Efficiency of Germanium Detectors

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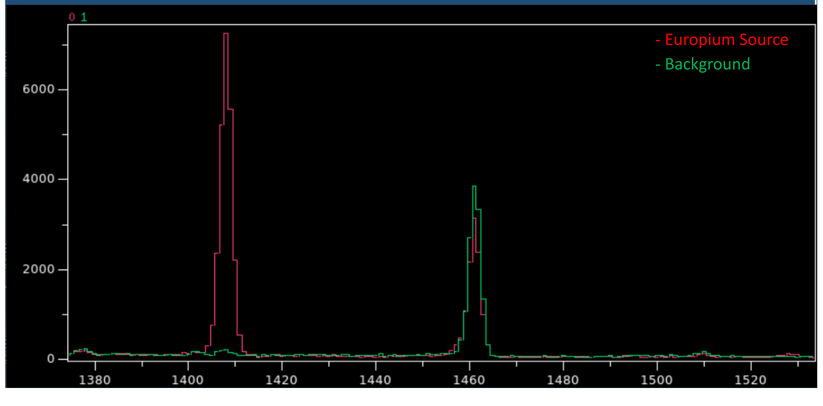
Project Overview

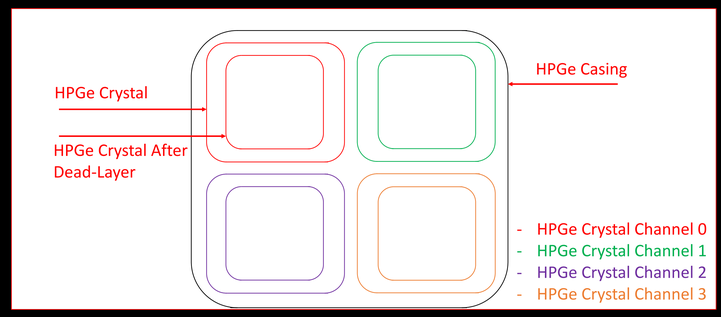
I Have Been Fortunate to Conduct My Research Down the Tobacco Road at the HIγS Facility in Triangle Universities Nuclear Laboratory. There, My Group Studies the Excited States of the Nucleus of Various Stable Isotopes. The Backbone of Our Experiments are the Clover-Type HPGe Detectors. My Job Was to Track the Efficiencies (ε) of Our Eight Detectors, and Estimate Their Dead-Layers. This Was Done By:

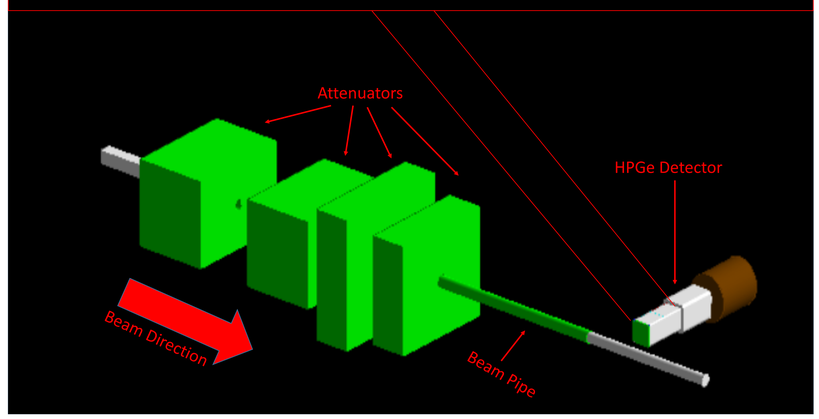
- Creating Calibrated and Background-Subtracted Spectra Graphs
- Finding the Measured Counts of the Spectra's Peaks to Calculate Detector Efficiency.
- Running Simulations of Our Experimental Setup.
- Comparing Our Experimental Efficiencies to Simulated Efficiencies.
- Determining the "True" Dead-Layer Through χ^2Calculations and a Polynomial Fit.
- Re-running Our Simulations With This "True" Dead-Layer to Find the "True" Efficiency.

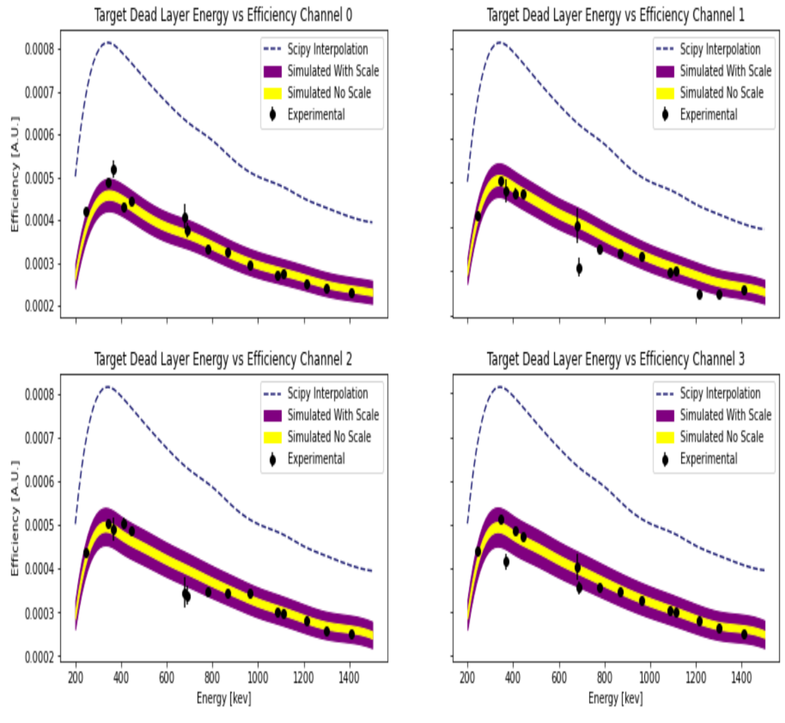
Spectra Work



Simulation And Plots







Experiment and Simulations

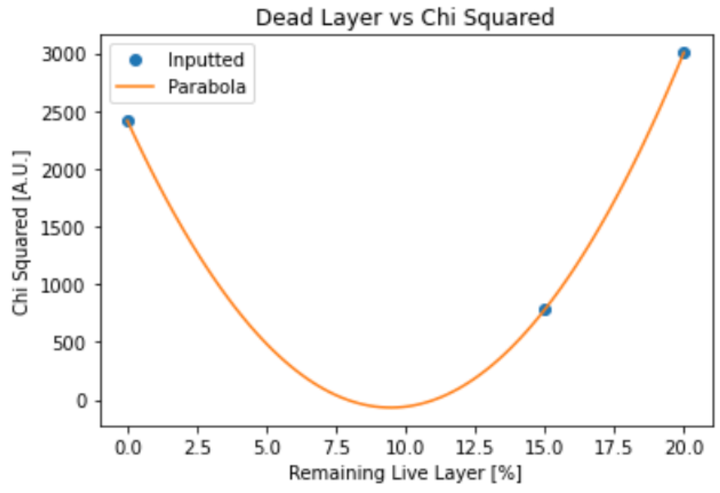
Experimental Data Analysis:

$$\frac{N}{A * t_{run} * I}$$

Simulated Experiment:

- Running *Geant4* to Simulate Experimental Setup. (Seen In Top Image)
- Over-Plotting the Experimental and Simulated Efficiencies, With Respective Uncertainties. (Bottom Image)

χ^2 Fit of Dead-Layer:



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