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Pair vibrational excitation modes and pair-field polarizability

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It is known that the nucleus becomes superfluid state when nucleus receives the effects of pair correlation, and this effects is important for experimentally and theoretically understanding the properties of the nucleus. Due to the spontaneous symmetry breaking, the pairing correlation energy can be expressed by a Mexican hat potential, and the phase mode (a Nambu-Goldstone mode) and the amplitude mode (a Higgs mode) of the pairing fluctuation appear. In the present work, we study the static polarizability of nuclei with respect to various types of pair fields, and its relation to the strength functions of the pair vibrational excitation modes. We define a specific combination of pair operators that is related to the curvature of Mexican hat potential.
We use the Skyrme-Hartree-Fock-Bogoliubov mean-field model and the continuum quasiparticle random phase approximation for ^{120}Sn, in order to describe the response to pair transfer operators and pair density operators. It is found that the convergence of response sum is improved When a Woods-saxon form factor is introduced. We also find that it is necessary to consider the response up to 20MeV including the Giant-Pairing-Vibration(GPV), in order to discuss the static polarizability experimentally.From the relation between the response of pair transfer operators and pair density operators,unmeasurable response of the pair density operators can be evaluated using a simple sum of measurable strength function of pair transfers if we take care of the lowest-lying pairing vibrational states.

Field of your work

Theoretical nuclear physics

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