Jacob Peter Kia Ngaha

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Education

PhD - Doctor of Philosophy in Physics

THE UNIVERSITY OF AUCKLAND

Supervised by Professor Howard Carmichael and Associate Professor Scott Parkins, I researched frequency filtering techniques in a quantum optical setting. We developed a theoretical model – the multi-mode array filter – which has an approximately rectangular frequency response, enabling much more precise measurements and calculations of frequency-filtered photon correlaitons.

New Zealand Diplomas in Te Reo Māori (Rumaki) (Levels 5-7)

Te Wānanga o Aotearoa

These diplomas were awarded after three separate years of full immersion learning of Te Reo Māori in the courses: Te Ronakitanga ki te Reo Kairangi (2022), Te Aupikitanga ki te Reo Kairangi (2023), and Te Pīnakitanga ki te Reo Kairangi (2024).

New Zealand Certificates in Te Reo (Rumaki, Reo Rua) (Levels 1-4)

Te Wānanga o Aotearoa

These certificates were awarded after two separate years of introductory Te Reo Māori through the Te Ara Reo Māori courses: He Pī Ka Pao (2020) and He Pī Ka Rere (2021).

MSc - Master of Science in Physics

THE UNIVERSITY OF AUCKLAND

Under the supervision of Professor Howard Carmichael, I applied open quantum systems techniques to study the fluorescence spectrum and photon correlations of a resonantly driven, three-level ladder-type atom. As a research masters program, the results of this project were then presented as a thesis, as part of the degree's requirements.

BSc (Hons) - Bachelor of Science (Honours) in Physics

THE UNIVERSITY OF AUCKLAND

The Honours degree consisted of a mix of course work and a year long research project, supervised by Professor Howard Carmichael. For the project, I explored the effects that spontaneous emssions, quantum dephasing, and thermal photon generation has on the generation of sub-Poissonian light in a maser model.

BSc - Bachelor of Science

THE UNIVERSITY OF AUCKLAND Double major in Physics and Mathematics.

Experience

Post-Doctoral Research Fellow

THE UNIVERISTY OF ALICKLAND

I worked in the Department of Mathematics with Professors Bernd Krauskopf and Neil Broderick as part of the project "Quantum effects in coupled nano-lasers". Given a perturbation into a stable, pulsating laser system, the laser will initially exhibit some response to the perturbation, but will ultimately reset back to the stable oscillations. There will be, however, an induced phase difference relative to the unperturbed oscillations. Modelling the laser as a nonlinear dynamical system, I used numerical continuation techniques to study the phase resetting of the stabel oscillations - or, periodic orbits - in the Yamada model.

Science Outreach Assistant - Science Wānanga

THE UNIVERSITY OF OTAGO

Science Wānanga is the University of Otago's Science outreach program aimed specifically at Māori youth, typically aged between 10 - 16. As part of this program, we stay on a marae (maori community house) with the children for two-three days, teaching and engaging them in different science fields. I specifcally worked with the Physics team, where we run several different workshops/demonstrations showing some properties of light and lasers, and how they can be applied to measurements. In particular, we showcase a cost effective water quality measuring kit, which ties in the concepts of light, absorption, measurement, and a dash of chemistry.

Auckland, New Zealand Sep. 2019 - Sep. 2023

Auckland, New Zealand

2022 - 2024

2020 - 2021

Auckland, New Zealand

Auckland, New Zealand

Feb. 2018 - Mar. 2019

Auckland, New Zealand

Mar. 2017 - Nov. 2017

Auckland, New Zealand

Mar 2014 - Nov 2016

Auckland, New Zealand

May. 2023 - May. 2025

New Zealand

2018 - 2025

Graduate Teaching Assistant

THE UNIVERSITY OF AUCKLAND

Over my various years of postgraduate study in the Department of Physics, I have worked in several teaching assitant roles:

- Marked tests and assignments for a first-year astronomy course: Physics 107 Planets, Stars and Galaxies. (Jul. 2017 Nov. 2017)
- Lab demonstrator for the Stage II and III laboratory students. This involves helping students with the experimental equipment and theory and marking reports and providing feedback. (Feb. 2018 Nov. 2022)
- Tutor for the Physics Tuākana drop in tutorials for Māori and Pasifika students. I would help students from all stages of physics with concepts from their classes, their assignments, as well as test preparation. (*Jul. 2018 Nov. 2022*)
- Student coordinator for the Physics Tuākana program. I would organise tutorial times, assist the main coordinator with administration tasks, and attend monthly Faculty meetings with other departments. Occasionally I would also offer pastoral care to students in need. (July. 2020 Nov. 2022)
- Marker and tutor for postgraduate courses on quantum mechanics and quantum optics: Physics 703 and 760, respectively. (Feb. 2022 Nov. 2022)

Publications_

Two-photon resonance fluorescence in a three-level ladder-type atom	Preprint on arXiv
J. Ngaha, S. Parkins, and H. J. Carmichael	Submitted Mar. 2025
Submitted to Physical Review A	
Multimode array filter of resonance fluorescence	Physical Review A
J. Ngaha, S. Parkins, and H. J. Carmichael	Aug. 2024
Phys. Rev. A 100, 023719 (2024).	
Frequency-Filtered Photon Correlations	ResearchSpace@Auckland
J. Ngaha	Jun. 2023
PhD. Thesis	
Two Photon Resonance Fluorescence in a Ladder System	ResearchSpace@Auckland
J. Ngaha	Feb. 2019
MSc. Thesis	

Select Presentations & Conferences _

NZMS Joint Meeting	Auckland, New Zealand
Phase-Resetting in the Yamada Model of a Q-Switched Laser	Dec. 2024
Presentation	
Nonlinear Photonics (NP)	Quebec City, Canada
Phase-Resetting in the Yamada Model of a <i>Q</i> -Switched Laser	Jul. 2024
Presentation	
CLEO-EQEC	Munich, Germany
Multi-Mode Frequency-Filtered Photon Correlations of a Driven Three-Level Atom	Jun. 2023
Presentation	
Dodd-Walls Centre Symposium	Rotorua, New Zealand
Hunting for Photon Correlations	Jun. 2023
Presentation	
Konference on Optics, Atoms, and Laser Applications (KOALA)	Adelaide, Australia
Frequency-Filtered Photon Correlations	Dec. 2022
Poster	

Skills

Technical Skills Programming Languages Soft Skills

Computational simulations of physical systems, numerical continuation of dynamical systems, open quantum systems, cavity quantum electrodynamics (QED). Fortran, Python, MATLAB, & KE

Committee Memberships

Te Ao Māori Rōpū - Māori Development Group

Auckland, New Zealand

The Te Ao Māori Rōpū is an organising committe for Māori staff, student, and research development in the Dodd Walls Centre. Māori are the indigenous people of Aotearoa / New Zealand, and are severly underrepresented in the sciences. One of the main goals of this rōpū is to help develop processes, and research, to achieve a better representation.

Faculty of Science Research Fellow Society

The University of Auckland

This is a society consisting of research fellows from the Faculty of Science at the University of Auckland. I represent the research fellows from the Department of Mathematics.

Awards_

Scholarships

Oct. 2021 Frederick Douglas Brown Postgraduate Science Research Scholarship

- Sep. 2019 The University of Auckland Doctoral Scholarship
- Feb. 2018 The Dodd-Walls Centre Masters Scholarship

The University of Auckland The University of Auckland Te Whai Ao – The Dodd-Walls Centre

Te Whai Ao – The Dodd-Walls Centre Dec. 2021 - Present

Auckland, New Zealand

Mar. 2024 - May. 2025