Analysis of fission yield measurements from ^{236}U* using prompt γ-ray spectroscopy: Challenges, Anomalies, and Resolutions

Aniruddha Dey[1,2], D. C. Biswas[1], A. Chakraborty[2], S. Mukhopadhyay[1]

[1]Nuclear Physics Division, Bhabha Atomic Research Centre, Mumbai 400 085, India

[2]Department of Physics, Siksha Bhavana, Visva-Bharati University, Santiniketan, West Bengal 731 235, India

Prompt γ-ray spectroscopy is one of the experimental approaches that can effectively be utilized for extracting the relative isotopic and mass yield distributions of the fission fragment nuclei, produced from the compound fissioning nucleus. Ideally, this is a novel technique, in the sense, that it can be used to measure accurate fission yield distributions with one unit of mass resolution. However, one has to deal with several difficulties while analyzing the in-beam fission fragment spectroscopic data. These difficulties are related to several factors, such as the unwanted contributions from beta-decay precursors, presence of isomeric states in the low-lying yrast band of the fragment nuclei, presence of close-lying transitions in the fragment nuclei, underestimation of γ-ray yields due to the accompanying electron conversion processes, etc. Hence, one has to properly optimize the analysis procedure for unambiguous extraction of the fission fragment yields from the coincidence γ-ray spectrum. Such an optimization in the analysis procedure has been followed for in-depth analysis of the in-beam fission fragment spectroscopic data obtained from two separate experiments: (i) thermal neutron-induced fission of ^{235}U during the EXILL campaign [1] at Institut Laue-Langevin (ILL), Grenoble, France, and (ii) alpha induced fission of ^{232}Th during the INGA campaign [2] at Variable Energy Cyclotron Centre (VECC), Kolkata, India. It is to be noted that the compound fissioning nucleus was ^{236}U* in both the measurement, albeit the excitation energy was slightly higher in the latter. The analysis procedure in detail, highlighting the challenges and approaches that were adopted to address those, will be presented at the conference. The important results that have been obtained from the analysis of the two sets of data will also be discussed.

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References:

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