

JSA Fellowship report

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I would like to thank the JSA Fellowship Program's committee for giving me the fellowship during 2017-2018. The fellowship gave me a financial support to work on my research as well as the travel support to present my results at different conferences. The following is a summary of the work I have done during the fellowship period.

Analyzing data for experiment E08014

My main research was doing data analysis for experiment E08-014 which was designed to study SRCs in nuclei through a measurement of electron-nucleus cross sections in a specific kinematic regime. These correlations arise from the short range interaction of nucleons (protons and neutrons) arising from the nucleon-nucleon (NN) potential. The NN potential consists of a long range attractive part and a very repulsive part at distances less than 1 fm; both pieces give rise to a high momentum tail (with momenta $> k_F$, the Fermi momenta) in the nucleon momentum distribution. In the region where SRCs dominate, the ratio of per nucleon cross sections of heavy to light nuclei expresses the probability of finding a SRC pair in the heavy nucleus as compared to the light. My analysis focuses on the isospin dependence of SRCs through the electron inclusive scattering from ^{48}Ca and ^{40}Ca .

- Finished the local efficiency study, optimized the acceptance cuts and studied the cross section model dependence
- Performed detailed uncertainty calculation for absolute cross section and cross section ratio
- Extracted the absolute cross section from different targets including ^{12}C , ^{48}Ca and ^{40}Ca with an uncertainty smaller than 3%.
- Obtained the per nucleon cross section ratio for $^{48}\text{Ca}/^{40}\text{Ca}$ for 3 different angle settings.

The result of this analysis provides an evidence of isospin dependence using the electron inclusive scattering. This is also the topic of my PhD thesis. I defended my thesis using the results from data analysis for experiment E08014 and started preparation for the results publication.

Contributing to data taking of experiment Ar(e,e'p) and Tritium

- I had a chance to contribute on data taking of experiment Ar(e,e'p) which was designed to do spectral function measurement for Ar and Ti. I was involved with the first state

of data analysis. This opportunity helped me gain a lot of experiences of running experiment and calibration for the detectors as well as the beam-line components. This experiment also helped me see the connection between the nuclear physics and neutrino physics, which is very important for my future career.

- In parallel I was helping to run other experiments of the Tritium program at JLab. One of them is the E12-12-112 which also focus on isospin dependence study using the mirror nuclei ${}^3\text{He}$ and ${}^3\text{H}$. The physics of this experiment is directly related to my PhD research. The results of this experiment will provide more information of SRCs for light nuclei.

Conferences

- DNP Oct/2017: Giving talk "Extracting 3N Short Range Correlations (SRCs) and the isospin dependence of SRCs"
- SRC Aug/2018: Attending the talks