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Research Scholar Final Report

At the end of last semester, I changed my focus from working on a muon Monte Carlo, to working more closely on the Daya Bay experiment. I began by manipulating some raw data in order to understand how the analysis software for the experiment was set up. After working with example scripts and learning how to use the software, I began to advance my knowledge of C++ and Python. After this, I began to work on adding necessary components into the simulation for the experiment.

The first task was to better understand how to use the analysis software for the experiment. Collaborators have done an excellent job of writing examples that explain how the software works and how to manipulate the software to plot different things. So, I began by working through some of the different software tutorials. These actually took a surprising amount of time to master (as one can imagine the software for the experiment is quite complex), and I was working through these for about a month before I really understood how to use the analysis software.

After I had a deeper understanding of the software, I began to learn more about the different components of the simulation, what they were simulating, and how the different components functioned in 'real life'. My ultimate task was to add the sums (energy sums or esums) of the PMT signals into the simulation. These were originally part of the electronics simulation, but they weren't implemented properly because they were not fully understood at the time the simulation was written. The most difficult portion of this was understanding exactly what the energy sum circuit was doing. After I was confident that I understood the esum circuit in 'real life', I added the code to simulate the esum circuit into the electronics simulation. I also gave a presentation about the esum simulation at the May Daya Bay Software Analysis Workshop held in Madison, WI.

It was during this time that I also realized how little C++ I actually knew. So, I also spent a few weeks brushing up on my C++ knowledge and digging a little deeper into what the language can actually do. The combination of understanding the esum circuit and a better understanding of C++ is what allowed me to actually add the esum simulation into the electronics simulation.

After working on the electronics simulation, I was tasked with the issue of adding the FADC board into the readout simulation. This was (and is) a difficult task. The first task (as before) was to understand what the FADC board actually does. This didn't take very long to figure out, but adding the code to the simulation ended up being very challenging. I gave a presentation about the FADC (in real life and in the simulation) during the July Daya Bay Analysis Workshop in Weihai, China. After the analysis workshop, I actually finished the code for the simulation, but upon committing my code for others to use, we found some errors, and I'm currently working on fixing those. I also wrote an example script that allows people to look at the output of the FADC simulation. I presented this at the July workshop in China as well.