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Measuring fission fragment mass distributions of 252-Cf with VERDI using a novel plasma delay correction procedure

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The VElocity foR Direct particle Identification (VERDI) is a fission-fragment spectrometer based on the detection of velocities as well as energies of fission fragments (2E-2v method). It aims at determining fission yield mass distributions with a resolution of at least A/ΔA = 100. VERDI includes two time-of-flight (TOF) sections, each equipped with a micro-channel plate (MCP) and up to 32 passivated implanted planar silicon (PIPS) detectors. One of the main challenges in achieving the desired mass resolution mentioned above, is the accurate determination of the fragment velocities with the PIPS detectors, which is affected by the so-called plasma delay time (PDT). The PDT distorts the PIPS signals, which alters the fission fragments'velocity spectra.

In the process of analyzing fission data taken with VERDI, the PDT needs to be modeled and applied, in order to determine correct fission fragment velocity distributions. However, previous models have fallen short in terms of producing reliable fission data that aligns with reference data. One reason could be that the PDT models proposed in the literature are detector-specific, and some of them present quite different functional dependencies with respect to the fission fragments' mass and kinetic energy.

To mitigate this problem, an experimental campaign was conducted at the LOHENGRIN recoil fission-fragment spectrometer, aimed at overcoming the PDT-related challenges faced by VERDI. This effort led to the development of a new PDT model, expressed as $PDT = 0.2A^{0.02}E^{0.5}$. The PDT model has been applied to the analysis of previous measurements taken with VERDI using ^{252}Cf. In this presentation, we will discuss the preliminary results of the mentioned data analysis.

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