Matt Eichenfield

Professor and Gustafson Endowed Chair in Quantum Engineering, University of Colorado Boulder, Department of Electrical, Computer and Energy Engineering
Distinguished Faculty Joint Appointee, Sandia National Labs
Affiliate Scientist, Center for Integrated Nanotechnologies, Los Alamos National Labs
Co-Director, Center for Quantum Networks, NSF Engineering Research Center

Education

Fellowship President Harry S. Truman Fellow, Sandia National Labs, 2011-2014
Postdoc Kavli Institute Prize Postdoctoral Fellow, California Inst. of Technology, 2010-2011
Ph.D. Physics, California Institute of Technology, Demetriades Prize for Best Caltech Thesis, 2010
M.S. Physics, California Institute of Technology, 2007
B.S. Physics, Summa Cum Laude and Valedictorian/Honored Graduate in College of Sciences, University of Nevada, Las Vegas, 2004

Employment

2026-present: Professor and Gustafson Endowed Chair in Quantum Engineering, Department of Electrical, Computer and Energy Engineering, University of Colorado Boulder
2022-Present: Distinguished Faculty Joint Appointee, Sandia National Labs
2022-2025: Professor and SPIE Endowed Chair in Optical Sciences, Wyant College of Optical Sciences, University of Arizona
2014-2022: Distinguished Member of the Technical Staff, Group Leader, and CINT Scientist, Sandia National Laboratories
2011–2014: Harry S. Truman Fellow, Sandia National Laboratories
2009–2011: Kavli Nanoscience Institute Prize Postdoctoral Scholar, California Institute of Technology
2004–2009*:* Graduate Student, California Institute of Technology, Advisor: Oskar Painter
2007–present: United States Patent Agent

Honors and Awards

- DARPA Director's Fellowship Award, 2025
- DARPA Young Faculty Award, 2023
- SPIE Endowed Chair in Optical Sciences, Wyant College of Optical Sciences, University of Arizona, 2022
- Distinguished Member of the Technical Staff, Sandia National Labs, 2020
- Appointment as CINT Affiliate Scientist, Quantum Materials Systems, 2019
- Sandia National Labs Innovation Award for most patents issued lab-wide in 2019
- Sandia National Labs Up-and-Coming Innovator Award, 2014
- President Harry S. Truman Fellow, Sandia National Labs, 2011
- Kavli Nanoscience Institute Prize Postdoctoral Fellow, 2010
- Dimitriades Prize for Best Caltech Thesis, 2009
- Caltech Everhart Lecturer Award for Excellence in Science Communication, 2009
- Distinguished Scholar/Valedictorian, University of Nevada College of Sciences, Las Vegas, 2004
- NASA Space Grant Fellow, 2000

Selected Service from Previous Two Years

- National Virtual Quantum Laboratory Town Hall Speaker and Panelist for 3 NVQL Centers (University of Michigan, MIT, University of New Mexico)
- Impacts of Quantum Technologies on Society, Panel Speaker, 2024, Optica's Frontiers in Optics Conference, 2024, Denver, CO

- Associate Editor, Optica Quantum
- White House OSTP advisory board for economic cooperation between EU and US in quantum technologies
- Center reviewer, NSF QSENSE QLCI, CU Boulder, June 2024
- Lead for Controls and Electronics, Quantum Systems Accelerator, a National Quantum Initiative Science Center (since 2000)
- Optica Quantum 2.0 Conference committee chair on Lasers, Optics, Integrated Photonics, and Interconnects, 2022, 2023, 2024, 2025
- Subcommittee Chair for Quantum Electronic & Photonic Devices, Compound Semiconductor Week Conference, Banff, Canada (May 2025)
- 2025, 2023, and 2021 Organizing Committee and Special Session Chair: Scalable Information Processing with Quantum Nano-Photonics (SIPQNP) Conference
- Co-Chair, Special Session on Quantum Phononics, 189th Annual Meeting of the Acoustical Society of America (Honolulu, 2025)
- Technical Program Committee: Hilton Head MEMS Conference 2022
- Special Session Chair for IEEE International Microwave Workshop Series on Advanced Materials and Processes, 2019, 2020, 2022
- Member of Sandia National Labs' Quantum Photonics Steering Committee
- University of Arizona representative for SouthWest Advanced Prototyping (SWAP) Microelectronics Commons Research Hub

Publications

Manuscripts Currently In Preparation

1. J.T. Mack,…,M. Eichenfield. "Reconfigurable quantum photon-phonon cooperativity in an optomechanical cavity via electron-phonon energy pumping". Two-page abstract based on work accepted to Optica's Conference on Lasers and Electro-Optics, 2025.
2. M. Mishra,…,M. Eichenfield. "Ultra-low-loss piezo-optomechanical devices for deep quantum photonic circuits". Two-page abstract and presentation based on work given at Optica's Conference on Lasers and Electro-Optics, 2025.
3. G. Choi,…,M. Eichenfield. "Nonlinear quantum frequency conversion for quantum networks based on Bragg scattering four-wave mixing". Two-page abstract and presentation based on work given at Optica's Conference on Lasers and Electro-Optics, 2025.
4. A. Zhai,…,M. Eichenfield. "MEMS-enabled quantum socket for the control of all photonic and electronic degrees of freedom of an artificial atom in a high-cooperativity diamond microresonator". Two-page abstract and presentation based on work given at Optica's Conference on Lasers and Electro-Optics, 2025.
5. W. Roberts,…,M. Eichenfield. "Towards parametric amplification via acousto-electric three-wave mixing for quantum-limited phononic readout". Two-page abstract and presentation based on work given at Optica's Conference on Lasers and Electro-Optics, 2025.
6. D. Anderson,…,M. Eichenfield. "PT-symmetric acousto-electric self-oscillating coupled SAW resonators for RF and acousto-optic sensing". Two-page abstract and presentation based on work given at Optica's Conference on Lasers and Electro-Optics, 2025.
7. K. Palm,...,M. Eichenfield, "Hybrid Piezoelectric and Electro-optic Photonic Integrated Circuits". Two-page abstract and presentation based on work given at Optica's Conference on Lasers and Electro-Optics, 2025.
8. J. Boyle,...,M. Eichenfield, M. Dong, "Nonvolatile Optical Memories implemented with Electrically Programmed Capacitive-Piezoelectric Cantilevers". Two-page abstract and presentation based on work given at Optica's Conference on Lasers and Electro-Optics, 2025.

9. N. Leclerc,...,M. Eichenfield, M. Dong, “Miniature magnetometers for magnetic navigation using NV-diamond-on-piezoelectric photonic circuits”. Two-page abstract and presentation based on work given at Optica’s Conference on Lasers and Electro-Optics, 2025.
10. Z. Castillo,...,M. Eichenfield, “Ultra-High-Dynamic Range Vector Magnetometry via Piezo-Optomechanical Magnetostrictive Photonic MEMS.”
11. L. Hackett,...,M. Eichenfield, “Gigahertz frequency optomechanical ultrasound for sub-cellular imaging”.
12. Y. Deng,...,M. Eichenfield, “Towards hybrid superconducting-phononic circuits in an aluminum-scandium nitride on silicon carbide architecture”.
13. A.R. Will-Cole,…,M. Eichenfield, “Ultra-low-loss phononic phase shifter mediated by acoustic driven magnetic resonance”.
14. E. Chatterjee,...,M. Eichenfield, “Quantum Phonon Amplifiers and MASERS in a 2DEG-Piezoelectric Heterostructure”.

Under Review/Accepted

15. A.J. Wendt, ... , M. Eichenfield. “An Electrically Injected and Solid State Surface Acoustic Wave Phonon Laser”. Under review in Nature. Preprint available at arXiv:2505.14385 (2025).
16. C. Ge, ... , M. Eichenfield. “Towards Navigation-Grade and Deployable Optomechanical Accelerometery”. Under review in Nature Photonics. preprint arXiv:2505.11751 (2025).
17. J. Freedman,…,M. Eichenfield. “Gigahertz-Frequency, Acousto-Optic Phase Modulation of Visible Light in a CMOS-Fabricated Photonic Circuit”. Under review in Nature Communications. Preprint available at arXiv:2502.08012 (2025).
18. Z. Castillo,…,M. Eichenfield. “CMOS-fabricated ultraviolet light modulators using low-loss alumina piezo-optomechanical photonic circuits. Under review in Optica. preprint arXiv:2407.00469
19. M. Saha, et al. "Breaking inertial limits for a scalable chip-to-world photonic interface." Under review in Nature. Preprint available at arXiv:2406.17662 (2024).
20. Y. Xue, et al. “All-optical reconfiguration of single silicon-vacancy centers in diamond for non-volatile memories.” Accepted in Nature Communications. No preprint available.
21. Y. Deng,...,M. Eichenfield, “Strongly electromechanically coupled phononic integrated waveguides in scandium nitride on silicon carbide”. Under review in Applied Physics Letters: Materials. Preprint available at arXiv:2503.18113 (2025).
22. T. Vanackere, et al. "Piezoelectrically actuated high-speed spatial light modulator for visible to near-infrared wavelengths." arXiv preprint arXiv:2410.19058. Under review in Nature Communications.
23. Raniwala, H., et al., “A spin-optomechanical quantum interface enabled by an ultrasmall mechanical and optical mode volume cavity”. Under review in Nature Communications. Preprint available arxiv:2202.06999.

2025 Published Papers

24. Cheng, Haotian, et al. "A terahertz-bandwidth non-magnetic isolator." Nature Photonics (2025): 1-7.
25. A.R. Will-Cole,…,M. Eichenfield, “Chiral Microwave Nonreciprocity Demonstrated via Rayleigh and Sezawa Modes Supported in an Al0.58Sc0.42N/4H-SiC Platform”. Physical Review Applied 23 (3), 034058.
26. Greenspon, Andrew S., et al. "Designs for scalable construction of hybrid quantum photonic cavities." APL Quantum 2.2 (2025).
27. J. Chen, et al. "Low-dimensional solid-state single-photon emitters." Nanophotonics 0 (2025).

2024 Published Papers

28. Hackett, L., Koppa, M., Smith, B., Miller, M., Santillan, S., Weatherred, S., ... & Eichenfield, M. “Giant electron-mediated phononic nonlinearity in semiconductor–piezoelectric heterostructures”. *Nature Materials*, 2024.

29. Y.H. Wen, et al. "Strain-concentration for fast, compact photonic modulation and non-volatile memory." Optica 11.11 (2024): 1511-1518.
30. Chatterjee, E., Wendt, A., Soh, D., & Eichenfield, M. (2024). “Ab-Initio Calculations of Nonlinear Susceptibility and Multi-Phonon Mixing Processes in a 2DEG-Piezoelectric Heterostructure”. *Physical Review Research*, 2024.
31. Wen, Y. Henry, et al. "Strain-concentration for fast, compact photonic modulation and non-volatile memory." Optica 11.11 (2024): 1511-1518.
32. Zhou, Yishu, et al. "Electrically interfaced Brillouin-active waveguide for microwave photonic measurements." *Nature Communications* 15.1 (2024): 6796.
33. Zhou, Yishu, et al. "Nonreciprocal Dissipation Engineering via Strong Coupling with a Continuum of Modes." *Physical Review X* 14.2 (2024): 021002.
34. Hackett, L., Du, X., Miller, M., Smith, B., Santillan, S., Montoya, J., ... & Eichenfield, M. (2024). S-band acoustoelectric amplifier in an InGaAs-AlScN-SiC architecture. *Applied Physics Letters*, 124(11).
35. Clark, Genevieve, et al. "Nanoelectromechanical control of spin-photon interfaces in a hybrid quantum system on chip." *Nanoletters*. (2024).

2023 Published Papers

36. Menssen, Adrian J., et al. "Scalable photonic integrated circuits for high-fidelity light control." *Optica* 10.10 (2023): 1366-1372.
37. Hackett, L., Miller, M., Weatherred, S., Arterburn, S., Storey, M. J., Peake, G., ... & Eichenfield, M. (2023). Non-reciprocal acoustoelectric microwave amplifiers with net gain and low noise in continuous operation. *Nature Electronics*, 6(1), 76-85.
38. Hackett, L., Miller, M., Beaucejour, R., Nordquist, CM., Taylor, JC., Santillan, S., Olsson, RH., Eichenfield, M. “Aluminum scandium nitride films for piezoelectric transduction into silicon at gigahertz frequencies.” *Applied Physics Letters*, vol 123, issue 7 (2023).
39. Golter, D. Andrew, et al. "Selective and Scalable Control of Spin Quantum Memories in a Photonic Circuit." *Nano Letters*, vol 23, issue 17 (2023): 7851-7858.
40. Hogle, Craig W., Daniel Dominguez, Mark Dong, Andrew Leenheer, Hayden J. McGuinness, Brandon P. Ruzic, Matthew Eichenfield, and Daniel Stick. "High-fidelity trapped-ion qubit operations with scalable photonic modulators." *npj Quantum Information* vol 9, no. 1 (2023): 74.
41. Zhou, Yishu, et al. "Electrically interfaced Brillouin-active waveguide for multi-domain transduction." arXiv preprint arXiv:2307.07875 (2023).
42. Raniwala, Hamza, Stefan Krastanov, Lisa Hackett, Matt Eichenfield, Dirk R. Englund, and Matthew E. Trusheim. "Piezoelectric Nanocavity Interface for Strong Coupling between a Superconducting Circuit, Phonon, and Spin." *Physical Review Applied* 19, no. 6 (2023): 064051.
43. Dong, Mark, et al. "Synchronous micromechanically resonant programmable photonic circuits." Nature Communications (14) (2023).
44. Palm, Kevin J., et al. "Modular chip-integrated photonic control of artificial atoms in diamond waveguides." *Optica* vol 10 issue 5 (2023): 634-641.
45. Otterstrom, N.T., Storey, M.J., Behunin, R.O., Hackett, L., Rakich, P.T. and Eichenfield, M. “Modulation of Brillouin optomechanical interactions via acoustoelectric phonon-electron coupling”. *Physical Review Applied,* vol 19, issue 1 (2023): 14059
46. Hackett, L., Miller, M., Weatherred, S., Arterburn, S., Storey, M., D., Peake, G., Dominguez, D., Finnegan, P., Friedmann, T.A. and Eichenfield, M. “Low-noise acoustoelectric microwave amplifiers with net gain in continuous operation”. *Nature Electronics* (January 2023)
47. Dong, Mark, et al. "Programmable photonic integrated meshes for modular generation of optical entanglement links." *npj Quantum Information*, vol 9, issue 1 (2023): 42.

2022 and Prior Published Papers

48. Taylor, J. C., Chatterjee, E., Kindel, W. F., Soh, D., & Eichenfield, M. “Reconfigurable quantum phononic circuits via piezo-acoustomechanical interactions”. *npj Quantum Information* (February 2022).
49. Dong, M., Heim, D., Witte, A., Clark, G., Leenheer, A.J., Dominguez, D., Zimmermann, M., Wen, Y.H., Gilbert, G., Englund, D. and Eichenfield, M., 2022. “Piezo-optomechanical cantilever modulators for VLSI visible photonics”. *APL Photonics 7.5 (2022): 051304*.
50. Dong, M., Clark, G., Leenheer, A. J., Zimmermann, M., Dominguez, D., Menssen, A. J., ... & Eichenfield, M. (2021). “High-speed programmable photonic circuits in a cryogenically compatible, visible–near-infrared 200 mm CMOS architecture.” *Nature Photonics* 16(1), 2022.
51. Chatterjee, E., Soh, D.B.S, and Eichenfield, M. "Optimal quantum transfer from input flying qubit to lossy quantum memory." *Journal of Physics A: Mathematical and Theoretical* (2022).
52. Neuman, T*, Eichenfield, M.*, Trusheim, M., Hackett, L., Narang, P., and Englund, D., “A Phononic Bus for Coherent Interfaces Between a Superconducting Quantum Processor, Spin Memory, and Photonic Quantum Networks”, *npj Quantum Information* 7(1), 2021.
53. Hackett, L., Miller, M., Brimigion, F., Dominguez, D., Peake, G., Tauke-Pedretti, A., ... & Eichenfield, M. (2021). Towards single-chip radiofrequency signal processing via acoustoelectric electron–phonon interactions. *Nature communications*, *12*(1), 2021.
54. Storey, M.J., Hackett, L., DiGregorio, S., Miller, M., Peake, G., Eichenfield, M. and Weinstein, D., 2021, June. “Acoustoelectric Surface Acoustic Wave Switch in An Epitaxial Ingaas on Lithium Niobate Heterostructure.” In 2021 21st International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers) (pp. 545-548). IEEE.
55. Soh, D., Chatterjee, E., & Eichenfield, M. High-fidelity State Transfer Between Leaky Quantum Memories. *Physical Review Research* 3(3), 2021.
56. Dominguez, D., Hackett, L., Miller, M., Restrepo, J., Casper, K. and Eichenfield, M., 2021, March. Megahertz bandwidth bulk micromachined optomechanical accelerometer with fiber optical interconnects. In 2021 IEEE International Symposium on Inertial Sensors and Systems (INERTIAL) (pp. 1-4). IEEE.
57. Branch, D.W., Jensen, D.S., Nordquist, C.D., Siddiqui, A., Douglas, J.K., Eichenfield, M. and Friedmann, T.A., 2019. Investigation of a solid-state tuning behavior in lithium niobate. *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, *67*(2), pp.365-373.
58. Hackett, L., Siddiqui, A., Dominguez, D., Douglas, J.K., Tauke-Pedretti, A., Friedmann, T., Peake, G., Arterburn, S. and Eichenfield, M., 2019. High-gain leaky surface acoustic wave amplifier in epitaxial InGaAs on lithium niobate heterostructure. Applied Physics Letters, 114(25), p.253503.
59. Stanfield, P, Leenheer A.J., Michael, C., Simms, R. and Eichenfield, M., “Cryogenically compatible, electro-optomechanically tunable silicon nitride photonic integrated circuits via integrated aluminum nitride piezoelectric actuators.” *Optics Express* 27.20 (2019): 28588-28605.
60. Siddiqui, A., Olsson, R.H., Eichenfield, M., "Lamb wave focusing transducer for efficient coupling to wavelength-scale structures in thin piezoelectric films." *Journal of Microelectromechanical Systems* 99 (2018): 1-17.
61. Moore, J., Martin, L.L., Maayani, S., Kim, K.H., Chandrahalim, H., Eichenfield, M., Martin, I.R. and Carmon, T., 2016. Regular oscillations and random motion of glass microspheres levitated by a single optical beam in air: publisher’s note. *Optics Express*, *24*(4), pp.4349-4349.
62. Olsson III, R.H., Hattar, K., Homeijer, S.J., Wiwi, M., Eichenfield, M., Branch, D.W., Baker, M.S., Nguyen, J., Clark, B., Bauer, T. and Friedmann, T.A., 2014. A high electromechanical coupling coefficient SH0 Lamb wave lithium niobate micromechanical resonator and a method for fabrication. *Sensors and Actuators A: Physical*, *209*, pp.183-190.
63. Eichenfield, M., and R. H. Olsson. "Design, fabrication, and measurement of RF IDTs for efficient coupling to wavelength-scale structures in thin piezoelectric films." In 2013 IEEE International Ultrasonics Symposium (IUS), pp. 753-756. IEEE, 2013.

64. Safavi-Naeini, A.H., Mayer Alegre, T.P., Chan, J., Eichenfield, M., Winger, M., Lin, Q., Hill, J.T., Chang, D.E., and Painter, O. "Electromagnetically induced transparency and slow light with optomechanics." *Nature* 472, no. 7341 (2011): 69.
65. Lin, Q., Rosenberg, J., Chang, D.E., Camacho, R., Eichenfield, M., Vahala, K.J., Painter, O. "Coherent mixing of mechanical excitations in nano-optomechanical structures." Nature Photonics 4, no. 4 (2010): 236.
66. Eichenfield, M., Chan, J., Camacho, R.M., Vahala, K.J., Painter, O. "Optomechanical crystals." *Nature* 462, no. 7269 (2009): 78.
67. Eichenfield, M., Chan,J., Safavi-Naeini, A., Vahala, K.J., Painter, O. "Modeling dispersive coupling and losses of localized optical and mechanical modes in optomechanical crystals." *Optics express* 17, no. 22 (2009): 20078-20098.
68. Camacho, R.M., Chan, J., Eichenfield, M. and Painter, O., 2009. Characterization of radiation pressure and thermal effects in a nanoscale optomechanical cavity. Optics Express, 17(18), pp.15726-15735.
69. Chan, J., Eichenfield, M., Camacho, R. and Painter, O., 2009. Optical and mechanical design of a "zipper" photonic crystal optomechanical cavity. Optics Express, 17(5), pp.3802-3817.
70. Eichenfield, M., Camacho, R.M., Chan, J., Vahala, K.J., Painter, O. "A picogram-and nanometre-scale photonic-crystal optomechanical cavity." *Nature* 459, no. 7246 (2009): 550.
71. Eichenfield, M., Michael, C., Perahia, R. and Painter, O. "Actuation of micro-optomechanical systems via cavity-enhanced optical dipole forces." *Nature Photonics* 1, 7 (2007): 416.
72. Harry, G.M., Abernathy, M.R., Becerra-Toledo, A.E., Armandula, H., Black, E., Dooley, K., Eichenfield, M., Nwabugwu, C., Villar, A., Crooks, D.R.M. and Cagnoli, G., 2006. Titania-doped tantala/silica coatings for gravitational-wave detection. Classical and Quantum Gravity, 24(2), p.405.

Selected Invited Presentations, Colloquia, Seminars, Symposia, Conference Presentations

1. Invited Tutorial Speaker, IEEE International Microwave Symposium, San Francisco, CA, June 2025
2. Invited Speaker, Compound Semiconductor Week, Banff, Alberta, Canada, May 2025
3. Invited Speaker, MRS Spring Meeting, Seattle, WA, April 2025
4. Seminar Speaker, CU Boulder Engineering Seminar Series, April 3, 2025
5. Apple Exploratory Design Group Seminar Series Invited Speaker, April 1, 2025
6. Optica OFC 2025 Invited Speaker and Panelist: Which Phase Tuning Technologies Have the Potential to Supplant Thermal Tuning in Silicon Photonics? April 2, 2025
7. Seminar Speaker, Northrop Grumman Corp., Baltimore, MD, March 11, 2025
8. Invited Speaker at National Virtual Quantum Laboratory Town Hall on Quantum Computing Applications of Photonics, University of New Mexico, February 2025
9. Invited Speaker, SPIE Photonics West/BIOS, Special Session on Application of Quantum Technologies to Biology, San Francisco, CA, January, 2025
10. Colloquium Speaker, Northeastern University's Institute for Nanosystems Innovation, January 2025
11. Invited Speaker at National Virtual Quantum Laboratory Town Hall on Quantum Computing with Neutral Atoms, Massachusetts Institute of Technology, January 2025
12. Invited Speaker at National Virtual Quantum Laboratory Town Hall on Quantum Photonic Integrated Circuits, University of Michigan, January 2025
13. Invited Speaker, Special Session on Quantum Computing Technologies, American Vacuum Society's 70th Annual Meeting, Tampa, FL, November 2024
14. Invited Speaker at Workshop for Quantum Repeaters and Networks, September 2024, Montreux, Switzerland
15. Invited Speaker for National Institutes of Health Quantum Speaker Series, August 2024
16. Stanford Q-FARM Seminar Series Speaker, April 2024
17. NSF Engineering Research Visioning Alliance Speaker and Panelist, March 2024
18. Invited talk at Gordon Research Conference on Mechanical Systems in The Quantum Regime, March 2024

19. Harvard Nanophotonics Colloquium Speaker, December 2023
20. Applied Materials Physics Seminar Series Invited Speaker, December 2023
21. Lockheed Martin RF Engineering Seminar Series Invited Speaker, December 2023
22. University of Illinois Urbana Champaign Micro and Nanotechnology Laboratory Colloquium Speaker, November 2023
23. Invited speaker (RF Photonics) at 2023 IEEE Photonics Conference, Orlando, FL, November 2023
24. Invited speaker (Quantum Memory Devices) at 2023 IEEE Photonics Conference, Orlando, FL, November 2023
25. Invited speaker DARPA Electronics Resurgence Initiative Conference, Seattle, August 2023
26. Keynote, META 2023, Conference on Metamaterials, Photonic Crystals, and Plasmonics, July 2023, Paris, France
27. IEEE Photonics Society Summer Topicals Meeting Series 2023, July 2023, Sicily, Italy
28. IEEE IMS2023, June 2023, San Diego, CA
29. Frontiers of Interacting Systems of Rydberg Atoms II, Institute for Theoretical Atomic and Molecular and Optical Physics, Harvard, June 2023
30. MIT Quantum Electronics Colloquium, June 2023
31. Caltech Applied Physics Colloquium, May 2023
32. *Keynote*, Arizona Quantum Initiative Inaugural Workshop April 2023, Tucson, AZ
33. *Keynote*, IEEE Inertial, March 2023, Kauai, Hawaii
34. UofA Physics Colloquium, March 2023, Tucson, AZ
35. Invited talk 1 at Optical Fiber Communications Conference (OFC), March 2023, San Diego, CA
36. Invited talk 2 at Optical Fiber Communications Conference (OFC), March 2023, San Diego, CA
37. *Keynote*, UA OSC Spring Industrial Affiliates, February 2023, Tucson, AZ
38. SIPQNP, February 2023, Tucson, AZ
39. *Plenary* Photonics West/Quantum West, January 2023, San Francisco, CA
40. Optical Sciences Winter School, January 2023, Tucson, AZ

Selected Conference Proceedings from Past Three Years

1. A.J. Wendt,...,M. Eichenfield, “A Solid-State and Electrically Injected Phonon laser”. Compound Semiconductor Week, Banff, Alberta, Canada, May 2025.
2. W. Roberts,…,M. Eichenfield. “Towards parametric amplification via acousto-electric three-wave mixing”. Compound Semiconductor Week, Banff, Alberta, Canada, May 2025.
3. J.M. Freedman,...,M. Eichenfield, “On-Chip Ultra-Efficient Acousto-Optic Modulation for Qubit Control”. Compound Semiconductor Week, Banff, Alberta, Canada, May 2025.
4. J.T. Mack,…,M. Eichenfield. “Reconfigurable quantum photon-phonon cooperativity in an optomechanical cavity via electron-phonon energy pumping”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.
5. M. Mishra,…,M. Eichenfield. “Ultra-low-loss piezo-optomechanical devices for deep quantum photonic circuits”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.
6. G. Choi,…,M. Eichenfield. “Nonlinear quantum frequency conversion for quantum networks based on Bragg scattering four-wave mixing”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.
7. A. Zhai,…,M. Eichenfield. “MEMS-enabled quantum socket for the control of all photonic and electronic degrees of freedom of an artificial atom in a high-cooperativity diamond microresonator”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.
8. W. Roberts,…,M. Eichenfield. “Towards parametric amplification via acousto-electric three-wave mixing for quantum-limited phononic readout”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.
9. D. Anderson,…,M. Eichenfield. “PT-symmetric acousto-electric self-oscillating coupled SAW resonators for RF and acousto-optic sensing”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.

10. K. Palm,...,M. Eichenfield, “Hybrid Piezoelectric and Electro-optic Photonic Integrated Circuits”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.
11. J. Boyle,...,M. Eichenfield, M. Dong, “Nonvolatile Optical Memories implemented with Electrically Programmed Capacitive-Piezoelectric Cantilevers”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.
12. A.J. Wendt,...,M. Eichenfield, “Phonon lasers for on-chip acousto-optic modulation at microwave frequencies”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.
13. J.M. Freedman,...,M. Eichenfield, “On-Chip Ultra-Efficient Acousto-Optic Modulation for Qubit Control”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025.
14. N. Leclerc,...,M. Eichenfield, M. Dong, “Miniature magnetometers for magnetic navigation using NV-diamond-on-piezoelectric photonic circuits”. Optica’s Conference on Lasers and Electro-Optics, Long Beach, CA, May 2025
15. E. Chatterjee, et al., “Acoustic Amplification by Stimulated Emission of Radiation Using a Piezoelectric-2DEG Heterostructure Pumped by a Drift Field”. APS Global Physics Summit 2025, Anaheim, CA.
16. Will-Cole, A.R., et al., (2025), “Ultra-low-loss magnetically tunable phononic phase shifter”. 2025 Conference on Magnetism and Magnetic Materials. New Orleans, LA, 2025.
17. B.P. Smith, Z. Castillo, et al., (2025), “Ultra-high dynamic range piezo-optomechanical magnetometer”. 2025 Conference on Magnetism and Magnetic Materials. New Orleans, LA, 2025.
18. Ge, C., et al., (2024). “A High Bias-Stability Optomechanical Accelerometer”. Optica Frontiers in Optics.
19. Wen, H., et al., (2024). “Stress Programmable Out-of-plane Interposers for 3-D Photonic Integration & Control”. Optica Frontiers in Optics.
20. Wen, H., et al., (2024). “Design rules for high refresh rate using piezo-MEMS multi-waveguide beamscanners”. Optica Frontiers in Optics.
21. Golter, A., et al., (2024). “Optical, Microwave, and Acoustic Control of Spin Qubit Arrays in a Scalable Integrated Nanophotonics Platform”. Optica Frontiers in Optics.
22. Otterstrom, N., et al., (2024). “Resonantly Driven Programmable Multimode Interference in Photonic Integrated Circuits”. Optica Frontiers in Optics.
23. Mishra, M., et al., (2024). “Piezo-Optomechanically Tunable Ultra-Low-Loss Linear Programmable Processors for Quantum Computing and Networking”. Optica Frontiers in Optics.
24. Castillo, Z., et al., (2024). “An Optically Broadband Piezo-Optomechanical Magnetometer with Wide Temperature Range: Towards Fieldable Devices”. Optica Frontiers in Optics.
25. Zhai, A., et al., (2024). “Design and Fabrication of a MEMS-Enabled Quantum Socket for the Control of All Photonic and Spin Degrees of Freedom of an Artificial Atom in a High-Cooperativity Diamond Microdisk”. Optica Frontiers in Optics.
26. Dong, M., et al., (2024). “Scalable and piezoelectrically tunable hybrid quantum photonic crystal cavities”. Optica Frontiers in Optics.
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Society Memberships

- IEEE
- American Physical Society
- Optica (Formerly Optical Society of America)
- American Vacuum Society
- SPIE

Extramural Research Contracts Awarded Since Joining University of Arizona in September 2022

Federal

Agency & Award Title	Role [PI, co-PI] All PIs listed	Eichenfield group funding at U of A total, duration, & dates	Total Amount
MITRE Corporation CRADA: Active Photonic Integrated Circuits for Cluster State Quantum Computing	PI	$550k/year from 2023 to 2026 (potentially longer)	Proprietary
DARPA MTO Seedling	PI	$750k for 9 months	$750k
National Virtual Quantum Laboratory	Senior Personnel	TBD	~$50M
DOE LDRD: EPIQ	PI	$200k/year for three years starting in October 2024	$600,000
DOE LDRD: Acoustoelectric Neuromorphic Computing	PI	$100k/year for three years starting in October 2024	$300,000
DOE LDRD: Optomechanical Accelerometer	PI	$100k/year for three years starting in October 2024	$300,000
DOE LDRD: Acousto-magnetic Circulator	PI	$100k/year for three years starting in October 2024	$300,000
DOE: CINT Affiliate Scientist Contract	PI	$75k/year for four years, starting 2023	$302,371
DARPA: HIFA	PI	$150k/year for two years, starting 2023	$75,000
DARPA: SynQuaNon	co-PI	$553k over two years, starting 2023	$823,222
Advent Diamond: NASA: SBIR	PI	$30k for one year, starting 2024	$30,000
Other Government Agency Sponsor: MQR	co-PI	$225k/year for two years, starting 2023	$382,501
ARO: QBEAM	co-PI	$258k over two years, starting 2024	$1,399,999
NSF: Photonic Engine Accelerating atomic QUantum Engineering (PEAQUE)	co-PI	$200k over two years, starting 2024	$212,000
DARPA: Young Faculty Award	PI	$1M over 3 years, starting 2023	$1,000,000
NSF: Center for Quantum Networks	PI	(2024/2025) ~$800k/year	$1,538,362
DOE LDRD: Quantum Phonons	PI	$450k over 3 years, starting 2023	$153,354

DOE LDRD: Acoustoelectric Cooling	PI	$450k over 3 years, starting 2024	$150,000
DARPA: MAGHITS	PI	$300k over 2.5 years, starting 2024	$250,000
DARPA: ACHIPS	PI	$300k over 2 years, starting 2023	$622,361
DOE LDRD: MOAB	PI	$300k over 3 years, starting 2023	$155,078
DOE LDRD: Optomechanical Gyroscope	PI	$300k over 3 years, starting 2023	$278,791
DOE LDRD: Optomechanical X-Ray Sensor	PI	$300k over 3 years, starting 2023	$212,844
DOE LDRD: Acoustoelectric Front-End	PI	$200k over 2 years, starting 2023	$154,517
DOE Office of Science: The Quantum Systems Accelerator	PI	$200k/year to UA in 2023 and 2024	$604,225