

Magic Numbers of Shape Coexistence

Andriana Martinou

Institute of Nuclear and Particle Physics, National Centre for Scientific Research
“Demokritos”, GR-15310 Aghia Paraskevi, Attiki, Greece

Shape coexistence refers to a phenomenon, where two 0^+ energy bands appear close to each other and reflect two different shapes of the nucleus. The phenomenon has attracted researchers the last decades. The most leading interpretation is, that single particle excitations create this second 0^+ band. Although there has been an explanation for the Z or N magic numbers of coexistence of certain regions of the the nuclear map, other regions still remain a mystery. For instance some Zr, Pd, Ru isotopes experimentally expose strongly coexisting bands, while the single particle excitation mechanism fails to predict these regions. A novel approach of the phenomenon is to attribute these two bands, to two different sets of magic numbers. The usual nuclear magic numbers 2,8,20,28,50,82,... are valid in small nuclear deformation, while as deformation evolves a new set appears. Therefore since two deformations coexist, two sets of magic numbers can coexist also. Each of the two sets will correspond to each of the two 0^+ bands. The magic numbers of shape coexistence, the bandheads and the deformation can be predicted with no fitting to the data. A comparison with experimental evidence will be usefull to test the validity of the new approach.

References

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