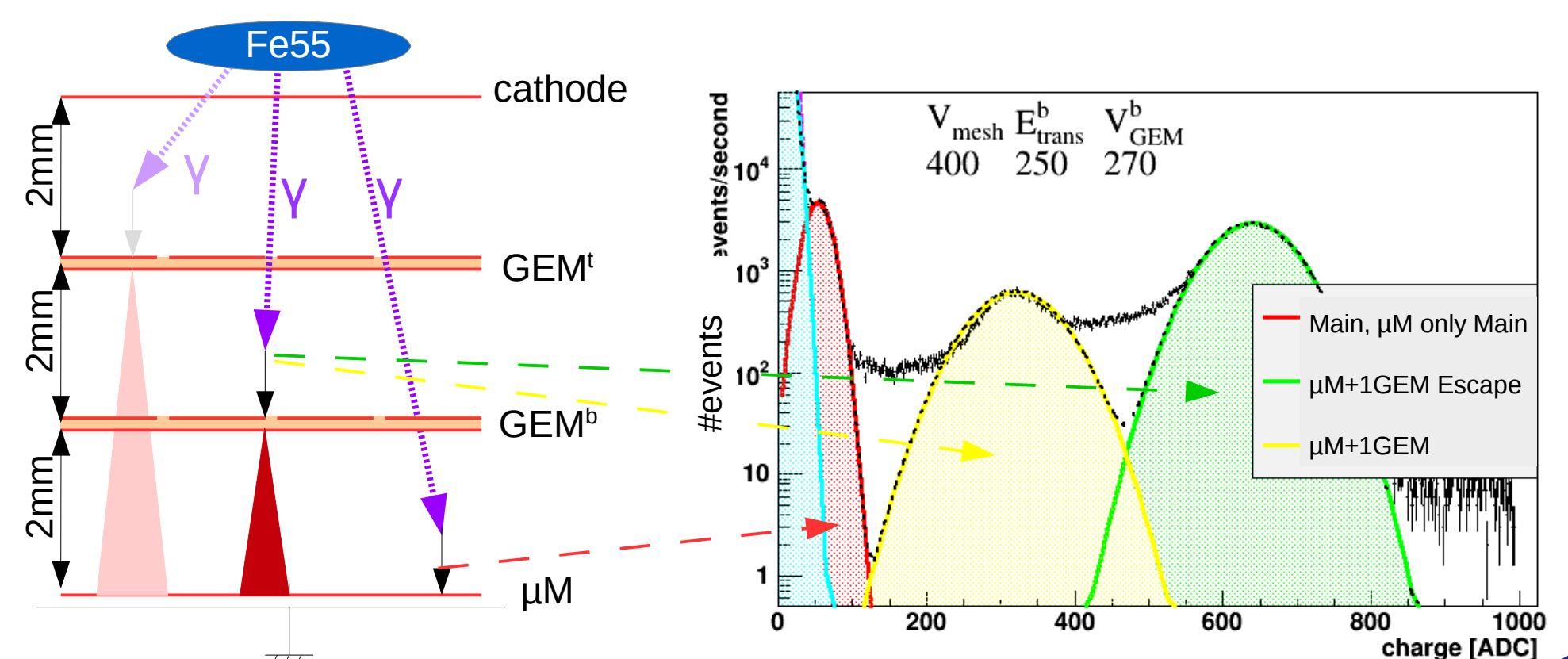
Cosmics data:

- Compatible with test box
- Help to find optimal operation configuration



Test box: three peaks are visible :

- Two ionization peak (main peak and escape peak) amplified through one GEM and one Micromegas
- The main ionization peak with Micromegas amplified only



Characterization with cosmic-rays

- Electron absorption along the track
- Drift velocity (drift time)
- Gain (total charge)

