
ALPHA CLUSTERING AND ITS CONNECTION TO THE E1 RESPONSE OF HEAVY NUCLEI

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Candidates for excited α -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 remained an open question, though different experimental observables have been discussed as possible signatures, see, *e.g.*, Ref. [2]. The electric dipole response of atomic nuclei is intimately connected to the breaking of isospin symmetry in simplified macroscopic nuclear models. Here, an α -cluster could oscillate against the remaining core, which would generate a dynamic electric dipole moment in the nucleus [3]. To study this possible excitation mode systematically, we have adopted the *spdf* interacting boson model for the description of the low-lying experimental $E1$ response in rare-earth nuclei [4], which was previously obtained by means of systematic (γ, γ') experiments [5].

In this contribution, we will discuss the low-lying $E1$ strength and show that the model successfully reproduces the main features of the experimental $E1$ response of rare-earth nuclei. In the end, our study might help to establish α -clusters as an important ingredient to describe the $E1$ strength distribution in heavier nuclei and might further support the general occurrence of cluster states in nuclear systems [4].

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REFERENCES

- [1] W. von Oertzen *et al.*, Phys. Rep. **432**, 43 (2006)
- [2] 3rd International Workshop on “State of the Art in Nuclear Cluster Physics”, Journal of Physics: Conference Series **569** (2014)
- [3] F. Iachello, Phys. Lett. B **160**, 1 (1985)
- [4] M. Spieker, S. Pascu, A. Zilges, F. Iachello, Phys. Rev. Lett., in press
- [5] C. Fransen *et al.*, Phys. Rev. C **57**, 129 (1998)