

Performance of the PANDA GEM-TPC prototype

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To face the challenges of the physics program in PANDA1, the cylindrical central tracker of the Target Spectrometer has to fulfill the following requirements: A high vertex resolution ($\sigma_z \sim 150 \text{ } \mu\text{m}$; $\sigma_z \sim 1 \text{ mm}$), high momentum resolution ($\sim 1 \%$), minimal material budget ($\sim 1\%$ of radiation length), high rate capability, resistance against aging, etc.

Due to the beam characteristics ($L=2 \cdot 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$, $2 \cdot 10^7 \text{ pbar p annihilations s}^{-1}$), the TPC has to work in a continuous mode, i.e. without

gating, which is another big challenge from the technical point of view.

Due to the rather long electron drift time, tracks from up to 1000 events are superimposed inside the TPC at any given time.

A Time Projection Chamber with Gas Electron Multiplier readout not only fulfills all the requirements above, but furthermore provides very good dE/dx measurement also in the region of low momenta, which is necessary for particle identification. In addition, the successful long-term operation of GEM-Detectors for example at the COMPASS2 experiment shows that this kind of detector has excellent properties concerning high rate capability. Due to asymmetric electrode configuration the GEM detectors have a high intrinsic suppression of ion back

flow. Such properties

enable a GEM-based TPC to operate in an ungated mode. A prototype GEM-TPC with a drift length of 72.78 cm and an outer diameter of 30 cm was designed and built by a collaboration of groups from GSI Darmstadt, HISKP Bonn, SMI Vienna, and TU Muenchen. This prototype was made to fit into the FOPI spectrometer at GSI where it is very useful to increase primary and secondary vertex resolutions. The progress and test results of a measurement campaign with the GEM-TPC prototype inside FOPI will be shown in this contribution.

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