

QPT 2019

Enshi, China

Contribution ID: 23

Type: not specified

Measurement of the sixth-order cumulant of net-proton multiplicity distributions at RHIC

Summary

In high-energy nuclear collisions, cumulants of conserved quantities are one of the powerful tools to study the QCD phase structure.

According to the Lattice Gauge Theory calculation, at vanishing baryon chemical potential (μ_B) a “smooth crossover” for the transition from QGP to hadronic system occurs in heavy-ion collisions [1].

One of the possible experimental ways to search for the evidence is to analyze the higher-order cumulant ratios of net-baryon distributions from high-energy nuclear collisions.

The sixth-order (C_6) to second-order (C_2) cumulants of baryon number fluctuations are predicted to be negative at the freeze-out temperature if it is close to the chiral transition temperature [2].

Net-proton multiplicity distributions can be studied as a reasonable proxy for net-baryon distributions [3,4]. In this talk, we will present the collision centrality, transverse momentum and rapidity dependence of C_6/C_2 of net-proton

distributions, measured from the high statistics data of $\sqrt{s_{NN}} = 54.4$ and 200 GeV Au+Au collisions. In addition, the physics implications of the data will be discussed in light of Lattice calculations as well as transport model predictions.

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