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

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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.

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 10 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.

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