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Lifetime measurement of ^{235}U fission products using Doppler-shift methods

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The fission process leads to excited states in neutron rich nuclei at high spin and excitation energy. Obtaining new data for nuclear lifetimes and transition probabilities is a step towards a better understanding of the structure of neutron-rich nuclei and nuclear theory, in general. This presentation deals with the use of the Doppler-shift Attenuation Method (DSAM) coupled with the coincidence method, with the goal to present new values for lifetimes in the sub picosecond range of excited states in neutron-rich nuclei of mass $A \approx 100$ and $A \approx 140$. These nuclei are produced with good yields in the neutron induced fission of ^{235}U . In this work, new results will be shown for the high-spin states of ^{104}Mo and ^{134}Te , which have not been studied using DSAM before. Complementary results using the coincidence method have been obtained for $^{97,99,100,101,102}\text{Zr}$, as well as $^{100,102}\text{Nb}$, which were the result of a previous work using the same analytical setup. The related experiment has been done at ILL, using the FIPPS high-resolution γ -ray spectrometer array, by using a beam of thermal neutrons on a ^{235}U target, dissolved in a liquid scintillator. In parallel, the GEANT4 simulation toolkit has been used to reproduce the experimental conditions at FIPPS and create Monte-Carlo generated spectra. Simulations have been performed for different lifetimes and the lifetime of a given nuclear state has been extracted via a χ^2 analysis. γ coincidences have been used both in experimental and simulated data to increase the selectivity in the lineshape analysis.

Type of contribution

Regular Abstract

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