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Multiple shape coexistence in Cd isotopes studied with Coulomb excitation

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Mid-shell Cd nuclei were traditionally considered to be the best examples of vibrational nuclei. Recent studies that combined detailed γ-ray spectroscopy with sophisticated beyond-mean-field calculations had suggested [1,2] that the low-lying 0+ states in 110,112Cd possessed prolate, triaxial, and oblate shapes with rotational-like bands built upon them. If confirmed, this would have major implications on structural interpretations of nuclei in the Z = 50 region, and perhaps beyond. Soon afterwards a similar picture was suggested for 106Cd [3,4].

The low-energy Coulomb-excitation technique represents an ideal tool to study nuclear deformation. It enables a direct determination of electromagnetic transition matrix elements between low-lying excited states including spectroscopic quadrupole moments and signs. Those can be further analysed in terms of quadrupole invariants [5] yielding model-independent information on shape parameters of individual states. This requires, however, extensive sets of high-precision experimental data.

A multi-faceted experimental program to ascertain the deformation of low-energy states in 110Cd has been initiated. We seek to firmly establish the shape of the first three lowest-lying 0+ states through the use of the rotation-invariant sum rules for E2 transitions. Coulomb-excitation measurements were performed using various reaction partners: 14N and 32S beams with EAGLE at HIL UW (Warsaw, Poland), 60Ni beam with AGATA at LNL (Legnaro, Italy) and 110Cd beam on a 208Pb target with GRETINA at ANL (Argonne , USA). These measurements have been complemented by an experiment performed at TRIUMF-ISAC with the GRIFFIN spectrometer examining the decays of 110Ag/110In that will provide high-precision data on γ-ray branching ratios and transition mixing ratios. First results on quadrupole deformation parameters for the 0+1 and 0+2 states, demonstrating non-axial character of the ground state in 110Cd, will be presented. These experimental findings will be discussed in the context of: (i) Symmetry-Conserving Configuration-Mixing approach [1,2] and, (ii) new calculations with the general quadrupole collective Bohr Hamiltonian model involving two variants of interactions: SLy4 and UNEDF0.

Future perspectives will be outlined, including a brief overview of Coulomb-excitation studies addressing shape coexistence in the Z ~ 50 region within the experimental campaigns at HIL Warsaw and at LNL Legnaro.

References
[1] P. Garrett et al., Phys. Rev. Lett. 123 (2019) 142502.
[2] P. Garrett et al., Phys. Rev. C 101 (2020) 044302.
[3] M. Siciliano et al., Phys. Rev. C 104 (2021) 034320.
[4] D. Kalaydjieva , PhD thesis, Universite Paris-Saclay, 2023
[5] K. Kumar et al., Phys. Rev. Lett. 28 (1972) 249

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