

Shape coexistence in ^{118}Sn and ^{120}Sn observed through the first lifetime measurements of the 0_3^+ states

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The semi-magic Sn nuclei, extending beyond the $N = 50$ and $N = 82$ shell closures, present one of the most-studied isotopic chains on the nuclear chart. $^{118}_{50}\text{Sn}_{68}$ and $^{120}_{50}\text{Sn}_{70}$ lie in the neutron mid-shell, where shape coexistence was proposed with the signature of deformed excited 0^+ states intruding into the seniority-like spherical yrast bands. However, transition strengths studies were hindered because only limits were available in the literature on the lifetimes of the excited 0_3^+ states. Notably, the lack of electric monopole strengths between the 0_3^+ and 0_2^+ states, $\rho^2(E0; 0_3^+ \rightarrow 0_2^+)$, obscured the shape difference and mixing amplitudes between the excited 0^+ states.

These 0_3^+ lifetimes were recently measured for the first time in a thermal-neutron capture experiment at the Institut Laue-Langevin. The world's highest-flux thermal neutron beam of 10^8 neutrons/cm²/s was delivered onto enriched ^{117}Sn and ^{119}Sn targets, respectively. Low-spin states in $^{118,120}\text{Sn}$ were populated up to the ≈ 9 -MeV neutron separation energies, and the decaying gamma-ray cascades were detected with the Fission Product Prompt Gamma-ray Spectrometer (FIPPS) comprised of eight Compton-suppressed HPGe clovers coupled to an array of 15 LaBr₃ fast scintillation detectors.

In total, $\approx 4 \times 10^9$ counts were recorded in the $\gamma\gamma\gamma$ cube for each isotope, where two LaBr₃ events were in coincidence with one HPGe.

Monopole transition strengths from the lifetime measurements for the 0_3^+ states in $^{118,120}\text{Sn}$ will be presented along with theoretical interpretations employing CDFT-GCM calculations without adjustable parameters.