Directed and elliptic flow of high-p_{T} charged hadrons, identified hadrons and light nuclei in Au+Au collisions at STAR

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The thermalized QCD matter formed in heavy-ion collisions is tilted in the reaction plane as a function of rapidity, while the production profile of partons from hard scatterings is symmetric in rapidity [1]. This leads to a rapidity-odd directed flow (v_1) for high-p_T hadrons and can provide valuable constraints on the initial longitudinal distribution of the fireball as well as the path length-dependent energy loss of partons. Hydrodynamic models suggest that the double sign change of v_1 slope ($\mathrm{d}v_1/\mathrm{dy}$) at midrapidity for net baryon as a function of beam energy is a signature of the first-order phase transition [2]. The light nuclei and strange hadrons might be more sensitive to the early EoS because of their heavy masses and smaller hadronic interaction cross section, respectively. Due to the different sensitivity of strange particles to hadronic phases, the mass ordering of elliptic flow (v_2) is expected to be violated between proton and ϕ meson in the low-p_T range (p_T <1.5 GeV/c) [3].

In this talk, we will present the new precise v_1 measurement of π, K, p and ϕ in Au+Au collisions at $\sqrt{s_{NN}}$ = 27, 54.4 GeV and deuteron at $\sqrt{s_{NN}}$ = 7.7 to 39 GeV. The first measurement of pseudorapidity and centrality dependence of the v_1 of high-p_T (>5 GeV/c) charged hadrons in Au+Au collisions at $\sqrt{s_{NN}}$ = 54.4 and 200 GeV will be presented. The v_2 of identified hadrons (π, K, p, ϕ, K^0_S, Λ, Ξ, Ω) in Au+Au collisions at $\sqrt{s_{NN}}$ = 54.4 GeV will also be presented. These results will be compared to model calculations and the physics implications will be discussed.

References

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