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Fast-timing lifetime measurements in A = 83 nuclei near the N = 50 shell closure

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Fast-timing measurements have been performed to investigate the nuclear structure of the A = 83 isobars 83Se and 83Br, with the aim of studying the evolution of collectivity and possible shape coexistence in the vicinity of the N = 50 shell closure.
The experiment was carried out at the LOHENGRIN recoil mass separator at the Institut Laue-Langevin. Neutron-induced fission products were separated and implanted, and γ-rays were detected using a fast-timing setup based on LaBr3(Ce) scintillators. Lifetimes were extracted using both Generalized Centroid Difference (GDC) and Advanced Time-Delayed (ATD) techniques, providing sensitivity in the picosecond range.
In 83Se, the lifetime of the state at E = 963.4 keV, depopulated by the 734.9 keV (3/2+ ⟶ 1/2−) transition, was measured for the first time and determined to be τ = 13 ± 3 ps using the GDC method and τ = 17 ± 6 ps using ATD. In 83Br, new lifetimes were measured for the state at E = 356.7 keV, depopulated by the 356.5 keV (5/2− ⟶ 3/2−) transition, yielding τ = 12 ± 2 ps, and for the state at E = 866.9 keV, depopulated by the 509.9 keV (7/2− ⟶ 5/2−) transition, with τ = 7 ± 3 ps, as determined via GDC analysis, with compatible values obtained using ATD.
These new lifetime data extend the experimental knowledge of nuclei close to the N = 50 shell closure and provide important constraints for the interpretation of structure evolution and possible shape coexistence in the A = 83 mass region.
This work was performed in collaboration with the University of Cologne and INFN.

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