Rahul Arora

- **Nationality : Indian ; Age : 25**
- **Done My Master Thesis from Punjab University Chandigarh (India) in April 2009.**

  Thesis title : "A Study of RPC detectors for INO-ICAL detector"
- **ESR at Detector Laboratory, GSI Darmstadt since May 2009.**

  Presently PhD student at University of Frankfurt ; PhD Supervisor : Prof. Klaus Peters
- **Working on MCPAD project P5 : GEM-TPC for MPGD readout. R&D of prototype Time Projection Chamber (TPC) detector with GEM readout for the PANDA experiment at FAIR facility in GSI / Project Leader : Dr. Bernd Voss**
- **MC-PAD Supervisor : Dr. Christian J. Schmidt.**

Outline

- *Training and benefits from MC-PAD Network*
- *Work done in First year/Achievements*
- *Future Goals*

Training and benefits from MC-PAD Network

Network Training

• 1st MC-PAD network training on Readout Electronics at AGH Krakow, Poland (Sep 2009).

• 2nd MC-PAD network training on Detector Simulation and Data Analysis at DESY (January 2010)

• 3rd MC-PAD network training on Processing and Radiation Hardness of Solid State Detectors (Sep 2010)

Presentations

• Participation in the collaboration meetings for PANDA and RD51 Collaboration meetings

• Given talks at several GEM-TPC collaboration meetings regarding the status of the detector testing.

Other Training

• German Language Course (beginners) at GSI.

• HGS-HIRe soft skill course on “Scientific Writing in English”(April 2010)

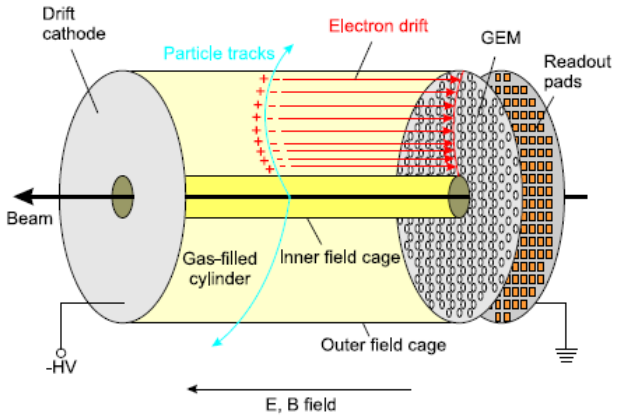
• Cern School of Computing 2010 (August 2010)

Publications.

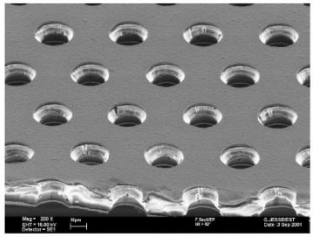
• GSI Scientific Report 2009; “The PANDA GEM-TPC prototype” Bernd Voss et. al.

What the project is all about

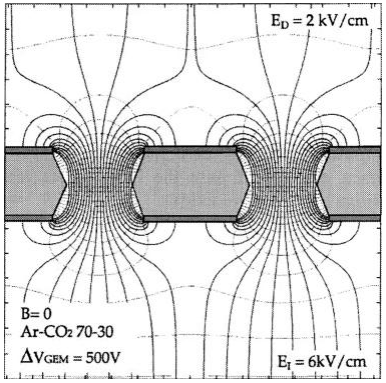
- Building a prototype Time Projection Chamber detector
  - For tracking upgrade of the FOPI experiment at GSI and at Crystal Barrel experiment at ELSA/Bonn.
  - Central tracker candidate for the PANDA experiment at the FAIR facility in GSI



GEM based TPC Detector

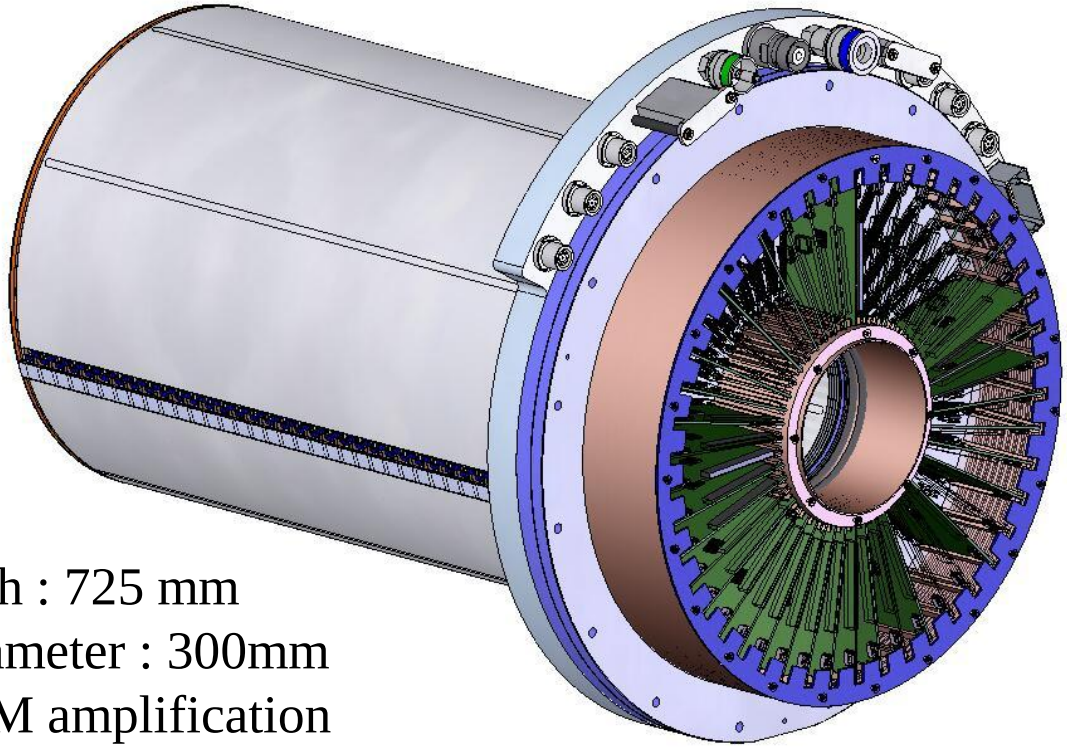


Microscopic view of GEMs



Field lines through GEM holes

Detector Layout of the GEM-TPC detector for FOPI experiment

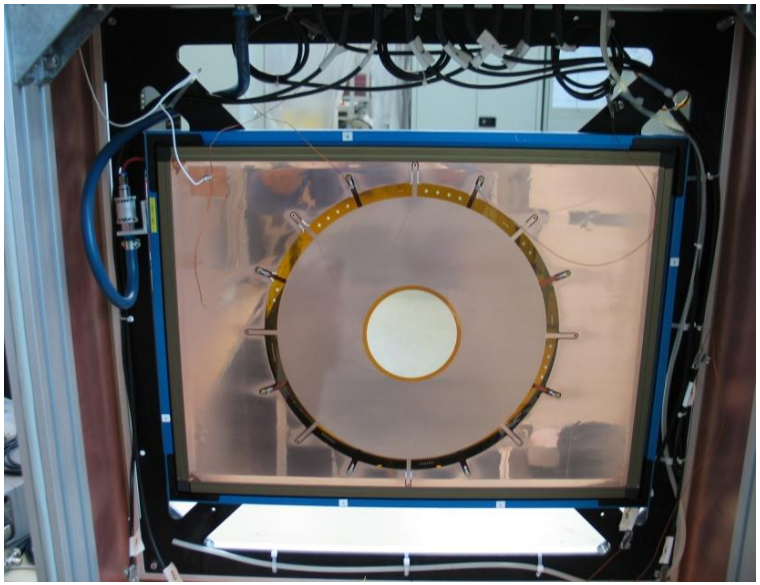


- Drift length : 725 mm
- Active Diameter : 300mm
- Triple GEM amplification

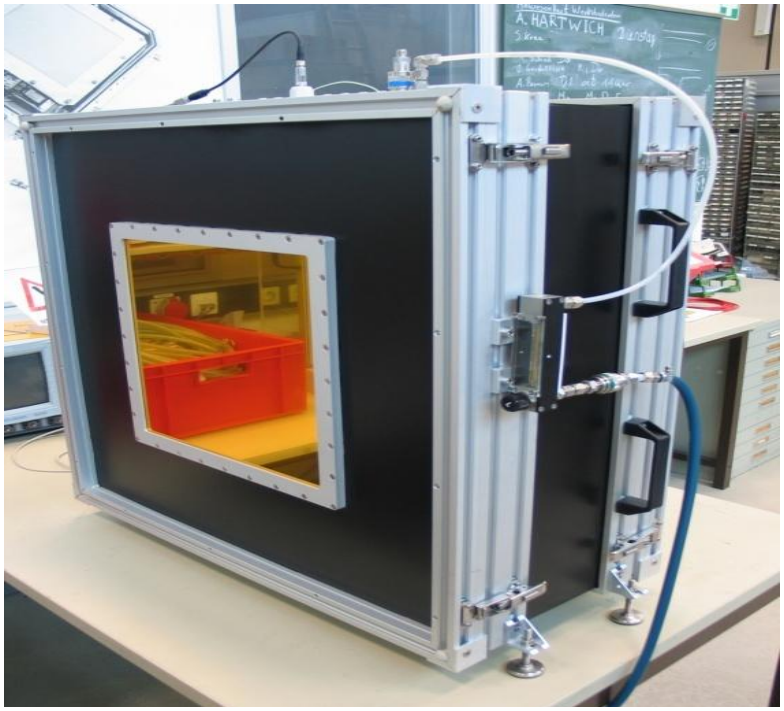
Work done in first year

- Work started with GEM foil testing
  - 10 GEM foils tested for their leakage current
- Gluing of GEMs on the glass fiber frames
- Preparation of Media Flange with all the sensors and media supplies (gas, LV, HV, Cooling)
- Fabrication of the Field Cage with strip line design (1.5mm pitch)
- Testing of all the components for High Voltage stability and gas tightness
- Testing of GEM detector Media Flange, GEM Flange and dummy cathode without the actual Field Cage and cooling for the FEB readout cards.

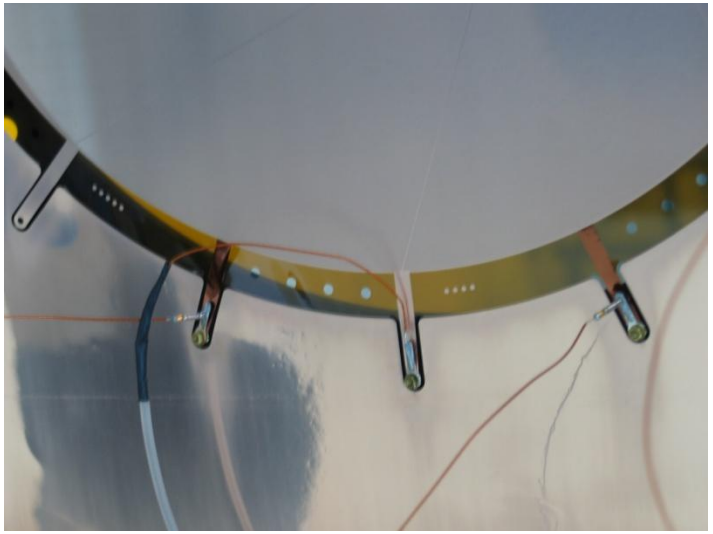
GEM testing Setup

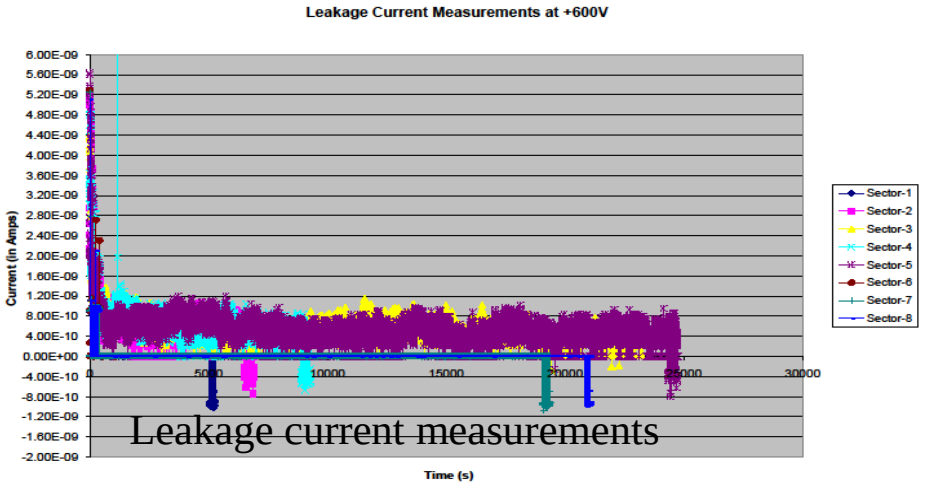


GEM foil stretched with pneumatically operated stretcher



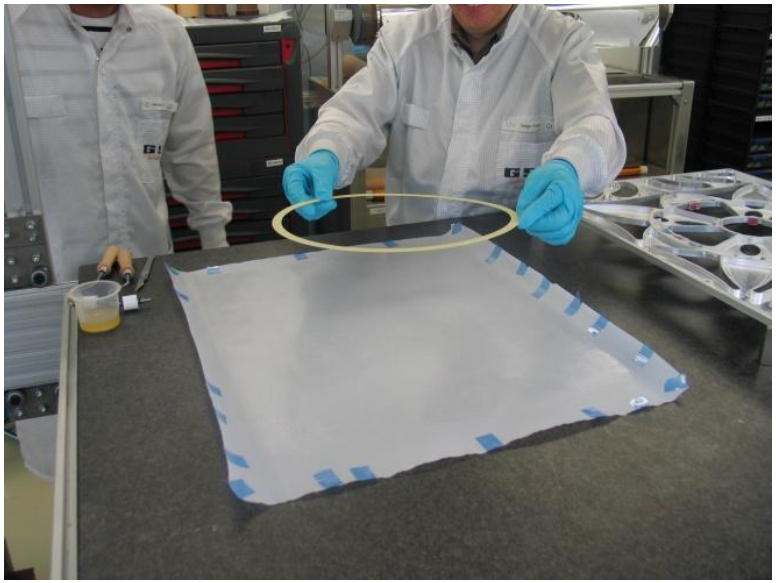
Test Box

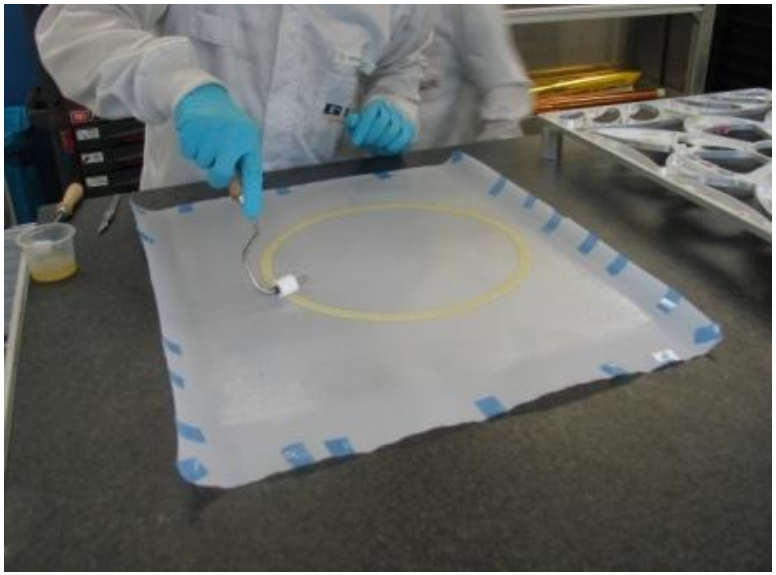


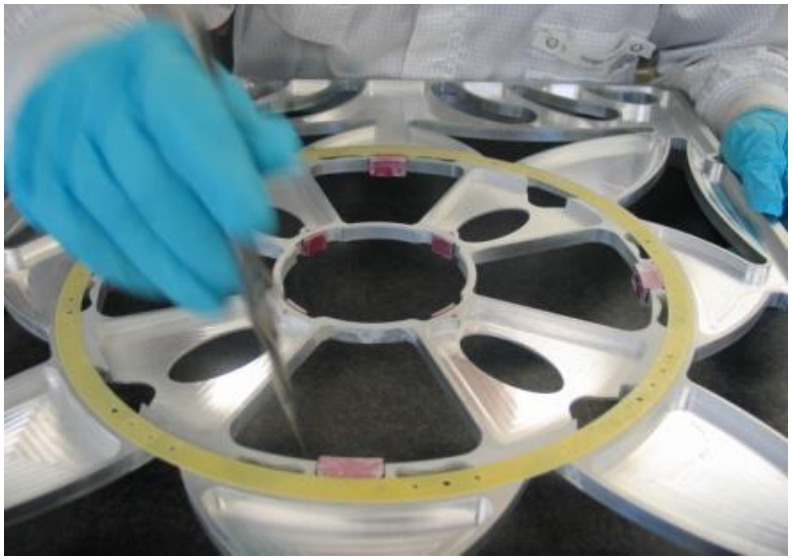


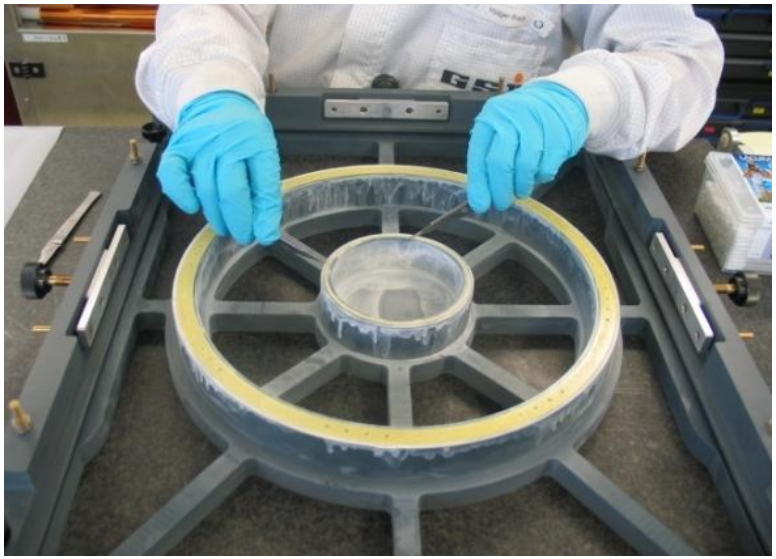
Leakage current measurements

Gluing of GEMs

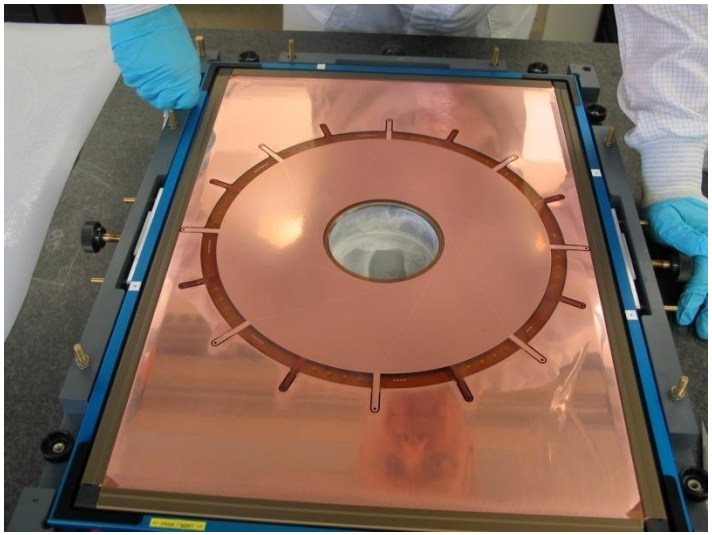


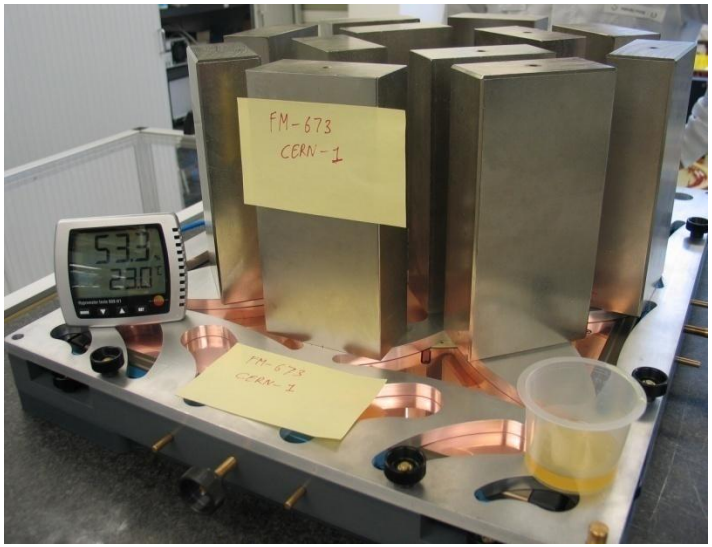


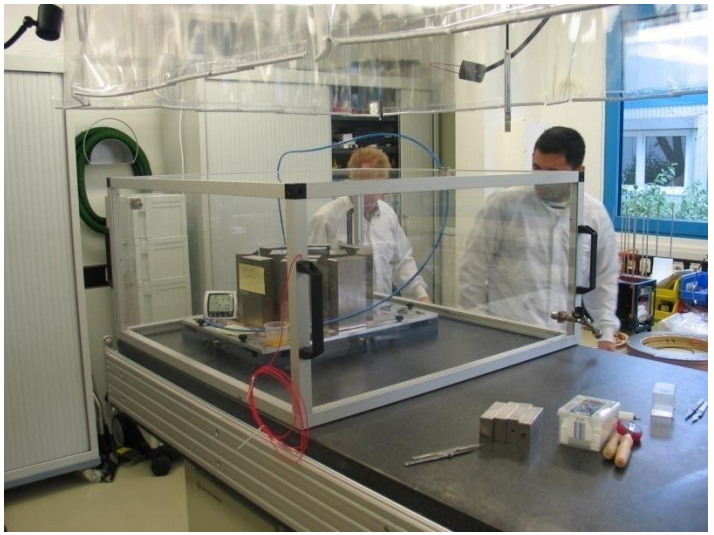




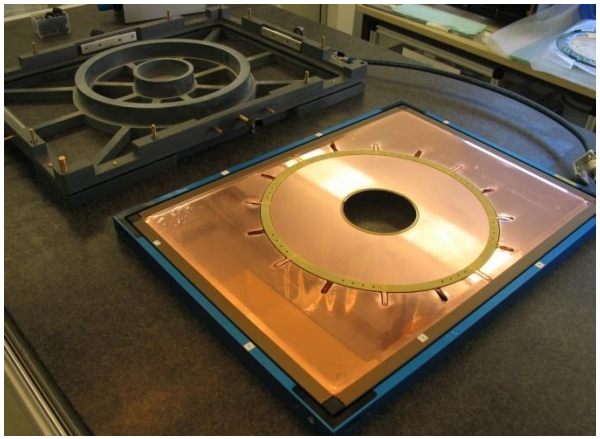
GEM foil gluing

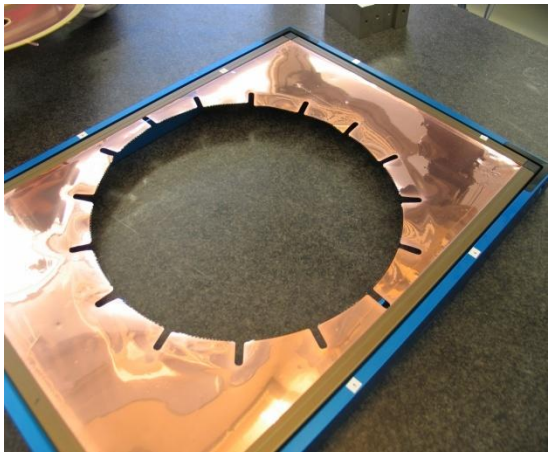


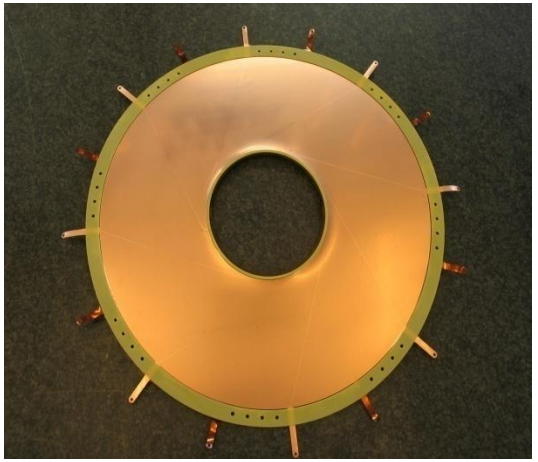


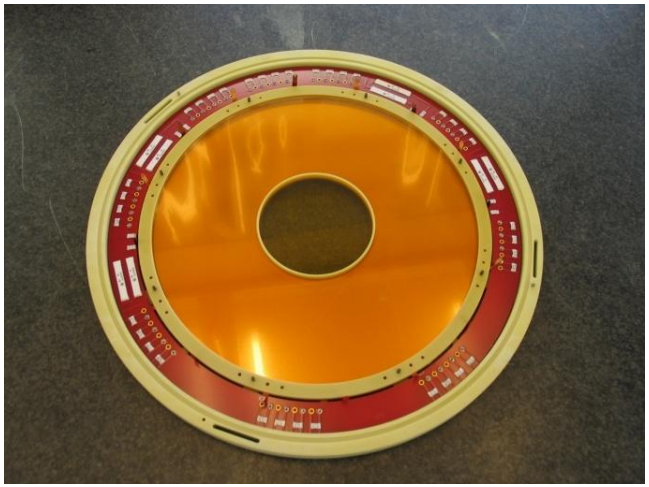


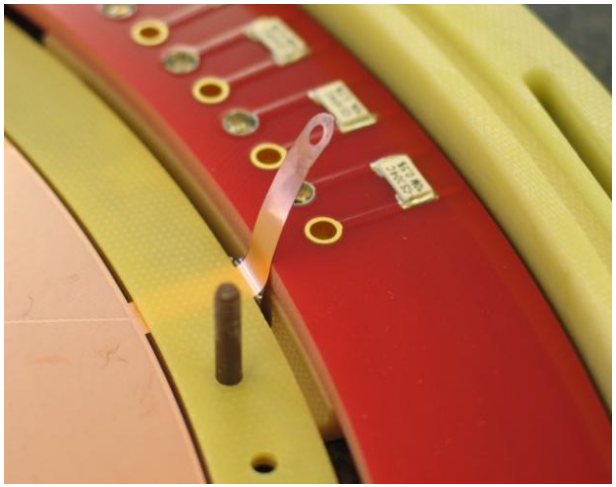
GEM foil mounting on GEM flange



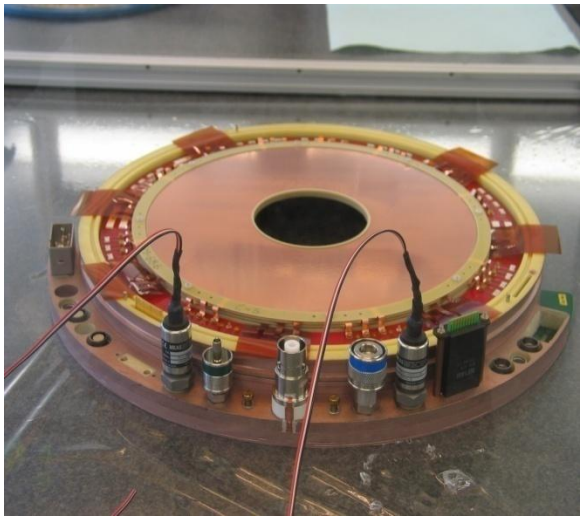






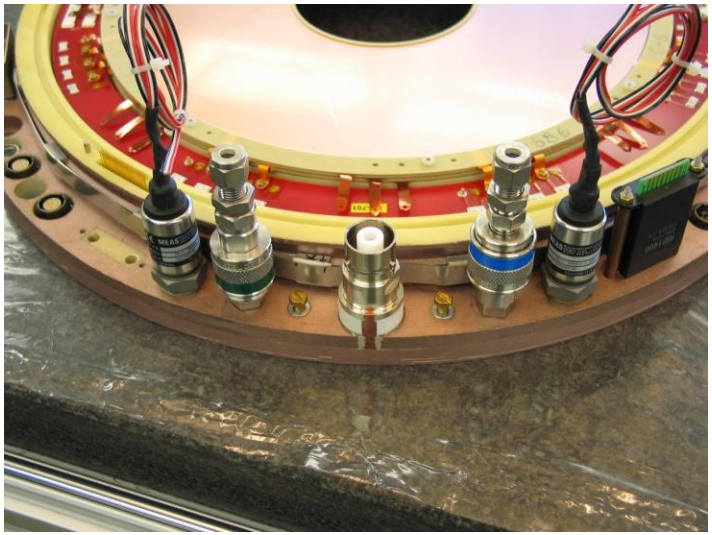


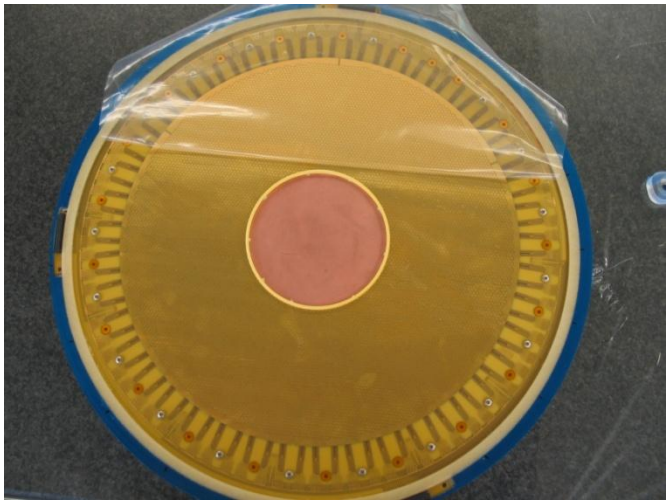
GEM Flange with voltage distribution circuit



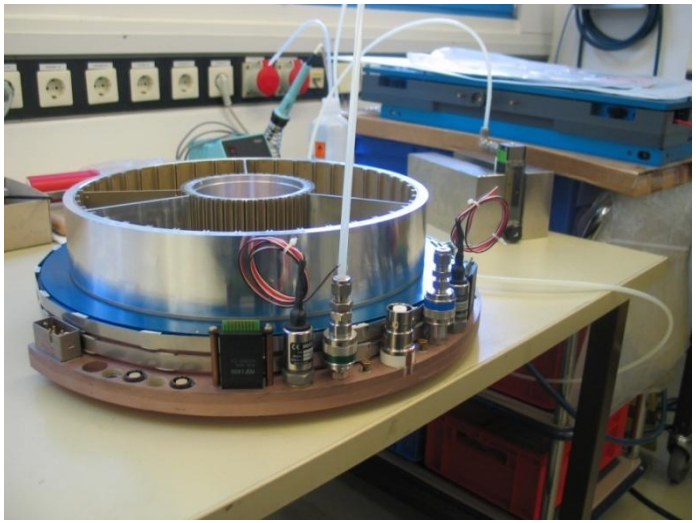
Media Flange with all the sensors and GEM Flange mounted

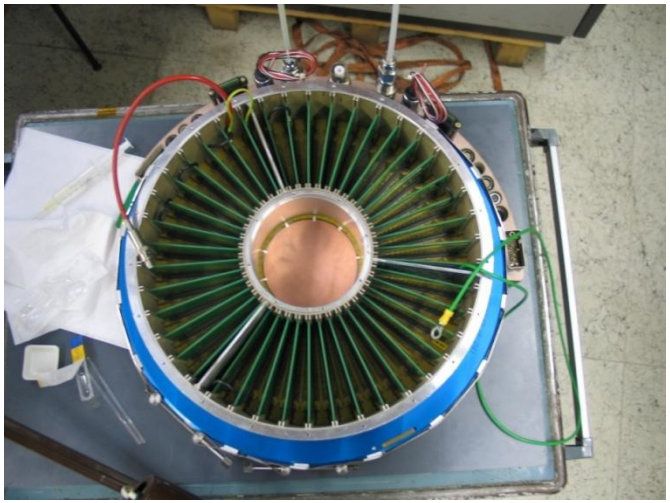
Media Flange assembly and GEM detector





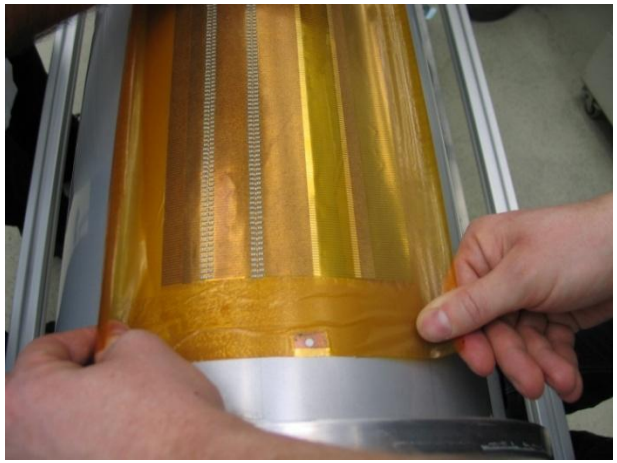
Pad plane and all the feed trough and sensors

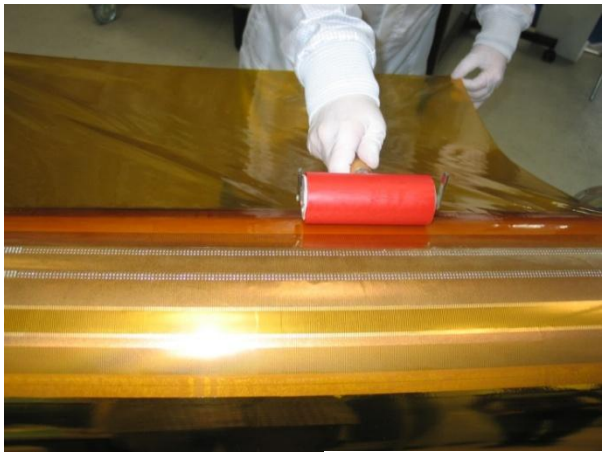




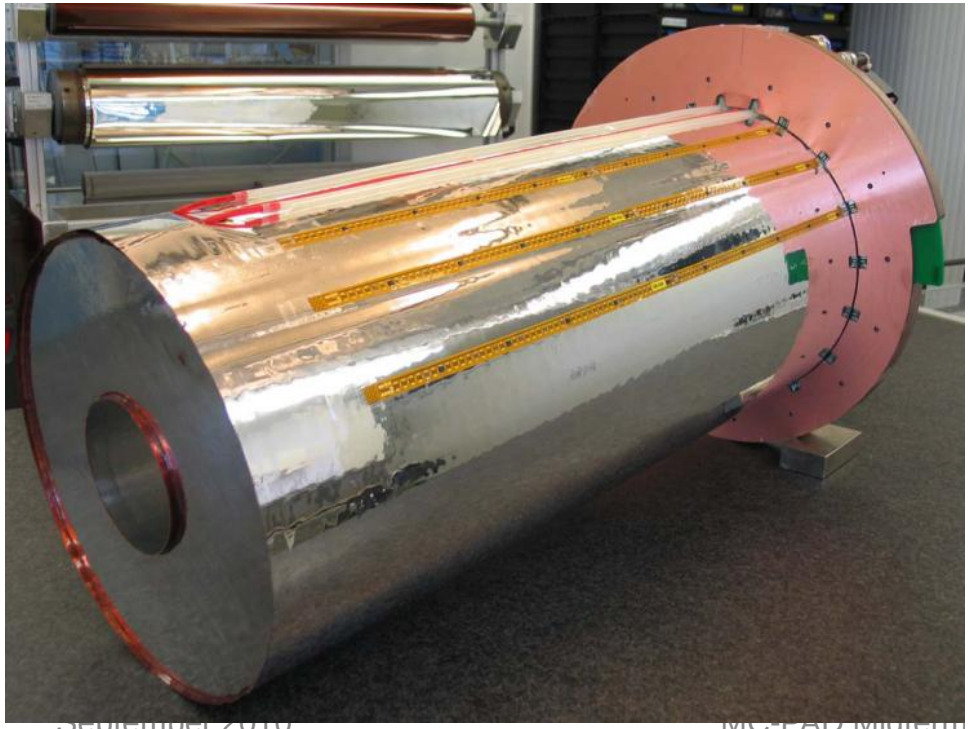
GEM detector with cooling pot ; all the electronic dummy cards

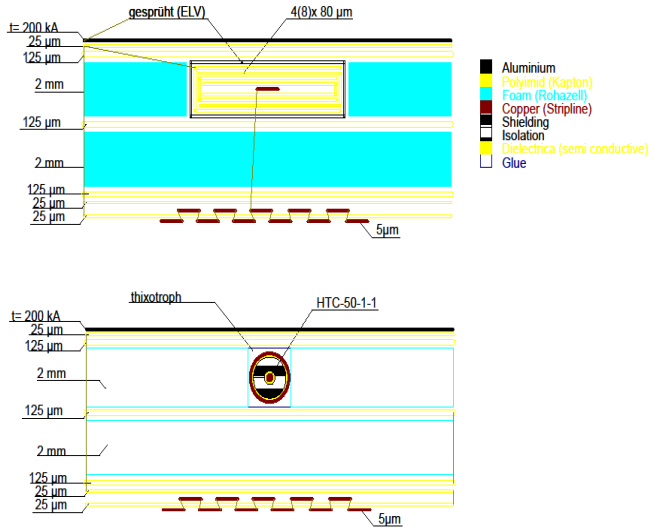
Fieldcage fabrication and assembly





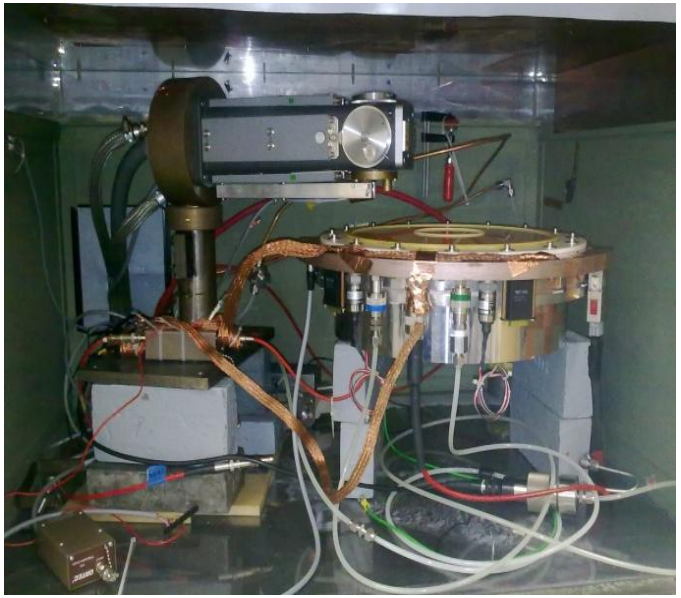
•The strip line with resistor chain ;
The laminating process for Field Cage

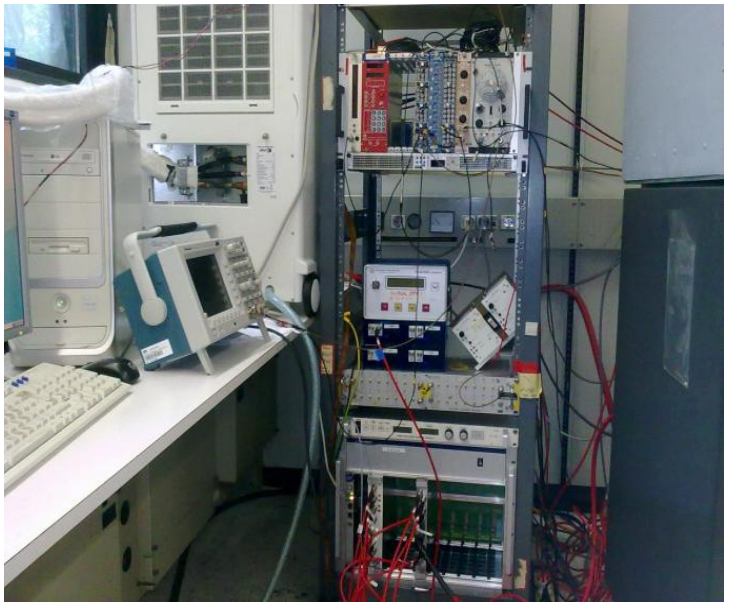


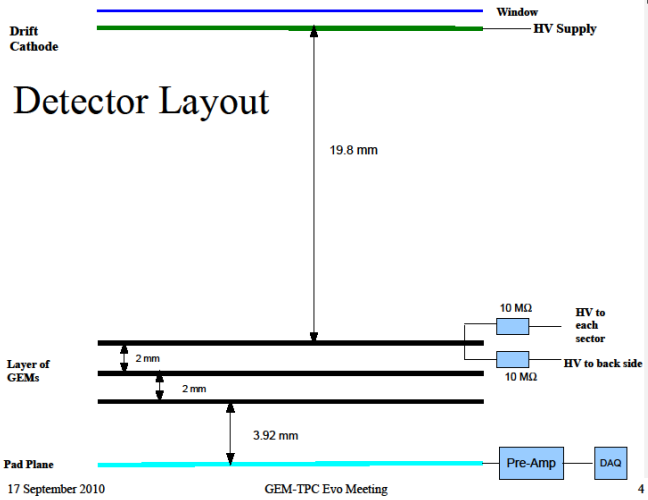


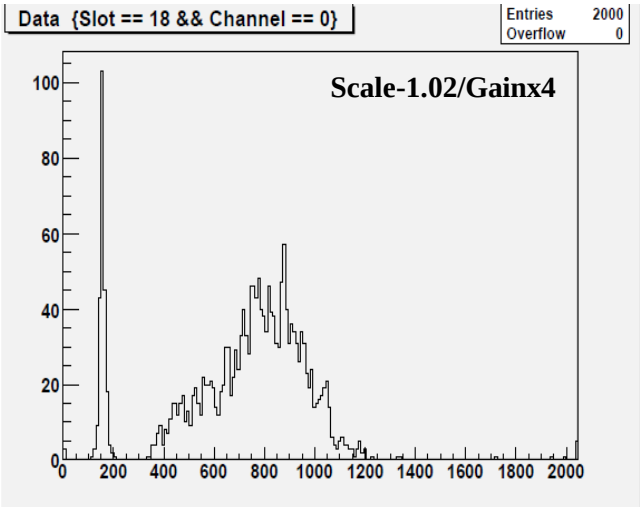
Fieldcage layer composition

Detector testing

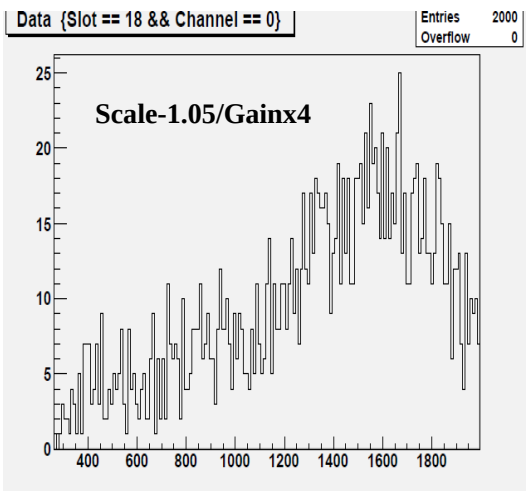








Gain~5130 ; Energy res.-41%



Gain~9790 ; Energy res.-41%

Achievements So far…

- The whole detector is ready for commissioning to the FOPI experiment starting Nov 2010
- Each component of the detector is tested in thoroughly for out gassing, gas tightness as well as HV stability.
- All the initial test results for major components are promising.
- Test results for the gain measurements for the GEMs are as expected.
- Design reviewing is going on in parallel.

Future Goals in coming months

- First goal to test the first prototype detector at FOPI experiment at GSI in beam time on 1st week of Nov 2010 and to see nice tracks….
- In parallel, Doing design reviews to improve some parts for the next run in March 2010
- Checking basic parameters like position, momentum and energy resolutions.
- FOPI has 0.6T of Magnetic Field. So interesting for momentum resolution measurements.
- Comparing the distortions due to ion space charge with simulations
- Relating tracks in TPC with tracks in CDC; also comparing measurements of RPC detectors in FOPI for PID.
- Operating the TPC at high particle rates
- To test the TPC at CB-ELSA in Bonn and a possibility to test at COMPASS exp. In CERN where we already have a test bench TPC.