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Efficiency Studies and Simulations of a Neutron Background Veto for Dark Matter Detectors SHAWN WESTERDALE, EMILY SHIELDS, JINGKE XU, FRANK CALAPRICE, Princeton University, DARKSIDE COLLABORATION — In direct WIMP dark matter detection experiments, neutrons from cosmogenic sources and nuclear reactions in detector materials can provide backgrounds indistinguishable from WIMP signals. To reduce this background, an active neutron veto filled with a boron-loaded scintillator is being developed. The scintillator used will be pseudocumene, mixed with trimethyl borate as a boron source, and a PPO wavelength shifter. Such a veto would detect neutrons in the volume surrounding the detector, allowing coincident background events in the detector to be rejected. Neutrons are captured by the ^{10}B with a high cross section, resulting in an α and ^{7}Li. The scintillation from the nuclear products is heavily quenched to an equivalent electron energy as low as 50 keV. To detect this, it is necessary to have high light collection efficiency. To model the neutron veto concept, light yield measurements were taken for a small prototype filled with the scintillator mixture and lined with a Lumirror reflector. These results were reproduced in GEANT4 and in an independent simulation. We then applied the simulations to the DarkSide-50 neutron veto to predict its neutron rejection power. Results from measurements taken with the prototype and from the simulation will be presented.

Shawn Westerdale
Princeton University

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