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

Abstract:

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 wave forms are processed to reconstruct the track. At this stage, the positions of hits and clusters along the track can be measured. However, a successful measurement of these hits and clusters must correct for distortion effects present in the TPC. There are 3 sources of distortion: 1) static distortions from E and B fields, 2) average distortion from space charge, and 3) event by event distortions from fluctuations in space charge. This poster focuses on a novel technique to measure 1) using a system of steerable Ultra-Violet lasers. These line lasers provide straight tracks at many different angles with an ability to sample the entire TPC volume between periods where beam is present. These laser 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.