Personal Experience

Nathan Brink

When I was first presented with the option of coming to SCIPP for a summer internship I jumped on it. It was a leap of faith, considering how little I knew of Particle Physics, but when the dust cleared it was a fully satisfying experience. For the first week we were assaulted with a solid stream of information from some of the university's top professors. Once we had our fill of useful and interesting information we split into various groups to perform various tasks. Anna Chang was the sole proprietor of the ADOM project, a small payload designed to be carried aloft on a balloon to measure muons at 1000 ft above ground level. Brooke Cosko and Melissa Sussman were assigned to measure the lifetime of muons. Ben Jolitz was assigned to coordinate the website and design a data analysis program. Marshal Rogers was assigned to study sources of error in the Lab Pro barometer equipment. Alex Bonnifield and I were assigned to design an experiment to utilize the new equipment which had just presented itself.

We ultimately decided to design and construct an apparatus which would allow us to determine the amount of muons blocked/absorbed by various materials of assorted thicknesses. This presented the need for specialized apparatus which would support the heavy shielding materials and protect the delicate Scintillators from damage. A heavy gauge steel frame served admirably in this regard while a thick aluminum plate supported 150+ pounds of lead. After only slight problems to construct this, we had the Scintillators out and collecting data.

And it's not to say that the Scintillators didn't have their own set of problems. In order to properly collect data from the Scintillators, one has to make sure that the voltages being fed through the photo-multiplier tubes is in the optimum range for collecting data.

If the voltages in the tubes is too high it will cause the dynodes inside of the tubes to shed electrons and give false signals, however if it is too low, then it will not pick up any signal at all. We had some problems calibrating the proper voltages as we were misinformed of the proper count rates. Once we redeveloped the plateauing process we had the PMT's calibrated it was a simple matter of collecting data.

The data we collected showed a dramatic drop-off in charged particles, a much larger drop then we had expected. And as such, we decided to test various materials. To our great surprise, we found that a half inch of lead blocks almost as many charged particles at two inches. We were incredulous, yet many of the physicists in the building backed up what we had found. So, when Mr. Kliewer presented a program to determine the amount of muons blocked by certain thicknesses of materials, and it showed a dramatic difference, the hunt for the source of error proceeded. Many options were looked into, but we were unable to test these options as the equipment we were using to test with became very scarce.

So the search for answers continued, but there were other matters that needed attending to, such as the repair of the aging suit used to protect people from the wrath of the Tesla coil used in many demonstrations. After that brief delay, we had hoped to continue with experimentation, but the equipment was unavailable. We then proceeded to continue with our reports and help other teams that were running increadably short on time. Brooke and Mellissa never managed to collect data due to equipment failure, and Anna's balloon launched quite admirably and collected data for Ben to analize.

Ultimately, though we may never know the source of the discrepancy between the measured and the predicted, this Internship was an increadably interesting and fulfilling experience which will remain treasured for quite some time into my future.