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# Higher moments of net-proton and net-charge multiplicity distributions at 14.5 GeV measured in Au+Au collisions at mid-rapidity with STAR at RHIC

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Studying fluctuations of conserved quantities, such as baryon number (B) and charge (Q), provides insight into the properties of matter created in high-energy nuclear collisions. Lattice QCD calculations suggest that higher moments of these quantities are sensitive to the phase structure of the hot and dense nuclear matter created in such collisions.

The Beam Energy Scan (BES)-I program at RHIC, spanning center-of-mass energies of $\sqrt{s_{\rm NN}}$ = 7.7 to 200 GeV of Au+Au collisions, provided measurements at different baryochemical potentials, μB, to map the QCD phase diagram. In the years 2010 and 2011, STAR collected data of Au+Au collisions at 7.7, 11.5, 19.6, 27, 39 and 62.4 GeV, leaving a wide gap of about $\mu_{\rm B}$ ~110 MeV between 19.6 ($\mu_{\rm B}$ ~206 MeV) and 11.5 GeV ($\mu_{\rm B}$ ~316 MeV).

In this talk, we present first experimental results of higher moments and their products of net-charge and net-proton distributions in Au+Au collisions at 14.5 GeV, measured with the STAR detector at RHIC at mid-rapidity and a transverse momentum up to $p_{\rm T}$ = 2 GeV/c. Their pseudo-rapidity and rapidity dependence will be shown as well. The corresponding value of the chemical potential from the top 5% central collisions is about $\mu_{\rm B}$ ~260 MeV, so that these results fill the largest gap of previous measurements, in $\mu_{\rm B}$, to complete the BES I program.

Moreover, the energy dependence of higher moments of net-proton distributions in Au+Au collisions at $\sqrt{s_{\rm NN}}$ = 7.7 - 200 GeV in a much larger $p_{\rm T}$ range, utilizing the PID capabilities of the Time-of-Flight detector, are shown. Detector effects, including tracking efficiency, are taken into account. Implications of these results will be discussed in light of the recent Lattice QCD calculations.

## On behalf of collaboration:

STAR

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