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Lifetime measurement of first 4+ state in 102Sn

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The long chain of Sn isotopes is a formidable testing ground for nuclear models studying the evolution of shell structure and interplay between pairing and quadrupole correlations. A transition from superfluid nuclei at midshell to spherical nuclei is also expected approaching the neutron shell closures at N = 50, where the seniority scheme can be adopted to describe the energy spectra. However, the corresponding B(E2 : $0+\longrightarrow 2+$) values have shown a presumed deviation from the expected parabolic behavior. From a theoretical point of view, various attempts have been done to explain the experimental results, in particular by including core-breaking excitations in the shell-model calculations by activating protons and neutrons from the g9/2 orbital to the higher ones. From experimental side, limited data are available beyond 104Sn on this very neutron-deficient region, leading to a difficulty in a firmly establishment of core-braking effect.

In this presentation, we will report on the first lifetime measurement for the 4+ state in 102Sn which is sensitive to the balance between the pairing and quadrupole terms in the nuclear interaction. The experiment is performed at GSI based on the use of hybrid AIDA+HPGe+LaBr3(Ce) array, made available by the HISPEC/DESPEC collaboration. The nuclei of interest were separated and identified through the FRS separator, following the production via fragmentation reaction of 124Xe beam incident on a 9Be target. The 102Sn ions are stopped by AIDA array and γ rays emitted from the 6+ seniority isomer are collected by FATIMA array which allows a direct lifetime measurement with a precision up to few tens of ps. The obtained experimental data would be compared with theoretical predictions, shedding light on the detailed wave function and the core breaking contribution.

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