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Neutron Multiplicity Discrimination in MoNA Using Hit Pattern Analysis[1] W.F. ROGERS, M. GARDNER, M. BENNETT, Westmont College, MONA COLLABORATION — The Modular Neutron Array (MoNA) at NSCL, Michigan State University, consists of 144 2-m long scintillator bars with PMT's attached at each end, designed to measure the kinematic trajectory of neutrons resulting from breakup reactions. The ability to filter data based on neutron multiplicity is critical to the study of multiple-neutron breakup reactions. The approach presented here is based on the analysis of "hit patterns"in MoNA, consisting of singlet (s) and doublet (d) event combinations ranging from multiplicity 2 (ss, d events) to 4 (sds, dd events, etc.). A singlet event is defined as a hit spatially separated from all other hits by more than a "separation"radius and a doublet event as two hits occurring within a "doublet"radius. A doublet event can result from neutron scattering that produces a sufficiently energetic proton (through charge exchange scattering, for example) to scintillate in two adjacent bars. Since a neutron loses significant energy in doublet scattering, multiple neutron decays are predicted to produce fractionally more doublet combination events (ds, dss, sds, dd etc.) than single-neutron decays. Neutron decay energy spectra are then gated on specific hit patterns to optimize the relative number of multiple neutron events in the dataset. Hit pattern analysis has been applied to three separate experimental data sets involving multiple neutron decay, and results will be presented.

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