





# QuarkNet 2022 - Vanderbilt University

## 20-24 June 2022

In-person meeting, Vanderbilt Physics Stevenson Center SC6322. Will try to run a Zoom for the meeting also, but likely up and down, [here](#). VU **Covid policy** is to mask indoors if within 6 feet---please separate for snacking.

**Monday**, introductions, news, and talks

**Tuesday**, cosmic ray muon detectors, speed-of-"light", showers, muon decay (anyone?)

**Wednesday** , Higgs@10 (with Jeremy Wegner, Ken Cecire)

**Thursday**, CRMD hardware in detail, scintillators, PMTs, DAQ card, GPS

**Friday**, implementation plans, survey, finish other data analysis

# Administration

- Check-ins around the room.
- Sign the attendance sheet.
- Our Admins will/have sent links to set new folks up as “vendors” for Vanderbilt, all legit and for paying the stipends.
- We have **four (five?)** working sets of cosmic ray muon detectors (CRMDs) and have laptops for datataking and control.
- We use the “standard” Java program *Equip* to control the boards/detectors. Though simpler programs are possible.
- Registration and Survey for QuarkNet Central, links on the [must-do-items](#) page. Time for Survey Friday.
- This years and prevous talks and data sets at [GitHub Vanderbilt-QuarkNet Workshops](#)



# Lunch Venues Near Campus

## 21<sup>st</sup> Ave Side (the East side):

- Chipotle Mexican Grill
- Subway Sandwich
- Panera Bread
- San Antonio Taco Co.
- Taco Mama-Hillsboro Village
- Double Dogs
- Shokku Ramen
- Hopdoddy

## West End Side (the West side):

- Jason's Deli
- Jersey Mike's Subs
- Oscar's Taco
- Martin's Bar-B-Que
- Wendy's
- Newk's Eatery
- Bombay Palace
- Taziki's Mediterranean Cafe

And Many More...





# Monday Schedule

## News and Talks

8:30-9:00am Bill Gabella, administration and news

9:00-10:00am Will Johns, Update from CERN (Zoom)

10:00-10:10am Break

10:10-11:10am Vicki Greene, Flow and jet quenching in high-energy heavy ion collisions (Zoom)

11:10-12:10am Bill Gabella, LIGO and Gravitational Waves

12:10-1:30pm Lunch

1:30-2:30pm Kelly Holley-Bockelmann, Black Holes, Gravitational Waves

2:40-3:40pm Sara Frederick, Quasar Spectroscopy with SDSS

Think about the use of the weeks material for use in the classroom, see the Guide to Teacher Implementation Plan Development . We will discuss and brainstorm these Friday.



# Tuesday Schedule

## **Cosmic Ray Muon Detectors (CRMDs), their use**

9:00-10:00am Bill Gabella, Cosmic Rays, Muons, and QuarkNet CRMDs

10:00-10:10am Break

10:10am-12:00pm Discuss experiments from the manual, set them up: some subset of flux on telescope (vertical, east-west, north-south), shower setup, muon decay setup.

12:00-1:15pm Lunch

1:15-2:20pm Data analysis

2:20pm-2:30pm Break

2:30-3:30pm More data analysis, eLab and non-eLab



# Wednesday Schedule

**Higgs@10 --- 10 years since the announcement of the Higgs particle discovery, 4 July 2012**

**Led by Jeremy Wegner.**

**Link: (original, might change) <https://quarknet.org/content/higgs10-workshop>**

9:00-Start Time

12:00-1:15pm Lunch

1:30pm-3:30pm Tentative Finish time

Other links of interest, **Higgs@10...**

[Rice Workshop, 6-10 June 2022](#) and

<https://quarknet.org/content/2022-cosmic-neutrino-data-higgs10-workshop-ksu> .

Last years Google Colab, Vanderbilt Coding agenda [here](#) .



# Thursday Schedule

## Hardware Day, Bill, Nick, Jeremy

9:00am-10:00am Bill Gabella, some details on the hardware, follow the signal...

12:00-1:15pm Lunch

1:30-3:30pm Analyze the PMT signals, compare with muon spectra, Green's photon counting, experiment with ideas

Exerpts from Dan Green's **The Physics of Particle Detectors**, Cambridge University Press, 2000:

Chapter 2 – The photoelectric effect, photomultipliers, scintillators is [here](#).

Appendix J – Statistics introduction, Appendix K – Monte Carlo models are [here](#).





# Friday Schedule

**Last Day, implementation plans, survey, miscellaneous**

9:00-12:00pm Implementation plans, discuss and brainstorm as a group; do the [survey](#) (surveymonkey.com)

12:00-1:30pm Lunch

1:30-3:30pm all other business



# News

## **We miss you, Med!**

Med Webster, long-time professor at Vanderbilt University in Physics and Astronomy passed away this year. We was the second mentor at Vanderbilt, after Bob Panvini.

He will be missed.



# Useful Links for This Workshop

- CRMD User Manual  
<https://github.com/gabella/VandyQuarkNet/tree/master/manuals>
- Vanderbilt QuarkNet “Drupal” group page:  
<http://quarknet.i2u2.org/group/vanderbilt-university-quarknet-center>



# Useful Links

- Vanderbilt QuarkNet Site, GitHub:  
<https://github.com/gabella/VandyQuarkNet>
- Vanderbilt QuarkNet Site, older web pages:  
<http://www.hep.vanderbilt.edu/~gabellwe/qnweb/>
- Vanderbilt QuarkNet “Drupal” group page:  
<http://quarknet.i2u2.org/group/vanderbilt-university-quarknet-center>
- Vanderbilt QuarkNet Workshop 2021 page:  
<https://github.com/gabella/VandyQuarkNet/tree/master/quarknet2021>
- QuarkNet Cosmic Ray eLab Teacher page:  
<http://www.i2u2.org/elab/cosmic/teacher/>
- QuarkNet CMS eLab page:  
<http://www.i2u2.org/elab/cms/home/project.jsp>