

# Ankur Agrawal

QUANTUM COMPUTING AND NETWORKING

14 Ward St, Somerville, MA - 02143

☎ (+1) 412-726-1874 | ✉ [ankur.agrawal92@gmail.com](mailto:ankur.agrawal92@gmail.com) | 📷 [ankur92](#) | 🌐 [ankur92](#)

## Summary

I am a Quantum Research Scientist at the AWS Center for Quantum Networking working towards a quantum safe internet. Full stack-engineer with 5+ years of experience in superconducting qubit design, characterization, quantum measurements, microwave engineering, and data analysis.

## Work Experience

### Center for Quantum Networking, Amazon Web Services (AWS)

Boston, USA

QUANTUM RESEARCH SCIENTIST, TEST AND MEASUREMENT TEAM

Sept. 2022 - Present

- Built a control stack including device driver repository to control and manipulate the spin and optical properties of a diamond based quantum memory.
- Established uniform protocols and developed a characterization pipeline in collaboration with the fabrication and cryogenic systems team to analyze materials grown under varied conditions.
- Developed a semi-autonomous framework to identify implantation spots in host material and run qubit characterization experiments with minimal intervention.
- Achieved a 10-fold reduction in insertion loss for a microwave signal-carrying PCB by leveraging electromagnetic simulations and optimizing the cable assembly.

## 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

- Performed a dark photon search 2.5 times faster than conventional methods by initializing a microwave cavity with  $n = 4$  Fock state using GRAPE based quantum optimal control methods.
- Developed a single photon counter based on a superconducting qubit with an error rate of  $1300\times$  lower than the standard quantum limit (SQL) to speed up dark photon searches.
- Designed, fabricated and characterized Josephson Parametric Amplifiers (JPA) for quantum limited qubit readout and dark matter axion searches.
- Designed, fabricated and tested a high-Q ( $> 10^6$ ) dielectric cavity compatible with large magnetic field for axion searches.
- Benchmarked an RFSoc based qubit controller system (QICK) to approach coherence limited single qubit gate fidelity of 99.93% using randomized benchmarking sequence.

### Axion Dark Matter eXperiment (ADMX)

Seattle, USA

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

June 2017 - Sept 2022

- Presented hot-load measurements to the scientific committee and investigated the systematic effects of magnetic field and frequency on the noise temperature of a RF chain.
- This tool is incorporated into mainline axion experiment for current and future runs, resulted in 4 publications.

### Master's Thesis with Prof. Raghava Varma

Mumbai, India

PHYSICS DEPARTMENT, IIT BOMBAY

July 2015 - June 2016

- Designed and simulated the device properties of radiation hard silicon pad detector geometries using simulation tool SILVACO.
- Fabricated and characterized the detectors to obtain the desired I-V characteristics for ALICE experiment at CERN.

### 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 the effects of radiation damage on silicon detectors due to various ionizing particles for future LHC upgrades.
- Built a computational framework in FLUKA using Non-Ionizing Energy Loss (NIEL) hypothesis and ROOT to estimate the 1 MeV Neutron Equivalent fluence to identify the high radiation dose layers.

## Skills

**Simulation Tools** Ansys HFSS, Palace, Comsol, MEEP (FDTD), Sonnet, QuTip

**Layout Tools** Autodesk Inventor, Gmsh, KLayout

**Quantum** Superconducting circuit design and characterization, gates and readout chain optimization, microwave hardware

**Programming** Python, Scikit-learn, Collaborative software development with Git, QUA, Instrument drivers

# Education

## The University of Chicago

PH.D. IN PHYSICS

- Superconducting Qubit Advantage for Dark Matter (SQuAD)

Chicago, USA

Sept. 2016 - Sept 2022

## IIT Bombay

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

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

Mumbai, India

July 2011 - Aug. 2016

# Mentorship and Service

2023-	Peer reviewed for 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
2017	Coordinator, Fermilab 50th Community Open House
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

## 16th Patras Workshop 2021

SUPERCONDUCTING QUBIT ADVANTAGE FOR DARK MATTER (SQUAD)

Virtual

June 2021

# Selected Publications

## 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  
Review of Scientific Instruments 93.4 (2022)

## 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)