

Measurement of the Cumulants of Conserved Charge Multiplicity Distributions in Au+Au Collisions from the STAR experiment

Toshihiro Nonaka¹, Ashish Pandav², Zhenzhen Yang^{1,3}, Yu Zhang¹

(for the STAR Collaboration)

Central China Normal University¹

National Institute of Science Education and Research²

Lawrence Berkeley National Laboratory³

1 Higher-order cumulants of conserved quantities (B, Q, S) are sensitive observables to study the QCD phase structures, nature of quark-hadron phase transition and freeze-out dynamics.

2 In this talk, we will present new measurements of sixth to second-order cumulant ratios (C_6/C_2) of net-proton distributions in Au+Au collisions at $\sqrt{s_{NN}}=54.4$ and 200 GeV, as well as cumulants up to the fourth-order of net-proton, net-kaon and net-charge multiplicity distributions in Au+Au collisions at $\sqrt{s_{NN}}=27$ and 54.4 GeV. The C_6/C_2 results are compared with a recent model calculation which predicts a negative C_6/C_2 value if the freeze-out occurs near the chiral transition temperature. The dependence of cumulants, measured in Au+Au collisions at $\sqrt{s_{NN}}=27$ GeV, on the centrality definition was tested using the Event Plane Detector (EPD). The physics implications of the results, a detailed discussion of the background contributions and the status and prospects of phase II of the STAR Beam Energy Scan program are discussed.