

RD51 Collaboration meeting in Bari  
October 7-10, 2010

# WG1 summary

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# Outline

- Large area MPGDs (task 1)
  - GEMs for CMS
  - Micromegas for ATLAS
- New structures (task 2)
  - Thin-mesh and segmented Micromegas
  - Laser-etched meshes
  - Light and ionisation
  - THGEM RICH
  - Neutron detection
- HV (task 4)

# Micromegas DHCAL first m<sup>2</sup>

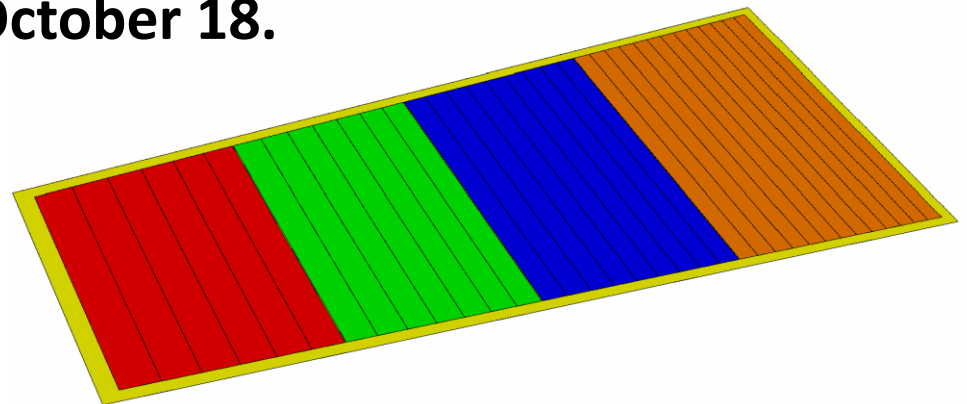
- Fine segmentation 1cm<sup>2</sup>, thickness 8mm for ILC hadronic calorimetry
- HardROC 2 chip too fast shaping -> calibration and threshold setting critical
- 1m<sup>2</sup> assembled
- Tested in 1kHz beam
- Future microROC much better suited (low noise, longer shaping)
- Hope to use the RD51 telescope



12

# GEM for CMS muon chambers

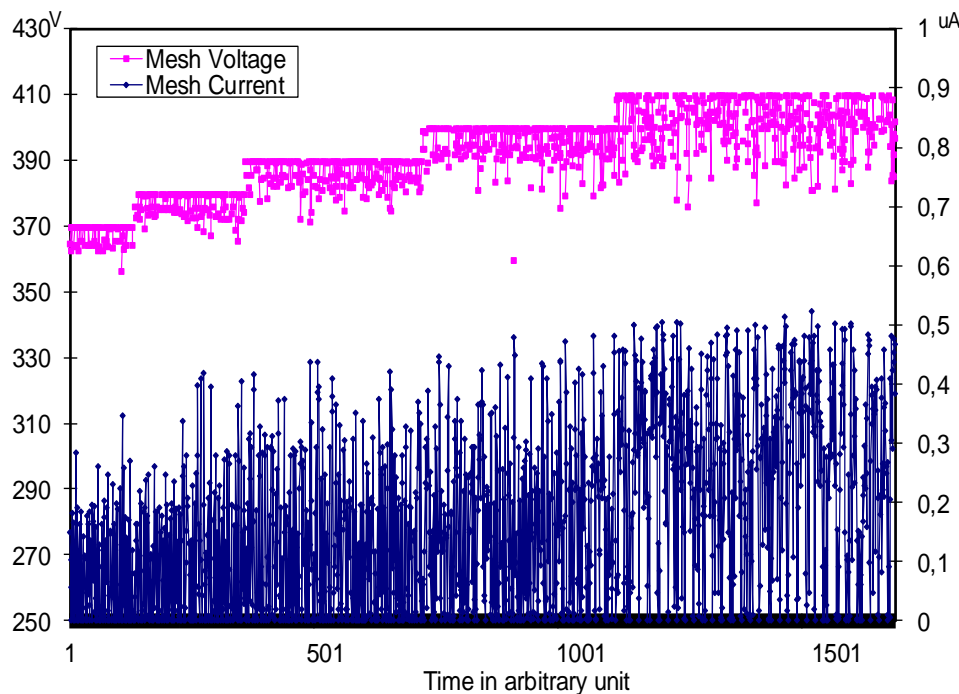
- Trapezoidal detector in the forward region
- GE1/1 prototype : 1 m x 45(22) cm, 19 mm thick, 35 HV sectors of 100cm<sup>2</sup>, 4.5 kV operating voltage. HV divider
- Largest size single-mask GEMs. (Rui's workshop)
- Collaboration with Florida IT : thermal stretching by infrared heating.
- RD51 beam test starting October 18.



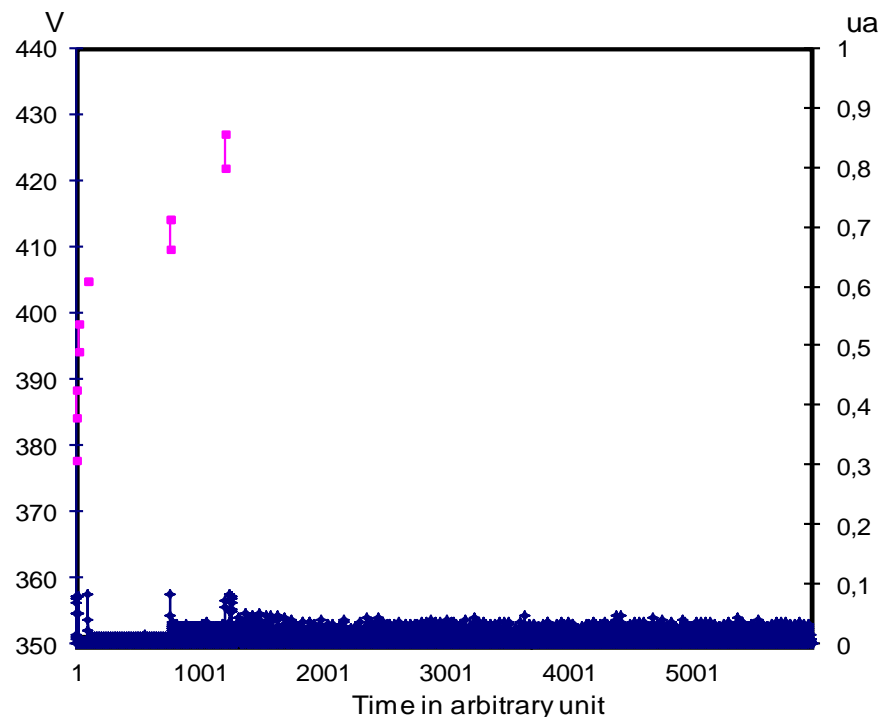
# Micromegas for ATLAS muon chamber

- **Was presented in WG2 (see WG2 report)**
- **CSC-like chamber being built**
- **Beam test in H6 at the same time as RD51**
- **Saclay telescope optimized and ready to study sparks**

## Standard bulk (SLHC2: 2mm)



## Resistive strip bulk (R6: 1mm, 400kΩ/□)



**SLHC2:** HV=400V (Gain ~3000):

- current when sparking < 0.4 mA
- voltage drop < 5%

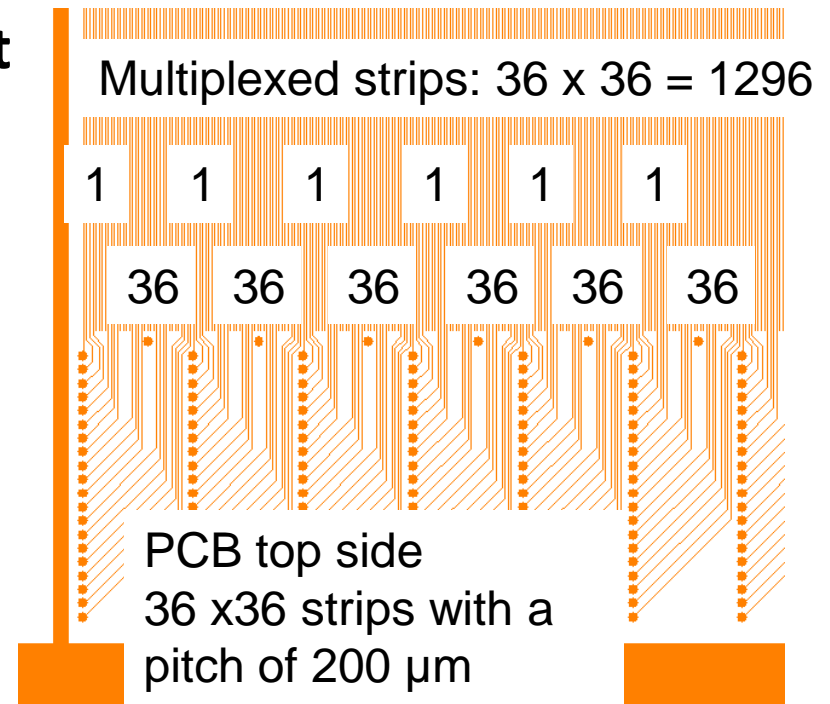
**R6:** HV=390V (Gain ~3000):

- current when sparking < 0.08 mA
- voltage drop < 0.5%

Ar / CF<sub>4</sub> / Iso (95/3/2)

# Double-sided, thin and segmented meshes at Saclay bulk workshop

- Very inventive detectors being tried.
- Double-sided : coarse readout on one side, finer multiplexed readout on the other side
- Bulk with thin meshes
- Also trying thick meshes (90% cheaper)
- The Saclay bulk workshop is now ready to help





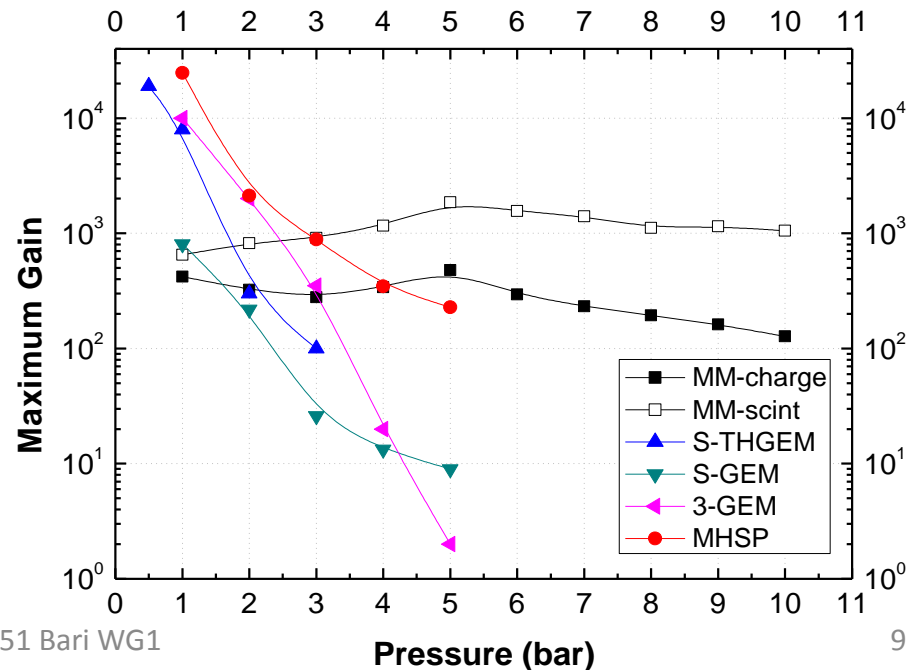
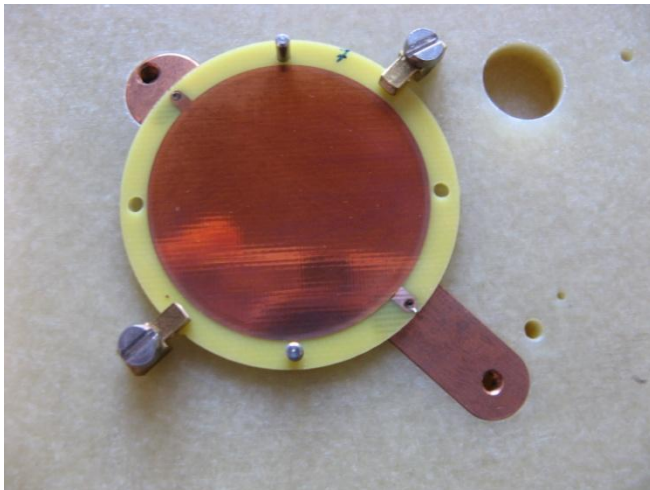


***Clas12 double sided bulk for cosmic bench***



# Microbulk, light and ionisation

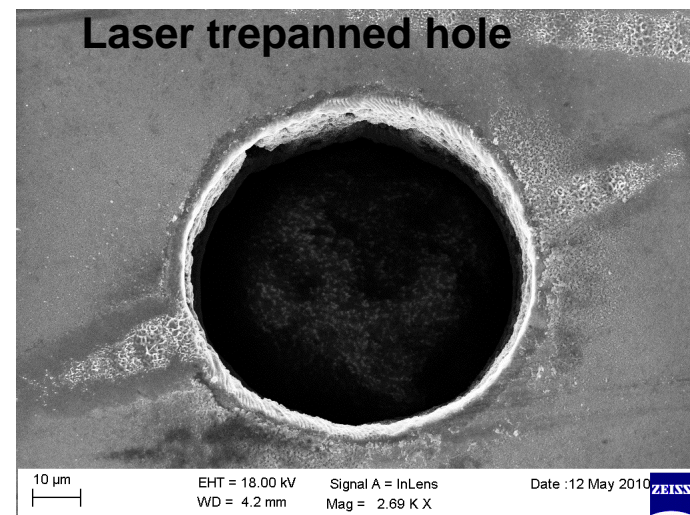
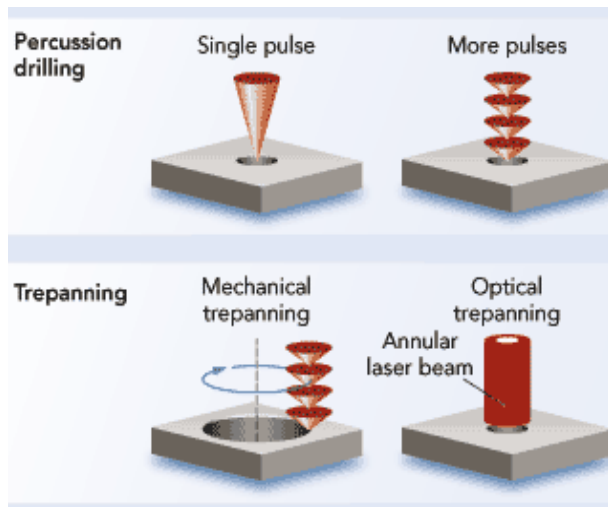
- Recent improvements : low radioactivity, removing kapton gives better gain and resolution, 25  $\mu\text{m}$  gap now exists. Used in CAST.
- Scintillation at high pressure. Maximum gain (both scintillation and ionization gains remain reasonable at high pressure)



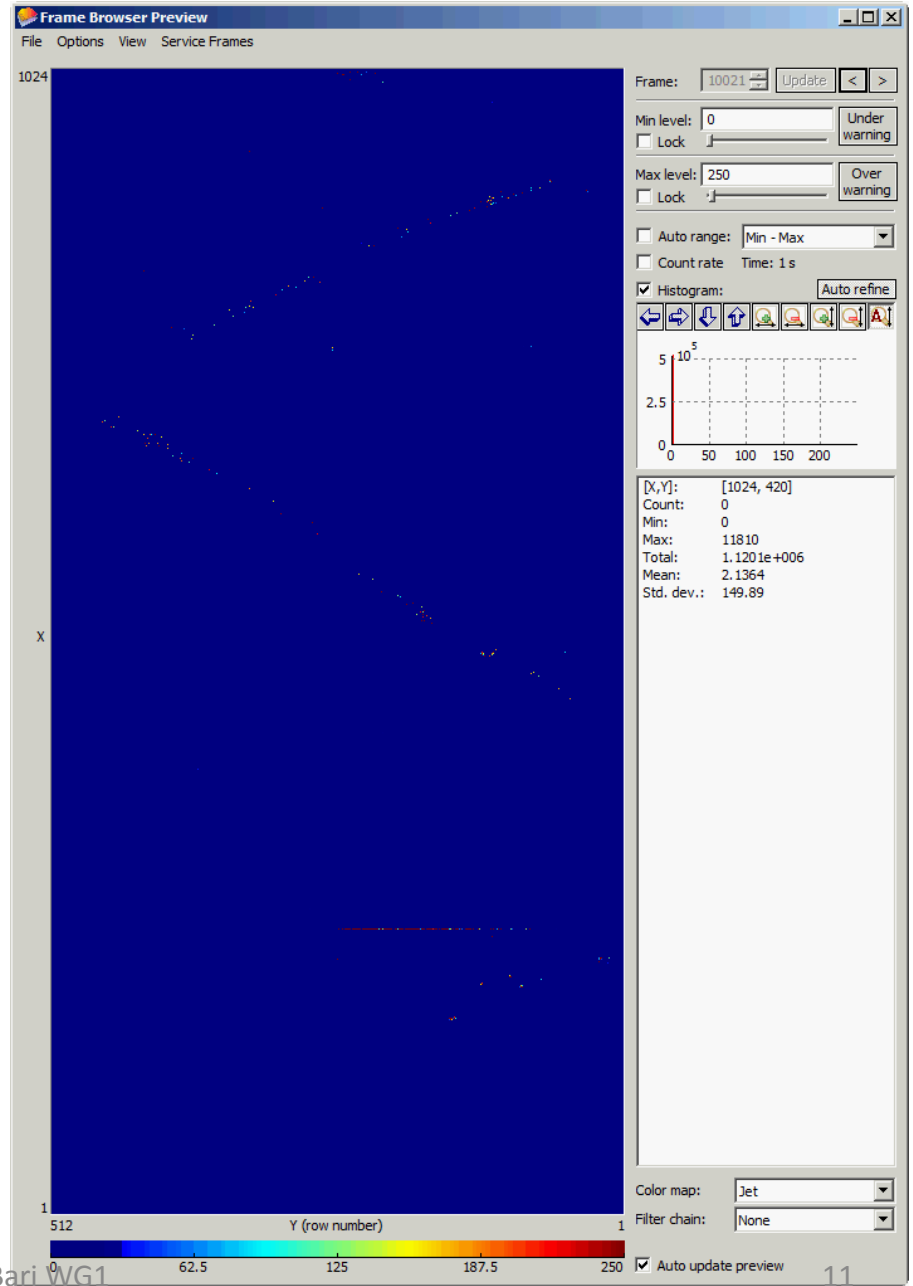
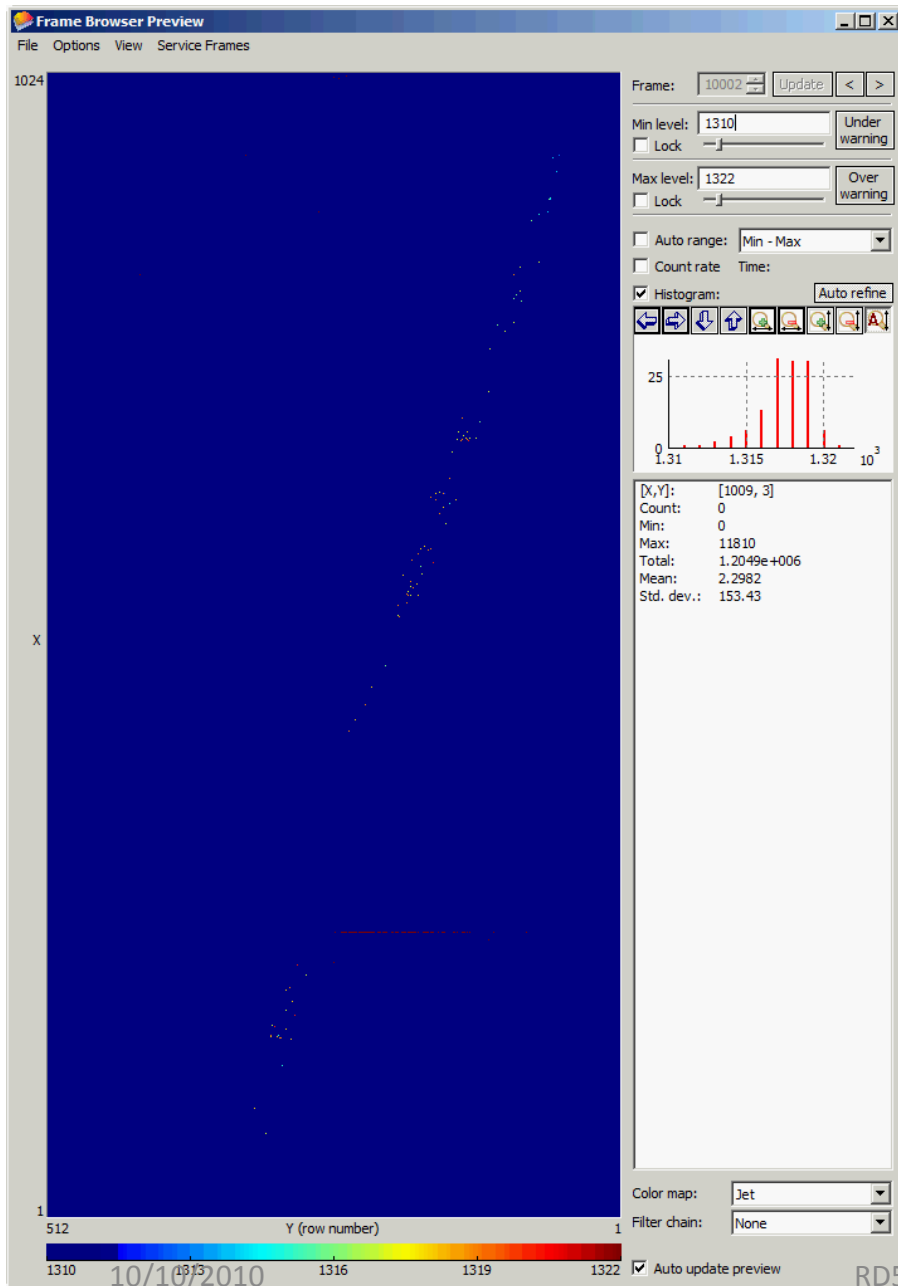
# Ultrafast laser drilling

- New high-rate 'fs' lasers make it possible to drill more perfect holes (no melting) in quantities.
- Might replace wet etching for some materials (ceramics) or down to 10  $\mu$  diameter

Various processes at various time scales

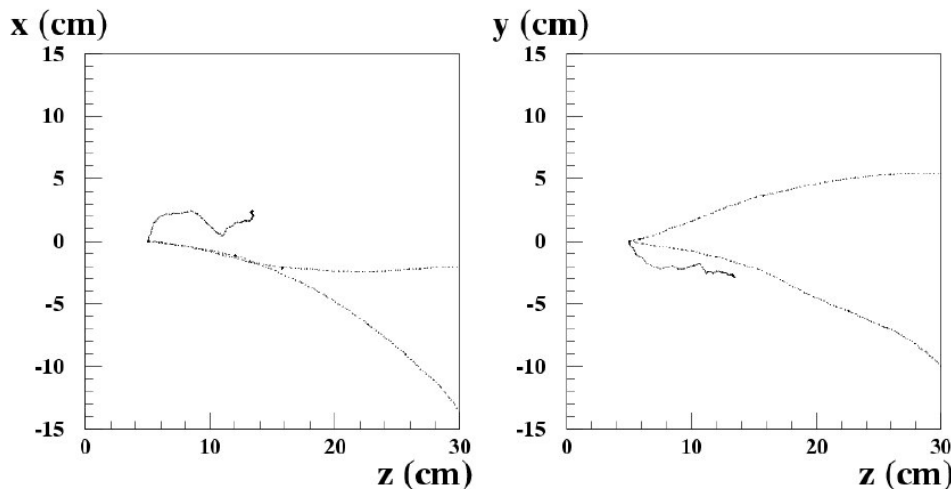


# Data taken in He + 20% isobutane at 375 V

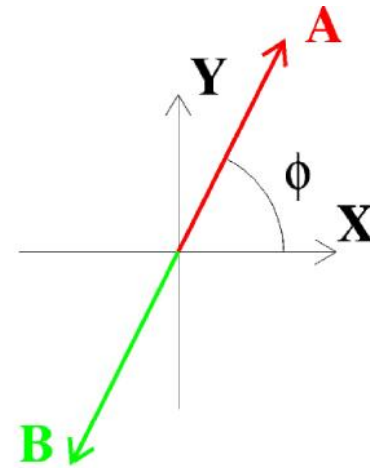


# HARPO : $\gamma$ polarimetry in the few-MeV region for astrophysics

- Use the triplet interaction  $\gamma e^- \rightarrow e^- e^+ e^-$
- 5 bar TPC,  $(30 \text{ cm})^3$  with 2D strip (1mm) readout
- 3 phases: demo at ground, balloon flight, satellite



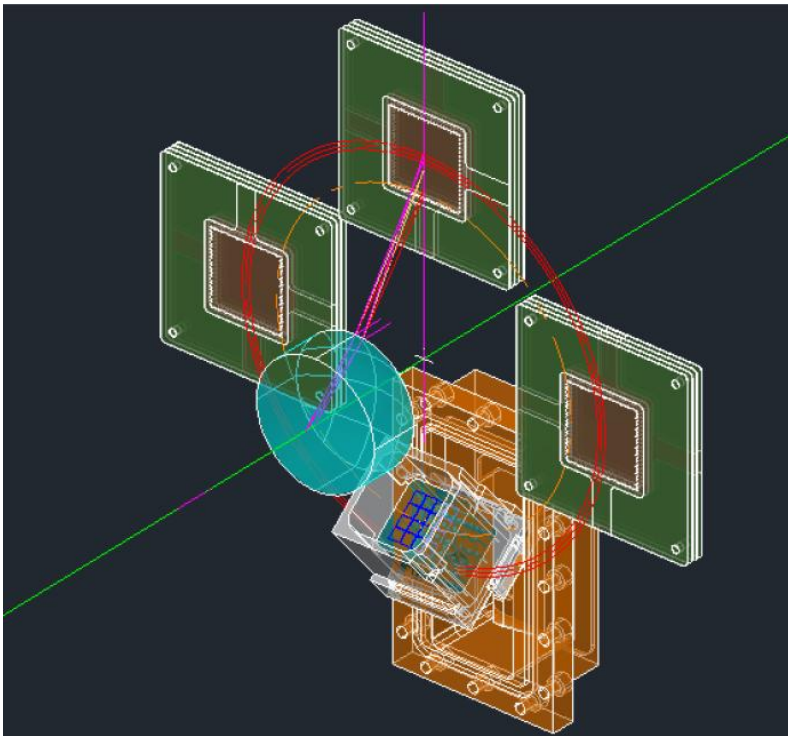
A 10 MeV  $\gamma$  photon undergoing triplet conversion in argon at 5 bar



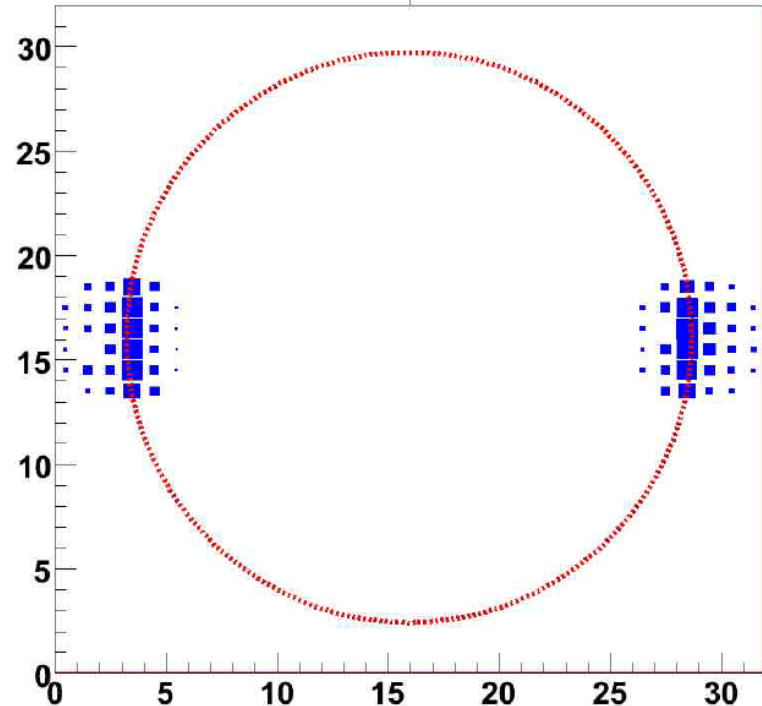
$$\frac{d\Gamma}{d\phi} \propto (1 + \mathcal{A}P \cos [2(\phi - \phi_0)])$$

# THGEMs for RICH

150 GeV  $\mu$ . Detect Cerenkov light from a quartz radiator.  
3-GEMs with CsI photocathode

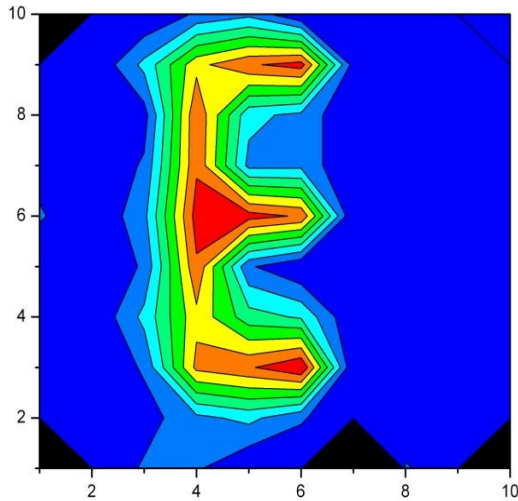


Circle : expected from Cerenkov  
Blue : overlap of events



# Neutron detection with GEMs at Beijing

- GEM with Boron converter
- Scanning with a  $^{239}\text{Pu}$  source



# Small and new-type High Voltage supply

- Cockroft-Walton chain
- 25 units being produced at Nikhef
- Accurate current monitoring
- Can provide divided HV to several GEMs
- Suitable for a large TPC? Could be integrated to the cage?

