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Experimental insights into neutron-induced fission of ^{235}U and ^{237}Np using the FALSTAFF spectrometer at NFS

The FALSTAFF spectrometer [1], designed to detect fission fragments produced in direct kinematics, is a key tool in advancing the understanding of neutron-induced fission, particularly in the MeV energy range. Fission models, both phenomenological and microscopic, have seen significant development over the past decade. However, their ability to accurately predict fission observables such as fragment masses, charges, kinetic energies, and neutrons/gammas, remains an area of active investigation. FALSTAFF employs a 2V-2EV measurement technique to determine the velocity and residual kinetic energy of fission fragments on an event-by-event basis. The velocity is obtained using time-of-flight measurements with a pair Secondary Electron Detectors (SEDs) [3], while the residual energy is measured by calorimetry in an axial ionization chamber.

Recent experiments were conducted at the Neutron For Science (NFS) facility of GANIL/SPIRAL2 [2], focusing on 235 U and 237 Np fission. These experiments spanned a neutron energy range from 0.5 to 40 MeV, providing valuable data on fission fragment mass distributions (FFMDs) and kinetic energies. In this presentation, we will present the results from the 235 U experiments and preliminary data from the 237 Np experiment, taken in October 2024. Comparisons with GEANT4 simulations will be discussed, and

the talk will conclude with an overview of the future FALSTAFF scientific program, which includes the commissioning of the second arm of the spectrometer for coincident detection of both fission fragments. These ongoing developments are expected to significantly enhance the capability of FALSTAFF and contribute to the improvement of nuclear data essential for the simulation of next-generation reactors and hence their design.

References

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Author: KATTIKAT MELCOM, Deby Treasa (Post Doctoral Fellow)

Co-authors: A. BAHINI (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); A. CHEBBOUBI (CEA/DES, CEA-Cadarache, F-13108, Saint-Paul-lez-Durance, France); A. LETOURNEAU (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); A. PORTA (Subatech, UMR6457, 4, rue A. Kesler, F-44307 Nantes, France); A.-M. FRELIN (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); B. MOM (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); D. DORÉ (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); D. RAMOS (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); D. THISSE (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); E. BERTHOUMIEUX (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); E. BONNET (Subatech, UMR6457, 4, rue A. Kesler, F-44307 Nantes, France); E. REY-HERME (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); G. KAUR (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); G. TOCABENS (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); I. JANGID (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); J. BEQUET (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); J. E. DUCRET (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); J. PANCIN (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); J. PÉPIN (Subatech, UMR6457, 4, rue A. Kesler, F-44307 Nantes,

France); L. DE ARRUDA SERRA FILHO (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); L. MATTHIEU (LP2I-Bordeaux, Site du Haut Vigneau, 19, Chemin du Solarium, F-33170 Gradignan, France); L. THULLIEZ (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); M. BALLU (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); M. ESTIENNE (Subatech, UMR6457, 4, rue A. Kesler, F-44307 Nantes, France); M. FALLOT (Subatech, UMR6457, 4, rue A. Kesler, F-44307 Nantes, France); M. VANDEBROUCK (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); O. LITAIZE (CEA/DES, CEA-Cadarache, F-13108, Saint-Paul-lez-Durance, France); O. SEROT (CEA/DES, CEA-Cadarache, F-13108, Saint-Paul-lez-Durance, France); P. HERRAN (IRFU/DPhN, CEA Paris-Saclay, F-91191 Gif sur Yvette, France); P. MARINI (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); P. MIRIOT-JAUBERT (LP2I-Bordeaux, Site du Haut Vigneau, 19, Chemin du Solarium, F-33170 Gradignan, France); P. SHARMA (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); S. NANDI (Subatech, UMR6457, 4, rue A. Kesler, F-44307 Nantes, France); S. OBERSTEDT (European Commission, Joint Research Center, Retiesweg 111, 2440 Geel, Belgium); T. KURTUKIAN-NIETO (LP2I-Bordeaux, Site du Haut Vigneau, 19, Chemin du Solarium, F-33170 Gradignan, France, CIEMAT, CSIC, 40, Avenida Complutense, E-28040 Madrid, Spain, LP2I-Bordeaux, Site du Haut Vigneau, 19, Chemin du Solarium, F-33170 Gradignan, France); T. MATERNA (GANIL, boulevard Henri Becquerel, F-14076 Caen, France); X. LEDOUX (GANIL, boulevard Henri Becquerel, F-14076 Caen, France)

Presenter: KATTIKAT MELCOM, Deby Treasa (Post Doctoral Fellow)

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