Systematics of β- and γ-bands in the A = 160 region

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By considering the nucleus as a vibrating liquid drop, and assuming the potential to be a function of the elongation β, and triaxiality γ, of the nucleus, the Bohr Hamiltonian can be solved to give the so-called $K=0^+$, β-vibrational and $K=2^+$ γ-vibrational bands. However, as summarized in the review by Garrett[1], very few of the observed 0^+_2 bands in deformed nuclei possess the properties expected of a β vibration. It is likely that the composition of the wavefunctions of the 0^+_2 states vary with the Fermi level, and contain admixtures of β-vibrational, two-phonon, pairing, and shape-coexisting states.

At iThemba LABS, a systematic investigation of low-lying levels in the mass 160 region is underway. An extensive set of data on the low-lying, positive-parity bands in the nuclides between N = 88 and 92 and Sm to Yb has been obtained from γ-γ coincidence measurements following fusion-evaporation reactions optimized of the population of low-spin states. Some these results point to the role of quadrupole pairing in forming 0^+_2 bands[2].

In this work, the energies and electromagnetic properties of the so-called β- and γ-bands of nuclei in this region are compared with the solutions of a five dimensional collective Hamiltonian for quadrupole vibrational and rotational degrees of freedom, with moments-of-inertia and mass parameters determined by constrained self-consistent relativistic mean-field calculations using the PC-F1 relativistic functional[3,4].

A good qualitative agreement is found between the measured energies and of the in-band/out-of-band branching ratios across the entire region.

[1] P.E. Garrett, *J. Phys.G* **100**, R1 (2001).
[2] J.F. Sharpey-Schafer *et al*., *Eur. Phys. J.* **A4**7, 6 (2011).
[3] T. Niksic *et al*., *Phys. Rev.* **C79**, 034303 (2009).
[4] Z.P. Li *et al*., *Phys. Rev.* **C79**, 054301 (2009).