Contribution ID: **175** Type: **Oral**

Pairing rotation and pairing energy density functional

Thursday, 16 May 2019 12:00 (20 minutes)

Pairing correlation produces the odd-even staggering of the binding energies.
In addition to that, it also introduces spontaneous breaking of the gauge symmetry.
The pairing rotation is the Nambu-Goldstone mode associated with the gauge symmetry breaking
in superconducting nuclei, and is measurable experimentally as a pairing rotational band.
In our previous work [1], it was shown that the binding-energy differences,
\delta_{2n}, \delta_{2p}, and \delta V_{pn}, are understood in terms of the
moment of inertia of the pairing rotation.
Conventionally a simple form is assumed for the pairing energy density functional
because of the lack of observables to constrain the coupling constants.
I will show that the moment of inertia for the pairing rotation can be used to constrain the coupling constants of the pairing energy density functional, and discuss an extended form of the pairing energy density functional by including the terms with the kinetic pair density and the spacial derivative of the pair density [2].
I will also show a systematic calculation of the pairing rotational moments of inertia from stable to unstable nuclei employing various pairing functionals by performing the linear response calculation using the finite-amplitude method.

[1] N. Hinohara and W. Nazarewicz, Phys. Rev. Lett. 116, 152502 (2016).
[2] N. Hinohara, J. Phys. G 45, 024004 (2018).

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Session Classification: Session XVI