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Structure evolution and shape phase transitions in odd-mass nuclei

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Abstract

The influence of the unpaired nucleon on the location and nature of phase shape transitions (PST) in odd-mass nuclei is an interesting question. To this end, one should find adequate definition/choice for the control and order parameters, empirical signatures of the PST and possible candidates for critical point nuclei. We study the evolution of the level structures determined by the unique parity orbitals in odd mass nuclei between Zn and Am, by correlations between excitation energies and ratios of such energies in both even-even (core) and odd-mass nuclei [1]. Clear evidence for a PST between decoupling and strong coupling is found for nuclei with mass about 160 around neutron number 90, which is closely correlated with the known PST of their even-even core nuclei from vibrator to rotor (around the X(5) critical point). This abrupt structure evolution is corroborated by a corresponding non-monotonic behaviour of the differential variation of the two-neutron separation energy.

References

[1] D. Bucurescu and N-V. Zamfir, *Phys. Rev. C* **95**, 014329 (2017).