
Current Position

- 01/2024–Present **Staff Scientist, LLNL, Livermore, CA.**
- Design of application specific superconducting quantum circuits
 - Investigating correlated errors in superconducting circuits
 - Calibration of single and two qubit gates for warm-dense matter quantum simulation

Education

- 08/2018–12/2023 **PhD Applied Physics, Colorado School of Mines, Golden, CO.**
- Advised by Dr. Eliot Kapit
 - Thesis title: *Design of tunable couplers and investigation of materials loss mechanisms in 2D and 3D superconducting systems*
- 09/2011–05/2016 **B.S. Electrical Engineering & Physics, Northeastern University, Boston, MA.**
- Minor in Mathematics, *magna cum laude*

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 solvers, 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 using GPUs.

Awards and Honors

- 10/2024 **Postdoc Research SLAM! Finalist, LLNL, Livermore, CA.**
- 10/2023 **NIST NRC Postdoctoral Fellowship Awardee, NIST Boulder.**
- 09/2018–12/2023 **Graduate Fellowships for Science, Technology, Engineering, and Mathematics Diversity, Colorado School of Mines.**
- 03/2014–05/2016 **NSF Cybersecurity Scholarship for Service, Northeastern University.**

Publications

Journals

- [1] L. A. Martinez, N. Du, **N. Materise**, S. O' Kelley, X. Wu, G. Qiu, K. L. Wang, G. P. Carosi, T. Low, and D. Qu. Circulators based on Coupled Quantum Anomalous Hall Insulators and Resonators. DOI: <https://doi.org/10.48550/arXiv.2505.07770>.
- [2] 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>.
- [3] S.G. Jones, **N. Materise**, K.W. Leung, J. C. Weber, 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. *Journal of Applied Physics*, 134(14):144402, 10 2023. DOI: <https://doi.org/10.1063/5.0169391>.
- [4] **N. Materise**, M.C. Dartiailh, W.M. Strickland, J. Shabani, and E. Kapit. Tunable capacitor

for superconducting qubits using an InAs/InGaAs heterostructure. *Quantum Science and Technology*, 8(4):045014, 2023. DOI: <https://dx.doi.org/10.1088/2058-9565/aceb18>.

- [5] C. G. Torres-Castanedo, D. P. Goronzy, T. Pham, A. McFadden, **N. Materise**, P. Masih Das, M. Cheng, D. Lebedev, S. M. Ribet, M. J. Walker, D. A. Garcia-Wetten, C. J. Kopas, J. Marshall, E. Lachman, N. Zhelev, J. A. Sauls, J. Y. Mutus, C. R. H. McRae, V. P. Dravid, M. J. Bedzyk, and M. C. Hersam. Formation and Microwave Losses of Hydrides in Superconducting Niobium Thin Films Resulting from Fluoride Chemical Processing. *Advanced Functional Materials*, 34(36):2401365, 2024. DOI: <https://doi.org/10.1002/adfm.202401365>.
- [6] **N. Materise**, S. Charkam, Y. Lu, J. Koch, and E. Kapit. Field overlap integral method to estimate static and driven interaction rates in superconducting circuits, 2025. Manuscript in preparation.

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

- 09/2024 **Adaptive Quantum Circuits**, Brewster, MA.
- 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, 08/2015 **Microwave Axion Dark Matter Experiment Cavity Workshop**, Livermore, CA.
- 09/2012 **Massachusetts Green High Performance Computing Center Workshop**.

Professional Activities

- 08/2018–Present **Journal Referee**, *Applied Physics Letters*, *Physical Review Applied*, *Nature Physics*, *Physical Review Letters*, *Physical Review A*, *New Journal of Physics*, *PRX Quantum*.
- 2024 **Chair of Hiring Committee**, LLNL, Livermore, CA.

Software and Hardware Skills

- Languages: Python, C, Julia, $\text{\LaTeX}$, OpenCL, CUDA, VHDL, Mathematica, Bash Scripting
- Modeling Software: COMSOL, Ansys HFSS, SolidWorks, AutoDesk Inventor
- Lab Skills: Oscilloscopes, waveform generators, multimeters, soldering, vector network analyzers, spectrum analyzers (scalar), operation of dilution and adiabatic demagnetization refrigerators, manual and automatic wirebonding