Measurements of near-threshold strange and anti-strange hadron production at STAR

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Abstract

Strange hadrons have been suggested as sensitive probes for the medium properties of the nuclear matter created in heavy-ion collisions. Dense baryon-rich medium is formed during collisions at center-of-mass energies of a few-GeV. Since strange hadrons are produced near or below the threshold, their phase space distribution and yield ratio may provide strong constraints on the equation of state (EoS) of high baryon density matter.

In this presentation, the recent results on strange hadron production in Au + Au collisions at $\sqrt{s_{\mathrm{NN}}}$ = 3.0, 3.2, 3.5, 3.9, 4.5, 5.2, 6.2, 7.2 GeV with the fixed-target mode from the STAR experiment will be presented. The transverse momentum spectra (p_{T}), rapidity density distributions (dN/dy) of $\mathrm{K}^{\pm}$, $\mathrm{K}^0_{\mathrm{S}}$, ϕ, Λ, $\overline{\Lambda}$, Ξ^-, $\overline{\Xi}^+$ and their yield ratios $\Lambda/\mathrm{K}^0_{\mathrm{S}}$, $\Xi^-/\mathrm{K}^0_{\mathrm{S}}$, $\Lambda/\overline{\Lambda}$, $\Xi^-/\overline{\Xi}^+$, ϕ/K^- will be presented as a function of centrality and collision energy. The p_{T} spectra and dN/dy ratios of baryon to anti-baryon will provide important input to differentiate between hadron production via quark coalescence and hadronic scattering. Results on $\Lambda/\mathrm{K}^0_{\mathrm{S}}$ hints at an onset of deconfinement in this energy range. We will also explore the centrality dependence of strange hadron yields and the evolution of their kinetic freeze-out temperature T_{Kin} and average radial expansion flow velocity $\langle\beta_{\mathrm{T}}\rangle$ extracted from the Blast-Wave model in the reported energy range, which can give insights on the EoS of the created medium. These results will be compared with those from higher collision energies and the physics implications will be studied by comparing to the thermal and transport model calculations.