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Determining analysis efficiency for Project 8's neutrino mass studies[1] SIERRA WILDE, University of Washington, PROJECT 8 COLLABORATION — The Project 8 experiment is developing a way to study neutrino mass called Cyclotron Radiation Emission Spectroscopy (CRES). In CRES, an electron's energy is measured by observing the cyclotron radiation emitted by the electron as it accelerates in a magnetic field; because of a special relativistic effect, this frequency depends on the electron's kinetic energy. A radiofrequency detection system collects, measures, and digitizes information about the radiation, and Project 8 analysis software processes the data to distinguish electron signals from noise. However, many electron signals are comparable in power to the noise, which can lead to missed signals and errors in cyclotron frequency reconstruction. This work aims to quantify the systematic effects of variations in signal properties on measured cyclotron frequencies. We use a Project 8 software package to create simulated electron signals and noise. We vary parameters of the simulated signals, and then measure how these variations affect the analysis efficiency in finding signals and its accuracy in determining their frequency. These calibrations will make it possible to quantify uncertainties in Project 8's ongoing experimental observation of the spectrum of electrons emitted in the beta decay of tritium.

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