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Determination of dead layer parameters of semiconductor germanium detectors using machine learning for the LEGEND experiment

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The search for neutrinoless double beta decay remains today one of the most important areas in particle and nuclear physics. Germanium detectors are an excellent technology for this search because of state-of-the-art energy resolution, but dead layers in germanium crystal could potentially harm the energy resolution. In this work, we used machine learning methods to study the dead layer in enriched germanium crystals. 1000 sets of events were simulated with various combinations of dead layer parameters. A fully connected neural network was used to determine these parameters from the energy spectra of a gamma calibration source Ba 133. As a result of training, this neural network determines the thickness of the dead layer with an accuracy about 0.01 mm and its fraction with an accuracy about 1%.

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