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A unified quark-hadron equation of state

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The aim of our work is to develop a unified equation of state (EoS) for nuclear and quark matter for a wide range in temperature, baryon density and iso-spin asymmetry, which will make it applicable for heavy-ion collisions as well as for the astrophysics of neutron stars, neutron-star mergers and supernova explosions. As a first step, we use improved EoS for the hadronic and quark matter phases and join them via Maxwell construction. To go beyond this simple Ansatz, we are developing a consistent cluster expansion for quark matter, based on the Phi- derivable formalism [1]. In hadronic phase this reproduces the generalized Beth-Uhlenbeck formalism by Roepke et.al. [2]. To this end, we work with a relativistic density functional approach for the self energies in a quasi particle picture [3], which gives us the possibility to start with a reasonable physical basis and apply improvements to fit certain constraints from lattice QCD and neutron star measurements.

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Keywords

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