Research Experience

Facility for Advanced Accelerator Experimental Tests (FACET-II) | SLAC National Accelerator Laboratory | Stanford University

June 2024 – August 2024

- Participated in summer physics research at SLAC National Accelerator Laboratory under the guidance of Spencer Gessner and Doug Storey.
- Wrote Python programs to simulate magnetic corrections of particle beams in the FACET-2 accelerator.
- Optimized particle beam quality in simulations though a plasma acceleration section.
- Worked on a GUI to measure beam statistics from physical images of beam.
- Wrote a paper describing my work and results and presented research at SLAC.

Cold Atom Lab | Cal Poly

April 2024 – June 2024

- Worked with Katerina Gillen over the course of a semester in her cold atom lab.
- Worked in conjunction with a quantum computing class with the goal of trapping rubidium atoms to be used in neutral atom quantum computing.
- Developed skills in laser tuning to increase wavelength range of diode lasers to trap and excite rubidium atoms.
- Learned basic quantum computing theory and specifically how to implement neutral atom quantum computing.

Facility for Advanced Accelerator Experimental Tests (FACET-II) | SLAC National Accelerator Laboratory | Stanford University

June 2023 – May 2024

- Participated in physics research at SLAC National Accelerator Laboratory under the guidance of Spencer Gessner, Alexander Knetsch, Doug Storey, and Robert Holtzapple
- Wrote programs in Matlab and Python to simulate particle acceleration at the FACET-2 accelerator.
- Used simulations to optimize settings for improvement of electron beam quality and energy gain
- Developed a GUI to visualize beam transport in sections of the FACET-2 accelerator.
- Presented summer research at Cal Poly's FROST conference
- Wrote a conference proceedings and presented a poster at IPAC 2024

CUORE Project | Cal Poly

Dec 2022 – May 2023

- Analyzed data from the Cryogenic Underground Observatory for Rare Events (CUORE) under the guidance of Thomas Gutierrez
- Programmed a calibration process to determine the energy spectra for various atomic decay processes.
- Used machine learning models to distinguish between pulse types detected by the CUORE detectors.

Interest in CMS and LDMX Research

Most of the research I have done up until this point has been more focused on accelerator physics, but I have always been interested in High Energy Physics and this is what I more than likely want to study in graduate school. While my undergraduate studies have not given me much experience with Higgs physics, I think that this area of research is fascinating, and I would really like to learn more about how Higgs Bosons and their decay products are detected as well as the relation between the Higgs field and other fundamental fields, specifically how this field leads to electroweak symmetry breaking and the generation of mass in fundamental particles.

However, I am mostly interested in LDMX research. For the past two summers I have worked at FACET-II at SLAC, performing various simulations relating to optimizing Plasma Wakefield Acceleration. During this time, I've reached a good understanding of how the accelerator functions to accelerate and alter electron beams. This application of using the existing SLAC infrastructure to indirectly detect dark matter is fascinating to me because it seems to be a perfect segue between my previous experience with accelerator physics and high energy experimentation. In regards to this project, I'd be very interested in learning about the detector system and how all of the SM particles produced through the electron scattering can be measured and accounted for to determine if dark matter was produced.