New Hypernuclei Measurements from STAR

Abstract

Hypernuclei are bound states of hyperons (Y) and nucleons (N). Measurements on their yields can help us investigate their production mechanisms. In particular, the $^{5}_{\Lambda}$He and $^{4}_{\Lambda}$H(e) are bounded substantially tighter compared to the $^{3}_{\Lambda}$H. The large radius of the $^{3}_{\Lambda}$H leads to suppression in coalescence models, but not in the thermal model where the size of the nucleus does not play a role. As such, studying the $A = 3 - 5$ hypernuclei yields allow us to extract information on the effects of hypernuclear binding on hypernuclei production in heavy-ion collisions. Meanwhile, measurements on their intrinsic properties can constrain the Y-N and Y-Y interactions, which are crucial ingredients for the equation-of-state of strange matter in dense environments.

In this talk, we will present $^{5}_{\Lambda}$He yields in Au+Au collisions at $\sqrt{s_{NN}} = 3$ GeV, $^{4}_{\Lambda}$H(e) yields in Au+Au collisions at $\sqrt{s_{NN}} = 3 - 4.5$ GeV, $^{3}_{\Lambda}$H yields in Au+Au collisions at $\sqrt{s_{NN}} = 3 - 27$ GeV, and $^{3}_{\Lambda}$H($^{3}_{\bar{\Lambda}}\bar{\mathrm{H}}$) yields in Ru(Zr)+Ru(Zr) collisions at $\sqrt{s_{NN}} =$ 200 GeV. These measurements and thier yield ratios will be compared to thermal and coalescence model calculations, and implications on their production mechansims will be discussed. In addition, we will present the first measurement of $\bar{\mathrm{R}}_3$, the relative branching ratio of $^{3}_{\bar{\Lambda}}\bar{\mathrm{H}}$, which can provide information on the spin of the $^{3}_{\bar{\Lambda}}\bar{\mathrm{H}}$.