

Updates on GEM related research for Chinese collaborators

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Five Chinese Groups

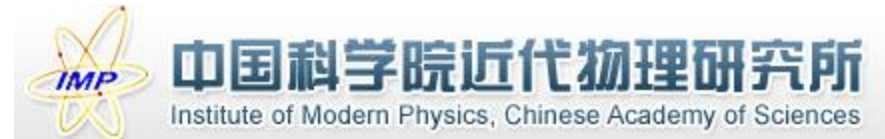
China Institute of Atomic Energy (CIAE)



Lanzhou University



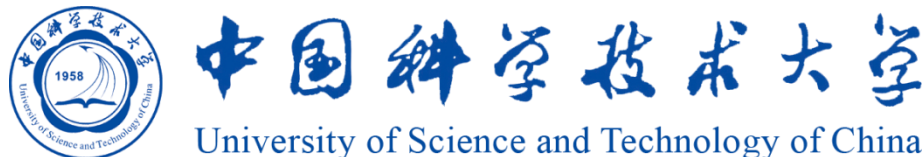
Institute of Modern physics



Tsinghua University



University of Science and Technology of China (USTC)



Common status for all groups

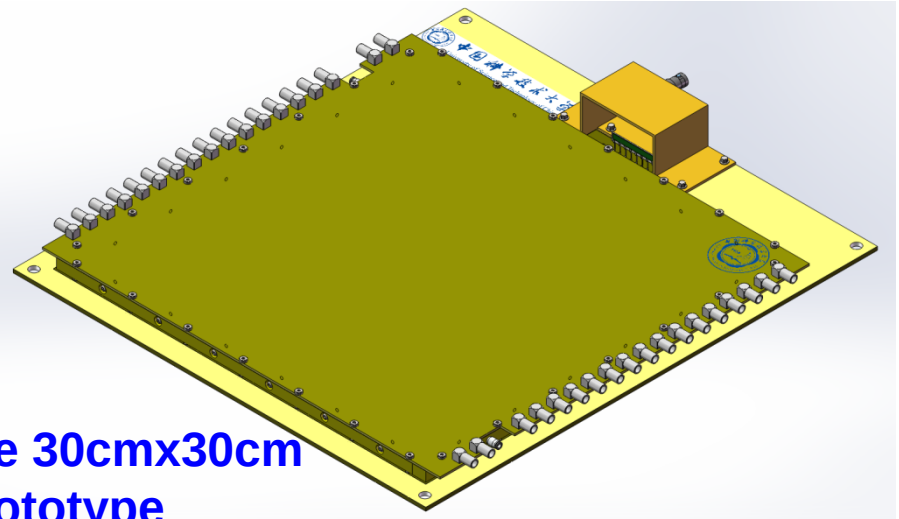
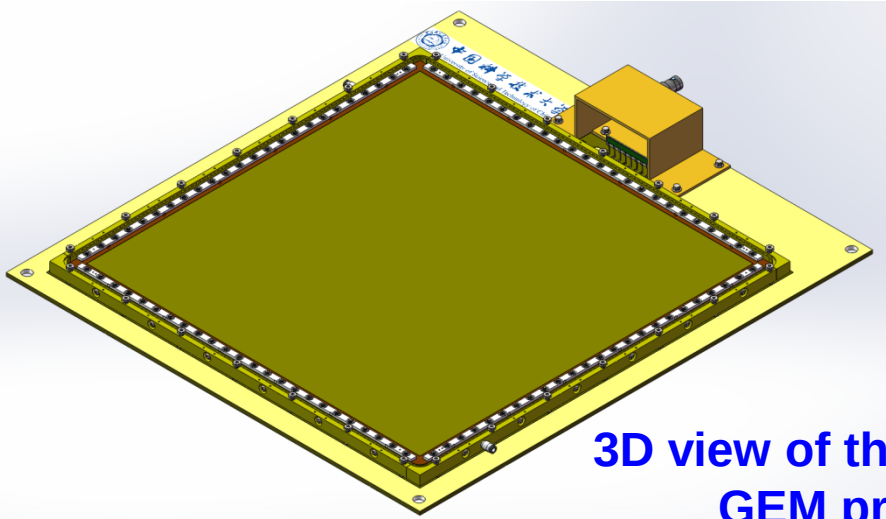
- Got electronics based on APV25 from Italian group
- Learning how to get it to work
- Setting up the test platform



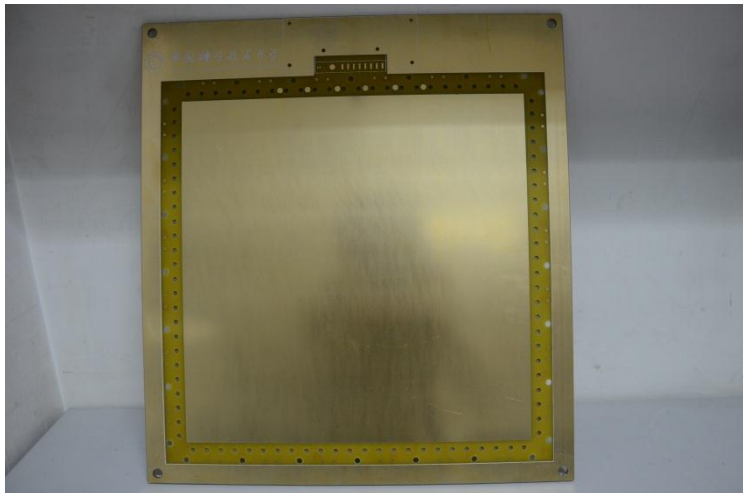
中国科学技术大学

University of Science and Technology of China

Design of the USTC 30cm x 30cm GEM(NS2 Tech.)



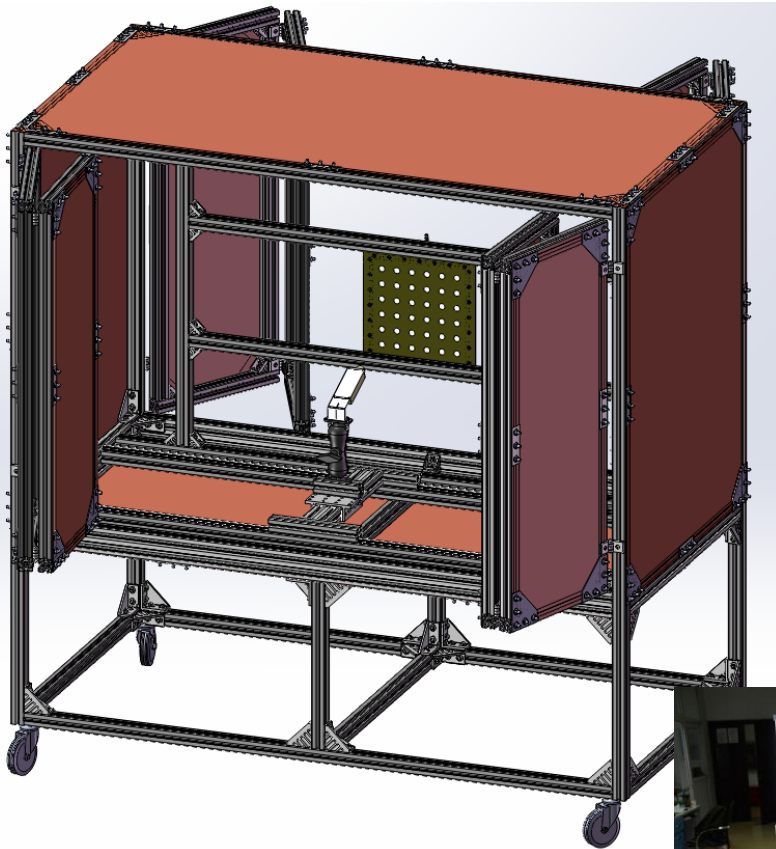
3D view of the 30cmx30cm
GEM prototype



Readout board



Test platform for large area GEM detectors



Model for the platform

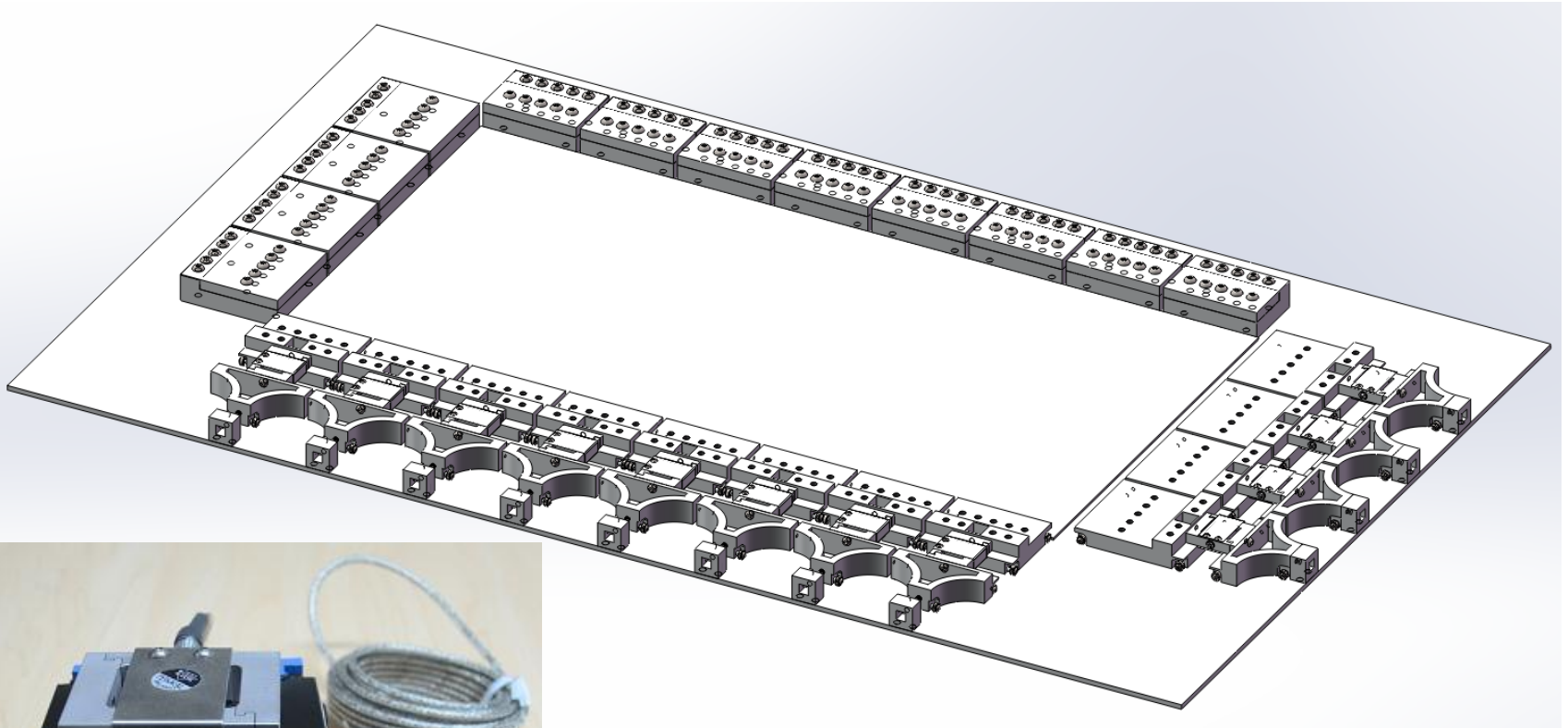


Picture for the test platform



Can be moved in 3 directions

Design for the tension test platform for large GEM foil



← Tension sensor

Near future work plan

- CERN 30cm x 30cm GEM test is moving on, hopefully will get some new results for the next meeting
- Modify the design of the new 30cm x 30cm GEM and build it at USTC
- Work on the APV25 electronics

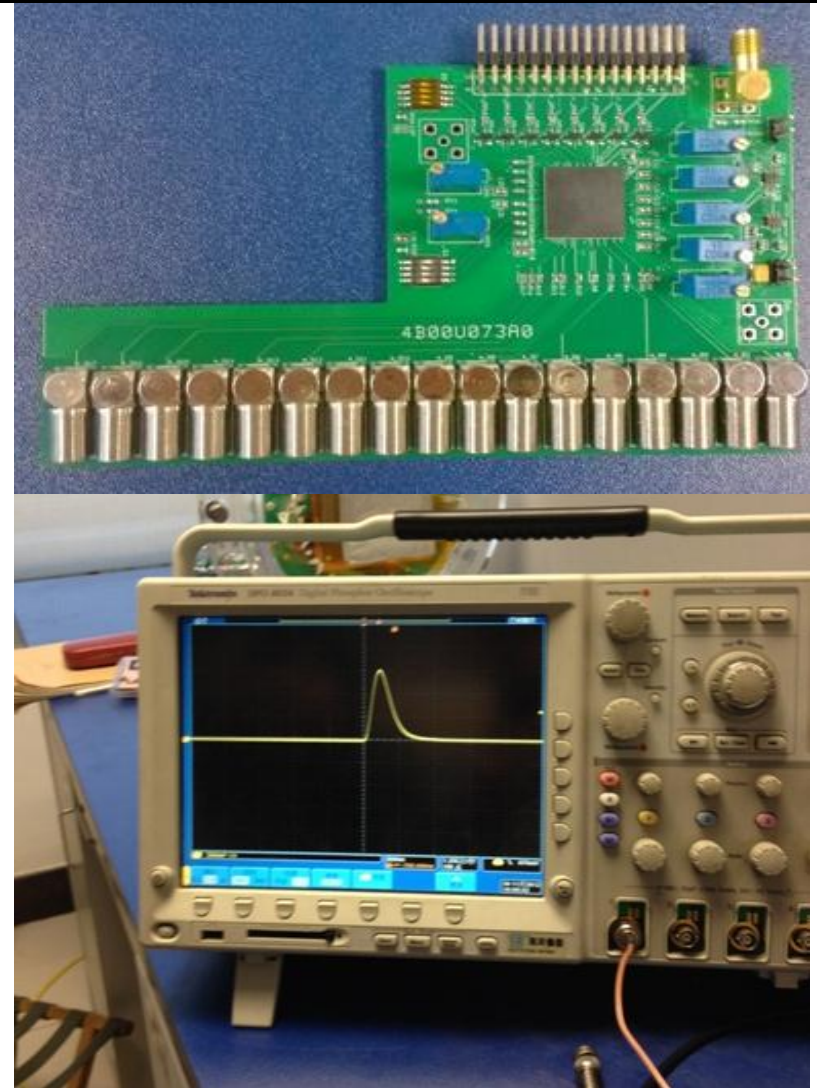


清華大學
Tsinghua University

→ ASIC-based FEE produced, to test with the GEM prototype.

→ Larger area GEM foil, information updated. Large GEM foil to be ready Feb. 2013.

→ The method to determine GEM spatial resolution is published in NIMA.



A practical method to determine the spatial resolution of GEM detector
Rensheng Wang^a, Yan Huang^a, Zhigang Xiao^{a,*}, Zhao Zhang^a, Rong Wang^b, Haiyan Gao^{a,c}



中国科学院近代物理研究所

Institute of Modern Physics, Chinese Academy of Sciences

Gaseous detector group @ IMP

- **Facilities**

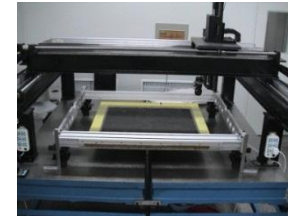
- 40 m2 clean room



- Automatic winding machine



- 2-dimensional measurement platform

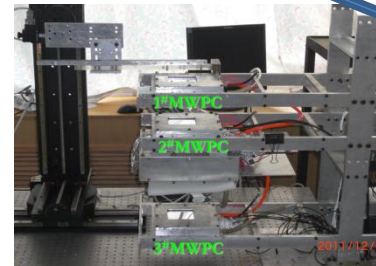


- Multi-component gas mixed system



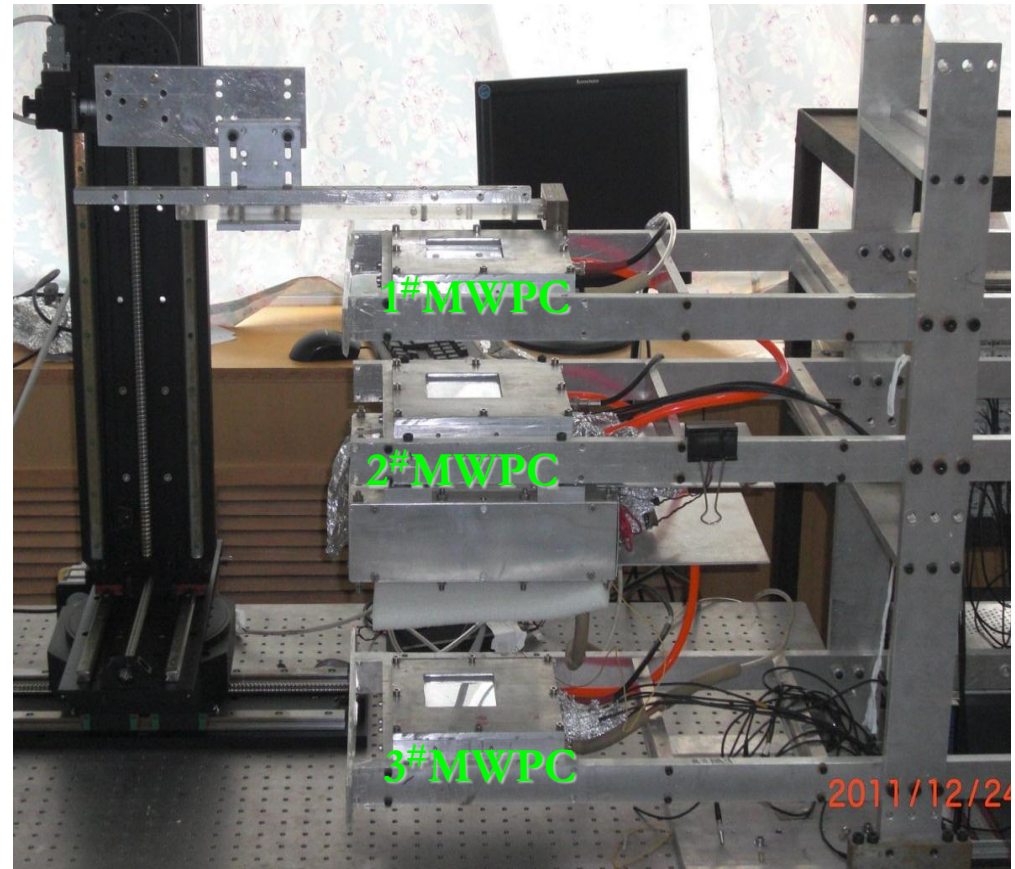
- Front-end electronics and data acquisition system

- Cosmic ray calibration system



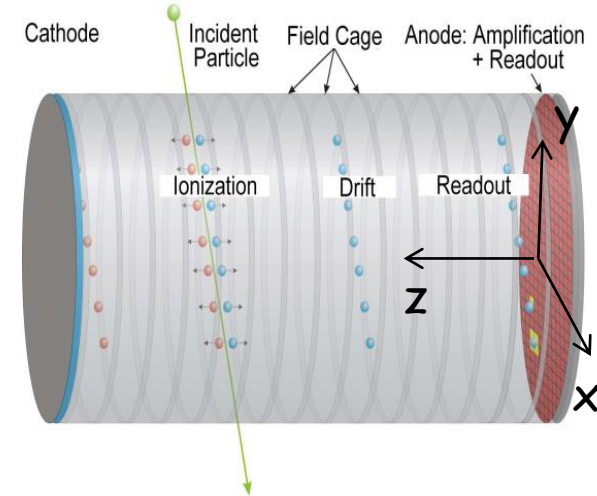
Cosmic Ray calibration system based on MWPC

- Consists of 3 MWPCs
- The sensitive area of each MWPC is 80mm*80mm
- Each MWPC consists of two anode wire planes (X,Y) segmented with the cathode wire planes
- Position resolution σ_x and σ_y are about 200 μ m respectively

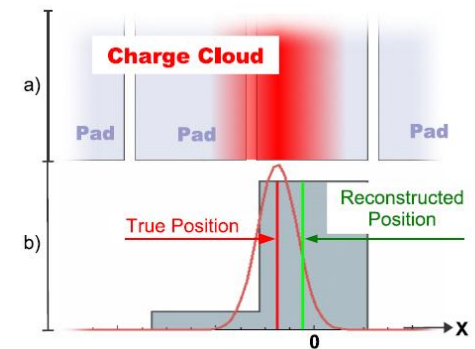


TPC R&D based on GEM

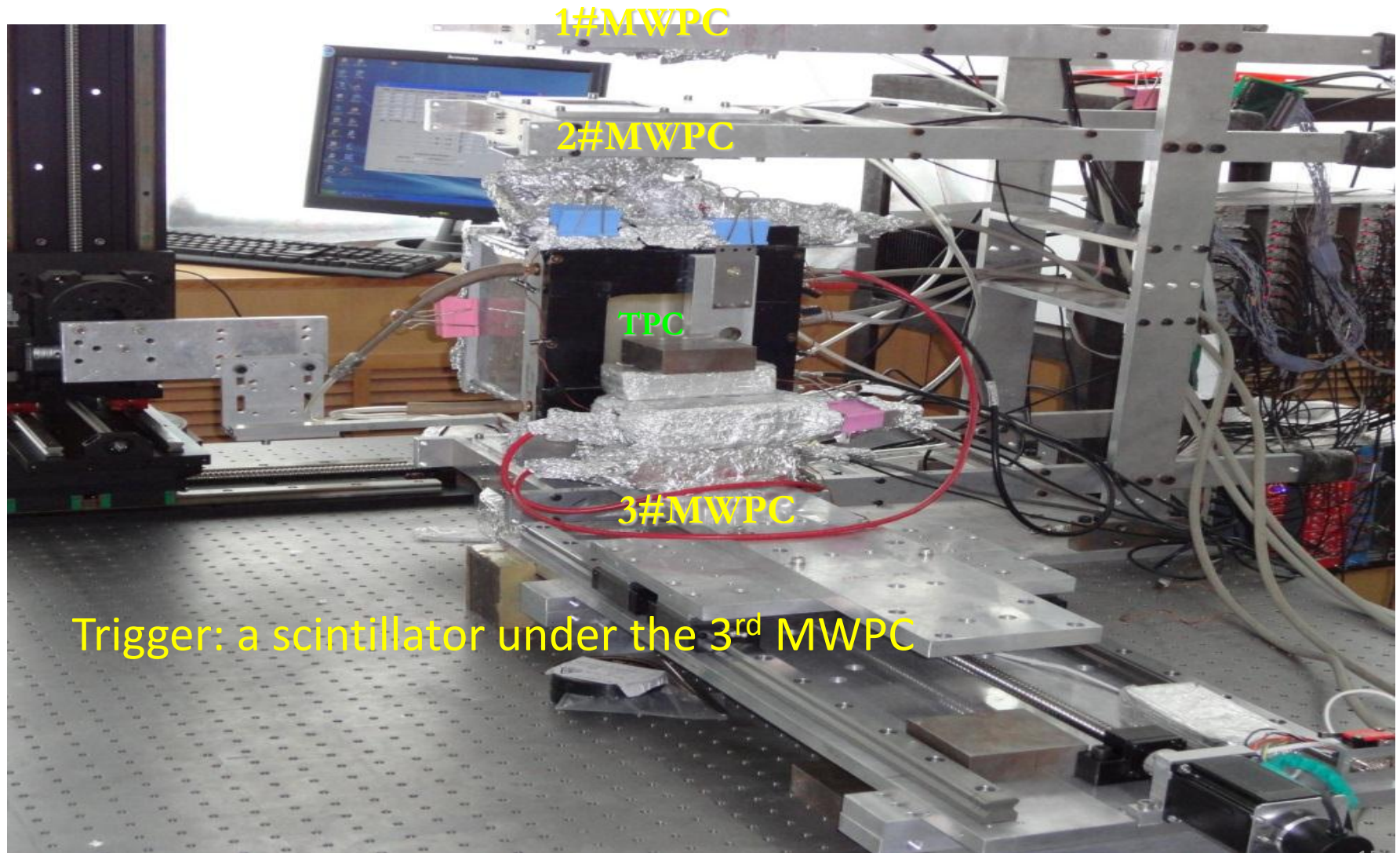
- Readout : GEM (pad readout, 2mm x 5mm)
- Electric field for sensitive area: 100 V/cm
- Readout pad is grounded
- X,Y coordinates are determined by the center-of-gravity of the hit charge
- Z is determined by the drift time and the electric field in the tube
- Drift length: 150mm



Sketch of a TPC

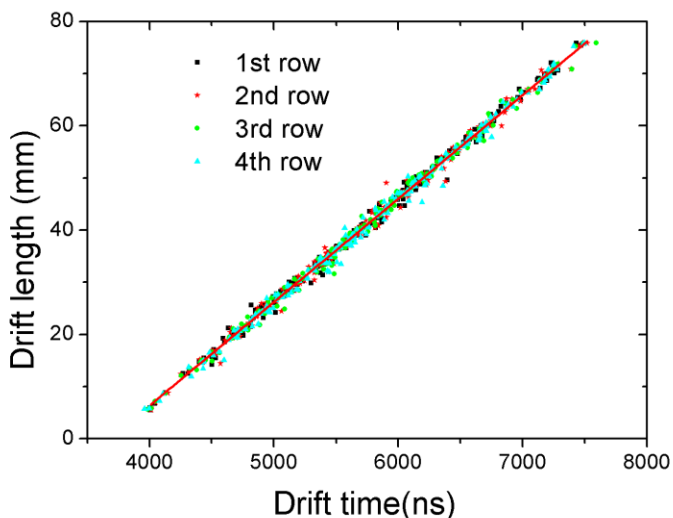


Test set-up for the TPC



Performance of the TPC

The drift length is provided by the tracking information from MWPC, drift time is the time discrepancy between trigger and signal from GEM

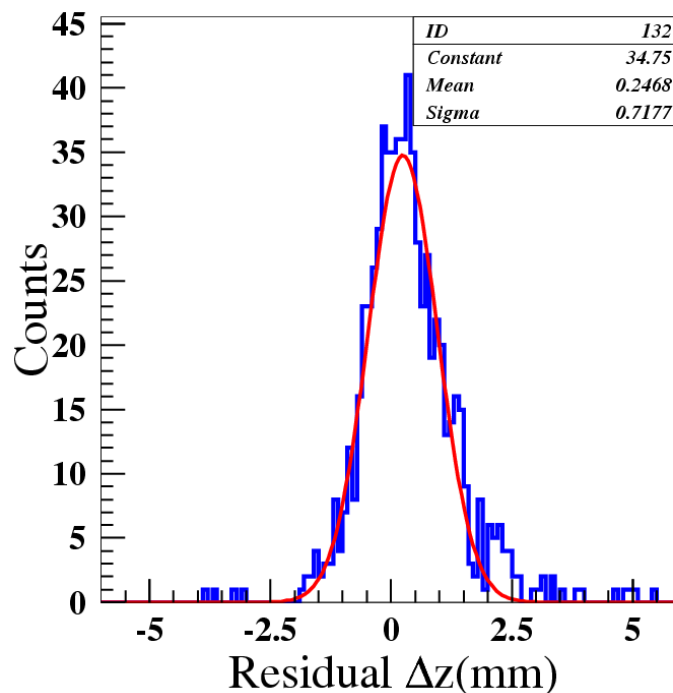


Scatter plot of drift length and drift time

Test condition: $E=130\text{V/cm}$

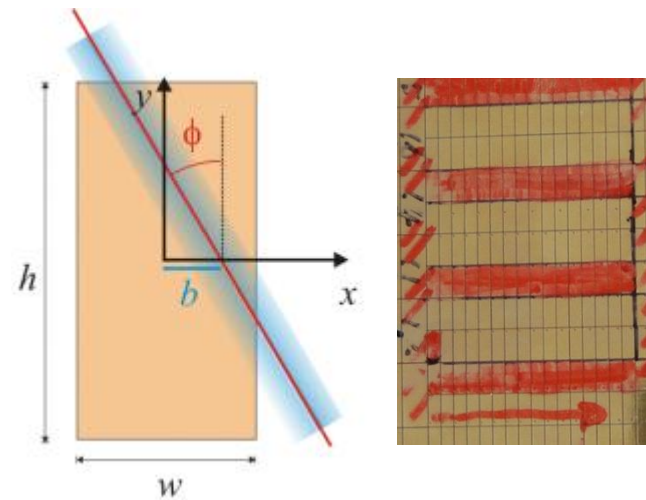
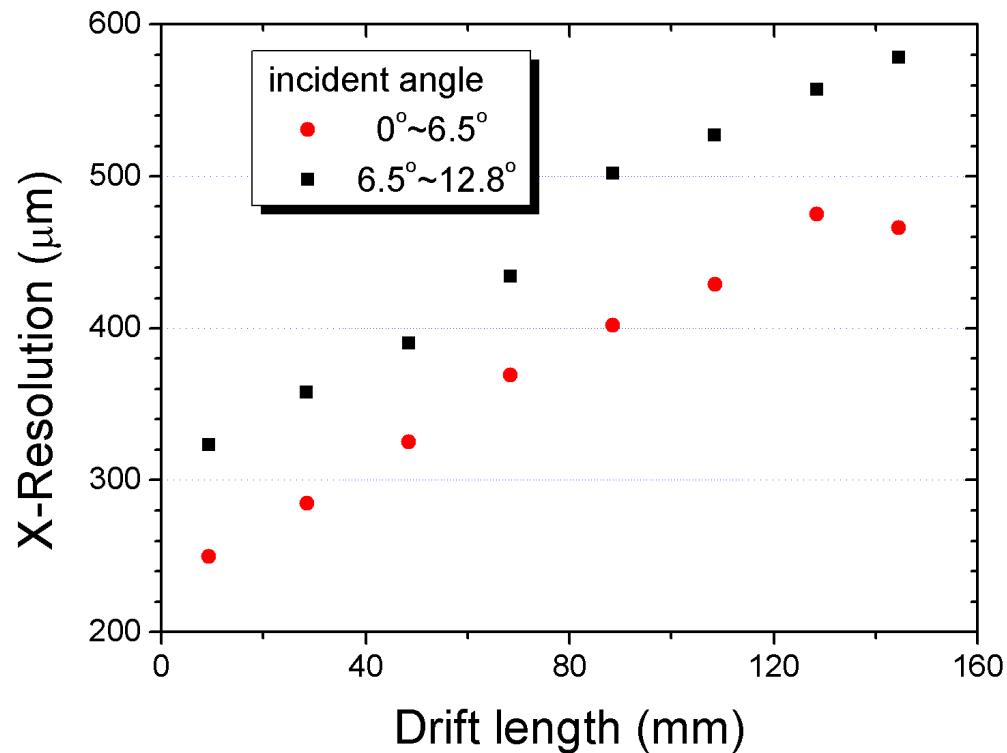
Gas mixture: 90%Ar+10%i-C₄H₁₀ (vol.)

After subtraction the systematic errors of the calibration system, the $\sigma_z=690\mu\text{m}$ was obtained.



Position resolution of drift length

Performance of the TPC



X resolution as a function of drift length

To do list

- Build another TPC with larger sensitive area
- Beam test for the TPC
- Doing test for different conditions



Current work

- Bought two GEM detectors from CERN. One is assembled, and the other will be assembled at CIAE
- Bought 1 m² GEM raw foil for studying and testing
- Order a training on GEM foil manufacturing at CERN in the beginning of next year



Additional information

1. APV25 electronics are ready to test
2. Ordering GEM raw foil from CERN
3. A professor from CERN RD51 visited CIAE group to discuss future collaboration on GEM detector

More news to share

- CMPGD 2012 workshop is held in Beijing during Dec.13-14, some of our collaborators mentioned the SoLID tracking system based on GEM detectors in their presentations
- Some people in the meeting are interested in the GEM foil manufacturing
- People from IHEP knows that a PCB factory in Beijing can be a candidate for manufacturing the GEM foil, they will contact the company next week