Project Title:

Study of nuclear structure by using many-body theory

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Atomic nucleus consists of nucleons (protons and neutrons) interacting each other with the so-called nucleon-nucleon (NN) forces. The structure of atomic nucleus can be studied via many-body theories. Some of them are the well-known the random-phase approximation (RPA) or the Bardeen-Cooper-Schrieffer (BCS) theory. These theories produce very well the properties of infinite systems such as superconductors, where the quantal and thermal fluctuations are zero or very small.

However, our recent studies have shown that these fluctuations are significant in finite systems such as atomic nuclei. As the result, the physical properties of nuclear systems are changed due to the effects of quantal and thermal fluctuations. Therefore, the well-known many body theories need to modify to include the effects of these fluctuations when they are applied to atomic nucleus.

That was the goal of our works, where we proposed a self-consistent quasiparticle RPA (SCQRPA) taking into account the effects of quantal and thermal fluctuations. The SCQRPA provided reasonable agreements with the exact solutions of the model cases as well as those obtained within the quantum Monte-Carlo method for realistic nuclei.

The purpose of our present study is to apply the SCQRPA to several realistic nuclei, especially to neutron-rich nuclei, and compare the results obtained within present approach with experimental data.

Fiscal Year 2010 List of Publications Resulting from the Use of RICC

[Publication]

1. N. Dinh Dang and N. Quang Hung, *Chemical potential beyond the quasiparticle meanfield*, Phys. Rev. C 81, 034301 (2010).
2. N. Quang Hung and N. Dinh Dang, *Canonical and microcanonical ensemble descriptions of thermal pairing within BCS and quasiparticle random–phase approximation*, Phys. Rev. C 81, 057302 (2010).
3. N. Quang Hung and N. Dinh Dang, N. Quang Hung and N. Dinh Dang, *Thermodynamic properties of hot nuclei within the self-consistent quasiparticle random–phase approximation*, Phys. Rev. C 82, 044316 (2010).

[Proceedings, etc.]

If a publication does not contain the acknowledgement, please provide the reason for the missing of acknowledgement

[Oral presentation at an international symposium]

[Others]