

Nuclear Theory

Turbulent fluctuations around Bjorken flow

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We study the evolution of local event-by-event deviations from smooth average fluid dynamic fields, as they can arise in heavy ion collisions from the propagation of fluctuating initial conditions. Local fluctuations around Bjorken flow are found to be governed by non-linear equations whose solutions can be characterized qualitatively in terms of Reynolds numbers. Perturbations at different rapidities decouple quickly, and satisfy (after suitable coordinate transformations) an effectively two-dimensional Navier-Stokes equation of non-relativistic form. We discuss the conditions under which non-linearities in these equations cannot be neglected and turbulent behavior is expected to set in.

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