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Characterization of Time Dependent Distortions in the sPHENIX TPC using the Central Membrane

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The Time Projection Chamber (TPC) is the main tracking detector in sPHENIX. Charged particles which pass through the TPC ionize the gas, with the transverse position being given by the readout pad and the time for the ionization electrons to drift to the endcaps defining the z position. The ionization electrons are clustered together in order to track particles and determine their momenta. In order to accurately track particles, calibrations must be performed and the performance of the TPC must be understood. As part of normal operation, space charge builds up within the TPC, leading to tracking distortions. These distortions must be accurately characterized over time such that they can be corrected as they evolve. Several calibration systems are used for this, including a set of diffuse lasers which illuminate the Central Membrane of the TPC. Aluminum stripes, deposited on the Central Membrane at well-surveyed positions, emit photoelectrons when struck by the diffuse laser. The resulting pattern can be reconstructed and used to characterize the 3-dimensional distortions at the position of the Central Membrane. These distortions are then extrapolated to the endcaps of the TPC in order to provide corrections throughout its entire volume. This poster will discuss the design, the algorithm, and the performance of the time dependent distortion corrections in the sPHENIX TPC and identify how this effort fits into the broader sPHENIX TPC calibration scheme.

Category

Experiment

Collaboration (if applicable)

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