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Thermodynamics of quark matter with multiquark clusters in an effective Beth-Uhlenbeck type approach

Sunday 25 September 2022 12:00 (20 minutes)

In this talk, I will present the outcome of our study on quark clusters at finite temperature and baryochemical potential. The properties of hadronic clusters are derived using generalized Beth-Uhlenbeck formulas with underlying quark degrees of freedom following from the PNJL model. This allows us to describe within a unified approach the transition from a hadronic phase where quarks are clustered into their hadronic bound states as composite objects to a phase where quarks are the only degrees of freedom above certain values of T and μ_B. We demonstrate how quark properties affect the clusters, most notably we show the effect of Polyakov-loop suppression on colored clusters (i.e. multiquark states that are not color-singlets). We also observe the reverse effect, where the presence of clusters impacts the suppression strength of the Polyakov-loop and, in turn, shifts the pseudocritical temperature of the PNJL model to lower values. We propose an effective cluster phase-shift ansatz, which allows us to simulate Mott dissociation of clusters at high temperatures while producing thermodynamic properties in good agreement with lattice-QCD calculations.

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