Measurements of p-Λ and d-Λ correlations in Au+Au collisions from the fixed-target program at the STAR experiment

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Abstract

Heavy-ion collisions offer a new way to understand nucleon-hyperon (N-Y) interactions. The two-particle correlation, which reveals valuable information about the space-time evolution of the particle-emitting source and final state interactions involving hyperons, is the primary observable of interest. The measurements of p-Λ and d-Λ correlations can shed light on the N-Y two body and the N-N-Y three body interactions, which are important to understand the inner structure and equation of state of neutron stars. Further, the measurement of d-Λ correlations provides insight into the internal structure and binding energy of light hypernuclei.

In this talk, we present the precise measurement of p-Λ correlation using high statics data and the first measurement of d-Λ correlation with $\sqrt{s_{\rm NN}} = 3$ GeV Au+Au collisions from the fixed-target program at the STAR experiment. The correlation functions are analyzed within the Lednicky-Lyuboshitz formalism in order to characterize the emission source size, the scattering length, and the effective range of p-Λ and d-Λ interactions. The extracted parameters will be compared to those from other baryon correlations (p-p, d-d, Λ-Λ) and various effective theory model calculations. Finally, physics implications on final state interactions involving hyperons and the hypertriton inner structure will be discussed.