

${}^5_{\Lambda}\text{He}$, ${}^4_{\Lambda}\text{H}(\text{e})$, and ${}^3_{\Lambda}\text{H}$ Measurements from the Beam-Energy Scan-II Program

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Despite extensive measurements on the production yields of light nuclei in heavy-ion collisions, a consensus on their formation mechanism remains elusive. While coalescence models can describe $A < 4$ nuclei yields with remarkable accuracy over a wide range of collision energies, recent results at the LHC indicate that the yields of ${}^4\text{He}$ is underestimated by such models. In contrast to normal nuclei, hypernuclei carry strangeness and offer an additional dimension for such studies. In particular, the ${}^5_{\Lambda}\text{He}$ and the $A = 4$ mirror hypernuclei (${}^4_{\Lambda}\text{H}(0^+)$, ${}^4_{\Lambda}\text{He}(0^+)$) are all bounded substantially tighter compared to the hypertriton (${}^3_{\Lambda}\text{H}$). The existence of excited states (${}^4_{\Lambda}\text{H}(*1^+)$, ${}^4_{\Lambda}\text{He}(*1^+)$) may also enhance the measured yields through feed-down. As such, studying the $A = 3 - 5$ hypernuclei yields allow us to extract information on the effects of hypernuclear binding, spin, and isospin content on hypernuclei production in heavy-ion collisions.

In this talk, we will present the first measurements of ${}^5_{\Lambda}\text{He}$ production in heavy-ion collisions utilizing the fixed-target dataset at $\sqrt{s_{NN}} = 3$ GeV from the STAR beam energy scan II program. We will also present the yields of ${}^4_{\Lambda}\text{He}$, ${}^4_{\Lambda}\text{H}$, and ${}^3_{\Lambda}\text{H}$ from $\sqrt{s_{NN}} = 3 - 27$ GeV. The transverse momentum spectra and rapidity distributions will be shown. Their mean transverse momenta will be presented as a function of energy, and compared to a blast-wave expectation using the freeze-out parameters from light hadrons. Calculations from the thermal model and coalescence model will be compared to these results, and the physics implications will be discussed.