Parity Violating Elastic Electron Scattering and Neutron Density Distributions in the Relativistic Hartree-Bogoliubov Model

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Parity violating elastic electron scattering on neutron-rich nuclei is described in the framework of relativistic mean-field theory. Self-consistent ground state density distributions of Ne, Na, Ni and Sn isotopes are calculated with the relativistic Hartree- Bogoliubov model, and the resulting neutron radii are compared with available experimental data. For the elastic scattering of 850 MeV electrons on these nuclei, the parity-violating asymmetry parameters are calculated using a relativistic optical model with inclusion of Coulomb distortion effects. The asymmetry parameters for chains of isotopes are compared, and their relation to the Fourier transforms of neutron densities is studied. It is shown that parity-violating asymmetries are sensitive not only to the formation of the neutron skin, but also to the shell effects of the neutron density distribution.
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Superdeformations in Relativistic and Non-relativistic Mean Field Theories

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The applications of the extensions of relativistic mean field (RMF) theory to the rotating frame, such as cranked relativistic mean field (CRMF) theory and cranked relativistic Hartree-Bogoliubov (CRHB) theory, for the description of superdeformed bands in the $A \sim 60$, $140-150$ and 190 mass regions are overviewed and compared briefly with the results obtained in non-relativistic mean field theories.
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Time-odd Mean Fields in the Rotating Frame: Microscopic Nature of Nuclear Magnetism

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The microscopic role of nuclear magnetism in rotating frame is investigated for the first time in the framework of the cranked relativistic mean field theory. It is shown that nuclear magnetism modifies the expectation values of single-particle spin, orbital and total angular momenta along the rotational axis effectively creating additional angular momentum. This effect leads to the increase of kinematic and dynamic moments of inertia at given rotational frequency and has an impact on effective alignments.
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Neutron Density Distributions for Atomic Parity Non-conserving Experiments

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The neutron distributions of Cs, Ba, Yb and Pb isotopes are described in the framework of relativistic mean-field theory. The self-consistent ground state proton and neutron density distributions are calculated with the relativistic Hartree-Bogoliubov model. The binding energies, the proton and neutron radii, and the quadrupole deformations are compared with available experimental data, as well as with recent theoretical studies of the nuclear structure corrections to the weak charge in atomic parity nonconservation experiments.
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