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**A Statistical Analysis of Background Contributions for Experiments Measuring Neutrinoless Double Beta Decay** STEPHEN MEE, ARTEMIS SPYROU, ALEX DOMBOS, STEPHEN QUINN, Michigan State University, NSCL — Large-scale experiments are underway to observe the neutrinoless double-beta decay of  $^{76}\text{Ge}$  with a respective energy of 2039.0-keV. A 2040.7-keV  $\gamma$  ray from the 69<sup>th</sup> excited state of  $^{76}\text{Ge}$  could create false signals in the  $^{76}\text{Ge}$ -enriched detectors used in these experiments. It is therefore crucial to estimate the background contribution of this 2040.7-keV  $\gamma$ -line. A recent experiment performed at the National Superconducting Cyclotron Laboratory was able to populate the energy state of interest and observe the 2040.7-keV  $\gamma$ -line. The present work focuses on the statistical analysis of this experiment in order to determine the branching ratio of the 2040.7-keV  $\gamma$  ray from the 69<sup>th</sup> excited state of  $^{76}\text{Ge}$ . This branching ratio is to be applied to experiments attempting to observe  $0\nu\beta\beta$  events. Successful observations of  $0\nu\beta\beta$  events would be the best way to obtain the mass of the neutrino and determine its nature as a Dirac or Majorana fermion.

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