Beam Energy Dependence of Directed Flow of ϕ meson in Au+Au Collisions from RHIC-STAR

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Abstract

The Beam Energy Scan (BES) program at RHIC is crucial for exploring the phase structure of strong interactions, and understanding the properties of quark-gluon plasma (QGP). Directed flow (v_1) is sensitive to the equation of state(EoS) of the nuclear matter formed during the collisions. The ϕ meson is composed of a strange quark and an anti-strange quark, and it has considerably smaller scattering cross section. Although it is a meson, its mass is comparable to that of protons and Λ baryons. Therefore, the directed flow of ϕ mesons serves as an important probe to understand directed flow and its relation to the EoS of the matter produced.

Using the enhanced statistics data collected by the STAR experiment during the RHIC Beam Energy Scan-II(BES-II) program, we will present measurements of v_1 for ϕ mesons in Au + Au collisions at $\sqrt{s_{NN}}$ = 7.7, 9.2, 11.5, 14.6, 17.3 and 19.6 GeV. The centrality and energy dependence of v_1 slope vs rapidity ($\mathrm{d}v_1/dy|_{y=0}$) will be discussed. The results for the v_1 slope of ϕ mesons will be compared with those of p, K and $\Lambda(\bar{\Lambda})$. The implications of these measurements for understanding the QCD phase structure will also be discussed.