

Abstract Submitted
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Non-Linear Behavior in Plastic Scintillator Neutron Detectors

ANDREA MUNROE, JEREMY HALLETT, WARREN ROGERS, Indiana Wesleyan University, MONA COLLABORATION — The MoNA Collaboration investigates the decay of exotic neutron-rich nuclei near the dripline using an array of 144 2-meter long scintillator bars with photomultiplier tubes attached to the ends. The energy and momenta of decay neutrons are determined by hit location in the array and time-of-flight. Accurate determination of decay energy is limited by position and time resolution in the bars. Anomalies in cosmic muon positron spectra from an experiment we conducted at LANSCE (Los Alamos Neutron Science Center) point to non-linear behavior in the detector. We have conducted a series of measurements using cosmic muons in a MoNA detector to develop a map of physical positron to its location in time-difference spectra, and have discovered that the non-linearity is due to waveform shape variations along the bar's length, resulting from light reflection at the ends. We have created an algorithm that corrects for this non-linear mapping of position. Results from our analysis can be used to improve the design of future scintillator-based detector arrays. Work supported by NSF grant PHY-2012511

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