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Quark-Nuclear Hybrid Star EoS with Excluded Volume Effects

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A two-phase description of the quark-nuclear matter hybrid equation of state that takes into account the effect of excluded volume in both the hadronic and the quark-matter phases is introduced. The nuclear phase manifests a reduction of the available volume as density increases, leading to a stiffening of the matter. The quark-matter phase displays a reduction of the effective string-tension in the confining density-functional from available volume contributions. The nuclear equation of state is based upon the relativistic density functional model DD2 with excluded volume. The quark-matter EoS is based upon a quasiparticle model derived from a relativistic density-functional approach and will be discussed in greater detail. The interactions are decomposed into mean scalar and vector components. The scalar interaction is motivated by a string potential between quarks, whereas the vector interaction potential is motivated by higher-order interactions of quarks leading to an increased stiffening at high densities. As an application, we consider matter under compact star constraints of electric neutrality and beta-equilibrium. We obtain mass-radius relations for hybrid stars that form a third family, disconnected from the purely hadronic star branch, and fulfill the $2M_{\text{sun}}$ constraint.

Type of contribution

Talk

Author: BLASCHKE, David (University of Wroclaw)

Presenter: BLASCHKE, David (University of Wroclaw)