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The Majorana Demonstrator (MJD) Neutrinoless Double-Beta Decay Experiment JOHN NANCE, University of North Carolina at Chapel Hill, MAJORANA COLLABORATION — While neutrino oscillation has shown that neutrinos have non-zero mass, many questions regarding the nature of the neutrino mass remain. Since they possess no charge, it is possible that neutrinos are Majorana particles, meaning that they are indistinguishable from their antiparticle. MJD aims to probe the Majorana nature of neutrinos by searching for neutrinoless double-beta decay ($0\upsilon\beta\beta$) of germanium-76, using germanium detectors as both the source and detector for the decay. In $0\upsilon\beta\beta$ decay, the two neutrinos are exchanged between the two decaying nucleons, resulting in a sharp energy peak at the endpoint energy of the decay. The sensitivity of this experiment relies upon the ability to reduce backgrounds to resolve such a peak, both by constructing a custom low-background apparatus and by active rejection of backgrounds by the use of pulse shape analyses. My research on MJD has included both computational and experimental activities. Modeling the electric fields inside the point contact Ge detectors supports the pulse shape rejection of some background events. Mechanical testing of some custom hardware components and will aid in the reliability of detector operations.

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