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Development of a Segmented Plastic Fast Neutron Detector SEAN STAVE, DAVID JORDAN, Pacific Northwest National Laboratory — Pacific Northwest National Laboratory is investigating segmented fast plastic scintillators as an alternative to liquid scintillator for fast neutron detection. Fast plastic scintillator is a non-volatile material, which offers neutron/gamma ray discrimination in segmented geometry and operates at much faster rates than liquid scintillator. Liquid scintillators use pulse shape discrimination (PSD) to distinguish neutrons from gamma rays. At higher rates, the pulses can pile up making PSD more difficult. Segmented plastic scintillator could provide a factor of 50 improvement in rate handling ability. Neutrons in the 2 to 10 MeV energy range and gamma rays interact in different ways with the plastic scintillator. Modeling studies indicate that neutrons can be discriminated from gamma rays by choosing the appropriate segmentation size and maintaining the necessary time resolution. Laboratory studies have been initiated to verify the modeling predictions and a multi-segment proof-of-concept detector is in development. We present anticipated characteristics of the detector, including the neutron detection efficiency and gamma-ray rejection ratio, as well as the method for detecting the light output and digitizing the resulting signals.

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