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Far-From-Equilibrium Initial Conditions and the Search for the QCD Critical Point

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Initial conditions for relativistic heavy-ion collisions may be far-from-equilibrium but it is expected that on very short time scales the dynamics converge to a universal attractor that defines hydrodynamic behavior. We investigate how far-from-equilibrium effects may influence experimentally driven searches for the Quantum Chromodynamic critical point at RHIC. We find that the path to the critical point is heavily influenced by far from equilibrium initial conditions where viscous effects lead to dramatically different $\{T, \mu_B\}$ trajectories through the QCD phase diagram. We compare hydrodynamic equations of motion with shear and bulk coupled together at finite μ_B for both DNMR and phenomenological Israel-Stewart equations of motion and discuss their influence on potential attractors at finite μ_B and their corresponding $\{T, \mu_B\}$ trajectories. First we explore this systematically in a 0+1 system exhibiting Bjorken symmetries and then we relax these symmetries and investigate the implementation of this kind of study for 2+1 viscous BSQ hydrodynamics.

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