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Modeling spinodal decomposition in a rapidly expanding fluid

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The QCD phase diagram is expected to have a first order phase transition at high baryon densities which will give rise to effects like spinodal decomposition and nucleation in the cooling quark gluon plasma. We expect to probe this region beyond the critical point at the Beam Energy Scan Program at RHIC and the upcoming experiments at the Facility for Antiproton and Ion Research (FAIR). It is crucial to include these effects in our simulations to explain the data. We derive the equations governing spinodal decomposition in an expanding hydrodynamic system. The equations account for surface effects between different phases. The equation of state is extended to the metastable region by interpolation. We numerically solve these equations for a 1D expanding Bjorken fluid and discuss the effects of phase separation.

Auteurs principaux: KAPUSTA, Joseph (University of Minnesota); SINGH, Mayank (Vanderbilt University)

Orateur: SINGH, Mayank (Vanderbilt University)

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