

## Searching for the QCD Critical Point Through Fluctuations at RHIC

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Fluctuations and correlations of conserved quantities (baryon number, strangeness, and charge) can be used to probe phases of strongly interacting QCD matter and the possible existence of a critical point in the phase diagram. The cumulants of the multiplicity distributions related to these conserved quantities are expected to be sensitive to possible increased fluctuations near a critical point and their ratios can be directly compared to the ratios of the susceptibilities from Lattice QCD. In this talk, we will present the measurements of the cumulants of net-proton multiplicity distributions from Au+Au collisions at  $\sqrt{s_{NN}} = 7.7, 11.5, 14.5, 19.6, 27, 39, 62.4$  (up to fourth order) and 200 GeV (up to sixth order) as measured by the STAR experiment at RHIC. Multi-particle correlation functions will also be presented.

The measurement of higher-order cumulants are extremely sensitive to experimental artifacts. Current efficiency correction methods are based on Binomial models. We will introduce an unfolding technique to account for multiplicity-dependent detector response and efficiency variations using large samples of AMPT events. The comparison of the various correction approaches should provide important guidance towards a reliable experimental determination of the multiplicity cumulants.

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