Contribution ID: **16** Type: **Short Talk**

Pairing dynamics in Richardson model

Wednesday, 15 June 2016 14:20 (10 minutes)

Nuclei show a variety of collective phenomena. Especially, excited 0^+ states in even-even nuclei show puzzling properties. Recent experiments reveal anomalous properties of the low-lying 0^+ states. We presume that the pairing dynamics plays a significant role in these low-lying excited 0^+ states. For instance, the 0_2^+ states in ^{152}Sm and ^{154}Gd, which were interpreted as the β vibrations, are strongly populated by two-neutron transfer reaction [1,2].
Our goal is to construct a new framework to elucidate pairing dynamics in nuclei.
As a first step, we treat simple systems with the two-body pairing interaction, known as the exactly solvable Richardson model [3]. We have found new properties about collective excited 0^+ states. The strength of two-particle transfer reaction to the excited 0^+ states strongly depends on the strength of pair correlation. In the strong pairing regime, these excited 0^+ states form a pair-rotational band, in addition to the "ground" pair-rotational band.
We have studied properties of these 0^+ states, employing the time-dependent Hartree-Fock-Bogoliubov (TDHFB) theory and requantizing the pairing dynamics. As a result of the quantization of the TDHFB, looking at the classical trajectories in the intrinsic gauge space, we are able to classify these collective excited 0^+ states into two types of states. Similar to the classification of the ground state, they are identified as either normal states or pair-condensed states. The pair-condensed excited states have properties analogous to the pair-condensed ground states.
In this contribution, we will present our recent results in two topics. (1) Requantization of collective coordinates in Richardson model; the application of Sommerfeld quantization and canonical quantization. (2) Applying the Richardson model to nuclei. We will show the strength of two-neutron transfer reaction in Sn isotope, discussing anomalous pairing vibration states discussed in Ref. [4].

[1] J. F. Sharpey-Schafer, et al. Eur, Phys. J. A 47, 5 (2011)
[2] P. E. Garrett, Phys, J. Phys. G 27, R1 (2001)
[3] R. W. Richardson, Phys, Lett 3, 277 (1963)
[4] H. Shimoyama and M. Matsuo, Phys. Rev. C 84, 044317 (2011)

Primary author: Mr NI, Fang (Univ. of Tsukuba)

Co-author: Dr NAKATSUKASA, Takashi (University of Tsukuba and RIKEN Nishina Center)

Presenter: Mr NI, Fang (Univ. of Tsukuba)

Session Classification: Students1