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Exploring the criticality of QCD with effective field theory for fluctuating hydrodynamics

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A non-equilibrium effective field theory framework has recently been formulated for fluctuating hydrodynamics [1]. In this talk, we present an example of applying this novel formalism to study the critical properties of QCD. In the view that non-Gaussian fluctuations of baryon density are important for the QCD critical point search, we derive evolution equations for the critical non-Gaussian fluctuations of a conserved density and obtain closed-form solutions based on field theory techniques [2]. Those results can be readily implemented for simulations in realistic situations of heavy-ion collisions. In addition, we find that nonlinear interactions among noise fields, which are missing in traditional stochastic hydrodynamics, could potentially contribute to the quartic (fourth-order) fluctuations in the scaling regime in off-equilibrium situations.

[1] Michael Crossley, Paolo Glorioso, and Hong Liu, "Effective field theory of dissipative fluids,"JHEP **09** (2017) 095.

[2] Noriyuki Sogabe and Yi Yin, "Off-equilibrium non-Gaussian fluctuations near the QCD critical point: an effective field theory perspective,"JHEP (to appear) [arXiv:2111.14667 [nucl-th]].

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Authors: SOGABE, Noriyuki (Institute of Modern Physics, Chinese Academy of Sciences); YIN, Yi (Institute of Modern Physics, Chinese Academy of Sciences)

Presenter: SOGABE, Noriyuki (Institute of Modern Physics, Chinese Academy of Sciences)

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