

LOCV calculations and Neutron Star properties

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There has been many activity recently regard to properties of dense nuclear matter in nuclear astrophysics and in heavy-ion physics. The maximum mass of neutron stars is intimately related to the underlying stiffness of the nuclear equation of state. This work analyze the behavior of such dense matter in neutron stars at both zero and finite temperature. We have used the lowest order constrained variational (LOCV) method; where is a fully self-consistent technique with state-dependent correlation functions, and employing various two-body nucleon-nucleon interactions such as charge dependent Reid (Reid93) and AV_{18} and AV_{14} potentials, for calculating the equation of state of nuclear and neutron matter. First we have shown that the LOCV normalization constraint plays a major role in the convergence of the cluster expansion of ground state energy. Then using the equation of state derived from LOCV formalism for neutron star matter, we have calculated the neutron star properties such as its mass-radius relation and minimum mass. We have found a maximum mass between $1.2M_{\odot}$ and $2M_{\odot}$ which is strongly dependent on the equation of state. Our results are in overall agreement with other theoretical approaches.

1. H. R. Moshfegh and M. Modarres, Nucl. Phys. A **792**, 201 (2007).
2. M. Modarres, A. Rajabi, H. R. Moshfegh, Phys. Rev. C **76**, 064311 (2007).