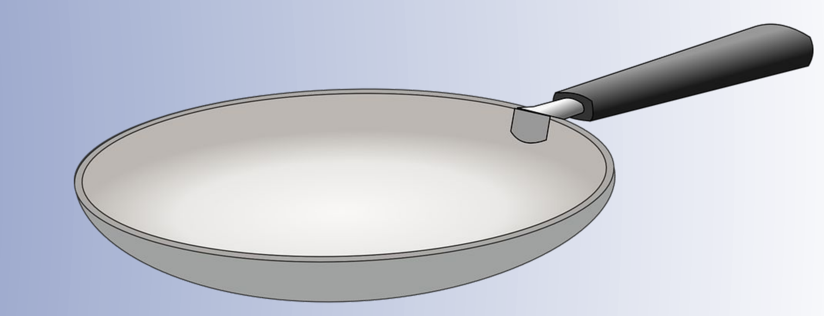

Frying PAN's Adventure

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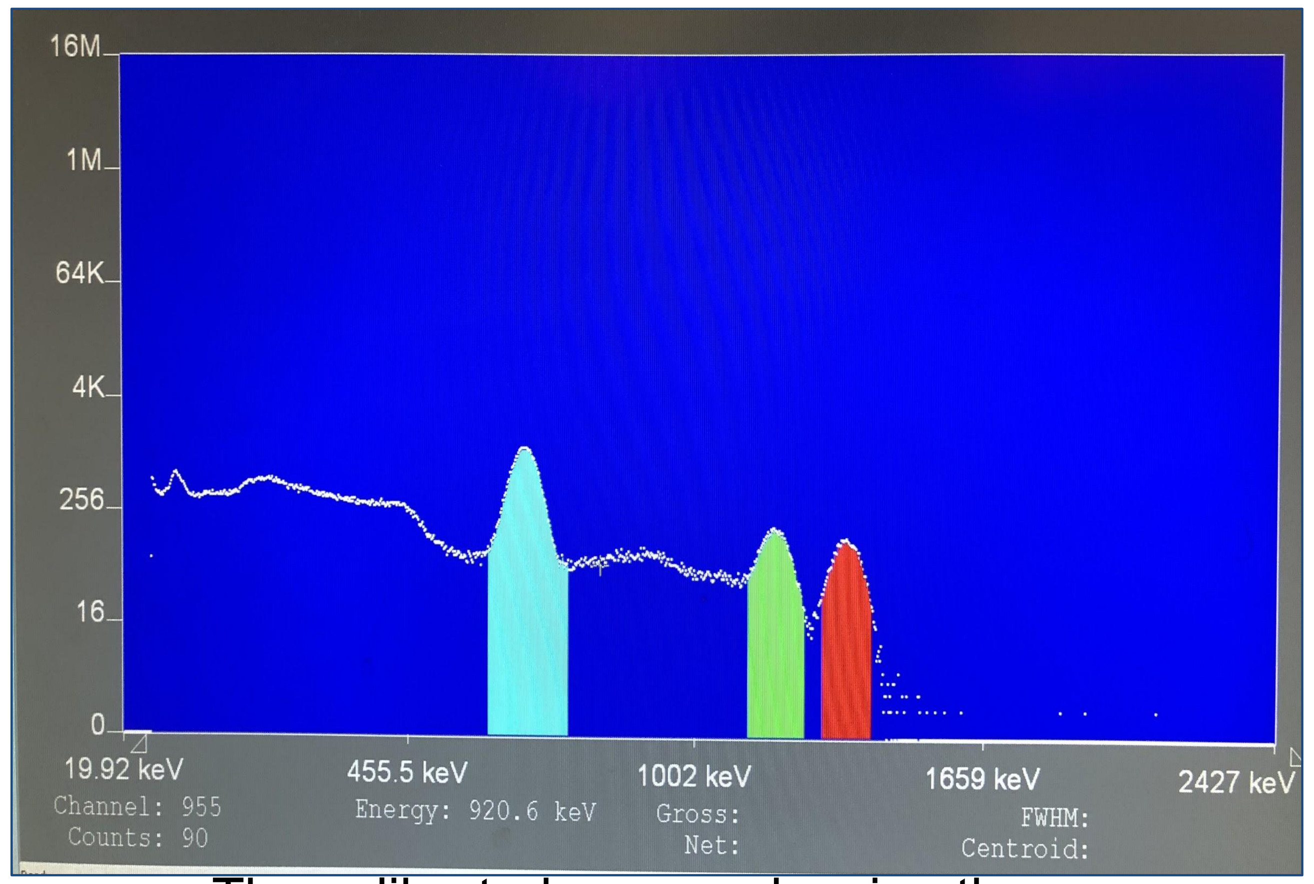
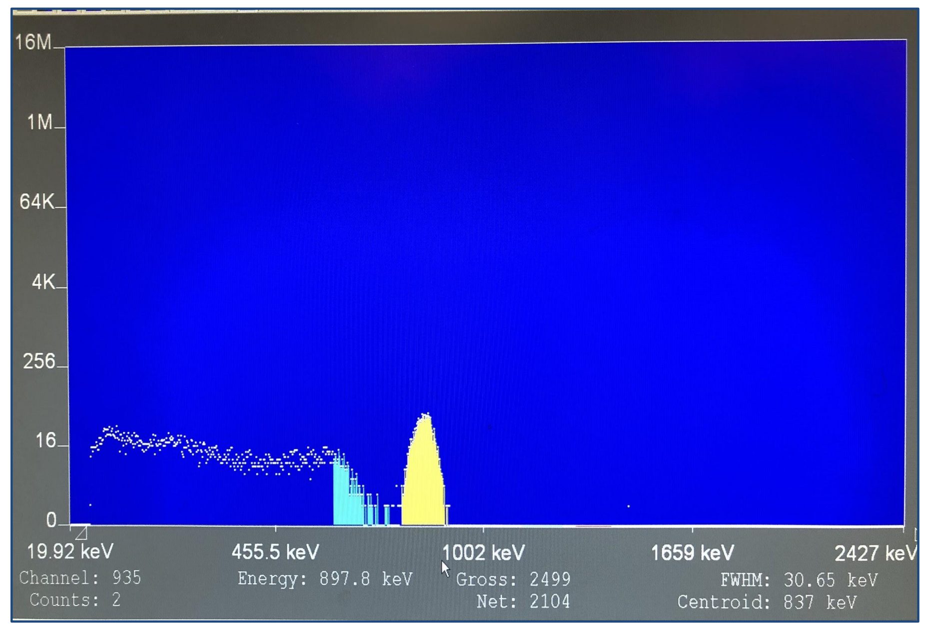
Gamma Ray Spectroscopy Experiment

This experiment was conducted in order to find out the identity of an unknown isotope.



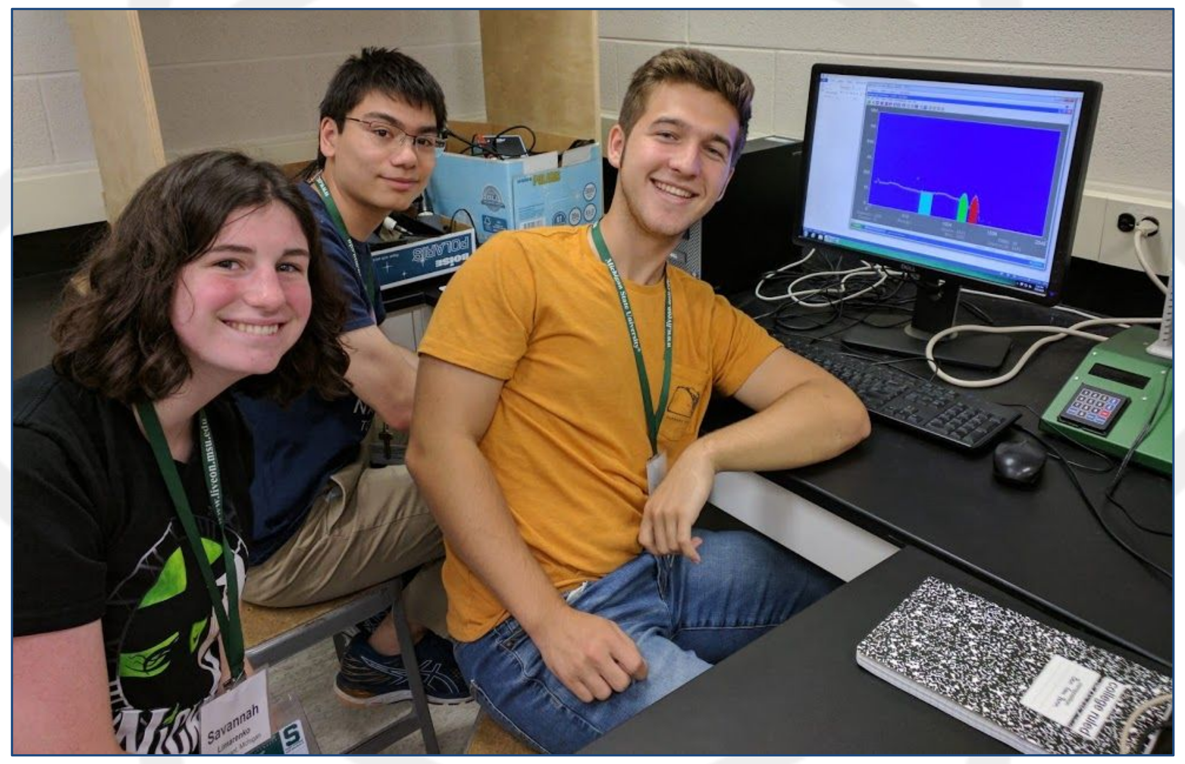
The calibrated screen showing the peaks for Cobalt 60 and Cesium 137.

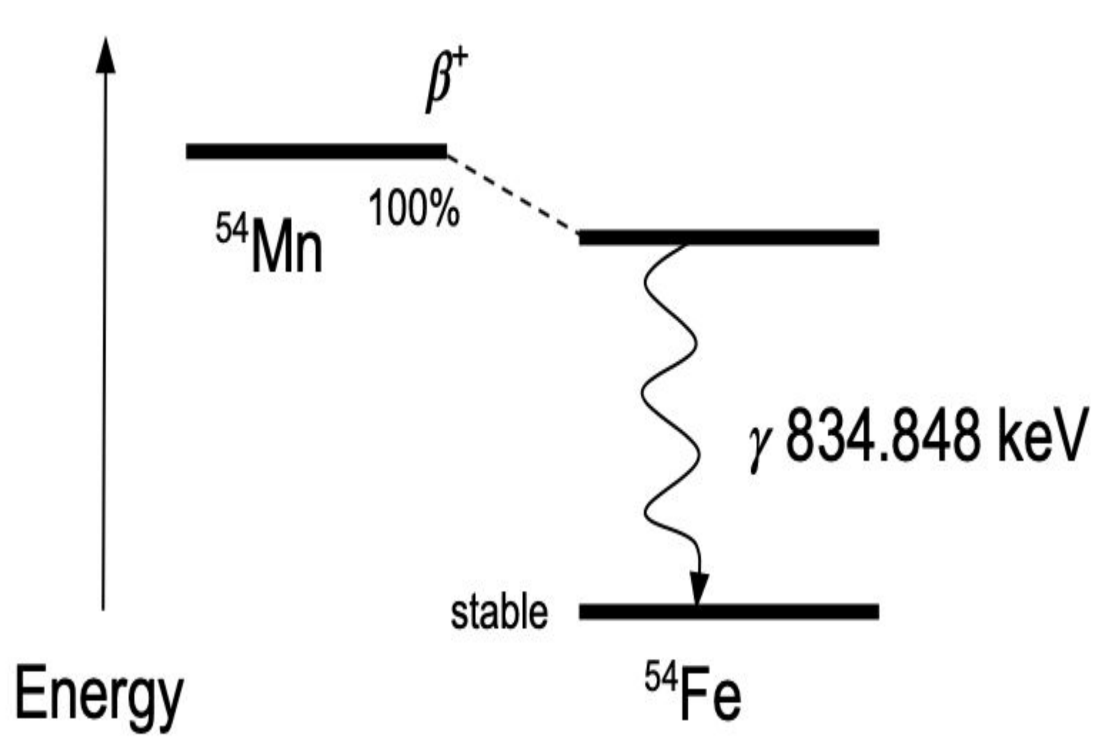
First, we used a NaI scintillator to measure the gamma emissions of two known isotopes, ^{60}Co (which has two peaks) and ^{137}Cs (which has one). Next, we calibrated the channels at which peaks were present to their (known) corresponding energies.



The yellow section is the gamma radiation peak of the mystery isotope.

Next, we recorded the energy of the gamma emissions from the mystery isotope, which had a peak at 837 keV with an error of ±13 keV. We found isotopes with similar energies on the LBNL Radiation Search. By filtering out unlikely candidates, such as those with short half-lives and low intensities, we concluded that the isotope was ^{54}Mn.





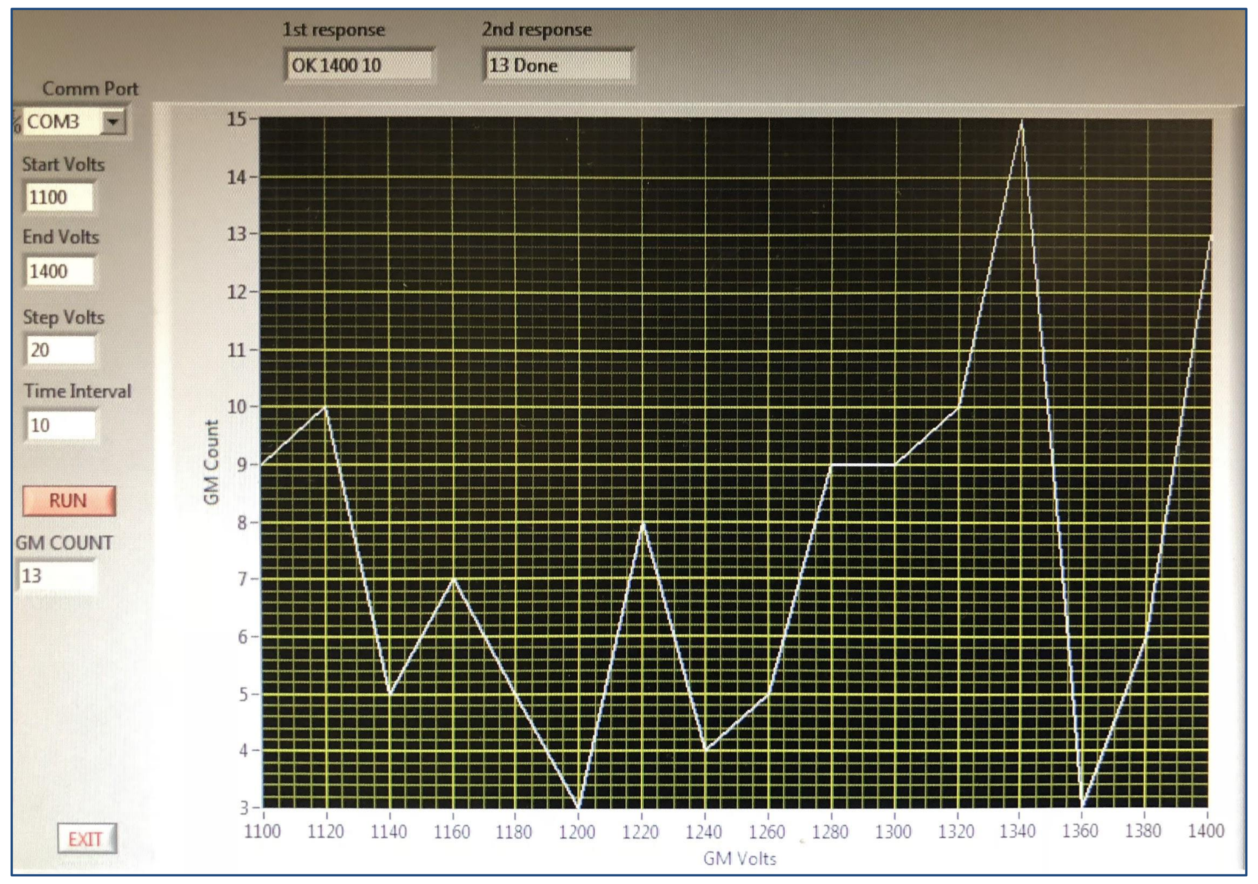
The decay scheme of ^{54}Mn.

Once we found the identity of the isotope we were ready to try and make a decay scheme. After looking up a little more information on ^{54}Mn, we were able to determine that the decay was β^+. Following the chart of nuclides, we concluded that ^{54}Mn decayed into ^{54}Fe, which is stable.

Measuring Half-Lives Experiment

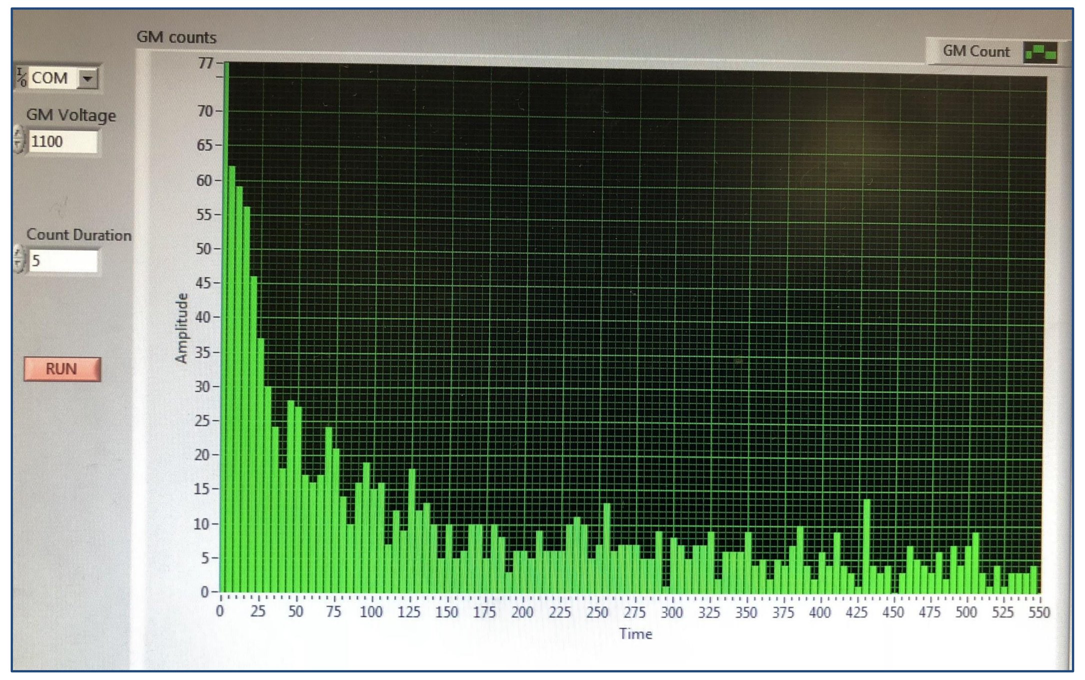
This experiment was conducted in order to determine the half-lives of two isotopes in the same sample..

Before we could start measuring half-lives we had to find how much voltage we could use without ionizing the gas inside the Geiger-Mueller tube. We ran a couple of tests and ultimately decided to use a voltage of 1100 V.



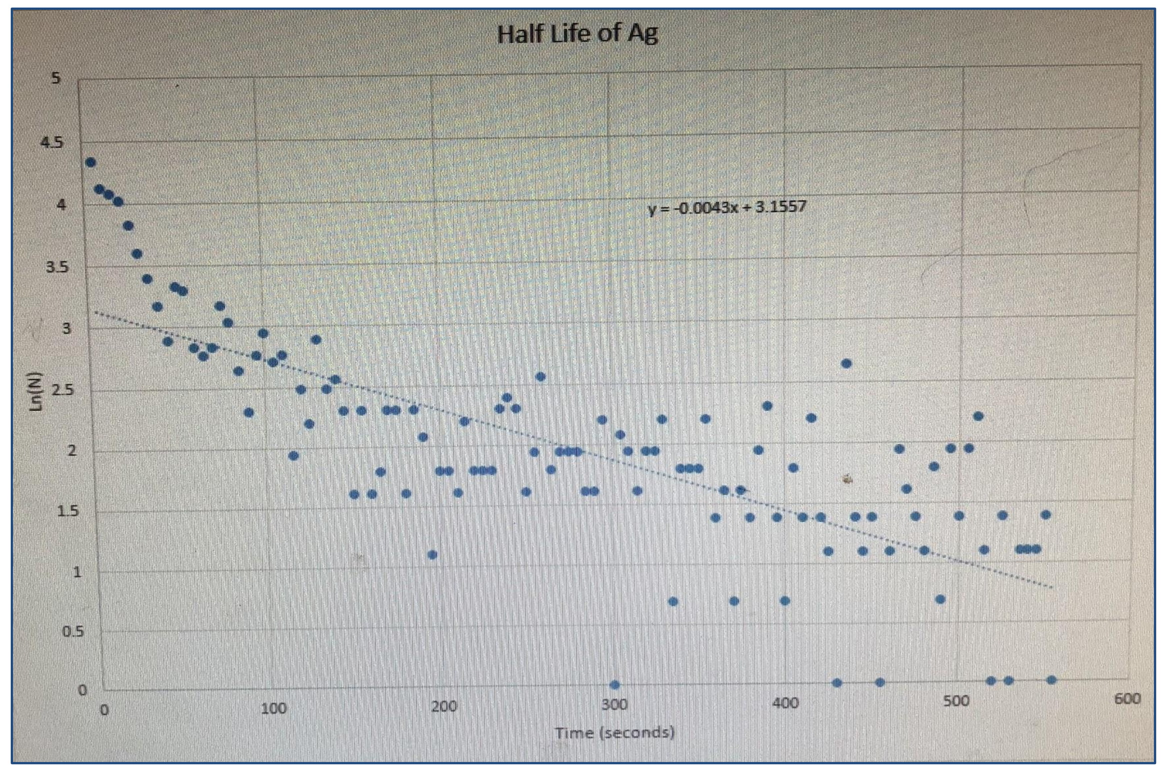
One of the test runs for finding the appropriate voltage.

The silver coin became radioactive through neutron capture, in which a nucleus picks up a free neutron. The neutrons required to turn stable ^{107}Ag and ^{109}Ag into radioactive ^{108}Ag and ^{110}Ag, respectively, were provided by an AmBe source.



The histogram of radiation coming off the silver coin in each interval.

By analyzing the trendline for our data, we determined the half-lives of ^{108}Ag and ^{110}Ag to be 3.7 minutes and 45 seconds, respectively. However, these were very different from the published values of 2.4 minutes and 24.6 seconds. Since the two isotopes were decaying at the same time, the data was skewed. We made two graphs, each showing the individual isotopes in different intervals but found that using the whole time frame produced the most accurate half-life for ^{108}Ag.



The slope of the linear regression of our data was -0.0043.

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