

AARON R. HAWKINS

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EDUCATION

Ph.D. Electrical and Computer Engineering (1998)

University of California, Santa Barbara Santa Barbara, CA

- Dissertation Title: Silicon-Indium-Gallium-Arsenide Avalanche Photodetectors
- Advisor: John E. Bowers

M.S. Electrical and Computer Engineering (1996)

University of California, Santa Barbara Santa Barbara, CA

B.S. (Honors) Applied Physics (1994)

California Institute of Technology Pasadena, CA

ACADEMIC EXPERIENCE

Associate Department Chair (2012 - Present)

Department of Electrical and Computer Engineering, Brigham Young University, Provo, UT

- Chair Rank & Status Committee (2012 – present)
- Chair Faculty Hiring Committee (2012 – present)

Professor (2008-Present)

Department of Electrical and Computer Engineering, Brigham Young University, Provo, UT

- Teach undergraduate and graduate classes
- Supervise and guide master's and doctoral students' thesis work
- Supervise and guide undergraduate research and senior level projects
- Establish and direct Microengineering research program

Associate Professor (2002-2008)

- Department of Electrical and Computer Engineering, Brigham Young University, Provo, UT

Director of Integrated Microfabrication Laboratory (cleanroom) (2002-Present)

Brigham Young University, Provo, UT

- Manage professional staff working in laboratory
- Oversee capital equipment and supply expenditures for laboratory
- Oversee student training, documentation, and research and teaching direction for laboratory
- Laboratory is a 2500 ft², class 10 cleanroom
- Since 2002, 23 new machines or systems have been brought on-line in this facility

COURSES TAUGHT

New Student Seminar (ECEn191)* – undergraduate level

includes laboratory portion

Introduction to Circuits (ECEn212) – undergraduate level

Semiconductor Devices (ECEn450)* – undergraduate level

Semiconductor Devices Laboratory (ECEn452)* – undergraduate level

* Indicates new course development

COURSES TAUGHT (CONT.)

Solar Lighting, Free Space Optical Communications, Lightsuits (ECEn490)* – senior project

Micro-electro-mechanical Systems (ECEn550)* – graduate level

includes laboratory portion

Optoelectronic Devices (ECEn555)* – graduate level

includes laboratory portion

* Indicates new course development

PROFESSIONAL EXPERIENCE

Scientific Board Member and Co-founder (2011 – 2013)

LiquiLume Technologies, San Jose, CA

- Oversaw attempts to transfer chip fabrication to commercial foundries
- Assisted with proposal writing and pitches to venture capital firms

Consultant (2004 – 2006)

Palmar Technologies, Provo, UT

- Designed thin-film based electrodes for compact mass spectrometer
- Oversaw electrode fabrication on silicon and ceramic substrates

Staff Applications Engineer (2001 - 2002)

Intel Corporation, Calabasas, CA

- Provide technical support to networking customers for Intel's products from the optical fiber layer to the framer including TIAs, LIAs, Laser Drivers, CDRs, Mux and Demuxes, and FECs
- Perform systems and component level testing for new products including noise characterization, jitter performance, S-parameter measurements, and sensitivity measurements and predictions
- Set product specifications for next generation devices for SONET and Ethernet applications

Principle Engineer (1998 – 2001)

CIENA Corporation, Santa Barbara, CA

- Lead technical effort to bring InGaAs-Silicon avalanche photodiodes (APDs) to commercial viability at 10 Gbit/s and 2.5 Gbit/s, creating world's most sensitive optical receivers
- Hired, trained, and supervised a team of engineers and technicians to create and validate component processes, DC and RF testing procedures, package designs, and device reliability.
- Oversaw and scheduled component production utilizing \$2M annual budget

Vice President of Research and Development (1997 – 1998)

Terabit Technology Incorporated, Santa Barbara, CA

- Co-founded company based on graduate research
- Oversaw \$15M corporate acquisition of Terabit by CIENA Corporation
- Built semiconductor cleanroom and procured processing and testing equipment with \$2M capital equipment budget
- Fabricated prototype APDs for commercial applications using wafer fusion and standard silicon and III-V processing including implantation, CVD, RIE, RTA, zinc diffusion, SOG application, SEM, and AFM

Graduate Student Researcher (1994 – 1997)

University of California, Santa Barbara, Santa Barbara, CA

- Reported world record gain-bandwidth-product for optical detector
- Invented technique of InGaAs to silicon wafer fusion

Undergraduate Research Assistant (1992 – 1993)

Los Alamos National Laboratory, Los Alamos, NM

- Worked in hydrodynamics testing group modeling X-ray production from large radiographic machines

Teaching Assistant (1993 – 1994)

Applied Physics Department, California Institute of Technology, Pasadena, CA

- Graded, conducted recitations, and supervised labs for undergraduate optics class

Undergraduate Research Assistant (1991 – 1992)

Chemistry Department, California Institute of Technology, Pasadena, CA

- Assisted with time-of-flight mass spectrometry experiments

HONORS AND AWARDS

- BYU University Professor (2016 – present)
- Institute of Electrical and Electronics Engineers (IEEE) Fellow (2016)
- Optical Society of America Fellow (2015)
- BYU Sponsored Research Achievement Award (2014)
- Engineering and Technology Endowed Chair (2012 – 2015)
- BYU Electrical Engineering Department Outstanding Faculty Award, 2011
- BYU Electrical Engineering Department Outstanding Faculty Teaching Award, 2011
- BYU Karl G. Maeser Research and Creative Arts Award, 2010
- BYU College of Engineering, Excellence in Scholarship Award, 2005
- IEEE Senior Member, 2004
- Intel Division Award, 2002
- UCSB Chancellor's Fellowship, 1994-1995
- Caltech ARCS Scholar, 1992-1994
- Robert C. Byrd Scholarship from state of New Mexico
- High school valedictorian

PUBLICATIONS AND PATENTS

Books

1. Aaron R. Hawkins and Holger Schmidt (Eds.), "Handbook of Optofluidics," CRC Press, Taylor & Francis, ISBN 9781420093544, (2010).
2. Aaron R. Hawkins and Stephen M. Schultz, "Practically Magic – A Guide to Electrical and Computer Engineering," Kendall Hunt, ISBN 9780757581786, (2010).

Book Chapters

1. Aaron R. Hawkins, Matthew R. Holmes, Tao Shang, and Yue Zhao, "Microfabrication," in "Handbook of Optofluidics," Aaron R. Hawkins and Holger Schmidt, eds., CRC Press, Taylor & Francis, ISBN 9781420093544, (2010).
2. Holger Schmidt and Aaron R. Hawkins, "Single molecule analysis with planar optofluidics," in "Advanced Photonic Structure for Biological and Chemical Sensing," Xudong Fan, ed., Springer Verlag, (2009).

3. K. Alexis Black, Aaron R. Hawkins, Near M. Margalit, Dubravko I. Babic, Archie L. Holmes, Jr., Ying-Lan Chang, Patrick Abraham, John E. Bowers, and Evelyn L. Hu, "Fusion Bonding: Hetero-interfacial Materials Analysis and Device Application," in "Heterogeneous Integration: Systems on a Chip" A. Husain, M. Fallahi, eds., SPIE, Bellingham, Washington, (1998).

Archival Journal Publications

1. Thomas Wall, Johnny McMurray, Gopikrishnan Meena, Vahid Ganjalizadeh, Holger Schmidt, and Aaron Hawkins, "Optofluidic Lab-on-a-Chip Fluorescence Sensor using Integrated Buried ARROW (bARROW) Waveguides Tom's Paper," in review *Micromachines*.
2. Damla Ozcelik, Aadhar Jain, Alexandra Stambaugh, Matthew A. Stott, Joshua Parks, Aaron Hawkins, Holger Schmidt, "Multi-modal spatial-spectral Multiplexing of Single-Virus Detection Using Multimode Interference Waveguides," in review *Scientific Reports*.
3. Abhijit Ghosh, Jacob E. Johnson, Jonathan G. Nuss, Brittany A. Stark, Aaron R. Hawkins, Luke T. Tolley, Brian D. Iverson, H. Dennis Tolley and Milton L. Lee, "Extending the Upper Temperature Range of Microchip Gas Chromatography Using a Heater/Clamp Assembly," in review *Journal of Chromatography A*.
4. Yuan Tian, Trevor K. Decker, Joshua McClellan, Ailin Li, Abraham de la Cruz, Derek Andrews, Stephen A. Lammert, Aaron R. Hawkins, Daniel E. Austin, "Improved miniaturized linear ion trap mass spectrometer using lithographically patterned plates and tapered ejection slit," in press *Journal of the American Society of Mass Spectrometry*.
5. Thomas Wall, Steven Hammon, Marcos Orfila, Erik Hamilton, Gabriel Zacheu, Holger Schmidt, and Aaron R. Hawkins, "Mitigating water absorption in waveguides made from unannealed PECVD SiO₂," *Photonics Technology Letters* **29**, 806-809, (2017).
6. Matthieu Giraud-Carrier, Trevor Decker, Joshua McClellan, Linsey Bennett, Jennifer Black, Holger Schmidt, and Aaron R. Hawkins, "Temperature and Wall Coating Dependence of Alkali Vapor Transport Speed in Micron-Scale Capillaries," *Journal of Vacuum Science and Technology A* **35**, 031602, (2017).
7. John M. Stout, Taylor M. Welker, and Aaron R. Hawkins, "Electrostatically Actuated Membranes Made from Silica Thin Films," *Applied Physics Letters* **110**, 053105, (2017).
8. Damla Ozcelik, Hong Cai, Kaelyn D. Leake, Aaron R. Hawkins, and Holger Schmidt, "Optofluidic bioanalysis: Fundamentals and applications," *Nanophotonics* **6**, 647-661, (2017).
9. Qinghao Wu, Yuan Tian, Ailin Li, Derek Andrews, Aaron R. Hawkins, Daniel E. Austin, "A miniaturized linear wire ion trap with electron ionization and single photon ionization sources," *Journal of The American Society for Mass Spectrometry* **28**, 859-865, (2017).
10. Ke Du, Hong Cai, M. Park, T.A. Wall, M.A. Stott, K.J. Alfson, A. Griffiths, R. Carrion, J.L. Patterson, A.R. Hawkins, H. Schmidt, and R.A. Mathies, "Multiplexed Efficient On-Chip Sample Preparation and Sensitive Amplification-Free Detection of Ebola Virus", *Biosensors and Bioelectronics* **91**, 489-496, (2017).

11. Hong Cai, Matthew A. Stott, Damla Ozcelik, Joshua W. Parks, Aaron R. Hawkins and H. Schmidt, "On-chip Wavelength Multiplexed Detection of Cancer DNA Biomarkers in Blood," *Biomicrofluidics* **10**, 064116 (2016).
12. Hong Cai, Aaron R. Hawkins, and Holger Schmidt, "Amplification-free direct detection of Ebola virus on hybrid optofluidic platform," *Clinical Laboratory International* **40**, 20-22, (2016).
13. Matthew A. Stott, Jennifer A. Black, Erik Hamilton, Holger Schmidt, and Aaron R. Hawkins, "Optimization of Y-splitting antiresonant reflecting optical waveguides-based rib waveguides", *Opt. Eng.* **55**, 100505 (2016).
14. M. Jaris, Y. Yahagi, B. K. Mahato, S. Dhuey, S. Cabrini, V. Nikitin, J. Stout, A. R. Hawkins, and H. Schmidt, "Intrinsic spin dynamics in optically excited nanoscale magnetic tunnel junction arrays restored by dielectric coating," *Applied Physics Letters* **109**, 202403, (2016).
15. Holger Schmidt and Aaron R. Hawkins, "Single-virus analysis through chip-based optical detection," *Bioanalysis* **8**, 867-870, (2016).
16. Matthieu Giraud-Carrier, Cameron Hill, Trevor Decker, Jennifer A. Black, Holger Schmidt, and Aaron Hawkins, "Perforated hollow-core optical waveguides for on-chip atomic spectroscopy and gas sensing," *Applied Physics Letters* **108**, 131105, (2016).
17. Thomas A. Wall, Roger P. Chu, Joshua W. Parks, Damla Ozcelik, Holger Schmidt, and Aaron R. Hawkins, "Improved environmental stability for plasma enhanced chemical vapor deposition SiO₂ waveguides using buried channel designs," *Optical Engineering* **55**, 040501, (2016).
18. Damla Ozcelik, Matthew A. Stott, Joshua W. Parks, Jennifer A. Black, Thomas A. Wall, Aaron R. Hawkins and Holger Schmidt, "Signal-to-noise enhancement in optical detection of single viruses with multi-spot excitation," *IEEE Journal of Special Topics in Quantum Electronics* **22**, 4402406, (2016).
19. Shuo Liu, Aaron R. Hawkins, and Holger Schmidt, "Optofluidic devices with integrated solid-state nanopores (Review)," *Microchimica Acta* **183**, 1275-1287, (2016).
20. Matthieu Giraud-Carrier, Cameron Hill, Trevor Decker, Aaron R. Hawkins, Jennifer A. Black, Soren Almquist, Holger Schmidt, "Non-diffusive Rubidium Vapor Transport in Confined Glass Channels," *Journal of Vacuum Science and Technology A* **34**, 031602, (2016),
21. Joshua W. Parks, Thomas A. Wall, Hong Cai, Aaron R. Hawkins, and Holger Schmidt, "Enhancement of ARROW Photonic Device Performance via Thermal Annealing of PECVD-based SiO₂ Waveguides", *IEEE J. Sel. Topics Qu. Elec.* **22**, 249-254, (2016).
22. Damla Ozcelik, Joshua W. Parks, Thomas A. Wall, Matthew A. Stott, Hong Cai, Joseph W. Parks, Aaron R. Hawkins, and Holger Schmidt, "Multiplex Optofluidic wavelength division multiplexing for single virus detection," *Proceedings of the National Academy of Sciences* **112**, 12933-12937, (2015).
23. Hong Cai, Joshua W. Parks, Thomas A. Wall, Matthew A. Stott, A. Stambaugh, K. Alfson, A. Griffiths, Richard A. Mathies, Ricardo Carrion Jr., Jean L. Patterson, Aaron R. Hawkins and Holger Schmidt, "Integrated optofluidic analysis for amplification-free detection of Ebola infection," *Scientific Reports* **5**, 14494 (2015).

24. Carlos Vilorio, Brittany Stark, Aaron R. Hawkins, Kendal Frogget and Brian Jensen, "Stress Relaxation Insensitive Designs for Metal Compliant Mechanism Threshold Accelerometers Metal Switches," *Sensing and Biosensing Research* **6**, 33-38, (2015).
25. Kaelyn D. Leake, Michael A.B. Olson, Damla Ozcelik, Aaron R. Hawkins, and Holger Schmidt, "Spectrally reconfigurable integrated multi-spot particle trap," *Optics Letters* **40**, 5435-5438, (2015).
26. Shuo Liu, Thomas A. Wall, Damla Ozcelik, Joshua W. Parks, Aaron R. Hawkins and Holger Schmidt, "Nanopore-Optofluidic λ -DNA Detection," *Chemical Communications* **51**, 2084-2087, (2015).
27. Anzi Wang, Sampo Hynynen, Aaron R. Hawkins, Samuel E. Tolley, H. Dennis Tolley, Milton L. Lee, "Axial thermal gradients in microchip gas chromatography," *Journal of Chromatography A* **1374**, 216-223, (2014).
28. Joshua W. Parks, Michael A. Olson, Jungkyu Kim, Ricardo Carrion Jr., Jean L. Patterson, Richard A. Mathies, Aaron R. Hawkins, and Holger Schmidt, "Integration of digital microfluidics and on-chip fluorescence detection for biosensing applications," *Biomicrofluidics* **8**, 054111, (2014).
29. Shuo Liu, Yue Zhao, Joshua W. Parks, David D. Deamer, Aaron R. Hawkins, and Holger Schmidt, "Correlated Electrical and Optical Analysis of Single Nanoparticles and Biomolecules on a Nanopore-Gated Optofluidic Chip," *Nano Letters* **14**, 4816-4820, (2014).
30. Spencer Chadderdon, LeGrand Shumway, Andrew Powell, Ailin Li, Daniel E. Austin, Aaron R. Hawkins, Richard H. Selfridge, Stephen M. Schultz, "Ion Trap Ion trap electric field measurements using slab coupled optical fiber sensors," *Journal of the American Society for Mass Spectrometry* **25**, 1622-1627, (2014).
31. Ailin Li, Brett J. Hansen, Andrew T. Powell, Aaron R. Hawkins, Daniel E. Austin, "Miniaturization of a Planar-Electrode Linear Ion Trap Mass Spectrometer," *Rapid Communications in Mass Spectrometry* **28**, 1338-1344, (2014).
32. Sara Ehlert, Nathan Ives, and Aaron R. Hawkins, "Cross-flow microfilters with large-diameter sacrificially-etched cross sections," *Microfluidics and Nanofluidics* **16**, 465 - 471, (2014).
33. Kaelyn D. Leake, Brian S. Phillips, Thomas D. Yuzvinsky, Aaron Hawkins, and Holger Schmidt, "Optical particle sorting on an optofluidic chip," *Optics Express* **21**, 32605-32610, (2013).
34. Suresh Kumar, Jie Xuan, Milton L. Lee, Dennis Tolley, Aaron R. Hawkins and Adam T. Woolley, "Thin-Film Microfabricated Nanofluidic Arrays for Size-Selective Protein Fractionation," *Lab on a Chip* **13**, 4591-4598 (2013).
35. Joshua W. Parks, Hong Cai, Lynnell Zempoaltecatl, Thomas D. Yuzvinsky, Kaelyn Leake, Aaron R. Hawkins, and Holger Schmidt, "Hybrid optofluidic integration," *Lab on a Chip* **13**, 4118-4123, (2013).
36. Kaelyn D. Leake, Aaron R. Hawkins, and Holger Schmidt, "All-optical particle trap using orthogonally intersecting beams," *Photonics Research* **1**, 47-51 (2013).
37. Bryan S. Blankenagel, Shiul Khadka, Aaron R. Hawkins, Karl F. Warnick, and Brian A. Mazzeo, "Radio-frequency microfluidic interferometer in printed circuit board," *Microwave and Optical Technology Letters* **55**, 1616-1618, (2013)

38. Brett J. Hansen, Richard J. Niemi, Aaron R. Hawkins, Stephen A. Lammert, and Daniel E. Austin, "A Lithographically Patterned Discrete Planar Electrode Linear Ion Trap," *IEEE/ASME Journal of Microelectromechanical Systems* **22**, 876 – 883 (2013).
39. John F. Hulbert, Matthieu Giraud-Carrier, Tom Wall, Aaron R. Hawkins, Scott Bergeson, Jennifer Black, and Holger Schmidt, "Versatile Rb vapor cells with long lifetimes," *Journal of Vacuum Science and Technology A* **31**, 033001 (2013).
40. Yue Zhao, Brian Phillips, Damla Ozcelik, Joshua Parks, Philip Measor, David Gulbransen, Holger Schmidt, and Aaron R. Hawkins, "Tailoring the spectral response of liquid waveguide diagnostic platforms," *Journal of Biophotonics* **5**, 703–711, (2012).
41. Damla Ozcelik, Brian S. Phillips, Joshua W. Parks, Philip Measor, David Gulbransen, Aaron R. Hawkins, and Holger Schmidt, "Dual-core optofluidic chip for independent particle detection and tunable spectral filtering," *Lab on a Chip* **12**, 3728-33, (2012).
42. Dirk Schulze-Makuch, Joop M. Houtkooper, Michael Knoblauch, Roberto Furfaro, Wolfgang Fink, James N. Head, Alberto G. Fairén, Hojatollah Vali, S. Kelly Sears, Mike Daly, David Deamer, Holger Schmidt, Aaron R. Hawkins, Henry J. Sun, Darlene S.S. Lim, James Dohm, Louis N. Irwin, Alfonso Davila, Abel Mendez, and Dale Andersen, "The Biological Oxidant and Life Detection (BOLD) Mission: A Proposal for a Mission to Mars," *Planetary and Space Science* **67**, 57–69, (2012).
43. Yue Zhao, Kaelyn D. Leake, Philip Measor, Micah H. Jenkins, Jared Keeley, Holger Schmidt, and Aaron R. Hawkins, "Optimization of Interface Transmission Between Integrated Solid Core and Optofluidic Waveguides," *Photonics Technology Letters* **24**, 46-48, (2012).
44. Holger Schmidt and Aaron R. Hawkins, "Photonic integration of non-solid media via optofluidics," *Nature Photonics* **5**, 598-604, (2011).
45. Matthew R. Holmes, Shuo Liu, Jared Keeley, Micah Jenkins, Kaelyn Leake, Holger Schmidt, and Aaron R. Hawkins, "Hollow Waveguides with Low Intrinsic Photoluminescence Fabricated with PECVD Silicon Nitride and Silicon Dioxide Films," *IEEE Photonics Technology Letters* **23**, 1466-1488, (2011).
46. Brian S. Phillips, Micah H. Jenkins, Shuo Liu, Holger Schmidt, and Aaron R. Hawkins, "Selective Thin Film Deposition for Optofluidic Platforms with Optimized Transmission," *IEEE Photonics Technology Letters* **23**, 721-723, (2011).
47. Jie Xuan, Mark N. Hamblin, John M. Stout, H. Dennis Tolley, Adam T. Woolley, Aaron R. Hawkins, and Milton L. Lee, "Effects of surfactant addition and alternating current electrophoretic oscillation on size fractionation of nanoparticles using channels with three different height segments," *Journal of Chromatography A* **1218**, 9102-9110, (2011).
48. Ying Peng, Brett J. Hansen, Hannah Quist, Zhiping Zhang, Miao Wang, Aaron R. Hawkins, and Daniel E. Austin, "Coaxial Ion Trap Mass Spectrometer: Concentric Toroidal and Quadrupolar Trapping Regions," *Analytical Chemistry* **83**, 5578–5584, (2011).
49. Mikhail I. Rudenko, Matthew R. Holmes, Dmitri N. Ermolenko, Evan J. Lunt, Sarah Gerhardt, Harry F. Noller, David W. Deamer, Aaron Hawkins, and Holger Schmidt, "Controlled gating and electrical detection of single 50S ribosomal subunits through a solid-state nanopore in a microfluidic chip," *Biosensors and Bioelectronics* **29**, 34-39, (2011).

50. Mark N. Hamblin, Aaron R. Hawkins, Dallin Murray, Daniel Maynes, Milton L. Lee, Adam T. Woolley, H. Dennis Tolley, "Capillary Flow in Sacrificially-etched Nanochannels," *Biomicrofluidics* **5**, 021103, (2011).
51. Micah H. Jenkins, Brian S. Phillips, Yue Zhao, Matthew R. Holmes, Holger Schmidt, and Aaron R. Hawkins, "Optical Characterization of Optofluidic Waveguides Using Scattered Light Imaging," *Optics Communications* **284**, 3980–3982 (2011).
52. John F. Hulbert, Katie Hurd, Aaron R. Hawkins, Bin Wu, and Holger Schmidt, "A versatile approach to Rb vapor cell construction," *Journal of Vacuum Science and Technology A*. **29**, 033001, (2011).
53. Yue Zhao, Micah Jenkins, Philip Measor, Kaelyn Leake, Shuo Liu, Holger Schmidt, and Aaron R. Hawkins, "Hollow Waveguides with Low Intrinsic Photoluminescence Fabricated with Ta₂O₅ and SiO₂ Films," *Applied Physics Letters* **98**, 091104 (2011).
54. Zhigang Liu, Rebekah Brandt, Yu Yahagi, Brett Hansen, Bruce Harteneck, Jeffrey Bokor, Stefano Cabrini, Aaron Hawkins, and Holger Schmidt, "Detecting single nanomagnet dynamics beyond the diffraction limit in varying magnetostatic environments," *Applied Physics Letters* **98**, 052502, (2011).
55. Aiqing Chen, M. M. Eberle, Evan J. Lunt, Shuo Liu, Kaelyn Leake, Mikhail I. Rudenko, Aaron R. Hawkins, and Holger Schmidt, "Dual-color fluorescence cross-correlation spectroscopy on a planar optofluidic chip," *Lab on a Chip* **11**, 1502-1506, (2011).
56. Philip Measor, Brian S. Phillips, Aiqing Chen, Aaron R. Hawkins, and Holger Schmidt, "Tailorable integrated optofluidic filters for biomolecular detection," *Lab on a Chip* **11**, 899-904, (2011).
57. Miao Wang, Hannah E. Quist, Brett J. Hansen, Ying Peng, Zhiping Zhang, Aaron R. Hawkins, Alan L. Rockwood, Daniel E. Austin, and Milton L. Lee, "Performance of a Halo Ion Trap Mass Analyzer with Exit Slits for Axial Ejection," *Journal of the American Society for Mass Spectrometry* **22**, 369-378, (2011).
58. Zhiping Zhang, Ying Peng, Hannah Quist, Brett J. Hansen, Aaron R. Hawkins, Daniel E. Austin, "Effects of Higher-order Multipoles on the Performance of a Quadrupole Ion Trap Mass Analyzer," *International Journal of Mass Spectrometry* **299**, 151-157, (2011).
59. Matthew Holmes, Jared Keeley, Katherine Hurd, Holger Schmidt, and Aaron R. Hawkins, "Optimized Piranha Etching Process for SU8 Based MEMS and MOEMS Construction," *Journal of Micromechanics and Microengineering* **20**, 115008, (2010).
60. Bin Wu, John F. Hulbert, Evan J. Lunt, Katie Hurd, Aaron R. Hawkins, and Holger Schmidt, "Slow light on a chip via atomic quantum state control," *Nature Photonics* **4**, 776-779, (2010).
61. Holger Schmidt and Aaron R. Hawkins, "Atomic Spectroscopy and Quantum Optics in Hollow-core Waveguides," *Laser & Photonics Reviews* **4**, 720–737, (2010).
62. Evan J. Lunt, Bin Wu, Jared M. Keeley, Philip Measor, Holger Schmidt, and Aaron R. Hawkins, "Hollow ARROW Waveguides on Self-Aligned Pedestals for Improved Geometry and Transmission," *IEEE Photonics Technology Letters* **22**, 1147 – 1149, (2010).
63. Tao Shang, Eric Teng, Adam T. Woolley, Brian A. Mazzeo, Stephen M. Schultz, and Aaron R. Hawkins, "Contactless conductivity detection of small ions in a surface micro-machined CE chip," *Electrophoresis* **31**, 2596–2601, (2010).

64. Brian S. Phillips, Philip Measor, Yue Zhao, Holger Schmidt, and Aaron R. Hawkins, "Optofluidic notch filter integration by lift-off of thin films," *Optics Express* **18**, 4790-4795, (2010).
65. Matthew R. Holmes, Mikhail Rudenko, Philip Measor, Tao Shang, Holger Schmidt, Aaron R. Hawkins, "Micropore and Nanopore Fabrication in Hollow ARROW Waveguides," *Journal of Micro/Nanolithography, MEMS, and MOEMS* **9**, 023004, (2010).
66. Benjamin Todd, Brian D. Jensen, Stephen M. Schultz, and Aaron R. Hawkins, "Design and Testing of a Thin-Flexure Bistable Mechanism Suitable for Stamping from Metal Sheets," *Journal of Mechanical Design* **132**, 071011 (2010).
67. Sergie Kühn, Philip Measor, Evan J. Lunt, Brian S. Phillips, David W. Deamer, Aaron R. Hawkins, and Holger Schmidt, "Ultralow power trapping and fluorescence detection of single particles on an optofluidic chip" *Lab on a Chip* **10**, 189-194, (2010).
68. Mark N. Hamblin, Jie Xuan, Daniel Maynes, H. Dennis Tolley, David M. Belnap, Adam T. Woolley, Milton L. Lee, and Aaron R. Hawkins, "Selective trapping and concentration of nanoparticles and viruses in dual-height nanofluidic channels," *Lab on a Chip* **10**, 173-178 (2010).
69. Philip Measor, Sergei Kühn, Evan J. Lunt, Brian S. Phillips, Aaron R. Hawkins, and Holger Schmidt, "Multi-mode mitigation in an optofluidic chip for particle manipulation and sensing," *Optics Express* **17**, 24342-24348 (2009).
70. Zhiping Zhang, Ying Peng, Brett J. Hansen, Ivan W. Miller, Miao Wang, Milton L. Lee, Aaron R. Hawkins and Daniel E. Austin, "Paul Trap Mass Analyzer Consisting of Opposing Microfabricated Electrode Plates," *Analytical Chemistry* **81**, 5241-5248, (2009).
71. Sergei Kühn, Philip Measor, Evan J. Lunt, Brian S. Phillips, David W. Deamer, Aaron R. Hawkins, and Holger Schmidt, "Loss-based optical trap for on-chip particle analysis", *Lab on a Chip* **9**, 2212 (2009).
72. Sergei Kühn, Philip Measor, Evan J. Lunt, Brian S. Phillips, Aaron R. Hawkins, and Holger Schmidt, "Optofluidic particle concentration by a long-range dual-beam trap", *Optics Letters* **34**, 2306-2308 (2009).
73. Mikhail I. Rudenko, Sergei Kühn, Evan J. Lunt, David W. Deamer, Aaron R. Hawkins and Holger Schmidt, "Ultrasensitive Q β Phage Analysis Using Fluorescence Correlation Spectroscopy on an Optofluidic Chip", *Biosensors and Bioelectronics* **24**, 3258-3263 (2009).
74. Michael S. Johnson, Joshua L. Beutler, Alan P. Nelson, Yuihin Tseung, and Aaron R. Hawkins, "SiO₂ Barriers for Increasing Gain Events in Solid-state Impact-ionization Multipliers," *IEEE Journal of Quantum Electronics* **45**, 1068 – 1073, (2009).
75. Michael S. Johnson, Joshua L. Beutler, Alan P. Nelson, and Aaron R. Hawkins, "Solid-state Impact-ionization Multiplier with P-N Junction Injection Node," *IEEE Transactions on Electron Devices* **56**, 1360-1364, (2009).
76. Christopher J. Carron, Mallory Phillips, Brian S. Phillips, Laurie-Anne Parks, Stephen M. Schultz, and Aaron R. Hawkins, "Fast Etch Channels Photo-definable Microchannels Made With Spin-on Polymers and Short Sacrificial Etch Times," *Journal of Microfluidics and Nanofluidics* **7**, 283-289, (2009).

77. Benjamin Todd, Mallory Phillips, Stephen M. Schultz, Aaron R. Hawkins, and Brian D. Jensen, "Low Cost RFID Shock Sensors," *IEEE Sensors Journal* **9**, 464 – 469, (2009).
78. Bin Wu, John F. Hulbert, Aaron R. Hawkins, and Holger Schmidt, "Planar hollow-core waveguide technology for atomic spectroscopy and quantum interference in alkali vapors (Invited)," *Journal of Lightwave Technology* **26**, 3727-3733, (2008).
79. Evan J. Lunt, Philip Measor, Brian S. Phillips, Sergei Kühn, Holger Schmidt, and Aaron R. Hawkins, "Improving solid to hollow core transmission for integrated ARROW waveguides" *Optics Express* **16**, 20981-20986, (2008).
80. Daniel E. Austin, Ying Peng, Brett J. Hansen, Ivan W. Miller, Alan L. Rockwood, Aaron R. Hawkins, and Samuel E. Tolley, "Novel Ion Traps Using Planar Resistive Electrodes: Implications for Miniaturized Mass Analyzers," *Journal of the American Society for Mass Spectrometry* **19**, 1435-1441, (2008).
81. Philip Measor, Sergei Kühn, Evan J. Lunt, Brian S. Phillips, Aaron R. Hawkins, and Holger Schmidt, "Hollow-core waveguide characterization by optically induced particle transport," *Optics Letters* **33**, 672-674, (2008). (Also selected for Vol. 3, Iss. 5 *Virtual Journal for Biomedical Optics*)
82. Holger Schmidt and Aaron R. Hawkins, "Optofluidic waveguides: I. Concepts and implementations (Invited Review)," *Journal of Microfluidics and Nanofluidics* **4**, 3-16, (2008).
83. Aaron R. Hawkins and Holger Schmidt, "Optofluidic waveguides: II. Fabrication and structures (Invited Review)," *Journal of Microfluidics and Nanofluidics* **4**, 17-32, (2008).
84. Hongze Liu, Aaron R. Hawkins, Stephen M. Schultz, and Travis E. Oliphant, "Fast Nonlinear Image Reconstruction for Scanning Impedance Imaging," *IEEE Transactions on Biomedical Engineering* **55**, 970-977, (2008).
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Conference Papers and Presentations

1. Matthew A. Stott, Vahid Ganjalizadeh, Holger Schmidt, and Aaron R. Hawkins, "High Fidelity MMI-Based Multi-Spot Excitation for Optofluidic Multiplexing, IEEE Photonics Conference, Orlando, FL, October 1-5, (2017).

2. M. Rahman, M. Harrington, M.A. Stott, T.D. Yuzvinsky, Y. Li, A.R. Hawkins, and H. Schmidt, "Optical trapping assisted enhancement of on-chip single molecule detection rate with a solid-state nanopore," IEEE Photonics Conference, Orlando, FL, October 1-5, (2017).
3. Joshua W. Parks, Alexandra Stambaugh, Matthew A. Stott, Aaron R. Hawkins, and Holger Schmidt, "Dual Detection of Zika Virus Nucleic Acid and Protein Using Multi-Mode Interference Waveguide Platform," IEEE Photonics Conference, Orlando, FL, October 1-5, (2017).
4. Steven Hammon, Thomas Wall, Erik Hamilton, Marcos Orfila, Gabriel Zacheu, Holger Schmidt, and Aaron R. Hawkins, "Preserving Optical Confinement in Unannealed PECVD SiO₂ Waveguides", CLEO/QELS, San Jose, CA, May 14-19, (2017).
5. Damla Ozcelik, Matthew A. Stott, Joshua W.Parks, Aadhar Jain, Aaron R. Hawkins, and Holger Schmidt, "Multimodal Multiplexing of Single-Virus Detection Using Multi-Mode Interference Waveguides", CLEO/QELS, San Jose, CA, May 14-19, (2017).
6. M. Rahman, M. Harrington, M.A. Stott, A.R. Hawkins, and H. Schmidt, "Single Particle Fluorescence Analysis on Demand on Electro-Optofluidic Chip with Gated Particle Delivery," CLEO/QELS, San Jose, CA, May 14-19, (2017).
7. K. B. Bywaters, H. Schmidt, W. Vercoutere, D. Deamer, A.R. Hawkins, R. C. Quinn, A. S. Burton, and C. P. McKay, "Development of Solid-State Nanopore Technology for Life Detection," submitted to Astrobiology Science Conference 2017.
8. Trevor Decker, Holger Schmidt, and Aaron R. Hawkins, "Perforated hollow-core optical waveguides for chip-scale spectroscopy and quantum interference," SPIE Photonics West, San Francisco, CA, Jan 28 – Feb 2 (2017).
9. Holger Schmidt and Aaron R. Hawkins, "Tunable optofluidic interference devices for bioanalysis", IEEE Photonics Conference, 29th Annual Conference of the IEEE Photonics Society, Waikoloa, HI, October 2-6 (2016).
10. G. Meena, Damla Ozcelik, Matthew Stott, Thomas Wall, Richard Robison, Aaron R. Hawkins and Holger Schmidt, "MMI waveguide based multispectral detection of nucleic acids for analysis of drug-resistant bacteria", 29th Annual Conference of the IEEE Photonics Society, Waikoloa, HI, October 2-6 (2016).
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12. Milton L. Lee, Abhijit Ghosh, Luke T. Tolley, Aaron R. Hawkins, Brian D. Iverson, H. Dennis Tolley, "Microchip Thermal Gradient Gas Chromatography," 40th Intern. Symp. on Capillary Chromatography, Riva del Garda, Italy, May 29-June 3, (2016).
13. Damla Ozcelik, Joshua Parks, Hong Cai, Thomas Wall, Matthew Stott, Aaron Hawkins, and Holger Schmidt, "Optofluidic wavelength division multiplexing for single biomolecule sensing" OSA Advanced Photonics Congress, Vancouver, Canada, July 18-20 (2016).
14. Matthieu Giraud-Carrier, Trevor K. Decker, Aaron Hawkins, Jennifer A. Black, and Holger Schmidt, "Perforated Hollow-Core Waveguide Devices for Atomic Spectroscopy with Alkali Vapor," CLEO/QELS, San Jose, CA, June 5 - 10, (2016).

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26. Hong Cai, Joshua W. Parks, Thomas Wall, Ricardo Carrion, Jean Patterson, Richard A. Mathies, Aaron R. Hawkins, and Holger Schmidt, "Integrated optofluidics chips for efficient on-chip infectious disease detection," Photonics West, San Francisco, CA, February 7-12, (2015).

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42. Adam T. Woolley, Suresh Kumar, Jie Xuan, Milton L. Lee, H. Dennis Tolley, and Aaron R. Hawkins, "Size-based protein fractionation in nanofluidic channel arrays," MicroTAS 2013, Freiburg, Germany, October 27-31, (2013).
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44. Aaron R. Hawkins, Lynnell U. Zempoaltecatl, and Holger Schmidt, "Design and fabrication of silicon-based optofluidic waveguide platforms," SPIE Optics + Photonics, San Diego, California, August 25-29, (2013).
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47. Damla Ozelik, Joshua W. Parks, Lynnell U. Zempoaltecatl, Kealyn Leake, Jennifer A. Black, Yaeji Lim, Holger Schmidt, Aaron Hawkins, "High Sensitivity Fluorescence Detection with Multi-spot Excitation Using Y-splitters," CLEO/QELS, San Jose, CA, June 9-14, (2013).
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55. Holger Schmidt and Aaron Hawkins, "Hollow-core Photonics for Optofluidics and Atom Photonics," CLEO/QELS, San Jose, CA, May 6, (2012).
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58. Kaelyn D. Leake, Shamik Mascharak, Philip Measor, Brian S. Phillips, Aaron R. Hawkins, and Holger Schmidt, "Manipulation, trapping, and SERS detection of nanoparticle-coated microspheres in optofluidic waveguides," Invited talk, Photonics West, San Jose, CA, January 21-26, (2012).
59. Bin Wu, John F. Hulbert, Katie Hurd, Aaron R. Hawkins, and Holger Schmidt, "Chip-scale platform for quantum interference based slow light in atoms," Invited talk, OSA Advanced Photonics Congress - Slow and Fast Light Meeting, Toronto, Canada, June 12-16, (2011).
60. Daniel Austin, Brett Hansen, Hannah Quist, and Aaron Hawkins, "Microfabricated Linear Ion Trap Mass Spectrometer," Pittcon, Atlanta, GA, March 13 – 18, (2011).
61. Kaelyn D. Leake, Brian S. Phillips, Aaron R. Hawkins, and Holger Schmidt, "Sized-Based Optical Particle Sorting Using an Orthogonal Beam in Optofluidic Waveguides," CLEO/QELS, Baltimore, MD, May 1-6, (2011).
62. Holger Schmidt and Aaron R. Hawkins, "All-optical particle trap using two orthogonally intersecting beams," CLEO/QELS, Baltimore, MD, May 1-6, (2011).
63. Yue Zhao, Micah Jenkins, Kaelyn D. Leake, Shuo Liu, Philip Measor, Holger Schmidt, and Aaron R. Hawkins, "Optofluidic Waveguides with Ta₂O₅ Cladding Layers and Low Photoluminescence," CLEO/QELS, Baltimore, MD, May 1-6, (2011).
64. Bin Wu, John F. Hulbert, Katie Hurd, Aaron R. Hawkins, and Holger Schmidt, "Slow light and EIT in atomic spectroscopy chips", Invited talk, Photonics West, San Jose, CA, January 22-27, (2011).
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66. Philip Measor, Brian S. Phillips, Aaron R. Hawkins, and Holger Schmidt "Liquid-core waveguide filter for optofluidic biosensing", European Optical Society Annual Meeting 2010, Paris, France, October 26-29, (2010).
67. Philip Measor, Brian S. Philips, Evan J. Lunt, Aaron R. Hawkins and Holger Schmidt, "Single-particle spectroscopy and manipulation in optofluidic devices," Frontiers in Optics, Rochester, NY, October 24-28, (2010).

68. Brian S. Phillips, Jared Keeley, Mikhail Rudenko, Kaelyn Leake, Philip Measor, Aiqing Chen, Shuo Liu, Evan Lunt, Holger Schmidt, and Aaron R. Hawkins, "Optimizing ARROW Transitions by Selective Deposition of Thin Films," Integrated Photonics Research, Silicon and Nano Photonics, Monterey, CA, July 25-28, (2010).
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71. Michael S. Johnson, Roy C. Shulberg, Aaron R. Hawkins, "Improving Gain Efficiency in Planar Impact Ionization Devices," The 218th Meeting of the Electrochemical Society, Las Vegas, NV, October 10-15, (2010).
72. Ying Peng, Zhiping Zhang, Brett J. Hansen, Miao Wang, Milton L. Lee, Aaron R. Hawkins, and Daniel E. Austin, "Design and Performance of Coaxial Ion Trap: Transferring Ions between Two Trapping Regions in One Mass Analyzer," 58th ASMS Conference on Mass Spectrometry, Salt Lake City, UT, May 23-27, (2010).
73. Brett Hansen, Hannah Quist, Brandon Barney, Aaron Hawkins, and Daniel Austin, "A Linear-type Ion Trap Realized with Two Lithographically Patterned Substrates," 58th ASMS Conference on Mass Spectrometry, Salt Lake City, UT, May 23-27, (2010).
74. Zhiping Zhang, Ying Peng, Hannah Quist, Junting Wang, Brett J. Hansen, Aaron R. Hawkins, and Daniel E. Austin, "Optimization of Multipole Components in a Planar Paul Trap," 58th ASMS Conference on Mass Spectrometry, Salt Lake City, UT, May 23-27, (2010).
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85. Daniel E. Austin, Zhiping Zhang, Brett J. Hansen, Ying Peng, Ivan Miller, Hannah Quist, J. Radebaugh, Milton L. Lee, and Aaron Hawkins, "Microfabricated Two-plate Ion Trap Mass Spectrometers: A New Tool for Planetary Atmosphere Analysis," 41st annual meeting of the Division of Planetary Sciences, American Astronomical Society, Fajardo, Puerto Rico, Oct. 5-9, (2009).
86. Brian S. Phillips, Yue Zhao, Philip Measor, Holger Schmidt, Aaron R. Hawkins, "Selective Deposition of Thin Films for Integrated Notch Filters in Optofluidic Sensors," Frontiers in Optics (FiO), San Jose, CA, October 11, (2009).
87. Matthew R. Holmes, Mikhail Rudenko, Philip Measor, Tao Shang, Holger Schmidt, Aaron R. Hawkins, "Nanopore Fabrication in Hollow Integrated Waveguides," Integrated Photonics and Nanophotonics Research and Applications (IPNRA) Conference, Honolulu, HI, July 12-17, (2009).
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95. Benjamin Todd, Mallory Phillips, Stephen M. Schultz, Aaron R. Hawkins, and Brian D. Jensen, "Low Cost RFID Shock Sensors," *IEEE Autotestcon*, Salt Lake City, UT, September 8-11, (2008).
96. Mikhail I. Rudenko, Sergei Kuehn, Evan J. Lunt, David W. Deamer, Aaron R. Hawkins, and Holger Schmidt, "Single Virus Detection Using Integrated Optofluidics," *IEEE/LEOS Summer Topical Meeting on Optofluidics*, Acapulco, Mexico, July 21-22, (2008).
97. Sergei Kuehn, Philip Measor, Evan J. Lunt, Aaron R. Hawkins, and Holger Schmidt, "Particle Manipulation with Integrated Optofluidic Traps (Invited)," *IEEE/LEOS Summer Topical Meeting on Optofluidics*, Acapulco, Mexico, July 21-22, (2008).
98. Philip Measor, Evan J. Lunt, Cory C. Jones, Aaron R. Hawkins, and H. Schmidt, "Characterization of Optofluidic ARROW Rejection Filter Devices," *IEEE/LEOS Summer Topical Meeting on Optofluidics*, Acapulco, Mexico, July 21-22, (2008).
99. Miao Wang, Daniel E. Austin, Samuel E. Tolley, Brett J. Hansen, Aaron R. Hawkins, and Milton Lee, "Design and Performance of a Halo Ion Trap Mass Analyzer," *Joint Northwest & Rocky Mountain Regional Meeting of the American Chemical Society*, Park City, UT, June 15-18, (2008).
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101. Edgar D. Lee, Samuel E. Tolley, Aaron R. Hawkins, Daniel E. Austin, Brett J. Hansen, Milton L. Lee, and Doug L. Later, "Planar Electrode Array Ion Traps including a unique Coaxial Geometry," *56th ASMS Conference on Mass Spectrometry & Allied Topics*, Denver, CO, June 1 - 5, (2008).
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106. Samuel E. Tolley, Aaron R. Hawkins, Daniel E. Austin, Brett J. Hansen, Edgar D. Lee, Milton L. Lee, "Coaxial Ion Trap Using Concentric Planar Electrode Arrays," *Pittcon*, March 2-6, New Orleans, LA, (2008).
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109. Evan J. Lunt, Brian S. Phillips, Cory J. Jones, Aaron R. Hawkins, Philip Measor, Sergei Kuehn, and Holger Schmidt, "Hollow waveguide optimization for fluorescence based detection," *Photonics West*, San Jose, CA, January 19-24, (2008).
110. Aaron R. Hawkins, John F. Hulbert, Brandon T. Carroll, Bin Wu, and Holger Schmidt, "Fabrication methods for compact atomic spectroscopy (Invited)," *Photonics West*, San Jose, CA, January 19-24, (2008).
111. Mikhail I. Rudenko, Sergei Kuehn, Evan J. Lunt, Brian S. Phillips, David W. Deamer, Aaron R. Hawkins, and Holger Schmidt, "Fluorescence correlation spectroscopy of single molecules on an optofluidic chip (Invited)," *Photonics West*, San Jose, CA, January 19-24, (2008).
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113. John F. Hulbert, Brandon T. Carroll, Aaron R. Hawkins, Bin Wu, and Holger Schmidt, "Sealing techniques for on-chip atomic vapor cells," *Photonics West*, San Jose, CA, January 19-24, (2008).
114. H. Schmidt, A. Barman, S. Wang, J. Maas, A.R. Hawkins, S. Kwon and J. Bokor, "Magneto-optical observation of picosecond dynamics in single nanomagnets (Invited)", *Symposium on "Magnetization dynamics in nanomagnets"*, 52nd MMM Conference, Tampa, FL, November 5-9, (2007).
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116. Sergei Kühn, Philip Measor, Holger Schmidt, Evan J. Lunt, and Aaron R. Hawkins, "Two-beam optical trap in a waveguide," (Postdeadline Paper) *OSA Annual Meeting*, San Jose, CA, September 16-20, (2007).
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119. Holger Schmidt, Wenge Yang, Bin Wu, Don B. Conkey, John Hulbert, and Aaron R. Hawkins, "Saturation Absorption Spectroscopy in an Integrated Rubidium Vapor Cell," *Nonlinear Optics: Materials, Fundamentals and Applications*, Kona, HI, July 30 - August 3, (2007).

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156. Matthew M. Smith, John P. Barber, Bridget A. Peeni, Dongliang Yin, Holger Schmidt, and Aaron R. Hawkins "Planar fabrication of liquid core optical waveguides and microfluidic devices," *Joint Conference on Information Sciences*, Salt Lake City UT, July 28-31, (2005).
157. Justin Henrie, Aaron R. Hawkins, and Stephen M. Schultz, "Spectrum Sampling Reflectometer," *50th SPIE Annual Meeting*, San Diego CA, July 1-5, (2005).
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159. Dongliang Yin, Holger Schmidt, John P. Barber, and Aaron R. Hawkins, "Fluorescence detection of few molecules with high collection efficiency in ARROWs," *Conference on Lasers and Electro-Optics/International Quantum Electronics Conference*, Baltimore MD, May 22-25, (2005).
160. John P. Barber, Donald B. Conkey, Matthew M. Smith, Jeffrey R. Lee, Bridget A. Peeni, Zackary A. George, Aaron R. Hawkins, Dongliang Yin, and Holger Schmidt, "Hollow waveguides on planar

- substrates with selectable geometry cores,” *Conference on Lasers and Electro-Optics/International Quantum Electronics Conference*, Baltimore MD, May 22-25, (2005).
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 162. Bridget A. Peeni, Donald B. Conkey, Adam T. Woolley, Milton L. Lee, and Aaron R. Hawkins, “Electro-osmotic Pumps Constructed Using Sacrificial Etching,” *28th International Symposium on Capillary Chromatography and Electrophoresis*, Las Vegas NV, May 22-25, (2005).
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 166. Dongliang Yin, John P. Barber , Aaron R. Hawkins, and Holger Schmidt, “Low-loss Integrated Optical Sensors Based on Hollow-Core ARROW Waveguides,” *SPIE Photonics West*, San Jose, CA, January 22-27, (2005).
 167. Holger Schmidt, Dongliang Yin, David W. Deamer, John P. Barber, and Aaron R. Hawkins, "Integrated ARROW waveguides for gas/liquid sensing" (Invited Paper), *SPIE's 49th Annual Meeting*, Denver, CO, August 2-6, (2004).
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 172. Holger Schmidt, Dongliang Yin, John P. Barber, Ghassan Sanber, Elizabeth Despain, and Aaron R. Hawkins, "Integration of Electromagnetically Induced Transparency in Alkali Atoms on a Semiconductor Chip," *Conference on Lasers and Electro-Optics/International Quantum Electronics Conference*, San Francisco, CA, May 16-21, (2004).

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174. Naser Qureshi, Holger Schmidt, and Aaron R. Hawkins: "Cavity-enhanced Kerr Effect for Magneto-Optic Spectroscopy of Nanostructures", *IEEE Nano-Conference*, San Francisco CA, August 12-14, (2003).
175. Holger Schmidt, Dongliang Yin, and Aaron R. Hawkins: "Integrated optical spectroscopy of low-index gases and liquids using ARROW waveguides", Technical Digest, *Integrated Photonics Research and Applications*, Washington, DC, June 16-18, (2003).
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177. Aaron R. Hawkins and John E. Bowers, "High-Speed Wafer-Fused Photodetectors," (Invited Paper), *Lasers and Electro-Optics Society Annual Meeting*, San Francisco, CA, November 11-13 (1997).
178. John E. Bowers, Aaron R. Hawkins, and Near M. Margalit, "Novel Optoelectronic Devices Using Wafer Bonding," (Invited Paper), *1997 American Vacuum Society Annual Meeting*, San Jose, October 20, (1997).
179. Weishu Wu, Aaron R. Hawkins, and John E. Bowers, "Silicon Based Telecommunication Avalanche Photodetectors," (Invited Paper), *OECC '97*, Seoul, Korea, July 8-11, (1997).
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181. Weishu Wu, Aaron R. Hawkins, and John E. Bowers, "Effect of Electric Field Profile on Gain-Bandwidth Product of InGaAs/Si Avalanche Photodetectors," *Conference on Lasers and Electro-Optics*, Baltimore, MD, May 18-23, (1997).
182. Patrick Abraham, Alexis K. Black, Near M. Margalit, Aaron R. Hawkins, Steven P. DenBaars, and John E. Bowers, "Substrate Engineering of 1.55 μm Lasers," *Indium Phosphide and Related Materials*, Hyannis, MA, May 11-15, (1997).
183. Barry F. Levine, Aaron R. Hawkins, Sangee Hiu, B. J. Tseng, Cliff A. King, L. A. Gruezke, R. W. Johnson, D. R. Zolnowski, and John E. Bowers, "20 GHz high performance planar Si/InGaAs P-I-N photodetector," *Indium Phosphide and Related Materials*, Hyannis, MA, May 11-15, (1997).
184. Weishu Wu, Aaron R. Hawkins, and John E. Bowers, "High Gain-Bandwidth Product Si/InGaAs Avalanche Photodetectors," *Optical Fiber Conference*, Dallas, TX, February 16-21, (1997).
185. Aaron R. Hawkins, Weishu Wu, and John E. Bowers, "Improvement of Avalanche Photodetectors Through Integration of InGaAs and Si," (invited paper), *SPIE Proceedings*, **2999**, 68-75, (1997).
186. Weishu Wu, Aaron R. Hawkins, and John E. Bowers, "Design of Si/InGaAs Avalanche Photodetectors for 400 GHz Gain-Bandwidth Product," (invited paper), *SPIE Proceedings*, **3006**, 38-47, (1997).
187. Aaron R. Hawkins, Weishu Wu, Patrick Abraham, Klaus Streubel, and John E. Bowers, "High Gain-Bandwidth Product Silicon Hetero-Interface Photodetector," (Postdeadline Paper), *Lasers and Electro-Optics Society Annual Meeting*, Boston, MA, November 18-21 (1996).

188. Aaron R. Hawkins, Thomas E. Reynolds, Derek England, Dubravko I. Babic, Klaus Streubel, and John E. Bowers, "81 GHz Gain-Bandwidth Product Silicon Hetero-Interface Photodetector," *Device Research Conference*, Santa Barbara, CA, June 24-26, (1996).
189. Aaron R. Hawkins and John E. Bowers, "Silicon-InGaAs APDs - the best of both worlds," *WOSCEMMAD*, Santa Fe, NM, February 19-21, (1996).
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Patents

5 Issued patents while at UCSB and CIENA on avalanche photodiodes and photonics packaging technology

Patents issued while at Brigham Young University:

- Apparatus for optical measurements on low index non-solid materials based on ARROW waveguides
- Noncontact scanning impedance imaging
- Impact ionization amplification apparatus method and system
- Apparatus for optical measurements on low-index non-solid materials based on ARROWs (continuation)
- Integrated sensor with electrical and optical single molecule sensitivity
- Low Loss Hollow Core Optical Waveguide
- Integrated electrical/optical sensor for biomolecule analysis with single molecule sensitivity
- Integrated platform for atomic absorption spectroscopy

Patents pending and filed while at Brigham Young University:

- Plastic latching accelerometer based on bistable compliant mechanisms
- Method to improve integrated optical waveguides with non-solid cores
- Device for light-based particle manipulation on waveguides
- Thin film planar nanosieving device

RECENT GRANT FUNDING

Project Name	Period	Funding Source	Role	Project PI	Total Grant	Funds Supervised
Multiplexed, Non-Amplified, Nucleic Acid-Based Identification of Multidrug Resistant Pathogens Using an Integrated Optofluidic Platform	2015-2020	NIH	PI		\$5.5 M	\$1.2 M
IMMERSE/IML/Chip Camp	2016-2017	Micron Foundation	PI		\$145,000	\$145,000

Project Name	Period	Funding Source	Role	Project PI	Total Grant	Funds Supervised
Collaborative Research: Nanopore-gated on-chip trapping for single bioparticle sensing	2014 - 2017	NSF	PI		\$200,000	\$200,000
Miniaturized mass spectrometry using lithographically patterned electrodes	2014 - 2017	NSF	Co-PI	Austin (BYU)	\$400,000	\$150,000
Hand-Held Thermal Gradient GC-MS System	2015 - 2016	Perkin Elmer	Co-PI	Lee (BYU)	\$250,000	\$70,000
All Planar Fabrication of Chip-based Microfluidics with Electrospray Emitters	2015 - 2016	Perkin Elmer	PI		\$70,000	\$70,000
IMMERSE/IML/Chip Camp	2014-2015	Micron Foundation	PI		\$145,000	\$145,000
IML Support	2013-2015	IMFlash	PI		\$150,000	\$150,000
Hybrid integrated molecular analysis (HIMAS) for point-of-care diagnostics	2014 - 2017	NIH	Co-PI	Schmidt (UCSC)	\$1.2M	\$303,000
Solid State Ion Detection (SSID) Technology	2012-2014	DTRA/ARO	Co-PI	Ramsey (UNC)	\$2M	\$250,000
A Dual-Nanopore Instrument for Single DNA Measurements and Control	2012-2014	NIH	Co-PI	Dunbar (UCSC)	\$325,000	\$100,000
Hybrid integrated molecular analysis (HIMAS) for point-of-care diagnostics	2012-2014	NIH	Co-PI	Schmidt (UCSC)	\$325,000	\$100,000
Collaborative Research: Ultrasensitive Cancer Biomarker Detection on Biophotonic Chips	2012-2015	NSF	PI		\$210,000	\$210,000
Rapid, low-cost mRNA analysis system for cancer companion diagnostics	2012-2013	NIH	Co-PI	Measor (LiquiLume)	\$250,000	\$40,000
MRI: Acquisition of a direct write micro patterning system	2011-2012	NSF	Co-PI	Austin (BYU)	\$400,000	\$50,000
Portable Amplification-free Virus Nucleic Acid Detector	2011-2012	NSF	Co-PI	Measor (LiquiLume)	\$200,000	\$30,000

Project Name	Period	Funding Source	Role	Project PI	Total Grant	Funds Supervised
Collaborative Research: Slow and Stopped Light Photonics with Atomic Spectroscopy Chips	2011-2014	NSF	PI		\$180,000	\$180,000
Integrated optical particle trap for biomolecule analysis and manipulation	2009-2011	NIH	Co-PI	Schmidt (UCSC)	\$325,000	\$147,000
MRI: Acquisition of chlorine based reactive ion etcher	2007-2008	NSF	PI		\$300,000	\$300,000
Impact Ionization Based Multipliers for Optical Receivers	2007-2010	NSF	PI		\$270,000	\$270,000
The Open Storage Ring: a Mass-Mobility Spectrometer for in situ Characterization of Planetary Atmospheres and Evolved Gases	2007-2010	NASA	Co-PI	Austin (BYU)	\$558,000	\$150,000
Research Initiation: Optically Powered Transistor	2007-2008	BYU	PI		\$15,000	\$15,000
Single biomolecule sensors using integrated optical waveguides with liquid cores	2006-2009	NIH	Co-PI	Schmidt (UCSC)	\$1.3 M	\$500,000
Collaboration: SST: Integrated optical and electrical single molecule sensors	2006-2009	NSF	PI		\$400,000	\$133,000
Visible/Short Wave Infrared-Photon Counting Arrays (PCAR)	2006-2009	DARPA	Co-PI	Jack (Raytheon)	\$4 M	\$425,000
Research Initiation: Impedance Measurement of Micro-Fluidic Channels	2006-2007	BYU	PI		\$15,000	\$15,000
Collaboration: Integrated optical sensors using quantum interference in antiresonant waveguides	2005-2008	NSF	PI		\$225,000	\$112,500
Single-photon nonlinear optics in integrated hollow-core waveguides	2005-2009	DARPA	Co-PI	Schmidt (UCSC)	\$900,000	\$400,000

Project Name	Period	Funding Source	Role	Project PI	Total Grant	Funds Supervised
Integrated Hollow-Core Optical Waveguides	2005 - 2007	D. Huber Found.	PI		\$75,000	\$75,000
Low Noise Ionization Amplifier	2005	Raytheon	PI		\$25,000	\$25,000
Integrated Optical Waveguide Sensors for Biomedical Research	2004-2006	NIH	Co-PI	Schmidt (UCSC)	\$375,000	\$175,000
Research Initiation: Scanning Impedance Imager	2004-2006	BYU	PI		\$25,000	\$25,000
Chemical and Biological Agent Detector	2003-2005	DOD	Co-PI	Lee (BYU)	\$250,000	\$100,000
Handheld Chemical and Biological Agent Detector	2003-2007	DTRA	Senior Person	Lee (BYU)	\$6M	\$125,000
IMMERSE – Intensive Mentoring and Research in Micro-Electronics for Students in Engineering	2003 - 2013	BYU	PI		\$200,000	\$200,000
IMMERSE and IML Maintenance	2007-2013	Micron Foundation	PI		\$430,000	\$430,000
				Totals:	\$27.64 M	\$7.016 M

STUDENT MENTORING

Graduate Students Advised

Completed Degrees – Primary Advisor

- John P. Barber – Ph.D. (2006)
- Hong-Wei Lee – Ph.D. (2006)
- Donald B. Conkey – M.S. (2007)
- Hanho Cho – M.S. (2008)
- Joshua L. Beutler – Ph.D. (2010)
- Tao Shang – Ph.D. (2010)
- Evan J. Lunt – Ph.D. (2010)
- Mark N. Hamblin – Ph.D. (2010)
- Katie Hurd – M.S. (2010)
- Michael S. Johnson – Ph.D. (2011)
- Matthew R. Holmes – Ph.D. (2011)
- Brian S. Phillips – Ph.D. (2011)
- Yue Zhao – Ph.D. (2012)
- Brett J. Hansen – Ph.D. (2013)

- John F. Hulbert – Ph.D. (2013)
- Lynnell Zempoaltecatl – M.S. (2013)
- Michael Olson – M.S. (2014)
- Sadek Sabbah – M.S. (2014)
- Cameron Hill – M.S. (2015)

Completed Degrees – Committee Member

- 18 Ph.D., 8 M.S. Students

Current Students – Primary Advisor

- Matthieu Girard-Carrier – Ph.D. (Expected 2016)
- Derek Andrews – M.S. (Expected 2016)
- Sanjiv Pant – M.S. (Expected 2016)
- Steven Hammon – M.S. (Expected 2017)
- John M. Stout – Ph.D. (Expected 2017)
- Thomas Wall – Ph.D. (Expected 2017)
- Matthew Stott – Ph.D. (Expected 2018)
- Joel Wright – Ph.D. (Expected 2019)
- Matthew Hamblin – Ph.D. (Expected 2019)
- Erik Hamilton – Ph.D. (Expected 2019)

Current Students – Committee Member

- 10 Ph.D., 5 M.S. Students

Undergraduate Research Programs

IMMERSE Program

Together with Prof. Stephen Schultz of BYU's Electrical and Computer Engineering Department, I initiated the Intensive Mentoring and Micro-Electronic Research for Students in Engineering (IMMERSE) program in 2003. Its goal is to prepare students for entry into top tier graduate programs and provide them an opportunity to author or co-author a technical paper. The program has grown to include approximately 50 undergraduate students and 8 faculty advisors annually. Students in the program receive one-on-one training by faculty and senior students and are assigned to an independent project. Students are offered full time employment in the summer and part time employment during the school year. Funding is provided by an existing BYU mentoring program, the MICRON Foundation, ORCA and department funds, and through external research grants.

IMMERSE Highlights:

- 186 Students employed since 2003
- > 80% of students have authored or co-authored a technical paper
- > 75% of students have pursued graduate degrees
- <http://immerse.byu.edu>

ORCA Scholarships

BYU's Office of Research and Creative Activities (ORCA) provides \$1800 scholarships for undergraduate students to conduct independent research projects. Students write proposals and conduct the projects with the assistance of a faculty advisor. To date, I have advised 22 of these ORCA scholarship projects.

PROFESSIONAL SERVICE

Editorships

- Editor-in-Chief for IEEE Journal of Quantum Electronics (2014 – 2017)
- Associate Editor for IEEE Journal of Quantum Electronics (2007 – 2014)

Technical Society Leadership

- IEEE Photonics Society Publications Council (2017 – present)

Conference Program Committees

- Conference on Lasers and Electro-Optics (CLEO) (2017 - 2019)
- University/Government/Industry Micro/Nanotechnology (UGIM) Symposium (2016)
- IEEE International Midwest Symposium on Circuits and Systems (MWSCAS) (2015)
- Advanced Fabrication Technologies for Micro/Nano-Optics & Photonics at *Photonics West* (2008 - present)
- Conference on Lasers and Electro-Optics (CLEO) (2010 - 2012)
- IEEE/LEOS Summer Topical Meeting on Optofluidics (2008)

Reviewer for Research Proposals

- Department of Energy
- Environmental Molecular Sciences Laboratory
- European Research Council
- Israel Science Foundation
- National Aeronautics and Space Administration
- National Institutes of Health
- National Science Foundation

Reviewer for Professional Journals

- Advances in Optical Technology
- Applied Materials and Interfaces
- Applied Optics
- Applied Physics Letters
- Biomedical Optics Express
- Biomicrofluidics
- Diagnostics
- IEEE Internet of Things Journal
- IEEE Photonics Technology Letters
- IEEE Journal of Quantum Electronics
- IEEE Journal of Lightwave Technology
- Journal of Electronic Materials
- Journal of Materials Chemistry C
- Journal of Microfluidics and Nanofluidics
- Journal of Micromechanics and Microengineering
- Journal of Nanoscience and Nanotechnology
- Lab-on-a-Chip
- Light: Science and Applications

- Measurement Science and Technology
- Micromachines
- Microsystems and Nanoengineering
- Nanomaterials and Nanotechnology
- Nanotechnology
- Nature Communications
- Optical and Quantum Electronics
- Optical Materials
- Optical Materials Express
- Optics Communications
- Optics Express
- RSC Advances
- Science
- Scientific Reports
- Soft Matter
- Solid-State Electronics

Nominator for Prizes and Awards

- The Kyoto Prize
- The Heinz Awards

Web Based Reference Tools

An effort was begun in 2003 to provide on-line instructions for the tools in BYU's cleanroom facility, the Integrated Microfabrication Laboratory. This work rapidly expanded to include basic reference information on semiconductors, microfabrication, and equipment operation, including tutorials and interactive calculators and graphs. This information is now contained at the following website: www.ee.byu.edu/cleanroom and contains over 250 separate pages of information. The site receives around 90,000 hits per month from external visitors who use it as an essential reference. A companion site was launched in 2005 dedicated to providing reference information on photonics topics: www.ee.byu.edu/photonics. This site contains over 100 separate pages and receives 50,000 hits per month from external visitors. Prof. Stephen Schultz and I oversee the continued expansion and improvement of these two sites. Most of the HTML coding is done by students participating in our IMMERSE program.

Professional Memberships

- IEEE - Institute of Electrical and Electronic Engineers
- APS – American Physical Society
- OSA – Optical Society of America
- ASEE – American Society of Engineering Education

UNIVERSITY SERVICE

Department Committees and Assignments

- Associate Department Chair (2012 – present)
- Chair Rank & Status Committee (2012 – present)
- Chair Faculty Hiring Committee (2012 – present)
- Chair External Relations Committee (2010 - 2012)
- Member External Relations Committee (2002 – 2010)

University Committees

- Utah Conference on Undergraduate Research selection committee (2006)

Laboratory Director

Since 2002 I have directed the Integrated Microfabrication Laboratory, a 2500 ft² class 10 cleanroom. This facility is open for use by all BYU faculty and students and provides a significant resource for researchers in the micro and nanotechnology fields. I have had oversight of fundraising, lab budgets, student training and admission, equipment removal and installation, lab procedures, and staff activities. Since my arrival, >30 new systems have been installed, dramatically improving the labs capabilities. The number of lab users has also significantly increased. Current registered users total >130, with approximately 60 of those coming from the Electrical and Computer Engineering Department. It is estimated that the laboratory currently supports research projects with total external funding levels of \$3 Million per year.

CV Last Updated November 2015