Marco Colangelo - CV

Assistant Professor of Electrical and Computer Engineering
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1. EDUCATION

- Ph.D., Electrical Engineering, Advisor: K. K. Berggren, Massachusetts Institute of Technology, Cambridge, June 2023
- M.Sc., Electronic Engineering, Politecnico di Milano, Italy, October 2018
- M.Sc., Nanotechnologies for ICTs, Politecnico di Torino, Italy and Grenoble Institute of Technology, October 2017
- B.Sc., Physics Engineering, Politecnico di Torino, Italy, October 2015

2. RESEARCH INTERESTS

I study nanodevices physics in both classical and quantum regimes. Specifically, my current research topics are:

- Applied superconductivity and microwave engineering: nanoscale devices in the superconducting regime operating at microwave frequency for application in cryogenic signal processing and quantum computing.
- Light-superconductor interface: free-space SNSPD, waveguide-integrated SNSPD, and their application in communication, astronomy, and biomedicine.
- Hybrid integration: Integration of nanoscale devices on photonic, acoustic, and electromechanical platforms.
- Nanofabrication technology: General interest in advancing Nanofabrication Technology

3. PROFESSIONAL EXPERIENCE

- 2025-present, Affiliated Faculty, Department of Physics, Northeastern University
- 2023-present, Assistant Professor, Electrical and Computer Engineering Department, Northeastern University
- 2022-2022, Research Scientist Intern, Amazon Web Services
- 2018-2023, Graduate Research Assistant, Massachusetts Institute of Technology
- 2017-2018, Visiting student and research associate, Massachusetts Institute of Technology

4. AWARDS AND OTHER FORMS OF RECOGNITION

- IEEE CSC Applied Superconductivity Graduate Fellowship, 2021
- MIT Claude E. Shannon Award, 2021
- MIT Jacobs Presidential Fellowship 2018

5. SERVICE

- Editorial board member at Nature npj Nanophotonics from (2023-present) and Nature Scientific Reports (2024-present)
- Technical Program Committee Member - Optica CLEO (2025)
- FONDECYT-Chile Proposal Review Panelist (2023)
- NSF Proposal Review Panelist (2024)
- DOE Proposal Review Panelist (2025)
- Review Editor for Frontiers in Electronic Materials, Superconducting Materials (2023-present)

- Reviewer for Nature Photonics, Optica, IEEE PJ, IOP SUST, IOP QST, AIP APL, AIP RSI, APS PRL, APS PRMaterials, APS PRApplied, APS PRB, PLOSOne.
- Member of IEEE (2018-present), SPIE (2025-present) and Optica (2018-present)
- Vice-Chair of OPTICA Photonic Detection Technical Group
- Serving in the Publicity Commitee for Northeastern University

6. TEACHING

- Spring 2024, 2025 – EECE5606 Northeastern University – Micro and Nanofabrication
- Fall 2023 – EECE7244 Northeastern University – Introduction to Micro-electro-mechanical Systems (MEMS)

8. LIST OF PUBLICATIONS (h-index - 22)

Journal Publications

Since at Northeastern University

1. Venza et al. "Research trends in single-photon detectors based on superconducting wires." APL Photonics 10.4, AIP Publishing, 2025
2. Warner,et al. "Coherent control of a superconducting qubit using light." Nature Physics: 1-8 Nature Publishing Group UK London, 2025
3. McCarthy et al., High-resolution long-distance depth imaging LiDAR with ultra-low timing jitter superconducting nanowire single-photon detectors, Optica 12.2, 168-177, Optica, 2025
4. Saggio et al., Cavity-enhanced single artificial atoms in silicon, Nature Communications, 15, 1, 5296, Nature Publishing Group UK London, 2024
5. Castellani et al., Nanocryotron ripple counter integrated with a superconducting nanowire single-photon detector for megapixel arrays, Physical Review Applied, 22, 2, 24020, American Physical Society, 2024
6. Charaev et al., Single-photon detection using large-scale high-temperature MgB2 sensors at 20 K, Nature Communications, 15, 1, 3973, Nature Publishing Group UK London, 2024
7. Christen et al., Scaled photonic interfaces for quantum networking with tin-vacancy color centers, Bulletin of the American Physical Society, American Physical Society, 2024
8. Colangelo et al., Molybdenum Silicide Superconducting Nanowire Single-Photon Detectors on Lithium Niobate Waveguides, ACS Photonics, 11, 2, 356-361, American Chemical Society, 2024
9. Patel et al., Improvements of readout signal integrity in mid-infrared superconducting nanowire single-photon detectors, Applied Physics Letters, 124, 16, AIP Publishing, 2024
10. Chen et al., A scalable cavity-based spin–photon interface in a photonic integrated circuit, Optica Quantum, 2, 2, 124-132, Optica Publishing Group, 2024
11. De Ponti et al., Localized topological states beyond Fano resonances via counter-propagating wave mode conversion in piezoelectric microelectromechanical devices, Nature Communications, 15, 1, 9617, Nature Publishing Group UK London, 2024
12. Batson et al., Effects of Helium Ion Exposure on the Single-Photon Sensitivity of MgB2 and NbN Detectors, IEEE Transactions on Applied Superconductivity, IEEE, 2024

Before joining Northeastern University

13. Colangelo et al., Impedance-matched differential superconducting nanowire detectors, Physical Review Applied, 19, 4, 44093, American Physical Society, 2023

14. Charaev et al., Single-photon detection using high-temperature superconductors, Nature Nanotechnology, 18, 4, 343-349, Nature Publishing Group UK London, 2023
15. Buzzi et al., A nanocryotron memory and logic family, Applied Physics Letters, 122, 14, AIP Publishing, 2023
16. Batson et al., Reduced ITO for transparent superconducting electronics, Superconductor Science and Technology, 36, 5, 55009, IOP Publishing, 2023
17. Foster et al., A superconducting nanowire binary shift register, Applied Physics Letters, 122, 15, AIP Publishing, 2023
18. Luskin et al., Large active-area superconducting microwire detector array with single-photon sensitivity in the near-infrared, Applied Physics Letters, 122, 24, AIP Publishing, 2023
19. Allmaras et al., Effect of temperature oscillations on kinetic inductance and depairing in thin and narrow superconducting nanowire resonators, Physical Review B, 107, 10, 104520, American Physical Society, 2023
20. Chen et al., Cavity-based Diamond Spin-Photon Interface in Photonic Integrated Circuits, Optica Publishing Group, 2023
21. Colangelo et al., Superconducting Nanowire Technology for Microwave and Photonics Applications, Massachusetts Institute of Technology, 2023
22. Dane et al., Self-heating hotspots in superconducting nanowires cooled by phonon black-body radiation, Nature Communications, 13, 1, 5429, Nature Publishing Group UK London, 2022
23. Shao et al., Electrical control of surface acoustic waves, Nature Electronics, 5, 6, 348-355, Nature Publishing Group UK London, 2022
24. Davis et al., Improved heralded single-photon source with a photon-number-resolving superconducting nanowire detector, Physical Review Applied, 18, 6, 64007, American Physical Society, 2022
25. Chiles et al., New Constraints on Dark Photon Dark Matter with Superconducting Nanowire Detectors in an Optical Haloscope, Physical Review Letters, 128, 23, 231802, American Physical Society, 2022
26. Colangelo et al., Large-area superconducting nanowire single-photon detectors for operation at wavelengths up to 7.4 μm, Nano Letters, 22, 14, 5667-5673, American Chemical Society, 2022
27. Lin et al., Surface plasmon enhanced upconversion fluorescence in short-wave infrared for in vivo imaging of ovarian cancer, Acs Nano, 16, 8, 12930-12940, American Chemical Society, 2022
28. Piatti et al., Reversible Tuning of Superconductivity in Ion-Gated NbN Ultrathin Films by Self-Encapsulation with a High-κ Dielectric Layer, Physical Review Applied, 18, 5, 54023, American Physical Society, 2022
29. Baghdadi et al., Enhancing the performance of superconducting nanowire-based detectors with high-filling factor by using variable thickness, Superconductor Science and Technology, 34, 3, 35010, IOP Publishing, 2021
30. Hallett et al., Superconducting MoN thin films prepared by DC reactive magnetron sputtering for nanowire single-photon detectors, Superconductor Science and Technology, 34, 3, 35012, IOP Publishing, 2021
31. Colangelo et al., Compact and tunable forward coupler based on high-impedance superconducting nanowires, Physical Review Applied, 15, 2, 24064, American Physical Society, 2021
32. Sypkens et al., Development of an Array of Kinetic Inductance Magnetometers (KIMs), IEEE Transactions on Applied Superconductivity, 31, 5, 45661, IEEE, 2021
33. Yi et al., Realization of in-band full-duplex operation at 300 and 4.2 K using bilateral single-sideband frequency conversion, IEEE Journal of Solid-State Circuits, 56, 5, 1387-1397, IEEE, 2021
34. Faramarzi et al., Initial design of a w-band superconducting kinetic inductance qubit, IEEE Transactions on Applied Superconductivity, 31, 5, 45662, IEEE, 2021

35. Verma et al., Single-photon detection in the mid-infrared up to 10 µm wavelength using tungsten silicide superconducting nanowire detectors, APL photonics, 6, 5, AIP Publishing, 2021
36. Santavicca et al., 50 Ω transmission lines with extreme wavelength compression based on superconducting nanowires on high-permittivity substrates, Applied Physics Letters, 119, 25, AIP Publishing, 2021
37. Korzh et al., Demonstration of sub-3 ps temporal resolution with a superconducting nanowire single-photon detector, Nature Photonics, 14, 4, 250-255, Nature Publishing Group UK London, 2020
38. Nguyen et al., Cryogenic memory architecture integrating spin Hall effect based magnetic memory and superconductive cryotron devices, Scientific reports, 10, 1, 248, Nature Publishing Group UK London, 2020
39. Wang et al., Oscilloscopic capture of greater-than-100 GHz, ultra-low power optical waveforms enabled by integrated electrooptic devices, Journal of Lightwave Technology, 38, 1, 166-173, IEEE, 2020
40. Glasby et al., Properties of a nanowire kinetic inductance detector array, Journal of Low Temperature Physics, 199, 631-638, Springer US, 2020
41. Charaev et al., Large-area microwire MoSi single-photon detectors at 1550 nm wavelength, Applied Physics Letters, 116, 24, AIP Publishing, 2020
42. Zhu et al., Resolving photon numbers using a superconducting nanowire with impedance-matching taper, Nano Letters, 20, 5, 3858-3863, American Chemical Society, 2020
43. Holzgrafe et al., Cavity electro-optics in thin-film lithium niobate for efficient microwave-to-optical transduction, Optica, 7, 12, 1714-1720, Optica Publishing Group, 2020
44. Toomey et al., Superconducting nanowire spiking element for neural networks, Nano letters, 20, 11, 8059-8066, American Chemical Society, 2020
45. Santavicca et al., Jitter characterization of a dual-readout SNSPD, IEEE Transactions on Applied Superconductivity, 29, 5, 45661, IEEE, 2019
46. Zhu et al., Superconducting nanowire single-photon detector with integrated impedance-matching taper, Applied Physics Letters, 114, 4, AIP Publishing, 2019
47. Medeiros et al., Measuring thickness in thin NbN films for superconducting devices, Journal of Vacuum Science & Technology A, 37, 4, AIP Publishing, 2019
48. Sinclair et al., Demonstration of microwave multiplexed readout of DC-biased superconducting nanowire detectors, IEEE Transactions on Applied Superconductivity, 29, 5, 45661, IEEE, 2019
49. Toomey et al., Bridging the gap between nanowires and josephson junctions: a superconducting device based on controlled fluxon transfer, Physical review applied, 11, 3, 34006, American Physical Society, 2019
50. Frasca et al., Determining the depairing current in superconducting nanowire single-photon detectors, Physical Review B, 100, 5, 54520, American Physical Society, 2019
51. Hochberg et al., Detecting sub-GeV dark matter with superconducting nanowires, Physical review letters, 123, 15, 151802, American Physical Society, 2019
52. Toomey et al., Investigation of ma-N 2400 series photoresist as an electron-beam resist for superconducting nanoscale devices, Journal of Vacuum Science & Technology B, 37, 5, AIP Publishing, 2019
53. Toomey et al., Influence of tetramethylammonium hydroxide on niobium nitride thin films, Journal of Vacuum Science & Technology B, 36, 6, AIP Publishing, 2018

Conference Publications

1. Gyger et al., Integrating superconducting single-photon detectors into active photonic circuits, Quantum Computing, Communication, and Simulation IV, 12911, 1291102, SPIE, 2024
2. Prabhu et al., Integrated quantum photonics with single color centers in silicon, Silicon Photonics XIX, 12891, 38-40, SPIE, 2024

3. Warner et al., Coherent Optical Driving of a Superconducting Qubit with an Electro-Optic Transducer, CLEO: Applications and Technology, ATh4G. 2, Optica Publishing Group, 2024
4. Wollman et al., Current state of mid-infrared superconducting nanowire single-photon detectors, X-Ray, Optical, and Infrared Detectors for Astronomy XI, PC1310306, SPIE, 2024
5. Shaw et al., Development of Superconducting Nanowire Single Photon Detectors (SNSPDs) for use in the far-infrared, JPL, 2024
6. Christen et al., Integrated quantum memories at 1.3 k with tin-vacancy centers and photonic circuits, CLEO: Science and Innovations, SM1K. 6, Optica Publishing Group, 2023
7. Errando-Herranz et al., Transfer-Printed Single-Photon Detectors on Arbitrary Photonic Substrates, 2023 Conference on Lasers and Electro-Optics (CLEO), 45659, IEEE, 2023
8. Saggio et al., Cavity-Enhanced Single-Photon Emission from Artificial Atoms in Silicon, CLEO: Science and Innovations, SM3P. 1, Optica Publishing Group, 2023
9. Colangelo et al., Large-area SNSPDs for up to 7.4 μm wavelengths, 2022 Conference on Lasers and Electro-Optics (CLEO), 45659, IEEE, 2022
10. Shao et al., Electrical Control of Gigahertz Frequency Phonons on Chip, Quantum 2.0, QTu2A. 14, Optica Publishing Group, 2022
11. Davis et al., Heralding single photons using photon-number-resolving superconducting nanowires, CLEO: QELS_Fundamental Science, FTh5O. 5, Optica Publishing Group, 2022
12. Davis et al., Heralding Single Photons from a Photon Pair Source using a Superconducting Nanowire Detector, Quantum 2.0, QW3B. 3, Optica Publishing Group, 2022
13. Christen et al., Scalable Photonic Integration of Long-Lived Tin-Vacancy Memories at 1.3 K, Quantum 2.0, QM2A. 4, Optica Publishing Group, 2022
14. Holzgrafe et al., On-Chip Optical Filters for Microwave-Optical Quantum Transduction in Thin-Film Lithium Niobate, CLEO: QELS_Fundamental Science, FTu1N. 4, Optica Publishing Group, 2021
15. Colangelo et al., Impedance-matched differential SNSPDs for practical photon counting with sub-10 ps timing jitter, 2021 Conference on Lasers and Electro-Optics (CLEO), 45659, IEEE, 2021
16. Holzgrafe et al., Toward efficient microwave-optical transduction using cavity electro-optics in thin-film lithium niobate, CLEO: QELS_Fundamental Science, FTh4D. 5, Optica Publishing Group, 2020
17. Zhu et al., Photon-Number Resolution using Superconducting Tapered Nanowire Detector, 2020 Conference on Lasers and Electro-Optics (CLEO), 45659, IEEE, 2020
18. Colangelo et al., Superconducting nanowire single-photon detector on thin-film lithium niobate photonic waveguide, CLEO: Science and Innovations, SM4O. 4, Optica Publishing Group, 2020
19. Korzh et al., WSi superconducting nanowire single photon detector with a temporal resolution below 5 ps, CLEO: QELS_Fundamental Science, FW3F. 3, Optica Publishing Group, 2018
20. Xie et al., NbN-gated GaN transistor technology for applications in quantum computing systems, 2021 symposium on VLSI technology, 45659, IEEE, 2021
21. Piatti et al., Control of bulk superconductivity via surface-bound electric fields in ion-gated niobium nitride thin films, Proceedings of the 11th Conference" Solid State Surfaces and Interfaces", 1, 67-69, Comenius University, 2020
22. Wang et al., Oscilloscopic capture of 100 GHz modulated optical waveforms at femtowatt power levels, 2019 Optical Fiber Communications Conference and Exhibition (OFC), 45660, IEEE, 2019
23. Errando-Herranz et al., New dynamic silicon photonic components enabled by MEMS technology, Silicon Photonics XIII, 10537, 96-102, SPIE, 2018
24. Kozorezov et al., Modeling Intrinsic Detection Latency and Timing Jitter in SNSPDs, JPL, 2018
25. Shaw et al., WSi superconducting nanowire single photon detector with a temporal resolution below 5 ps, JPL, 2018

26. Berggren et al., Experimental Methods for Studies of Intrinsic Jitter and Latency in SNSPDs, JPL, 2018
27. Errando-Herranz et al., MEMS tunable silicon photonic grating coupler for post-assembly optimization of fiber-to-chip coupling, 2017 IEEE 30th International Conference on Micro Electro Mechanical Systems (MEMS), 293-296, IEEE, 2017
28. Briano et al., A fast uncooled infrared nanobolometer featuring a hybrid-plasmonic cavity for enhanced optical responsivity, 2017 IEEE 30th International Conference on Micro Electro Mechanical Systems (MEMS), 932-935, IEEE, 2017
29. Boldini et al., Metereosensitive user-controllable skin for dynamic façades, 12th Conference on Advanced Building Skins, 729-738, Advanced Building Skins GmbH, 2017
30. Boldini et al., Exploitation of shape memory materials in sun adaptive user-controllable building façades, ne–xt facades, 72-73, TU Delft, 2017
31. Shaw et al., Single photon detection with a system temporal resolution below 10 ps, JPL, 2017

Patents and patent applications

- Zhu, Di, Marco Colangelo, Boris Korzh, Matthew Shaw, and Karl K. Berggren. "Impedance matched superconducting nanowire photodetector for single-and multi-photon detection." **U.S. Patent 11,522,115**, issued December 6, 2022.
- Mariani, Stefano, Alain Boldini, Andrea Pilla, Matilde Tavanti, and Marco Colangelo. "Dynamic facade system for controlling shading." **U.S. Patent 12,000,204**, issued June 6, 2024.

9. INVITED PRESENTATIONS

- Photon Number Resolving Superconducting Nanowire Single-Photon Detectors - 16th IEEE Workshop On Low-Temperature Electronics (WOLTE16) in Cagliari, Italy 06/03/2024
- Superconducting Nanowire Single-Photon Detectors: Maturity Stage and Current Trends - Optica Webinar - 12/18/2024
- SPIE Defense + Commercial Sensing 2025 (Orlando, FL) - Photonic Integrated SNSPDs: traditional methods and expanded compatibility with arbitrary substrates - 04/16/2025
- SPIE Single-Photon Detection and Quantum Optics 2025 (Prague, CZ) - 04/07/2025

10. LIST OF SUPERVISED STUDENTS AND POSTDOCS, PAST AND PRESENT

Graduate Student

- Francesco Paolo Venza (2024 - Present)
- Kartikey Agarwal (2025 - Present)

Graduate Student - Collaboration

- Tommaso Maggioli

Visiting Master Student

- Federica Marinelli (Incoming Spring 2025)
- Lorenzo Barbati (Incoming Spring 2025)

Co-op students

- Liam Kelly
- Evan Clifford

Undergraduate Students

- Faith Degawa

- Nathan Backer
- Diego Velazquez