

Abstract Submitted
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Design of a Low Background Liquid Scintillation Counter for a Shallow Underground Laboratory JOHN ORRELL, CRAIG AALSETH, BRUCE BERNACKI, MATT DOUGLAS, JENNIFER ERCHINGER, ERIN FULLER, MARTIN KEILLOR, SHANNON MORLEY, CRYSTAL MULLEN, MARK PANISKO, SARAH SHAFF, GLEN WARREN, MICHAEL WRIGHT, Pacific Northwest Natl Lab — Pacific Northwest National Laboratory operates a 35-meter water-equivalent overburden, shallow underground laboratory for measuring low-concentration radioactive isotopes in environmental samples collected. A low-background liquid scintillation counter is under development. Liquid scintillation counting is useful for beta-emitting isotopes without (or low) gamma ray yields. The high-efficiency beta detection in a liquid scintillation cocktail coupled with the low-background environment of a shield located in a clean underground laboratory provides for increased-sensitivity measurements to a range of isotopes. Benchmarked simulations have evaluated the shield design requirements to assess the background rate achievable. Assay of shield construction materials provides the basis for the shield design development. The low background design is informed by efforts in experimental design of neutrinoless double beta decay experiments, direct detection dark matter experiments, and low energy neutrino detection experiments. In this vein a background budget for the instrument is presented with attention to low background methods directed toward applications of nuclear measurements.

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