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Design, Construction, and Operation of a Small-Scale Radioactivity Assay Chamber WESLEY KETCHUM, Center for Experimental Nuclear Physics and Astrophysics, Univ. of Washington, and Homer L. Dodge Dept. of Physics and Astronomy, Univ. of Oklahoma, J.A. DETWILER, P.J. DOE, R.A. JOHNSON, M.G. MARINO, A.S. REDDY, A.G. SCHUBERT, B.A. VANDEVENDER, J.F. WILKERSON, Center for Experimental Nuclear Physics and Astrophysics, University of Washington — The ability to limit background signals from naturally occurring and cosmic ray induced radioactive materials is often essential for many nuclear physics experiments. Projects investigating the nature of neutrinos, such as the tritium single-beta decay experiment KATRIN and the neutrinoless double-beta decay experiment Majorana, require very low levels of backgrounds noise in order to succeed. To test the radioactivity of materials that may be used in these experiments, we have designed, constructed, and operated a small-scale low-background radiometric assay chamber at the University of Washington, CENPA. This chamber consists of two high-purity germanium detectors enclosed in both active and passive shields. We present early results showing energy calibrations, efficiency calculations for known sources, and the effectiveness of a lead shield and cosmic veto at reducing background radiation from the environment and the resulting increase in sensitivity to radioactive impurities. With the aid of computer simulations, we hope to be able to maximize this sensitivity by optimizing the detector geometry, shield, and cosmic veto design.

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