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Efficiency and Gamma Sensitivity of a Lithium Glass Neutron Detector ADAM WALLACE, LAWRENCE REES, BART CZIRR, MARGARITA HOGGAN, Brigham Young University — Neutron detectors are used in national security applications for detecting potential radioactive material entering the country. Due to the shortage of Helium-3 for neutron detectors, Lithium-6 glass scintillators could be a good material for a replacement detector. Lithium-6 has a large neutron capture cross section, which gives high neutron detection rates. Our detector is based on the fact that neutrons are captured by Lithium-6 which rapidly decays into an alpha particle and triton. Those particles induce scintillation in the glass scintillator and are detected in a photomultiplier tube. The orientation of the plastic and Lithium-6 glass changes the efficiency of the detector. Monte Carlo for Neutral Particles (MCNP) calculations have shown that increasing amounts of plastic provide more efficient neutron detection and that placing a layer of glass in the front of the detector is the ideal configuration. Homeland Security requires that a replacement for Helium-3 detectors must have low gamma sensitivity and high neutron detection efficiency. We are measuring the absolute gamma sensitivity of various arrangements of glass and plastic scintillator. Our goal is to meet the Department of Homeland Security requirement for gamma sensitivity of one part in 10,000.

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