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Background Rejection for the MAJORANA Experiment[1]

REYNOLD COOPER, Joint Institute for Heavy Ion Research, Oak Ridge National Laboratory

The MAJORANA project is a neutrinoless double beta decay experiment based on the use of high purity, enriched, ^{76}Ge crystals housed in ultra low background Cu cryostats as both the source ans the detector. In order to demonstrate the feasibility of the experiment, the collaboration is currently building a demonstrator consisting of up to 30 kg of enriched High Purity Germanium (HPGe) detectors and 10 kg of natural HPGe detectors. These detectors, which will take a P-type Point Contact (PPC) geometry, are designed to maximise performance in terms of energy resolution and background rejection efficacy. In order to achieve the background goal of 1 count per tonne-year in a 4 keV wide region of interest around the 2039 keV neutrinoless double beta decay Q-value, the MAJORANA DEMONSTRATOR will be constructed using ultra-clean materials and will employ sophisticated background rejection techniques. One such technique, which is key to achieving this background goal, is the ability to distinguish between single-site events from neutrinoless double beta decay and multiple-site events resulting from background gamma rays. This will be achieved through analysis of the digitised signal response of the HPGe detectors. The physics goals of the MAJORANA experiment will be discussed, along with the roles played by digital electronics and digital pulse processing techniques. Details of key background rejection algorithms will also be presented.

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