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Observation of Strong Collectivity for ϕ meson in High Baryon Density Region at RHIC

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Directed flow v_1 has been used to probe early dynamics in high-energy nuclear collisions. The vector meson $\phi(s\bar{s})$, with a mass comparable to that of light baryons, exhibits a small interaction cross section with other hadrons. Therefore, the measurement of ϕ-meson directed flow v_1 provides clean access to the early collision dynamics and the production mechanisms of the vector-mesons.

In this talk, we report the measurement of ϕ-meson directed flow (v_1) from Au+Au collisions at center-of-mass energies of 3.0, 3.2, 3.5, 3.9 and 4.5 GeV, using data collected by the STAR experiment as part of the RHIC Beam Energy Scan program. In the high-baryon-density region, the observed ϕ-meson v_1 values are all positive and comparable to those of baryons (protons and Λ), while the v_1 values of lighter mesons, such as pions and kaons, are much smaller than those of ϕ mesons. The new results will be compared within the framework of hadronic transport model calculations (UrQMD and JAM), and the role of vector meson-baryon coupling in ϕ-meson production will be discussed.

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