Neutron Production Rates in Dark Matter Detector Materials

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— One of the sources of background radiation for direct detection dark matter experiments is neutrons produced by (α,n) nuclear reactions in the detector materials. Using the programming language Python, an open-source calculator is being developed to calculate the anisotropic reaction rates from the (α,n) reaction process as well as the angles and energies of the outgoing neutrons produced. With these computations, it will be possible to minimize the amount of background radiation present in direct detection dark matter experiments like PICO-2L and SuperCDMS. A stopping power calculation for any given detector material and a differential cross section portion of the code have been written and are used in the energy spectrum and reaction rate calculation. This last portion of the code will determine the final reaction rates, angles and energies of the neutron yields. Further developments of the code will enable a user to work with detector materials containing more than one element and with a greater number of target isotopes.

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