

Vanderbilt-QuarkNet Workshop 2021

21-25 June 2021 hosted in the Department of Physics and Astronomy, room SC6322.

Table of Contents

Objectives	2
Links of Interest	2
Mon 21 June - Talks	2
8:30 Administration and News	2
9:00-9:50 Bill Gabella, LHC and Particle Physics	2
9:50-10:00 Break	2
10:00-11:00 Will Johns, CMS and Pixel Detector, Teaching during a Pandemic	2
11:00-12:00 Dale Julson, Particle Physics, SUSY, and Dark Matter	2
12:00-13:30 Lunch	2
13:30-14:30 Collin Dabbieri, Quasars	2
14:30-15:30 Bill Gabella, Gravitational Waves and LIGO and friends	2
Tues 22 June - Speed-of-"Light" with CRMDs	3
9:00 Take Down and Setup CRMD Run	3
9:30 Consider the Med Webster handout	3
10:00 Check Data Run	3
10:30 Create and Use Spreadsheet	3
Break, as convenient	3
11:00 Collect "swapped data"	3
12:00 Lunch	4
13:30 Continue Data Analysis and Discuss Results	4
14:00-15:30 New run(s)	4
Google Colab notebook	4
Weds 23 June - Thurs 24 June Coding Workshop	4
9:00-15:30 Coding Workshop	4
Fri 25 June - Finish Coding, Survey, Cloud Chamber, de-Brief	4
13:30 Implementation plan	4
14:30-15:30 Cloud Chambers Display and Demo working cloud chamber.	5

This will be an in-person meeting, with efforts to have Zoom going for those that may wish to attend that way.

Objectives

Participating teachers will:

- Re-acquaint themselves with the Cosmic Ray Muon Detectors and their use in the classroom.
- Follow the Coding Workshop and think about the ways it can be used in the classroom.
- Re-visit connections and share resources and stories with fellow teachers.

Links of Interest

- [GitHub 2021](#)
-

Mon 21 June - Talks

8:30 Administration and News

- Welcome & introductions

9:00-9:50 Bill Gabella, LHC and Particle Physics

9:50-10:00 Break

10:00-11:00 Will Johns, CMS and Pixel Detector, Teaching during a Pandemic

11:00-12:00 Dale Julson, Particle Physics, SUSY, and Dark Matter

12:00-13:30 Lunch

13:30-14:30 Collin Dabbieri, Quasars

14:30-15:30 Bill Gabella, Gravitational Waves and LIGO and friends

Tues 22 June - Speed-of-"Light" with CRMDs

9:00 Take Down and Setup CRMD Run

- Save data and turn off CRMDs, 9th floor.
- Set up the CRMDs in some standard order 12 gap 34, say.
- Set gap at least 2 m, but a couple of floors is good too.
- Start a data taking run, usual one full hour.

9:30 Consider the Med Webster handout

- Read handout [Measurement of c v2.pdf](#) .
- Also pages 13-17 of [VUHEP_students20140227.pdf](#) .
- Discuss the swapping of the detectors.

10:00 Check Data Run

- If you have enough points, save the run and swap scintillators.
- Run the "hits" (or "hitsBill") program on the file, generate mspeed.csv.
- Re-start the run.
- Move both files (EQUIP and muspeed) via thumb drive or other means to your computer (Google Drive)

10:30 Create and Use Spreadsheet

Break, as convenient

11:00 Collect "swapped data"

- Stop the run and create the muspeed.csv file and move to your computer.
- Generate the spreadsheet for that dataset.
- Calculate the differences in a way to cancel the time offsets and find the speed-of-muons.

12:00 Lunch

13:30 Continue Data Analysis and Discuss Results

14:00-15:30 New run(s)

- Start a run with all the scintillators on top of one another.
- Or to ensure muons from cosmic rays, only stack one of the active scintillators on the other one.
- Take a run and generate muspeed.
- Can the timing offsets be found in the spreadsheet? Does this help with speed determination?

Google Colab notebook

- Try this [Colab notebook](#).
-

Weds 23 June - Thurs 24 June Coding Workshop

9:00-15:30 Coding Workshop

- See document [Vanderbilt QuarkNet Coding Agenda 2-Day](#)
-

Fri 25 June - Finish Coding, Survey, Cloud Chamber, de-Brief

Schedule still under development!

9:00-15:30 Finish Coding, do Surveys, build cloud chambers as time allows

09:30 Multi-floor CRMD readings?

13:30 Implementation plan

- Create an implementation plan.
 - We will make “posters” on the whiteboards. This [sample](#) will guide you as to what you might put in but the design and format are yours.

- Use anything we have done in the workshop so far or something from the [Data Activities Portfolio](#).
- You can work in teams or individually.
- Connecting from home? Add a page to the sample (it is perfectly editable) and use that - or another online format, as long as it does not take too much to get going and you can share it.
- We will work on plans for about 20-30 min, make posters for about 10 min, and then present/describe our work.
- This is not a contract. You do not have to use this plan in your class...but we hope you do!
- You can [use this as a guide](#) for your implementation plan.

14:30-15:30 Cloud Chambers Display and Demo working cloud chamber.

- Follow [this document](#) from QuarkNet on cloud chamber construction.
Thank you to Bill Hunnicutt for the pieces and parts.