MODEL ENERGY FUNCTIONALS DERIVED BY *AB INITIO* METHODS

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The aim of this work is to study new classes of Energy Density Functionals (EDFs). In a recent publication [1], a method was proposed to derive the coupling constants as well as the relevant terms of the functional directly from *ab initio* calculations in light nuclei. The method consists in adding perturbative terms to the *ab initio* Hamiltonian (built from true nucleon-nucleon interactions) so as to probe the response of the nuclear system to potentials that are then used to build the EDF. A numerical analysis of such *ab initio* results provides the coupling constants of the EDF (with error estimates) that best reproduce the *ab initio* ground-state energies of nuclei. The method offers a way to extend the predictions of *ab initio* techniques to the domain of heavy systems.

I will present the basic formalism of this derivation and, more specifically, preliminary results obtained for the *ab initio*-equivalent Skyrme-like EDFs. These first principle calculations were performed with the Self-Consistent Green's Functions (SCGF) method. Special care will be paid to the treatment of the 3-body terms, using a 3-body contact interaction to replace the standard 2-body density-dependent contact interaction. I will highlight the advantages of this method to obtain functionals that do not give rise to difficulties when going to beyond mean-field and symmetry-restoration techniques. I will also discuss possible future developments to consider EDFs based on finite-range momentum dependent interactions.

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REFERENCES

[1] J. Dobaczewski, *J. Phys. G: Nucl. Part. Phys.* **43** (2016) 04LT01