

# ALEC YEN

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## EDUCATION

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### Massachusetts Institute of Technology

GPA: 5.0/5.0

Ph.D. in Electrical Engineering and Computer Science

September 2022 - May 2026 (projected)

M.S. in Electrical Engineering and Computer Science

September 2020 - August 2022

Thesis: *Fast and Scalable Measurement of Superconducting Qubits*

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*

## SKILLS

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*Languages:* Python (primary), Julia, C++, C, MATLAB, Git

*Design:* Ansys HFSS, Qiskit Metal, SPICE, ADS, Solidworks, Cadence

*Skills:* Circuit QED theory and experiment, superconducting circuit design, qubit readout simulation, two-qubit gate simulation, Hamiltonian engineering, noise modeling, time-domain master equation simulation, quantum processor design, qubit control stacks, microwave engineering

## RESEARCH EXPERIENCE

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### Quantum Coherent Electronics Group

September 2021 - Present

*Graduate Research Fellow (Advisor: Prof. Kevin O'Brien)*

Cambridge, MA

*Designing and validating novel circuit QED architectures to engineer fast, high-fidelity, and scalable measurement and suppress environmental noise for fault-tolerant quantum processors.*

- Developing experimental demonstration of fast, low-leakage, and high-fidelity qubit readout using novel arm qubit architecture; performed readout simulations incorporating measurement-induced state transitions and noise modeling (arXiv:2506).
- Simulated arm qubit readout assignment error below  $10^{-4}$  in 27 ns, for steady-state photon number of 3.5 and measurement efficiency of 0.5 (arXiv:2506).
- Invented and demonstrated “directional” readout of a qubit with 99.0% fidelity in 300 ns using a resonator that emits photons preferentially in one direction across its full bandwidth, mitigating the need for off-chip circulators to enable scalable multiplexing (*Phys. Rev. Applied*, 2024).
- Designed and experimentally validated a superconducting qubit with Purcell-limited lifetime of more than 16 ms using destructive interference in the feedline (*Phys. Rev. Applied*, 2025).
- Performed design optimization and sensitivity analysis for superconducting qubit readout using the “quarton coupler” (*Science Advances*, 2024; *Nature Communications*, 2025).
- Engineered a design framework alongside Qiskit Metal to quickly route and simulate chip layouts, reducing design iteration time for multi-qubit devices.
- Implemented an experimental control stack using QICK firmware on an RFSoc to execute complex control and readout pulse sequences in conjunction with flux tuning, used by multiple experiments in the group (*Phys. Rev. Applied*, 2024; *Phys. Rev. Applied*, 2025; *IEEE MTT*, 2025; arXiv:2503).
- Designed, fabricated, and characterized our group’s first superconducting transmon qubits and MIT’s first on-campus fluxonium qubits using a Dolan junction process tailored for TWPAs.
- Mentored masters and undergraduate students on additional projects related to circuit QED.

### Terahertz Integrated Electronics Group

August 2020 - August 2021

*Graduate Research Fellow (Advisor: Prof. Ruonan Han)*

Cambridge, MA

- Investigated technologies toward chip-scale molecular clock miniaturization (*IEEE IFCS*, 2021).
- Designed tripler to operate at 557 GHz in 65nm CMOS.
- Designed and validated micromachined terahertz waveguide on silicon (*AIAA ASCEND*, 2022).

## Integrated Circuits and Systems Laboratory

August 2019 - July 2020

Research Assistant (Advisor: Prof. Benjamin Blalock)

Knoxville, TN

- Designed a high-slew rate, super-class AB operational amplifier in 180nm CMOS.
- Published state-of-the-art design for fast, low-power applications (*IEEE MWSCAS*, 2020).

## Previous Experience

August 2017 - August 2019

Garmin International, Oak Ridge National Laboratory

- Designed adjustable constant current board with 90-95% efficiency for load testing.
- Characterized & modified datalink Bluetooth antennas to meet design requirements.
- Developed high-dynamic-range imaging and face recognition algorithms for a high-performance vehicle security portal face recognition system (*SPIE Electronic Imaging*, 2019).
- Developed a numerical algorithm to optimize compressed sparse matrix operations for power system simulations (*IEEE NAPS*, 2018).

## SELECTED PUBLICATIONS & PRESENTATIONS

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**A. Yen**, “Fast and scalable measurement of superconducting qubits,” **Invited Seminar**, IBM Quantum (T.J. Watson Research Center), Yorktown Heights, NY, June 2024.

**A. Yen**, *et al.* “[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**, *et al.* “[Interferometric Purcell suppression of spontaneous emission in a superconducting qubit](#),” *Physical Review Applied*, vol. 23, no. 2, p. 024068, Feb. 2025.

J. B. Kline, **A. Yen**, S. Chen, and K. P. O’Brien, “[The arm qubit: a superconducting qubit co-designed for coherence and coupling](#),” Jun. 05, 2025, arXiv: arXiv:2506.05315. (Under Review)

Y. Ye, J. B. Kline, **A. Yen**, *et al.*, “[Near-ultrastrong nonlinear light-matter coupling in superconducting circuits](#),” *Nature Communications*, vol. 16, no. 1, p. 3799, Apr. 2025.

Y. Ye, ... **A. Yen**, *et al.*, “[Ultrafast superconducting qubit readout with the quarton coupler](#),” *Science Advances*, vol. 10, no. 41, p. eado9094, Oct. 2024.

J. Kedziora, E.Q. Bui, **A. Yen**, *et al.*, “[Reflectionless filter for superconducting quantum circuits](#),” *IEEE Transactions on Microwave Theory and Techniques*, pp. 1–11, Oct. 2025.

J. Wang\*, K. Peng\*, ... **A. Yen**, *et al.*, “[High-efficiency, low-loss Floquet-mode traveling wave parametric amplifier](#),” Apr. 15, 2025, arXiv: arXiv:2503.11812. (Under Review)

G. Cunningham, ... **A. Yen**, *et al.*, “[Variable frequency pulse generation from breathers in Josephson transmission lines](#),” *IEEE Transactions on Applied Superconductivity*, vol. 35, no. 7, Oct. 2025.

## SELECTED HONORS & FELLOWSHIPS

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Best Poster Award, MIT Quantum Science and Engineering Consortium Annual Conference (2024)

NSF Graduate Research Fellow (2021-2025)

MIT Jacobs Presidential Fellow (2020-2021)

UTK Undergraduate Researcher of the Year & Top Graduate (2020)

## SERVICE

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MIT Graduate Application Assistance Program Mentor (2021-2023)

UTK IEEE Robotics Team (Hardware Team Lead 2018-2019, Team Captain 2019-2020)