

Simulating DAEMON: A New Complementary Neutron Detector for GRIFFIN

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The study of neutron rich nuclei far from the valley of stability has become an increasingly important field of research within nuclear physics. One of the decay mechanisms that opens when the decay Q value becomes sufficiently large is that of beta-delayed neutron emission. This decay mode is important when studying the astrophysical r -process as it can have a direct effect on theoretical solar abundance calculations. The utilization of large-scale neutron detector arrays in future experiments is therefore imperative in order to study these beta-delayed neutron emitters and better understand these processes.

The deuterated scintillator array, DESCANT, was designed to be coupled with the large-scale gamma-spectrometer arrays GRIFFIN and TIGRESS at the TRIUMF ISAC facilities. However, DESCANT was originally intended to be a neutron-tagging array and extracting the neutron energy was not considered a priority over optimized neutron detection efficiency. This limitation could be overcome through the use of thin plastic scintillators positioned in front of the DESCANT detectors. The energy of the neutrons can then be determined via the TOF technique, improving the precision of the neutron energy with the existing setup significantly and allow for a more in-depth analysis of beta-delayed neutron emitters at the GRIFFIN decay station. To investigate this augmentation, GEANT4 will be used to simulate and optimize the experimental design, the progress of which will be discussed.

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Instrumentation

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