

Finite-Volume effects in QCD and functional RG methods

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Quantum Chromodynamics at finite temperature and density is currently a subject of great interest, due to both advances in experimental heavy-ion collisions and theoretical improvement of our understanding in recent years. Simulations of the theory on finite space-time lattices provide important theoretical advances. But in particular for investigating QCD phase transitions, large quark masses and finite volumes in the simulations need to be taken into account. The investigation of finite-volume effects in QCD has a long tradition in the framework of chiral perturbation theory and random matrix theory and can provide useful tools for the analysis. With regard to a description the chiral phase transition in QCD, it is very important to correctly take into account the effects of long-range fluctuations such as pions as the Goldstone bosons of spontaneous chiral symmetry breaking. It is natural to employ Renormalization Group methods for this purpose. Together with Prof. Pirner, we have initiated work in this direction with functional Renormalization Group methods, and with steadily improving results from QCD lattice simulations there has been increased interest in the investigation of finite-volume effects. These effects have implications for the chiral phase transition in QCD and the interpretation of lattice simulation results. I will give an overview over recent developments.

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