Scientists are puzzled by the interactions between protons and neutrons, also known as nucleons. The goal of this experiment was to learn more about nucleon-nucleon interactions through the electron-Helium nucleus scattering reaction at Jefferson Lab. This high energy scattering experiment allows us to observe proton momentum distributions inside the Helium nucleus. My work was on data analysis and the extraction of the missing energy spectra after background subtraction.

To learn more about nucleon-nucleon interactions, energies and momenta of the incident electron, scattered electron and ejected proton must be measured with the use of spectrometers. The electron beam at JLab accelerated to 6 GeV. This beam is shot at a target (Helium-4) and results in electron scattering and proton ejection. The data is observed and cuts are made based on the kinematics laws.

Cross section results are compared to relativistic calculations and showed that some of the strength in the cross section is not accounted for.

The objective was to get the clean missing energy spectra and extract the number of events that will be used in the cross section analysis. The cleaning of the spectra was done by studying the physics acceptance that takes into account the geometrical phase-space and target length reconstruction as well as spectrometer momentum resolution and coincidence events were validated by selecting a time window of 20 ns for the difference of the arrival time of electrons.