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Calculations of background from radioactivity in dark matter detectors

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New generation dark matter experiments aim at exploring the 10e-9 - 10e-10 pb cross-section region for the WIMP-nucleon scalar interactions. Neutrons and gamma-rays produced in detector components are the main factors that can limit detector sensitivity. Energy spectra and production rates of neutrons coming from radioactive contamination of materials with uranium and thorium have been estimated using the code SOURCES4A. The code libraries for (alpha,n) cross-section and transition probabilities have been updated and extended using the code EMPIRE 2.19. Radioactive background event rates from some detector components (such as copper and stainless steel), as well as from rock and concrete (lab walls), have been estimated for a hypothetical dark matter detector based on Ge crystals (for instance EURECA). Different shielding configurations (water, lead, paraffin) have been considered. Neutrons and photons have been propagated to the detector using GEANT4. Some requirements for the radiopurity of the materials have been deduced from the results of these simulations. Thickness of shielding in different configurations and required gamma discrimination factor have been investigated.

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