

Low-Background Techniques Applied within the MAJORANA DEMONSTRATOR Experiment

The MAJORANA Collaboration is searching for neutrinoless double-beta decay in Ge-76 with an array of p-type, point-contact Ge detectors. The MAJORANA DEMONSTRATOR is comprised of 44 kg (30 kg enriched in Ge-76) of Ge detectors split between two modules contained in a low background passive and active shield at the Sanford Underground Research Facility in Lead, South Dakota. Our latest results from a modest 26 kg-yr of exposure set a half-life lower limit of 2.7×10^{25} yr (90% C.L.) owing to an unprecedented energy resolution of 2.5 keV FWHM and a background rate of 12 cts/(FWHM t yr) at the double-beta decay Q value of 2039 keV. The ultra-low background rate achieved in the MAJORANA DEMONSTRATOR relied on careful material selection, development of improved cleanliness protocols and cleaning procedures, and the strength of the Ge detector pulse-shape analysis routines. A description of the low radioactivity techniques applied, progress towards modeling the extremely low measured backgrounds, along with the overall physics potential of the MAJORANA program will be presented.

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