

Simultaneous measurement of (n,γ) and $(n,\text{fission})$ cross sections with the DANCE 4π BaF₂ array

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Neutron capture cross section measurements on many of the actinides are complicated by low-energy neutron-induced fission, which competes with neutron capture to varying degrees depending on the nuclide of interest. Measurements of neutron capture on ²³⁵U using the Detector for Advanced Neutron Capture Experiments (DANCE) have shown that we can partially resolve capture from fission events based on total photon calorimetry (i.e. total γ -ray energy and γ -ray multiplicity per event). The addition of a fission-tagging detector to the DANCE array will greatly improve our ability to separate these two competing processes so that improved neutron capture and $(n,\gamma)/(n,\text{fission})$ cross section ratio measurements can be obtained. The addition of a fission-tagging detector to the DANCE array will also provide a means to study several important issues associated with neutron-induced fission, including $(n,\text{fission})$ cross sections as a function of incident neutron energy, and total energy and multiplicity of prompt fission photons. We have focused on two detector designs with complementary capabilities, a parallel-plate avalanche counter and an array of solar cells. Results from the initial in-beam tests of these two designs will be presented.

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