Density Dependent Relativistic Mean Field Theory in Deformed Nuclei

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We perform density dependent relativistic mean field calculations for deformed nuclei in order to examine the possibility of describing nuclear deformation properties in a parameter-free framework. The results are compared with experimental data and with results from earlier phenomenological relativistic mean field calculations using non-linear terms in the σ-field.

Hadrodynamic Approach to Compressible Nonuniform Nuclear Systems

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The energy-momentum tensor for isospin-symmetric semi-infinite nuclear matter (SINM) as well as for finite spherically symmetric nuclei is evaluated in the relativistic Thomas-Fermi (RTF) approximation of the $\sigma - \omega$ model. The T_{33} stress tensor component of self-bound SINM vanishes identically. Our field theoretical RTF approach reflects the elementary relation $p = 2\sigma/R$ between the bulk pressure p, the surface tension σ and the radius R of a nucleus.

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Skyrme Representation of Relativistic Spin-Orbit Field ◇

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We find that a spin-orbit force with the conventional Skyrme form reproduces satisfactorily the isospin dependence of the spin-orbit field generated in relativistic Hartree calculations on semi-infinite nuclear matter with different neutron excesses. We also examine a generalization of the Skyrme-type energy-density functional that leads to still better agreement with the relativistic Hartree calculations.

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