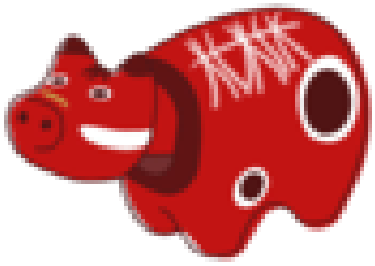

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Isospin symmetry breaking energy density functional based on quantum chromodynamics

Wednesday, 5 March 2025 15:05 (1 minute)

The isospin symmetry of atomic nuclei is broken due to the Coulomb interaction and the isospin symmetry breaking part of the nuclear interaction. The former gives the dominant contribution to the isospin symmetry breaking of atomic nuclei, and the latter is a small part of the whole; however, it sometimes gives important contributions to nuclear properties, such as the mass difference of mirror nuclei and the isobaric analog states [1, 2]. Especially, it has been a long-standing problem that the Coulomb interaction is not enough to describe the mass difference of mirror nuclei, which is known as the Okamoto-Nolen-Schiffer anomaly [3, 4]. It also contributes to the slope parameter of the symmetry energy, which is known as the L parameter, affecting the neutron-skin thickness non-negligibly [2]. The isospin symmetry breaking can be classified into two parts: the charge symmetry breaking and the charge independence breaking.
Recently, we pinned down the effective interaction, i.e., the energy density functional, of charge symmetry breaking interaction using the effective mass in medium of nucleons calculated based on the quantum chromodynamics sum rule [5]. We also estimated the energy density functional of the charge independence breaking based on the quantum electrody- namics effects in the one-pion exchange potential [6], where we can, in principle, consider the effective mass of pions in medium.
In this talk, I will report our recent progress on the derivation of the isospin symmetry breaking energy density functional based on quantum chromodynamics.

Reference

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Type of contribution

Are you a student or postdoc?

yes

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