

Development and test of fast readout chambers for the CBM-TRD

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A three-stage GEM detector with two-dimensional strip readout [1] was tested with FEE based on the nXYTER chip (FEB, D revision) in the laboratory (Fig. 1). The active area of the detector is $10 \times 10 \text{ cm}^2$. The strip pitch of the 2-D readout board amounts to $800 \mu\text{m}$, while the width of upper and bottom strips are $160 \mu\text{m}$ and $640 \mu\text{m}$, respectively. The total number of readout channels was 256. The detector test was performed with a ^{55}Fe α source applying a gas mixture of Ar/CO₂ (85/15). The counting plateau of the tested detector is shown in Fig. 2. The profile of the collimated ^{55}Fe source along the x direction is displayed in Fig. 3; the profile in y direction is similar.

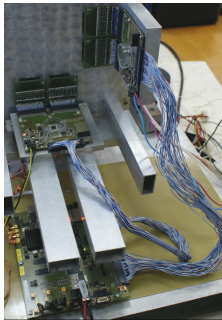


Figure 1: A three-stage GEM detector (back side view) with FEE electronics (based on the nXYTER) at the laboratory test stand

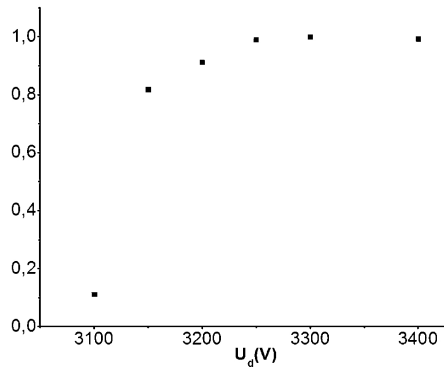


Figure 2: Counting plateau measured with the ^{55}Fe source

Two Dubna-type TRD prototypes were in addition tested in beam at the CERN-PS in November 2010 [2] using a pion-electron beam. These detectors are based on MWPC ($10 \times 10 \text{ cm}^2$) with pad readout, 2 mm anode wire pitch and an anode-cathode gap of 3 mm. The drift gaps are 2 mm and 5 mm respectively, the active area of the detector is $40 \times 40 \text{ mm}^2$ with a pad size of $5 \times 20 \text{ mm}^2$. Fiber radiators of 4.8 cm thickness were used, the same as for the ALICE TRD [3]. The detectors were operated with a gas mixtures of Ar/CO₂ (80/20) and Xe/CO₂ (80/20). To

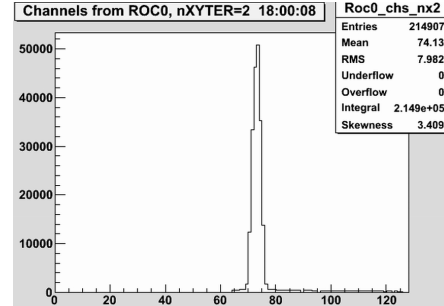


Figure 3: Profile of collimated ^{55}Fe source

identify pions as well as electrons, Čerenkov and Pb-glass counters were used.

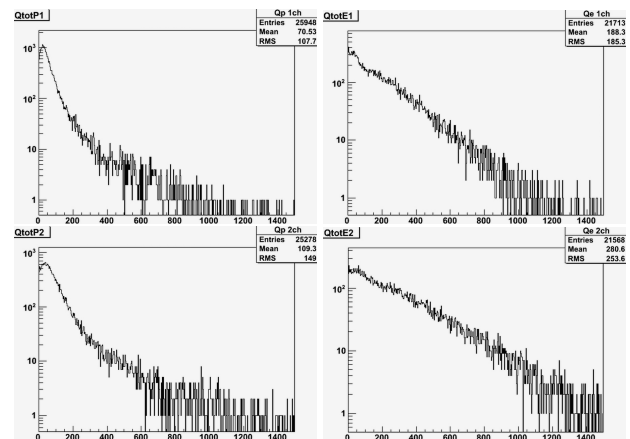


Figure 4: Total charge distribution for MWPC with 3 mm (top row) and 5 mm (bottom row) drift gap for 4 GeV/c pions (left column) as well as electrons (right column)

Preliminary result of the data analysis are presented in Fig. 4. One can see that the pion-electron separation can be performed by these prototypes for beam energies of 4-5 GeV/c. The preliminary value of spatial resolution measured along the wires is better than $300 \mu\text{m}$. Further data analysis is in progress.

References

- [1] S. Chernenko *et al.*, *CBM Progress Report 2009*, Darmstadt 2010, p. 34
- [2] D. Emschermann and C. Bergmann, *First common beam test of the CBM STS, RICH and TRD subsystems at the CERN Proton Synchrotron*, this report
- [3] ALICE TRD, TDR CERN/LHCC 2001-21