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Séminaire de Physique Nucléaire Théorique

Nuclear energy-density functional method : Towards microscopic and systematic calculations.

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Thanks to the developments of RI beam technology around the world, the nuclear systems that we can access have been expanding to more exotic ones. In this situation, desirable is developing a microscopic theoretical model which can describe nuclei in the whole region from proton drip line to neutron drip line and from light nuclei to superheavy nuclei in a single framework. Nuclear density-functional theory (DFT) or energy-density functional (EDF) method is considered as a candidate. I am going to discuss two directions in the nuclear EDF method. The existence of the EDF that gives us the ground-state energy and density is guaranteed, but the microscopic construction of the EDF is still a challenging issue in DFT. I am going to introduce our recent progress with the help of functional renormalization group (FRG) and show that an FRG-aided DFT is a promising way for solving the long-standing problem [1]. Nuclear EDF studies for odd-mass and odd-odd nuclei are still scarce due to the blocking procedure that is troublesome beyond the even-even nuclei. I am going to present our novel and easy way for handling the spin direction in a system with an odd particle parity. An example of application to ^{37}Mg will be shown where a deformed halo structure is expected to occur.

[1] T. Yokota, K. Yoshida, and T. Kunihiro, arXiv :1803.07439, PRC (in press).

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