Contribution ID: **838** Type: **Poster**

Signals from the critical point in Bjorken fluid dynamics

Wednesday 6 April 2022 19:06 (4 minutes)

A non-monotonic net-proton kurtosis for very central collisions at $\sqrt{s} = 200$ GeV has been suggested and may be confirmed by recent BES-II program results advocating the existence of the QCD critical point. Fluctuations at the origin of this peculiar behavior are produced in the highly dynamical environment of ultra-relativistic collisions. Especially, the violent longitudinal expansion and the associated temperature cooling may have a non-trivial impact on how we interpret the experimental data. The in- or out-of equilibrium nature of the fluctuations during this expansion is a crucial question in discriminating between critical contributions and purely dynamical features.
Here, we inspect the diffusive dynamics of the critical net-baryon density fluctuations coupled to energy and momentum fluctuations. Equations are expressed in the Milne coordinates to include the longitudinal Bjorken-type expansion in 1+1D. Fluctuations are connected to critical point physics using a stochastic diffusion equation in which the potential is derived from a free-energy functional including non-linear coupling and fully parametrized by the second a fourth order susceptibilities. The latter come from the 3D Ising model correlation length in the scaling region and lattice QCD calculations at vanishing baryo-chemical potential.
We demonstrate the great sensitivity of the second and fourth order cumulants of the net-baryon and energy density fluctuations to the expansion dynamics. Via particlization the net-proton number cumulants are obtained. Special emphasis is put on the dependence on the diffusion length and the freeze-out conditions. The phenomenological consequences of these two parameters are discussed. We study the non-trivial rapidity dependence as a signal for the QCD critical point.

Authors: PIHAN, Grégoire (CNRS); BLUHM, Marcus (Subatech. Nantes); NAHRGANG, Marlene (Subatech); KITAZAWA, Masakiyo; SAMI, Taklit (Subatech Nantes)

Presenter: NAHRGANG, Marlene (Subatech)

Session Classification: Poster Session 2 T07_2

Track Classification: Correlations and fluctuations