# 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* Bachelor of Arts in Physics

May 2021

#### 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 throughgoing 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 <sup>6</sup>Li in the low-energy region of data taken at the Triangle Universities Nuclear Laboratory (TUNL)
- · Characterized the identification efficiency of neutron captures on <sup>6</sup>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 April 2019 Neal Klausner Sophomore Book Award Phi Beta Kappa Society

RESEARCH TALKS	
FORMOSA: looking forward to millicharged particles at the LHC Parallel Talk at ICHEP 2024, Prague, Czech Republic	July 2024
FORMOSA detector for millicharged particles in the LHC forward region Plenary Talk at BOOST 2023 Conference, Lawrence Berkeley National Lab	August 2023
Neutron Captures on $^6Li$ : MicroCHANDLER at TUNL $UMich\text{-}CERN\ Summer\ REU\ Exit\ Talk$	August 2020

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