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Characterization of Static Distortions in the sPHENIX TPC with a Steerable Laser System

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The sPHENIX Time Projection Chamber (TPC) is a gaseous drift detector designed to measure charged particle tracks. It is filled with Argon/CF4 and uses Gaseous Electron Multiplier (GEM) foils at readout for electron amplification and ion back-flow suppression. The electrons at readout are measured, converted to digital current, and their signal waveforms are processed to reconstruct the track. At this stage, the positions of hits and clusters along the track can be measured. A successful measurement of these hits and clusters must correct for distortion effects present in the TPC. There are three primary sources of distortion: static distortions from E and B fields, average distortion from space charge, and event-by-event distortions due to fluctuations in space charge. This poster focuses on a novel technique to measure the static distortions using a system of steerable ionizing lasers. These provide straight tracks at many different angles with an ability to sample the entire TPC volume between periods when beam is present. These laser induced tracks are used measure the distortions from non-uniform and slightly misaligned drift electric fields and solenoidal magnet fields in single voxels of the TPC. From these measurements, one can determine the static distortion correction. This poster presents the methodology by which the TPC volume is sampled by steering the laser and how the distortions are measured from reconstructed laser data.

Category

Experiment

Collaboration (if applicable)

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