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Hydrodynamic analyses of nuclear collisions in Landau and Eckart frames

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The quark matter created in relativistic nuclear collisions is interpreted as a nearly-perfect fluid. The recent efforts to explore its finite-density properties in the beam energy scan programs motivate one to revisit the issue of the local rest frame fixing in off-equilibrium hydrodynamics. We first investigate full second-order relativistic hydrodynamics in the Landau and Eckart frames, which are defined with energy and baryonic flows, respectively. Then we perform numerical simulations to elucidate the effect of frame choice on flow observables in nuclear collisions. The results indicate that the flow can differ in the two frames but charged particle and net baryon rapidity distributions are mostly frame independent when off-equilibrium kinetic freeze-out is considered.

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