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Constraining the initial baryon profile from baryon and anti-baryon directed flow split

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The origin of rapidity odd directed flow(v_1) has been understood as a response of the asymmetric distribution of energy and net-baryon density present in the medium at the initial stages of heavy ion collisions. So, the observed splitting of directed flow between baryon and anti-baryon in RHIC BES could be a useful observable to constrain the initial net-baryon profile by model to data comparison. This in turn can enhance our understanding about the mechanism of baryon stopping. In this context, we have proposed an initial condition model of net-baryon and matter deposition which is taken as an input for a multi stage hybrid framework of hydrodynamics evolution and late stage hadronic interaction. In the model calculations we are able to describe the measured splitting of directed flow between baryons(p, Λ) and anti-baryons($\bar{p}$, $\bar{\Lambda}$) along with v_1 of mesons like $\pi^{\pm}$, $K^{\pm}$ and ϕ. Even though we have not considered the evolution of other two conserved charges(corresponding to strangeness and electric charge) in our model, still the splitting of v_1 between strange and anti-strange particles have been observed at lower collision energies. This effect has been attributed to the employed equation of state which possesses the constraints of strangeness neutrality($n_S = 0$) and net electric charge density $n_Q = 0.4n_B$. We will systematically present the model calculations of rapidity, centrality and p_T dependency of measured identified or charged particle's v_1 at $\sqrt{s_{NN}} = 7.7$ GeV to 200 GeV and compare those with experimental data. With the observations from our model calculations, we will explicitly demonstrate the importance to include the conserved charges evolution along with energy density in hydrodynamics simulations of heavy ion collisions.

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