CALIBRATION OF NOVEL ENERGY DENSITY FUNCTIONALS

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We will present the results of the first attempt to calibrate the nuclear energy density functional constructed in terms of derivatives of densities up to sixth, next-to-next-to-next-to leading order (N^3LO) [1,2]. The functional is built on the standard functionals related to the contact and Skyrme forces, which constitute the zero-order and second-order expansions, respectively. The EDF constructed in this way conforms the ideas of the density matrix expansion and effective theories. We restrict our considerations to the spherical, space-inversion and time-reversal symmetries. Furthermore we impose Galilean invariance.

To calibrate the functional we use the extensive set of experimental data consisting of 71 binding energies of spherical nuclei, 48 charge radii and 48 well defined single particle energies. To adjust the parameter of the functional, for the first time, we apply the Bayesian approach. We show that the proposed form of the energy density functional allows to significantly reduce the discrepancy between the experimental results and theoretical data. However, the information content of the experimental data is too limited to precisely constrain the parameters of the functional.

REFERENCES

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