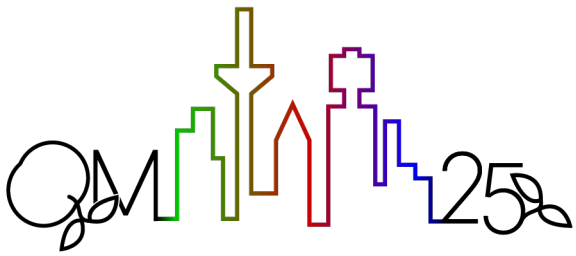

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$\pi^{\pm}$, $\mathrm{K}^{\pm}$, $\mathbf{p}(\bar{p})$ production measurements with Au+Au Collisions from $\sqrt{s_{\mathrm{NN}}} = 3.2 - 27$ GeV with STAR

One of the main physics goals of the Beam Energy Scan (BES) program at RHIC is to study the QCD phase diagram, especially around the phase transition between the quark-gluon plasma (QGP) and hadronic matter. BES Phase-I studied Au+Au collisions from center-of-mass energies ($\sqrt{s_{\mathrm{NN}}}$) of 7.7 to 62.4 GeV. BES Phase-II extended these measurements in several important ways, one of which was the addition of a fixed-target program that pushed the collision energy down to 3.0 GeV (or baryon chemical potential, μ_{B}, up to 720 MeV).

Fixed-target (FXT) collisions at STAR allow for a more extensive scanning of the QCD phase diagram to an important region where the QCD critical point may lie, and to a region dominated by dense baryonic matter. One key measurement in both FXT and collider modes is the spectrum of the light hadrons ($\pi^{\pm}$, $\mathrm{K}^{\pm}$, $\mathrm{p}(\bar{p})$) as a function of transverse momentum, rapidity, and collision centrality. Such measurements enable the empirical determination of the colliding system's location on the phase diagram at chemical freeze-out. Moreover, certain observables involving the production of hadrons have been proposed as a signature of a first order phase transition between hadronic matter and QGP. Specifically, studying the rapidity density distribution (dN/dy) of protons as a function of center-of-mass energy has been suggested as a way to probe the nature of the QCD phase transition from hadron gas to QGP.

In this talk, the transverse momentum spectra and rapidity density distributions of pions, kaons, and (anti-)protons are presented in an energy range of $\sqrt{s_{\mathrm{NN}}} = 3.2 - 27$ GeV, which includes measurements from both FXT and collider configurations. Implications of these measurements on the QCD phase diagram are then discussed.

Category

Experiment

Collaboration (if applicable)

STAR

Author: LABONTE, Mathias

Presenter: LABONTE, Mathias

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