Contribution ID: **21** Type: **not specified**

Thermodynamics of QCD with quarks and multi-quark clusters

We present a generalized Beth-Uhlenbeck approach to thermodynamics of QCD, which treats hadrons as color singlet multiquark clusters in medium with a background gluon field coupled to the underlying chiral quark dynamics. Colored multiquark clusters are treated on the same footing. The confining aspect of QCD is modeled by the property of color SU(3) center symmetry within the Polyakov gauge and by a large vacuum quark mass motivated by a confining density functional approach. The spectrum of multiquark clusters consists of a bound and a scattering continuum states. For the corresponding cluster-cluster phase shifts we discuss simple ansätze that capture the Mott dissociation of multiquark clusters. This allows us to demonstrate the role of the continuum correlations and introduce an improved model that includes them in a generic form. We calculate thermodynamic properties such as baryon density and entropy and compare them to the results of lattice QCD. A striking result is the suppression of the abundance of colored multiquark clusters at low temperatures by the coupling to the Polyakov loop and their importance for a quantitative description of lattice QCD thermodynamics at non-vanishing baryochemical potentials. We demonstrate that the limits of a hadron resonance gas at low temperatures and perturbative QCD at high temperatures are correctly reproduced. A comparison with lattice calculations shows that the model provides a unified and systematic description of the properties of the quark-gluon-hadron system.

Primary author: IVANYTSKYI, Oleksii (University of Wroclaw)

Co-authors: BLASCHKE, David; Prof. ROPKE, Gerd (University of Rostock)

Presenter: IVANYTSKYI, Oleksii (University of Wroclaw)

Session Classification: Lectures