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Study of neutron induced fission of ^{235}U and ^{237}Np with FALSTAFF spectrometer at NFS

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The study of nuclear fission continues to attract significant interest due to its fundamental scientific importance and its practical applications in nuclear reactor technology. The FALSTAFF project aims to deliver high-quality experimental data to enhance our understanding of the fission process, particularly in the context of improving predictive capabilities of fission models. These models are critical for nuclear data evaluations essential for next-generation reactor designs.

Recent experiments using the FALSTAFF spectrometer[1] were performed at the Neutron For Science (NFS) facility of GANIL/SPIRAL2 [2] to study neutron-induced fission of ^{235}U and ^{237}Np . Using the one-arm configuration of FALSTAFF, these experiments covered an incident neutron energy range from 0.5 to 40 MeV, enabling the measurement of Fission Fragment Mass Distributions (FFMDs) and fragment kinetic energies. Fragment velocities were determined using the time-of-flight method with a pair of Secondary Electron Detectors (SEDs)[3], comprising a thin emissive foil and a Multi-Wire Proportional Counter (MWPC). Such measurements are crucial for understanding the damping of nuclear shell effects as a function of the incident neutron beam energy i.e., the excitation energy of the fissioning system.

In this presentation, we will share the results obtained for ^{235}U , focusing on the FFMDs and the evolution of fragment kinetic energies with neutron energy. Additionally, preliminary results from the ^{237}Np experiment, conducted in October 2024, will also be presented. These measurements, spanning an extensive neutron energy range, represent a significant contribution to the experimental understanding of fission in the MeV domain, where data are scarce. The presentation will conclude with recent updates on the ongoing construction and commissioning of our second arm of FALSTAFF, for the detection of both fission fragments in coincidence.

References

- [1] D. Doré et al., Nucl. Data. Sheets. 119, 346-348 (2014).
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