

The Next JINAration

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Our mission: To boldly go where no PAN students have gone before.

Experiment 1: Gamma and X-Ray Spectroscopy

Objective:

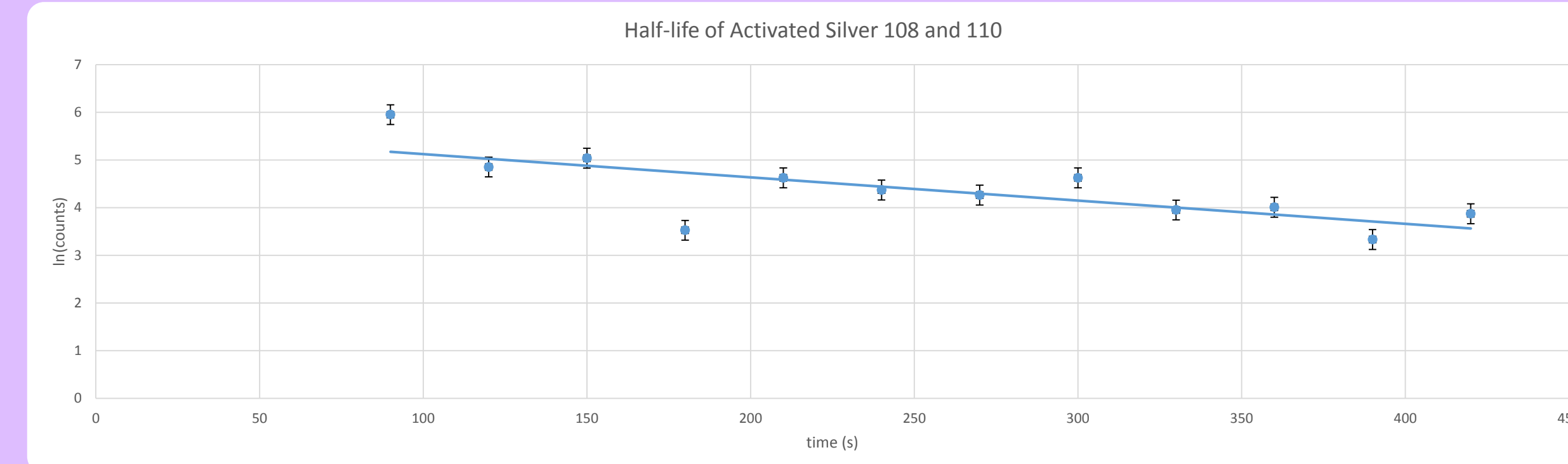
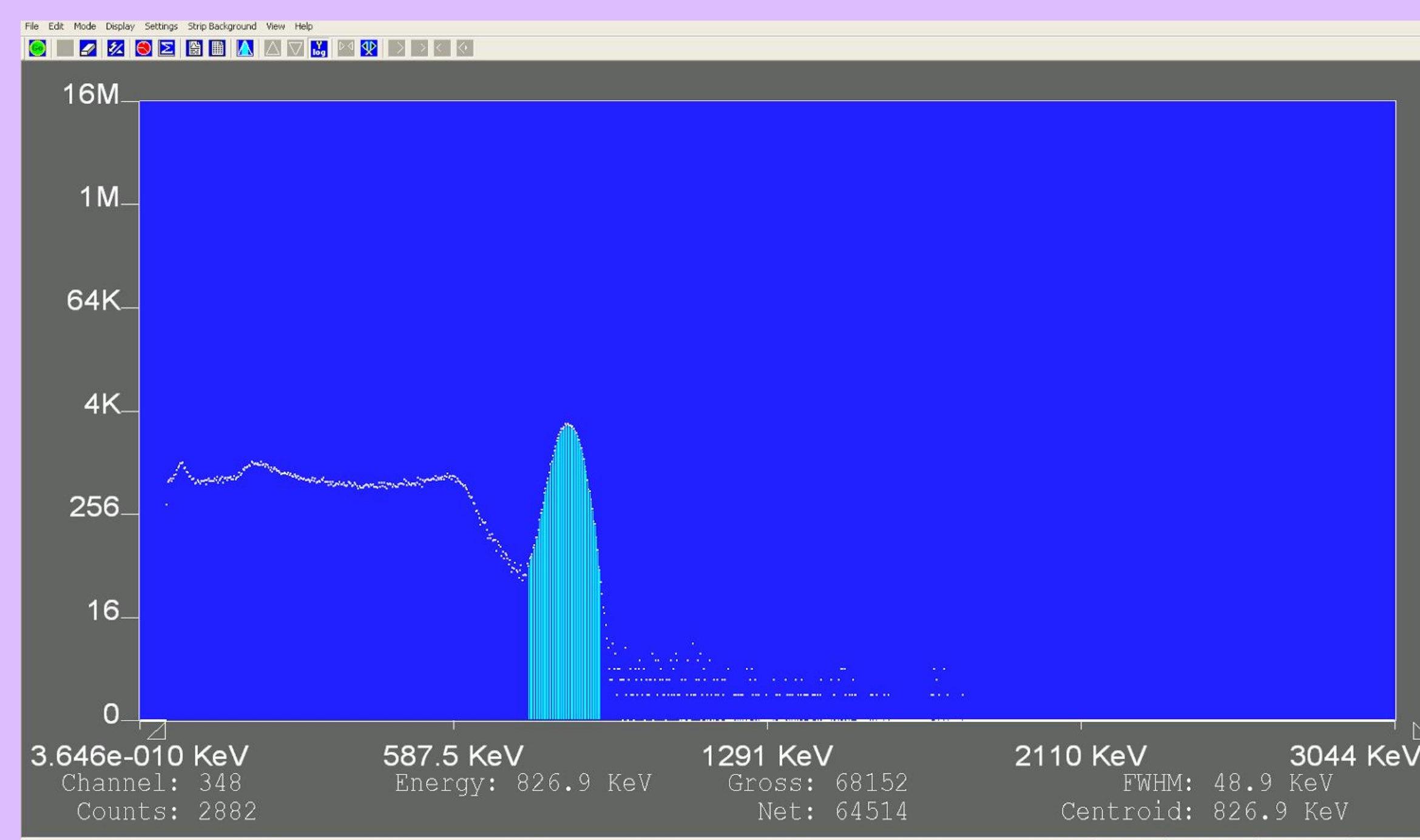
- Determine the photo peak of an unidentified isotope
- Identify the unknown isotope
- Create a map of the decay scheme

Procedure:

- Calibrate UCS20 software using known Co-60 source
- Make Gamma Ray Spectrum of the unknown material to determine photo peak
- Calculate margin of error
- Use LBNL Radiation Search to find the isotope with our measured characteristics

Results:

- We determined that the unknown isotope was Mn-54
- Range of Half-life
- Within margin of error for gamma energy
- High intensity required for the single photo peak



Experiment 2: The Geiger Müller Counter

Objective:

- Find the operating voltage of the Geiger Müller counter
- Determine the half-life of an activated piece of Silver 107 and 109

Procedure:

- Scan voltage ranges to find the optimal voltage for Geiger Müller tube operation using Cesium 137
- Scan background radiation to verify that the operating voltage was reasonable
- Collect data on the silver disks until getting parallel results
- Analyze data with scatterplot to determine half-life

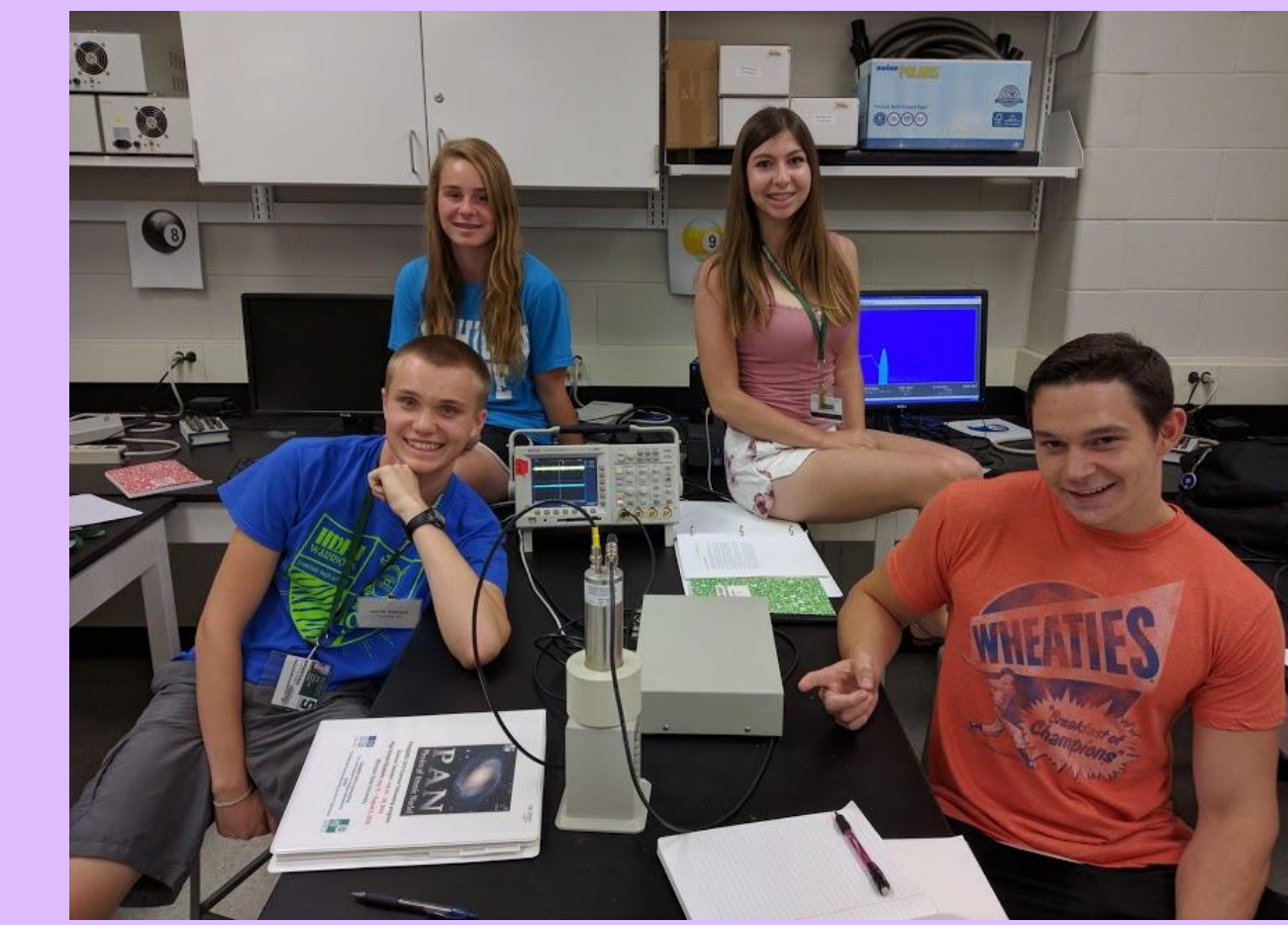
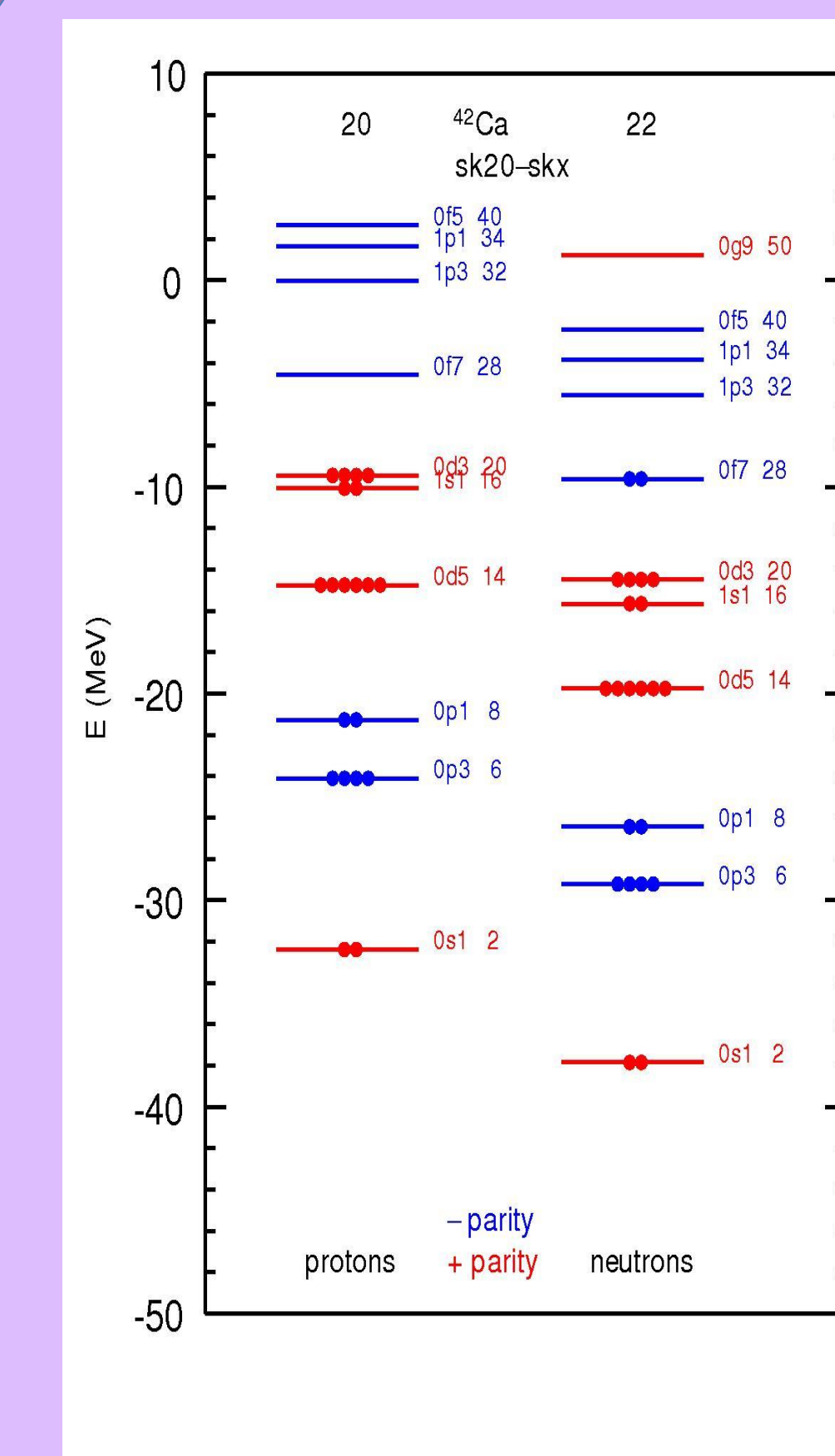
Results:

- Our initial tests had the voltage in the Geiger Müller counter too high, so our initial results were significantly varied
- We lowered the voltage and got answers similar to a past result and made an average of the results with the lower voltage and higher voltage
- We determined that the half-life for Silver 108 and 110 was 136 +/- 7.5 seconds

Theoretical Quantum Physics Lecture and Activity

Summary:

- The wave equation
- Quantum numbers
- Spin of nucleons
- Radial potential
- Finding proton and neutron drip lines



Additional Lessons:

- Nuclear experimentation process
- How radiation detectors work
- Nuclear astrophysics and cosmology
- Cosmic rays
- Big Bang Theory
- Cosmic microwave background
- Neutron capture processes