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(G*) External Background Mitigation and Shielding Methods for SBC-SNOLAB

Monday, May 27, 2024 11:30 AM (15 minutes)

The Scintillating Bubble Chamber (SBC) collaboration is combining the well-established technologies of bubble chambers and liquid noble scintillators to develop a detector sensitive to low-energy nuclear recoils with the goal of a GeV-scale dark matter search. Liquid noble bubble chambers benefit from excellent electronic recoil suppression intrinsic in bubble chambers with the addition of energy reconstruction provided by scintillation signals. The detector to be operated at SNOLAB is currently in development, featuring 10 kg of xenon-doped liquid argon superheated to 130 K at 1.4 bar. Surrounding the active volume are 32 FBK VUV-HD3 silicon photomultipliers to detect the emitted scintillation light. Deploying at SNOLAB allows for excellent cosmogenic suppression from exposure to 6010 m.w.e. of overburden, however, radiocontaminants embedded in the rock become a major source of background. Monte Carlo simulations in GEANT4 were performed to study the imposed background event rate from both the high energy gamma-rays and fast neutrons in the cavern environment. This talk aims to discuss the development of external shielding around SBC to suppress the background flux with the goal of a quasi-background-free low-mass ($< 10 \text{ GeV}/c^2$) WIMP dark matter search.

Keyword-1

Dark Matter

Keyword-2

Bubble Chambers

Keyword-3

Xenon-doped Liquid Argon

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