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Spectroscopy of quadrupole excitations at low spin in even-even N~90 nuclei

Vibrational levels are well known in atomic nuclei but despite many decades of research, some of their properties still remain elusive. In particular, low-lying rotational bands based on the first excited 0+ state, which are traditionally understood as β vibrational bands nevertheless show properties at odds with this interpretation, more especially in the transitional rare earth region with N~90 [Gar01]. An alternative is that they can be better be described as a "second vacuum", or coexisting minimum in the pairing degree of freedom [Sch11a]. In order to produce a complete and definitive microscopic picture of the so-called β and γ bands, an extensive systematic review is performed for nuclides in the 160 mass region, between N = 88 and 92 and Sm to Yb. The data are explained using a five dimensional collective Hamiltonian for quadrupole rotational and vibrational degrees of freedom [Li09, Nik09]. A good qualitative agreement is obtained between measured energies and electromagnetic transition rates across the entire A ~ 160 mass region. The implication of these findings on the interpretation the first excited 0+ states is there from discussed.

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