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The Majorana Demonstrator

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The Majorana collaboration is searching for neutrinoless double beta decay using ^{76}Ge , which has been shown to have a number of advantages in terms of sensitivities and backgrounds. The observation of neutrinoless double-beta decay would show that lepton number is violated and that neutrinos are Majorana particles and would simultaneously provide information on neutrino mass. Attaining sensitivities for neutrino masses in the inverted hierarchy region, $15\text{--}50\text{ meV}$, will require large, tonne-scale detectors with extremely low backgrounds, at the level of 1 count $\times 1\text{ yr}$ or lower in the region of the signal. The Majorana collaboration, with funding support from DOE Office of Nuclear Physics and NSF Particle Astrophysics, is constructing the Demonstrator, an array consisting of 40 kg of p-type point-contact high-purity germanium (HPGe) detectors, of which 30 kg will be enriched to 86% in ^{76}Ge . The Demonstrator is being constructed in a clean room laboratory facility at the 4850' level (4160 m.w.e.) of the Sanford Underground Research Facility (SURF) in Lead, SD. It utilizes a compact graded shield approach with the inner portion consisting of ultra-clean Cu that is being electroformed and machined underground. The primary aim of the Demonstrator is to show the feasibility of a future tonne-scale measurement in terms of backgrounds and scalability.

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