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Investigating shape coexistence in neutron deficient Cd isotopes

The study of shell evolution far from stability is a major focus of modern nuclear physics, such evolution is the cause of several interesting phenomena, one of which is shape coexistence. Shape coexistence can be characterized by the presence, in a narrow energy range, of several deformed nuclear configurations in the same nucleus. It is nowadays accepted that this phenomenon occurs almost in every isotope across the nuclear chart [1], but its study far from stability is fundamental in order to constrain nuclear models which aim at describing it in a microscopic approach. Recently, multiple shape coexistence was suggested to appear in ^{110}Cd and ^{112}Cd , following an extensive β -decay study performed at the TRIUMF facility using the GRIFFIN spectrometer [2]. The low-energy part of the level scheme of both isotopes was compared to beyond-mean-field calculations, and was interpreted as four rotational bands built on the first four 0^+ states, all corresponding to different shapes. In a more recent study aiming at the low-lying states in ^{106}Cd , a number of half-lives were determined using the AGATA array and the recoil distance Doppler-shift method [3]. Again, beyond-mean-field calculations predicted multiple different shapes for excited states in ^{106}Cd . Following these studies, an experiment was conducted at TRIUMF to reach more neutron-deficient Cd isotopes, namely $^{104,106}\text{Cd}$. This LOI aims to extend the study of shape coexistence in Cd isotopes towards the $N = Z$ line, closing in on region of the doubly-magic nucleus ^{100}Sn .

[1] P. E. Garrett, M. Zielińska, and E. Clément, An experimental view on shape coexistence in nuclei, *Progress in Particle and Nuclear Physics* 124, 103931 (2022)

[2] P.E. Garrett et al., Multiple shape coexistence in $^{110,112}\text{Cd}$, *Phys. Rev. Lett.* 123, 142502 (2019)

[3] M. Siciliano et al., Lifetime measurements in the even-even $^{102-108}\text{Cd}$ isotopes, *Phys. Rev. C* 104, 034320 (2021)

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