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Various Aspects of the Deformation Dependent Mass Model of Nuclear Structure

D. Petrellis[1], **D. Bonatsos**[2], **N. Minkov**[3]

[1]Department of Physics, University of Istanbul, 34134 Vezneciler, Istanbul, Turkey

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

[3]Institute of Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences, 72 Tzarigrad Road, 1784 Sofia, Bulgaria

Abstract

Recently, a variant of the Bohr Hamiltonian was proposed [1] where the mass term is allowed to depend on the β variable of nuclear deformation. Analytic solutions of this modified Hamiltonian have been obtained using the Davidson [1] and the Kratzer [2] potentials, by employing techniques from supersymmetric quantum mechanics. Apart from the new set of analytic solutions, the newly introduced Deformation-Dependent Mass (DDM) model offered a remedy to the problematic behavior of the moment of inertia in the Bohr Hamiltonian, where it appears to increase proportionally to β^2. In the DDM model the moments of inertia increase at a much lower rate, in agreement with experimental data. The current work presents an application of the DDM-model suitable for the description of nuclei at the point of shape/phase transitions between vibrational and gamma-unstable or prolate deformed and is based on a method that was successfully applied before [3] in the context of critical point symmetries.

References

[1] D. Bonatsos, P. E. Georgoudis, D. Lenis, N. Minkov, and C. Quesne, *Phys. Rev. C* **83** (2011) 044321.

[2] D. Bonatsos, P. E. Georgoudis, N. Minkov, D. Petrellis, and C. Quesne, *Phys. Rev. C* **88** (2013) 034316.

[3] D. Bonatsos, D. Lenis, N. Minkov, D. Petrellis, P.P. Raychev and P.A. Terziev, *Phys. Lett. B* **584** (2004) 40.