

Julian Yocum

Faculty Supervisor: Lindley Winslow

Direct Supervisor: Daniel Mayer

Summer UROP Direct Funding Request \$6240

May 4, 2020

Searching for Magnetic Monopoles with CUORE

Project Overview

This project is a continuation of the magnetic monopole search being conducted in Professor Winslow's group involving the use of data from the Cryogenic Underground Observatory for Rare Events (CUORE). Although CUORE's primary purpose is investigating Neutrinoless Double Beta Decay as well as dark matter candidates, I will be tasked with adapting the experiment for the monopole search.

Personal Role & Responsibilities

My role in this project will be putting the next steps in place for the search. As it currently stands, I have built much of the platform for characterization of muons in the CUORE detector. Next steps are to compare experimental data with a Monte Carlo simulation. Following this, I shall expand my dataset from the one-month dataset I'm currently working with. Through this process I shall re-evaluate the trigger algorithm implemented for muon characterization before beginning an in-depth study of monopole phenomenology and systematics. If am able to get through these steps, the goal is to conclude with monopole selection and search.

Remote Work Plan

This project is primarily conducted via software and data analysis on computers, which makes it an excellent candidate for remote work. In the spring, all of the work was done on my laptop. However, this summer, the plan is to gain remote access to a computer cluster to run the code as it is becoming more and more tedious to manage locally. Communication will occur weekly over Zoom with my direct Supervisor and throughout the week via Slack.

Personal Statement

My personal goals for the UROP are to gain experience with statistics and data analysis in physics. Even if what I am doing in this project will not be what I ultimately focus on in my career, data science will surely be a part of my journey. Moreover, the actual content of the physics that I learn will no doubt be beneficial as I continue my study of advanced physics. As far as the overall aim of the project, the search for magnetic monopoles has not been done so far at CUORE. This means that the research I do could potentially be groundwork for future research in this search.