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235U fission fragment study with Falstaff at NFS

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Abstract: Nowadays the fission process still presents a great interest from both theoretical and experimental points of view. New developments on microscopic calculations and expected improvements of nuclear reactors are among the main motivations for new experimental programs devoted to the study of nuclear fission. The FALSTAFF spectrometer aims at providing constraining data that may significantly contribute to an accurate description of the fission process. In its future two-arm configuration, the goal of the FALSTAFF program will be to determine the evolution of prompt neutron multiplicity and the fragment characteristics (mass, charge and kinetic energy) as a function of the compound nucleus excitation energy, by studying neutron-induced fission of specific actinides in the MeV range. Recently FALSTAFF in its one-arm configuration was used in an experiment dedicated to the study of 235U(n,f) at NFS (Neutrons for Science, SPIRAL2/GANIL).

The white energy spectrum of incident neutron beam provided by reactions of deuterons on a thick 9Be production target at NFS allows us to study 235U post-neutron evaporation fission fragments over the incident neutron energy range from 0.5 to 40 MeV. The fragment velocities were measured thanks to two MWPC-SED detectors giving access to the time and position of the fragments crossing an emissive foil while an axial ionization chamber measured the residual energy and the energy loss profile of fragments. LaBr3 detectors were coupled to FALSTAFF to provide an absolute time reference point allowing the determination of the incident neutron energy. The evolution of the fragment characteristics can then be studied as a function of the incident neutron energy.

In this paper, the motivations for the FALSTAFF@NFS experiment will be detailed and the experimental setup will be described. Preliminary results for the fragment velocity, energy, mass and charge distributions will be presented. Foreseen experiments at NFS will be discussed.

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