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RCNP Week 4 Report

This week, we were able to finish our angular correlation experiment. At the start of the week, we found out that, due to the activity of our source (16kBq), the angular resolution of our scintillators was ~52. This value is extremely high which resulted in some of the data we took during our experiment to not follow the expected trend. When we would put the scintillators less than 90º from each other, we saw that the resulting counts per second did not follow the expected sinusoidal relationship. To fix this, we simply chose angles that were greater than 90º and less than 270º.

For the measurements of each angle to have an uncertainty of $\leq$1%, we had to acquire at least 10,000 counts. Because the counts per second change based on the angle we choose, we typically had to run our tests for about 6 hours per scintillator. We also had to account for the accidental coincidence and uncertainty, which caused us to run each test for more than 10,000 counts (typically about 15,000). Since these tests took a while, we would run them in the background while working on our machine time proposal for our beam time on July 12th. To write our proposal, we had to calculate values such as the maximum angular momentum, the beam intensity, target thickness, and expected counts for our measurement. The germanium detector cannot exceed 10,000 counts per second because this will cause pile up and prevent us from reading anything. Because of this, we had to calculate which beam intensity we would use to ensure that we would be able to keep it under 10,000 cps. We also created the excitation functions for our beam energy and created an experimental setup based on the physical properties of the detector as well as the H-course beam line.

When we take data during our beam time, we cannot use the previously used "Coincidence mode" in the MCA (since we will only have one detector), so we are also trying to learn how to use the "List mode" in the MCA which attributes timestamps to each event that occurs. This will take some time since the files are very large and typically save as big-endian binary file types which we are still learning how to correctly read. While we learn how to read these files, we are also preparing for the interim presentation next week as well as two facility tours.