

New Gogny Interaction Suitable for Astrophysical Applications

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The D1 family of parametrizations of the Gogny interaction commonly suffers from a rather soft neutron matter equation of state that leads to maximal masses of neutron stars well below the observational value of two solar masses. We propose a reparametrization scheme that preserves the good properties of the Gogny force but allows one to tune the density dependence of the symmetry energy, which, in turn, modifies the predictions for the maximum stellar mass. The scheme works well for D1M, and leads to a new parameter set, dubbed D1M*. In the neutron-star domain, D1M* predicts a maximal mass of two solar masses and global properties of the star in harmony with those obtained with the SLy4 Skyrme interaction. By means of a set of selected calculations in finite nuclei, we check that D1M* performs comparably well to D1M in several aspects of nuclear structure in nuclei.