2024 Hawaii QuarkNet Center Annual Report

Submitted by mentor Jason Kumar on October 17, 2024.

The UH QuarkNet effort in 2024 centered on a CMS Masterclass held at Punahou School on March 15, 2024. The lead organizer of the Masterclass was Tiffany Coke (Punahou School). The Masterclass was attended by 26 students from two high schools. The morning events for this Masterclass included hands-on activities which introduced the students to the basics of particle physics and the Standard Model. There were also morning presentations by three UH physics professors (Jason Kumar, David Rubin, and Jeremy Sakstein) describing the broad research topics which they work on. The morning events ended with a panel discussion in which the professors answered questions from the students. This was followed by a pizza lunch, in which the students could engage with the professors in small groups. Discussions largely centered around career advice, and discussions of questions like "what is the life of a physicist like?" In addition ot the UH professors, a UH physics graduate student (Katharena Christy) also participated in these events. Following lunch, the students received a tutorial on how to analyze the CMS data, followed by a data analysis session. Finally, the students participated in a videoconference with physicists at Fermilab and with other students from New Zealand to discuss their results. Here is the agenda for the CMS Masterclass day:
https://quarknet.org/content/hawaii-cms-masterclass-punahou-school-march-15-2024

The day after the CMS Masterclass (Mar. 16, 2024), a group of five high school teachers participated in a half-day Teacher's Workshop focused on physics underlying cosmic ray muons and muon detectors. Here is the agenda for the teacher workshop:
https://quarknet.org/content/hawaii-teacher-workshop-march-16-2024

More recently, a new UH faculty member (Peter Lewis) is being onboarded into the UH QuarkNet effort. His research focus is experimental particle physics, and he will take over primary responsibility for interacting with the teachers in operating the CR muon detectors.

Currently, three cosmic ray detectors are fully operational with the Hawaii QuarkNet program (at Punahou School, BYU-Hawaii, and at Windward Community College). A fourth detector is located at the Kamehameha School and in the process of being made fully operational. A fifth detector at Maui High School is not currently operational.

Notes on Hawaii CRDs in 2024:

A noteworthy observation was a flux decrease near 12 May 2024 due to a solar storm. A plot of data for the BYU-Hawaii and Punahou CRDs combined is in file byuhpunahsmay2024.

All CRDs have similar stacked geometry with about 1 m top-bottom separation.

BYU-Hawaii : Michael Weber

(6993 + Hyperterminal) : 239 files with 4 channels in 2024,

216 files with 4 channels in 2023,

data lost June-Sept. 2023 due to power outage

new site & new GPS for detector in Oct 2022

new geometry -- .9 m top-bottom compared to 1.1 m before

testing in Oct 2022, 4-channel data starting 1 Nov 2022

typical 2022 flux was 445/m^2/min -- byuh6993dec2022

flux unstable due to plateau tests in Feb

channel 4 occasionally unstable March->May -- byuh6993janmay2023

typical flux 420/m^2/min July=Sept 2024 -- byuh6993julsep2024ch1

Kamehameha : Benjamin Mountz

(6948 + EQUIP) : 35 files since Aug 2024

39 files mostly channels 2, 3, & 4 in 2019

none Sept 2019 to July 2024

Peter Grach died in Dec. 2021

Benjamin Mountz took over detector since Fall 2022

Maui : Keith Imada

(6231 + ?) : 84 files in 2021, none since April 2021

channels 1 & 4 only, channel 4 often unstable

student Cyrus Salahub restored two channels in 2020-1

new group of students in 2022

John Andrei Balanay, Raiden Ravida, Ano Motulalo

Balanay sent photos of DAQ on 3 Feb. 2022

blue lights on DAQ not blinking

sent notes to Maui students on 4 Feb. 2022

Balanay reports on 4 May 2022 that DAQ is not working

Punahou : Hanno Adams

(6432 + Hyperterminal) : 92 files in 2024 (none since May)

300 files in 2022, 277 in 2023

typical flux 305/m^2/min since 28 Feb. -- punahou6432febmar2022

typical flux 305->287/m^2/min Mar->Jul -- punahou6432marjul2022

typical flux 290->280/m^2/min Aug->Oct -- punahou6432augoct2022

typical flux 280->275/m^2/min Oct->Jan -- punahou6432oct2022jan2023

ch 1 flux 290->260/m^2/min Jun->May -- punahou6432ch12022to2023

ch 4 flux 290->260/m^2/min Jun->May -- punahou6432ch42022to2023

ch 1 flux 259->250/m^2/min Jun->Sep -- punahou6432junsep2023

ch 1 flux 205/m^2/min in May -- punahouaprmay2024

sudden drop in flux to 200/m^2/min and chan 3 singles rate in Feb 2022

data taking with channels 1,2, & 4 since 28 Feb 2022

typical flux 275/m^2/min since 26 Dec. -- punahou6432dec15to31

UH Windward : Jacob Hudson

(6100 + Hyperterminal) : 161 files in 2024

124 files in 2022, 159 in 2023 (none in July-Oct)

typical flux 395/m^2/min in 28 May to 21 Aug 2021 -- wcc6100mayaug2021

typical flux 385/m^2/min in 20 Sep to 11 Dec 2022 -- wcc6100sepdec2022

typical flux 380/m^2/min in July-Aug 2024 -- wcc6100junsep2024

typical flux 355-370/m^2/min in July-Aug 2024 ch 3 -- wcc6100junsep2024ch3

upload problem in March 2022 for data from 5 Dec 2021 to 11 March 2022

data lost for June-Sept. 2023 due to power outage for renovation

files since 2015

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024*
BYU-Hawaii	185	55	132	294	68	275		87	216	239
Kamehameha	73	222	230	39		4	35			
Maui	30	23	132	74	76	78	84			
Punahou	113	237	262	283	208	192	246	300	277	92
Windward	178	205	270	235	167	358	236	124	159	161

*2024 files as of 10/11/2024