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Correlated fluctuations near the QCD critical point

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Recently, the 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 [3] for critical fluctuations. 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, but always over-predicts the C2 and C3 data with the poisson/binomial baselines due to the positive contributions from the static critical fluctuations [2]. In the later part of this talk, we will briefly discuss the dynamical critical fluctuations, showing that the sign of C3 could be solved by the memory effects after a dynamical evolution [4].

- [1] X. Luo PoS CPOD2014, 019 (2014).
- [2] Lijia Jiang, Pengfei Li, Huichao Song, arXiv:1502.06164[nucl-th].
- [3] M. Stephanov, Phys. Rev. Lett. 102, 032301 (2009).
- [4] Lijia Jiang and Huichao Song, in preparation.

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