MAGIC

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Effective field theory of composite nucleons in high density matter

At sufficiently high baryon densities, the internal quark-gluon wave functions of neighboring nucleons begin to overlap and delocalize, potentially giving rise to a percolation-like phenomenon. Modeling such systems is particularly challenging, as nucleons gradually lose their identities and can no longer be treated as appropriate degrees of freedom in dense nuclear matter. In this talk, I will discuss an effective field theory (EFT) that incorporates the internal structure of nucleons through modified nucleon field operators. Rather than employing complex many-quark composite field operators, this EFT retains nucleon fields whose anticommutation relations deviate only slightly from the canonical fermionic form. These deviations, arising from the internal structure of nucleons, are explicitly dependent on the baryon density.I will also present numerical results for the equation of state of both symmetric nuclear matter and pure neutron matter, obtained within the mean-field approximation of this EFT framework.

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