

R&D studies of a small-strip thin gap chamber as a STAR forward tracker

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The STAR experiment at the Relativistic Heavy Ion Collider is en route on a forward upgrade to address open questions in the QCD physics in very low and very high Bjorken- x , during $p+p$ and $p+Au$ collisions planned in the years 2021 and beyond. Measurements from Au+Au collisions will enable to probe the longitudinal structure of the nuclear initial state as well as transport properties. The detector upgrades, the Forward Calorimeter System and the Forward Tracking System, provide precise identification of pions, photons, electrons, jets and as well as hadrons in the pseudorapidity region 2.5 to 4. The forward tracking system is a combination of silicon mini-strip detectors and small-strip thin gap chambers (STGC), which provide charge sign discrimination, and excellent photon and electron identification.

STGCs are the variant of Multi-Wire Proportional Counters, which provides better spatial resolution at high particle flux regions. In between collision point and forward calorimeters four planes of STGC chambers are planned to be installed, and each plane contain two chambers to measure $x-y$ diagonal position for tracking. Two prototype chambers, each $(30\text{ cm})^2 \times 0.28\text{ cm}$ was built. In this talk, we will present the test results from the R&D studies aimed to measure the performance of different gas mixtures and the results from 200 GeV Au+Au collisions.