Public Abstract

First Name:Andrea

Middle Name:Alejandra

Last Name:Saltos

Adviser's First Name:William

Adviser's Last Name:Miller

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Title:CROSS CORRELATION CALCULATIONS AND NEUTRON SCATTERING ANALYSIS FOR A PORTABLE SOLID STATE NEUTRON DETECTION SYSTEM

In efforts to perform accurate dosimetry, Oakes et al. [Nucl. Intrum. Mehods. (2013)] introduced a new portable neutron dosimeter for spectroscopy applications. The system utilizes high thermal efficiency Li-6 based detectors to generate measurement signals that are used to infer information of the incident neutron source. The problem associated to deduce dose from the dosimeter response is addressed by applying a cross-correlation method which allows estimation of dose with average errors less than 15%. In this work, an evaluation of the performance of this system was extended to take into account new correlation techniques and neutron scattering contribution. To test the effectiveness of correlations, the Distance correlation, Pearson Product-Moment correlation, and their weighted versions were performed between simulated detector responses obtained from nine different test sources, and the spatial response for known input source spectra. Results indicate that there is no advantage of using the Distance Correlation over the Pearson Correlation, and that weighted versions of these correlations do not increase their performance in evaluating dose. To evaluate the effect produced by room-return neutrons on the dosimeter readings, dosimeter responses were simulated for five isotropic neutron sources placed inside different sizes of rectangular concrete rooms. Results show that the contribution of scattered neutrons to the response of the dosimeter can be significant, so that for most cases the dose is over predicted with errors as large as 500%. A possible method to correct for the contribution of room-return neutrons is also assessed and can be used as a good initial estimate on how to approach the problem.