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. In this talk, we report the first observation of the hyper-nuclei ${}^{3}_{\Lambda}$H and ${}^{4}_{\Lambda}$H directed flow v_1 from $\sqrt{s_{NN}} = 3$ 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 2018. About 3500 and 6100 ${}^{3}_{\Lambda}$H candidates from their two-body and three-body decay channels respectively, and about 5800 ${}^{4}_{\Lambda}$H candidates from their two-body decay channel are used in this analysis. The directed flow of ${}^{3}_{\Lambda}$H and ${}^{4}_{\Lambda}$H are compared with those of the copiously produced particles such as p, Λ, d, t, ^{3}He, and ^{4}He. It is observed that the slopes of v_1 at midrapidity for the hyper-nuclei ${}^{3}_{\Lambda}$H and ${}^{4}_{\Lambda}$H follow a mass number scaling implying that coalescence process is a dominant mechanism for the hyper-nuclei production in the collisions.