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Investigating shape coexistence close to ^{80}Zr

Nuclei in the region of ^{80}Zr have long been thought to exhibit strong nuclear deformation, and rapid changes in nuclear shape happen in this region of the nuclear chart. From spherical at $N = 50$, nuclei become strongly deformed in the $N \leq 40$ region. Until now, studies focus on Yrast states and the observation of deformed bands in neutron-deficient Sr nuclei. Another way of studying these phenomena is through conversion electron spectroscopy, by which $E0$ transitions between two 0^+ states can be measured. Low-lying 0^+ states and large $E0$ strengths are usually a hint of coexisting shapes becoming mixed [1] and their measure could very much help our understanding of the southern border of this region of deformation. Such low-lying 0^+ states have already been observed in neutron-deficient Kr and Se nuclei [2, 3] but a systematic study is still missing in Sr isotopes, approaching $N = Z$ and the ^{80}Zr nucleus, where multiple shape coexistence is expected [4]. One low-lying 0^+ state has been observed in ^{80}Sr via $^{78}\text{Kr}(^3\text{He}, n)$ reaction at 1 MeV, but its decay to the ground-state was not [5] and could be related to a coexisting structure for which $E0$ information is missing. This LOI proposes to study 0^+ states in ^{82}Sr and ^{80}Sr , where $E0$ information is missing, down to ^{78}Sr where no such states have been observed yet and everything is to be done.

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