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Background radiation in direct dark matter experiments

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Key improvements in the sensitivity of direct dark matter search experiments can only be achieved if the radiation causing background events in detectors is well understood and proper measures are taken to suppress it.

The background radiation arising from radioactivity and cosmic-ray muons is discussed in this paper in connection with the sensitivity of large-scale experiments to direct dark matter searches. Different shielding designs are considered to attenuate gamma-rays and neutrons coming from radioactivity in rock and lab walls. Purity of materials used in detector construction is analysed and the background event rates due to the presence of radioactive isotopes in detector components are presented. Event rates in dark matter detectors caused by muon-induced neutrons with and without active veto systems are discussed providing requirements for a depth of an underground laboratory and the efficiency of the veto system.

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