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A Deuterated Neutron Detector Array For Nuclear (Astro)Physics Studies.[1] SERGIO ALMARAZ-CALDERON, B. W. ASHER, P. BARBER, K. HANSELMAN, J. F. PERELLO, Department of Physics, Florida State University, Tallahassee, FL 32306 — The properties of neutron-rich nuclei are at the forefront of research in nuclear structure, nuclear reactions and nuclear astrophysics. The advent of intense rare isotope beams (RIBs) has opened a new door for studies of systems with very short half-lives and possible fascinating properties. Neutron spectroscopic techniques become increasingly relevant when these neutron rich nuclei are used in a variety of experiments. At Florida State University, we are developing a neutron detector array that will allow us to perform high-resolution neutron spectroscopic studies with stable and radioactive beams. The neutron detection system consists of 16 deuterated organic liquid scintillation detectors with fast response and pulse-shape discrimination capabilities. In addition to these properties, there is the potential to use the structure in the pulse-height spectra to extract the energy of the neutrons and thus produce directly excitation spectra. This type of detector uses deuterated benzene (C_6D_6) as the liquid scintillation medium. The asymmetric nature of the scattering between a neutron and a deuterium in the center of mass produces a pulse-height spectrum from the deuterated scintillator which contains useful information on the initial energy of the neutron.

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