Foundations of the proxy-SU(3) symmetry in heavy nuclei

I.E. Assimakis[1], **D. Bonatsos**[1], **N. Minkov**[2], **A. Martinou**[1], **R.B. Cakirli**[3], **R.F. Casten**[4,5], **K. Blaum**[6]

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

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

[3] Department of Physics, University of Istanbul, 34134 Istanbul, Turkey

[4] Wright Laboratory, Yale University, New Haven, Connecticut 06520, USA

[5] Facility for Rare Isotope Beams, 640 South Shaw Lane, Michigan State University, East Lansing, MI 48824 USA

[6] Max-Planck-Institut für Kernphysik, Saupfercheckweg 1, D-69117 Heidelberg, Germany

Abstract

An approximate SU(3) symmetry appears in heavy deformed even-even nuclei, by omitting the intruder Nilsson orbital of highest total angular momentum and replacing the rest of the intruder orbitals by the orbitals which have escaped to the next lower major shell. The approximation is based on the fact that there is an one-to-one correspondence between the orbitals of the two sets, based on pairs of orbitals having identical quantum numbers of orbital angular momentum, spin, and total angular momentum. The accuracy of the approximation is tested through calculations in the framework of the Nilsson model in the asymptotic limit of large deformations, focusing attention on the changes in selection rules and in avoided crossings caused by the opposite parity of the proxies with respect to the substituted orbitals.

References

[1] D. Bonatsos, I. E. Assimakis, N. Minkov, A. Martinou, R. B. Cakirli, R. F. Casten, and K. Blaum, *Phys. Rev. C* **95** (2017) 064325.