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Characterization of the Gamma Response of a Cadmium Capture-gated Neutron Spectrometer NATHANIEL HOGAN, LAWRENCE REES, BART CZIRR, SURAJ BASTOLA, Brigham Young University — We have studied the gamma response of a newly developed capture-gated neutron spectrometer. Such spectrometers detect a dual signal from incoming neutrons, allowing for differentiation between other particles, such as gamma rays. The neutron provides a primary light pulse in either plastic or liquid scintillator through neutron-proton collisions. A capture material then delivers a second pulse as the moderated neutron captures in the intended material, which then de-excites with the release of gamma energy. The presented spectrometer alternates one centimeter thick plastic scintillators with sheets of cadmium inserted in between for neutron capture. The neutron capture in cadmium offers a release of gamma energy ~ 9 MeV. To verify that the interaction was caused by a neutron, the response functions of both events must be well known. Due to the prior existence of many capture-gated neutron spectrometers, the proton recoil pulse has already been studied, but the capture pulse is unique to each spectrometer and must be measured. Experimental results agree with theoretical Monte-Carlo code, both suggesting that the optics and geometry of the spectrometer play a large role in its efficiency. Results prove promising for the efficiency of the spectrometer.

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