

# Curriculum Vitae - Greg Sun (Updated March, 2016)

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## **Greg Sun**

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## **Education**

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**Ph.D.** Electrical Engineering, Johns Hopkins University, Baltimore, Maryland, 1993  
**M.S.** Electrical Engineering, Marquette University, Milwaukee, Wisconsin, 1988  
**B.S.** Microelectronics, Beijing University, Beijing, China, 1984

## **Positions**

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**Founding Chair**, Department of Engineering, 7/2014-present  
University of Massachusetts Boston, Massachusetts  
**Director**, Engineering Program, 9/2000-6/2014  
University of Massachusetts Boston, Massachusetts  
**Professor**, Engineering and Physics, 9/2004-present  
University of Massachusetts Boston, Massachusetts  
**Visiting Professor**, Research Center for Applied Sciences, Academia Sinica, Taipei, Taiwan, Summer or Winter periods, 2013-present  
**Visiting Professor**, Center for Condensed Matter Sciences, National Taiwan University, Summer or Winter periods, 2007, 2011, 2012  
**Associate Professor**, Engineering and Physics, 9/1999-8/2004  
University of Massachusetts Boston, Massachusetts  
**Assistant Professor**, Engineering and Physics, 9/1993-8/1999  
University of Massachusetts Boston, Massachusetts  
**Research Scientist**, 9/1992-8/1993  
Structured Materials Industries, Inc., Piscataway, New Jersey  
**Graduate Intern**, 5/1990-8/1992  
Philips Laboratories, North American Philips Corporation, Briarcliff Manor, New York

## **Professional Activities and Honors**

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**Board of the Editorial Committee**, Journal of Semiconductors, 2011-present  
**Guest Editor**, Feature Issue for Optics Express: Nanophotonics, OSA Publishing, 2016

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**Symposium Organizer**, MRS Symposium on Phonon transport, interactions, and manipulations in nanoscale materials and devices – fundamentals and applications, 2013, 2015

**CLEO Subcommittee**: Optical Materials, Fabrication and Characterization Subcommittee, 2014-present

**Nonlinear Optics Committee**, IEEE Photonics Conference (formally IEEE LEOS Annual meeting), 2008-present

**International Advisory Committee**, International Conference on Microwave and Photonics (Da, 2013-present)

**Technical Program Committee**, 9<sup>th</sup> International Conference on Nanophotonics (Taipei, Taiwan, March, 2016)

**Technical Program Committee** for the session on Plasmonics in Sensing, Optical Sensors - OSA Annual Topical Meeting (Boston, June-July, 2015)

**Technical Program Committee**, 2<sup>nd</sup> Quantum Optics Workshop, (Muju Resort, South Korea, January, 2007)

**Technical Committee**, 1<sup>st</sup> International Conference on Group IV photonics sponsored by IEEE (Hong Kong, September, 2004)

**Session Chair**, 9<sup>th</sup> International Conference on Nanophotonics (Taipei, Taiwan, March, 2016)

**Session Chair**, Poster Session, Materials Research Society Fall Meeting (Boston, December, 2015)

**Session Chair**, Session on Phonons in Nano and Bulk Materials, Materials Research Society Fall Meeting (Boston, December, 2015)

**Session Chair**, “Nanoscale Activity I, Plasmonics: Metallic Nanostructures and Their Optical Properties XII” SPIE Optics + Photonics (San Diego, August, 2014)

**Session Chair**, “Optoelectronic Materials and Devices,” International Conference on Microwave and Photonics, (India, December, 2013)

**Session Chair**, “Vibrational Properties and Phonon Interactions” 2013 Fall Meeting of the Materials Research Society, (Boston, December, 2013)

**Session Chair**, “Advances in Materials Science and Engineering” International Conference on Computational and Experimental Engineering and Science (ICCES), (Seattle, May, 2013)

**Session Chair**, “Si Photonics and Ultrafast Techniques” IEEE Photonics 2012 Conference (IPC12), (Burlingame, California, September, 2012)

**Session Chair**, “Nonlinear Plasmon Polaritons and Effects” IEEE Photonics 2011 Conference (IPC11), (Arlington, Virginia, October, 2011)

**Session Chair**, “Symposium I on Transport and Photonics in Si-based Nanodevices: Ge on Si: Materials and Designs” The Spring Meeting of European Materials Research Society (E-MRS), (Nice, France, May, 2011)

**Session Chair**, “Novel Applications in Nonlinear Optics” 21<sup>th</sup> Annual IEEE Lasers and Electro-Optics Society Annual Meeting, (Newport Beach, California, November, 2008)

**Session Chair**, “Intersubband Phenomena and Fundamentals II” 9<sup>th</sup> International Conference on Intersubband Transitions in Quantum Wells (Ambleside, Cumbria, United Kingdom, September, 2007)

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**Session Chair**, “Plasmonic and Terahertz Devices” 1<sup>st</sup> International Conference on Group IV photonics sponsored by IEEE (Hong Kong, September, 2004)

**National Renewable Energy Laboratory Panel**, (Morgantown, West Virginia, May, 2014; May 2015)

**National Science Foundation Panel**, (Arlington, Virginia, May, 2012; January, 2016)

**Reviewer** for Nature, Nature Photonics, Optics Letters, Optica Express, Physica B, Physica E, Journal of the Optical Society of America B, Physical Review B, Applied Physics Letters, Journal of Applied Physics, IEEE Journal of Quantum Electronics, IEEE Photonics Technology Letters.

**Air Force Summer Faculty Program**, Hanscom Air Force Base, Massachusetts (1995, 1996, 2000, 2001, 2002, 2005, 2008)

**Outstanding Research Achievement**, College of Arts and Sciences, UMass Boston (1998-1999)

## Teaching Activities

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### **Undergraduate:**

Freshman Seminars

Circuit Analysis I, Circuit Analysis II, Circuit Labs

Engineering Mathematics, Freshman Seminars

Digital Systems with Lab, Analog Electronics I with Lab

Fundamentals of Semiconductor Devices

College Physics I (Algebra-based), College Physics II (Algebra-based)

Fundamentals of Physics I (Calculus based)

Fundamentals of Physics II (Calculus based)

College Physics Labs I and College Physics Labs II

### **Graduate:**

Semiconductor Materials and Devices

Solid State Electronic Devices

Special Topics in Physics

Projects in Physics

Applied Physics Masters Internship

## Research Interests

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**Novel materials and structures:** Group-IV, III-V and II-VI systems, quantum wells, quantum dots, optical waveguides

**Quantum processes:** Carrier scattering and transport, phonon dynamics and engineering, band-to-band and intersubband transitions in semiconductor structures

**Semiconductor opto-electronics:** Emitters and photodetectors spanning UV to far infrared including conventional lasers and quantum cascade lasers

**Silicon photonics:** Silicon based photonic devices and systems, lasers, LEDs, and IR detectors, waveguides and SiGeSn-based devices

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**Nano-photonics:** Surface plasmon enhanced optical processes and devices with the use of subwavelength metal structures

## Administrative Responsibilities

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**Engineering Department Chair:** Led the effort for the first publically supported B. S. degree programs in ECE in Boston area; successfully sought for their approval by UMB campus and UMass system governance, as well as Massachusetts Board of Higher Education; designed new ECE curricula and led the effort for their implementation at UMB; chaired ECE faculty search committees; established a new Department of Engineering at UMB; freshman and transfer admissions; academic advising; course scheduling; fundraising.

**Committee Work:** Departmental Personnel Committee Chair, Healey Grant Review Committee Chair (for university wide internal grant applications), Collegiate Personnel Committee, University Committee on Honorary Degrees, Senior Administrator Review Committees.

## Refereed Journal Papers

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1. C. Chang, H. Li, S. H. Huang, H. H. Cheng, **G. Sun**, and R. A. Soref, "Sn-based Ge/Ge<sub>0.975</sub>Sn<sub>0.025</sub>/Ge p-i-n photodetector operated with back-side illumination," submitted to *Applied Physics Letters*
2. H. Tran, W. Du, S. A. Ghetmiri, A. Mosleh, **G. Sun**, R. A. Soref, J. Margetis, J. Tolle, B. Li, H. A. Naseem, and S.-Q. Yu "Absorption coefficient and refractive index studies of Ge<sub>1-x</sub>Sn<sub>x</sub> alloys towards Si photonics device applications," accepted to *Journal of Applied Physics* (2016)
3. S. Al-Kabi, S. A. Ghetmiri, J. Margetis, W. Du, A. Mosleh, M. Alher, W. Dou, **G. Sun**, R. A. Soref, J. Tolle, B. Li, M. Mortazavi, H. A. Naseem, and S.-Q. Yu, "Optical characterization of Si-based Ge<sub>1-x</sub>Sn<sub>x</sub> alloys with Sn compositions up to 12%," accepted to *Journal of Electronic Materials*
4. T. Pham, W. Du, H. Tran, J. Margetis, J. Tolle, **G. Sun**, R. A. Soref, H. A. Naseem, B. Li, and S.-Q. Yu, "Systematic study of Si-based GeSn photodiodes with 2.6  $\mu$ m detector cutoff for short-wave infrared detection," *Optics Express*. **24**, 4519-4531 (2016)
5. J. B. Khurgin, **G. Sun**, W. T. Chen, W.-Y. Tsai, and D. P. Tsai, "Ultrafast Thermal Nonlinearity," *Scientific Reports* 5, 17899 (2015)
6. A. Mosleh, M. Alher, W. Du, L. C. Cousar, S. A. Ghetmiri, S. Al-Kabi, W. Dou, P. C. Grant1, **G. Sun**, R. A. Soref, B. Li, H. A. Naseem, and S.-Q. Yu, "Si<sub>y</sub>Ge<sub>1-x-y</sub>Sn<sub>x</sub> films grown on Si using a cold-wall ultra-high-vacuum chemical-vapor-deposition system," **Editor's Pick** *Journal of Vacuum Science & Technology B* **34**, 011201 (2016)
7. J. B. Khurgin and **G. Sun**, "Impact of surface collisions on enhancement and quenching of the luminescence near the metal nanoparticles," *Optics Express* **23**, 30739-30748 (2015)

8. C. Chang, H. Li, T. P. Chen, W. K. Tseng, H. H. Cheng, C. T. Ko, C. Y. Hsieh, M. J. Chen, and **G. Sun**, "The strain dependence of  $\text{Ge}_{0.917}\text{Sn}_{0.083}$  Raman shift," *Thin Solid Films* **593**, 40–43 (2015)
9. Y.-W. Huang, W. T. Chen, W.-Y. Tsai, P. C. Wu, C.-M. Wang, **G. Sun**, and D. P. Tsai, "Aluminum plasmonic multi-color meta-hologram," *Nano Letters* **15**, 3122–3127 (2015)
10. A. Mosleh, M. Alher, W. Du, L. C. Cousar, S. A. Ghetmiri, S. Al-Kabi, W. Dou, B. R. Conley, **G. Sun**, R. A. Soref, B. Li, H. A. Naseem, S.-Q. Yu, "Direct growth of  $\text{Ge}_{1-x}\text{Sn}_x$  films on Si using a cold-wall ultra-high-vacuum chemical-vapor-deposition system," **invited paper**, *Frontiers in Materials* **2**, 1-7 (2015)
11. W.-L. Hsu, P. C. Wu, J.-W. Chen, T.-Y. Chen, B. H. Cheng, W. T. Chen, Y.-W. Huang, C. Y. Liao, **G. Sun**, and D. P. Tsai, "Vertical split-ring resonator based anomalous beam steering with high extinction ratio," *Scientific Reports* **5**, 11226 (2015)
12. P. C. Wu, W.-L. Hsu, W. T. Chen, Y.-W. Huang, C. Y. Liao, A. Q. Liu, N. I. Zheludev, **G. Sun**, and D. P. Tsai, "Plasmon coupling in vertical split-ring resonator metamolecules," *Scientific Reports* **5**, 9726 (2015)
13. T.N. Pham, W. Du, B.R. Conley, J. Margetis, **G. Sun**, R.A. Soref, J. Tolle, B. Li, S.-Q. Yu, "Si-based  $\text{Ge}_{0.9}\text{Sn}_{0.1}$  photodetector with peak responsivity of 2.85 A/W and longwave cutoff at 2.4  $\mu\text{m}$ " *Electronics Letters* **51**, 854 – 856 (2015)
14. B. R. Conley, J. Margetis, W. Du, H. Tran, A. Mosleh, S. A. Ghetmiri, J. Tolle, **G. Sun**, R. Soref, B. Li, H. A. Naseem, and S.-Q. Yu, "Si based GeSn photoconductors with a 1.63 A/W peak responsivity and a 2.4  $\mu\text{m}$  long-wavelength cutoff," *Applied Physics Letters* **105**, 221117 (2014)
15. S. A. Ghetmiri, W. Du, B. R. Conley, A. Mosleh, A. Nazzal, **G. Sun**, R. A. Soref, J. Margetis, J. Tolle, H. A. Naseem, and S.-Q. Yu, "Shortwave-infrared photoluminescence from  $\text{Ge}_{1-x}\text{Sn}_x$  thin films on silicon," *Journal of Vacuum Science & Technology B* **32**, 060601 (2014)
16. S. A. Ghetmiri, W. Du, J. Margetis, A. Mosleh, L. Cousar, B. R. Conley, L. Domulevich, A. Nazzal, **G. Sun**, R. A. Soref, J. Tolle, B. Li, H. A. Naseem, and S.-Q. Yu, "Direct-bandgap GeSn grown on Silicon with 2230 nm photoluminescence," *Applied Physics Letters* **105**, 151109 (2014)
17. P. C. Wu, **G. Sun**, W. T. Chen, K.-Y. Yang, Y.-W. Huang, Y.-H. Chen, H. L. Huang, W.-L. Hsu, H. P. Chiang, and D. P. Tsai, "Vertical split-ring resonator based nanoplasmonic sensor," *Applied Physics Letters* **105**, 033105 (2014)
18. W. Du, S. A. Ghetmiri, B. R. Conley, A. Mosleh, A. Nazzal, R. A. Soref, **G. Sun**, J. Tolle, J. Margetis, H. A. Naseem, and S.-Q. Yu, "Competition of optical transitions between direct and indirect bandgaps in  $\text{Ge}_{1-x}\text{Sn}_x$ ," *Applied Physics Letters* **105**, 051104 (2014)
19. W. Du, Y. Zhou, S. A. Ghetmiri, A. Mosleh, B. R. Conley, A. Nazzal, R. A. Soref, **G. Sun**, J. Tolle, J. Margetis, H. A. Naseem, and S.-Q. Yu, "Room-temperature electroluminescence from  $\text{Ge}/\text{Ge}_{1-x}\text{Sn}_x/\text{Ge}$  diodes on Si substrates," *Applied Physics Letters*, **104**, 241110 (2014)
20. B. R. Conley, A. Mosleh, S. A. Ghetmiri, W. Du, R. A. Soref, **G. Sun**, J. Margetis, J. Tolle, H. A. Naseem, and S.-Q. Yu, "Temperature dependent spectral response

- and detectivity of GeSn photoconductors on silicon for short wave infrared detection,” *Optics Express* **22**, 15639-15652 (2014)
21. J. B. Khurgin and **G. Sun**, “SPASER’s, VCSEL’s, and Surface plasmon emitting diodes (SPED’s): their unique features and figures of merit,” *Nature Photonics* **8**, 468–473 (2014)
  22. W. T. Chen, K.-Y. Yang, C.-M. Wang, Y.-W. Huang, **G. Sun**, I.-D. Chiang, C. Y. Liao, W.-L. Hsu, H. T. Lin, S. Sun, L. Zhou, A.-Q. Liu, and D. P. Tsai, “High-efficiency broadband meta-hologram with polarization-controlled dual images,” *Nano Letters* **14**, 225–230 (2014)
  23. H. H. Tseng, H. Li, V. Mashanov, Y. J. Yang, H. H. Cheng, G.-E. Chang, R. A. Soref, and **G. Sun**, “GeSn-based p-i-n photodiodes with strained active layer on a Si wafer,” *Applied Physics Letters* **103**, 231907 (2013)
  24. J. B. Khurgin and **G. Sun**, “Third-order nonlinear plasmonic materials: enhancement and limitations,” *Physics Review A* **88**, 053838 (2013)
  25. **G. Sun**, J. B. Khurgin, and D. P. Tsai, “Spoof plasmon waveguide enabled ultrathin room temperature THz GaN quantum cascade laser - a feasibility study,” *Optics Express* **21**, 28056-28061 (2013)
  26. J. B. Khurgin and **G. Sun**, “Plasmonic enhancement of the third order nonlinear optical phenomena: figures of merit,” *Optics Express* **21**, 27460-27480 (2013)
  27. K.-Y. Wu, B.-H. Tsai, J.-Z. Chen, G.-E. Chang, V. I. Mashanov, H. H. Cheng, **G. Sun**, and R. A. Soref, “Sn-based group-IV structure for resonant tunneling diodes,” *IEEE Electron Device Letters* **34**, 951-953 (2013)
  28. H. H. Tseng, K. Y. Wu, H. Li, V. Mashanov, H. H. Cheng, **G. Sun**, and R. A. Soref, “Mid-infrared electroluminescence from a Ge/Ge<sub>0.922</sub>Sn<sub>0.078</sub>/Ge double heterostructure p-i-n diode on a Si substrate,” *Applied Physics Letters* **102**, 182106 (2013). **APL Editor's Picks on Semiconductor Research**
  29. **G. Sun** and S. Yu, “The SiGeSn Approach towards Si-based Lasers,” *Solid State Electronics* **83**, 76-81 (2013)
  30. K. Y. Wu, I. S. Yu, H. H. Cheng, K. M. Hung, and **G. Sun**, “Theoretical analysis of n-type Si-based resonant tunneling diodes deposited on either partially or fully relaxed SiGe buffer layers,” *IEEE Transactions on Electron Devices* **60**, 1298 - 1301 (2013)
  31. J. B. Khurgin and **G. Sun**, “The case for using gap plasmon-polaritons in second-order optical nonlinear processes,” *Optics Express* **20**, 28717-28723 (2012)
  32. P. C. Wu, W. T. Chen, K.-Y. Yang, C. T. Hsiao, **G. Sun**, A.-Q. Liu, and D. P. Tsai, “Magnetic plasmon induced transparency in three dimensional metamolecules,” *Nanophotonics* **1**, 131-138 (2012)
  33. J. B. Khurgin and **G. Sun**, “How small can ‘nano’ be in a ‘nanolaser’?” *Nanophotonics* **1**, 3-8 (2012)
  34. **G. Sun** and J. B. Khurgin, “Origin of giant difference between fluorescence, resonance and non-resonance Raman scattering enhancement by surface plasmons,” *Physical Review A* **85**, 063410 (2012)
  35. J. B. Khurgin and **G. Sun**, “Injection pumped single mode surface plasmon generators: threshold, linewidth, and coherence,” *Optics Express* **20**, 15309–15325 (2012)



36. M. L. Tseng, Y.-W. Huang, M.-K. Hsiao, H. W. Huang, H. M. Chen, Y. L. Chen, C. H. Chu, N.-N. Chu, Y. J. He, C. M. Chang, W. C. Lin, L. C. Kuo, Y. J. Liu, D.-W. Huang, H.-P. Chiang, R.-S. Liu, **G. Sun**, and D. P. Tsai, "Fast fabrication of Ag nanostructure substrate using the femto-second laser for broadband and tunable plasmonic enhancement," *ACS Nano* **6**, 5190–5197 (2012)
37. G. E. Chang, H. H. Cheng, **G. Sun** and R. A. Soref, "Transformation of a two-dimensional to one-dimensional energy profile on a spatially deformed  $\text{Ge}_{0.51}\text{Si}_{0.49}/\text{Ge}_{0.82}\text{Si}_{0.18}$  wrinkled heterostructure," *Journal of Applied Physics* **111**, 104321 (2012)
38. R. A. Soref, **G. Sun**, and H. H. Cheng, "Franz-Keldysh electro-absorption modulation in germanium-tin alloys," *Journal of Applied Physics* **111**, 123113 (2012)
39. Z. Pan, J. Guo, R. A. Soref, W. Buchwald, and **G. Sun**, "Guided Plasmon modes of triangular and inverted triangular cross section silver nano-ridges," *Journal of Optical Society of America B* **29**, 950-958 (2012)
40. **G. Sun**, J. B. Khurgin, and D. P. Tsai, "Comparative analysis of photoluminescence and Raman enhancement by metal nanoparticles," *Optics Letters* **37**, 1583-1585 (2012)
41. **G. Sun**, "Towards Si based electrically injected group-IV lasers," **invited paper**, *Optical and Quantum Electronics* **44**, 563-573 (2012)
42. Z. Pan, J. Guo, R. A. Soref, W. Buchwald, and **G. Sun**, "Mode properties of flat-top silver nano-ridge surface Plasmon waveguides," *Journal of Optical Society of America B* **29**, 340-345 (2012)
43. J. B. Khurgin and **G. Sun**, "Practicality of compensating the loss in the plasmonic waveguides using semiconductor gain medium," *Applied Physics Letters* **100**, 011105 (2012)
44. J. B. Khurgin and **G. Sun**, "Scaling of losses with size and wavelength in nanoplasmonics and metamaterials," *Applied Physics Letters* **99**, 211106 (2011)
45. R. A. Soref, J. Guo, and **G. Sun**, "Low-energy MOS depletion modulators in silicon-on-insulator micro-donut resonators coupled to bus waveguides," *Optics Express* **19**, 18122 (2011)
46. **G. Sun**, J. B. Khurgin, and A. Bratkovsky "Coupled-mode theory of field enhancement in complex metal nanostructures," *Physical Review B* **84**, 045415 (2011)
47. **G. Sun** and J. B. Khurgin, "Optimization of the nanolens consisting of coupled metal nanoparticles: an analytical approach," *Applied Physics Letters* **98**, 153115 (2011)
48. **G. Sun** and J. B. Khurgin, "Plasmon enhancement of luminescence by metal nanoparticles" **invited paper**, *IEEE Journal of Selected Topics in Quantum Electronics* **17**, 110 (2011)
49. **G. Sun** and J. B. Khurgin, "Theory of optical emission enhancement by coupled metal nanoparticles: an analytical approach," *Applied Physics Letters* **98**, 113116 (2011)

50. **G. Sun**, “The intersubband approach to silicon based lasers –circumventing the indirect bandgap limitation,” **invited article**, *Advances in Optics and Photonics* **3**, 53-87 (2011)
51. **G. Sun** and J. B. Khurgin, “Comparative study of field enhancement between isolated and coupled metal nanoparticles: an analytical approach,” *Applied Physics Letters* **97**, 263110 (2010)
52. **G. Sun**, R. A. Soref, and H. H. Cheng, “Design of a Si-based lattice-matched room-temperature GeSn/GeSiSn multi-quantum-well mid-infrared laser diode,” *Optics Express* **18**, 19957-19965 (2010)
53. H. H. Cheng, W.-P. Huang, V.I. Mashanov, and **G. Sun**, “Local intermixing on Ge/Si heterostructures at low temperature growth,” *Journal of Applied Physics* **108**, 044314 (2010)
54. **G. Sun**, R. A. Soref, and H. H. Cheng, “Design of an electrically pumped SiGeSn/GeSn/SiGeSn double-heterostructure mid-infrared laser,” *Journal of Applied Physics* **108**, 033107 (2010)
55. K. M. Hung, J.-Y. Kuo, C. C. Hong, H. H. Cheng, **G. Sun**, R. A. Soref, “Carrier dynamics of terahertz emission based on strained SiGe/Si single quantum well,” *Applied Physics Letters* **96**, 213502 (2010)
56. J. B. Khurgin and **G. Sun**, “In search of the elusive lossless metal,” *Applied Physics Letters* **96**, 181102 (2010)
57. A. I. Fedorchenko, H. H. Cheng, **G. Sun**, and R. A. Soref, “Radiation emission from wrinkled SiGe/SiGe nanostructure,” *Applied Physics Letters* **96**, 113104 (2010)
58. **G. Sun**, F. Chang, and R. A. Soref, “High efficiency thin-film crystalline Si/Ge tandem solar cell,” *Optics Express*, **18**, 3746-3753 (2010)
59. **G. Sun**, J. B. Khurgin, and C. C. Yang, “Impact of high-order surface Plasmon modes of metal nanoparticles on enhancement of optical emission,” *Applied Physics Letters* **95**, 171103 (2009)
60. J. B. Khurgin and **G. Sun**, “Enhancement of optical properties of nanoscaled objects by metal nanoparticles,” *Journal of Optical Society of America B* **26**, B83-B95 (2009)
61. J. B. Khurgin and **G. Sun**, “Impact of disorder on surface plasmons in two-dimensional arrays of metal nanoparticles,” *Applied Physics Letters* **94**, 221111 (2009)
62. J. B. Khurgin and **G. Sun**, “Enhancement of light absorption in a quantum well by surface plasmon polariton,” *Applied Physics Letters* **94**, 191106 (2009)
63. **G. Sun**, J. B. Khurgin, and R. A. Soref, “Practical enhancement of photoluminescence by metal nanoparticles,” *Applied Physics Letters* **94**, 101103 (2009)
64. J. B. Khurgin, **G. Sun**, and R. A. Soref, “Practical limits of absorption enhancement near metal nanoparticles,” *Applied Physics Letters* **94**, 071103 (2009)
65. W. P. Huang, H. H. Cheng, **G. Sun**, R.-F. Lou, J. H. Yeh, and T.-M. Shen, “Observation of in-plane strain fluctuation in relaxed SiGe virtual substrate,” *Thin Solid Films*, **517**, 281-284 (2008)



66. T. H. Cheng, K. Y. Wang, W. P. Huang, H. H. Cheng, **G. Sun**, and R. A. Soref, "Electron tunneling in strained n-type  $\text{Si}_{1-x}\text{Ge}_x/\text{Si}/\text{Si}_{1-x}\text{Ge}_x$  double barrier structure," *Applied Physics Letters* **93**, 123509 (2008)
67. **G. Sun**, J. B. Khurgin, and R. A. Soref, "Plasmonic light-emission enhancement with isolated metal nanoparticles and their coupled arrays," *Journal of Optical Society of America B* **25**, 1748-1755 (2008)
68. J. B. Khurgin, **G. Sun**, and R. A. Soref, "Electroluminescence efficiency enhancement using metal nanoparticles," *Applied Physics Letters* **93**, p.021120 (2008)
69. W. P. Huang, H. H. Cheng, **G. Sun**, R. F. Lou, J. H. Yeh, and T. M. Shen, "The characteristic of strain relaxation on SiGe virtual substrate with thermal annealing," *Applied Physics Letters* **91**, 142102 (2007)
70. K. Y. Wang, W. P. Huang, H. H. Cheng, **G. Sun**, R. A. Soref, and Y. W. Suen "Observation of type-I and type-II excitons in strained Si/SiGe quantum-well structures," *Applied Physics Letters* **91**, 072108 (2007)
71. **G. Sun**, H. H. Cheng, J. Menendez, J. B. Khurgin, and R. A. Soref, "Strain-free Ge/GeSiSn quantum cascade lasers based on L-valley intersubband transitions," *Applied Physics Letters* **90**, 251105 (2007)
72. J. B. Khurgin, **G. Sun**, and R. A. Soref, "Enhancement of luminescence efficiency using surface plasmon polaritons: figures of merit," *Journal of Optical Society of America B* **24**, 1968-1980 (2007)
73. **G. Sun**, J. B. Khurgin, and R. A. Soref, "Practicable enhancement of spontaneous emission using surface plasmons," *Applied Physics Letters* **90**, 111107 (2007)
74. Y. Lu and **G. Sun**, "Design and simulation of a mid-infrared quantum cascade laser based on Ge-Si superlattices," *Diffusion and Defect Data Pt.B: Solid State Phenomena*, **121-123**, 677-680 (2007)
75. G. S. Huang, T. C. Lu, H. H. Yao, H. C. Kuo, S. C. Wang, **G. Sun**, C.-W. Lin, L. Chang, R. A. Soref, "GaN/AlGaN active regions for terahertz quantum cascade lasers grown by low-temperature metal vapor deposition," *Journal of Crystal Growth* **298**, 687-690 (2007)
76. **G. Sun**, "Design of unipolar intersubband lasers for terahertz emission," **invited paper**, *Journal of Luminescence* **119-120**, 528-534 (2006)
77. **G. Sun**, J. B. Khurgin, and R. A. Soref, "Design of a GaN/AlGaN intersubband Raman laser electrically tunable over the 3~5  $\mu\text{m}$  atmospheric transmission window," *Journal of Applied Physics* **99**, 33103 (2006)
78. **G. Sun**, J. B. Khurgin, and R. A. Soref, "Nonlinear all-optical GaN/AlGaN multi-quantum-well devices for 100 Gb/s applications at  $\lambda = 1.55 \mu\text{m}$ ," *Applied Physics Letters* **87**, 201108-201110 (2005)
79. **G. Sun** and R. A. Soref, "Design and simulation of a GaN/AlGaN quantum cascade laser for terahertz emission," *Microelectronics Journal* **36**, 450-452 (2005)
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## Conference Proceedings and Presentations

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2. J. B. Khurgin and **G. Sun**, “Limits of plasmonic enhancement: what if the metal becomes ‘lossless’?” Proceeding of the Conference on Lasers and Electrooptics (CLEO), (San Jose, June, 2016)
3. J. B. Khurgin, **G. Sun**, W. T. Chen, W.-Y. Tsai, and D. P. Tsai “Ultrafast thermal nonlinearity,” Proceeding of the Conference on Lasers and Electrooptics (CLEO), (San Jose, June, 2016)
4. C. Chang, H. Li, S. H. Huang, H. H. Cheng, and **G. Sun**, “Ge/Ge<sub>0.975</sub>Sn<sub>0.025</sub>/Ge p-i-n photodetector operated with back-side illumination,” **invited talk**, The 9<sup>th</sup> International Conference on Nanophotonics (Taipei, Taiwan, March, 2016)
5. **G. Sun** and H. H. Cheng, “Surface plasmon enhanced GeSiSn infrared detectors,” **invited talk**, 2015 Joint USAF-Korea NBIT-Taiwan Nanoscience Program Review and Technical Exchange (Seoul, South Korea, October, 2015)
6. T. Pham, W. Du, J. Margetis, S. A. Ghetmiri, A. Mosleh, **G. Sun**, R. A. Soref, J. Tolle, H. A. Naseem, B. Li, and S.-Q. Yu, “Temperature dependent study of Si based GeSn photoconductor,” SPIE Optics + Photonics (San Diego, August, 2015)
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  11. **G. Sun**, “Practicality of enhancement and spasing with metal nanoparticles,” **invited talk**, the 45<sup>th</sup> Winter Colloquium on the Physics of Quantum Electronics (Snowbird, Utah, January, 2015)
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73. B. S. Ham, **G. Sun**, and S. K. Noh, "Ultrafast on-demand all-optical buffer memory in coupled quantum wells," The 13th International Symposium on the Physics of Semiconductors and Applications, (Jeju, South Korea, August, 2006)
74. **G. Sun**, J. B. Khurgin, and R. A. Soref, "Design of a GaN/AlGa<sub>N</sub> intersubband Raman laser electrically tunable over the 3~5  $\mu$ m atmospheric transmission window," (Extended abstract), Proceeding of Conference of Lasers and Electro-Optics, (Long Beach, California, May, 2006)
75. S. C. Wang, R. A. Soref, and **G. Sun** "Fabrication and Characteristics of GaN/AlGa<sub>N</sub> multilayer structure for terahertz quantum cascade laser," **invited talk** in Terahertz Physics, Devices, and Systems, edited by Mehdi Anwar, Anthony J. DeMaria, Michael S. Shur, Proceedings of SPIE, **6373** (SPIE, Bellingham, WA, 2006) p.637309-1
76. S. C. Wang, **G. Sun**, and R. A. Soref "Fabrication and characterization of GaN/AlGa<sub>N</sub> multilayer structure for terahertz quantum-cascade laser," **invited talk**, Optics East, (Boston, Massachusetts, October, 2006)
77. J. B. Khurgin **G. Sun**, and R. A. Soref, "Nonlinear all-optical devices based on intersubband GaN/AlGa<sub>N</sub> coupled quantum wells for wide bandwidth applications at  $\lambda = 1.55 \mu$ m," The 8<sup>th</sup> International Conference on Intersubband Transitions in Quantum Wells, (Cape Cod, Massachusetts, September, 2005)
78. **G. Sun**, J. B. Khurgin, and R. A. Soref, "Engineering intersubband nonlinearities in GaN/AlGa<sub>N</sub> coupled quantum wells for optimized performance in wide bandwidth applications," (Extended abstract), Proceeding of Conference of Lasers and Electro-Optics, (Baltimore, Maryland, May, 2005)
79. Y. Lu and **G. Sun**, "Design and simulation of terahertz GaN/Al<sub>0.15</sub>Ga<sub>0.85</sub>N quantum cascade laser, (Beijing, China, September 2004) *SIMC* 2005, art. no. 1511438, pp. 284-288
80. **G. Sun**, "Design and modeling of THz quantum cascade lasers," **invited talk**, 15<sup>th</sup> International Conference on Dynamical Processes in Excited States of Solids, (Shanghai, China, August, 2005)
81. **G. Sun**, R. A. Soref, and Jacob B. Khurgin, "A comparative study of InAs quantum dot lasers with barriers of indirect and direct band gap," 5<sup>th</sup> International Conference on Low Dimension Structures and Devices, (Cancun, Mexico, December, 2004)
82. **G. Sun** and R. A. Soref, "Design and simulation of a GaN/AlGa<sub>N</sub> quantum cascade laser for terahertz emission," 5<sup>th</sup> International Conference on Low Dimension Structures and Devices, (Cancun, Mexico, December, 2004)
83. **G. Sun** and R. A. Soref, "Design of room temperature GaN/AlGa<sub>N</sub> THz quantum ," IEEE Semiconducting and Semi-Insulating Materials Conference cascade lasers," March Meeting of the American Physical Society, (Montreal, Canada, March, 2004)
84. J. B. Khurgin, **G. Sun**, and R. A. Soref, "Intersubband spin pump," The 7<sup>th</sup> International Conference on Intersubband Transitions in Quantum Wells, (Evolene, Switzerland, September, 2003)
85. **G. Sun**, R. A. Soref, and J. B. Khurgin, "Improved temperature characteristics in quantum dot lasers with indirect bandgap barriers," (Extended abstract),

- Proceedings of Conference of Lasers and Electro-Optics, (Baltimore, Maryland, June, 2003)
86. Y. Lu, C. Lu, and **G. Sun**, "Valence intersubband laser with strained-symmetrized silicon-based Si-Ge superlattice" Proceedings of SPIE **4918** (SPIE, Bellingham, WA, 2002), pp.378-384
  87. **G. Sun** and R. A. Soref, "Si-based quantum staircase THz lasers," The 4<sup>th</sup> International Conference on Low Dimension Structures and Devices, (Fortaleza, Brazil, December, 2002)
  88. B. S. Ham and **G. Sun**, "Ultrahigh-speed all-optical modulation in GaAs/AlGaAs quantum wells," The 11<sup>th</sup> Seoul International Symposium on the Physics of Semiconductors and Applications, (Seoul, South Korea, August, 2002)
  89. **G. Sun**, "Promising SiGe quantum well and superlattice laser candidates," **invited talk**, Optical Amplification and Stimulation in Silicon, (Trento, Italy, September, 2002)
  90. **G. Sun** and R. A. Soref, "Inverted-mass HH2 intersubband quantum staircase lasers," (Extended abstract), The 6<sup>th</sup> International Conference on Intersubband Transitions in Quantum Wells, (Asilomar, California, September, 2001)
  91. **G. Sun** and R. A. Soref, "Phonon-pumped semiconductor terahertz lasers," (Extended abstract), The 6<sup>th</sup> International Conference on Intersubband Transitions in Quantum Wells, (Asilomar, California, September, 2001)
  92. **G. Sun**, "Terahertz SiGe Interminiband Laser Based on Phonon Engineering," The 10th International Conference on Narrow Gap Semiconductors and Related Small Energy Phenomena, Physics and Applications, (Ishikawa, Japan, May, 2001)
  93. **G. Sun**, "Acoustic Phonon Scattering between light hole and heavy hole in a SiGe/Si superlattice," The 3rd Joint Meeting of Chinese Physicist World Wide (Hong Kong, August, 2000)
  94. R. A. Soref, L. Friedman, **G. Sun**, M. J. Noble, and L. R. Ram-Mohan, "Intersubband quantum-well terahertz lasers and detectors" in Terahertz and Gigahertz Photonics, edited by R. Jennifer Hwu, Ke Wu, Proceedings of SPIE **3795**, (SPIE, Bellingham, WA, 1999) pp.516-527
  95. **G. Sun**, Y. Lu, and J. B. Khurgin, "Valence intersubband lasers without total population inversion based on the inverted mass," in Semiconductor Lasers III, edited by Qiming Wang, Lawrence J. Davis, Siamak Forouhar, Proceedings of SPIE **3547**, (SPIE, Bellingham, WA, 1998) pp.333-340
  96. **G. Sun**, L. Friedman and R. A. Soref, "Feasibility of novel Si-based interminiband lasers," Materials Research Society Symposium Proceedings **533**, pp.227-234 (1998)
  97. **G. Sun**, Y. Lu, and J. B. Khurgin, "THz intersubband lasers using the inverted mass scheme," The 1997 International Workshop on Intersubband Transitions in Quantum Wells: Physics and Devices, (Tainan, Taiwan, December, 1997)
  98. **G. Sun** and J. B. Khurgin, "Electron Raman infrared laser based on intersubband transitions in coupled quantum wells," 8th International Conference on Narrow Gap Semiconductors, (Shanghai, China, April, 1997)
  99. L. Friedman, R. A. Soref, and **G. Sun**, "Si-based intersubband laser," General Meeting of the American Physical Society (March, 1997)



## Curriculum Vitae- Greg Sun

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100. N. A. Pendergrass and **G. Sun**, "Using Computer Assisted Collaborative Learning to Improve Distance Education," Frontiers In Education - FIE'97, (Pittsburg, PA, Nov. 1997)
101. N. A. Pendergrass and **G. Sun**, "Using Computer Assisted Collaborative Learning for High Quality Distance Education," Frontiers In Education - FIE'96, (Salt Lake City, UT, Nov. 1996)
102. **G. Sun**, L. Friedman, and R. A. Soref, "Intersubband lasing in silicon-based quantum well structure," 9th International Conference in Superlattices, Microstructures, and Microdevices, (Liege, Belgium, July, 1996)
103. **G. Sun**, J. B. Khurgin, L. Friedman and R. A. Soref, "Intersubband lasing in silicon-based multiple quantum wells," in Semiconductor Lasers II, edited by Siamak Forouhar, Qiming Wang, Proceedings of SPIE **2886** (SPIE, Bellingham, WA, 1996), pp.198-204
104. **G. Sun**, J. B. Khurgin, L. Friedman and R. A. Soref, "Optically pumped intersubband electron Raman lasers," in Semiconductor Lasers II, edited by Siamak Forouhar, Qiming Wang, Proc. SPIE **2886** (SPIE, Bellingham, WA, 1996), pp.20-24
105. J. B. Khurgin, L. Friedman, R. A. Soref, and **G. Sun**, "Comparative analysis of optically pumped intersubband lasers and intersubband Raman oscillators," (Extended abstract), Proceeding of Conference of Lasers and Electro-Optics, (Baltimore, Maryland), 143 (1996)
106. L. Friedman, R. A. Soref, and **G. Sun**, "Intersubband lasing in Si-based quantum well structures," General Meeting of the American Physical Society, (March, 1996)
107. L. Friedman and **G. Sun**, "Effect of phonon confinement on intersubband lasing lifetimes of Si/SiGe quantum well structures," Materials Research Society Symposium Proceedings **402**, pp.455-459 (Boston, Massachusetts 1996)
108. **G. Sun**, "Comparative analysis of intersubband lasing lifetimes of SiGe/Si and GaAs/AlGaAs multiple quantum well structure," **invited talk**, the 26th Winter Colloquium on the Physics of Quantum Electronics, (Snowbird, Utah, January, 1996)
109. **G. Sun**, L. Friedman, and R. A. Soref, "SiGe-on-Si quantum cascade intersubband laser", General Meeting of the American Physical Society, (March, 1995)
110. **G. Sun**, Y. Li, Y. Lu, B. Khan, and G. S. Tompa, "Investigation of efficiency improvement on Si solar cells due to porous layers," Materials Research Society Symposium Proceedings **358**, pp.593-598 (1995)
111. S. I. Kim, T. Hart, B. K. Khan, G. S. Tompa, Y. Lu, **G. Sun**, and J. Khurgin, "IR, visible, and UV photoluminescence dependence on the composition of quantum nanocrystals," Materials Research Society Symposium Proceedings **326**, pp.591-596 (1994)
112. **G. Sun**, J. Petruzzello, J. Gaines, and D. Olego, "Band offsets in ZnSe/ZnCdSe multiple quantum well structures," (Extended abstract), Proceeding of Conference of Lasers and Electro-Optics, (Baltimore, Maryland), (1993)
113. **G. Sun** and J. Khurgin, "Band engineering of optically-pumped four-level infrared lasers," Annual Meeting of IEEE Lasers and Electro-Optics Society (1991)



114. **G. Sun**, K. Shahzad, J. Gaines, and J. Khurgin, “Low threshold operation of optically-pumped double heterostructure  $\text{ZnSe}/\text{ZnS}_x\text{Se}_{1-x}$  lasers,” (Extended abstract), Proceeding of Conference of Lasers and Electro-Optics, (Baltimore, Maryland), 268 (1991)
115. X. Feng and **G. Sun**, “A new on-line approach for AIDS modeling and prediction through dynamic data systems identification (DDSI) method,” Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, (New Orleans, Louisiana, November, 1988) **10**, pp.1084-1085

### Seminars and Colloquia

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1. “Is sky the limit for plasmonic enhancement if metal becomes lossless?” Academia Sinica, (Taipei, Taiwan, January, 2016)
2. “Why does size matter in plasmonic enhancement,” Sung Kyun Kwan Univerity, (Suwon, South Korea, October, 2015)
3. “Surface plasmon enhanced GeSiSn detectors and basics of intersubband lasers,” Institute of Semiconductors, Chinese Academy of Sciences, (Beijing, China, October, 2015)
4. “Group-IV approach towards Si-based light sources,” Academia Sinica, (Taipei, Taiwan, December, 2014)
5. “Is nitride a solution for compact, room temperature THz laser?” Institute of Semiconductors, Chinese Academy of Sciences, (Beijing, China, June, 2014)
6. “Towards Si-based light sources” 2014 Peking University Summer School on Silicon Photonics Technology and Applications, (Beijing, China, July, 2014)
7. “Understanding nanoplasmonics” 2014 Peking University Summer School on Silicon Photonics Technology and Applications, (Beijing, China, July, 2014)
8. “Prospect of a compact, room temperature THz laser,” Academia Sinica, (Taipei, Taiwan, May, 2014)
9. “Why size matters,” presented at the Department of Electrical and Computer Engineering, University of Massachusetts Lowell, (Lowell, Massachusetts, March, 2014)
10. “Approaches towards Si based lasers,” 2013 Peking University Summer School on Silicon Photonics Technology and Applications, (Beijing, China, July, 2013)
11. “Origin of Optical Enhancement by Metal Nanoparticles,” 2013 Peking University Summer School on Silicon Photonics Technology and Applications, (Beijing, China, July, 2013)
12. “Why size matters in nanophotonics,” Research Center for Applied Sciences, Academia Sinica, (Taipei, Taiwan, August, 2013)
13. “Where does the plasmonic enhancement come from?” School of Physics, Shanghai Jiao Tong University, (Shanghai, China, January, 2012)
14. “Intersubband transitions in nitride quantum wells,” School of Physics, Shanghai Jiao Tong University, (Shanghai, China, January, 2012)

15. "Towards silicon based lasers – leaping over the last hurdle in silicon photonics," Department of Electrical Engineering, University of Arkansas, (Fayetteville, Arkansas, November, 2011)
16. "Origin of enhancement by metal nanoparticles," Department of Optical Engineering, Zhe Jiang University, (Hangzhou, China, August, 2011)
17. "Approaches towards Si-based lasers," Department of Physics, National Tsinghua University, (Hsingchu, Taiwan, July, 2011)
18. "Why metal nanoparticles can enhance optical properties?" Instrument Technology Research Center, (Hsingchu, Taiwan, July, 2011)
19. "Understanding the optical enhancement by metal nanoparticles" Center for Condensed Matter Science, National Taiwan University, (Taipei, Taiwan, July, 2011)
20. "Understanding optical enhancement by metal nanoparticles," Rochester Institute of Technology, (Rochester, New York, May, 2011)
21. "Understanding metal nanoparticles with an analytical approach," Department of Physics, University of Massachusetts Lowell, (Lowell, Massachusetts, February, 2011)
22. "Calculating the optical enhancement by metal nanoparticles the analytical way," Department of Electrical and Computer Engineering, University of Alabama at Huntsville, (Huntsville, Alabama, November, 2010)
23. "The Intersubband approach towards Si-based lasers," Department of Electrical and Computer Engineering, Marquette University, (Milwaukee, Wisconsin, September, 2010)
24. "Understanding optical enhancement by metal nanoparticles," Institute of Semiconductors, Chinese Academy of Sciences, (Beijing, China, July, 2010)
25. "Understanding optical enhancement by metal nanoparticles," Nanoelectronics, Electromagnetics and Photonics Seminar, University of Delaware, (Delaware, April, 2010)
26. "Intersubband approach to Si-based lasers," Technology Research Center, University of Maryland at Baltimore County, (Maryland, April, 2010)
27. "Where does the optical enhancement come from with metal nanoparticles?" University of Wisconsin at Madison, (Wisconsin, March, 2010)
28. "How metal nanoparticles enhance optical processes?" Cairo University, (Egypt, January, 2010)
29. "What metal nanoparticles can do to nearby nanoscaled objects?" Hebrew University of Jerusalem, (Israel, January, 2010)
30. "Enhancement of optical properties of nanoscaled objects by metal nanoparticles," Graduate Institute of Electro-Optical Engineering, National Taiwan University, (Taipei, Taiwan, July, 2009)
31. "Plasmonic enhancement of spontaneous emission efficiency," Department of Electronics Engineering, National Kaohsiung University of Applied Sciences, (Kaohsiung, Taiwan, August, 2008)
32. "Si-based quantum cascade laser using L-valley intersubband transitions," Department of Physics, National Taiwan University, (Taipei, Taiwan, June, 2007)

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33. “Novel approaches in quantum cascade lasers,” Department of Photonics and Institute of Electro-Optical Engineering, National Chiao Tung University, (Hsinchu, Taiwan, May, 2007)
34. “Efficiency improvement of light emitting devices using surface plasmons,” Graduate Institute of Electro-Optical Engineering, National Taiwan University, (Taipei, Taiwan, March, 2007)
35. “Group-IV quantum cascade lasers operating in the *L*-valleys – a feasibility study,” Institute of Semiconductors, Chinese Academy of Sciences, (Beijing, China, April, 2007)
36. “Intersubband lasing – a pathway towards Si-based lasers,” Center for Condensed Matter Science, National Taiwan University, (Taipei, Taiwan, March, 2007)
37. “Terahertz intersubband quantum cascade lasers,” Institute of Semiconductors, Chinese Academy of Sciences, (Beijing, China, August, 2004)
38. “Design and modeling of intersubband lasers,” Institute of Semiconductors, Chinese Academy of Sciences, (Beijing, China, December, 2002)
39. “Valence intersubband laser designs,” Center for Quantum Coherence and Communications, Electronics and Telecommunications Research Institute, (Taejon, South Korea, February, 2002)
40. “GaAs and SiGe inverted mass and phonon pumped THz lasers,” Institute for Microstructural Sciences, National Research Council, (Ottawa, Canada, October, 2001)
41. “Lasing in Si-based material systems using intersubband transitions,” Physics Colloquium at University of Massachusetts at Lowell, (Lowell, Massachusetts, March, 1997)
42. “Intersubband lasing lifetimes in Si-based multiple quantum well structures,” Physics Colloquium at Worcester Polytechnic Institute, (Worcester, Massachusetts, February, 1996)
43. “Electro-optical properties of ZnSe-based heterostructures,” presented at the Institute of Microelectronics, Peking University, (Beijing, China June, 1994)

### Patents

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R. A. Soref and **G. Sun**, “Phonon-pumped semiconductor lasers,” U.S. Patent 6,621,841, issued on September 16, 2003

### Professional Organizations

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Optical Society of America  
IEEE Photonics Society  
Materials Research Society

### Grants and Contracts

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1. “GeSn based near and mid infrared heterostructure detectors”  
PIs: G. Sun, UMass Boston and H. H. Cheng, National Taiwan University

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- The Asian Office of Aerospace Research and Development  
Amount: \$160K (2016-2017)
2. "SiGeSn heterostructure photonics technology for ultrafast communications in the 2–mm infrared region"  
P.I.: G. Sun and R. A. Soref, UMass Boston  
Air Force Office of Scientific Research, Amount: \$250K (July, 2014 - June, 2017)
  3. "Silicon based mid infrared SiGeSn heterostructure emitters and detectors"  
P.I.: G. Sun, UMass Boston  
Asian Office of Aerospace Research and Development, Amount: \$60K (June, 2014 - December, 2015)
  2. "Plasmonic enhanced photocatalysis,"  
Co-PI: G. Sun, UMass Boston  
with University of Wisconsin Madison and University of Massachusetts Lowell  
DoE ARPA E program, Amount: \$1.5M (February, 2013 – January, 2014)
  3. "The longwave silicon chip: Integrated plasma-photonics in group IV and III-V semiconductors"  
P.I.: G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$352K (September, 2010 - August, 2013)
  4. "High Efficiency Photovoltaic and Plasmonic Devices"  
P.I.: G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$150K (July, 2009 - July, 2011)
  5. "Infrared and Terahertz lasers on Si using novel group IV alloys,"  
Co-PI: G. Sun, UMass Boston  
with Arizona State University and University of Illinois, Urbana Champaign - a MURI program  
Air Force Office of Scientific Research, Amount: \$2.5M (June, 2006 – May, 2011)
  6. "Semiconductor Terahertz Technology"  
P.I.: G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$150K (April, 2007 - April, 2009)
  7. "Summer Transportation Institute"  
P.I.: Tomas Materdey; co-P.I.; G. Sun, UMass Boston  
Federal Highway Administration, Amount: \$83K (July, 2007)
  8. "Summer Transportation Institute"  
P.I.: Tomas Materdey; co-P.I.; G. Sun, UMass Boston  
Federal Highway Administration, Amount: \$43K (July, 2006)
  9. "Intersubband and Plasmonic Device Modeling"  
P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$150K (April, 2005 - March, 2007)
  10. "Summer Transportation Institute"  
P.I.: Tomas Materdey; co-P.I.; G. Sun, UMass Boston  
Federal Highway Administration, Amount: \$50K (July, 2005)
  11. "Modeling of GaN-based THz emitters and quantum dot lasers with indirect barriers"

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- P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$141K (April, 2003 - March, 2005)
12. “Modeling of infrared ladar detectors and terahertz emitters”  
P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$105K (May, 2001 - November, 2003)
13. “Semiconductor multi-spectral sensors”  
P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$40K (May, 2000 - October, 2001)
14. “InAs/GaInSb detectors sensitive to radiation beyond 16 microns”  
P.I.: G. Sun, UMass Boston  
SBIR Subcontract to Epitaxial Technologies, Inc., Amount: \$15K (Sept., 1999-Aug., 2000)
15. “Investigation of Si-based intersubband infrared laser”  
P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$68K (Feb., 1998 - March, 1999)
16. “Modeling of Si quantum structures”  
P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$25K (Aug, 1997 - July, 1998)
17. “Investigation of Si/ZnS near infrared intersubband lasers”  
P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$25K (Jan, 1997 - Dec, 1997)
18. “Quantum modeling”  
P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$25K (Aug, 1996 - July, 1997)
19. “Silicon intersubband laser characterization”  
P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$63K (July, 1996 - Feb, 1998)
20. “Investigation of Si-based intersubband quantum well lasers”  
P.I.; G. Sun, UMass Boston  
Air Force Office of Scientific Research, Amount: \$25K (Jan, 1996 - Dec, 1996)
21. “Development of long wavelength infrared detectors for trace gas detection”  
P.I.: G. Sun, Structured Materials Industries, Inc.  
Department of Energy SBIR Contract Award, Amount: \$75K (1993)
22. “Development of quantum nanocrystal sensor based technology”  
P.I.: G. Sun, Structured Materials Industries, Inc.  
Department of Defense SBIR Contract Award, Amount: \$50K (1993)
23. “Development of highly efficient porous polycrystalline Si solar cells for space based applications”  
P.I.: G. Sun, Structured Materials Industries, Inc.  
Department of Defense SBIR Contract Award, Amount: \$50K (1993)