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Hot and dense matter in quark-hadron models

Content :

We present a general approach to incorporate hadronic as well as quark degrees of freedom in a unified approach. This approach implements the correct degrees of freedom at high as well as low temperatures and densities. An effective Polyakov loop field serves as the order parameter for deconfinement. We employ a well-tested hadronic flavor-SU(3) model based on a chirally symmetric formulation that reproduces properties of ground state nuclear matter and yields good descriptions of nuclei and hypernuclei. Excluded volume effects simulating the finite size of the hadrons drive the transition to quarks at high temperatures and densities. We study the phase structure of the model and the transition to the quark gluon plasma and compare results to lattice gauge calculations. In addition, we investigate the effect of the strangeness content of the matter on the chiral restoration and deconfiment transition by varying the strange chemical potential.
Using this model apporach we use the calculated equation of state in simulations of heavy-ion collisions using a hybrid molecular-dynamical and hydrodynamical approach and discuss possible observable effects. With the same appraoch we study and present neutron and proto-neutron star properties.

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