

The Deformation-Dependent Mass Davidson Model of Collective Nuclei

**D. Bonatsos¹, P. E. Georgoudis¹, D. Lenis¹, N. Minkov²,
C. Quesne³**

¹Institute of Nuclear Physics, N.C.S.R. "Demokritos",
GR-15310 Aghia Paraskevi, Attiki, Greece

²Institute of Nuclear Research and Nuclear Energy,
Bulgarian Academy of Sciences,
72 Tzarigrad Road, 1784 Sofia, Bulgaria

³Physique Nucléaire Théorique et Physique Mathématique,
Université Libre de Bruxelles, Campus de la Plaine CP229,
Boulevard du Triomphe, B-1050 Brussels, Belgium

Analytical expressions for spectra and wave functions are derived for a Bohr Hamiltonian, in which the mass is allowed to depend on the nuclear deformation. Solutions are obtained [1] for separable potentials consisting of a Davidson potential in the β variable, resulting in the Deformation Dependent Mass (DDM) Davidson model. The solution is achieved by using techniques of supersymmetric quantum mechanics (SUSYQM), involving a deformed shape invariance condition. Spectra and $B(E2)$ transition rates are compared to experimental data both for γ -unstable nuclei and for axially symmetric deformed nuclei. The dependence of the mass on the deformation, dictated by SUSYQM for the potential used, reduces the rate of increase of the moment of inertia with deformation, removing a main drawback of the model.

References

- [1] D. Bonatsos, P. E. Georgoudis, D. Lenis, N. Minkov, and C. Quesne, *Phys. Rev. C*, accepted (2011); arXiv 1103.5935 [nucl-th].