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Generalized Beth-Uhlenbeck approach to quark-hadron matter

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An effective model for low-energy QCD thermodynamics is presented which provides a microscopic interpretation of the transition from a gas of hadron resonances to the quark-gluon plasma by Mott dissociation of hadrons. The self consistent approximation scheme of the Φ-derivable approach is applied to describe the thermodynamics of the Polyakov loop extended Nambu–Jona-Lasinio (PNJL) model which is shown to take the form of a Generalized Beth-Uhlenbeck (GBU) equation of state. This approach goes beyond the mean-field description of quark matter by taking into account hadronic correlations (bound and scattering states) as well as their backreaction on the quasiparticle properties of the constituents. The approach is straightforwardly extended to include more hadronic degrees of freedom than just the low-lying pseudoscalar mesons. To this end a model for the generic behavior of hadron masses and phase shifts at finite temperature is employed which shares the basic features with the PNJL model for correlations in quark matter. The results compare well with data from lattice QCD simulations [1].

[1] D. Blaschke, A. Dubinin, L. Turko, in preparation (2016)

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