

Ankur Agrawal

QUANTUM COMPUTING AND NETWORKING

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Summary

I am a Quantum Engineer at Quantum Circuits Inc. (QCI) working in the qubit calibration and deployment team. Full stack engineer with 8+ years of experience in superconducting qubit design, gates characterization, quantum measurements, microwave engineering, and data analysis.

Work Experience

Quantum Circuits, Inc.

New Haven, USA

QUANTUM ENGINEER, SYSTEMS DEPLOYMENT AND GATES GROUP

Oct. 2024 - Present

- Developing a scalable, graph-based calibration framework to optimize and monitor subsystem parameters for high-fidelity single- and two-qubit gate tuning and benchmarking
- Designing and benchmarking a mid-circuit erasure detection (MCED) protocol in a dual-rail architecture for surface code demonstrations
- Collaborated with design and simulation teams to identify and suppress spurious modes in parametrically driven couplers, doubling gate speed performance
- Partnered with software and controls teams to define a scalable control system roadmap enabling quantum error correction for fault-tolerant quantum computing

Center for Quantum Networking, Amazon Web Services (AWS)

Boston, USA

QUANTUM RESEARCH SCIENTIST, TEST AND MEASUREMENT TEAM

Sept. 2022 - Oct 2024

- Integrated hardware and device drivers to realize spin-photon entangling gates with time-bin qubits in diamond quantum memory, deployed in a new lab environment
- Developed standardized protocols and a characterization pipeline in collaboration with fabrication and cryogenic teams to evaluate materials grown under varied conditions
- Increased material characterization throughput by $20\times$ using a confocal implantation detection routine, accelerating project delivery by two months
- Reduced microwave PCB insertion loss by $10\times$ through EM simulations and optimized cryogenic cable assembly, minimizing heat load on the dilution refrigerator base plate

Research Experience

Graduate Research Assistant with Prof. David Schuster and Dr. Aaron Chou

Chicago, USA

PHYSICS DEPARTMENT, THE UNIVERSITY OF CHICAGO

June 2017 - Sept 2022

- Accelerated dark photon searches by $2.78\times$ using a microwave cavity coupled to a transmon qubit in the $n = 4$ Fock state with GRAPE-based quantum control
- Developed a superconducting qubit-based single-photon counter with an error rate $1300\times$ below the standard quantum limit, enabling faster dark photon detection
- Designed, fabricated, and characterized Josephson Parametric Amplifiers (JPAs) achieving near-50% quantum efficiency
- Engineered a high-Q dielectric resonator ($Q > 10^6$) for axion detection, realizing a $20\times$ improvement in quality factor over copper cavities and compatibility with 14T magnetic fields
- Benchmarked an RFSOC-based qubit control system (QICK), achieving 99.93% single-qubit gate fidelity via randomized benchmarking

Axion Dark Matter eXperiment (ADMX)

Seattle, USA

CENTER FOR EXPERIMENTAL NUCLEAR PHYSICS AND ASTROPHYSICS (CENPA), UNIVERSITY OF WASHINGTON

June 2017 - Sept 2022

- Performed hot-load measurements (Y-factor method) and investigated the systematic effects of magnetic field and frequency on the noise temperature of cryogenic amplifiers.
- This tool is incorporated into mainline axion experiment for current and future runs, resulted in 4 publications.

Research Internship with Prof. Thomas Peitzmann and Dr. Marco van Leeuwen

Utrecht, The Netherlands

INSTITUTE FOR SUBATOMIC PHYSICS, UTRECHT UNIVERSITY

May 2015 - June 2015

- Studied radiation damage effects on silicon detectors from ionizing particles for future LHC upgrades
- Developed a FLUKA-based computational framework using NIEL hypothesis and ROOT to estimate 1 MeV Neutron Equivalent fluence, identifying high radiation dose layers

Skills

Simulation Tools	Ansys HFSS, Palace, Comsol, MEEP (FDTD), Sonnet, QuTip
Layout Tools	Autodesk Inventor, Gmsh, KLayout, Qiskit Metal
Quantum	Superconducting circuit design and characterization, gates and readout chain optimization, microwave hardware
Programming	Python, Scikit-learn, Git, QUA, Instrument drivers

Education

The University of Chicago

PH.D. IN PHYSICS

Chicago, USA

Sept. 2016 - Sept 2022

- Superconducting Qubit Advantage for Dark Matter (SQUAD)

IIT Bombay

B.TECH. AND M.TECH. IN ENGINEERING PHYSICS

Mumbai, India

July 2011 - Aug. 2016

- Master's Thesis - Study of Radiation Damage and Fabrication of Silicon Particle Detectors

Mentorship and Service

2025	UChicago GRADUCon International panel
2023-	Peer reviewer for physics journals - PRX, PRD, EPJ, APL
2023	Volunteer, Computer Science Education Weekend, Museum of Science Boston
2021-2022	Kester Anyang, Graduate student (Illinois Institute of Technology, Chicago)
2019-2022	Ege Halac, High school student (Chicago)
2021	Judge, Chicago Area Undergraduate Research Symposium
2016-2019	Teaching Assistant for Undergraduate Physics courses Phys 121, 122, 123, 131

Selected Presentations

Fermilab Friday Seminar (Invited)

DARK MATTER SIGNAL ENHANCEMENT WITH A SUPERCONDUCTING QUBIT

Batavia, USA

March 2023

ASC 2022 (Invited)

DARK MATTER SIGNAL ENHANCEMENT WITH A SUPERCONDUCTING QUBIT

Honolulu, USA

Oct 2022

APS March Meeting 2022

DARK MATTER SIGNAL ENHANCEMENT WITH A SUPERCONDUCTING QUBIT

Chicago, USA

March 2022

Selected Publications

Bias-preserving and error-detectable entangling operations in a superconducting dual-rail system

Nitish Mehta, James D. Teoh, Taewan Noh, **Ankur Agrawal**, Richard Chamberlain, Tzu-Chiao Chien, Jacob C. Curtis, Bassel Heiba Elfeky, S. M. Farzaneh, Benjamin Gudlewski, Trevor Keen, Nishaad Khedkar, Cihan Kurter, Richard Li, Gangqiang Liu, Pinlei Lu, Heather McCarrick, Anirudh Narla, Sitakanta Satapathy, Tali Shemma, Ruby A. Shi, Daniel K. Weiss, Jose Aumentado, Chan U Lei, Joseph O. Yuan, Shantanu O. Mundhada, Jr. S. Harvey Moseley, Kevin S. Chou, Robert J. Schoelkopf
2025

Stimulated Emission of Signal Photons from Dark Matter Waves

Agrawal, Ankur, Akash V. Dixit, Tanay Roy, Srivatsan Chakram, Kevin He, Ravi K. Naik, David I. Schuster, Aaron Chou
Phys. Rev. Lett. 132 (14 Apr. 2024)

The QICK (Quantum Instrumentation Control Kit): Readout and control for qubits and detectors

Leandro Stefanazzi, Kenneth Treptow, Neal Wilcer, Chris Stoughton, Collin Bradford, Sho Uemura, Silvia Zorzetti, Salvatore Montella, Gustavo Cancelo, Sara Sussman, Andrew Houck, Shefali Saxena, Horacio Arnaldi, **Agrawal, Ankur**, Helin Zhang, Chunyang Ding, David I. Schuster

Searching for Dark Matter with a Superconducting Qubit

Akash V. Dixit, Srivatsan Chakram, Kevin He, **Agrawal, Ankur**, Ravi K. Naik, David I. Schuster, Aaron Chou
Phys. Rev. Lett. 126 (14 Apr. 2021)

Seamless High- Q Microwave Cavities for Multimode Circuit Quantum Electrodynamics

Srivatsan Chakram, Andrew E. Oriani, Ravi K. Naik, Akash V. Dixit, Kevin He, **Agrawal, Ankur**, Hyeokshin Kwon, David I. Schuster
Phys. Rev. Lett. 127 (10 Aug. 2021)

Niobium coaxial cavities with internal quality factors exceeding 1.5 billion for circuit quantum electrodynamics

Andrew E. Oriani, Fang Zhao, Tanay Roy, Alexander Anferov, Kevin He, **Ankur Agrawal**, Riju Banerjee, Srivatsan Chakram, David I. Schuster
arxiv:2403.00286 (Mar. 2024)