Femtoscopy of Protons and Light Nuclei in Au+Au Collisions at $\sqrt{s_{\rm NN}}$ = 3 GeV, 14.6 GeV, and 19.6 GeV from RHIC-STAR

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Two-particle correlations at small relative momenta contain information about the space-time characteristics of the particle emitting source and final-state interaction effects. Light nuclei, such as deuteron (d), triton (t), and helium (^{3}He, ^{4}He), are loosely bound objects that are expected to be formed at the late stage of relativistic heavy-ion collisions. The measurement of two-particle correlations for various light nuclei combinations provides a unique tool to obtain detailed information about the spatial and temporal evolution of the particle emitting source as well as the isospin dependence of strong interaction. Moreover, this analysis can be further applied to investigate the production mechanism of light nuclei in heavy-ion collisions, such as coalescence vs. thermal production.

In this talk, we will present the first measurements of proton and light nuclei correlation functions in Au+Au collisions with fixed-target and collider modes recorded by the STAR experiment at RHIC. The experimental results will be fitted by model to extract the size of emitting source and the properties of final state interactions. The collision energy and centrality dependence of the source size will be studied. Finally, the implications for the production mechanism of light nuclei will be discussed.