Andrew Sarangan

Dept. of Electro-Optics and Photonics
School of Engineering
University of Dayton, Dayton, OH
(937) 229-3190
sarangan@udayton.edu
http://professornano.com/

OVERVIEW

Professor & Chair, Dept. of Electro-Optics and Photonics
- Focus areas: Thin Films, Nanofabrication, Optoelectronics

Licensed Professional Engineer (Ohio)
Commercial Pilot & Flight Instructor
Amateur Radio: KE8ORW (General)
Citizenship: USA & Canada
Security Clearance: Current (details available upon request)

ACADEMIC APPOINTMENTS

University of Dayton, OH, USA
Department of Electro-Optics and Photonics

Dean's Cabinet	2023 - present
Department Chair	2020 - present
Full Professor	2011 - present
Associate Professor	2006 - 2011
Assistant Professor	2000 - 2006

- **Key Accomplishments (as chair)**:
  - Led the creation of the Semiconductor Manufacturing Minor and the EOP Minor degrees, including several new courses in semiconductors.
  - Re-negotiated several partnerships with industries and universities to better align with the mission of my department and the university.
  - Prioritized diversity and inclusion in the department with a focus on integration and disability accommodation.
  - Dean's cabinet member.
- **Key Accomplishments (as faculty)**:
  - Produced over $9M in research funding in thin films, nanofabrication and optoelectronics.
  - Established a nanofabrication cleanroom as a single-PI effort *entirely from externally sponsored research funds*. To the best of my knowledge, there is no other facility of this magnitude that was created and run by a single PI.
  - My lab is currently the focal point for UD's participation in the federal Chips Act and Intel's educational partnership.

  - I personally maintain its daily operations, and until recently received no subsidies or course-release from the university. The laboratory has all of the standard fab capabilities (thin films, photolithography, deep-UV interference lithography, thermal processes and plasma etching). Laboratory website: http://nano-fab.com

- **Research Areas**: Nanofabrication, Optical thin films, Phase change materials, Lithography

University of New Mexico, Albuquerque, NM, USA
Center for High Technology Materials (CHTM) 1997 - 2000
Research Assistant Professor

- High power, high brightness semiconductor lasers

EDUCATION

PhD Electrical Engineering 1993-1997
University of Waterloo, Canada
"Multi-wavelength distributed feedback lasers"
Dissertation advisor: W. -P. Huang (currently at Shandong University, China)

MASc Electrical Engineering 1991-1993
University of Waterloo, Canada
"An electronic switch based on quantum interference"
Thesis advisor: W. -P. Huang

BASc Electrical Engineering 1986-1991
University of Waterloo, Canada
Physics Option

AWARDS & HONORS

- 2019 IEEE Dayton Section Photonics Society Award:
  For recognition of his work in supporting photonics in the greater Dayton area, including his many years of service as the head of the IEEE Dayton Photonics Society, as well as his work in teaching and research in the fields of thin films and nanofabrication
- AFOSR Summer Faculty Fellowship (2001 - 2002, 2017 - 2020) for research at Air Force Research Laboratory, Wright-Patterson AFB.
- 2018 Vision Award for Excellence - University of Dayton
- 2013 Faculty Excellence in Teaching Awards – Southwestern Ohio Council for Higher Education
- 2013 Affiliate Societies Council Outstanding Scientists & Engineers Award – Research category, Dayton, OH
- 2008 Sigma Xi Noland Award for Excellence in Research, University of Dayton
- Post-Doctoral Fellowship for Research in Optoelectronics (1997 &1998) - Natural Sciences and Engineering Research Council (NSERC) of Canada. This is a prestigious two-year award. Only 14 were awarded in all of Canada in Electrical Engineering during this cycle, and I was the only Engineering recipient at the University of Waterloo.

- Post-Graduate Scholarship, NSERC of Canada (1991-1995). Full scholarships for MS & PhD.
- Telecommunications Research Institute of Ontario (Canada) Internship award (1995-1997).

PROFESSIONAL SOCIETIES & SERVICE

- Conference Program Committee - SPIE Nanoscience + Engineering (2022 - present)
- Associate Editor of IEEE Journal of Quantum Electronics (2016 - 2021)
- Chair of the Technical program committee of IEEE Photonics Society on Photodetectors, Sensors, Systems and Imaging (2017, 2018 & 2019)
- Chair of the IEEE/Photonics Society chapter of Dayton, OH (2002 - 2018)
- Conference Chair - SPIE Great Lakes Photonics Symposium, Nano and Micro Technologies and Applications (2004)
- Conference Chair - SPIE Great Lakes Photonics Symposium, Nano and Microphotonics: Materials, Devices, Processing, and Applications (2006)
- Conference Program Committee - Great Lakes Photonics Symposium, Liquid Crystal Technology and Applications (2006)
- Conference Program Committee - SPIE International Symposium on Photonics and Optoelectronics, SOPO, (2014)
- Conference Program Committee - SPIE International Workshop on Thin Films for Electronics, Electro-Optics, Energy and Sensors (2019)
- IEEE, Photonics Society, Electron Devices Society, Member (1994 - present), Senior Member (2005 - present)
- SPIE, Member (2004 - present), Senior Member (2015 - present), Lifetime Member (2016 - present)
- Member, AIAA, American Institute of Aeronautics and Astronautics (2023 -present)
- Member, AOPA, Aircraft Owners and Pilots Association (1997 - present)
- Member, EAA, Experimental Aircraft Association (1999 - present)

ENGINEERING EXPERIENCE

- Consultant for Silfex (Lam Research Corp.) on semiconductor etch process development
- Consultant for several DoD contractors in semiconductors and photonics
- Employed at Nortel Networks, IBM & Air Force Research Laboratory (Kirtland AFB).

PROFESSIONAL AVIATION EXPERIENCE

- FAA Certificates:
  - Commercial Pilot: Airplane Single Engine Land/Instrument Airplane
  - Flight Instructor: Airplane Single Engine/Instrument
  - Ground Instructor: Advanced/Instrument
  - Remote Pilot

- Flight Experience:
  - $\sim$ 1600 hours as pilot-in-command
  - 25 years of flight experience in USA & Canada
- Sinclair Community College, Dayton, OH
  - Over 300 hrs of IFR instruction given in the Redbird FMX motion flight simulator
  - Taught classes for primary and instrument ratings
- Flight Instructor (freelance), Dayton, OH (MGY & I73) 2000 - present
  - Professional pilot training for primary and instrument students
- Flight Instructor (freelance), Albuquerque, NM (ABQ) 1998 - 2000
  - Professional pilot training for primary and instrument students
  - Taught high density altitude and mountain operations

PATENTS

- Agus Widjaja, Andrew Sarangan, "*Thin film structures with negative inductance and methods for fabricating inductors comprising the same*", U.S. Patent No. 20090261936, 2011
- Gregory M. Peake, Stephen D. Hersee and Andrew M. Sarangan, "*Non-Planar Micro-Optical Structures*", U.S. Patent No. 6,728,289, 2004
- Gregory M. Peake, Stephen D. Hersee and Andrew M. Sarangan, "*Method of Making Non-Planar Micro-Optical Structures*", U.S. Patent No. 6365237, 2002
- G.P. Li, T. Makino, A. Sarangan and W.P. Huang, "*Multi-Wavelength Gain-Coupled Distributed Feedback Laser Arrays with Fine Tunability*", U.S. Patent No. 5536085, 1996

EXTERNAL FUNDING [$6.1M as PI, $2.9M as Co-PI, Total $9.0M]

- **(Active)** National Science Foundation (NSF), "Equipment: Acquisition of a laser direct-write photolithography system", $390,390 (PI, 09/2023 - 08/2026).
- **(Active)** Air Force Research Laboratory/Azimuth, "Thin Film Design", $324,996 (PI, 07/2022-07/2027).
- **(Active)** Lam Research Corp., "Metal-Assisted Chemical Etching (MACE) for surface roughening of silicon", $25,000 (Unlocking Ideas Competition Award) (PI, 10/2021).
- **(Active)** Ford Motor Co., "E-Tunable NIR Filter", $50,000 (Ford University Research Program) (PI, 10/2022).
- **(Active)** Air Force Research Laboratory/DAGSI, "Nonlinear Optical Materials", $151,614 (PI, 08/2021-10/2024).
- Ohio Federal Research Network/OSU, "ALTITUDE: Affordable LIDAR Technologies for Integration and Unmanned Deployment", $267,035 (PI, 10/2021-04/2023).

- Ohio Federal Research Network/OSU, "Thin-film Crystals for High-speed Optical Modulation", $401,669 (co-PI, 10/2021-04/2023).
- Air Force Research Laboratory/UES, "Vanadium Oxide Growth & Characterization", $51,576 (PI, 08/2021-03/2023).
- Air Force Research Laboratory/Azimuth, "Novel Optical Thin Films", $259,846 (PI, 06/2021-07/2022).
- Brisk Computing LLC., "Neuromorphic Chip Fabrication", $10,023 (PI, 09/2020-02/2021).
- Silfex Inc., "Fundamental studies of etch vs morphology research", $25,000 (PI, 06/2020).
- Air Force Research Lab., "Tunable high energy laser system", $140,000 (Equipment Donation) (PI, 02/2021).
- Gentex Corp., "Stylus Profilometer", $15,000 (Equipment Donation) (PI, 10/2019).
- Lam Research Corp./Silfex Inc, "Laser-assisted chemical etching for deep silicon micromachining", $25,000 (Unlocking Ideas Competition Award) (PI, 08/2018).
- STTR Phase 2 - Air Force, "Fast Optical Limiters with Enhanced Dynamic Range", $376,910, Aegis Inc. (PI, 11/2018-02/2022).
- Gentex Corp., "Wiregrid polarizers for automotive applications", $39,220 (PI, 06/2017 - 12/2018).
- National Science Foundation (NSF), "Collaborative Research: Nanopatterning and temporal control of phase-change materials for reconfigurable photonics", $197,768 (Co-PI, 08/2017 - 07/2020).
- Silanna Semiconductor, "UVC Material evaluation", $9000 (PI, 03/2017 - 08/2017).
- Dayton Area Graduate Studies Institute, "An Integrated Photonics CMOS Compatible Platform for Chemical and Biological Sensors", $228,393 (PI, 07/2016 - 12/2019).
- Air Force Research Laboratory, "Transition Metal Nitrides for Opto-Electronic Applications & New Ferroelectrics & Composite Multiferroic Materials for RF", $98,734 (PI, 07/2017 - 08/2019).
- Air Force Research Laboratory, "Silicon Nanowires", $35,000 (PI, 04/2014 - 12/2014).
- Air Force Research Laboratory/UES, "Infrared Anti-Reflection Coatings", $51,962 (PI, 01/2015 - 06/2017).
- Missile Defense Agency Phase 1 SBIR/Rnet, "ID Compromised Electronic Components", $40,000 (PI, 01/2015 - 07/2015).
- Air Force Research Laboratory, "Thermal Diffusion Tube Furnace System", $13,352 (PI, 10/2014 - 10/2014).
- Air Force Research Laboratory, "Ion Assisted Deposition System", $19,514 (PI, 07/2014 - 07/2014).

- Air Force Research Laboratory, "Interferometric Lithography and Substrate Patterning/Epitaxy for Nonlinear Quasi-Phase-Matched Device Development", $368,505 (PI, 01/2014 - 07/2016).
- Air Force Research Laboratory/UES, "Anti-reflection coatings", $25,000 (PI, 01/2014 - 12/2015).
- National Science Foundation (NSF), "CC-NIE Network Infrastructure: Network 10Gb Upgrade and Science DMZ Implementation to Support Science and Engineering Research and Enhance Outreach for High School STEM Education", $232,788 (Co-PI, 12/2013 - 05/2016).
- National Science Foundation (NSF), "CCSS: Spectral Filter Array for Multispectral Imaging", $319,952 (Co-PI, 09/2013 - 08/2016).
- National Science Foundation (NSF), "Collaborative Research: Cross-institutional Nanotechnology Education and Workforce Training Project", $100,000 (PI, 01/2012 - 12/2014).
- China Southern Glass Holding Co. Ltd, "Electrochromic glass research and development", $175,000 (Co-PI, 10/2012 - 09/2013).
- FMI Imaging, "Development of metal vapor coating & blue-enhanced detectors for medical imaging", $30,800 (PI, 09/2012 - 04/2013).
- FMI Imaging, "Rapid thermal annealer for blue enhanced detector development", $44,300 (PI, 06/2011 - 01/2012).
- Air Force Research Laboratory/UES, "Infrared Coatings for Laser Effects on Materials, Structures and Sensors", $39,000 (PI, 04/2011 - 10/2013).
- Navy SBIR Phase 1/Forza Silicon, "Dual Well Focal Plane Array", $19,536 (PI, 08/2010 - 12/2010).
- Air Force Research Laboratory, "Interdisciplinary Technology Development for Future MAV Systems", $1,506,500 (Co-PI, 10/2008 - 09/2011).
- Air Force Research Laboratory, "Project Biosense", $175,000 (PI, 08/2010 - 07/2013).
- Air Force Research Laboratory, "Mid-Wave Infrared Sensing Technology Advancement (MISTA)", $99,989 (PI, 08/2010 - 12/2012).
- DARPA/University of Rochester, "Development of Mini-Cluster Computational Facility For Modeling Large Mode Area Fibers", $45,200 (PI, 04/2009 - 08/2010).
- Missile Defense Agency SBIR Phase 2/Aegis, "Beam Steering", $33,121 (PI, 04/2009 - 03/2011).
- L3 Cincinnati Electronics, "Development of Spectral and Polarimetric Devices for Lenslet Imaging", $34,158 (PI, 07/2009 - 06/2010).
- Air Force Research Laboratory/GDIT, "Anti-reflection coatings", $44,600 (PI, 04/2008 - 10/2010).
- Air Force Research Laboratory, "Development of Advanced Infrared Detectors", $78,016 (PI, 01/2009 - 10/2009).

- Institute for the Development and Commercialization of Advanced Sensors Technology, "Polarimetric Imaging Technology", $200,000 (PI, 02/2007 - 01/2010).
- Institute for the Development and Commercialization of Advanced Sensors Technology - OSCAR Project, "Fabrication of MWIR Micro-lenslet imaging arrays", $24,530 (PI, 07/2009 - 06/2010).
- Air Force Research Laboratory/L3CE, "Multispectral/Polarimetric Imaging Camera Program", $202,000 (PI, 04/2006 - 12/2007).
- Office of Naval Research/L3CE, "Multi Color IR FPA Utilizing Low Cost 2D Pixel Architecture", $37,000 (PI, 04/2006 - 12/2006).
- Mantech/L3CE, "Large Area Micro-Optics", $25,000 (PI, 10/2005 - 04/2006).
- Air Force Research Laboratory, "Quantum Cascade Lasers", $18,000 (PI, 05/2005 - 12/2005).
- Missile Defense Agency/L3CE, "C-QWIP Based IR Detectors", $45,598 (PI, 05/2005 - 04/2006).
- Ohio Third Frontier Wright Project, "Development and Commercialization of Long-wavelength Infrared Focal Plane Arrays", $1,092,800 (PI, 01/2005 - 03/2009).
- L3 Cincinnati Electronics, "Micro-optic IR FPA Project", $126,727 (PI, 09/2004 - 12/2008).
- Wright Capital Project Fund, "Development of Arrayed micro-optic elements for enhanced infrared image detection", $773,589 (PI, 09/2003 - 08/2006).
- Navy Research Laboratory STTR Phase 1/Defense Research Associates, "Silicon-Based Visible/Near-Infrared Affordable Missile Warning", $17,644 (PI, 07/2003 - 01/2004).
- National Science Foundation (NSF) SBIR Phase 1/Srico Inc, "Photonic Band Gap Waveguide Structures in Lithium Niobate", $19,714 (Co-PI, 07/2002 - 12/2002).
- Dayton Area Graduate Studies Institute, "Measurement and Modeling of Aero-Optical Aberrations in Coherent Laser Radiation", $66,660 (Co-PI, 07/2001 - 06/2004).

GRADUATE STUDENTS

Current

- Remona Heenkenda (PhD), Maryam Al-Saud (PhD), Osama Rana (PhD), Ifeanyi Njoku (PhD), Angelica Drees (MS), Yi Wang (MS).

Past

- Angelica Dress (MS, 2024), Roseanna Lawandi (PhD, 2023), Gongxu Bai (MS, 2021), Maggie Lankford (MS, 2021), Haixin Zhang (MS, 2021), Jacob Hoehler (MS, 2020), David Lombardo (PhD, 2020), Zachary Biegler (MS, 2019), Roseanna Lawandi (MS, 2018), Josh Duran (PhD, 2018), Pengfei Guo (PhD, 2018), Chuan Ni (PhD, 2017) Shen Yangfei (MS, 2016), Mengyang Zou (MS, 2015), Ying Xu (MS, 2015), Junxin Wang (MS, 2014), Chuan Ni (MS, 2014), Emily Fehrman (PhD, 2014), Piyush Shah (PhD – WSU, 2012), Alex Watson (MS, 2011), Josh

Duran (MS, 2011), Ben Booso (MS, 2010), Lirong Sun (PhD, 2009), Adam Cooney (PhD, 2009), Anupriya Krishnan (MS, 2008), Mengshu Pan (MS, 2008), Emily Fehrman (MS, 2007), Aziz Mahfoud (PhD, 2006), Jang-Pyo Kim (PhD, 2006), Cijy Sunny (MS, 2005), Sreelakshmi Talluri (MS, 2005), Saikiran Tiramareddy (MS, 2004), Sarah Blickenstaff (MS, 2004), Luke Borntrager (MS, 2004).

TEACHING

Currently teaching:

Graduate Courses

- Photonic Devices and Systems EOP-506/ECE-573
- Fundamental Principles of Nanofabrication EOP-533/ECE-580 (course was created by me)
- Optical Thin Film Design EOP-532 (course was created by me)

Previously taught:

Graduate Courses

- Integrated Optics EOP-604/ECE-674
- Quantum Electronics EOP-626/ECE-676

Undergraduate Courses

- Electrical and Electronic Circuits EGR-203

Sample Student Evaluation Comments

- *Professor Andrew is an excellent teacher who can explain complicated concepts in a way that's easy to understand. Having more instructors like him would certainly benefit the department!* - Spring 2024
- *I would suggest if all the lectures would be recorded and kept so that students can revisit all the awesome lectures and revision again.* - Spring 2024
- *The lectures were thoroughly enjoyable. Material was always conveyed to be interesting, examples helped to work out minor understandings in how equations would be used, and frequent questions and discussions were great for rounding out material.* - Spring 2023
- *Thanks for the class really enjoyed the information that was provided and I think this class was very informative and the information was delivered in a very concise and robust manner. I learned a lot and the only complaint I have (a small one) is that I wish some parts of the notes provided more derivations from first principals. I know that is not really the purpose of the course but I am pretty nerdy and like that stuff.* - Spring 2022
- *Good class, Good content. Thanks for everything you prepared.* - Spring 2022

- *I really like the notes of this course. It contains lots of pictures, graphs and models, makes the content clear and vivid. Explanation and description are easy to understand. Math and algebra are rather simple, without complex derivation. Actually this is the only textbook I can read just for fun after class, while others really takes courage.* – Spring 2021
- *A lot of advanced technology and sensors are mentioned, which can really arouse one's interest. And I'm able to know much of the details, like the applications, designs and costings.* – Spring 2021
- *Dr. Sarangan educated us to always have the exploring spirit.* – Spring 2021
- *I am impressed by his ability to communicate difficult subjects as if they are intuitive.* – Spring 2020
- *Prof. Andrew provided us with many examples on each topic, which clearly illustrated both theory and application.* – Spring 2020
- *Having access to the notes allowed me to focus on what Dr. Sarangan was saying, not what he was writing. Additionally, the notes were great for studying outside of class.* – Spring 2019
- *Dr. Sarangan did an excellent job preparing notes for the lectures and presenting them in a clear and efficient manner.* – Spring 2019
- *I really liked the way this course was presented. The information seemed to flow logically, the instructor was excited about the topic, and we had projects that required us to think through all the information we learned throughout the semester and apply it to a problem.* – Fall 2018
- *I really enjoyed this course. The material was explained well and the professor's excitement for the field really showed through his teaching. Additionally, the lack of homework and exams, I felt, really took the pressure of academia out of the class and allowed us to simply try to soak in the material. The fact that we did projects throughout the semester allowed us to take the information we had learned in class and apply it to a problem and try to solve it to the best of our ability. Plus, the public speaking gave us practice presenting our work and helped us prepare for questions on our work in the future. All in all, this was one of my favorite (if not my favorite) courses I have taken at UD.* – Fall 2018
- *Dr. Sarangan did a wonderful job organizing the subject matter and repeating the important concepts to really help drive them home.* – Fall 2018
- *Not only did Dr. Sarangan introduce us to the basics of nanofabrication, but he also included many practical engineering insights that enhanced my understanding.* – Fall 2018

SERVICE

I have served on a large number of university committees, including three consecutive School of Engineering Dean search committees, Associate Provost's search committee, School of Engineering Graduate Studies Committee, Graduate Student Summer Fellowship Committee, Research Council Seed Grant Committee, Academic Senate, Faculty Affairs Committee, Dean's Cabinet, etc. I have also served on numerous NSF panel reviews and performed many DoD proposal reviews. I have not kept track of these activities to provide a chronological list.

In addition to serving on formal committees, I have also established new efforts outside the scope of my regular duties, such as creating student organizations, seminar series, workshops etc... which continue to this day.

SOLE-AUTHOR BOOKS

- Andrew Sarangan. *Nanofabrication: Principles to Laboratory Practice (Optical Sciences and Applications of Light)*. CRC Press, 2016. doi:10.1201/9781315370514
- Andrew Sarangan. *Optical Thin Film Design*. CRC Press, 2020. doi:10.1201/9780429423352

BOOK CHAPTERS

- A. Sarangan. "Quantum mechanics and computation in nanophotonics". *Fundamentals and Applications of Nanophotonics*, pages 45–87. Elsevier, 2016. doi:10.1016/B978-1-78242-464-2.00003-8
- A. Sarangan. "Nanofabrication". *Fundamentals and Applications of Nanophotonics*, pages 149–184. Elsevier, 2016. doi:10.1016/B978-1-78242-464-2.00005-1
- Andrew M. Sarangan. "Design and nanophotonic thin film devices using phase change materials". *Thin Film Nanophotonics*, pages 179–199. Elsevier, 2021. doi:10.1016/b978-0-12-822085-6.00004-2

PUBLICATIONS AND PROCEEDINGS [Google Scholar]

2024

Journals

158. Roseanna G. Lawandi, Dylan Morden, Imad Agha, Shivashankar Vangala, and Andrew M. Sarangan. "VO_2 wire grid polarizers for MWIR applications". *Journal of the Optical Society of America B*, 41(3):744, 2024. doi:10.1364/josab.512439

157. Roseanna G. Lawandi, Zhanibek Bolatbek, Imad Agha, Keigo Hirakawa, and Andrew M. Sarangan. "Continuously variable fourier filters fabricated using varying angle glancing angle deposition for chip-scale spectroscopy". *Applied Optics*, 63(6):1517, 2024. doi:10.1364/ao.514319

2023

Journals

156. Md Shah Alam, Ryan Laing, Zhanibek Bolatbek, Remona Heenkenda, Rudra Gnawali, Tamara E. Payne, Andrew Sarangan, Joshua R. Hendrickson, and Imad Agha. "Fast cycling speed with multimillion cycling endurance of ultra-low loss phase change material (sb2se3) by engineered laser pulse irradiation". *Advanced Functional Materials*, 2023. doi:10.1002/adfm.202310306

155. Roseanna G. Lawandi, Trent Malone, Joshua A. Burrow, Joshua R. Hendrickson, Shivashankar Vangala, Andrew Sarangan, and Imad Agha. "Fabrication, characterization and numerical modeling of Sb_2Se_3 nano-patterned structures". *Optical Materials Express*, 13(12):3428, 2023. doi:10.1364/ome.504959

154. Joshua A. Burrow, Roseanna G. Lawandi, Andrew Sarangan, and Imad Agha. "Electrically addressable tungsten doped phase change device in a through pixel configuration". *Optical Materials Express*, 13(4):1131, 2023. doi:10.1364/ome.486073

Proceedings & Presentations

153. Angelica Drees, Peter Stevenson, and Andrew M. Sarangan. "Deposition and characterization of distributed feedback resonant-cavities with complex index active layers". *Nanoengineering: Fabrication, Properties, Optics, Thin Films, and Devices XX*. SPIE, 2023. doi:10.1117/12.2681693

152. Roseanna G. Lawandi, Zhanibek Bolatbek, Imad Agha, Keigo Hirakawa, and Andrew M. Sarangan. "Single-shot spectroscopy using continuously variable filters". *Nanoengineering: Fabrication, Properties, Optics, Thin Films, and Devices XX*. SPIE, 2023. doi:10.1117/12.2681657

151. Joshua A. Burrow, Kimani C. Toussaint, Andrew Sarangan, and Imad Agha. "Reconfigurable opto-chirality enabled by chalcogenide phase change nanomaterials". *International Workshop on Thin Films for Electronics, Electro-Optics, Energy and Sensors 2022*. SPIE, 2023. doi:10.1117/12.2645974

150. Joshua A. Burrow, Md Shah Alam, Evan M. Smith, Riad Yahiaoui, Ryan Laing, Piyush J. Shah, Thomas Searles, Shivashankar Vangala, Joshua R. Hendrickson, Andrew Sarangan, and Imad Agha. "Reconfigurable chiral phase change nanomaterials". *CLEO 2023*. Optica Publishing Group, 2023. doi:10.1364/cleo_si.2023.sm3h.6

2022

Journals

149. Roseanna Lawandi, Remona Heenkenda, and Andrew Sarangan. "Switchable distributed Bragg reflector using GST phase change material". *Optics Letters*, 47(8):1937, 2022. doi:10.1364/OL.455220

148. Adam C Stahler, Piyush J Shah, Andrew M Sarangan, and Ioana E Pavel. "Establishing the SERS-based sensing capabilities of silver nanorod thin films fabricated through oblique angle deposition at different temperatures". *Asian Journal of Physics*, 31(2):341–353, 2022

147. Robert T. Busch, Riccardo Torsi, Angelica Drees, David Moore, Andrew Sarangan, Nicholas R. Glavin, Joshua A. Robinson, Jonathan P. Vernon, W. Joshua Kennedy, and Peter R. Stevenson. "Effective optical properties of laterally coalescing monolayer MoS_2". *The Journal of Physical Chemistry Letters*, 13(25):5808–5814, 2022. doi:10.1021/acs.jpclett.2c01292

146. Gary A. Sevison, Trent Malone, Remona Heenkenda, Joshua A. Burrow, Andrew Sarangan, Joshua R. Hendrickson, and Imad Agha. "Independent measurement of phase and amplitude modulation in phase change material-based devices". *Optical Materials Express*, 12(7):2899, 2022. doi:10.1364/ome.463337

145. Z. Li, Y. Zhao, J. D. Gallagher, D. Lombardo, A. Sarangan, Imad Agha, J. Kouvetakis, J. Menéndez, and J. Mathews. "Room temperature emission spectroscopy of GeSn waveguides under optical pumping". *AIP Advances*, 12(7):075016, 2022. doi:10.1063/5.0094589

Proceedings & Presentations

144. Angelica Drees, Lirong Sun, Peter R. Stevenson, and Andrew Sarangan. "Distributed bragg reflector designs for the shortwave infrared with complex active layers". *Optical Interference Coatings Conference (OIC) 2022*. Optica Publishing Group, 2022. doi:10.1364/oic.2022.ta.8

143. Remona Heenkenda and Andrew M. Sarangan. "Design principles of tunable optical filters using phase change materials". *International Workshop on Thin Films for Electronics, Electro-Optics, Energy and Sensors 2022*. SPIE, 2023. doi:10.1117/12.2647782

142. Joshua A. Burrow, Kimani C. Toussaint, Andrew Sarangan, and Imad Agha. "Reconfigurable opto-chirality enabled by chalcogenide phase change nanomaterials". *International Workshop on Thin Films for Electronics, Electro-Optics, Energy and Sensors 2022*. SPIE, 2023. doi:10.1117/12.2645974

2021

Journals

141. Remona Heenkenda, Keigo Hirakawa, and Andrew Sarangan. "Tunable optical filter using phase change materials for smart IR night vision applications". *Optics Express*, 29(21):33795, 2021. doi:10.1364/OE.440299

140. Gary A. Sevison, Joshua A. Burrow, Haiyun Guo, Andrew Sarangan, Joshua R. Hendrickson, and Imad Agha. "Wavelength and power dependence on multilevel behavior of phase change materials". *AIP Advances*, 11(8):085327, 2021. doi:10.1063/5.0058178

139. Andrew Sarangan, Gamini Ariyawansa, Ilya Vitebskiy, and Igor Anisimov. "Optical switching performance of thermally oxidized vanadium dioxide with an integrated thin film heater". *Optical Materials Express*, 11(7):2348, 2021. doi:10.1364/OME.430751

Proceedings & Presentations

138. Remona Heenkenda, Keigo Hirakawa, and Andrew Sarangan. "Switchable PCM optical filter for automotive color-IR imaging". *2021 IEEE Photonics Conference (IPC)*. IEEE, 2021. doi:10.1109/ipc48725.2021.9593035

2020

Journals

137. Andrew Sarangan. "Design of resonant cavity thin film structures with complex active layers". *Journal of the Optical Society of America B*, 37(11):3461, 2020. doi:10.1364/JOSAB.404894

136. Pengfei Guo, Zach Biegler, Tyson Back, and Andrew Sarangan. "Vanadium dioxide phase change thin films produced by thermal oxidation of metallic vanadium". *Thin Solid Films*, page 138117, 2020. doi:10.1016/j.tsf.2020.138117

135. Pengfei Guo, Joshua A. Burrow, Gary A. Sevison, Heungdong Kwon, Christopher Perez, Joshua R. Hendrickson, Evan M. Smith, Mehdi Asheghi, Kenneth E. Goodson, Imad Agha, and Andrew M. Sarangan. "Tungsten-doped $Ge_2Sb_2Te_5$ phase change material for high-speed optical switching devices". *Applied Physics Letters*, 116(13):131901, 2020. doi:10.1063/1.5142552

134. Gary A. Sevison, Shiva Farzinazar, Joshua A. Burrow, Christopher Perez, Heungdong Kwon, Jaeho Lee, Mehdi Asheghi, Kenneth E. Goodson, Andrew Sarangan, Joshua R. Hendrickson, and Imad Agha. "Phase Change Dynamics and Two-Dimensional 4-Bit Memory in $Ge_2Sb_2Te_5$ via Telecom-Band Encoding". *ACS Photonics*, 2020. doi:10.1021/acsphotonics.9b01456

133. Chan Kyaw, Riad Yahiaoui, Joshua A. Burrow, Viet Tran, Kyron Keelen, Wesley Sims, Eddie C. Red, Willie S. Rockward, Mikkel A. Thomas, Andrew Sarangan, Imad Agha, and Thomas A. Searles. "Polarization-selective modulation of supercavity resonances originating from bound states in the continuum". *Communications Physics*, 3(1), 2020. doi:10.1038/s42005-020-00453-8

Proceedings & Presentations

132. J. A. Burrow, A. Sarangan, Q. Zhan, and I. Agha. "Chalcogenide cylindrical helix nanocollumnar thin films for switchable polarization effects". *2020 Conference on Lasers and Electro-Optics (CLEO)*, pages 1–2, 2020

131. J. A. Burrow, G. A. Sevison, M. Asheghi, J. R. Hendrickson, A. Sarangan, K. E. Goodson, and I. Agha. "Pixel level demonstration of phase change material based spatial light modulation". *2020 Conference on Lasers and Electro-Optics (CLEO)*, pages 1–2, 2020

130. G. A. Sevison, J. A. Burrow, J. R. Hendrickson, A. Sarangan, and I. Agha. "Waveform-agile frequency doubled laser system for optical switching and characterization of phase change materials at near-ir wavelengths". *2020 Conference on Lasers and Electro-Optics (CLEO)*, pages 1–2, 2020

129. Roseanna G. Lawandi, Keigo Hirakawa, and Andrew M. Sarangan. "Spectroscopy using tunable liquid crystal Fourier filters". *Nanoengineering: Fabrication, Properties, Optics, Thin Films, and Devices XVII*, volume 11467, pages 77 – 84. International Society for Optics and Photonics, SPIE, 2020. doi:10.1117/12.2567658

2019

Journals

128. Joshua A. Burrow, Riad Yahiaoui, Andrew Sarangan, Jay Mathews, Imad Agha, and Thomas A. Searles. "Eigenmode hybridization enables lattice-induced transparency in symmetric terahertz metasurfaces for slow light applications". *Optics Letters*, 44(11):2705, 2019. doi:10.1364/OL.44.002705

127. David Lombardo, Piyush Shah, and Andrew Sarangan. "Single step fabrication of nano scale optical devices using binary contact mask deep UV interference lithography". *Optics Express*, 27(16):22917, 2019. doi:10.1364/OE.27.022917

126. Pengfei Guo, Andrew Sarangan, and Imad Agha. "A Review of Germanium-Antimony-Telluride Phase Change Materials for Non-Volatile Memories and Optical Modulators". *Applied Sciences*, 9(3):530, 2019. doi:10.3390/app9030530

125. M. M. R. Hussain, I. Agha, Z. Gao, D. de Ceglia, M. A. Vincenti, A. Sarangan, M. Scalora, P. Banerjee, and J. W. Haus. "Harmonic generation in metal-insulator and metal-insulator-metal nanostructures". *Journal of Applied Physics*, 125(10):105302, 2019. doi:10.1063/1.5085123

124. Joshua Duran and Andrew M. Sarangan. "Schottky-Barrier Photodiode Internal Quantum Efficiency Dependence on Nickel Silicide Film Thickness". *IEEE Photonics Journal*, pages 1–1, 2019. doi:10.1109/JPHOT.2018.2886556

Proceedings & Presentations

123. Roseanna G. Lawandi, Keigo Hirakawa, Partha Banerjee, and Andrew M. Sarangan. "Fabrication of integrated single-chip Fourier spectrometers". *Nanoengineering: Fabrication, Properties, Optics, Thin Films, and Devices XVI*, page 30. SPIE, 2019. doi:10.1117/12.2529798

122. James A. Ethridge, Michael A. Marciniak, and Andrew M. Sarangan. "Computational and experimental development of 2D anisotropic photonic crystal metamaterials". *Nanoengineering: Fabrication, Properties, Optics, Thin Films, and Devices XVI*, page 27. SPIE, 2019. doi:10.1117/12.2529654

121. Joshua A. Burrow, Pengfei Guo, Gary A. Sevison, Heungdong Kwon, Christopher Perez, Mehdi Asheghi, Joshua R. Hendrickson, Andrew Sarangan, Kenneth E. Goodson, and Imad Agha. "Optical and electrical properties of phase change materials for high-speed optoelectronics". *Conference on Lasers and Electro-Optics*, page SF2O.5, Washington, D.C., 2019. OSA. doi:10.1364/CLEO_SI.2019.SF2O.5

120. Andrew Sarangan. "Design and fabrication of photonic systems using phase change materials (Conference Presentation)". *Active Photonic Platforms XI*, volume 11081. International Society for Optics and Photonics, SPIE, 2019. doi:10.1117/12.2529812

119. Matthew Howard, Andrew Sarangan, and Keigo Hirakawa. "Shortwave Infrared Fourier Multispectral Imaging". *Imaging and Applied Optics 2019 (COSI, IS, MATH, pcAOP)*, page ITu3B.4, Washington, D.C., 2019. OSA. doi:10.1364/ISA.2019.ITu3B.4

118. Shuo Sun, Joseph W. Haus, Imad Agha, Andrew Sarangan, Parag Banerjee, Domenico de Ceglia, Maria A. Vincenti, Michael Scalora, and Partha P. Banerjee. "Photon-assisted Tunneling Applied to Metal-Insulator-Metal Nanorods for High Efficiency Infrared Photodetection and Energy Harvesting". *Frontiers in Optics + Laser Science APS/DLS*, page JTu3A.56, Washington, D.C., 2019. OSA. doi:10.1364/FIO.2019.JTu3A.56

117. Roseanna G. Lawandi, Remona Heenkenda, and Andrew M. Sarangan. "Silicon photodetectors integrated with GSST phase change material for switchable color filter pixels". *Frontiers in Optics + Laser Science APS/DLS*, page JW3A.124, Washington, D.C., 2019. OSA. doi:10.1364/FIO.2019.JW3A.124

2018

Journals

116. Pengfei Guo, Joshua A. Burrow, Gary A. Sevison, Aditya Sood, Mehdi Asheghi, Joshua R. Hendrickson, Kenneth E. Goodson, Imad Agha, and Andrew Sarangan. "Improving the performance of $Ge_2Sb_2Te_5$ materials via nickel doping: Towards RF-compatible phase-change devices". *Applied Physics Letters*, 113(17):171903, 2018. doi:10.1063/1.5053713

115. Andrew Sarangan, Josh Duran, Vladimir Vasilyev, Nicholaos Limberopoulos, Ilya Vitebskiy, and Igor Anisimov. "Broadband Reflective Optical Limiter Using GST Phase Change Material". *IEEE Photonics Journal*, 10(2):1–9, 2018. doi:10.1109/JPHOT.2018.2796448

114. Chuan Ni, Jie Jia, Matthew Howard, Keigo Hirakawa, and Andrew Sarangan. "Single-shot multispectral imager using spatially multiplexed fourier spectral filters". *J. Opt. Soc. Am. B*, 35(5):1072–1079, 2018. doi:10.1364/JOSAB.35.001072

113. Andrew Sarangan. "Design of metal-dielectric resonant-cavity thin-film structures using the effective reflectance index method". *Journal of the Optical Society of America B*, 35(9):2294, 2018. doi:10.1364/JOSAB.35.002294

112. R. Yahiaoui, J. A. Burrow, S. M. Mekonen, A. Sarangan, J. Mathews, I. Agha, and T. A. Searles. "Electromagnetically induced transparency control in terahertz metasurfaces based on bright-bright mode coupling". *Physical Review B*, 97(15):155403, 2018. doi:10.1103/PhysRevB.97.155403

Proceedings & Presentations

111. Pengfei Guo, Gary Sevison, Imad Agha, Andrew Sarangan, and Joshua Burrow. "Electrical and optical properties of nickel-doped $Ge_2Sb_2Te_5$ films produced by magnetron co-sputtering". *Nanoengineering: Fabrication, Properties, Optics, and Devices XV*, page 19. SPIE, 2018. doi:10.1117/12.2320843

110. Joshua Duran and Andrew Sarangan. "Internal Quantum Efficiency Dependence on Thickness of NiSi Schottky Barrier Photodetectors". *2018 IEEE Photonics Conference (IPC)*, pages 1–2. IEEE, 2018. doi:10.1109/IPCon.2018.8527106

109. Riad Yahiaoui, Jay Mathews, Joshua A. Burrow, Imad Agha, Gary Sevison, Augustine M. Urbas, Andrew Sarangan, and Thomas A. Searles. "Thermally tunable far-infrared metasurfaces enabled by $Ge_2Sb_2Te_5$ phase-change material". *2018 IEEE Research and Applications of Photonics In Defense Conference (RAPID)*, pages 1–4. IEEE, 2018. doi:10.1109/RAPID.2018.8508956

108. Riad Yahiaoui, Joshua A. Burrow, Jay Matthews, Andrew Sarangan, Imad Agha, and Thomas A. Searles. "Tunable Electromagnetically Induced Transparency in $Ge_2Sb_2Te_5$-Based Infrared Metasurfaces". *Frontiers in Optics / Laser Science*, page JTu2A.96, Washington, D.C., 2018. OSA. doi:10.1364/FIO.2018.JTu2A.96

107. Sirak M. Mekonen, Riad Yahiaoui, Joshua A. Burrow, Andrew Sarangan, Imad Agha, Jay Matthews, and Thomas A. Searles. "Modulation of Electromagnetically Induced Transparency in Toriodal Resonance Terahertz Metasurfaces". *Frontiers in Optics / Laser Science*, page JTu3A.103, Washington, D.C., 2018. OSA. doi:10.1364/FIO.2018.JTu3A.103

106. Riad Yahiaoui, Sirak M. Mekonen, Joshua A. Burrow, Pheona O. Williams, Andrew Sarangan, Imad Agha, Jay Mathews, and Thomas A. Searles. "Toroidal Response of Asymmetric Metasurfaces with Multiple High Q-Factor Resonances". *Conference on Lasers and Electro-Optics*, page JW2A.112, Washington, D.C., 2018. OSA. doi:10.1364/CLEO_AT.2018.JW2A.112

105. Joshua A. Burrow, Riad Yahiaoui, Andrew Sarangan, Jay Mathews, Imad Agha, and Thomas A. Searles. "Mode hybridization in lattice induced transparency for polarization-insensitive THz metasurfaces". *Conference on Lasers and Electro-Optics*, page JW2A.106, Washington, D.C., 2018. OSA. doi:10.1364/CLEO_AT.2018.JW2A.106

104. Andrea Aboujaoude, Joshua Burrow, Joshua Hendrickson, Imad Agha, Andrew Sarangan, and Joseph W. Haus. "Influence of geometry on speed of phase-change in GST-based nanorods". *Conference on Lasers and Electro-Optics*, page JW2A.105, Washington, D.C., 2018. OSA. doi:10.1364/CLEO_AT.2018.JW2A.105

103. Gary A. Sevison, Joshua A. Burrow, Andrea Aboujaoude, Matthew Mircovich, Andrew Sarangan, Joshua Hendrickson, and Imad Agha. "Free-Space optical switching of GST phase-change thin films via 1550 nm light". *Conference on Lasers and Electro-Optics*, page JTu2A.6, Washington, D.C., 2018. OSA. doi:10.1364/CLEO_AT.2018.JTu2A.6

102. Mallik M. R. Hussain, Zhengning Gao, Domenico de Ceglia, Maria A. Vincenti, Andrew Sarangan, Imad Agha, Michael Scalora, Parag Banerjee, and Joseph W. Haus. "Enhanced Harmonic Generation in Metal-Insulator-Metal Nanostructures". *Conference on Lasers and Electro-Optics*, page JTh2A.71, Washington, D.C., 2018. OSA. doi:10.1364/CLEO_AT.2018.JTh2A.71

2017

Journals

101. Joshua A. Burrow, Riad Yahiaoui, Andrew Sarangan, Imad Agha, Jay Mathews, and Thomas A. Searles. "Polarization-dependent electromagnetic responses of ultrathin and highly flexible asymmetric terahertz metasurfaces". *Optics Express*, 25(26):32540, 2017. doi:10.1364/OE.25.032540

100. Zhengning Gao, Mallik M. R. Hussain, Domenico de Ceglia, Maria A. Vincenti, Andrew Sarangan, Imad Agha, Michael Scalora, Joseph W. Haus, and Parag Banerjee. "Unraveling delocalized electrons in metal induced gap states from second harmonics". *Applied Physics Letters*, 111(16):161601, 2017. doi:10.1063/1.4996893

99. Joshua M. Duran and Andrew Sarangan. "Fabrication of ultrahigh aspect ratio silicon nanostructures using self-assembled gold metal-assisted chemical etching". *Journal of Micro/Nanolithography, MEMS, and MOEMS*, 16(1):014502, 2017. doi:10.1117/1.JMM.16.1.014502

98. Chenhao Wan, David Lombardo, Andrew Sarangan, and Qiwen Zhan. "Geometric-Phase Polarization Fan-out Grating Fabricated with Deep-UV Interference Lithography". *Journal of Physics: Conference Series*, 844(1):012028, 2017. doi:10.1088/1742-6596/844/1/012028

97. Diego Garcia Mina, Joseph W. Haus, Andy Chong, Ankita Khanolkar, Andrew Sarangan, and Karolyn Hansen. "Bi-tapered fiber sensor using visible to near infrared light". *Sensors and Actuators A: Physical*, 263:285–290, 2017. doi:10.1016/j.sna.2017.06.017

Proceedings & Presentations

96. Mallik Mohd Raihan Hussain, Zhengning Gao, Domenico de Ceglia, Maria Vinceti, Andrew Sarangan, Imad Agha, Michael Scalora, Parag Banergee, and Joseph W. Haus. "Observation of Third Harmonic Enhancement Due to Tunneling at a Metal-Insulator-Metal Junction". *Frontiers in Optics 2017*, volume Part F66-F, page JTu3A.29, Washington, D.C., 2017. OSA. doi:10.1364/FIO.2017.JTu3A.29

95. Pengfei Guo, David Lombardo, and Andrew M. Sarangan. "Vanadium dioxide switchable components based on wiregrids for mid-infrared applications". *Nanoengineering: Fabrication, Properties, Optics, and Devices XIV*, page 43. SPIE, 2017. doi:10.1117/12.2272758

94. Chenhao Wan, David Lombardo, Andrew Sarangan, and Qiwen Zhan. "High efficiency geometric-phase polarization fan-out grating on silicon". *Optics Express*, 25(20):24559, 2017. doi:10.1364/OE.25.024559

93. J. Duran and A. Sarangan. "Infrared absorption in MacEtch fabricated silicon quantum walls". *2016 IEEE Photonics Conference, IPC 2016*, 2017. doi:10.1109/IPCon.2016.7831057

92. C. Ni, J. Jia, K. Hirakawa, and A. Sarangan. "A Fourier multispectral imaging camera with pixel-level sinusoidal filter arrays". *2016 IEEE Photonics Conference, IPC 2016*, 2017. doi:10.1109/IPCon.2016.7831060

2016

Journals

91. Alessandro Belardini, Marco Centini, Grigore Leahu, David C. Hooper, Roberto Li Voti, Eugenio Fazio, Joseph W. Haus, Andrew Sarangan, Ventsislav K. Valev, and Concita Sibilia. "Chiral light intrinsically couples to extrinsic/pseudo-chiral metasurfaces made of tilted gold nanowires". *Scientific Reports*, 6(1):31796, 2016. doi:10.1038/srep31796

Proceedings & Presentations

90. David Lombardo, Piyush Shah, Pengfei Guo, and Andrew Sarangan. "Deep-UV interference lithography combined with masked contact lithography for pixel wiregrid patterns". *Proc. SPIE - The International Society for Optical Engineering*, volume 9777, page 97771N, 2016. doi:10.1117/12.2219484

89. Mengyang Zou, Chuan Ni, and Andrew Sarangan. "Ion-assisted evaporation of vanadium dioxide thin films". *Proc. SPIE Nanoengineering: Fabrication, Properties, Optics, and Devices XIII*, page 99271Q, 2016. doi:10.1117/12.2238491

88. A. Belardini, G. Leahu, M. Centini, R. Li Voti, E. Fazio, C. Sibilia, Joseph W. Haus, Andrew Sarangan, D. Hooper, and V. K. Valev. "Effective chiral behavior on self-assembled tilted gold nanowires metasurface by means of linear and nonlinear optical techniques". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 9894, page 98941V, 2016. doi:10.1117/12.2230382

2015

Journals

87. Jie Jia, Chuan Ni, Andrew Sarangan, and Keigo Hirakawa. "Fourier multispectral imaging". *Optics Express*, 23(17):22649, 2015. doi:10.1364/OE.23.022649

86. Junxin Wang, Yun Zhao, Imad Agha, and Andrew M. Sarangan. "SU-8 nanoimprint fabrication of wire-grid polarizers using deep-UV interference lithography". *Optics Letters*, 40(19):4396, 2015. doi:10.1364/OL.40.004396

Proceedings & Presentations

85. A. Belardini, A. Benedetti, M. Centini, E. Fazio, M. Bertolotti, C. Sibilia, Joseph W. Haus, and Andrew Sarangan. "Symmetry breaking in the second harmonic field of self-assembled metallic nanostructures". *Proc. SPIE - The International Society for Optical Engineering*, volume 9502, page 950206. SPIE, 2015. doi:10.1117/12.2182759

84. Alessandro Belardini, Marco Centini, Grigore Leahu, Eugenio Fazio, Concita Sibilia, Joseph W. Haus, and Andrew Sarangan. "Second harmonic generation on self-assembled tilted gold nanowires". *Faraday Discussions*, 178:357–362, 2015. doi:10.1039/C4FD00200H

83. Chuan Ni, Jie Jia, Keigo Hirakawa, and Andrew Sarangan. "Design and fabrication of sinusoidal spectral filters for multispectral imaging". *Proc. SPIE - The International Society for Optical Engineering*, volume 9556, page 95560I, 2015. doi:10.1117/12.2188830

82. Yun Zhao, Andrew Sarangan, and Imad Agha. "Frequency conversion via asymmetrically pumped four-wave-mixing Bragg scattering in silicon waveguides". *Frontiers in Optics 2015*, page FTh2B.5, Washington, D.C., 2015. OSA. doi:10.1364/FIO.2015.FTh2B.5

2014

Journals

81. Michael Benson, Piyush Shah, Michael Marciniak, Andrew Sarangan, and Augustine Urbas. "Optical Characterization of Silver Nanorod Thin Films Grown Using Oblique Angle Deposition". *Journal of Nanomaterials*, 2014:1–8, 2014. doi:10.1155/2014/694982

80. Long Wang, Peter E. Powers, Andrew Sarangan, and Joseph W. Haus. "Image revivals in multi-mode optical fibers with periodic multiple sub-apertures". *Optics Communications*, 326:57–63, 2014. doi:10.1016/j.optcom.2014.04.022

Proceedings & Presentations

79. Junxin Wang and Andrew M. Sarangan. "Nanoimprint fabrication of wiregrids micro-polarizers in near infrared spectra using SU-8 as an intermediate film". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 9170, page 917010, 2014. doi:10.1117/12.2061230

78. Chuan Ni, Piyush Shah, and Andrew M. Sarangan. "Effects of different wetting layers on the growth of smooth ultra-thin silver thin films". *SPIE Proceedings*. SPIE, 2014. doi:10.1117/12.2061256

2013

Journals

77. Emily M. Fehrman Cory, Roberto S. Aga, Jack P. Lombardi, Carrie M. Bartsch, Andrew Sarangan, and Emily M. Heckman. "Nanoimprint lithography of deoxyribonucleic acid biopolymer films". *Journal of Micro/Nanolithography, MEMS, and MOEMS*, 12(4):040501, 2013. doi:10.1117/1.JMM.12.4.040501

76. Piyush J. Shah, Zhi Wu, and Andrew M. Sarangan. "Effects of CO2 critical point drying on nanostructured SiO2 thin films after liquid exposure". *Thin Solid Films*, 527:344–348, 2013. doi:10.1016/j.tsf.2012.10.057

75. Piyush Shah, Dongquan Ju, Xiaoxu Niu, and Andrew M. Sarangan. "Vapor Phase Sensing Using Metal Nanorod Thin Films Grown by Cryogenic Oblique Angle Deposition". *Journal of Sensors*, 2013:1–6, 2013. doi:10.1155/2013/823041

74. Susan Derenko, René Kullock, Zhi Wu, Andrew Sarangan, Christiane Schuster, Lukas M. Eng, and Thomas Härtling. "Local photochemical plasmon mode tuning in metal nanoparticle arrays". *Optical Materials Express*, 3(6):794, 2013. doi:10.1364/OME.3.000794

Proceedings & Presentations

73. Susan Derenko, Roland Wuchrer, Andrew Sarangan, Christiane Schuster, and Thomas Härtling. "Plasmonic gradient structures of nanoparticle arrays for optical sensing applications". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8693, page 869305, 2013. doi:10.1117/12.2008954

72. A. Sarangan, J.W. Haus, S.M. Jain, J. Moradmand, and N. Reeder. "Collaborative classroom tools for nanotechnology process education". *ASEE Annual Conference and Exposition, Conference Proceedings*, 2013

71. Branden J. King, Ighodalo Idehenre, Peter E. Powers, Andrew M. Sarangan, Joseph W. Haus, and Karolyn M. Hansen. "Tapered optical fibers for aqueous and gaseous phase biosensing applications". *Progress in Biomedical Optics and Imaging - Proceedings of SPIE*, volume 8570, page 85700G, 2013. doi:10.1117/12.2004799

70. Joseph W. Haus, Long Wang, Peter E. Powers, and Andrew M. Sarangan. "Coherent superposition of multiple beams in a large mode area fiber". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8775, page 87750G, 2013. doi:10.1117/12.2018765

2012

Journals

69. Piyush J Shah, Xiaoxu Niu, and Andrew M Sarangan. "Journal of Nanoscience Letters High aspect ratio silver nanorod thin films grown at cryogenic substrate temperature". *Journal of Nanoscience Letters*, 2012

68. G. Nehmetallah, R. Aylo, P. Powers, A. Sarangan, J. Gao, H. Li, A. Achari, and P. P. Banerjee. "Co-sputtered SiC + Ag nanomixtures as visible wavelength negative index metamaterials". *Optics Express*, 20(7):7095, 2012. doi:10.1364/OE.20.007095

67. Jian Gao, Andrew M. Sarangan, and Qiwen Zhan. "Polarization multiplexed fluorescence enhancer using a pixelated one-dimensional photonic band gap structure". *Optics Letters*, 37(13):2640, 2012. doi:10.1364/OL.37.002640

66. Xiaoxu Niu, Paul T. Murray, and Andrew Sarangan. "Synthesis of Fe–Ni bimetallic nanoparticles from pixel target ablation: plume dynamics and surface characterization". *Journal of Nanoparticle Research*, 14(8):1017, 2012. doi:10.1007/s11051-012-1017-z

65. R. C. G. Smith, A. M. Sarangan, Z. Jiang, and J. R. Marciante. "Direct measurement of bend-induced mode deformation in large-mode-area fibers". *Optics Express*, 20(4):4436, 2012. doi:10.1364/OE.20.004436

Proceedings & Presentations

64. P. P. Banerjee, R. Aylo, G. Nehmetallah, H. Li, A. Sarangan, and P. Powers. "Binary nanoparticle dispersed metamaterial implementation and characterization". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8268, page 826805, 2012. doi:10.1117/12.915689

63. Piyush Shah, Xiaoxu Niu, and Andrew Sarangan. "Effect of Cryogenic Substrate Temperature on the Growth of Ag and Cu Nanostructured Optical Metamaterials". *2012 Symposium on Photonics and Optoelectronics*, pages 1–2. IEEE, 2012. doi:10.1109/SOPO.2012.6270908

2011

Journals

62. Jian Gao, Qiwen Zhan, and Andrew M. Sarangan. "High-index low-loss gallium phosphide thin films fabricated by radio frequency magnetron sputtering". *Thin Solid Films*, 519(16):5424–5428, 2011. doi:10.1016/j.tsf.2011.02.068

61. Nkorni Katte, Joseph W. Haus, Peter Powers, Andrew Sarangan, Jian Gao, and Michael Scalora. "Third-order nonlinear optical properties of metallodielectric stacks". *Journal of the Optical Society of America B*, 28(9):2277, 2011. doi:10.1364/JOSAB.28.002277

60. Jian Gao, Andrew M. Sarangan, and Qiwen Zhan. "Experimental confirmation of strong fluorescence enhancement using one-dimensional GaP/SiO_2 photonic band gap structure". *Optical Materials Express*, 1(7):1216, 2011. doi:10.1364/OME.1.001216

59. Andrew Sarangan. "Fabrication of sloped sidewalls by inductively coupled plasma etching for silicon micro-optic structures". *Journal of Micro/Nanolithography, MEMS, and MOEMS*, 10(2):023006, 2011. doi:10.1117/1.3574136

Proceedings & Presentations

58. Nkorni Katte, Joseph W. Haus, Peter Powers, Andrew Sarangan, Jian Gao, and Michael Scalora. "Z-scan simulations on metallodielectric stacks with nonlinear absorption". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8093, page 80930J, 2011. doi:10.1117/12.894130

57. Nkorni Katte, Joseph W. Haus, Peter Powers, Andrew Sarangan, Jian Gao, and Michael Scalora. "Nonlinear Response of Metallodielectric Stacks". *Nonlinear Optics*, page NTuA4, Washington, D.C., 2011. OSA. doi:10.1364/NLO.2011.NTuA4

56. Chris Yakopcic, Andrew Sarangan, Jian Gao, Tarek M. Taha, Guru Subramanyam, and Stanley Rogers. "TiO_2 memristor devices". *Proceedings of the 2011 IEEE National Aerospace and Electronics Conference (NAECON)*, pages 101–104. IEEE, 2011. doi:10.1109/NAECON.2011.6183085

55. Nkorni Katte, Jian Gao, Andrew Sarangan, Joseph Haus, Michael Scalora, and Rachel Jakubiak. "Broadband, tunable super-lenses in the visible region of the electromagnetic spectrum with metallodielectric stacks (MDS)". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8096, page 80963E, 2011. doi:10.1117/12.894164

54. Zhi Wu, Andrew M. Sarangan, and Qiwen Zhan. "Fabrication and characterization of long range surface plasmon devices based on metallic subwavelength gratings". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 8096, page 80962L, 2011. doi:10.1117/12.893133

53. Alex Watson, Yu Wang, Zhi Wu, and Andrew Sarangan. "Fabrication of wiregrid micropolarizers for imaging from visible to infrared wavelengths". *IEEE Photonic Society 24th Annual Meeting*, pages 99–100. IEEE, 2011. doi:10.1109/PHO.2011.6110444

52. John Marciante and Andrew Sarangan. "Impact of Draw Inhomogeneitites on the Loss and Mode Content of Large-Mode-Area Fibers". *Advanced Photonics*, page SOWD2, Washington, D.C., 2011. OSA. doi:10.1364/SOF.2011.SOWD2

51. Andrew Sarangan and Josh Duran. "Next Generation Infrared Imaging Sensors". *Imaging and Applied Optics*, page LThB1, Washington, D.C., 2011. OSA. doi:10.1364/LSC.2011.LThB1

2010

Journals

50. A. T. Cooney and A. M. Sarangan. "Real-time modeling of quantum cascade laser operation using linear combinations of intrawell properties". *Journal of Computational Electronics*, 9(1):8–15, 2010. doi:10.1007/s10825-009-0290-2

Proceedings & Presentations

49. Jonathan W. Evans, Kenneth L. Schepler, Peter E. Powers, and Andrew Sarangan. "A Novel Electro-Optic Beam Switch in 5molCongruent Lithium Niobate". *Frontiers in Optics 2010/Laser Science XXVI*, page FThV5, Washington, D.C., 2010. OSA. doi:10.1364/FIO.2010.FThV5

48. Richard C. Smith, John R. Marciante, and Andrew M. Sarangan. "Direct Measurement of Bend-Induced Mode Deformation Using a Helical-core Fiber". *Frontiers in Optics 2010/Laser Science XXVI*, page FWK3, Washington, D.C., 2010. OSA. doi:10.1364/FIO.2010.FWK3

2009

Journals

47. Daniel Schmidt, Benjamin Booso, Tino Hofmann, Eva Schubert, Andrew Sarangan, and Mathias Schubert. "Monoclinic optical constants, birefringence, and dichroism of slanted titanium nanocolumns determined by generalized ellipsometry". *Applied Physics Letters*, 94(1):011914, 2009. doi:10.1063/1.3062996

46. D. Schmidt, B. Booso, T. Hofmann, E. Schubert, A. Sarangan, and M. Schubert. "Generalized ellipsometry for monoclinic absorbing materials: determination of optical constants of Cr columnar thin films". *Optics Letters*, 34(7):992, 2009. doi:10.1364/OL.34.000992

2008

Journals

45. Zhi Wu, Peter E. Powers, Andrew M. Sarangan, and Qiwen Zhan. "Optical characterization of wiregrid micropolarizers designed for infrared imaging polarimetry". *Optics Letters*, 33(15):1653, 2008. doi:10.1364/OL.33.001653

44. Aziz Mahfoud Familia and Andrew Sarangan. "Threshold gain analysis of second order distributed feedback lasers based on [2-methoxy-5-(2′-ethylhexyloxy)-1,4-phenylenevinylene]". *Optics Communications*, 281(2):310–318, 2008. doi:10.1016/j.optcom.2007.09.022

Proceedings & Presentations

43. Andrew M. Sarangan, Aziz Mahfoud, Zhi Wu, Qiwen Zhan, David P. Forrai, Darrel W. Endres, John W. Devitt, Robert T. Mack, and James S. Harris. "Wiregrid micro-polarizers for mid-infrared applications". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 6959, page 695915, 2008. doi:10.1117/12.778028

42. Jian Gao, Agus Widjaja, Mengshu Pan, Andrew Sarangan, and Qiwen Zhan. "Design and fabrication of an omnidirectional reflector as ultra-sensitive biochemical sensing platform". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 7035, page 70350W, 2008. doi:10.1117/12.793160

41. Mengshu Pan, Andrew Sarangan, and Qiwen Zhan. "Optical Birefringence of Nano-porous Dielectric Thin Films". *Frontiers in Optics 2008/Laser Science XXIV/Plasmonics and Metamaterials/Optical Fabrication and Testing*, page FThR2, Washington, D.C., 2008. OSA. doi:10.1364/FIO.2008.FThR2

40. Lirong Sun and Andrew Sarangan. "A Novel Micromachining Technique for Achieving Optical Structures with Arbitrary Sidewall Profiles". *Frontiers in Optics 2008/Laser Science XXIV/Plasmonics and Metamaterials/Optical Fabrication and Testing*, page FThW4, Washington, D.C., 2008. OSA. doi:10.1364/FIO.2008.FThW4

2007

Journals

39. Aziz M. Familia, Andrew Sarangan, and Thomas R. Nelson. "Gas to crystal Effect on the Spectral Line Narrowing of MEH-PPV". *Optics Express*, 15(13):8231, 2007. doi:10.1364/OE.15.008231

38. Jang Pyo Kim and Andrew M. Sarangan. "Temperature-dependent Sellmeier equation for the refractive index of $Al_xGa_{1-x}As$". *Optics Letters*, 32(5):536, 2007. doi:10.1364/OL.32.000536

Proceedings & Presentations

37. David P. Forrai, Darrel W. Endres, John W. Devitt, Andrew M. Sarangan, Qiwen Zhan, Aziz Mahfoud-Familia, Robert T. Mack, and James S. Harris. "Development of a MWIR polarimetric FPA". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 6660, page 666007, 2007. doi:10.1117/12.737777

2006

Journals

36. C. Deng, J. W. Haus, A. Sarangan, A. Mahfoud, C. Sibilia, M. Scalora, and A. Zheltikov. "Photonic band-gap enhanced second-harmonic generation in a planar lithium niobate waveguide". *Laser Physics*, 16(6):927–947, 2006. doi:10.1134/S1054660X06060053

35. Aziz Mahfoud, Andrew Sarangan, Thomas R. Nelson, and Elmo A. Blubaugh. "Role of aggregation in the amplified spontaneous emission of [2-methoxy-5-(2′-ethylhexyloxy)-1,4-phenylenevinylene] in solution and films". *Journal of Luminescence*, 118(2):123–130, 2006. doi:10.1016/j.jlumin.2005.08.012

34. Jang Pyo Kim and Andrew M. Sarangan. "Design and simulation of resonant cavity enhanced corrugated quantum well infrared photodetectors". *Applied Optics*, 45(24):6065, 2006. doi:10.1364/AO.45.006065

Proceedings & Presentations

33. Cong Deng, Joseph W. Haus, Andrew Sarangan, Aziz Mahfoud, Concita Sibilia, Michael Scalora, and Aleksei M. Zheltikov. "Enhanced Cerenkov second-harmonic generation in patterned lithium niobate". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 6123, page 61230N, 2006. doi:10.1117/12.646952

32. Adam T. Cooney. "Quantum Cascade Terahertz Emitters for Subsurface Defect Detection". *AIP Conference Proceedings*, volume 820, pages 500–507. AIP, 2006. doi:10.1063/1.2184569

31. Webin Chen, Lirong Sun, Andrew Sarangan, and Qiwen Zhan. "Characterization of Silicon Micro-Optic Structures with a Near-Infrared Near-Field Scanning Optical Microscope". *Frontiers in Optics*, page FTuT5, Washington, D.C., 2006. OSA. doi:10.1364/FIO.2006.FTuT5

30. Aziz Mahfoud Familia, Andrew Sarangan, Thomas R. Nelson, and Elmo A. Blubaugh. "Photoluminescence and amplified spontaneous emission studies of [2-methoxy-5-(2'-ethylhexyloxy)-1,4-phenylenevinylene] in solution and films". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 6117, page 61170P, 2006. doi:10.1117/12.644809

29. Jang Pyo Kim and A.M. Sarangan. "A novel design and simulation of resonant cavity enhanced (RCE) corrugated quantum well infrared photodetectors (C-QWIP) using the finite difference time domain (FDTD) method". *2006 Sixth IEEE Conference on Nanotechnology*, volume 1, pages 35–38. IEEE, 2006. doi:10.1109/NANO.2006.247560

2005

Journals

28. Sarah B. Blickenstaff;, Andrew M. Sarangan;, Thomas R. Nelson;, Kevin Leedy;, and Donald Agresta;. "Influence of shadow mask design and deposition methods on nonplanar dielectric material deposition". *Journal of Micro/Nanolithography, MEMS, and MOEMS*, 4(2):023015, 2005. doi:10.1117/1.1897381

27. Aziz Mahfoud Familia, Andrew Sarangan, and Thomas R. Nelson. "Optically pumped photonic crystal polymer lasers based on [2-methoxy-5-(2'-ethylhexyloxy)- 1,4-phenylenevinylene]". *Optics Express*, 13(8):3136, 2005. doi:10.1364/OPEX.13.003136

Proceedings & Presentations

26. T.R. Nelson, S. Blickenstaff, A.M. Sarangan, and J.E. Ehret. "Improved light extraction from LEDs utilizing nonplanar dielectric layers from shadow mask deposition". *(CLEO). Conference on Lasers and Electro-Optics, 2005.*, volume 1, pages 340–342. IEEE, 2005. doi:10.1109/CLEO.2005.201772

25. Jang Pyo Kim and A.M. Sarangan. "Temperature-dependent Sellmeier equation for the refractive index of $Al_xGa_{1-x}As$ in the $1.46 \sim 1.58\mu$m range". *CLEO/Europe. 2005 Conference on Lasers and Electro-Optics Europe, 2005.*, pages 305–305. IEEE, 2005. doi:10.1109/CLEOE.2005.1568089

2004

Journals

24. A.M. Sarangan and G.M. Peake. "Enhancement of Lateral Mode Discrimination in Broad-Area VCSELs Using Curved Bragg Mirrors". *Journal of Lightwave Technology*, 22(2):543–549, 2004. doi:10.1109/JLT.2004.824378

23. Jang Pyo Kim and Andrew M. Sarangan. "Simulation of resonant cavity enhanced (RCE) photodetectors using the finite difference time domain (FDTD) method". *Optics Express*, 12(20):4829, 2004. doi:10.1364/OPEX.12.004829

2003

Proceedings & Presentations

22. S.B. Blickenstaff, T.R. Nelson, and A.M. Sarangan. "Techniques for shadow mask deposition of nonplanar dielectric layers". *The 16th Annual Meeting of the IEEE Lasers and Electro-Optics Society, 2003. LEOS 2003.*, volume 2, pages 700–701. IEEE, 2003. doi:10.1109/LEOS.2003.1252993

2002

Proceedings & Presentations

21. J.W. Haus, A. Sarangan, C. Deng, Cong Deng, A.B. Fedotov, A.M. Zheltikov, V.V. Yakovlev, M. Scalora, M. Bloemer, C.M. Bowden, C. Sibilia, D. Pezzetta, and R. Ramponi. "Enhanced second-harmonic generation in proton-exchanged lithium niobate planar photonic band-gap waveguides". *Summaries of Papers Presented at the Quantum Electronics and Laser Science Conference*, volume 74, pages 163–164. Opt. Soc. America, 2002. doi:10.1109/QELS.2002.1031257

20. Andrew M. Sarangan. "Angled grating high-power semiconductor lasers: simulation of beam characteristics under thermal effects". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 4732, pages 1–6, 2002. doi:10.1117/12.477416

2001

Proceedings & Presentations

19. John R. Marciante, Andrew M. Sarangan, and David J. Bossert. "Performance and design considerations of angled-grating semiconductor lasers". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 4270, pages 154–162, 2001. doi:10.1117/12.424668

18. A.M. Sarangan, O.H. Kwon, and G.M. Peake. "Enhancement of lateral mode confinement in VCSELs using curved Bragg mirrors". *LEOS 2001. 14th Annual Meeting of the IEEE Lasers and Electro-Optics Society (Cat. No.01CH37242)*, volume 2, pages 657–658. IEEE, 2001. doi:10.1109/LEOS.2001.968985

2000

Journals

17. G. M. Peake, L. Zhang, N. Y. Li, A. M. Sarangan, C. G. Willison, R. J. Shul, and S. D. Hersee. "A micromachined, shadow-mask technology for the OMVPE fabrication of integrated optical structures". *Journal of Electronic Materials*, 29(1):86–90, 2000. doi:10.1007/s11664-000-0100-x

Proceedings & Presentations

16. Marek Osinski, William E. Thompson, Andrew M. Sarangan, and Alexander P. Bogatov. "Theory of angled grating semiconductor lasers: comparison of an analytical model and BPM simulation". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 3889, page 108, 2000. doi:10.1117/12.380852

1999

Journals

15. A.M. Sarangan, M.W. Wright, J.R. Marciante, and D.J. Bossert. "Spectral properties of angled-grating high-power semiconductor lasers". *IEEE Journal of Quantum Electronics*, 35(8):1220–1230, 1999. doi:10.1109/3.777224

1998

Proceedings & Presentations

14. G.M. Peake, A.M. Sarangan, and S.D. Hersee. "Integrated optical structures grown by shadow masked MOCVD". *Conference Proceedings. LEOS'98. 11th Annual Meeting. IEEE Lasers and Electro-Optics Society 1998 Annual Meeting (Cat. No.98CH36243)*, volume 2, pages 411–412. IEEE, 1998. doi:10.1109/LEOS.1998.739788

13. A.M. Sarangan, Malcolm Wright, J.R. Marciante, and D.J. Bossert. "Spectral properties of angled-grating high-power semiconductor lasers". *Conference Proceedings. LEOS'98. 11th Annual Meeting. IEEE Lasers and Electro-Optics Society 1998 Annual Meeting (Cat. No.98CH36243)*, volume 1, pages 344–345. IEEE, 1998. doi:10.1109/LEOS.1998.737871

1997

Proceedings & Presentations

12. Q.J. Zhang, G. Wilson, R. Venkatachalam, A. Sarangan, J. Williamson, and F. Wang. "Ultra fast neural models for analysis of electro/optical interconnects". *1997 Proceedings 47th Electronic Components and Technology Conference*, pages 1134–1137. IEEE, 1997. doi:10.1109/ECTC.1997.606317

11. Andrew M. Sarangan, Wei-Ping Huang, and Toshi Makino. "Spectral domain modeling of distributed feedback lasers". *Proceedings of SPIE - The International Society for Optical Engineering*, volume 2994, pages 723–733, 1997. doi:10.1117/12.275622

1996

Journals

10. G.P. Li, T. Makino, A. Sarangan, and W. Huang. "16-wavelength gain-coupled DFB laser array with fine tunability". *IEEE Photonics Technology Letters*, 8(1):22–24, 1996. doi:10.1109/68.475765

9. A.M. Sarangan, W.-P. Huang, G.P. Li, and T. Makino. "Selection of transverse oscillation modes in tilted ridge DFB lasers". *Journal of Lightwave Technology*, 14(8):1853–1858, 1996. doi:10.1109/50.532023

8. A.M. Sarangan, W.-P. Huang, T. Makino, and G.P. Li. "Wavelength control in DFB laser arrays by tilting the ridge with respect to the gratings". *IEEE Photonics Technology Letters*, 8(11):1435–1437, 1996. doi:10.1109/68.541541

7. A.M. Sarangan, W.-P. Huang, and T. Makino. "A ridge waveguide DFB laser model including transverse carrier and optical effects". *IEEE Journal of Quantum Electronics*, 32(3):408–416, 1996. doi:10.1109/3.485391

Proceedings & Presentations

6. G.P. Li, A. Sarangan, W.P. Huang, T. Makino, and F. Shepherd. "Multiwavelength DFB laser array utilizing combined effect of ridge width and ridge tilt". *Proceedings of 8th International Conference on Indium Phosphide and Related Materials*, pages 173–175. IEEE, 1996. doi:10.1109/ICIPRM.1996.491964

5. Andrew M. Sarangan, Guo P. Li, W. P. Huang, and Toshi Makino. "Three-dimensional analysis of multiwavelength dfb laser arrays". *Proceedings of SPIE - The International Society for Optical Engineering*, pages 276–285, may. doi:10.1117/12.238924

4. A.M. Sarangan, W.-P. Huang, T. Makino, and G.P. Li. "Dynamic single-transverse-mode properties of varying ridge width DFB laser arrays". *IEEE Photonics Technology Letters*, 8(10):1305–1307, 1996. doi:10.1109/68.536636

1995

Journals

3. A.M. Sarangan and Wei-Ping Huang. "A higher order electron wave propagation method". *IEEE Journal of Quantum Electronics*, 31(6):1107–1113, 1995. doi:10.1109/3.387049

1994

Journals

2. A.M. Sarangan and Wei-Ping Huang. "A coupled mode theory for electron wave directional couplers". *IEEE Journal of Quantum Electronics*, 30(12):2803–2810, 1994. doi:10.1109/3.362729

1993

Proceedings & Presentations

1. A.M. Sarangan and Wei-Ping Huang. "A coupled mode theory for electron wave directional couplers". *Proceedings of IEEE/Cornell Conference on Advanced Concepts in High Speed Semiconductor Devices and Circuits*, pages 182–188. IEEE, 1993. doi:10.1109/CORNEL.1993.303085