Nicholas Materise

Current Position (s)

08/2018–Present **Research Assistant**, *Colorado School of Mines*, Golden, CO.
- Modeling and design of parametric tuning elements for superconducting qubits
  - NYU Collaboration
    - Semiconducting physics, RF electromagnetic, and circuit quantization modeling of voltage-tunable, planar capacitive coupling elements
  - Rutgers / Northwestern / SQMS Collaboration
    - Simulation and design of tunable couplers for 3D cavities

08/2018–Present **Indeterminate Status Employee**, *LLNL*, Livermore, CA.
- Multiscale modeling of loss in superconducting circuits

10/2020–Present **Research Associate / Guest Researcher**, *NIST / JILA / ECEE*, Boulder, CO.
- Loss extraction of III-V semicoductors and dielectrics using superconducting 3D cavities
- Characterization of near-quantum limited amplifiers
- Contributor to measurement and fitting software package scresonators
- Superconducting planar resonator measurements for materials loss extraction

Education

08/2018–12/2023 **PhD Applied Physics**, *Colorado School of Mines*, Golden, CO.

09/2016–12/2016 **Distance Learning Program**, *UC Davis Extension School*, Davis, CA.
- Courses Completed: Condensed Matter Physics (graduate)

09/2011–05/2016 **B.S. Electrical Engineering & Physics**, *Northeastern University*, Boston, MA, Minor in Mathematics, *magna cum laude*.

Awards and Honors

01/2020–Present **Sigma Pi Sigma Inductee**, *Colorado School of Mines*.

09/2018–Present **Graduate Fellowships for Science, Technology, Engineering, and Mathematics Diversity**, *Colorado School of Mines*.

03/2014–05/2016 **NSF Cybersecurity Scholarship for Service**, *Northeastern University*.

2016 **IEEE Eta Kappa Nu Inductee**, *Northeastern University*.

Research Experience

06/2016–08/2018 **Computer Scientist**, *LLNL*, Livermore, CA.
- Experimental Focus: developing drivers for superconducting qubit hardware, performing qubit characterization, and 3D cavity measurements
- Theory / Computational Focus: modeling dissipation in superconducting circuits with finite element, integro-differential equations, and circuit quantum electrodynamics approaches

07/2015–12/2016 **Materials Science Co-op**, *LLNL*, Livermore, CA.
Purpose: To simulate theoretical sources of noise in superconducting qubits

03/2014–03/2015 **Research Assistant**, *Northeastern University*, Boston, MA.
Focus: To accelerate the calculation of periodic metamaterial structures using GPUs

07/2013–12/2013 **Quantum Information Co-op**, *Raytheon BBN Technologies*, Cambridge, MA.
Focus: To develop low-latency signal demodulation firmware for superconducting qubit readout

06/2012–12/2012 **Research Experience for Undergraduates**, *Northeastern University*, Boston, MA.
Focus: To develop an efficient adaptive integration routine for parallel architectures.

Publications

Journals

[1] E. T. Holland, Y. J. Rosen, **N. Materise**, N. Woollett, T. Voisin, Y. M. Wang, S. G. Torres, J. Mireles, G. Carosi, and J. L DuBois. High-kinetic inductance additive manufactured superconducting microwave cavity. *Applied Physics Letters*, 111(20):202602, 2017. DOI: https://doi.org/10.1063/1.5000241.

nmaterise.github.io • nmaterise • arXiv • 0000-0002-7353-4770

[2] **N. Materise**, M. Dartiailh, J. Shabani, and E. Kapit. Tunable Capacitor For Superconducting Qubits Using an InAs/InGaAs Heterostructure, 2022. https://arxiv.org/abs/2212.04598, Manuscript submitted to *Quantum Science and Technology*.

[3] S. G. Jones, **N. Materise**, K. W. Leung, B. D. Isakov, X. Chen, J. Zheng, A. Gyenis, B. Jaeck, and C. R. H. McRae. Grain size in low loss superconducting Ta thin films on c-axis sapphire. 2023. https://arxiv.org/abs/2307.11667, Manuscript submitted to *Journal of Applied Physics*.

Conferences

[1] Y. Ukidave, F. N. Paravecino, L. Yu, C. Kalra, Z. Chen, A. Momeni, **N. Materise**, B. Daley, and D. Kaeli. NUPAR: A Benchmark Suite for Modern Heterogeneous Architectures. In *International Conference on Performance Engineering*, 2015. DOI: https://doi.org/10.1145/2668930.2688046.

[2] **N. Materise**. An Introduction to Superconducting Qubits and Circuit Quantum Electrodynamics. In *Proceedings of the 2nd Workshop on Microwave Cavities and Detectors for Axion Research*, 2018. DOI: https://doi.org/10.1007/978-3-319-92726-8_10.

Technical Reports

[1] J. L DuBois, G. Carosi, N. Woollett, E. Holland, M. Horsley, D. Qu, **N. Materise**., O. Drury, G. Chapline, and S. Friedrich. Report to Lincoln Labs on TWPAs, 2017. Lawrence Livermore National Laboratory, DOI: https://doi.org/10.2172/1399728.

Patents

[1] E. Kapit, **N. Materise**, and J. Shabani. Tunable capacitor for superconducting qubits, U.S. Patent Application No. 17/564,789, December 2020.

[2] E. Kapit, S. Chakram, **N. Materise**, and J. Koch. Galvanic Coupling Element for 3D Superconducting Cavities, U.S. Patent Application No. Not Assigned, February 2023.

Conference & Workshop Talks

11/2022–11/2023 **American Vacuum Society International Symposium**.
10/2022 **Superconducting Quantum Materials & Systems Center Meeting**, *Batavia, IL*.
03/2018–03/2023 **American Physics Society March Meeting**.
01/2017 **Microwave Axion Dark Matter Experiment Cavity Workshop**, *Livermore, CA*.
08/2015 **Microwave Axion Dark Matter Experiment Cavity Workshop**, *Livermore, CA*.
09/2012 **Massachusetts Green High Performance Computing Center Workshop**.

Professional Activities

08/2019 **Applied Physics Letters**, *Invited Reviewer*.
12/2022 **Nature Physics**, *Co-Reviewer*.

Outreach & Volunteering

02/2022–11/2022 **Inspiring Girls Expeditions: Girls on Rock**, *Boulder, CO*.
10/2021 **Science Riot Late Night Comedy Talk**, *Denver, CO*.
2021–2023 **National Science Bowl Official**, *Colorado, Illinois Regional Competitions*.
01/2019 **Science Fair Judge**, *Evergreen Country Day Middle School*.
09/2018 **San Joaquin Valley Expanding Your Horizons**, *Pacific University*.
05/2018 **STEM Day**, *Lawrence Livermore National Laboratory*.
08/2017–05/2018 **Girls Who Code**, *East Ave Middle School*.
03/2017 **Science Fair Judge**, *Alameda County Science and Engineering Fair*.