

SU(3) Dual QCD Thermodynamics at Finite Temperature and Chemical Potential

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Following the study for SU(2) case with zero bario -chemical potential, a dual QCD formulation for SU (3) color gauge has been proposed to be constructed in terms of dual gauge potentials which takes into account the local as well as the topological structure of the color gauge group into its dynamics. The dynamical configuration of the resulting dual QCD vacuum and its flux tube configuration have been proposed to be investigated for analyzing the non-perturbative features of QCD. The thermal behavior of the non-perturbative QCD vacuum has been proposed to be investigated for exploring the dynamics of quark-hadron phase transition at non-vanishing bario-chemical potential. Related thermodynamic quantities and Equation of State (EoS) to characterize quark matter have also been proposed to be discussed within the framework of dual QCD based hadronic bag which guarantees the critical parameters and the associated critical points for quark hadron phase transition. These thermodynamic quantities are expected to play important role in understanding the order of phase transition and are likely to predict the features of first order phase transition for non-vanishing bario-chemical potential. Furthermore, in addition to the variation of normalized pressure for hadron and QGP phases, the scaled pressure difference, quark number density and susceptibility have been proposed to be investigated, as they serves as useful tool to understand the nature of QCD phase transition and measures intrinsic statistical fluctuations close to thermal equilibrium. Moreover, we also propose to investigate the bulk properties of quark matter by constructing the free energy change and the associated surface tension for quark-hadron phase transition. For consistency and compatibility check, we will compared our results with state of the art three-loop Hard Thermal Loop perturbative results and available lattice QCD results.

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