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Study of resolution of the PANDA GEM detector with Garfield

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The PANDA (AntiProton ANnihilation at DArmstadt) experiment is one of the key projects at the future Facility for Antiproton and Ion Research, which is currently under construction at GSI, Darmstadt. The PANDA experiment will perform precise studies of antiproton-proton annihilations and reactions of antiprotons with nucleons of heavier nuclear targets. Particles emitted at angles covering the range from 5° to 22°, which are not covered fully by the central tracking detectors (STT and MVD), will be tracked by three planar GEM stations placed down-stream of the target. Each station consists of double planes with two projections per plane. The stations will be equipped with gaseous micro-pattern detectors based on Gas Electron Multiplier (GEM) foils as amplification stages. The chambers have to sustain a high counting rate of particles peaked at the most forward angles due to the relativistic boost of the reaction products as well as due to the small angle proton-antiproton elastic scattering.

Creation and propagation of an electron avalanche and its collection by a pad plane in a GEM detector has been simulated with the Garfield program. The influence of the size of the pad strips on the position resolution given by the distribution of charge in space at the readout plane has been investigated. It is determined by two main processes: drift of electrons in the electric field and their diffusion in the gas filling the detector. The time-dependence of the signal at the readout plane has been simulated to study the detector performance in high-rate environment.

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