The QCD Mixed Phase at RHIC: Shaken but not Stirred

Sean Gavin

Physics Department, Wayne State University

Presented by: Sean Gavin

Abstract

Measurements of event-by-event fluctuations of baryon number in a rapidity interval in RHIC collisions may probe the QCD phase transition, particularly if the transition is sufficiently near first order to produce an inhomogeneous mixed phase [1]. We apply experimentally successful field theory methods from condensed matter systems to explore the dynamics of phase separation in the short-lived heavy-ion system. Specifically, we perform numerical simulations of the mean field Cahn-Hilliard-Ginzberg-Landau hydrodynamic equations for the order parameter for several models of the QCD free energy [2]. As in many condensed matter systems, we find that the mixed phase is far more complex than then our usual notion of QGP bubbles surrounded by hadronic vapor. Nevertheless, simulations show that the strong fluctuations can arise. We explore the degree to which fluctuations persist if the phase change is nearly first order, as likely in QCD.

[1] S. Gavin, nucl-th/9908070. [2] D. Bower and S. Gavin, in preparation (see preliminary results at http://rhic.physics.wayne.edu/šean/Toledo/ToledoNew_files/frame.htm)