

Objectives

Participating teachers will be able to:

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

Agenda

*Times and specific activities are subject to adjustment*

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| **Monday June 25**09:00     Coffee and Registration09:15     Introduction and Objectives09:30     What are cosmic rays? Introduction to CRMDs. Workshop theme: Muon absorption in Matter10:15 Shuffle the Particle Deck10:45     Standard ModelNoon     Lunch13:00     Explore Cosmic Ray e-Lab, plateau* Review geometry
* Calibrate barometers
* Distribute GPS signals
* Review EQUIP
* Review uploading data
* Aiming

14:15    Small group research. Select experiment* Absorption: rate versus overburden
* Imaging wall versus window

Set up experiment for overnight data15:45     Reflection of day16:00 End of Day  | **Tuesday June 26**09:00     Coffee and sign in09:15     Reflection on previous day    09:30     Upload Data (from overnight)10:00     Break10:15     Tour e-Lab I               Performance, Blessing* Time of flight
* Flux
* Speed of muon

11:00 Prepare report     12:00     Lunch13:00     Report out14:30     Set-up for 2nd Data Run 15:45     Reflection of day16:00 End of Day |
| **Wednesday June 27**FermiLab08:50 Meet at Information Desk, Wilson Hall. Close toed shoes required. Tours of neutrino and muon campuses.11:30     Lunch12:30     Lederman Center with computers* Penny mass activity
* e-Lab studies of existing workshop data
* Discuss plan to install CRMD and GPS in neutrino enclosure

15:00     Reflection of day 15:15     End of Day **Thursday June 28**09:00    Coffee and registration09:15     Reflection on previous two days09:30     Upload/analyze data10:00 Discussion of Experiment Design11:15 Presentation work time12:00     Lunch13:00 Guest Speaker Neutrinos (tentative)14:00     Conclude research;               create poster; Teacher implementation plan15:00 Setup for last overnight data collection15:45     Reflection and evaluation16:30     End of day**Contacts*** **Mark Adams**, QN Staff (cosmic focus)
* **Nate Unterman**,  Cosmic Fellow/Presenter
 | **Friday June 29**09:00    Coffee and registration09:15     Reflection on previous day09:30     Upload/analyze data10:45 Finish poster and power point12:00     Lunch13:00 Experiment and Implementation presentations14:30 Reflections and evaluation14:45 Clean up.15:30 Workshop ends.**Resources*** [**QuarkNet**](https://quarknet.i2u2.org/)
* [**Cosmic Ray e-Lab**](http://www.i2u2.org/elab/cosmic)
* https://sites.google.com/view/quarknet2017eclipse/home
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