JACOB HENRY STEENIS

EDUCATION

University of California, Davis *Davis, CA* *(Expected) June 2026*
PhD in Physics

University of California, Davis *Davis, CA* *June 2023*
Master of Science in Physics

Grinnell College *Grinnell, IA* *May 2021*
Bachelor of Arts in Physics

GRADUATE PROJECTS

FORMOSA Demonstrator June 2023 - Present
CERN, Geneva, Switzerland

- Contributed to the construction and characterization of a dedicated "millicharged particle" detector in the forward region of ATLAS, immediately next to the Large Hadron Collider (LHC)
- Constructed milliQan-like physical DAQ setup to collect and digitize analog output from detector photomultiplier tubes
- Developed DAQ firmware to to trigger on signal-like events while vetoing signatures from muonic and radiation backgrounds produced by the LHC
- Performed offline analysis on the data to produce timing calibrations, understand timing structure of events relative to LHC collisions, trigger rates of background events

MilliQan Detector November 2022 - Present
CERN, Geneva Switzerland

- Assessed the effectiveness of the current process of assigning timestamps to pulses output from another dedicated millicharged particle detector, the precursor to FORMOSA
- Performed physical interventions milliQan detector, including replacing PMT bases, re-cabling the detector, and calibrating the channels to ensure proper gain of signals
- Explored the effectiveness of mu-metal in shielding the channels from the magnetic field produced by the nearby CMS detector
- Helped develop user-interface code to help other collaborator to select useful data runs within the analysis framework

Delayed-Jets LLP Search, CMS Analysis May 2023 - Present
University of California, Davis

- Assessed the need for timing corrections within channels of CMS's electromagnetic calorimeter to allow for a search for jets that are displaced primary vertices (potential long-lived particle candidates)
- Generated a set of spatial and temporal corrections to be applied to the jets in our Run-3 JetMET data samples, ultimately using the corrected data to assess the timing resolution of our study

LANL-mQ Experiment November 2023
Los Alamos National Lab

- Measured preliminary background rates in the Lujan Center at Los Alamos Neutron Science Center (LANSCE) using plastic scintillator bars coupled to Hamamatsu R7725 PMTs

· Generated comparison plots to assess coincident events that contribute to a background of through-going particles exiting the main hall (millicharged particles should similarly be through-going)

Proton Beam X-ray Monitor Project February 2023 - September 2023
Crocker Nuclear Lab, Davis, CA

· Deployed several devices designed to measure x-ray backgrounds and background rates in the proton test hall at Crocker Nuclear Lab
· Calibrated the channels using various sources: Americium, Cesium, and intrinsic LYSO (from the scintillator itself)
· Extracted decay constants for a feature in the post-beam energy spectrum from rate versus time plots

UNDERGRADUATE PROJECT

MicroCHANDLER Prototype anti-Neutrino Detector June 2019 - June 2021
Virginia Tech Center for Neutrino Physics

· Refined cutflow for identifying low-energy from thermal neutron captures ^{6}Li in the low-energy region of data taken at the Triangle Universities Nuclear Laboratory (TUNL)
· Characterized the identification efficiency of neutron captures on ^{6}Li (of MicroCHANDLER's neutron detection sheets) by breaking these events into nine cases based on their location within the detector
· Calibrated and gain-matched PMT channels of MicroCHANDLER prior to its deployment at TUNL
· Analyzed the characteristics of an unknown feature in the energy plots which we hypothesized to be caused by neutron captures on hydrogen within borated polyethylene shielding

TEACHING ASSISTANT EXPERIENCE

PHY 7A - Intro to Energy and Thermodynamics Fall 2021 & Fall 2022

PHY 7B - Intro to Classical Mechanics Winter 2022 & Winter 2023

PHY 7C - Intro to Waves and Quantum Mechanics Spring 2022

OTHER TEACHING EXPERIENCE

PHY 371 - Teaching in an Active-Engagement Physics Discussion/Lab Setting Fall 2023

· Facilitated discussions about teaching methods for incoming physics PhD students
· Created course syllabus and crafted assignments aimed at enriching in-class discussion

PHY 9HA - Honors Intro. Classical Mechanics November 2023

· Substitute lecturer for introductory gravitational content

PHY 245A - (Graduate Level) High-Energy Particle Physics September 2023

· Held review sessions on special relativistic topics in high-energy physics

UNDERGRADUATE TEACHING ASSISTANT EXPERIENCE

PHY 131 - General Physics I Fall 2019

PHY 234 - Indermediate Classical Mechanics Spring & Fall 2020

PUBLICATIONS

1. Jacob Steenis, "Responding to The Great Gatsby: Can the Reading Process Itself Reinforce Racist Assumptions?," *F. Scott Fitzgerald Review*, October 2022.
2. C. Awe, P. Barbeau, A. Haghighat, S. Hedges, T. Johnson, S.Li, J.M. Link, V. Mascolino, J. Runge, **J. Steenis**, T. Subedi, K. Walkup, "Measurement of Proton Quenching in a Plastic Scintillator Detector." Preprint arXiv:2011.11103, *Journal of Instrumentation*, January 2021.

HONORS AND AWARDS

Andrew W. Archibald Prize for Highest Scholarship May 2021
Grinnell College

H. George Apostle Prize in Physics May 2021
Grinnell College Physics Department

Phi Beta Kappa (Member) May 2020
Phi Beta Kappa Society

Neal Klausner Sophomore Book Award April 2019
Phi Beta Kappa Society

RESEARCH TALKS

FORMOSA: looking forward to millicharged particles at the LHC July 2024
Parallel Talk at ICHEP 2024, Prague, Czech Republic

FORMOSA detector for millicharged particles in the LHC forward region August 2023
Plenary Talk at BOOST 2023 Conference, Lawrence Berkeley National Lab

Neutron Captures on ^6Li: MicroCHANDLER at TUNL August 2020
UMich-CERN Summer REU Exit Talk

Neutron Captures in Borated Polyethylene: MicroCHANDLER at TUNL February 2020
Lunch Seminar at Grinnell College Department of Physics

POSTER PRESENTATIONS

Searching for Lightly Charged Matter at the LHC September 2023
UC Davis Undergraduate Research Fair (Recruiting Undergraduates)

Neutron Captures in Borated Polyethylene: MicroCHANDLER at TUNL July 2019
Undergraduate Research Fair, Virginia Tech Center for Neutrino Physics

SERVICE AND LEADERSHIP

Discussion on Inclusivity As Undergraduate Teaching Assistants September 2020 & 2023
Grinnell College, Grinnell, IA

· Facilitated discussions on how to improve inclusivity practices in the classroom

Annual Incoming TA Orientation September 2022 & 2023
University of California, Davis Department of Physics

· Led discussions on experiences as a teaching assistant at UC Davis

High School Student Tutor January 2022 - September 2023
Davis, CA