17th International Conference on Strangeness in Quark Matter
Universiteit Utrecht
10-15 July 2017
Utrecht, the Netherlands

Contribution ID: **129** Type: **oral presentation**

Fluctuating fluid dynamics for the QGP in the LHC and BES era

Thursday 13 July 2017 11:50 (20 minutes)

Fluid dynamical fluctuations drive a system constantly out of equilibrium in connection with dissipative properties such as shear and bulk viscosity. The interaction of the fluctuations leads to a renormalization in the equation of state and in the transport coefficients. These effects are particularly important near phase transitions and in small systems. In an era of the high-precision extraction of QGP transport properties, it is crucial to incorporate the contributions from fluctuations into our models. Moreover, the critical fluctuations in the diffusive net-baryon density, which are searched for in the beam energy scan (BES) programs at RHIC and SPS as experimental signal for the conjectured QCD critical point, develop dynamically from fluid dynamical fluctuations.

In this talk, we discuss the effect of fluid dynamical fluctuations that are consistently propagated. For LHC physics, we focus on fluctuations in the energy-momentum tensor. The nonlinearities in fluid dynamics lead to cutoff-dependent corrections in the equation of state which we quantify for static systems. Moreover, we analyze correlation functions and the time-evolution of fluctuations in the thermodynamic quantities. For BES physics, we study the dynamics and nonlinearities of critical phenomena related to fluctuations in the net-baryon density. We show under which conditions Gaussian and non-Gaussian cumulants emerge from purely white noise. The influence of finite-size and finite-resolution effects as well as exact baryon number conservation are discussed. Performing real-time fluid dynamical simulations, we observe the formation of critical phenomena in the fluctuations of the net-baryon density - a crucial step toward a realistic modeling of critical point signals in heavy-ion collisions.

List of tracks

QCD phase diagram (BES)

Primary author: BLUHM, Marcus (University of Wroclaw)

Co-authors: NAHRGANG, Marlene (Subatech); SCHAEFER, Thomas (North Carolina State University); Prof. BASS, Steffen A. (Duke University)

Presenter: BLUHM, Marcus (University of Wroclaw)

Session Classification: Parallel BES

Track Classification: QCD phase diagram (BES)