

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 Registration  09:15     Introduction and Objectives  09:30     What are cosmic rays? Introduction to CRMDs. Workshop theme: Muon absorption in Matter  10:15 Shuffle the Particle Deck  10:45     Standard Model  Noon     Lunch  13:00     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 data  15:45     Reflection of day  16:00 End of Day | **Tuesday June 26**  09:00     Coffee and sign in  09:15     Reflection on previous day  09:30     Upload Data (from overnight)  10:00     Break  10:15     Tour e-Lab I                Performance, Blessing   * Time of flight * Flux * Speed of muon   11:00 Prepare report  12:00     Lunch  13:00     Report out  14:30     Set-up for 2nd Data Run  15:45     Reflection of day  16:00 End of Day |
| **Wednesday June 27**  FermiLab  08:50 Meet at Information Desk, Wilson Hall. Close toed shoes required. Tours of neutrino and muon campuses.  11:30     Lunch  12:30     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 registration  09:15     Reflection on previous two days  09:30     Upload/analyze data  10:00 Discussion of Experiment Design  11:15 Presentation work time  12:00     Lunch  13:00 Guest Speaker Neutrinos (tentative)  14:00     Conclude research;                create poster; Teacher implementation plan  15:00 Setup for last overnight data collection  15:45     Reflection and evaluation  16:30     End of day  **Contacts**   * [**Mark Adams**](mailto:adams@fnal.gov), QN Staff (cosmic focus) * [**Nate Unterman**](mailto:nunterman@gmail.com),  Cosmic Fellow/Presenter | **Friday June 29**  09:00    Coffee and registration  09:15     Reflection on previous day  09:30     Upload/analyze data  10:45 Finish poster and power point  12:00     Lunch  13:00 Experiment and Implementation presentations  14:30 Reflections and evaluation  14:45 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 |