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Characterization of a 1-D perforated diode neutron detector array

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Performance of a 4 cm long 32 pixel perforated diode neutron detector array is compared to an identical array of thin-film coated diodes. The perforated neutron detector design has been adapted to a 1-D pixel array capable of 120 micrometer spatial resolution and counting efficiency greater than 15%. Deep vertical trenches filled with ⁶LiF provide outstanding improvement in efficiency over thin-film coated diode designs limited to only 4.5%. The entire system including custom read-out electronics and user interface software is a result of collaborative efforts between Kansas State University, the University of Tennessee, and Oak Ridge National Laboratory. This work marks the final progressive step before a much larger array of 1024 pixels spanning across 10 cm will be constructed by tiling a 64 pixel sensor specifically for use in small-angle neutron scattering experiments at the Spillation Neutron Source of Oak Ridge National Laboratory.

Author: Mr MCNEIL, Walter

Presenter: Mr MCNEIL, Walter

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