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Multiple shape coexistence in ^{100}Zr

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A sudden onset of deformation is observed in the ground states of Zr and Sr appearing sharply at $N = 60$ [1]. This unique feature will be discussed in the context of state-of-the-art Monte Carlo Shell Model (MCSM) calculations which were the first to successfully reproduce the rapid increase of collectivity and dramatic changes in the low-energy spectra of the Zr isotopes [2]. According to the MCSM calculations, an inversion of nearly-spherical and well-deformed configurations in ^{98}Zr and ^{100}Zr appears with small to no mixing, causing an abrupt ground-state shape transition. Furthermore, the presumably prolate ground state of ^{100}Zr is predicted to coexist with multiple excited configurations possessing different intrinsic shapes.

The MCSM theoretical predictions were put to the test in a recent β -decay study of ^{100}Zr performed at the TRIUMF ISAC I facility. A mixture of ^{100}Rb and ^{100}Sr ions was delivered onto a mylar tape in the center of the powerful GRIFFIN spectrometer [3], comprising 15 large-volume HPGe clover detectors coupled to seven LaBr₃ detectors for fast-timing lifetime measurements. The collected $\gamma - \gamma$ coincidence data was used to substantially extend the level scheme of ^{100}Zr and firmly assign the spins of key states via $\gamma - \gamma$ angular correlations. Those include several newly found 0^+ states, some of which were recently reported in Ref. [4], and a potential candidate spin-2 member of a band built on the 0_4^+ state [5].

Selected results will be presented, including the lifetime of the 2_2^+ state, extracted for the first time in this work. The shape-coexistence scenario in ^{100}Zr will be put on firm ground and striking structural similarities between ^{100}Zr and ^{98}Sr [6] will be revealed.

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- [6] E. Clément et al., Phys. Rev. Lett. 116 (2016) 022701.

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