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Collision Energy Dependence of Hypertriton Production in Au+Au Collisions at RHIC

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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. In contrast to normal nuclei, hypernuclei carries strangeness and can offer an additional dimension for such studies. In particular, the hypertriton ${}^{3}_{\Lambda}\mathrm{H}$, a bound state consisting of a proton, neutron and Λ hyperon, is the lightest known hypernucleus with a very small binding energy of $\sim$ 130 keV. Currently, published measurements of the ${}^{3}_{\Lambda}\mathrm{H}$ yield are scarce and are limited to low ($\sqrt{s_{\mathrm{NN}}} < 5$ GeV) or high collision energies ($\sqrt{s_{\mathrm{NN}}} \geq 200$ GeV). Precise measurements on the energy dependence of ${}^{3}_{\Lambda}\mathrm{H}$ production will give invaluable information on hypernuclei production mechanisms due to its unique intrinsic properties.

In this presentation, we will present comprehensive measurements of the collision energy dependence of ${}^{3}_{\Lambda}\mathrm{H}$ transverse momentum p_{T} and p_{T} -integrated yield at mid-rapidity in Au+Au collisions at ten collision energies between $\sqrt{s_{\mathrm{NN}}} = 3$ and 27 GeV. It is found that thermal model calculations overestimated the ${}^{3}_{\Lambda}\mathrm{H}$ yield and the ${}^{3}_{\Lambda}\mathrm{H}/\Lambda$ ratio by a factor of $\sim$ 2 in the reported energy region, while coalescence calculations are closer to data. We will also present the mean p_{T} of ${}^{3}_{\Lambda}\mathrm{H}$ as a function of collision energy. The mean p_{T} of ${}^{3}_{\Lambda}\mathrm{H}$ is observed to be lower than the Blast-Wave expectation using the same freeze-out parameters from light hadrons. These observations suggest that similar to light nuclei, hypertritons are formed at a later stage than light hadrons possibly through nucleon/hyperon coalescence during these collisions.

Primary author: 鄢, 雨楼 (N)

Presenter: 鄢, 雨楼 (N)

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