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Origin of low-lying enhanced E1 strength in rare-earth nuclei

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Candidates for excited alpha-cluster states have been identified in many light nuclei being organized in rather simple quasi-molecular configurations [1]. For heavier nuclei the existence of these states remains an open question, though different experimental observables have been discussed as possible signatures. The electric dipole response of atomic nuclei is intimately connected to the breaking of isospin symmetry in simplified macroscopic nuclear models. Here, an alpha-cluster could oscillate against the remaining core, which would generate a dynamic electric dipole moment in the nucleus [2]. To study this possibility, we have adopted the spdf interacting boson model for the description of the experimental E1 response below 4 MeV in the neodymium isotopes and other rare-earth nuclei, which was obtained by means of systematic (g,g') experiments [3]. In this contribution, we will show that the model successfully reproduces the main features of the experimental E1 response and, thus, might establish alpha-clusters as an important ingredient to describe the E1 strength distribution in heavier nuclei. This work is supported by the DFG (ZI-510/4-2). M.S. is supported by the Bonn-Cologne Graduate School of Physics and Astronomy.

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