

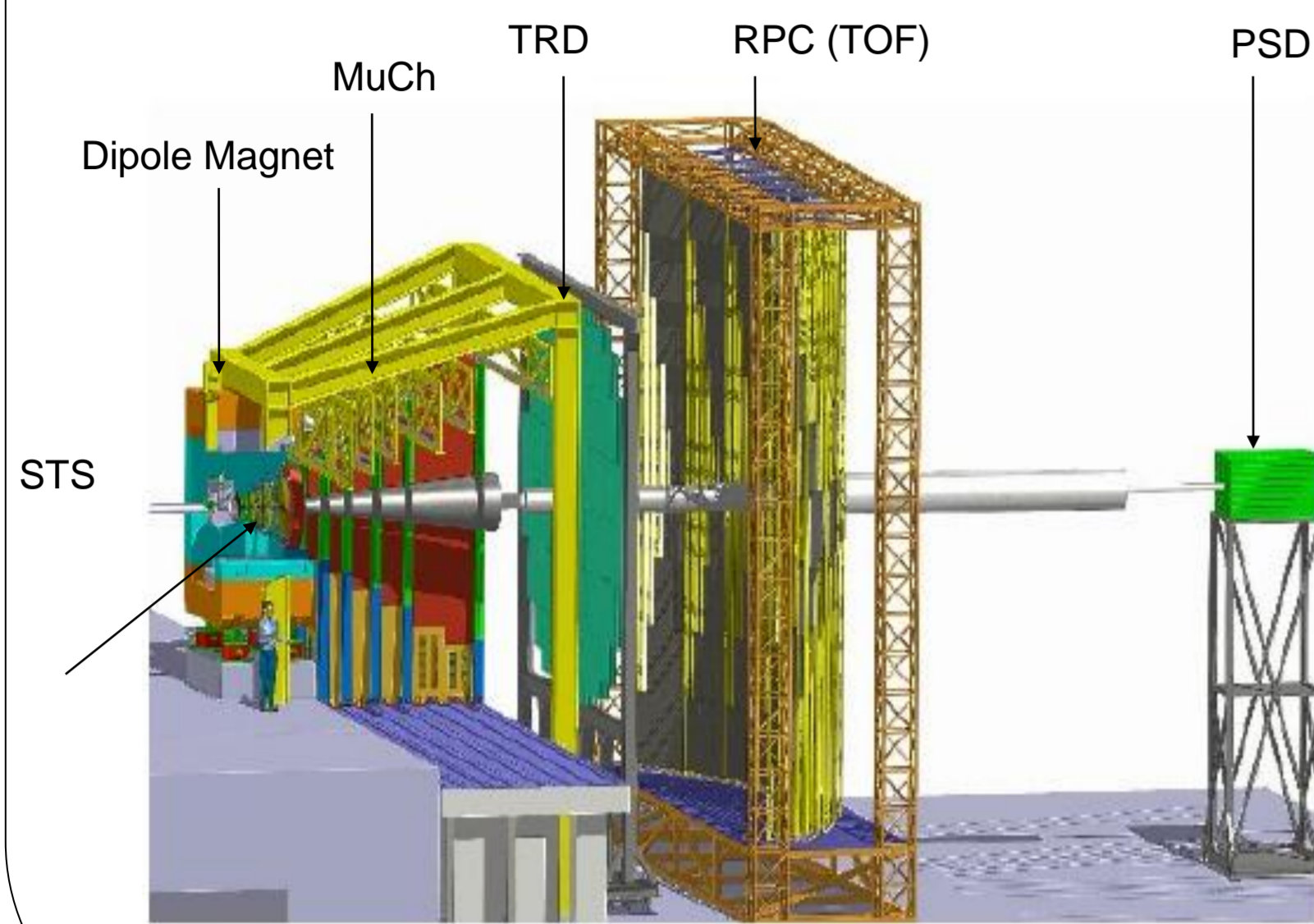
GEM Detector Development for CBM experiment at FAIR

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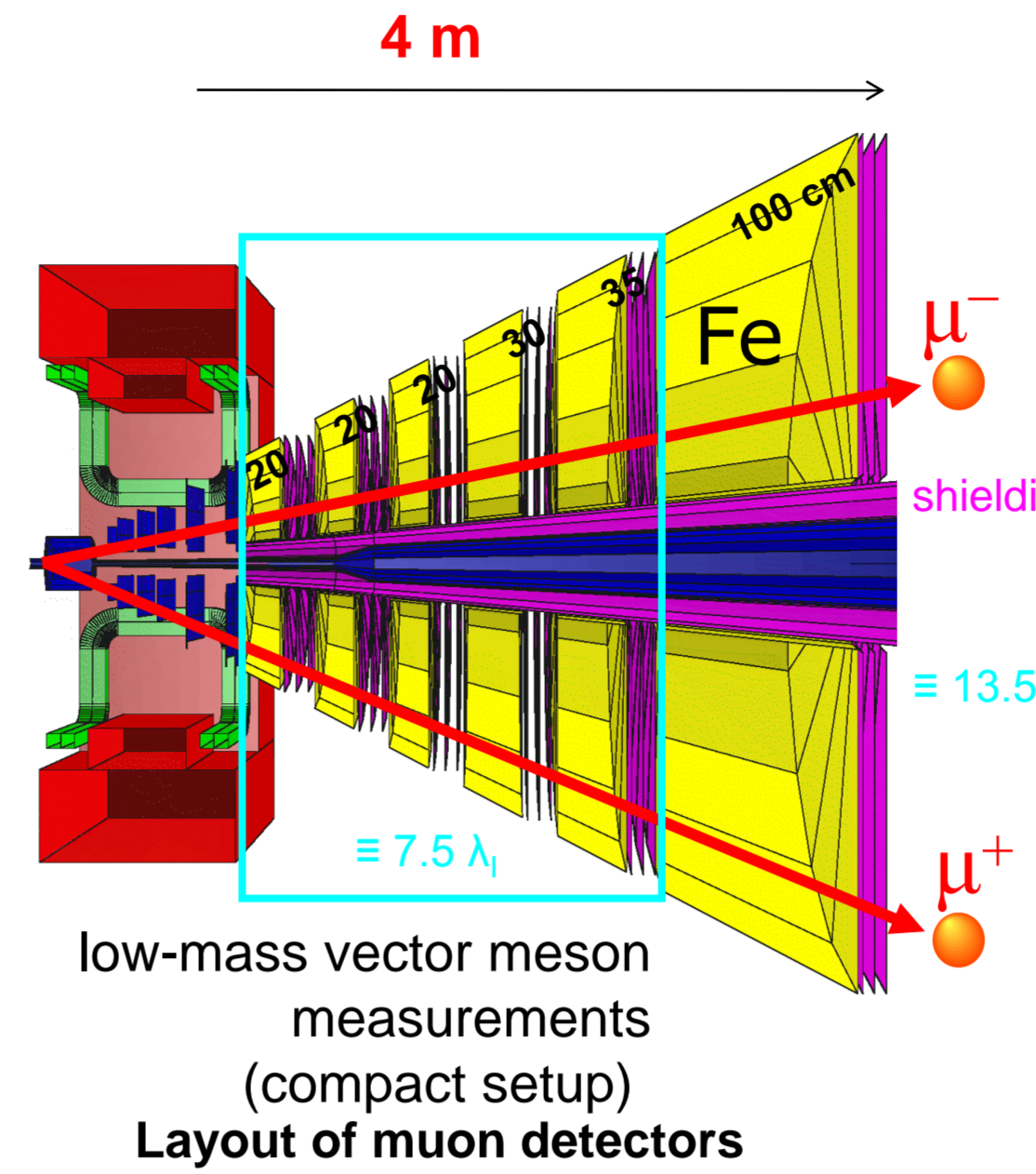
for the CBM Collaboration

CBM setup with muon detector



STS : track, vertex and momentum reconstruction
 MuCh : muon identification
 TRD : global tracking
 RPC-TOF : time of flight measurement
 PSD : centrality determination

Muon Detection System (MUCH)



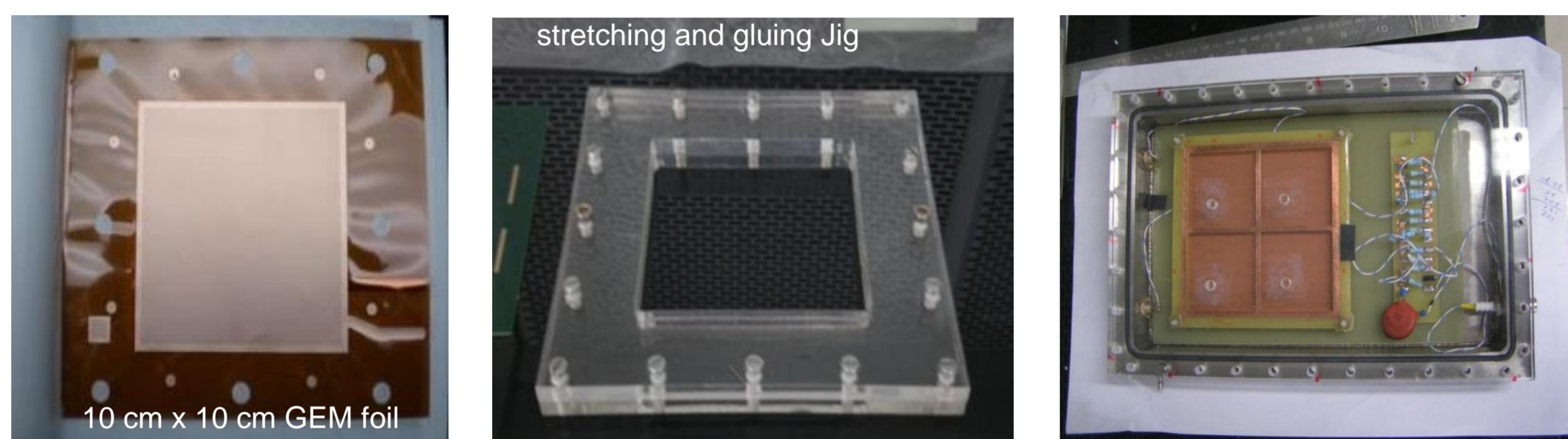
Alternating layers of absorbers and detector triplets

Challenges for muon detection:

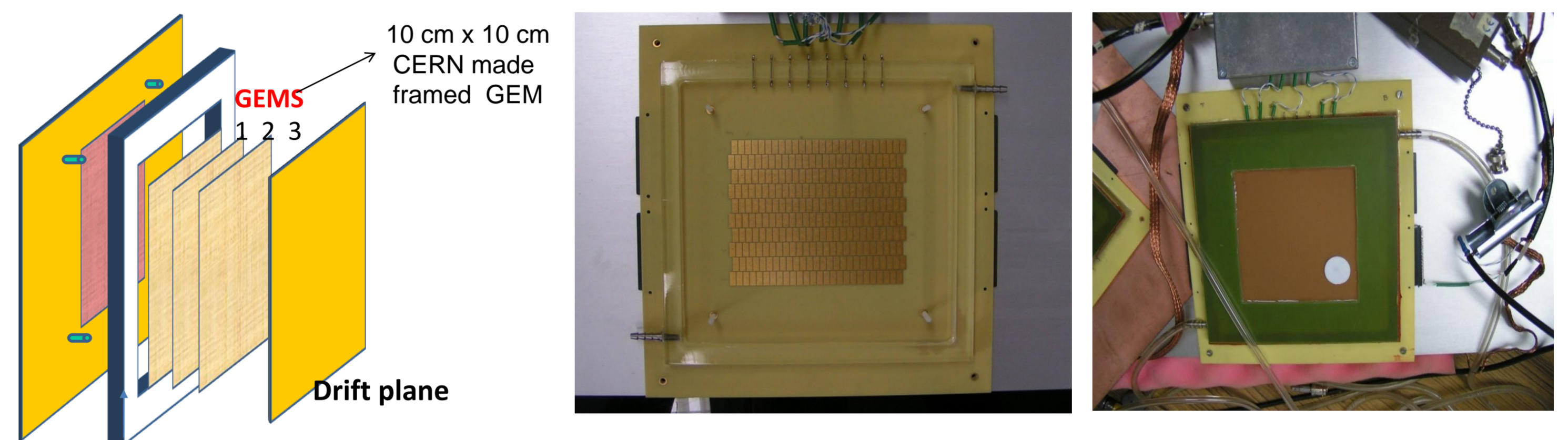
- ✓ high rate capability (up to 1MHz/cm²)
- ✓ high granularity (up to 1 hit/cm² in central Au-Au collisions)
- ✓ Good position resolution
- ✓ Should be radiation resistant
- ✓ Large area detector – modular
- ✓ Data to be readout in a self triggered mode

GEM chambers for the first few stations

Prototype Chamber fabrication and assembly

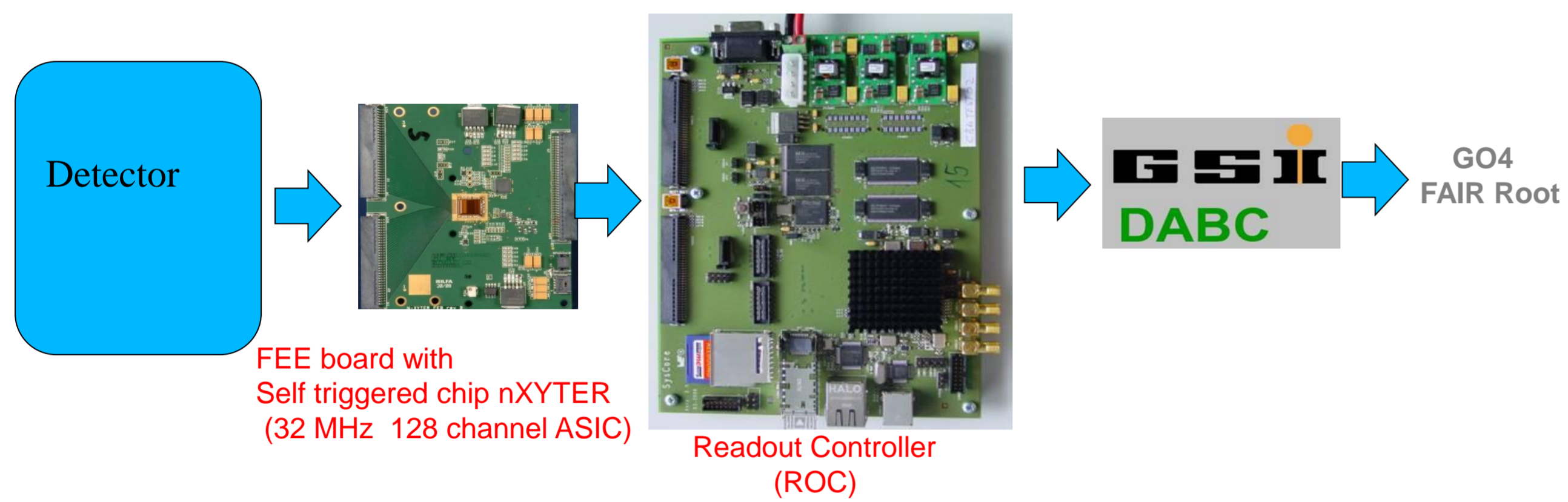


Stretching/gluing of GEMs at VECC First chamber for lab tests



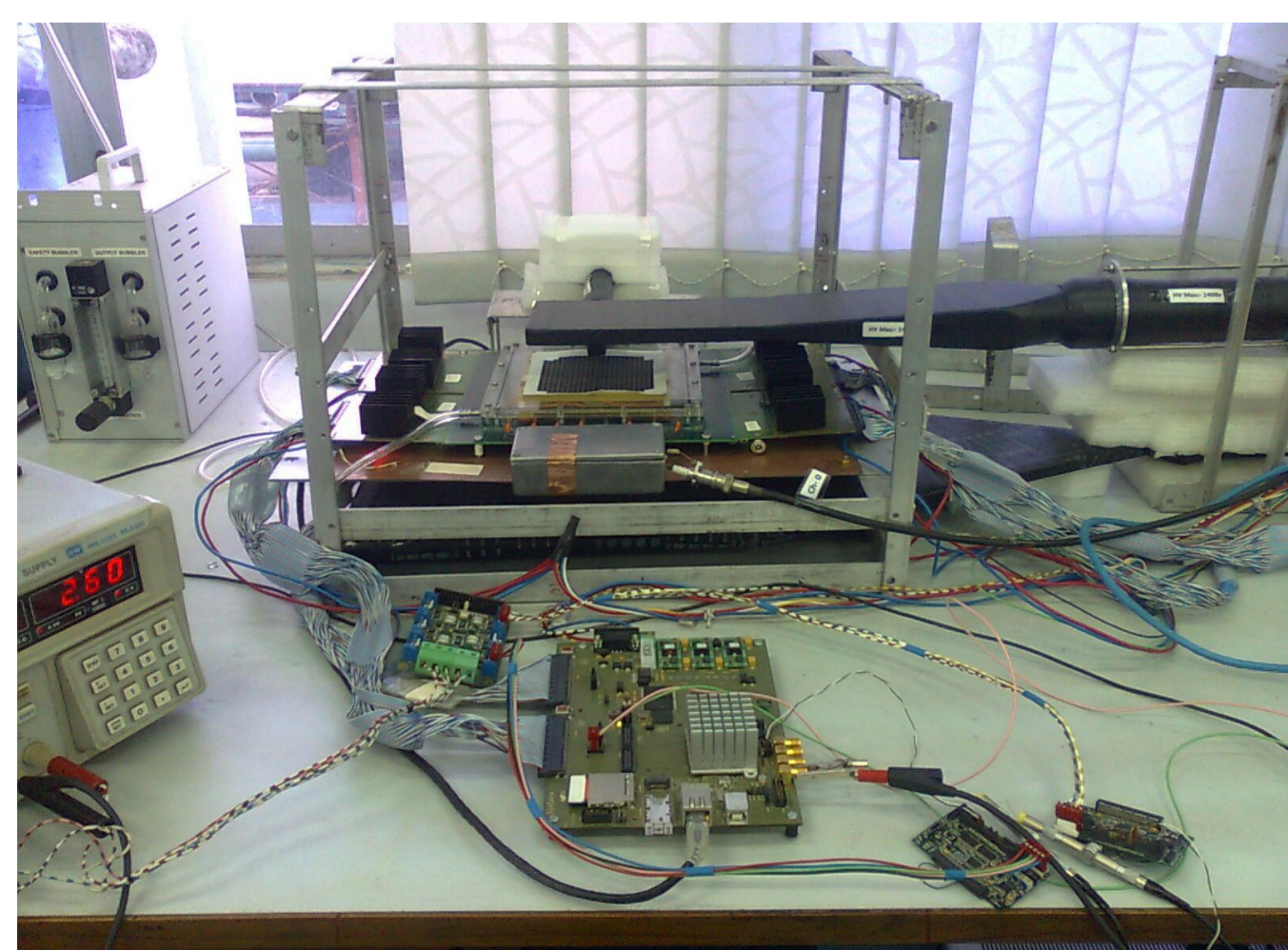
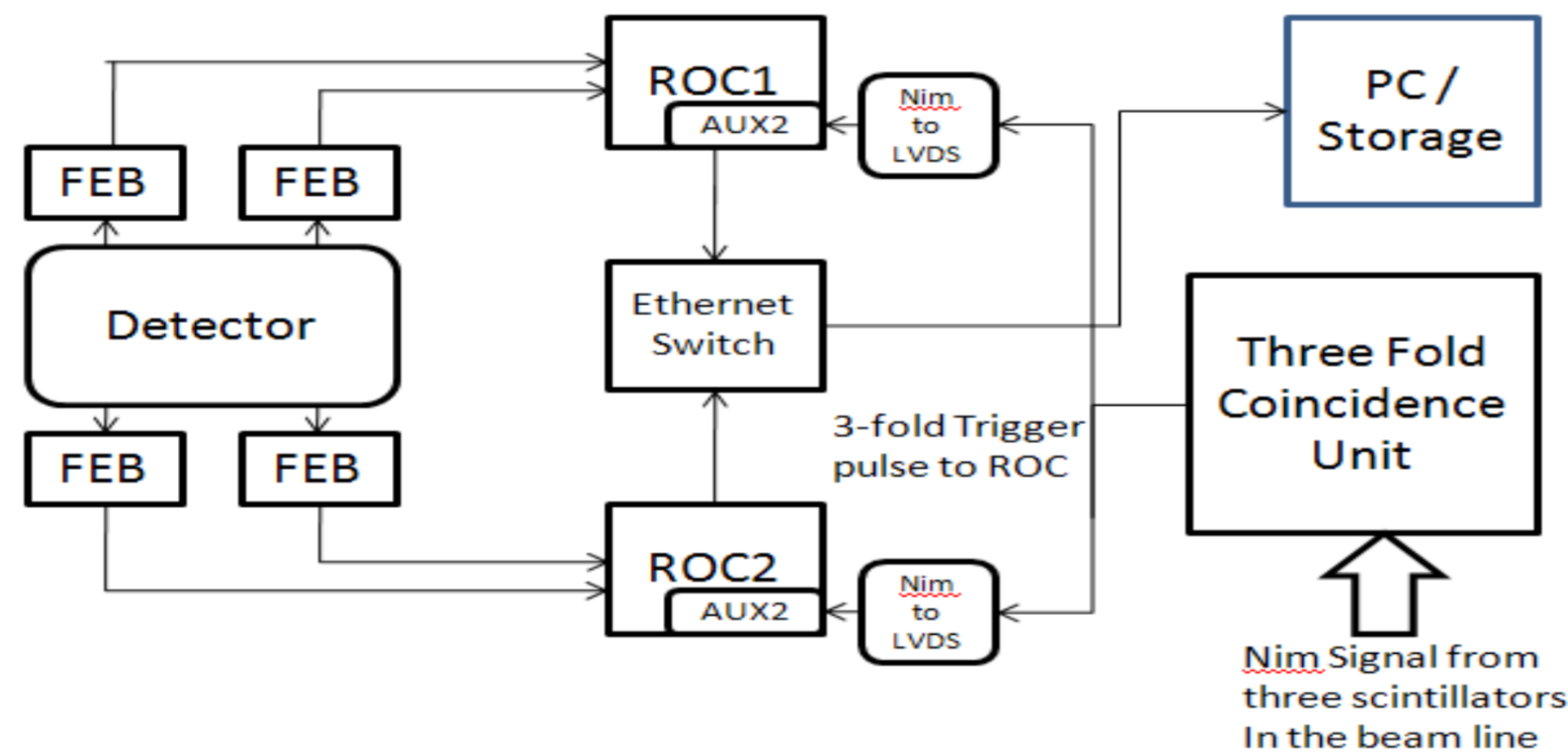
Schematic of prototype chamber assembly for beamtests

Testing in self triggered mode

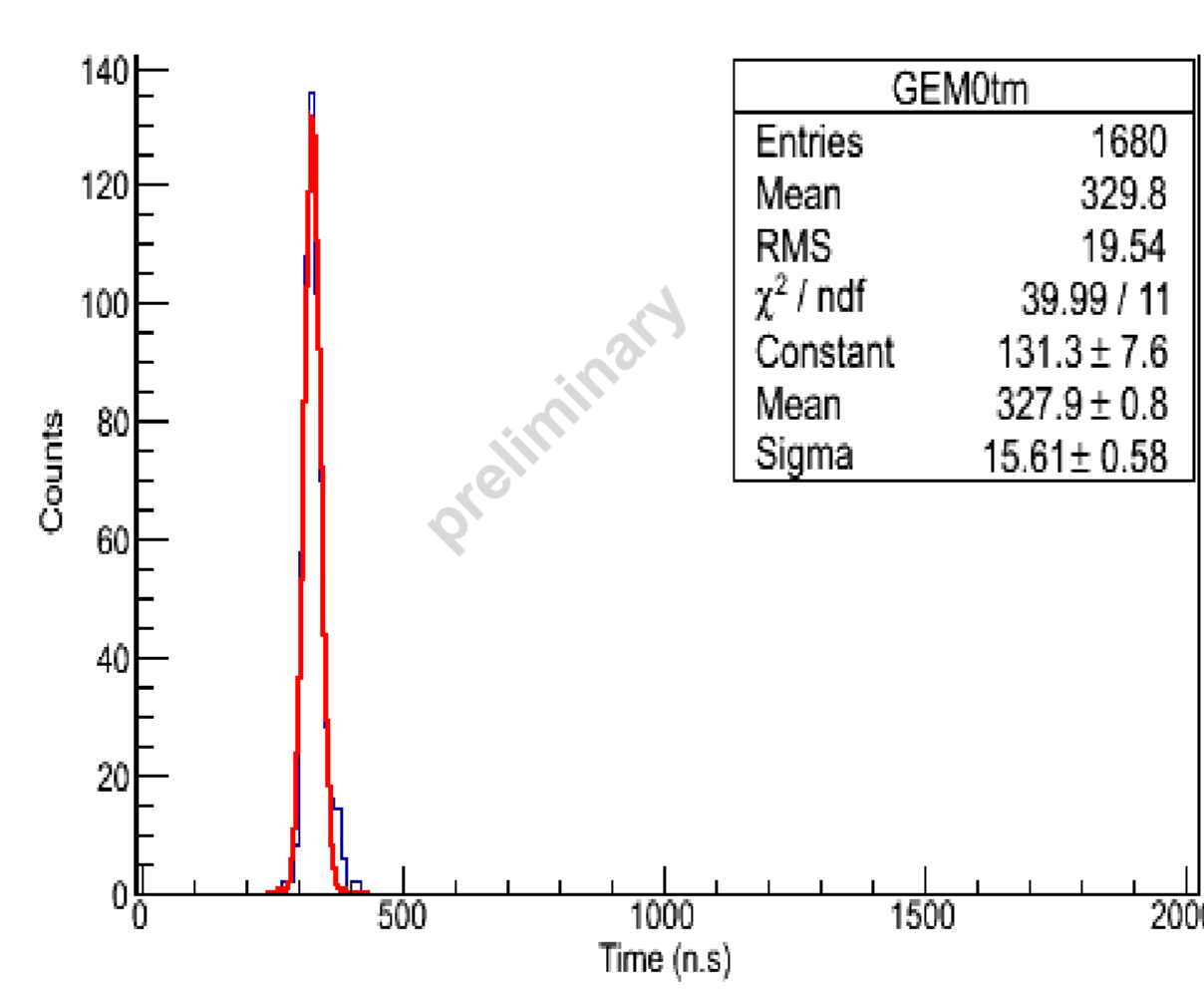


General Schematic of self triggered data acquisition

Schematic of test setup in lab

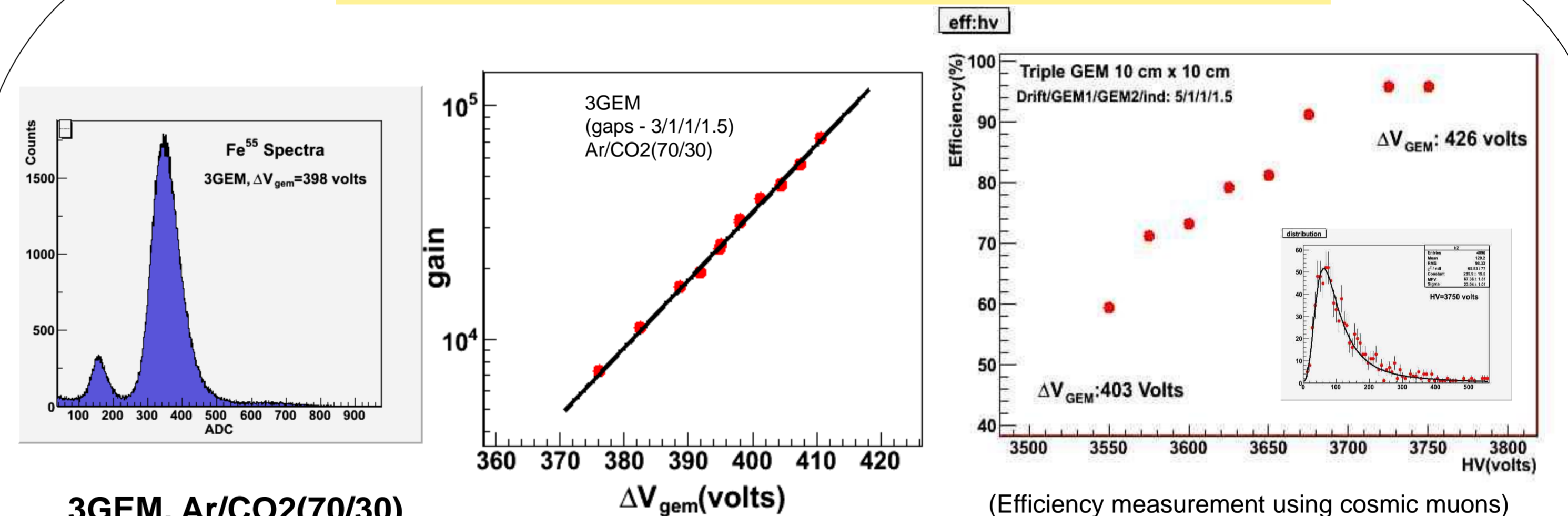


test setup in VECC lab

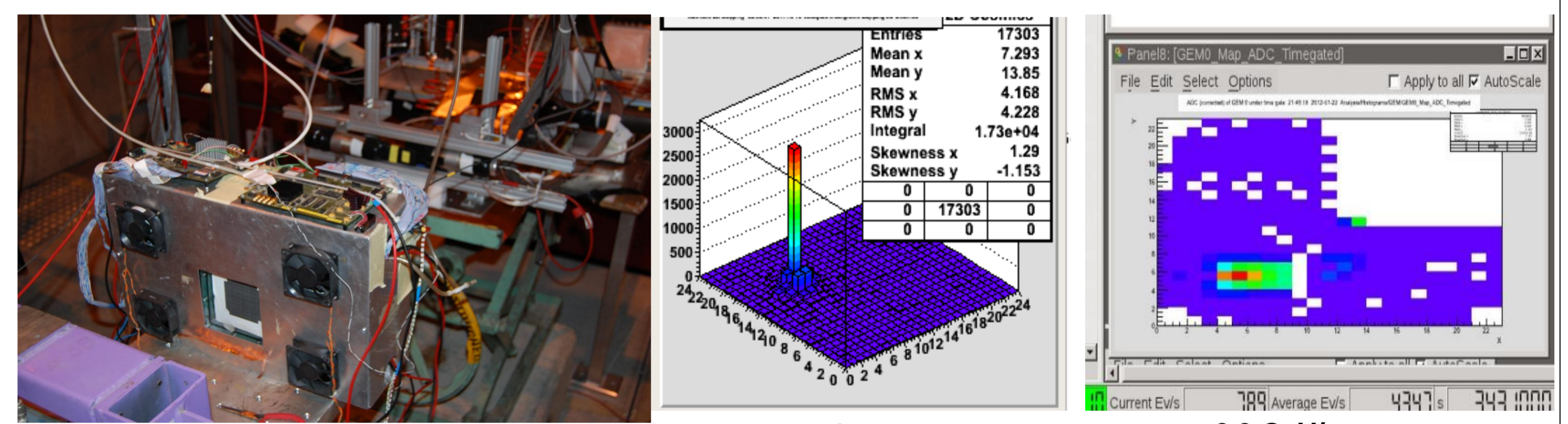


Time difference between detector signal and trigger

Test Results

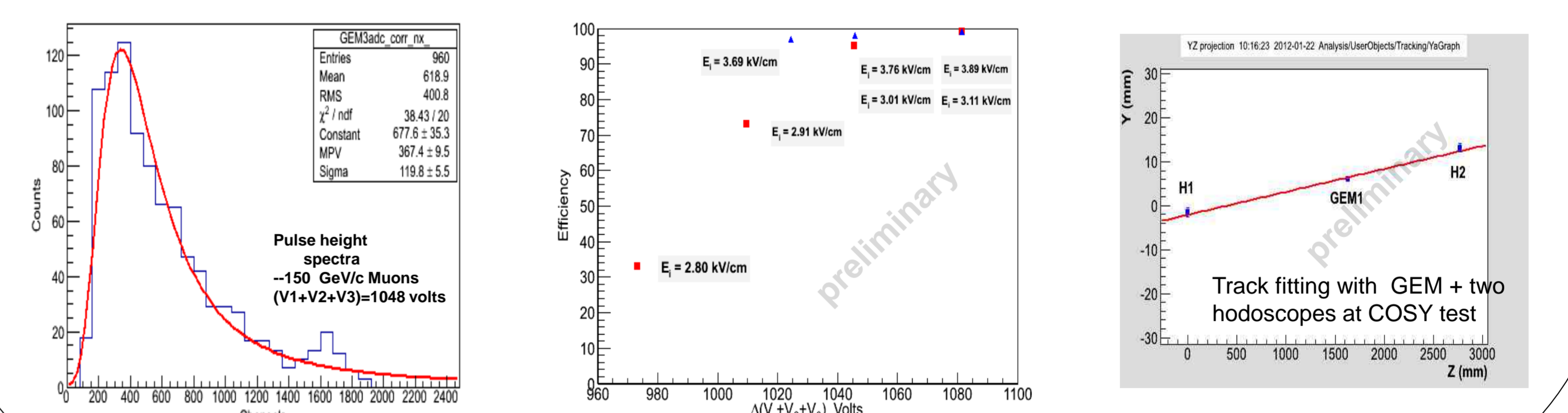


Using conventional electronics



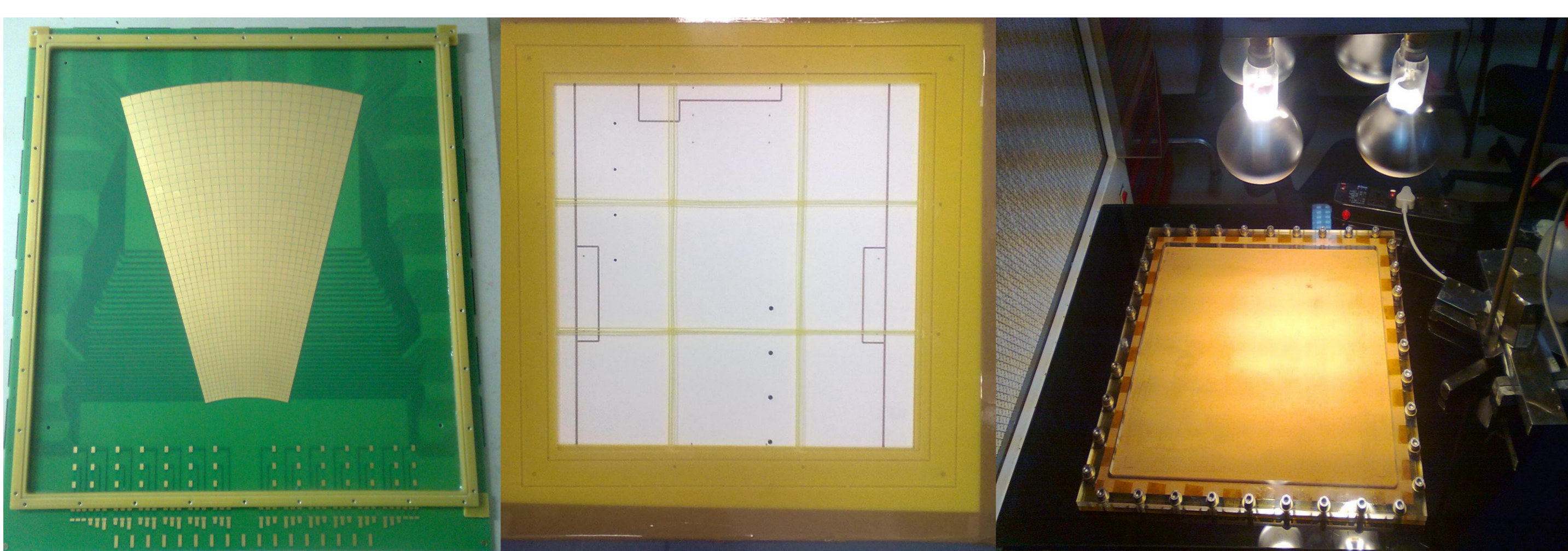
Setup of beamtest at H4 beamline at CERN SPS

BEAM SPOTS



Using self triggered FEE, nXYTER

Towards building a 30cm x 30 cm chamber



readout pcb with sector layout

Thermal stretching mechanism of foils

Summary and Outlook

- We have built and tested several multi GEM prototypes at VECC. Charged particle detection efficiency of > 95% has been obtained using cosmic muons.
- Have tested the response of the chambers to MIPs using pion/muon beams at CERN and also with protons at GSI and COSY in a self triggered mode and using CBM DAQ. An Efficiency ~95 % is observed. More detailed analysis is underway.
- Next Steps:
 - Building and testing a large size GEM (30 cm x 30 cm).
 - Solving issues concerning design, stretching/gluing, optimizing jigs, etc., Radiation test with neutrons at VECC.
 - Testing of rate capability using the X-ray source.
- FEE – a new 68 channel ASIC similar to nXYTER is under consideration.