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Development of PPACs for neutron-induced fission cross-section measurements

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Despite long efforts on experimental and theoretical studies of nuclear reactions, it is still not possible to predict the cross sections of most reactions from the first principles, and therefore accurate measurements are still necessary in order to improve evaluated nuclear data files and to benchmark nuclear model codes. In particular, studies of neutron-induced reactions in medium-energy range are demanded by both fundamental research and applications.

Neutron-induced fission cross sections of ^{235}U and ^{238}U are widely used as standards for monitoring of neutron beams and fields. Nevertheless, there are few measurements above 20 MeV at an absolute scale, i.e., versus the H(n,n) scattering cross section, which is regarded as the primary neutron standard. Taking advantage of the high-intense white neutron beam under construction at the NFS (Neutrons For Science) facility at GANIL, we will measure the ^{235}U and ^{238}U fission cross sections relative to each other and to H(n,n) in a continuous energy range, from 1 to 40 MeV, and in a single measurement, thus canceling out systematic effects due to variations in the beam characteristics. Angular distributions of fission fragments, of interest for studying the states of the fissioning nuclei, will be also measured.

An upgraded version of the Medley setup will be used. It consisted originally of eight ΔE-ΔE-E telescopes, each composed of two Si detectors and one CsI(Tl) crystal, to detect and identify light ions. The new version will also include PPACs (Parallel Plate Avalanche Counter). Each PPAC will produce a fast signal when detecting a fission fragment, before its arrival to a front Si detector in a telescope. The energy of the incident neutron will be measured by the time-of-flight technique.

The first prototypes of the PPACs to be used at NFS have already been built in Uppsala and are being characterized using alpha decay and fission events from a ^{252}Cf sample. During this talk, the status of the whole project will be shown, and the latest available results on PPAC characterization will be discussed.

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