Production of light nuclei in Au+Au collisions with the STAR BES-II program

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The studies of the production of light nuclei, such as deuteron, triton, and helium nuclei in heavy-ion collisions, are essential for understanding the dynamics of nuclear matter under extreme conditions and provide valuable insights into the underlying equation of state. In addition, the yields and ratios of light nuclei serve as an effective method for distinguishing between the thermal and coalescence models. The significantly larger datasets from the STAR Beam Energy Scan phase-II, combined with a wider collision energy range extending to the high baryon density region and enhanced detector capabilities, allow for more precise and comprehensive measurements compared to phase-I.

In this talk, we will present measurements of light nuclei production, including p, $\bar{\text{p}}$, d, $\bar{\text{d}}$, t, ^{3}He at $\sqrt{s_{\text{NN}}} \geq 7.7$ GeV and p, d, t, ^{3}He, ^{4}He at $\sqrt{s_{\text{NN}}} < 7.7$ GeV, in Au+Au collisions at BES-II energies of $\sqrt{s_{\text{NN}}} = 3$ - 27 GeV. The results will cover the centrality and rapidity dependence of transverse momentum (p_{T}) spectra and dN/dy. We will also report the coalescence parameters (B_{A}), along with the kinetic freeze-out temperature (T_{kin}) and collective velocity (β_{T}) for each nucleus. The physics implications of these results will be discussed.