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Study of Baryon Number Transport via Ω-hadron Correlations

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In nuclear collisions at low RHIC energies, although s and $\bar{s}$ quarks are produced in pairs, there is a significant excess of Ω^- over $\bar{\Omega}^+$ which suggests that Ω^- carries a net baryon number. Such an excess of net baryon number at mid-rapidity in Au+Au collisions manifests effective mechanisms of baryon number transport over a large rapidity gap. Gluon junction has been proposed as a possible structure allowing for baryon number transport over large rapidity gaps. We also argue that the net Ω^- production on the proton-going side of p+Au collisions may provide a sensitive probe of the gluon junction mechanism. We will present AMPT model simulations of Ω-K, Ω-Ξ, and Ω-Λ correlations in Au+Au collisions at $\sqrt{s_{NN}}$ = 14.6 GeV and 7.7 GeV as well as p+Au collisions at 62 GeV. These correlations reflect the effects of strangeness conservation and baryon number transport in nuclear collisions. In particular, the Ω-hadron correlations in AMPT show distinct dependence on baryon densities indicating quantitative sensitivity to details of the baryon number transport dynamics. Results from the default and string-melting versions of the AMPT calculations are used to examine the imprints on such correlations left by the hadronization schemes of string fragmentation and quark coalescence, respectively. AMPT calculations predict very significant differences in the correlations at 7.7 GeV between these hadronization schemes, which can be used experimentally to investigate the extent of roles played by partonic degrees of freedom in Au+Au collisions at this energy. Implications on the experimental program to measure these correlations with the STAR experiment at RHIC will also be discussed.

Category

Experiment

Collaboration (if applicable)

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