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**Optimization of a Modular Neutron Detector Array for the Detection of Halo Neutron Pairs using GEANT4** DAVID WALTER, FREDERIC SARAZIN, DUANE SMALLEY, SERGEY ILYUSHKIN, Colorado School of Mines — The study of halo neutrons in light nuclei may require the detection of multiple neutrons in a neutron detector array. The detection of multiple neutrons is especially challenging due to the “false-positives” induced by cross-talk events between detectors. In this work, we report on the development of a cross-talk filter used to efficiently identify true neutron pairs while rejecting cross-talk events based on time of flight considerations. The classic method of neutron detection in the MeV range involves elastic scattering interactions with the hydrogen contained in organic scintillators, either plastic or liquid. To improve the performance of the cross-talk filter, it is possible to take into account the energy loss of the scattered neutrons. In this context, we are also investigating the possibility of using deuterated liquid scintillators, which can potentially provide better energy loss discrimination than in normal scintillators. This work is done by simulating the interactions of neutron pairs in various detector configurations using the simulation package GEANT4.

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