THE FAYANS ENERGY-DENSITY FUNCTIONAL IN APPLICATIONS TO NEUTRONS STARS

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The energy-density functional in the form proposed by Fayans has proved to be convenient and efficient for describing a large class of nuclear phenomena from nuclear masses and radii to proton and neutron density distributions and decay probabilities. Originally the parameters of the potential functional (FaNDF0) were tuned to reproduce the variational calculations of the nuclear equation of state with the ν_{14} potential and Urbana three-nucleon forces. Nowadays the parameter set DF3 has become very popular. We study the compositions and mass-radius relations of neutron stars using these two parameterizations. We find general relations between parameters of the functions and the expansion parameters of the nuclear equation of state at the saturation density. We set bounds on the Fayans functional parameters so that the corresponding maximum masses and radii of neutron stars satisfy new empirical constraints.