Contribution ID: **11** Type: **Contributed Talk**

Determination of the Plasma Delay Time in PIPS detectors for fission fragments with the LOHENGRIN spectrometer

Wednesday 27 October 2021 14:40 (20 minutes)

The particle spectrometer VERDI (VElocity foR Direct particle Identification) allows high-precision measurements of fission fragment (FF) yield by using the so-called 2E-2v technique. The spectrometer allows the determination of the FF mass, both before and after neutron emission, by means of a time-of-flight (ToF) and energy measurement. VERDI consists of two arms with 16 Silicon PIPS (Passivated Implanted Planar Silicon) detectors and a Micro Channel Plate (MCP) each. The MCPs provide the start signal for the ToF measurement, and the Si detectors are used both for energy detection and as a stop signal. In silicon detectors, the signal amplitude and shape get affected by the formation of a plasma from the interaction between the heavy ions and the detector material, which entails both, a signal loss and a signal delay. The amplitude defect and the time delay, are referred to as Pulse Height Defect (PHD) and Plasma Delay Time (PDT), respectively. If not accounted for, they can render faulty fission-neutron correlations, which makes PHD and PDT corrections imperative.

A characterization of the PDT in the silicon detectors used in VERDI was performed at the LOHENGRIN recoil separator of the Institut Laue Langevin, for a wide range of energies and masses, $E \sim$ 40-110 MeV and $A \sim$ 80-160 u, respectively. With LOHENGRIN, characteristic FFs from ^{239}Pu(n,f) were selected based on their A/q and E/q ratios. A unique collaboration allowed the utilization of a MCP detector from the STEFF spectrometer [1] and 6 silicon detectors from VERDI. The measured ToF, between the MCP and Si was compared to the true ToF derived from LOHENGRIN. The signals were recorded in a digital acquisition system to completely exploit the offline analysis capabilities. All the PIPS detectors were fully characterized to study their individual response to the PDT effect. The data will provide a calibration procedure in which the PDT contribution is calculated relative to alpha particles and protons. The achieved combined timing and energy resolutions of our experimental setup are around 160 ps and 0.1 MeV (FWHM), respectively.

The first preliminary results from the analysis will be presented, where the PDT is estimated both in absolute terms and relative to alpha particles.

[1] I. Tsekhanovich, J.A. Dare, A. G. Smith, *et. al.* A novel 2v2e spectrometer in Manchester: new development in identification of Fission Fragments *Seminar on Fission pp 189-196* (2008). https://doi.org/10.1142/9789812791061_0018

Authors: AL-ADILI, A. (Department of Physics and Astronomy, Uppsala University, Box 516, 751 20 Uppsala, Sweden); SMITH, A. G. (University of Manchester, M13 9PL Manchester, United Kingdom); GÓMEZ, A. (Department of Physics and Astronomy, Uppsala University, Box 516, 751 20 Uppsala, Sweden); OBERSTEDT, A. (Extreme Light Infrastructure - Nuclear Physics (ELI-NP), Horia Hulubei National Institute for Physics and Nuclear Engineering (IFIN-HH), 077125 Bucharest-Magurele, Romania); SOLDERS, A. (Department of Physics and Astronomy, Uppsala University, Box 516, 751 20 Uppsala, Sweden); TARRÍO, D. (Department of Physics and Astronomy, Uppsala University, Box 516, 751 20 Uppsala, Sweden); SOSNIN, N. V. (University of Edinburgh, EH9 3FD Edinburgh, United Kingdom); BENNETT, S. (University of Manchester, M13 9PL Manchester, United Kingdom); OBERSTEDT, S. (European Commission, Joint Research Centre, Directorate G-2, Geel, Belgium); POMP, S. (Department of Physics and Astronomy, Uppsala University, Box 516, 751 20 Uppsala, Sweden); KÖSTER, U. (Institut Laue-Langevin, 38042 Grenoble, France); KIM, Y. H. (Institut Laue-Langevin, 38042 Grenoble, France); GAO, Z. (Department of Physics and Astronomy, Uppsala University, Box 516, 751 20 Uppsala, Sweden)

Presenter: GÓMEZ, A. (Department of Physics and Astronomy, Uppsala University, Box 516, 751 20 Uppsala, Sweden)

Session Classification: Wednesday