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Hybrid star properties with the NJL and mean field approximation of QCD models: A Bayesian approach

Neutron stars are the most compact objects in the Universe. The core of these extremely compact objects has such high densities that it reaches regions of the QCD phase diagram that are still unknown. In this work we explore the possibility of deconfined quark matter inside neutron stars. For this purpose, we generated eight sets of hybrid equations of state. For the hadron phase, we used the relativistic mean-field model with nonlinear meson terms. The quark phase is described by two different models: the Nambu-Jona-Lasinio model with multiquark interactions and the mean-field theory of QCD, a model similar to the vectorial MIT bag model. The phase transition is obtained by applying Maxwell's construction. Bayesian inference was used to reproduce the observational data of neutron stars. In half of the sets we also imposed the constraint imposed by the pQCD calculations. The results show that the hybrid stars are compatible with the observational data. Although the pQCD calculation reduces the maximum mass, these models were able to reach $M_{\text{max}} = 2.1 - 2.3 M_{\odot}$. Other consequences of the imposed constraints and the chosen model will be discussed.

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