Symmetry Energy in Dense Nuclear Matter

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We present the new calculations of the symmetry energy of Nuclear Matter (NM) in the frame of a Modified Relativistic Mean Field (RMF) model where we take into account excluded volume corrections to nuclear energy [1], proportional to nuclear pressure and absent in a standard RMF with point-like nucleons. In particular we show how to determined the saturation density which now depends additionally from sizes of nucleon bags inside NM. The symmetry energy E_S in our model has the similar corrections emerging from finite nucleon volumes. It gives in our model the relation between the E_S and its derivative L which is well satisfied by the empirical constrain of E_s and L [2]. Having the E_s, nuclear compressibility and L at the initial saturation point we solve the differential equations and present the resulting energy and the symmetry energy E_s for high density and pressure. Equation of state in our modified RMF model agrees with a semi-empirical estimate and is close to results obtained from extensive DBHF calculations with a Bonn A potential, which produce the EoS stiff enough to describe neutron star properties (mass–radius constraint), especially the masses of "PSR J16142230" and "PSR J0348+0432", most massive ($\sim 2M_{\odot}$) known neutron stars [3].

References

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