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The depth-sensitivity relation (DSR) for underground laboratories ANDREW HIME, DONG-MING MEI, Los Alamos National Laboratory — Muon-induced background constrains the sensitivity of next generation underground low energy neutrino and dark matter experiments. Muon-induced background sources are (1) fast neutrons produced in the detector and surrounding materials (rock and shield materials) with a hard energy spectrum; (2) cosmogenic radioactivity created in the detector and surrounding materials; (3) stopping negative muon capture on nuclei produces neutrons and radioactive isotopes in the detector and surrounding materials; and (4) muons hit the detector due to a finite veto efficiency. Understanding and reducing these four muon-induced sources of background are essential to dark matter, double beta decay and θ_{13} experiments. An effective way to reduce such background is to increase the depth of the experimental site. Therefore, it is essential to study DSR for underground experiments. We proposed a unified approach to study muons, the muon-induced neutron flux, energy spectrum, angular distribution, multiplicity and lateral distribution with respect to the muon track for six underground laboratories. This study provides a comprehensive understanding of the muon-induced background level for underground laboratories and hence the reduction methods.

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