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Emission processes in a self-consistent field

A self-consistent description of cluster emission processes in terms of nucleonic degrees of freedom is presented. The starting point is a Woods-Saxon mean field with spin-orbit and Coulomb terms where pairing is treated through standard Bardeen-Cooper-Schrieffer quasiparticles. A residual two-body interaction is introduced in terms of a density-dependent Wigner force having a Gaussian shape with a center of mass correction localized in a region of low nuclear density slightly beyond the geometrical contact radius of a system comprised from a nucleus and a surface cluster. Self-consistency is achieved through a Hartree-Fock iterative procedure that includes these cluster surface corrections. It is shown that such a description adequately reproduces the ground state properties of a spherical nucleus while the surface corrections enhance the tail of single particle orbitals, thus allowing for a good description of the decay width for unstable systems.

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