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A New Neutron Fluence Calibration Monitor for the BL3 Experiment GEOFFREY GREENE, University of Tennessee, CHEN-YU LIU, Indiana Univ - Bloomington, BL3 COLLABORATION — The BL3 experiment determines the neutron lifetime by measuring the rate of decay protons emerging from a beam of cold neutrons at the NIST research reactor. To reach the precision goal of less than 0.03%, the fluence of the neutron beam passing through the decay volume needs to be determined to a precision better than accuracy attained in the previous calibration[A. Yue, et al., Metrologia 55, 460 (2018)]. To improve the performance beyond the current statistical limit, we will implement a new Alpha-Gamma device (AG) to accept a larger neutron beam (∼35 mm vs 10 mm for BL2) with higher detection efficiency. The new device will employ the previous the 4-step measurement procedure based on geometrical efficiency determination, but will also employ an alternative, independent, coincidence method that provides a first principles calibration [Gilliam, Greene, Lamaze G P 1989 Nucl. Instrum. Meth., A 284, 220, (1989)]. In this talk, we will describe the working principles of the new AG device that includes optimized detector positioning to reduce systematic effects from the extended beam profile and angular correlations between the reaction particles as well as precision in-situ target positioning for rapid target alternation.

Chen-Yu Liu
Indiana Univ - Bloomington

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