Abstract Submitted
for the DNP16 Meeting of
The American Physical Society

Neutron Scattering Differential Cross Sections for ^{12}C[1] STEPHEN T. BYRD, S. F. HICKS, M. T. NICKEL, S. G. BLOCK, University of Dallas, E. E. PETERS, A. P. D. RAMIREZ, S. MUKHOPADHYAY, M. T. MCELLISTREM, S. W. YATES, University of Kentucky, J. R. VANHOY, United States Naval Academy
— Because of the prevalence of its use in the nuclear energy industry and for our overall understanding of the interactions of neutrons with matter, accurately determining the effects of fast neutrons scattering from ^{12}C is important. Previously measured ^{12}C inelastic neutron scattering differential cross sections found in the National Nuclear Data Center (NNDC) show significant discrepancies (>30%). Seeking to resolve these discrepancies, neutron inelastic and elastic scattering differential cross sections for ^{12}C were measured at the University of Kentucky Acceleratory Laboratory for incident neutron energies of 5.58, 5.83, and 6.04 MeV. Quasi monoenergetic neutrons were scattered off an enriched ^{12}C target (>99.99%) and detected by a C_6D_6 liquid scintillation detector. Time-of-flight (TOF) techniques were used to determine scattered neutron energies and allowed for elastic/inelastic scattering distinction. Relative detector efficiencies were determined through direct measurements of neutrons produced by the ^{2}H(d,n) and ^{3}H(p,n) source reactions, and absolute normalization factors were found by comparing ^{1}H scattering measurements to accepted NNDC values. This experimental procedure has been successfully used for prior neutron scattering measurements and seems well-suited to our current objective. Significant challenges were encountered, however, with measuring the neutron detector efficiency over the broad incident neutron energy range required for these measurements.

[1]Funding for this research was provided by the National Nuclear Security Administration (NNSA).

Stephen Byrd
University of Dallas

Date submitted: 25 Jul 2016 Electronic form version 1.4