



Ryan Camacho

Department of Electrical and Computer Engineering

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OVERVIEW

Associate Professor of Electrical and Computer Engineering; Research in Nanophotonics Experiment and Theory.

APPOINTMENTS

Associate Professor of Electrical and Computer Engineering

2017-

Brigham Young University, Provo, UT

- Research and teaching in nanophotonics, quantum information, circuits, and microfluidics
- Mentoring: Research group of approximately 14 undergraduate and graduate students

Principal Member of Technical Staff and CINT Scientist

2015-2017

Senior Member of Technical Staff and CINT Scientist

2014-2015

Senior Member of Technical Staff

2010-2014

Sandia National Laboratories, Albuquerque

- Nanophotonics Research: nonlinear optics, optomechanics, quantum communication, optical color centers, quantum information
- Mentoring: 11 graduate students and 5 postdocs
- Leadership: Led team of 35 Scientists/Engineers in Department of Energy Grand Challenge Research Project, Chair of SEQUIS committee on quantum communications research
- Joint Appointment: Affiliate CINT Scientist at Los Alamos National Lab

Postdoctoral Scholar

2008-2010

California Institute of Technology

- Division of Engineering and Applied Science, Painter Lab: research on optomechanics in photonic crystals

EDUCATION

PhD Physics

2005-2008

University of Rochester

[“Implementations of slow light using double-resonances”](#)

Provost Fellow, Thesis advisor: John Howell (Physics) / Robert Boyd (Optics)

MA Physics

2003-2005

University of Rochester

BS Physics

1997-2003

Brigham Young University

Heritage Scholar, Academic/Research advisors: David Allred and Larry Knight

PEER-REVIEWED JOURNAL PAPERS [statistics]

31. Alec Hammond, Ian W Frank, Ryan Camacho, “[Error Correction in Structured Optical Receivers](#)”, *IEEE Journal of Selected Topics in Quantum Electronics* **24**, 3900308 (2018).
30. Darius Bunandar, Anthony Lentine, Catherine Lee, Hong Cai, Christopher M Long, Nicholas Boynton, Nicholas Martinez, Christopher DeRose, Changchen Chen, Matthew Grein, Douglas Trotter, Andrew Starbuck, Andrew Pomerene, Scott Hamilton, Franco NC Wong, Ryan Camacho, Paul Davids, Junji Urayama, Dirk Englund, “[Metropolitan quantum key distribution with silicon photonics](#)”, *Physical Review X* **8**, 021009 (2018).
29. Hong Cai, Christopher M Long, Christopher T DeRose, Nicholas Boynton, Junji Urayama, Ryan Camacho, Andrew Pomerene, Andrew L Starbuck, Douglas C Trotter, Paul S Davids, Anthony L Lentine, “[Silicon photonic transceiver circuit for high-speed polarization-based discrete variable quantum key distribution](#)”, *Optics Express* **25**, 12282 (2017).
28. S Liu, H Cai, CT DeRose, P Davids, A Pomerene, AL Starbuck, DC Trotter, R. Camacho, J Urayama, A Lentine, “[High speed ultra-broadband amplitude modulators with ultrahigh extinction > 65 dB](#)”, *Optics Express* **25**, 11254 (2017).
27. Tim Schröder, Matthew E Trusheim, Michael Walsh, Luozhou Li, Jiabao Zheng, Marco Schukraft, Alp Sipahigil, Ruffin E Evans, Denis D Sukachev, Christian T Nguyen, Jose L Pacheco, Ryan M Camacho, Edward S Bielejec, Mikhail D Lukin, Dirk Englund, “[Scalable focused ion beam creation of nearly lifetime-limited single quantum emitters in diamond nanostructures](#)”, *Nature Communications* **8**, 15376 (2017).
26. Mohan Sarovar, Daniel BS Soh, Jonathan Cox, Constantin Brif, Christopher T Derose, Ryan Camacho, Paul Davids, “[Silicon nanophotonics for scalable quantum coherent feedback networks](#)”, *EPJ Quantum Technology* **3**, 14 (2016).
25. A Sipahigil, RE Evans, DD Sukachev, MJ Burek, J Borregaard, MK Bhaskar, CT Nguyen, JL Pacheco, HA Atikian, C Meuwly, RM Camacho, F Jelezko, E Bielejec, H Park, M Lončar, MD Lukin, “[An integrated diamond nanophotonics platform for quantum optical networks](#)”, *Science* **354**, 847 (2016).
24. Daniel BS Soh, Constantin Brif, Patrick J Coles, Norbert Lütkenhaus, Ryan M Camacho, Junji Urayama, Mohan Sarovar, “[Self-referenced continuous-variable quantum key distribution protocol](#)”, *Physical Review X* **5**, 4 (2015).
23. Scott M Hendrickson, Amy C Foster, Ryan M Camacho, B David Clader, “[Integrated nonlinear photonics: emerging applications and ongoing challenges \[Invited\]](#)”, *JOSA B* **31**, 12 (2014).
22. BD Clader, SM Hendrickson, RM Camacho, BC Jacobs, “[All-optical microdisk switch using EIT](#)”, *Optics Express* **21**, 5 (2013).
21. SM Hendrickson, CN Weiler, RM Camacho, PT Rakich, AI Young, MJ Shaw, TB Pittman, JD Franson, BC Jacobs, “[All-optical-switching demonstration using two-photon absorption and the Zeno effect](#)”, *Physical Review A* **87**, 2 (2013).
20. Ryan M Camacho, “[Entangled photon generation using four-wave mixing in azimuthally symmetric microresonators](#)”, *Optics Express* **20**, 21977 (2012).
19. Peter T Rakich, Charles Reinke, Ryan Camacho, Paul Davids, Zheng Wang, “[Giant enhancement of stimulated Brillouin scattering in the subwavelength limit](#)”, *Physical Review X* **2**, 011008 (2012).
18. Praveen K Vudyasetu, Ryan M Camacho, John C Howell, “[Rapidly reconfigurable slow-light system based on off-resonant Raman absorption](#)”, *Physical Review A* **5**, 053807 (2010).
17. Qiang Lin, Jessie Rosenberg, Darrick Chang, Ryan Camacho, Matt Eichenfield, Kerry J Vahala, Oskar Painter, “[Coherent mixing of mechanical excitations in nano-optomechanical structures](#)”, *Nature Photonics* **4**, 236 (2010).

16. Matt Eichenfield, Jasper Chan, Ryan M Camacho, Kerry J Vahala, Oskar Painter, “Optomechanical crystals”, *Nature* **462**, 78 (2009).
15. Ryan M Camacho, Jasper Chan, Matt Eichenfield, Oskar Painter, “Characterization of radiation pressure and thermal effects in a nanoscale optomechanical cavity”, *Optics Express* **17**, 15726 (2009).
14. M Eichenfield, R Camacho, J Chan, KJ Vahala, O Painter, “A picogram-and nanometre-scale photonic-crystal optomechanical cavity”, *Nature* **459**, 7246 (2009).
13. J Chan, M Eichenfield, R Camacho, O Painter, “Optical and mechanical design of a “zipper” photonic crystal optomechanical cavity”, *Optics Express* **17**, 3802 (2009).
12. RM Camacho, PK Vudyasetu, JC Howell, “Four-wave-mixing stopped light in hot atomic rubidium vapour”, *Nature Photonics* **3**, 103 (2009).
11. RM Camacho, PB Dixon, RT Glasser, AN Jordan, JC Howell, “Realization of an all-optical zero to π cross-phase modulation jump”, *Physical Review Letters* **102**, 013902 (2009).
10. CJ Broadbent, RM Camacho, R Xin, JC Howell, “Preservation of energy-time entanglement in a slow light medium”, *Physical Review Letters* **100**, 133602 (2008).
9. PK Vudyasetu, RM Camacho, JC Howell, “Storage and retrieval of multimode transverse images in hot atomic rubidium vapor”, *Physical Review Letters* **100**, 123903 (2008).
8. Z Shi, RW Boyd, RM Camacho, PK Vudyasetu, JC Howell, “Slow-light Fourier transform interferometer”, *Physical Review Letters* **99**, 240801 (2007).
7. MV Pack, RM Camacho, JC Howell, “Transients of the electromagnetically-induced-transparency-enhanced refractive Kerr nonlinearity”, *Physical Review A* **76**, 033835 (2007).
6. MV Pack, RM Camacho, JC Howell, “Electromagnetically induced transparency line shapes for large probe fields and optically thick media”, *Physical Review A* **76**, 013801 (2007).
5. RM Camacho, MV Pack, JC Howell, A Schweinsberg, RW Boyd, “Wide-bandwidth, tunable, multiple-pulse-width optical delays using slow light in cesium vapor”, *Physical Review Letters* **98**, 153601 (2007).
4. RM Camacho, CJ Broadbent, I Ali-Khan, JC Howell, “All-optical delay of images using slow light”, *Physical Review Letters* **98**, 043902 (2007). 
3. RM Camacho, MV Pack, JC Howell, “Slow light with large fractional delays by spectral hole-burning in rubidium vapor”, *Physical Review A* **74**, 033801 (2006).
2. MV Pack, RM Camacho, JC Howell, “Transients of the electromagnetically-induced-transparency-enhanced refractive Kerr nonlinearity: Theory”, *Physical Review A* **74**, 013812 (2006).
1. RM Camacho, MV Pack, JC Howell, “Low-distortion slow light using two absorption resonances”, *Physical Review A* **73**, 063812 (2006).

PAPERS UNDER REVIEW

2. Alec Hammond, Ryan Camacho, “Designing Silicon Photonic Devices using Artificial Neural Networks”, *arXiv:1812.03816* , (2019).
1. Alec Hammond, Easton Potaker, Ryan Camacho, “Accelerating Silicon Photonic Parameter Extraction using Artificial Neural Networks”, *submitted* , (2019).

PATENTS

- U.S. Patent 9906311, [Transceivers and receivers for quantum key distribution and methods pertaining thereto](#)
- U.S. Patent 10031158, [Optomechanical force sensors, cantilevers, and systems thereof](#)
- U.S. Patent 9553677, [Self-referenced continuous-variable quantum key distribution](#)
- U.S. Patent 8600200, [Nano-optomechanical transducer](#)
- U.S. Patent 9268092, [Guided wave opto-acoustic device](#)
- U.S. Patent 9268195, [Methods and apparatus of entangled photon generation using four-wave mixing](#)

BOOK CHAPTER

- Ryan M. Camacho and John C. Howell, [“Slow Light in Atomic Vapors”](#), Slow Light: Science and Applications (CRC Press, 2008), Jacob B. Khurgin & Rodney S. Tucker, eds.

FUNDING [≈ 18M/8yr]

- ORNL, “Chipscale QKD”, \$96,000 (PI, 01/19 - 01/20).
- BYU MRG, “Undergraduate Contributions to 3D-Printed Microfluidic Resonators”, \$25,000 (PI, 09/18 - 09/20).
- DOE CEDS, “Timing Authentication Secured by Quantum Correlations (TASQC)”, \$450,000 (Sandia PI, 09/15 - 05/17).
- DOE Office of Science Grand Challenge LDRD, “SECANT: Chip-Scale Quantum Communications”, \$15,200,000 (PI, 09/13 - 09/16).
- DARPA, “Quiness: Macroscopic Quantum Communications”, \$1,280,000 (PI, 10/13 - 4/16).
- DOE BES, “CINT User Facility Support for nanoscale quantum photonics”, \$800,000 (PI, 05/13 - 09/17).
- DOE Office of Science LDRD, “Micro-resonator based Optical Frequency Combs”, \$600,000 (PI, 01/11 - 09/12).
- DARPA, “Zeno-based Opto-Electronics (ZOE)”, \$1,100,000 (PI, 11/10 - 05/13).

INVITED TALKS AT INTERNATIONAL CONFERENCES

12. SPIE Security + Defence, Berlin, Germany, 9/2018
11. SPIE Security + Defence, Warsaw, Poland, 9/2017
10. GOMAC Tech, Orlando, FL, 3/2016
9. Scalable Information Processing in Nanophotonics (also organizer), Boston, MA, 3/2016
8. SPIE Security + Defence, Toulouse, France, 9/2015
7. Scalable Information Processing in Nanophotonics , Boston, MA, 3/2015
6. SPIE Security + Defence, Amsterdam, Netherlands, 9/22/2014

5. Phononics 2013, Sharm El-Sheikh, Egypt, 06/2013
4. ETOPIM, Marseilles, France, 08/2012
3. SPIE Smart Structures/NDE, San Diego, CA, 03/2012
2. Phononics 2011, Santa Fe, NM, 05/2010
1. SPIE Photonics West, San Jose, CA, 01/2008

SEMINARS AND COLLOQUIA

15. Oak Ridge National Lab, Quantum Networking Symposium, 01/16/2019
14. BYU, Applied Math Seminar, 11/15/2018
13. BYU, Condensed Matter Seminar, 02/15/2018
12. University of New Mexico, CQuIC Quantum Seminar, 10/26/2016
11. National Intelligence Science and Technology Council, Science Briefing, 04/21/2016
10. University of New Mexico, [CHTM Colloquium](#), 01/11/2016
9. University of Rochester, Physics/Optics Colloquium, 09/17/2015
8. Pomona College, Physics Colloquium, 03/01/2015
7. University of New South Wales Seminar, School of Physics, 02/23/2015
6. Australian Research Council CUDOS Center, Photonic Forum, 02/17/2015
5. University of Bristol, Physics Colloquium, 9/25/2014
4. Office of Naval Research, Workshop on Quantum Communications, Organizer + Speaker, 7/2014
3. Brigham Young University, Physics Colloquium, 9/2009
2. Massachusetts Institute of Technology, Physics Seminar, 7/2007
1. National Institute of Science and Technology, Physics Seminar, 11/2007

SYNERGISTIC ACTIVITIES

- Proposal reviewer: NSF, DOE, LDRD, ONR
- Referee: Physical Review Letters, Science, , Nature Communications, Optica, Physical Review A, Optics Express, Optics Letters, Journal of Quantum Electronics, Applied Physics Letters, etc.
- Program Committee: 2017 CLEO:QELS conference, subcommittee on Quantum Science, Engineering, and Technology; SIPQNP Boston 2015, 2016; SPIE Quantum Information Science and Technology 2015, 2016; Phononics 2011; Joint ONR/Sandia Workshop on Quantum Communications 2014; Air Force GSC Summit on Quantum Technologies, 2015
- STEM Outreach: MathCounts Coach, Eisenhower Middle School 2013, 2014, 2016. State champions in 2016; Centennial Middle School 2018, Utah State Champions, DOE Science Bowl Coach, Eisenhower/Desert Ridge/Centennial Middle School 2015, 2016, 2017, 2018, Regional Champions 2017, 2018. Director of BYU Connections "Build it", 2018.

IN THE MEDIA

- 22 Jan 2019 [ORNL](#)
- 14 Nov 2016 [NASA Tech Briefs](#)
- 14 Oct 2016 [Science Magazine](#)
- 14 Oct 2016 [Phys.org](#)
- 17 Oct 2016 [Daily Mail](#)
- 16 Oct 2016 [International Business Times](#)
- 16 Oct 2016 [MSN](#)
- 14 Oct 2016 [EurekaAlert](#)
- 14 Oct 2016 [Motherboard](#)
- 15 Oct 2016 [Science Daily](#)
- 18 Oct 2016 [Nano](#)
- 17 Oct 2016 [New Electronics](#)
- 16 Oct 2016 [New Atlas](#)
- 14 Oct 2016 [Nanotechweb](#)
- 14 Oct 2016 [Space Daily](#)
- 19 Oct 2016 [Nanotechweb](#)
- 18 Oct 2016 [Nanowerk](#)
- 17 Oct 2016 [I4U News](#)
- 18 Oct 2016 [Fars News](#)
- 24 Oct 2016 [NYCT](#)
- 17 Oct 2016 [Health Medicinet](#)
- 14 Oct 2016 [China Topix](#)
- 15 Oct 2016 [Nanotechnology Now](#)
- 17 Oct 2016 [ECN](#)
- 17 Oct 2016 [Controlled Environments](#)
- 18 Oct 2016 [Tech Times](#)
- 15 Oct 2016 [Engineering.com](#)
- 17 Oct 2016 [TechEye](#)
- 18 Oct 2016 [Photonics Online](#)
- 19 January 2007 [Washington Post](#)

AWARDS

- 2016 [R&D 100 Award; Video Description](#)
- 2007 Best Presentation Award, OSA Annual Meeting Optical Society of America
- 2003 Provost Fellowship, University of Rochester
- 2001, 2002 Undergraduate Fellowship, American Physical Society
- 1997 Heritage Scholarship, Brigham Young University