Abstract Submitted
for the DNP15 Meeting of
The American Physical Society

MCNP Neutron Simulations: The Effectiveness of the University of Kentucky Accelerator Laboratory Pit[1] DANIEL JACKSON, THIEN AN NGUYEN, S.F. HICKS, University of Dallas, BEN RICE, J.R. VANHOY, United States Naval Academy — The design of the Van de Graaff Particle Accelerator complex at the University of Kentucky is marked by the unique addition of a pit in the main neutron scattering room underneath the neutron source and detection shielding assembly. This pit was constructed as a neutron trap in order to decrease the amount of neutron flux within the laboratory. Such a decrease of background neutron flux effectively reduces as much noise as possible in detection of neutrons scattering off of desired samples to be studied. This project uses the Monte-Carlo N-Particle Transport Code (MCNP) to model the structure of the accelerator complex, gas cell, and the detector's collimator and shielding apparatus to calculate the neutron flux in various sections of the laboratory. Simulations were completed with baseline runs of 10^7 neutrons of energies 4 MeV and 17 MeV, produced respectively by ^{3}H(p,n)^{3}He and ^{3}H(d,n)^{4}He source reactions. In addition, a comparison model of the complex with simply a floor and no pit was designed, and the respective neutron fluxes of both models were calculated and compared. The results of the simulations seem to affirm the validity of the pit design in significantly reducing the overall neutron flux throughout the accelerator complex, which could be used in future designs to increase the precision and reliability of data.

[1]This project was supported in part by the DOE NEUP Grant NU-12-KY-UK-0201-05 and the Donald A. Cowan Physics Institute at the University of Dallas.

Sally Hicks
University of Dallas

Date submitted: 10 Jul 2015 Electronic form version 1.4