

8th Annual QuarkNet Workshop Report

Purdue University QuarkNet Center

June 13-17, 2022

This is a brief report on the QuarkNet Workshop held at the Purdue University Northwest Center for High Energy Physics, under the auspices of PNW QuarkNet Center. The week-long program had participation from 5 high school teachers and 3 high school students from Northwest Indiana and South Chicago. While the teachers were supported by the QuarkNet funding from University of Notre Dame, the students were paid stipends from support provided by PNW.

The 2022 workshop was designed to be a hands-on interactive experience for both students and teachers. Introductory talks were provided by N. Parashar (QuarkNet mentor) and J. Dolen (QuarkNet Coordinator), after which the lead teachers, L. Hautzinger and A. Erler, provided an introduction to the QuarkNet Cosmic Ray Muon Detector (CRMD) and a summary of past experiments. After the introductory talks, the first two days of the workshop were dedicated to learning how to setup and calibrate the CRMD, how to take data, and how to interpret the results (Fig. 1).



Figure 1: Initial setup of the CRMD.

The final three days of the workshop were dedicated to project-based learning, during which the students and teachers split into separate groups. The student group was dedicated to designing a collaborative research experiment between different high schools and creating a formal research plan (Fig. 2). Ultimately the student group designed an experiment to test different methods of shielding cosmic rays. They planned to use coincidence detectors above and below a column of water of variable depth. They developed a list of required materials, a plan for conducting the experiment at multiple schools, and presented their research plan to the teachers, workshop leaders, and visitor Spencer Pasero. The students additionally worked to design a new logo for our QuarkNet center.



Figure 2: Student group during the initial stages of planning the CRMD experiment.

The teacher group was dedicated to creating new lesson plans which incorporate high energy physics concepts. Their goal was to combine energy and momentum concepts in one lesson. Particle collisions served as excellent examples to excite and motivate students within the lesson.

The 2022 PNW QuarkNet workshop was fun for both leaders, students, and teachers. The students asked excellent questions and demonstrated an excitement about particle physics and a willingness to research new ideas on their own. The students left the workshop motivated to complete their research plan. The teachers planned to share their lesson plan with other teachers in the area.