Vector interaction enhanced quark matter bag model

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In order to study quark matter in astrophysics, the thermodynamic bag model (tdBAG) has been widely used [1]. This model was designed to mimic quark confinement, but it neglects other important properties of Quantum Chromodynamics (QCD). The vector enhanced bag model (vBAG) extends tdBAG by taking into account the effects of dynamical chiral symmetry breaking (DχSB) and repulsive vector interactions. The latter is of particular importance to studies of dense matter in β-equilibrium in order to explain the $2M_\odot$ maximum mass constraint for neutron stars [2, 3].

The model can be derived from the QCD based framework of Dyson–Schwinger equations by assuming a simple quark-quark contact interaction [4]. An important feature of this model is the treatment of DχSB and confinement as simultaneously occurring phenomena. The latter links vBAG to the given hadronic equation of state for the construction of the phase transition. Extensions of the model to arbitrary temperatures and isospin asymmetries have been performed in [5, 6, 7] and this work will focus on the resulting phase diagram and neutron star equations of state.

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