Probing nuclear structure using elliptic flow of strange and multi-strange hadrons in isobar collisions

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Abstract

Isobar collisions, ${}^{96}_{44}$Ru+${}^{96}_{44}$Ru and ${}^{96}_{40}$Zr+${}^{96}_{40}$Zr, at $\sqrt{s_{\rm NN}}$ = 200 GeV have been performed at RHIC in order to study the charge separation along the magnetic field, called the Chiral Magnetic Effect (CME). Elliptic flow, which acts as a background to the small CME signal, has been observed to differ in magnitudes for charged hadrons between the two isobar species. These differences indicate a contrast in nuclear structure and deformation between these nuclei. Hence, it is essential to understand the initial state geometry of these collisions to characterize them precisely. Elliptic flow measurements of the strange and multi-strange hadrons are an excellent probe for understanding these initial state anisotropies of the medium produced in these isobar collisions, owing to their smaller hadronic cross-section compared to light hadrons. The collected datasets include approximately two billion events for each isobar species and provide a unique opportunity for statistics hungry measurements.

In this presentation, we will report the elliptic flow (v_2) measurement of K^0_s, Λ, $\overline{\Lambda}$, ϕ, Ξ^-, $\overline{\Xi}^+$, Ω^-, and $\overline{\Omega}^+$ at mid-rapidity for Ru+Ru and Zr+Zr collisions at $\sqrt{s_{\rm NN}}$ = 200 GeV. The differential and p_T-integrated studies of v_2 of (multi-)strange hadrons will be shown. System size dependence of v_2 will be explored by comparing them with the results from Cu+Cu, Au+Au, and U+U collisions. The number of constituent quark (NCQ) scaling for these strange hadrons will also be tested. Experimental data will be compared with transport model calculations to provide further quantitative constraints on the nuclear structure.