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From conserved charge fluctuations to the QCD critical point

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Higher order cumulants of fluctuations of conserved charges are an important diagnostic tool for the thermodynamic properties of strong interacting matter close to freeze out [1] at LHC energies as well as in the entire energy range covered with the beam energy scan (BES) at RHIC. We present recent progress on the calculation of conserved charge fluctuations with highly improved staggered quarks (HISQ action). In particular we will focus on higher order cumulants up to 6th order of net baryon number, net electric charge and net strangeness fluctuations. We will discuss how these quantities approach the hadron resonance gas at low temperatures, the perturbative limit at high-T [2] and analyze to what extent they show sensitivity to universal scaling behavior, *i.e.* we estimate the relative strength of contributions from the regular and singular part of the free energy. Based on this analysis we discuss consequences for the QCD phase diagram and the radius of convergence of the Taylor expansion of the QCD partition function. The latter can be used to locate the QCD critical point. Furthermore, we comment on the signature of the QCD critical point in various ratios of conserved charge fluctuations that are measured in the BES at RHIC.

References

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On behalf of collaboration:

None

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