

Nuclear Data Measurements at LANSCE: The NIFFTE fission TPC

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The Neutron and Nuclear Science Group at Los Alamos National Laboratory (LANSCE-NS) has a diverse experimental program aimed at measuring nuclear data: prompt fission neutron and gamma output; fission fragment mass, charge, and energy distributions; cross sections for direct and surrogate (n,γ) , $(n,2n)$, (n,X) , and (n,f) reactions. These data are fundamental to nuclear energy and defense applications, which are increasingly dependent upon advanced simulation and modeling due to testing restrictions and high development costs.

With respect to neutron-induced fission cross section measurements, sensitivity studies have indicated a need for high-precision data, as uncertainties in nuclear data inputs propagate into uncertainties in key performance parameters for applications. To address this need, the Neutron Induced Fission Fragment Tracking Experiment collaboration has developed a fission Time Projection Chamber (TPC). Designed to address sources of systematic uncertainty that have plagued previous measurements, the fission TPC is based on well-established technology, miniaturized and modified for use in fission research.

Fission TPC experiments take place at the Los Alamos Neutron Science Center (LANSCE) Weapons Neutron Research facility, a spallation neutron source which provides a white neutron spectrum ranging from hundreds of keV to hundreds of MeV. During the 2012 LANSCE run cycle, the fission TPC was used to measure the $^{238}\text{U}/^{235}\text{U}$ (n,f) cross-section ratio. This ratio will be used to benchmark TPC performance.

An overview of the LANSCE-NS experimental program and the fission TPC project will be presented along with early performance results.