2018 TTU QUARKNET SUMMER WORKSHOP: COSMIC MUON DETECTOR

Date: May 31, June 13-15, & July 13-14, 2018
Facilitator: Dr. Sungwon Lee & Martin Shaffer (QuarkNet cosmic ray fellow)

In Attendance

James Holloway (QuarkNet teacher)

Neil Pratt (QuarkNet teacher)

Agenda

Learning objectives:

a. Configure a cosmic ray detector appropriately for acquisition of data for calibration and analysis of measurements.
b. Identify and describe the e-Lab tools available for conducting studies with data collected using a cosmic ray detector.
c. Create, organize and interpret a data plot to make a claim based on evidence; provide reasoning and identify data limitations.
d. Develop a plan for taking students from their current level of data use to subsequent levels using activities and/or ideas from the workshop.

Pre-Workshop notes:

-- needs assessment including communicating with mentor and/or lead teacher
-- check GPS location
-- check room
-- check projector and cables for presentations
-- print workshop evaluation
-- gather tools & supplies - **TAPE! TAPE! TAPE!** Wide Black Electrical Tape works best
-- optional: black light --> scintillator
-- create e-Lab and Quarknet accounts for all teachers
--- have data collection computers with EQUIP installed and JAVA updated

Summer Workshop 1st Day June 13 – June 15:

1st day June 13:

Welcome/Intros and mission statement and enduring understanding Science Buiilding Room 12
Sign-in:

- Needs assessment, norms, goals and learning objectives
- Logistics: schedule, meals, parking lot for questions/comments, etc
- Cosmic Ray science lecture
- QuarkNet overview: "*The Purpose of Quarknet*" Video conference with Shane Wood

Cosmic Ray Mission discussion:

- Cosmic Ray Muon Detector hardware components
- Assemble CRMD: assist by QN staff
- Four teams --> assemble four counters
- One team --> plan DAQ/GPS placement
- Plan study type: shower array or stacked array?
- Measure GEOMETRY
- Data-taking: 'EQUIP' procedure
- Cosmic Ray e-Lab overview
- e-Lab Login: verify accounts
- Tour e-Lab: Teacher side: Student side
- Manage accounts: create student groups, change password
- Reflection and Discussion of the day's activities
- Take CR data: overnight

2nd/3rd day June 14-15:

Review of previous day's activities

- Teacher: Learning Objectives, Community
- Student: Cool Science, Library, Upload, Data, Posters
- CRMD data UPLOAD: overnight data
- PERFORMANCE analysis tool
  - Assess data quality and discuss need for plateauing.
- Load GEOMETRY
- FLUX, SHOWER, Lifetime, and Time of Flight analysis tools
- Team CR investigation: FLUX, SHOWER --> write shared POSTER
- POSTER presentations Very short just enough to see how it works.
- Implementation Plan: classroom approach
- Future plans for group: CRMD data-taking, coordinate research, CRMD rotation schedule

July 13-14

- Meeting with interested high school students
- Discussion on muon's and cosmic particles
- Set up detector
- Research discussion/options
- Possible publications from adequate research

Proposed Projects by Students:

- Affects of sun storms on detection
- Electronic device interference
- Detection at different positions of detectors
- Long Calibration of device and effects of data qualit