Light- and Hyper-Nuclei Collectivity in Au+Au Collisions at RHIC-STAR

Chengdong Han, Sharang Rav Sharma and Yue Xu

Studying the production and collectivity of light and hyper-nuclei in high-energy nuclear collisions in the high baryon density region can help us understand how they form and how hyperons interact with nucleons under finite pressure.

In this talk, we will present the first results on the energy dependence of directed flow v_1 of light and hyper-nuclei (p, d, ^{3}He, and Λ, $^3_\Lambda$H, $^4_\Lambda$H) in mid-central Au+Au collisions at $\sqrt{s_{NN}}$ = 3.0, 3.2, 3.5, and 3.9 GeV, along with new results on elliptic flow v_2 for light nuclei. All data have been collected by the STAR experiment in the fixed-target mode during the second phase of the RHIC beam energy scan program. The directed flow of hypernuclei shows a similar collision energy and mass dependence to light nuclei, as seen in the slope of v_1 at mid-rapidity $dv_1/dy|_{y=0}$. This suggests that the two types of nuclei are formed in a similar way. We also observe that the slope $dv_1/dy|_{y=0}$ decreases with increasing energy, with a stronger energy dependence for heavier nuclei. For light nuclei, the elliptic flow results indicate an out-of-plane expansion ($v_2 < 0$) at the lowest collision energy, whereas in-plane expansions ($v_2 > 0$) are evident at all other collision energies.

We will discuss these new results within the framework of a hadronic transport model in combination with coalescence after-burner calculations.