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Axial quadrupole and octupole dynamics in medium mass and heavy even-even nuclei

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A quadrupole-octupole axially symmetric geometric model is proposed for the description of alternate parity bands observed in heavy [1] and medium mass even-even nuclei [2]. The shapes and the dynamical behaviour of the considered nuclei are ascertained from the phenomenology of the adopted model and the obtained parameters [2,3]. The model parameters exhibit a regular evolution as a function of neutron number [2,4]. As a result, the quadrupole shape phase transition around $N=90$ is found to be accompanied by the increase of the vibrational character for the octupole deformation. A similar critical point is also identified in the $A = 224-228$ mass region of the Ra and Th nuclei. It marks different stages of the transition between static and dynamic octupole deformation with a specific spin dependence for the electromagnetic transitions. Model extrapolations are performed for various types of excited states, for which distinguishing spectral signatures are forwarded.

[1] R. Budaca, P. Buganu, A. I. Budaca, Phys. Rev. C 106, 014311 (2022).

[2] R. Budaca, A. I. Budaca, P. Buganu, Phys. Scr. 99, 035309 (2024).

[3] R. Budaca, P. Buganu, A. I. Budaca, Eur. Phys. J. A 59, 242 (2023).

[4] R. Budaca, P. Buganu, A. I. Budaca, Il Nuovo Cimento C 47, 25 (2024).

Auteur principal: BUDACA, Radu (IFIN-HH, Magurele, Romania)

Co-auteurs: Dr BUDACA, Andreea-Ioana ("Horia Hulubei" National Institute for R&D in Physics and Nuclear Engineering); BUGANU, Petrica ("Horia Hulubei" National Institute for R&D in Physics and Nuclear Engineering)

Orateur: BUDACA, Radu (IFIN-HH, Magurele, Romania)

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