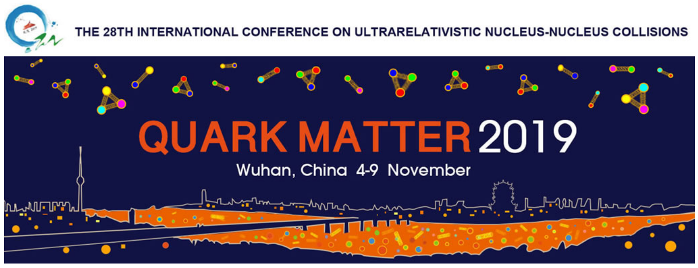

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Fluctuation dynamics near the QCD critical point

Monday 4 November 2019 17:40 (20 minutes)

Near the QCD critical point (CP), critically slow processes can invalidate the conventional (dissipative) hydrodynamic description, which simply integrates out all non-hydrodynamic modes. We explore the critical dynamics near the QCD CP with the novel Hydro+ framework [1] which extends the conventional hydrodynamic description by coupling it to additional explicitly evolving slow modes. Their slow relaxation is controlled by the correlation length in the critical region, which is independent from the density inhomogeneities of the QCD matter that control the evolution of the hydrodynamic quantities. In this presentation we study the evolution of a single critical slow mode on top of a simplified matter background with non-zero net baryon density undergoing Gubser flow [2], as a function of the slow mode's wave number and the correlation length. We also discuss how the non-equilibrium slow mode affects the bulk properties of the matter, such as the pressure and entropy density. We find that over a wide range of wave numbers the non-equilibrium effects of the slow mode are dominatingly driven by the fluid expansion rather than by critical slowing-down. Last but not least we explore the critical fluctuation dynamics in systems of various sizes and at different collision energies. As one of the first studies based on Hydro+, this work provides guidance to future more realistic, fully (3+1)-dimensional simulations aiming at locating the QCD CP.

[1] Hydrodynamics with parametric slowing down and fluctuations near the critical point, M. Stephanov and Y. Yin, Phys. Rev. D98 (2018) 036006.

[2] Symmetry constraints on generalizations of Bjorken flow, S. Gubser, Phys. Rev. D82 (2010) 085027.

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