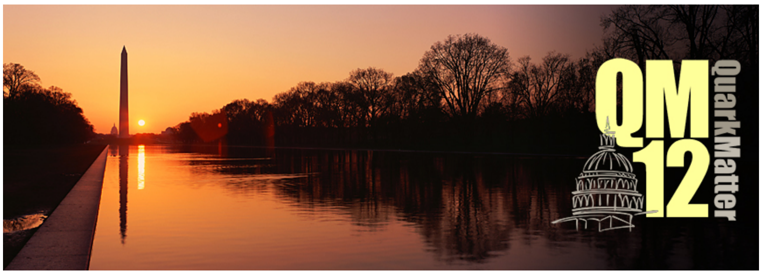

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Systematic study of the dipolar flow associated with initial density fluctuations in heavy ion collisions at RHIC and LHC within a multi-phase transport (AMPT) model

Thursday, 16 August 2012 16:00 (2 hours)

The anisotropy associated with the initial dipole asymmetry in heavy ion collisions is studied via the first harmonic coefficient $v_{1,1}$ of the two-particle azimuthal angle correlations, within AMPT and HIJING model (AMPT is essentially HIJING + parton/hadron transport). For a broad selection of centrality, transverse momenta and pseudorapidity (η), a fitting method is used to decompose $v_{1,1}$ into a rapidity-even component, characterized by the Fourier coefficient v_1, and a global momentum conservation component. We found that the $v_{1,1}$ data from HIJING can be entirely described by the momentum conservation component, while description of the data from AMPT requires both components. This proves that the rapidity-even v_1 is indeed a collective phenomena transferred from initial dipole asymmetry by the strong final state interaction. The extracted v_1 values are negative for pT < 0.7-0.9 GeV, reach a maximum at 2-3 GeV, and decreases at higher pT. The v_1 values vary weakly with η and centrality, but increase with collision energy, strong coupling constant (α_s) and parton cross-section (σ). We compare our results with ATLAS v_1 data extracted from same two-component fit [1]. This comparison allows us to constrain α_s and σ, and consequently the values of shear viscosity. We analyze the values of the extracted global momentum conservation component and compare with those calculated based on Borghini et.al. [2]; the comparison suggests that the effective size of the system that conserve momentum is about 1/3 of the total multiplicity of the event, also consistent with the ATLAS data. We then extract v_1 using the modified event plane method proposed by Luzum et.al. [3] and compared with those obtained from two-particle correlation. The differences between the two methods, and consequently the caveat for applying this event plane method to experimental analysis, are discussed. Finally, we extend our simulation to identified particles (proton, kaon and meson). This extension allows us to predict/test the constituent quark scaling which was only done before for higher-order harmonic flow. These studies represent a significant extension of our results presented in a recent publication [4].

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