Measurements of light hypernuclei production and properties in Au+Au collisions from STAR experiment

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Hypernuclei are bound states of nucleons and hyperons. The hyperon−nucleon (Y-N) interaction, which is an essential ingredient in the equation of state of high-baryon-density matter, remains poorly constrained. Also, the production mechanisms of hypernuclei are currently not well understood. Precise measurements of hypernuclei properties and production yields can shed light on their production mechanisms and the strength of the Y-N interaction.

In heavy-ion collisions, light hypernuclei are expected to be abundantly produced at low collision energies due to the high baryon density. Thanks to the high statistics data collected by the STAR BES II program which extends the collision energy down to $\sqrt{s_{NN}} = 3$ GeV, a series of measurements on light hypernuclei have been carried out. In particular, the hypernuclei to light nuclei yield ratios, S_3 and S_4, have been measured to study the medium properties at freeze-out.

In this presentation, we will report production yields of light hypernuclei ($^{3}_{\Lambda}$H, $^{4}_{\Lambda}$H) in Au+Au collisions at $\sqrt{s_{NN}} = 3$, 19.6, and 27 GeV. Hypernuclei to light nuclei yield ratios, S_3 and S_4, will also be presented. We will also report precise measurements of $^{3}_{\Lambda}$H branching ratio and lifetimes of light hypernuclei ($^{3}_{\Lambda}$H, $^{4}_{\Lambda}$H, and $^{4}_{\Lambda}$He). The results will be compared with model calculations and physics implications will be discussed.