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Design and construction of the sPHENIX TPC

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The sPHENIX experiment at RHIC will be starting its operations in early 2023. It is designed to study heavy ion and proton-proton collisions by measuring hard QCD processes. The Time Projection Chamber (TPC) is used in the sPHENIX detector as one of the main tracking detectors. The Time Projection Chamber (TPC) is used in the sPHENIX detector as one of the main tracking detectors. It is designed for operation in a 1.4 T magnetic field and high luminosity to provide a rapidity coverage of $|\eta| < 1.1$ and over the full azimuth.

The sPHENIX TPC design involves optimization of the gas mixture for fast operation in a 1.4 T magnetic field to reduce ion backflow (IBF) and provide sufficient amplification with a quadruple-GEM gain structure. Signals will be collected with zigzag patterned readout pads, and processed with the SAMPA ASIC. Two laser systems are designed to calibrate the static and dynamic distortions.

We will present the final design of the sPHENIX TPC along with the R&D results that drove the decisions.

Primary authors: SHULGA, Evgeny (Stony Brook University); SPHENIX COLLABORATION (sPHENIX collaboration)

Presenter: SHULGA, Evgeny (Stony Brook University)

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