

# $0\nu\beta\beta$ searches at a theoretical DUNE 4th module

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If observed, neutrino-less double beta decay could provide answers for many current mysteries in particle physics, such as the possibility of Lepton number conservation violation, matter-antimatter asymmetry and neutrino mass ordering. This project examined the capability of a theoretical enhanced (through the doping of the detector medium with  $^{136}\text{Xe}$ , a double beta decay candidate) Deep Underground Neutrino Experiment 4th module observing a neutrino-less double beta decay. In order to do this, an energy region of interest and optimal minimum distance to the closest wall were found to optimize a fiducial volume for event selection in the presence of a wide variety of the most significant backgrounds. Imperfect detector energy resolution was accounted for by smearing the energy according to a Gaussian distribution. While the detection significance decreased with worsening energy resolution, the optimal energy ROI center was found to improve detection significance by up to a factor of 1.7 when compared to centering the energy ROI at  $Q_{\beta\beta}$ .

## Summary

**Primary author:** REESMAN, Grace (University of Missouri at Kansas City)

**Co-authors:** Dr ZENNAMO, Joseph (Fermilab); Dr PSIHAS OLMEDO, Fernanda (Fermi National Accelerator Laboratory)

**Presenter:** REESMAN, Grace (University of Missouri at Kansas City)

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