Triaxiality and configuration coexistence in ^{74}Zn

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We explored collectivity of the neutron-rich ^{74}Zn nucleus by combining high-statistics β decay, studied with the GRIFFIN γ-ray spectrometer at TRIUMF, with multiple Coulomb excitation performed as the very first experiment with the HIE-ISOLDE facility at CERN. The β-decay study [1] provided firm spin-parity assignments for the 2_2^+, 3_1^+, 0_2^+ and 2_3^+ states. The relative $B(E2)$ values deduced using the measured branching and $E2/M1$ mixing ratios for transitions de-exciting the 2_2^+, 3_1^+ and 2_3^+ states allowed organisation of the states into rotational-like structures, namely a $K = 2$ 'γ' band and a $K = 0$ band built on the 0_2^+ state. The appearance of a 'γ' band at low excitation energy suggests that the triaxial degree of freedom plays an important role in the structure of ^{74}Zn, which is further supported by a value of the spectroscopic quadrupole moment of its first 2_1^+ state deduced from the Coulomb-excitation experiment [2] that is close to zero. This conclusion is consistent with the new results of Monte-Carlo and conventional shell-model calculations, which both predict non-axial shapes of the ground-state bands in neutron-rich Zn nuclei. The excited structure built on the 0_2^+ state is interpreted as having a similar shape as that of the ground state, but arising from fewer neutron excitations across the energy gap for $N = 40$. This suggests that ^{74}Zn belongs to the $N = 40$ island of inversion, which has previously been thought to be limited from the north by the $Z = 26$ Fe isotopes.

[1] M. Rocchini, P.E. Garrett, M. Zielińska *et al.*, Phys. Rev. Lett. **130**, 122502 (2023).
[2] A. Illana, M. Zielińska, M. Huyse *et al.*, submitted to Phys. Rev. C.