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Elliptic flow of light nuclei and identified hadrons, their centrality and energy dependence in STAR

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A strongly interacting medium, namely Quark Gluon Plasma (QGP), is formed in high energy heavy ion collisions at RHIC. Elliptic flow (v_2), the second order Fourier coefficient of azimuthal distribution of the produced particles with respect to reaction plane, is used to investigate the properties of QGP. Light nuclei (d, $\bar{d}$, t, ^3He), produced in such collisions, are believed to be formed by coalescence of nucleons. By comparing v_2 of light nuclei with their constituents, we can understand the production mechanism of nuclei in heavy ion collisions. At top RHIC energies, identified hadron v_2 revealed many features like the number-of-constituent quark (NCQ) scaling and mass ordering. With the combined statistics, we can test the scaling behaviors for rare multi-strange particles (ϕ, Ξ and Ω). An energy dependent difference in v_2 (Δv_2) between particles and anti-particles was also observed in beam energy scan data at STAR.

In this talk, we show the p_T and centrality dependence of v_2 of light nuclei (d, $\bar{d}$, t, ^3He), and identified hadrons ($\pi^{\pm}$, $K^{\pm}$, K^0_s, p, $\bar{p}$, ϕ, Λ, $\bar{\Lambda}$, $\Xi^{\pm}$, $\Omega^{\pm}$) at mid-rapidity for Au+Au collisions at $\sqrt{s_{NN}} = 7.7,\ 11.5,\ 19.6,\ 27,\ 39,\ 62.4$ and 200 GeV from STAR. Light nuclei and hadrons are identified using the time projection chamber and time-of-flight detector systems of STAR. The mass number and constituent quark scaling of nuclei v_2 will be presented. Light nuclei v_2 will be compared to those from $p(\bar{p})$ and to a coalescence model calculation using the phase space distributions of produced nucleons in a transport model. The centrality dependence of Δv_2 for identified hadron will be shown and compared to model calculations.
We further discuss NCQ scaling and mass ordering of multi-strange hadron v_2 at the top energy Au+Au collisions at RHIC.

On behalf of collaboration:

STAR

Primary author: HAQUE, Md. Rihan (V)

Presenter: HAQUE, Md. Rihan (V)

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