

Yuyi Shen

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RESEARCH SUMMARY

Investigated RFIC design integrating physical layer-security measures into reconfigurable power amplifiers and the design of RF amplifiers for extreme cryogenic environments.

EDUCATION

Carnegie Mellon University Pittsburgh, PA
Doctor of Philosophy, Electrical and Computer Engineering Aug 2024
Thesis title: Self-Healing Power Amplifiers for Wireless Security and Extreme Environments
Master of Science, Electrical and Computer Engineering May 2024
GPA: 3.857/4.00
Bachelor of Science, Electrical and Computer Engineering May 2020
GPA: 3.95/4.00

TECHNICAL SKILLS

EDA Software: Keysight ADS, Virtuoso Studio, KiCad, Sonnet Lite, HFSS, SPICE

Programming languages: Matlab, Python

Measurement equipment: Vector network analyzers, spectrum analyzers

RELEVANT COURSEWORK

RF IC Design and Implementation | Advanced Digital Integrated Circuit Design | Wireless Communications | Advanced Analog Integrated Circuits Design | Digital Signal Processing

WORK EXPERIENCE

EECS Lab, Carnegie Mellon University Pittsburgh, PA
Graduate Research Assistant Fall 2020 – May 2024

- Taped out class-E amplifier integrating combinatorial randomness in 65nm technology in support of RF transmitter identification study.
- Taped out and tested re-configurable PA for cryogenic application in 65nm technology down to 4.2K.
- Investigated large-scale linear PA configurability for enhanced PHY-layer authentication.

Carnegie Mellon University Pittsburgh, PA
Teaching Assistant | RFIC Design and Implementation Fall 2021

- Teaching assistant (TA) for RFIC class composed of 11 students.
- Conducted design reviews with students, set up and graded design projects, held office hours.

Teaching Assistant | Microelectronic Circuits Fall 2020

- Teaching assistant (TA) for Microelectronic Circuits class comprised of 28 students.
- Worked with two other TAs to create homework assignments, review exams, manage lab sections, held weekly office hours.

Apple Inc. Fremont, CA
Custom Circuit Design Intern Summer 2020

- Worked remotely in Digital Circuits Group to evaluate different sense amp types for improving PPA.
- Designed StrongARM, double-tail-style comparators with random offset compensation.

PMANS Lab, Carnegie Mellon University Pittsburgh, PA
Undergraduate Research Assistant Fall 2017 – Spring 2020

- Investigated the applications of a lateral overtone bulk acoustic resonator (LOBAR) phase modulator for electronic frequency comb generation.
- Characterized a variety of MEMS resonators across temperature corners (room temperature, cryo, high temperatures) with RF probe stations.
- Designed and prototyped buffered VHF oscillator circuit for demonstrating MEMS resonators.
- Assisted with layout, fabrication, and troubleshooting of 70 H-bridge PCB for driving electro-permanent magnets.

OTHER EXPERIENCE

Ph.D Thesis Revisions, EECS Lab, Carnegie Mellon University	May 2024 – Aug 2024
<ul style="list-style-type: none">Collected additional data on re-configurable CMOS PA for cryogenic application to reinforce thesis conclusions	
EECS Lab, Carnegie Mellon University	Pittsburgh, PA
<i>Visiting Scholar</i>	Aug 2024 – Nov 2024
<ul style="list-style-type: none">Refined measurement data on re-configurable current-steering PA at 4.2 K for publication	
Gap Year	Nov 2024 – Present
<ul style="list-style-type: none">Extended solo travel through Canada, UK, AustraliaWrote up and published experimental results for re-configurable current-steering PA at cryogenic temperatures	

PUBLICATIONS

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- Y. Shen, E. Chen and V. Chen, "A Current-Steering 6-GHz Power Amplifier With Extensive Reconfigurability for Cryogenic Operation in 65 nm CMOS," in *IEEE Open Journal of the Solid-State Circuits Society*, vol. 5, pp. 497-510, 2025, doi: 10.1109/OJSSCS.2025.3631573.
- J. Xu, J. Kan, Y. Shen, E. Chen and V. Chen, "A 0.45-mm² 3.49-TOPS/W Cryogenic Deep Reinforcement Learning Module for End-to-End Integrated Circuits Control," in *IEEE Open Journal of the Solid-State Circuits Society*, vol. 5, pp. 240-250, 2025, doi: 10.1109/OJSSCS.2025.3601153.
- E. Chen et al., "Dynamic Partial Reconfiguration of FPGAs for Energy-Efficient Machine Learning Inference in IoT Systems," 2025 26th International Symposium on Quality Electronic Design (ISQED), San Francisco, CA, USA, 2025, pp. 1-5, doi: 10.1109/ISQED65160.2025.11014371.
- J. Xu, Y. Shen, J. Deng, E. Chen and V. Chen, "A Reinforcement-Learning-Assisted Power Amplifier for RF Fingerprint Generation in 65 nm CMOS," in *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 71, no. 7, pp. 3050-3063, July 2024, doi: 10.1109/TCSI.2024.3390694.
- J. Wang et al., "Wireless Actuation for Soft Electronics-free Robots," in *Proceedings of the 29th Annual International Conference on Mobile Computing and Networking*, New York, NY, USA: Association for Computing Machinery, 2023.
- J. Xu, Y. Shen, J. Yi, E. Chen and V. Chen, "Deep Reinforcement Learning on FPGA for Self-Healing Cryogenic Power Amplifier Control," in *IEEE Open Journal of Circuits and Systems*, vol. 4, pp. 176-187, 2023, doi: 10.1109/OJCAS.2023.3282929.
- V. Chen, J. Xu, Y. Shen and E. Chen, "RF Fingerprint Classification With Combinatorial-Randomness-Based Power Amplifiers and Convolutional Neural Networks: Secure analog/RF electronics and electromagnetics," in *IEEE Solid-State Circuits Magazine*, vol. 14, no. 4, pp. 28-36, Fall 2022, doi: 10.1109/MSSC.2022.3200302.
- J. Kan, Y. Shen, J. Xu, E. Chen, J. Zhu and V. Chen, "RF Analog Hardware Trojan Detection Through Electromagnetic Side-Channel," in *IEEE Open Journal of Circuits and Systems*, vol. 3, pp. 237-251, 2022, doi: 10.1109/OJCAS.2022.3210163.
- Y. Shen, J. Xu, J. Yi, E. Chen and V. Chen, "Class-E Power Amplifiers Incorporating Fingerprint Augmentation With Combinatorial Security Primitives for Machine-Learning-Based Authentication in 65 nm CMOS," in *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 69, no. 5, pp. 1896-1909, May 2022, doi: 10.1109/TCSI.2022.3141336.
- J. Xu, Y. Shen, E. Chen and V. Chen, "Bayesian Neural Networks for Identification and Classification of Radio Frequency Transmitters Using Power Amplifiers' Nonlinearity Signatures," in *IEEE Open Journal of Circuits and Systems*, vol. 2, pp. 457-471, 2021, doi: 10.1109/OJCAS.2021.3089499.
- A. Kochhar, A. Mahmoud, Y. Shen, N. Turumella and G. Piazza, "X-Cut Lithium Niobate-Based Shear Horizontal Resonators for Radio Frequency Applications," in *Journal of Microelectromechanical Systems*, vol. 29, no. 6, pp. 1464-1472, Dec. 2020, doi: 10.1109/JMEMS.2020.3026167.

HONORS

Nicholas Minnici (E '59) Dean's Graduate Fellowship Carnegie Mellon University	2023 – 2024
Ben Cook Graduate Fellowship Carnegie Mellon University	2021 – 2022
Analog Devices Outstanding Student Designer Award Carnegie Mellon University	2021
Carnegie Institute of Technology Dean's Fellow Carnegie Mellon University	2020
Dean's List Carnegie Mellon University	Fall 2016 – Spring 2020