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Directed flow in heavy-ion collisions and its implications for astrophysics

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Analysis of directed flow (v1) of protons, antiprotons and pions in heavy-ion collisions is performed in the range of collision energies $\sqrt{s_{NN}} = 2.7$-39 GeV. Simulations have been done within a three-fluid model em\-ploy\-ing a purely hadronic equation of state (EoS) and two versions of the EoS with deconfinement transitions: a first-order phase transition and a smooth crossover transition. The crossover EoS is unambiguously preferable for the description of the most part of experimental data in this energy range. The directed flow indicates that the crossover deconfinement transition takes place in semicentral Au+Au collisions in a wide range of collision energies $4 < \sqrt{s_{NN}} < 30$ GeV. The obtained results suggest that the deconfinement EoS?s in the quark-gluon sector should be stiffer at high baryon densities than those used in the calculation. The latter finding is in agreement with that discussed in astrophysics.

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