Additivity in the Highly-Deformed Rotational Bands in the A $\sim$ 130 Mass Region *

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In the present work [1] we perform theoretical analysis of rotational bands in the A $\sim$ 130 light rare-earth region. We carried out two different sets of self-consistent calculations: the cranked Skyrme Hartree-Fock (CHF) and the relativistic mean field (RMF) approach.

The Hartree-Fock analysis of the SD bands in A $\sim$ 130 nuclei has been accomplished within the cranking approximation (without pairing) with the Skyrme SLy4 interaction [2] used in the p-h channel. The self-consistent equations have been solved using the code HFODD (v1.75) [3] which employs the three-dimensional Cartesian harmonic-oscillator basis.

In the relativistic mean field (RMF) theory [4,5] the nucleus is described as a system of point-like nucleons (Dirac spinors) which interact in a relativistic covariant manner through the exchange of virtual mesons: the isoscalar-scalar σ-meson, the isoscalar-vector ω-meson and the isovector-vector ρ-meson. It is based on the one-boson exchange description of the nucleon-nucleon interaction. The RMF calculations have been performed with the NL1 parametrization [5] of the Lagrangian and the RMF-equations are solved in the basis of an anisotropic three-dimensional harmonic oscillator in Cartesian coordinates.

Our work provides a consistent understanding of the highly deformed rotational structures in the A $\sim$ 130 mass region. From our self-consistent results, we deduce effective single-particle quadrupole moments and alignments, according to Ref. [6]. The calculated quadrupole moments are compared with the recent experimental data from global lifetime measurements at GAMMASPHERE [7].

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