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Erosion of $j-1$ Anomaly

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Abstract

The Nuclear Shell model and the Particle-Core model are among the cornerstones in the modern Nuclear physics. Their success is based on the applicability of the adiabatic principle which allows to disentangle single-particle from collective modes. It is now well established that nuclei of well pronounced shell-model behaviour are located near the magic numbers, while nuclei with a large number of valence particles form regions of collectivity on the Segré chart. In each of these regimes, however, there are distinctive features that are outside the respective model space, but rather reside in the adversary group of models. Such a feature is the seniority concept, which is well understood within the spherical shell model space, but it is completely orthogonal to the deformed shell model concept. The data on the light and medium odd-mass systems, however, seems to support a gradual evolution between the two regimes [1, 2]. Of particular interest are the $\nu = 3$ seniority multiplets that arise in vicinity of the doubly magic systems. These multiplets gradually evolve with the valence space giving rise to the $j-1$ anomaly. A strong correlation between the $j, j-1$ energy spiting and the 2^+ level energy of the neighbouring even-even nuclei has been found in the medium mass nuclei [1]. In the heavy-mass nuclei, however, this correlation seems to erode [3].

References

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[3] S. Lalkovski, *Nuclear Theory*, **37** (2018) 52.