Contribution ID: **23** Type: **Contributed Talk**

Excitation-energy dependence of the prompt fission neutron-multiplicity in the fission of Uranium 235

Wednesday 27 October 2021 15:30 (25 minutes)

The neutron emission is an important signature of the energy sharing in the nuclear fission process. Highly excited, neutron-rich nuclei release their energy by emitting prompt neutrons and γ-rays. Improved determination of particle-emission characteristics enhances the understanding of fission dynamics. The nuclear data libraries lack data which are crucial for these areas, especially the evolution of nuclear observables as a function of excitation energy. For instance, the change in the prompt neutron multiplicity, \bar{ν}(A), as a function of excitation energy is one of many open questions, which leads to divergences between fission models. Earlier data, based on indirect neutron measurements, suggest that only the heavy fission fragments exhibit an increased \bar{ν}(A). This needs to be systematically verified as it has bearings on fission modeling and has an impact on calculation codes for reactors, nuclear waste-management and other applications.

We report on a direct experimental determination of the so-called sawtooth shape, \bar{ν}(A), as a function of the nuclear excitation energy. Fission fragment from the 235U(n,f) reaction were measured, in coincidence to fission neutrons, at the MONNET accelerator of the EC-JRC-GEEL. Most existing literature data are a result of indirect measurements, by detecting the fission fragment velocities and energies. We performed a direct coincidence measurement by use of liquid scintillators and a Twin Frisch-grid ionization chamber. The experiments were conducted at thermal neutron energy and are now being performed at 5.5 MeV incident neutron energy. A fully digital data acquisition system was used which allowed detailed offline analysis on the raw signal traces.

We will present \bar{ν}(A) and \bar{ν}(Total Kinetic Energy) for ˆ{235}U at thermal and discuss the preliminary data at 5.5 MeV incident neutron energy.

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Session Classification: Wednesday