Measurements of ${}^{3}_{\Lambda}$H and ${}^{4}_{\Lambda}$H directed flow in $\sqrt{s_{NN}} = 3$ GeV Au+Au collisions from STAR

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Abstract

Collective flow has been commonly used for studying the propertries of nuclear matter created in high-energy heavy-ion collisions, due to its high sensitivity on early stages of the collision dynamics. The first-order Fourier coefficient of azimuthal distributions of produced particles v_1, also called directed flow, has been analyzed for different particle species from the lightest mesons to light nuclei in such collisions. So far, the collectivity for hyper-nuclei has not been studied. Hyper-nuclei directed flow measurements at low energies would shed light on the hyperon-nucleon (YN) interaction in dense nuclear medium with finite pressure.

In this talk, we report the first observation of the hyper-nuclei ${}^{3}_{\Lambda}$H and ${}^{4}_{\Lambda}$H directed flow v_1 in $\sqrt{s_{NN}} = 3$ GeV mid-central (5-40%) Au+Au collisions at RHIC. This is a part of the beam energy scan program (fixed target mode) carried by the STAR experiment in the year 2018. Hyper-nuclei ${}^{3}_{\Lambda}$H are reconstructed via both 2-body and 3-body decay channels, while ${}^{4}_{\Lambda}$H are reconstructed via 2-body decay channel. The directed flow of ${}^{3}_{\Lambda}$H and ${}^{4}_{\Lambda}$H are compared with those of the copiously produced light nuclei such as ^{3}He and ^{4}He. It is observed that the midrapidity slopes of v_1 for the hyper-nuclei ${}^{3}_{\Lambda}$H and ${}^{4}_{\Lambda}$H seem to follow a mass number scaling implying that the coalescence of hyperons and nucleons is the dominant mechanism for the hyper-nuclei production in these collisions.