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Theme for the Internship Project of the Erasmus Mundus 2019

Shape Coexistence in the Geometric Collective Model of nuclei

Shape Coexistence is nowadays one of the leading research areas in nuclear structure. The Nuclear Shape is intimately connected with the symmetry of the ground state of an atomic nucleus as this symmetry is revealed by its low-lying collective excitations[1]. A recent approach addresses Shape Coexistence in the non-relativistic Schrodinger equation of the Geometric Collective Model of nuclei[2]. This is achieved via potentials with double degenerate minima, a spherical minimum and a deformed minimum separated by a finite barrier. This internship project aims to introduce the trainee to nuclear collective models in conjunction with Shape Coexistence. It will start from the basics of the non-relativistic Schrodinger equation for the collective states of atomic nuclei, its analytical solutions in terms of a spherical, a γ-unstable and an axially symmetric shape. In parallel simple group theoretical methods will be discussed for the classification of states in terms of the dynamical symmetry limits of the Interacting Boson Model[3] and through the convergence process of the $SU(1,1) \times SO(5)$ Spectrum Generating Algebra[4]. The trainee will create realistic Shape Coexistence scenarios and examine them with available experimental data in series of isotopes expected to manifest coexistence of spherical and γ-unstable shapes or coexistence of spherical and axially symmetric shapes.

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[1] A. Frank, J. Jolie and P.Van Isacker, *Symmetries in Atomic Nuclei* ,Springer-Verlag (2009).
[2] P. E. Georgoudis and A. Leviatan, IOP Journal of Physics: Conf. Series 966, 012043 (2018).
[3] F. Iachello and A. Arima, *The Interacting Boson Model,* Cambridge (1989).
[4] D. J. Rowe and J. L. Wood, *Fundamentals of Nuclear Models,* World Scientific (2010).