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Absolute Neutron Fluence Measurements at the NIST Center for Neutron Research A. YUE, M. DEWEY, D. GILLIAM, J. NICO, National Institute of Standards and Technology, E. ANDERSON, M. SNOW, Indiana University, G. GREENE, University of Tennessee / Oak Ridge National Laboratory, A. LAPTEV, Los Alamos National Laboratory — Precise, absolute fluence measurements of cold and thermal neutron beams are of primary importance to beam-type determinations of the neutron lifetime, measurements of standard neutron cross sections, and the development of standards for neutron dosimetry. At the National Institute of Standards and Technology (NIST), a totally absorbing neutron detector based on absolute counting of the $^{10}\text{B}(n,\alpha_1)^7\text{Li}$ reaction 478 keV gamma ray has been used to perform fluence measurements with a precision of 0.06 %. This detector has been used to improve the neutron fluence determination in the 2000 NIST beam neutron lifetime by a factor of five, significantly reducing the uncertainty in the lifetime result. Ongoing and possible future uses of the Alpha-Gamma device include 1) Calibration of the neutron fluence monitors that will be used in the upcoming NIST beam neutron lifetime measurement BL2; 2) The first direct, absolute measurement of the $^6\text{Li}(n,t)^4\text{He}$ neutron cross section at sub-thermal neutron energy; 3) Measurements of the $^{10}\text{B}(n,\gamma)^{11}\text{B}$ and $^{235}\text{U}(n,f)$ neutron cross sections; 4) A re-calibration of the national neutron standard NBS-1. The apparatus, measurement technique, and applications will be discussed.

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