ALEC YEN

alecyen@mit.edu ⋄ www.alecyen.com

EDUCATION

Massachusetts Institute of Technology GPA: 5.0/5.0
Ph.D. in Electrical Engineering and Computer Science September 2022 - Present
M.S. in Electrical Engineering and Computer Science September 2020 - August 2022
Thesis: *Interference Purcell Filter for Fast, Modular, and Hardware-Efficient Quantum Measurement*
Advisor: Prof. Kevin O'Brien

University of Tennessee, Knoxville GPA: 4.0/4.0
B.S. in Electrical Engineering, Minor in Computer Science August 2016 - May 2020
Thesis: *A High Slew Rate, Low Power, Compact Operational Amplifier using Recycling Folded Cascode*
Advisor: Prof. Benjamin Blalock
Undergraduate Researcher of the Year, College of Engineering Top Graduate

SKILLS

Languages: Python, Julia, C++, C, MATLAB
Design: Ansys HFSS, SPICE, ADS, Solidworks, Cadence
Packages: QuTiP, Qiskit Metal, gdspy, pyEPR, QuCAT, JosephsonCircuits.jl

RESEARCH EXPERIENCE

Quantum Coherent Electronics Group September 2021 - Present
Research Assistant (Advisor: Prof. Kevin O'Brien) Cambridge, MA

- Developing experimental demonstration of ultrafast, high-fidelity qubit readout using novel quarton coupler; numerical simulations of the full circuit Hamiltonian suggest readout fidelity exceeding 99.8% and leakage below 1e-4 in 10 ns for realistic measurement efficiency of 0.5.
- Investigating long-distance coupling techniques between two qubits.
- Developed and demonstrated readout of a superconducting qubit with 99.0% fidelity in 300 ns using a resonator that emits photons preferentially in one direction across its full bandwidth.
- Developed and demonstrated a superconducting qubit with Purcell-limited lifetime of more than 16 ms using a novel method of destructive interference of the qubit mode in the feedline.
- Led effort to build experimental infrastructure for the MIT Quantum Coherent Electronics group, including design of fridge mounting, printed circuit boards, packages.
- Designed and fabricated our group's first superconducting qubit chips (coherence lifetimes as high as 100 µs) using an on-campus Dolan junction process tailored for TWPAs.

Terahertz Integrated Electronics Group August 2020 - August 2021
Research Assistant (Advisor: Prof. Ruonan Han) Cambridge, MA

- Investigated technologies toward chip-scale molecular clock miniaturization.
- Designed tripler to operate at 557 GHz in 65nm CMOS.
- Designed and fabricated micromachined terahertz waveguide on silicon in cleanroom.

Integrated Circuits and Systems Laboratory August 2019 - July 2020
Research Assistant (Advisor: Prof. Benjamin Blalock) Knoxville, TN

- Designed a novel op-amp topology based on the recycling folded cascode and super class-AB.
- Simulated performance achieved highest figure of merit of state of the art for applications requiring high bandwidth, high load capacitance, and low power consumption.
- Implemented compensation scheme to ensure good stability performance.

Garmin International May 2019 - August 2019
Hardware Design Intern (Aviation and Avionics Group) Olathe, KS

- Designed adjustable constant current board with 90-95% efficiency for load testing.
- Characterized & modified datalink Bluetooth antennas to meet design requirements.

TENNLab Research Center October 2018 - May 2019
Research Assistant (Advisor: Prof. Mark Dean) Knoxville, TN

- Designed and built the fully neuromorphic two-wheeled, self-balancing robot.
- Developed physics model and performed analysis to facilitate training of neural networks.

Oak Ridge National Laboratory June 2018 - August 2018
Research Intern (Advisor: Prof. Hector Santos-Villalobos) Oak Ridge, TN

- Designed and implemented vehicle security portal face recognition system.
- Led the efforts of integration of modules of triggering mechanism, camera calibration, image registration, high dynamic range merging, face detection/recognition.

CURENT Engineering Research Center August 2017 - May 2018
Research Assistant (Advisor: Prof. Kevin Tomsovic) Knoxville, TN

- Independently created new numerical algorithm to optimize compressed sparse matrix operations by exploiting power system equation characteristics.
- Developed numerical solution for differential alg. eq. framework for power system simulations.

PUBLICATIONS

Y. Ye, J. Kline, **A. Yen**, G. Cunningham, M. Tan, A. Zang, M. Gingras, B.M. Niedzielski, H. Stickler, K. Serniak, M.E. Schwartz, K.P. O'Brien, "Near-ultrastrong nonlinear light-matter coupling in superconducting circuits," *Nature Communications*, vol. 16, no. 1, p. 3799, Apr. 2025.

A. Yen, Y. Ye, K. Peng, J. Wang, G. Cunningham, M. Gingras, B.M. Niedzielski, H. Stickler, K. Serniak, M.E. Schwartz, K.P. O'Brien. "Interferometric Purcell suppression of spontaneous emission in a superconducting qubit," *Physical Review Applied*, vol. 23, no. 2, p. 024068, Feb. 2025.

Y. Ye, J. B. Kline, S. Chen, **A. Yen**, and K. P. O'Brien, "Ultrafast superconducting qubit readout with the quarton coupler," *Science Advances*, vol. 10, no. 41, p. eado9094, Oct. 2024.

A. Yen, Y. Ye, K. Peng, J. Wang, G. Cunningham, M. Gingras, B.M. Niedzielski, H. Stickler, K. Serniak, M.E. Schwartz, K.P. O'Brien. "Directional emission of a readout resonator for quantum measurement," *Physical Review Applied*, vol. 22, no. 3, p. 034035, Sep. 2024. *(Editor's Suggestion)*

A. Yen, M. Kim, R. Han, L. Yi, and H. Javadi. "Integrable Timing on Silicon Wafer Supporting CubeSats-based Communications, Navigation and Radio Science," AIAA Accelerating Space Commerce, Exploration, and New Discovery (ASCEND), Las Vegas, USA, 2022.

L. Yi, H. Javadi, W. Zhang, J. Mckelvy, M. Kim, **A. Yen**, and R. Han. "Sub-Terahertz Heterodyne Spectroscopy of Carbonyl Sulfide," 2021 Joint Conference of the European Frequency and Time Forum and IEEE International Frequency Control Symposium (EFTF/IFCS), July 2021, pp. 1-2.

A. Yen and B. J. Blalock, "A High Slew Rate, Low Power, Compact Operational Amplifier Based on the Super-Class AB Recycling Folded Cascode," 2020 IEEE 63rd International Midwest Symposium on Circuits and Systems (MWSCAS), Springfield, MA, USA, 2020, pp. 9-12.

G. Long, M. Ericson, C. Britton, B. Roehrs, E. Farquhar, S. Frank, **A. Yen**, and B. J. Blalock, "A Sub-Threshold Low-Power Integrated Bandpass Filter for Highly-Integrated Spectrum Analyzers," 27th IEEE Int. Conference on Electronics Circuits and Systems (ICECS), Glasgow, Scotland, 2020, pp. 1-4.

D. Cornett, **A. Yen**, G. Noyola, D. Montez, C. R. Johnson, S. T. Baird, H. J. Villalobos, and D. S. Bolme, "Through the Windshield Driver Recognition." *Electronic Imaging*, 2019(13), pp. 140-1.

A. Yen, H. Cui and K. Tomsovic, "CXSparse-Based Differential Algebraic Equation Framework for Power System Simulation," 2018 North American Power Symp. (NAPS), Fargo, ND, 2018, pp. 1-6.

PREPRINTS

G. Cunningham, Y. Ye, K. Peng, **A. Yen**, J. Kedziora, and K. P. O'Brien, "Variable Frequency pulse generation from breathers in Josephson transmission lines," May 06, 2025, arXiv: arXiv:2505.03689. doi: 10.48550/arXiv.2505.03689.

J. Wang*, K. Peng*, J. M. Knecht, G. D. Cunningham, A. E. Lombo, **A. Yen**, D. A. Zaidenberg, M. Gingras, B. M. Niedzielski, H. Stickler, K. Sliwa, K. Serniak, M. E. Schwartz, W. D. Oliver, and K. P. O'Brien, "High-efficiency, low-loss Floquet-mode traveling wave parametric amplifier," Apr. 15, 2025, arXiv: arXiv:2503.11812. doi: 10.48550/arXiv.2503.11812.

PRESENTATIONS

A. Yen, J. Kline, Y. Ye, K.P. O'Brien. "Realizing ultra-fast qubit readout using the quarton coupler." Presentation presented at: 2025 APS Global Physics Summit; 2025 March 16-21; Anaheim, CA.

A. Yen, Y. Ye, K. Peng, J. Wang, G. Cunningham, M. Gingras, B.M. Niedzielski, H. Stickler, K. Serniak, M.E. Schwartz, K.P. O'Brien. "Readout of a Transmon Qubit using an All-Pass Readout Resonator with Interference Purcell Suppression." Presentation presented at: 2024 APS March Meeting; 2024 March 3-8; Minneapolis, MN.

A. Yen, Y. Ye, K. Peng, G. Cunningham, J. Wang, K.P. O'Brien. "Directional readout resonator with interference Purcell filter for scalable and modular qubit readout." Presentation presented at: 2023 APS March Meeting; 2023 March 5-10; Las Vegas, NV.

A. Yen and B. J. Blalock. A High Slew Rate, Low Power, Compact Operational Amplifier Based on the Super-Class AB Recycling Folded Cascode. Presentation presented at: 2020 IEEE 63rd International Midwest Symposium on Circuits and Systems (MWSCAS); 2020 August 10-12; Springfield, MA.

A. Yen. Design of Adjustable High-Efficiency Constant-Current Device for Load Testing. Poster session presented at: Intern Poster Session at Garmin International; 2019 July 25; Olathe, KS.

A. Yen, Y. Mensah, and M. Dean. SABR: Development of a Neuromorphic Balancing Robot. Poster session presented at: Exhibition of Undergraduate Research and Creative Achievement (EURēCA) at University of Tennessee; 2019 April 22; Knoxville, TN.

A. Yen, D. Montez, G. Noyola, D. Cornett, D. Bolme, and H. Santos-Villalobos. Optimizing Facial Recognition through Vehicle Windshields Using High Dynamic Range Imaging. Poster session presented at: 4th Annual Discovery Day at University of Tennessee; 2018 Aug 30; Knoxville, TN.

A. Yen, D. Montez, G. Noyola, D. Cornett, D. Bolme, and H. Santos-Villalobos. Optimizing Facial Recognition through Vehicle Windshields Using High Dynamic Range Imaging. Poster session presented at: 72nd Annual Research Poster Session at Oak Ridge Natl Laboratory; 2018 Aug 9; Oak Ridge, TN.

A. Yen, H. Cui, and K. Tomsovic. CXSparse-Based Differential Algebraic Equation Framework for Power System Simulation. Presentation presented at: 50th Annual North American Power Symposium (NAPS); 2018 September 8-11; Fargo, ND.

FELLOWSHIPS

NSF Graduate Research Fellow (2021 - 2024)

MIT Jacobs Presidential Fellow (2020 - 2021)

HONORS AND AWARDS

Research

UTK Undergraduate Researcher of the Year (2020)

UTK Distinction in Undergraduate Research (2020)

1st Place in Engineering at EURēCA, UTK's premier research showcase (2019)

Gold Award at EURēCA, awarded to top 10 research presentations out of 500+ (2019)

Academic

UTK College of Engineering Top Graduate (2020)

UTK Electrical Engineering Top Graduate (2020)

UTK Chancellor's Citation for Extraordinary Academic Achievement (2020)

UTK EECS Outstanding Electrical Engineering Junior (2019)

UTK EECS Min H Kao Scholar, highest student honor in department (2018)

Service and Teaching

UTK EECS Outstanding Undergraduate TA (2020)

UTK CURENT Education Outreach Outstanding Volunteer (2018)

SERVICE

MIT Graduate Application Assistance Program (GAAP) Mentor (2021-2023)

UTK IEEE Robotics Team (Hardware Team Lead 2018-19, Team Captain 2019-20)

UTK IEEE Student Chapter (Executive Board 2017-19, Student Advisor 2019-20)

UTK Pursuit Undergraduate Research Journal Review Board (Technical Reviewer 2016-20)

UTK Alternative Break Program (Service Trip Participant 2016-17, Service Trip Leader 2017-18)

TEACHING AND LEADERSHIP

Teaching Assistant August 2019 - December 2019
University of Tennessee, Knoxville Knoxville, TN

- Led and instructed weekly lab sections of ECE 201: Circuits I, introductory circuits course.
- Initiated and organized multiple review sessions to aid students.
- Tutored on one-to-one basis three days a week for class of 56 students.
- Awarded Undergraduate Teaching Assistant of the Year by my department for my efforts.

Robotics Team Captain January 2017 - May 2020
University of Tennessee, Knoxville Knoxville, TN

- Led and coordinated yearly effort to build a fully autonomous robot for hardware competition at annual IEEE conference SoutheastCon (5-10 hours a week).
- Led weekly meetings and organize sub-team tasks (software, electrical, mechanical).
- Mentored younger students in electronics/embedded systems fundamentals and PCB design.

IEEE Student Chapter Treasurer August 2017 - May 2019
University of Tennessee, Knoxville Knoxville, TN

- Led effort as treasurer for proposal development and budgeting external funding.
- Raised a total of $15,600 in funding over the course of two years.
- Helped plan and implement IEEE events, such as workshops where students can build a small-scale robot and industry seminars by Texas Instruments and Garmin International.

Service Trip Leader April 2017 - October 2017
Alternative Break Program Birmingham, AL

- Organized and led four-day service trip for students to travel to Birmingham, AL and serve homeless shelters, soup kitchens, supplies closets, and veterans with disabilities.
- Coordinated service sites and housing with multiple institutions.
- Guided daily discussions and reflections on the past day's events, to encourage participants to internalize and understand the impact of their service.