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Relativistic quantum molecular dynamics approach for heavy-ion collisions at high baryon density region

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A new N-body non-equilibrium transport model based on the relativistic quantum molecular dynamics (RQMD) is developed for the simulations of high energy heavy ion collisions at high baryon density regions. In this approach, hadrons interact via the sigma-omega fields in the mean-field approximation as well as the hard two-body scatterings which produce the strings and hadronic resonances in JAM transport code. We compare results on the beam energy dependence of the directed and elliptic flows with the E895,NA49 and STAR data. The relativistic mean-field theory predicts the density isomer state which is a strong first-order phase transition to the nucleon matter to the resonance matter. We investigate the effects of such strong first-order phase transition to the delta-matter on the directed flow. Our dynamical approach can be also applied to the event-by-event fluctuations. We also discuss the effects of delta-matter transition on the net-proton cumulant ratios.

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