DANIEL KAMRATH WEISS

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PERSONAL INFORMATION

Yale Quantum Institute
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CURRENT POSITION

Yale Quantum Institute — New Haven, CT
Postdoctoral Associate — 2022 - Present
Advisors: Steven Girvin and Shruti Puri

RESEARCH INTERESTS

Superconducting circuits, noise/error protected qubits, novel gates for protected qubits, fluxonium, quantum random access memory (QRAM)

EDUCATION

Ph.D., Northwestern University — Evanston, IL
Department of Physics and Astronomy — 2017 - 2022
Thesis: *Control and coherence of next-generation superconducting qubits*
Advisor: Jens Koch

B.A., Wesleyan University — Middletown, CT
Department of Physics — 2013 - 2017
High Honors
Thesis: *Phase transitions of charged particles in a Paul trap*
Advisor: Reinhold Blümel

PROFESSIONAL EXPERIENCE

Northrop Grumman Corporation — Linthicum, MD
College Intern Technical - Superconducting — Summer 2018
Advisor: David Ferguson

PUBLICATIONS

1. Y. Lu, K. Smith, **D. K. Weiss**, X. You, Y. Zhang, S. Ganjam, A. Maiti, J. Garmon, I. Shem, J. Koch, S. Girvin, R. Schoelkopf, "Numerically modeling the Hamiltonian of a microwave-driven superconducting circuit" (in preparation)
2. S. Hazra, W. Dai, **D. K. Weiss**, P. Parakh, M. Devoret, "Mitigating nonlinear resonances by linearly decoupling a qubit from its readout resonator" (in preparation)
3. **D. K. Weiss**, S. Puri and S. M. Girvin, "QRAM architectures using superconducting cavities," PRX Quantum (2024)

4. H. Zhang, C. Ding, **D. K. Weiss**, Z. Huang, Y. Ma, C. Guinn, S. Sussman, S. P. Chitta, D. Chen, A. A. Houck, J. Koch, D. I. Schuster, "Tunable inductive coupler for high fidelity gates between fluxonium qubits," arXiv:2309.05720 (2023) (accepted in PRX Quantum)
5. J. Bryon, **D. K. Weiss**, X. You, S. Sussman, X. Croot, Z. Huang, J. Koch and A. A. Houck, "Time-dependent magnetic flux in devices for circuit quantum electrodynamics," Phys. Rev. Applied 19, 034031 (2023) (Editor's Suggestion)
6. **D. K. Weiss**, H. Zhang, C. Ding, Y. Ma, D. I. Schuster and J. Koch, "Fast high-fidelity gates for galvanically-coupled fluxonium qubits using strong flux modulation," PRX Quantum 3, 040336 (2022)
7. **D. K. Weiss**, W. DeGottardi, J. Koch and D. G. Ferguson, "Variational tight-binding method for simulating large superconducting circuits," Phys. Rev. Research 3, 033244 (2021)
8. H. Zhang, S. Chakram, T. Roy, N. Earnest, Y. Lu, Z. Huang, **D. K. Weiss**, J. Koch and D. I. Schuster, "Universal fast-flux control of a coherent, low-frequency qubit," Phys. Rev. X 11, 011010 (2021)
9. **D. K. Weiss**, Andy C. Y. Li, D. G. Ferguson and J. Koch, "Spectrum and coherence properties of the current-mirror qubit," Phys. Rev. B 100, 224507 (2019) (Editor's Suggestion)
10. Y.S. Nam, **D. K. Weiss** and R. Blümel, "Explicit, analytical radio-frequency heating formulas for spherically symmetric nonneutral plasmas in a Paul trap," Phys. Lett. A 381, 3441 (2017)
11. **D. K. Weiss**, Y.S. Nam and R. Blümel, "Lifetimes of metastable ion clouds in a Paul trap: power-law scaling," Phys. Rev. A 93, 043424 (2016)

HONORS, PRIZES AND FELLOWSHIPS

Quantum Computing Graduate Research Fellowship, funded by the Army Research Office, 2019-2022

Bertman Prize, Wesleyan University, 2017
Awarded to a senior majoring in physics who displays a particularly resourceful and creative approach to physics research

Phi Beta Kappa, Wesleyan University, early election, Fall 2016

Karl van Dyke Prize, Wesleyan University, 2016
Awarded each year to one or more students majoring in physical science who show outstanding achievement in academic work and a promise of productivity in a professional career

Dean's List, Wesleyan University, 2014-2017

PROFESSIONAL SERVICE

Journal refereeing

- PRX (1)
- PRX Quantum (3)
- Npj Quantum Information (1)

Conference review

- QIP 2024

Session chair

- APS March Meetings 2022, 2023, 2024

RQS student-postdoc council

OPEN-SOURCE SOFTWARE

Author

- **qontrol**: Python package for quantum optimal control leveraging dynamiqs, diffrax and jax
- **floquet**: Python package for exploring nonlinear resonances in quantum systems

Developer

- **dynamiqs**: Added sepropagator, mepropagator, floquet, mcsolve, helped refactor solver internals

Contributor

- QuTiP, ScQubits, Matplotlib

CONTRIBUTED PRESENTATIONS

1. **D. K. Weiss**, S. Puri, S. M. Girvin, "QRAM architectures using superconducting cavities," APS March Meeting 2024
2. **D. K. Weiss**, S. J. de Graaf, S. Xue, R. J. Schoelkopf, S. Puri, S. M. Girvin, "Towards a scalable QRAM architecture based on coupled bosonic modes," APS March Meeting 2023, D67.12
3. **D. K. Weiss**, Helin Zhang, Chunyang Ding, David I. Schuster and Jens Koch, "High-fidelity entangling gates for fluxonium qubits via flux modulation of a tunable coupler," APS March Meeting 2022, T41.05
4. **D. K. Weiss**, Wade DeGottardi, Jens Koch and D. G. Ferguson, "Tight binding as a numerical tool for diagonalizing superconducting-circuit Hamiltonians," APS March Meeting 2021, X30.02
5. **D. K. Weiss**, D. G. Ferguson, M. S. Khalil, Andy C. Y. Li, Jens Koch, "Numerical Methods for Current Mirror Qubit Simulations," APS March Meeting 2019, B29.04
6. **D. K. Weiss**, Y.S. Nam and R. Blümel, "Discovery of an Unexpected Liquid Phase in the Periodically Driven Paul Trap," APS March Meeting 2017, P13.09
7. **D. K. Weiss**, Y.S. Nam and R. Blümel, "Universal critical phenomena of the cloud crystal phase transition in the Paul trap: Powerlaws," APS March Meeting 2016, X50.05

INVITED PRESENTATIONS

1. **D. K. Weiss**, "Quantum Computing in Practice," Sievert Lectures at Northwestern University, February 2023
2. **D. K. Weiss**, J. Bryon, Z. Huang, X. You, Jens Koch, A. A. Houck, "Allocation of time-dependent flux: towards experimental verification," Quantum Computing Program Review (QCPR) July 2021
3. **D. K. Weiss**, Wade DeGottardi, Jens Koch and D. G. Ferguson, "Tight binding as a numerical tool for diagonalizing superconducting-circuit Hamiltonians," QCPR October 2020

TEACHING EXPERIENCE

Yale University
Substitute lecturer: Quantum Information and Computation (2x, Spring 2023), Multivariable Calculus for Engineers (2x, Spring 2023), Quantum Optics (1x, Fall 2023), Introductory Physics (2x, Fall 2024)

Northwestern University
Teaching Assistant: College Physics I (Fall 2018), College Physics II (Winter 2018-2019), College Physics III (Spring 2019)

Wesleyan University
Teching Assistant: Principles of Chemistry (Fall 2014), General Physics II (Spring 2015), Quantum Mechanics

I (Spring 2016), Vectors and Matrices (Fall 2016), General Physics I (Fall 2016), Quantum Mechanics I (Spring 2017)
Tutor: Scientific Computing and Informatics Center (2016-2017)

MENTORING EXPERIENCE

Rumman Rahman, Yale University 2022 - Present
Investigating measurement-free error-correction protocols using superconducting circuits

Pranav Parakh, Yale University 2023 - Present
Analyzing the Dimon superconducting circuit as a possible solution for the "readout problem"

Ben McDonough, Yale University 2022 - 2023
Mentored in the analysis of superconducting circuits, resulting in the completion of a unitaryHACK challenge posted for scqubits

Elijah Hansen, Northwestern University 2021 - 2023
Mentored in superconducting circuit theory and best practices for contributing to scqubits

Athena Zheng and Sydney Wang, Illinois Math and Science Academy 2018 - 2020
Introduced high-school students to quantum algorithms as well as introductory superconducting circuit theory

PRESS

1. **Researchers develop new tool for analyzing large superconducting circuits**
   NorthwesternU September 2021

REFERENCES

Prof. Steven Girvin, Yale University *Email*: steven.girvin@yale.edu

Prof. Shruti Puri, Yale University *Email*: shruti.puri@yale.edu

Prof. Jens Koch, Northwestern University *Email*: jens-koch@northwestern.edu

Prof. David Schuster, University of Chicago *Email*: david.schuster@uchicago.edu

Dr. David Ferguson, Northrop Grumman Corporation *Email*: david.george.ferguson@ngc.com

Prof. Reinhold Blümel, Wesleyan University *Email*: rblumel@wesleyan.edu