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Nucleon localization function in rotating nuclei[1] TONG LI, MENGZHI CHEN, CHUNLI ZHANG, WITOLD NAZAREWICZ, Michigan State University, MARKUS KORTELAINEN, University of Helsinki and University of Jyväskylä — The electron localization function was originally introduced in atomic physics to visualize atomic shell structures and molecular bonds. In nuclear physics, a nucleon localization function (NLF) has been used to characterize cluster structures in light nuclei, fragment formation in fission and pasta phases in neutron stars. In this work we use a generalized NLF, which involves both time-even and time-odd local densities, to study the nuclear response to rotation. Illustrative calculations for the superdeformed yrast band of ^{152}Dy were carried out by using the cranked Skyrme-Hartree-Fock method. The self-consistent results are compared to the cranked harmonic oscillator. We find that the nodal pattern of the NLF results from a constructive interference between kinetic-energy and particle densities. The pattern along the major axis of the nucleus comes from single-particle orbits with large aligned angular momentum; the variation along the minor axis is associated with deformation-aligned levels. The NLF allows a simple interpretation of shell structure evolution in rotating nuclei in terms of the angular-momentum alignment of individual nucleons. We expect that the NLF will become a useful tool in studies of various nuclear collective modes and time-dependent processes.

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