Measurements of Light and Strange Hadron Production in the High Baryon Density Region Using Fixed-Target Collisions with STAR

To be determined

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One of the main physics goals of the Beam Energy Scan (BES) program at RHIC is to study the phase diagram of the QCD matter. The lowest center-of-mass energy ($\sqrt{s_{\rm NN}}$) achieved in the collider mode is 7.7 GeV, and the fixed target collisions included in BES-II extend the energy down to $\sqrt{s_{\rm NN}}$ = 3.0 GeV, enabling us to probe the QCD matter with even higher baryon density. The production of light and strange hadrons is sensitive to the properties of the medium created in heavy-ion collisions, and can provide insight to the onset of deconfinement.

In this talk, we will present the measurements on light and strange hadron production in Au+Au collisions from $\sqrt{s_{\rm NN}}$ = 3.0 to 7.2 GeV. The transverse momentum spectra of $(K^{\pm}, K^0_S, \phi, \Lambda, \Xi^-)$ at $\sqrt{s_{\rm NN}}$ = 3.0 GeV will be reported. The rapidity and centrality dependence of these strange hadron yields will also be presented, whose trends are well described by hadronic transport models. The Λ/p and Ξ^-/Λ yield ratios at the same energy will be shown as well, which are inconsistent with Grand Canonical Ensemble but can be described by Canonical Ensemble with a strangeness correlation length of $r_C \sim 5.7$ fm. This suggests the dominance of hadronic scattering in the Equation-of-State of the medium created in 3.0 GeV Au+Au collisions. In addition, the transverse momentum and rapidity distributions of $(\pi^{\pm}, K^{\pm}, p,\ K^0_S, \Lambda, \bar{\Lambda})$, together with K^0_S/Λ and $\bar{\Lambda}/\Lambda$ yield ratios, from $\sqrt{s_{\rm NN}}$ = 3.2 to 7.2 GeV will be reported. These results will be compared with those at higher energies and the physics implications on medium properties will be discussed.