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Investigating the deformation of the intruder isomeric 1/2+ state in 79Zn (N=49) via Coulomb excitation

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For nuclei with N around 50, several pieces of evidence supporting shape coexistence close to ^{78}Ni have been found. In particular, the ~940-keV $1/2^+$ isomeric state in ^{79}Zn has been interpreted as an intruder state, related to neutron excitations across N=50. Laser-spectroscopy measurements found a large isomeric shift for this state with respect to the ^{79}Zn $9/2^+$ ground state indicating a signifcantly larger mean squared charge radius. Assuming an axial quadrupole shape, this would suggest a deformation of β=0.22, considerably larger than β=0.15 of the ground state, and would imply a significant mixing from the $2d_{5/2}$ neutron orbital. Alternatively, the larger radius could be due to the enlarged spherical shape coming from the contribution of the higher major oscillator shell orbital $3s_{1/2}$.

In order to probe the quadrupole deformation of the intruder isomer in ^{79}Zn and to understand the nature of its wave function, we used a post-accelerated ^{79}Zn beam from ISOLDE that consisted of a mixture of nuclei in the $9/2^+$ ground state and the $1/2^+$ isomeric state, to populate excited states built on these two different configurations via Coulomb excitation on ^{196}Pt and ^{208}Pb targets. In the experiment, ɣ rays were detected by the Miniball array, while scattered projectiles and beam recoils by an annular DSSD detector placed at forward angles.

We will present preliminary results of this study, providing evidence for strong Coulomb excitation of states built on the intruder isomer, and for the observation of new transitions that fill the gaps in the known level scheme of ^{79}Zn. We will discuss their possible implications in the context of the deformation of the $1/2^+$ isomer in ^{79}Zn, and of the 80Zn ground state.

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