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Mott-hadron resonance gas and lattice QCD thermodynamics

We present an effective model for low-energy QCD thermodynamics which provides a microscopic interpretation of the transition from a gas of hadron resonances to the quark-gluon plasma by Mott dissociation of hadrons and compare results with data from lattice QCD simulations. We consider the thermodynamics of the Polyakov-loop extended Nambu–Jona-Lasinio (PNJL) model within the self consistent approximation scheme of the Φ-derivable approach. This allows us to obtain the Generalized Beth-Uhlenbeck (GBU) equation of state. Our approach goes beyond the mean-field description of quark matter by taking into account hadronic correlations (bound and scattering states) (Annals Phys. 348 (2014) 228-255) as well as their backreaction on the propagator of constituents. The next step in our work is to include more hadronic degrees of freedom than just the low-lying pseudoscalar mesons. For that purpose we discuss a model for the generic behavior of hadron masses and phase shifts at finite temperature which shares basic features with recent developments within the PNJL model for correlations in quark matter. We also discuss the occurrence of an anomalous mode for mesons composed of quarks with unequal masses which is particularly pronounced for positive kaon and kappo states at finite densities a possible mechanism possible mechanism to explane the “horn effect” for the positive Kion/pion ratio in heavy-ion collisions (arXiv:1608.05383v3).

Preferred Track

New Theoretical Developments

Collaboration

Not applicable

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