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Effects of equation of state and spectators on directed flow in Au+Au collisions at √sNN = 3-20 GeV from JAM model

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The STAR experiment has published the energy dependence of the directed flow (v1) of identified particles, such as proton, charged kaons and pions [1]. A clear sign change is observed in excitation function of the proton v1 slope, which could be an indication of the softening of the equation of state (EoS) due to 1st order phase transition. The v1 slope for produced particles, such as charged pions and kaons are negative while the v1 slope of protons show positive values at low energies. This anti-correlation between proton and pion v1 slope has been previously studied at 1GeV beam energy [2].

In this talk, we will report the v1 of proton, and charged pions, kaons in Au+Au collisions at √sNN = 3-20 GeV from transport model (JAM). For the first time, we explicitly and quantitatively discuss the effects of spectator shadowing on the v1 at RHIC BES energy region. We observe that the negative v1 slope for both pions and kaons BES energies are caused by their scattering with the spectator nucleons (shadowing effects), which can explain the different behavior of the directed flow for proton and other produced particles. We also find that a softening of EoS will lead to a negative proton v1 slope within JAM hadronic transport model.

[1] STAR Collaboration, arXiv: 1708.07132, PRL in Press.
[2]S. A. Bass, R. Mattiello, H. Stocker, W. Greiner, Physics Letters B
302, 381(1993).

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