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# N=40 : from IOI to IOI

*mardi 13 mai 2025 11:10 (30 minutes)*

The development of collectivity along the N = Z is one of the subjects that has recently attracted great experimental efforts. In particular, heavy N = Z nuclei in the mass region A = 80 are expected to be some of the most deformed ground states which have been found[1] in mid-mass nuclei, typically 8p−8h, 12p−12h for e.g. the cases of 76Sr, 80Zr. This strong enhancement of collectivity with respect to lighter N=Z nuclei has its origin in cross shell excitations across the N=40 shell gap to g9/2, d5/2 and s1/2 which are intruder quadrupole partners generating
deformations. These structures can be interpreted in terms of algebraic Nilsson-SU3 self-consistent model to describe the intruder relative evolution in the vicinity of 80Zr[2]. In this presentation, we will expose some of the latest developments in microscopic nuclear structure calculations for exotic nuclei far from stabilitity at the N=Z[3]. The new theoretical calculations for the very region of 80Zr will be presented for the first time within the interacting shell model framework using an enlarged model space outside a 56Ni core comprising the pseudo-SU3 p3/2 f5/2 p1/2 and quasi-SU3 g9/2 d5/2 s1/2 orbitals for both protons and neutrons. We will present and compare results from both exact Shell Model diagonalization [4] and our newly developed DNO Shell Model approach employing beyond mean field techniques [5]. These theoretical calculations allow a very good description of the rapid transition (A = 60 − 100) from spherical to deformed structures which can be interpreted in terms of "simple"many particles - many holes configurations. Emphasis will be put on the intimate relationship between shell evolution far from stability at the neutron-rich AND proton-rich edges.
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[5] D. D. Dao and F. Nowacki, Phys. Rev. C 105, 054314 (2022).

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