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Conserved charge fluctuations at vanishing net-baryon density from Lattice QCD

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Cumulants of net charge fluctuations and their correlations at vanishing values of the charge chemical potentials ($\mu_{B,Q,S} = 0$) provide the basis for Taylor expansions of various thermodynamic observables at non-zero values of the chemical potentials. At $\mu_{B,Q,S} = 0$ continuum extrapolated results for these cumulants can directly be compared with charge fluctuations and correlations currently being measured by the ALICE collaboration at the LHC.

We present here continuum extrapolated results for all second order and some of the fourth order cumulants of net baryon-number, strangeness and electric charge fluctuations as well as their cross-correlations obtained by the HotQCD collaboration. As the chemical freeze-out temperature at LHC is found to be close to the pseudo-critical temperature for the QCD chiral transition these cumulants potentially probe remnants of critical behavior in the crossover region. Using results from calculations with smaller than physical quark masses we estimate the singular part contributing to these second and fourth order cumulants. Furthermore, we will show comparisons of our results with hadron resonance gas (HRG) model calculations and argue that particularly in the electric charge sector there is evidence for strong modifications of the resonance spectrum in the transition region.

We also will use the updated results of HotQCD on higher order cumulants to constrain the radius of convergence of Taylor series as estimator for the location of a possible critical point in the QCD phase diagram.

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