Micromegas detectors for CLAS12 experiment at Jefferson Lab

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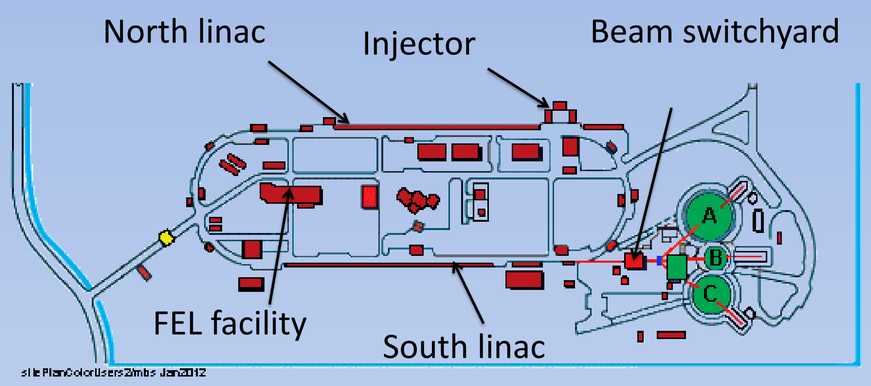
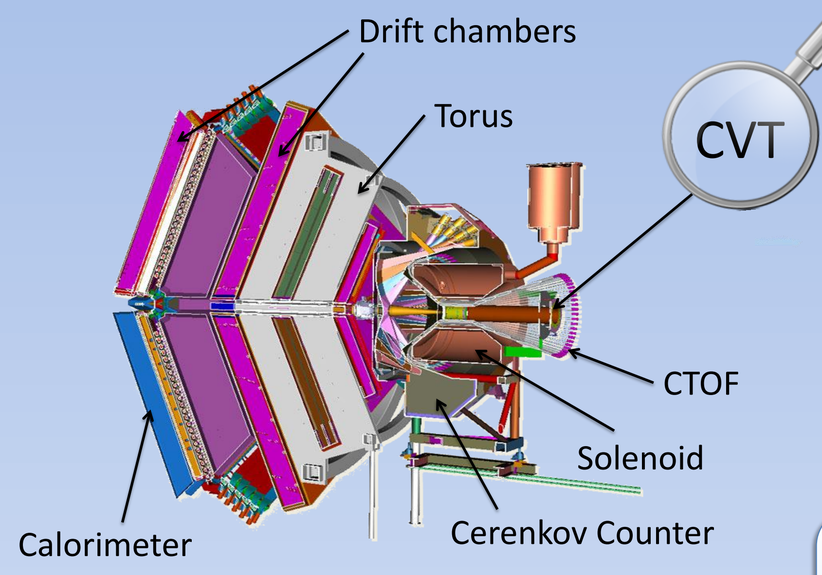
Introduction

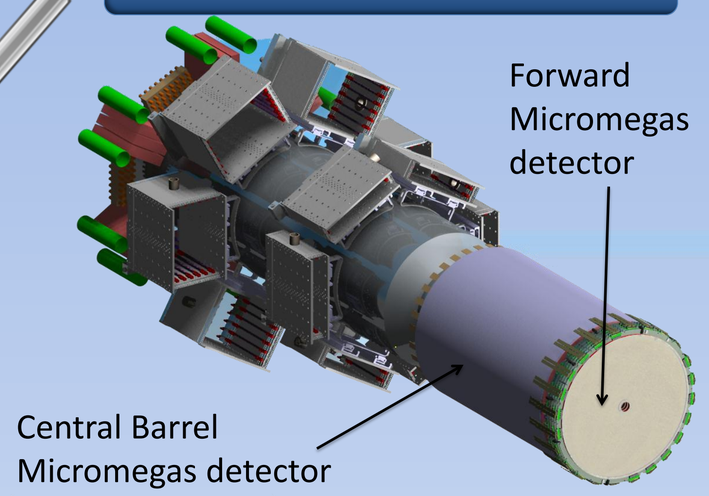


The electron accelerator of the Thomas Jefferson Laboratory (Virginia, USA) will soon be upgraded to deliver 12 GeV high intensity beams. This increase of performance will give the opportunity to study the nucleon structure with an unprecedented accuracy. To meet this end, new equipment will be installed in the experimental areas, particularly in the Hall B with CLAS12 spectrometer.



Cebaf Large Acceptance Spectrometer at 12 GeV (Hall B)

Central Vertex Tracker

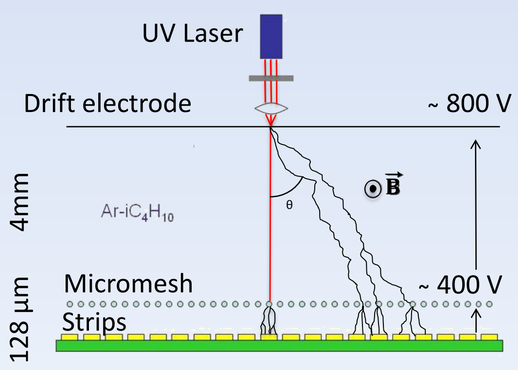


Many challenges :

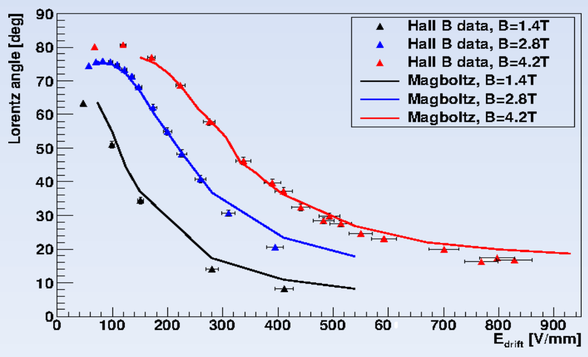
- strong magnetic field
- curved Micromegas
- high spark rate
- new electronics
- large area

Research and development

Micromegas in a magnetic field

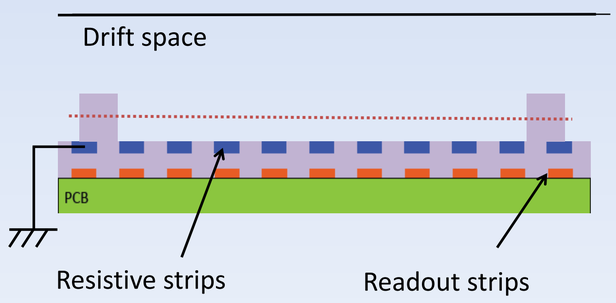


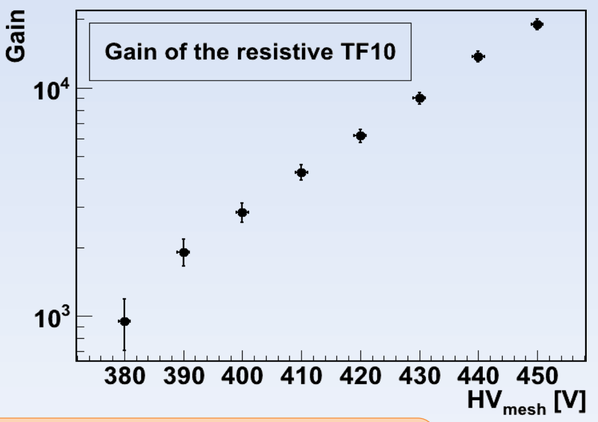
P. Konczykowski et al., Nucl. Instr and Meth. A, 612 (2010) 274



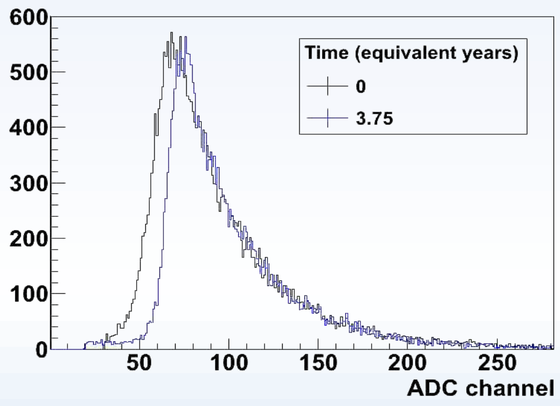
These tests strongly suggest that the Lorentz angle can be reduced to 20° at 5T if the drift field is set to about 8 kV/cm.

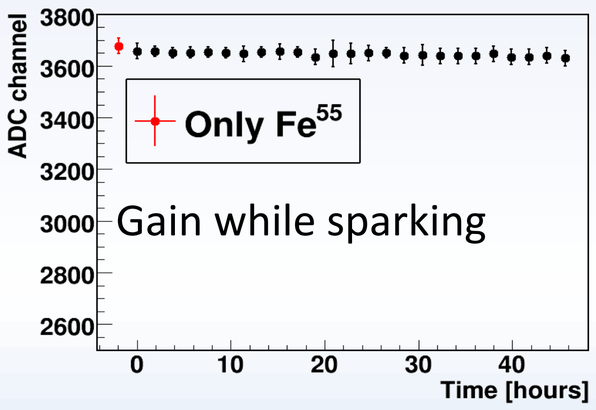
Resistive Micromegas





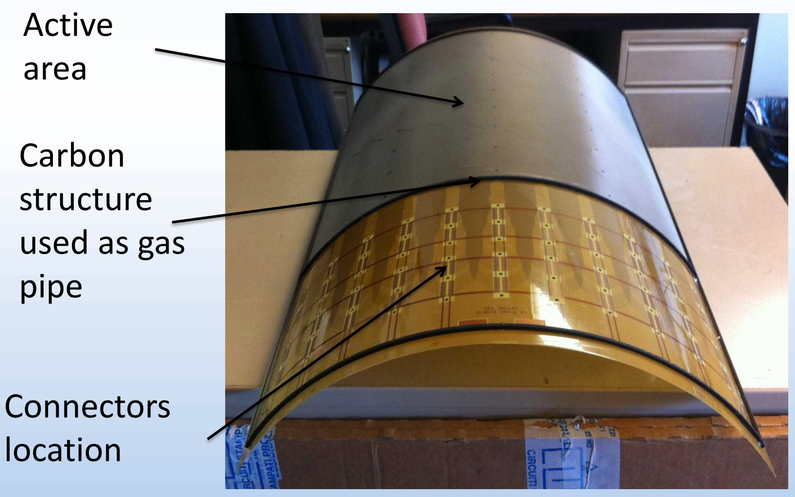
No ageing effect seen





Intensive tests of resistive Micromegas have shown no ageing effect in conditions equivalent to five years at full CLAS12 luminosity. Moreover when the detector is experiencing sparks it keeps a gain close to the nominal one with almost no dead time.

Curved Micromegas



New techniques are developed to curve the detector, keep it curved and bring the gas to the active area with the requirement that the quantity of material must be as low as possible.

Conclusions and prospects

Many issues of the R&D on Micromegas detector for CLAS12 have been fixed. We are now investigating the possibility of building curved resistive Micromegas within 1.5 year, as the central barrel Micromegas should be ready to take data at the end of 2013. The developments of Micromegas made for CLAS12 could benefit to future high luminosity experiments looking for a light, fast, high resolution and cheap central tracker.