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Pulse shape analysis studies for the Majorana Demonstrator

The Majorana Collaboration is constructing the Majorana Demonstrator, an ultra-low background, 40-kg modular HPGe detector array to search for neutrinoless double beta decay in ^{76}Ge. In view of the next generation of tonne-scale Ge-based 0νββ decay searches that will probe the neutrino mass scale in the inverted-hierarchy region, a major goal of the Majorana Demonstrator is to demonstrate a path forward to achieving a background rate at or below 1 count/tonne/year in the 4 keV region of interest around the Q-value at 2039 keV. The P-Type Point Contact design of the Demonstrator's germanium detectors allows for significant reduction of background through pulse shape analysis. The background suppression techniques to be applied to the data using pulse shape analysis will be described. These techniques allow, for instance, single-site events such as 0νββ decay to be distinguished from multi-site background events in germanium detectors.

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