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# Pairing rotations in ground states of open-shell even-even deformed nuclei

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A pairing rotation, which has been seen in binding energies of open-shell semi-magic nuclei, such as Sn and Pb isotopes, is a signature of nuclear superconductivity; it explains the collective enhancement of two-nucleon transfer cross sections between ground states of even-even nuclei [1].
By applying the linear response formalism to the zero-energy Nambu-Goldstone pairing mode within the nuclear energy density functional theory [2], we compute the pairing-rotational moments of inertia in open-shell nuclei, and show that the state-of-the-art nuclear energy density functional [3,4] reproduces the experimental binding energy differences in the semi-magic systems such as Ca, Ni, Sn, and Pb isotopes, and N=50, 82 isotones. We extend our analysis to open-shell deformed nuclei, with both of the neutrons and protons being in the superconducting phases, and show how the mixing of neutron and proton pairing rotational modes can explain the experimental double binding-energy differences [5]. Our results confirm that the symmetry-restoring pairing rotational modes are tilted in the neutron-proton two-dimensional gauge space due to the residual neutron-proton interaction. These findings emphasize the importance of pairing rotational modes for two-nucleon and, possibly, alpha transfer reactions between the ground states of even-even open-shell nuclei.

References:

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