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Correlated fluctuations near the QCD critical point

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Recently, STAR beam energy scan (BES) measured the multiplicity distributions of net protons with the maximum transverse momentum extended from 0.8 GeV to 2 GeV. The related higher cumulants (moments) present large deviations from the poisson baselines, showing the potential of discovery the QCD critical point in experiment.

In this talk, we introduce a freeze-out scheme for the dynamical models near the QCD critical point through coupling the classical particles with the correlated fluctuating sigma field [2]. For an infinite and stationary medium, such freeze-out scheme can reproduce the standard Staphanov formulas for cumulants presented in Ref[3].

Within this framework, we calculate the correlated fluctuations of net protons emitted from the hydrodynamic freeze-out surface at various collision energies. A comparison with recent STAR BES data shows that our model could reproduce kurtosis (and C4) through tuning the related parameters. However, the critical fluctuations in our model (also in the Stephanov formula) always give positive contributions to the cumulants C2 and C3, which over-predicts the data with poisson expectations served as the thermal fluctuation baselines[2]. In order to qualitatively /quantitatively describe these cumulants data, the effects from dynamical evolution and the deviations from poisson thermal fluctuations should be investigated in the near future.

[1] X. Luo PoS CPOD2014, 019 (2014)

[2] Lijia Jiang, Pengfei Li, Huichao Song, in preparation

[3] M.Stephanov Phys. Rev. Lett. 102, 032301 (2009)

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