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Nuclear matter and neutron star matter with quark gluon phase transition in the effective chiral model

Content :

In the effective SU(2) chiral model, we systematically investigate the vacuum stability and nuclear properties having higher order terms in the chiral potential. The condition of the vacuum stability in the model is discussed in the parameter plane.

We calculate the equation of state EOS for symmetric nuclear matter with moderate choice of the incompressibility between 300 and 400 MeV, the effective masses around 0.85 of nucleon mass, under the constraint of vacuum stability. The parameters are chosen accordingly by constraining the above conditions at nuclear saturation points.

We have applied our model to finite spherical nuclei, and perform a naive dimensional analysis to examine the naturalness of the effective Lagrangian. We explained the binding energies of heavy nuclei reasonably well.

However, in this presentation we will discuss the implication of this model to the astrophysical system such as neutron stars structure with rotation having phase transition to quark-gluon plasma.

Reference: P.K. Sahu, K. Tsubakihara and A. Ohnishi; Phys.Rev. C81: 014002,2010.

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