

Alyssa B. Apsel

Department of Electrical and Computer Engineering
Cornell University
412 Phillips Hall
Ithaca, NY 14850

Email: apsel@ece.cornell.edu
Phone: (607) 255-3962
Fax: (607) 254-4565
Web: oevlsi.ece.cornell.edu

Education

Ph.D., Electrical Engineering, The Johns Hopkins University, August 2002.

Dissertation: Optoelectronic Receivers in Silicon on Sapphire CMOS: Architecture and Design for Efficient Parallel Interconnects

Advisor: Andreas Andreou

M.S., Electrical Engineering, California Institute of Technology, Pasadena, CA, 1996.

B.S. (with distinction), Electrical Engineering, Swarthmore College, Swarthmore, PA, 1995.

Professional Experience

Associate Professor, Electrical and Computer Engineering, Cornell University, Ithaca, NY, June 2008-present.
Primary research interests: low power radio design and networking, design in presence of process variation, optoelectronic CMOS, high speed RF.

Consultant, Intel Research, Hillsboro Oregon, January – June 2009. Developed process invariant calibration blocks for high speed I/O circuits.

Assistant Professor, Electrical and Computer Engineering, Cornell University, Ithaca, NY, Aug. 2002-May 2008.
Research interests include: Mixed mode design in scaled CMOS processes, Optoelectronic CMOS systems and architectures, Short distance interconnect design, High speed CMOS interfaces, Integrated photonics, Low Power RF circuits.

Graduate Research Assistant, Electrical and Computer Engineering, Johns Hopkins University, Baltimore, MD, May 1997-August 2002. Research projects include: opto-electronic interconnects in Silicon on Sapphire (SOS) CMOS, Address-Event architecture development and algorithm development, examination of novel SOS devices and structures.

Graduate Research Assistant, Army Research Laboratory, Adelphi, MD, December 2000 - 2002. Research Projects include: Development of 2 dimensional arrays of opto-electronic interconnects using VCSELs and MSMs.

Graduate Research Assistant, Electrical Engineering, California Institute of Technology, Pasadena, CA, September 1995-May 1997. Research Projects include: Study of floating-gate devices for analog memory in subthreshold translinear circuits, electronic nose project using chemical sensors.

Teaching Experience

ECE 2100 (Electric Circuits) Instructor, Cornell University, Fall 2010. Taught undergraduate introduction to electronics course with attached lab. Material includes linear systems theory and basic RLC circuits. (88 students)

ECE 695 (Advanced Data Converters) Instructor, Cornell University, Fall 2008. Taught graduate course in data converter techniques. Focus on research work and new architectures for ADC/DAC. (15 students)

ECE 453 (Analog VLSI) Instructor, Cornell University, Fall 2004- 2007. Taught undergraduate CDE (culminating design experience) course in analog VLSI. (35-65 students annually.)

ECE 554 (Advanced Analog VLSI) Instructor, Cornell University, Spring 2004-2011 (except 2009) Taught graduate course in advanced analog VLSI including noise, translinear circuits, and high speed circuits. (10-30 students annually)

ECE 150 (Freshman Advising) Fall 2006. Coordinated and instructed new freshman in an introduction to Cornell University. (17 students)

ECE 315 (Integrated Microelectronics) Laboratory Coordinator, Cornell University, Fall 2003. Coordinated, instructed, and designed laboratory sections for junior level electronics laboratory. (68 students)

ECE 596 (VLSI for Optical Interconnect) Instructor, Cornell University, Spring 2003. Designed and taught new graduate and senior level course on VLSI for opto-electronic interconnects. (23 students)

ECE 315 Laboratory Section Instructor, Cornell University, Fall 2002. Instructor for junior level electronics laboratory. (30 students)

Research Interests

Circuits for UWB communication enabling ultra-low power communication networks and emergent behavior

Analysis and design of high speed, low power VLSI circuits for robust inter-chip and intra-chip communication.

Design of Mixed Mode circuits in scaled and high variation CMOS processes.

Low power mixed mode circuit and system design for data communication.

Current Research

Low Power I/O interfaces and signaling: For both high speed and RF communications, many applications are currently limited not by the capabilities of modern electronics, coding, and wiring, but by the power consumption and cost incurred by standard techniques. By examining the problems of low power RF and optical communications from the perspective of the hardware designer, new and realistic solutions for low power communication that sacrifice channel capacity for power may be realized. The questions we ask in this research are “What is the practical power minima?” and “What can you do with almost no resources?”

Analog and Mixed Signal circuit design in scaled CMOS: Scaled CMOS processes pose a number of challenges for interface and mixed mode circuit designers. One of the most significant of these challenges is achieving high yield in the presence of process induced variation without degradation in circuit performance such as output loading. Through examination of a variety of techniques including stochastic compensation, redundancy, and feedback in addition to alternative signaling styles, we hope to extend the useful scaling curve for circuits for mixed signal systems.

Interconnect Design: Analysis of power and performance in ultra-short distance and board level optoelectronic interconnects. Construction of high performance and low power optically interconnected on-chip and chip-to-chip systems in silicon technologies such as bulk CMOS, BiCMOS, and SOI technologies. This includes investigation and construction of low cost photonic interfaces such as coupling structures, waveguides, and low cost detectors.

Honors & Awards

ISLPED Design Contest, second place, Austin TX, 2010

Best Poster Award, National Academy of Engineering Japan America Frontiers of Engineering, Kobe, Japan, 2008

Invited Participant for National Academy of Engineering Japan America Frontiers of Engineering, Kobe, Japan, 2008

John Swanson '61 ME in honor of his mother, Dorothy G. Swanson College Teaching Award, 2007

IEEE MICRO "Top Picks" for 2006 (IEEE Micro Top Picks is an annual selection of "most industry relevant and significant papers of the year in computer architecture")

Best Paper Award, International Symposium on Asynchronous Circuits and Systems (ASYNC), 2006

Invited Participant for National Academy of Engineering "Frontiers in Engineering Symposium", 2005

2004 MIT Technology Review's Top 100 Young Innovators (TR100)

NSF Early CAREER award, 2004.

Clare Boothe Luce Chair in Electrical and Computer Engineering, 2002-2007.

Best Student Paper, IEEE Midwest Symposium on Circuits and Systems 2000.

Abel Wolman Fellowship, Johns Hopkins University, 1997-1998.

Caltech Institute Fellowship, California Institute of Technology, 1995-1996.

Best Student Paper, Philadelphia Section IEEE Student Paper Contest, 1995.

SUNFEST Summer Undergraduate Fellowship, University of Pennsylvania, 1994.

Patents

S. Manipatruni, R.K. Dokania, A. B. Apse and M. Lipson, "Method and Apparatus for Wide Temperature Range Operation of Resonant Silicon Electro-optic Modulators" (Docket Number: D-4475) provisional filed

R. Dokania, X. Wang and A. Apse, "Systems and Methods for PCO based UWB Impulse Radio with Localized Synchronization Detection and Retention", provisional patent application CRF#D-4583-01, Application No. 61/140,143, filed 12/23/2008. Patent Application No. PCT/US09/69195 filed 12/22/09.

X. Wang and A. Apse, "Pulse Coupled Oscillator Based Synchronization for Wireless Communications", provisional patent application CRF#D-4200-01, Application No. PCT/US08/72141, filed 8/3/2007.

A. Apse, A. Pappu, C.P. Chen, T. Yin, "Integrated Receiver in a Commercial SiGe BiCMOS Process" CRF# D-3970 Provisional Filed 08/09/2006. Application No. 11/837,222 filed August 2007.

A. Pappu, A. Apse, "Current Source Circuit and Design Methodology", U.S. Patent No. 7,629,832, Dec. 8, 2009.

Filipp Akopyan, Rajit Manohar, Alyssa B. Apse., "Architecture for an Asynchronous Analog-to-Digital Converter.", U.S. Patent No. 7,446,258, December 16, 2008.

A. Apse, A. Andreou, "Low Power, Differential Optical Receiver in Silicon on Insulator", U.S. Patent 6,720,830, April 13, 2004.

R. Reedy, R. Athale, G. Simonis, A. Andreou, A. Apsel, Z. Kalajian, P. Pouliquen, "Integrated electronic-optoelectronic devices and method of making the same", U.S. Patent 6,583,445, June 24, 2003.

Professional Activities

Chair, Analog Signal Processing Technical Committee, IEEE-ISCAS, 2010-2011,
Chair Elect, Analog Signal Processing Technical Committee, IEEE-ISCAS, 2009-2010,
Secretary/Webmaster, Analog Signal Processing Technical Committee, IEEE-ISCAS, 2008-2009,
Chair of the Optics in Digital Systems Group, Science and Engineering Council of OSA 2007,
Vice-Chair of the Optics in Digital Systems Group, Science and Engineering Council of OSA 2006,
Associate Editor for IEEE Transactions on VLSI Systems 2008-2009
Associate Editor for IEEE Transactions on Circuits and Systems I 2006-2008,
Associate Editor for IEEE Transactions on Circuits and Systems II 2003-2006, 2009-present
Member, Program committee for SPIE ITCOM,
Member, Program committee for SPIE Photonics West,
Organizer for Invited Special Session on "Heterogeneous Integration" for International Symposium on Circuits and Systems 2004,
Member, analog signal processing technical committee International Symposium on Circuits and Systems,
Member, sensory systems technical committee International Symposium on Circuits and Systems,
Member, Program committee for IEEE LEOS Annual Meeting.

Reviewing Activities: IEEE Sensors Journal, IEE Proceedings – Optoelectronics, IEEE Transactions on Circuits and Systems I, IEEE Transactions on Circuits and Systems II: Analog and Digital Signal Processing, Journal of Applied Optics, IEEE International Symposium on Circuits and Systems, and others.

Member, Cornell ECE Curriculum and Standards Committee, 2010-present
Member for Site Visit Team for NSF COINS NSEC, UC-Berkeley 2008, 2010
Member, Cornell ECE General Hiring Committee, 2008-2009
Member, Cornell ECE Master Plan Committee, 2007,2008,
Member, Cornell ECE Director Evaluation/Search Committee, 2005-2006,
Member, Cornell ECE Circuits/Computer Engineering Hiring Committee, 2005-2007,
Member, Cornell Engineering College Teaching Awards Committee 2004-2006,
Member, Cornell Graduate Education/Admissions Committee 2003-2005,
Organizer, Cornell Colloquim Series 2004-2005,
Organizer, Cornell VLSI Seminar Series 2003-2007 (procured Analog Devices sponsorship for 2005-2007),
Panelist for NSF proposal reviews: Photonics - spring 2003, NIRT - winter 2005, CCF-CISE CAREER – fall 2005

Graduate Student Representative Committee, Electrical and Computer Engineering, Johns Hopkins University, 1999-2001.

SOS Peregrine/OIDA/PTAP workshop, Peregrine Semiconductor, Sept. 2004.
SOS Peregrine/USC/COOP workshop, University of Southern California, 2001.
Industrial Visits Include: Lockheed Martin, Owego (March 2003) Agilent, Palo Alto (August 2003) IBM, Yorktown Heights (March 2004) Peregrine Semiconductor, San Diego (September 2004), Analog Devices, Wilmington (July 2005), Moog Inc, Buffalo (July 2006), Motorola, Chicago (August 2006), National Semiconductor (October 2006), TSMC (October 2006), AMD (October 2006) , Intel Hillsboro (winter/spring 2009), TSMC (May 2009), Intel Seattle (June 2009)

Member IEEE, Member IEEE Solid State Circuit Society, Member IEEE Circuits and Systems Society, Member IEEE LEOS, Member OSA

Invited Lectures and Seminars

"Process Compensated High Speed Ring Oscillators in Sub-Micron CMOS", IEEE CAS-FEST Workshop, Athens, Greece, December 10, 2010

“Firefly Radios”, Cornell Physics Department Colloquium, September 20, 2010.

“Firefly Radios”, Cornell Welch-Allyn Workshop, August 4, 2010.

“Mixed Signal Electronics in a Digital Environment ”, University of Massachusetts, Amherst, MA, March 26, 2010

“Mixed Signal Electronics in a Digital Environment ”, Intel Corporation, Seattle, WA, June 12, 2009.

“Mixed Signal Electronics in a Digital Environment ”, TSMC, Xinchu, Taiwan, May 27, 2009.

“Mixed Signal Electronics in a Digital Environment ”, Intel Corporation, Hillsboro, OR, Feb 15, 2009

“Mixed Signal Electronics in a Digital Environment ”, University of Maryland ECE Seminar, College Park, MD, October 24, 2008.

“Mixed Signal Electronics in a Digital Environment”, MIT/MTL Seminar Series, Cambridge, MA, October 7, 2008.

“New Paradigms to Push Power and Performance in Mixed Signal Electronics”, CHIPS – Cornell Highly Integrated Physical Systems Workshop, Ithaca, NY, October 2, 2008.

“ICECS 2007 Tutorial: Analog and Asynchronous Variation-aware Circuits for the Nanoscale era” ICECS, Morocco, Dec. 2007. A. Apsel, R. Manohar, and A. Martin

“Optical Interconnect for Computing”, IBM Austin Research Labs, Austin, Texas, October 5, 2007.

“Mixed Signal Electronics in a Digital Environment”, University of Texas, Austin, Electrical Engineering, October 5, 2007.

“Optical Interconnect for Computing”, University of Texas, Austin, Computer Science, October 4, 2007.

“Mixed Signal, Mixed Media: Interfacing Optical Interconnects with Silicon Electronics”, MIT Microphotonics Consortium Fall Meeting, September 10, 2007

“From Interconnect to Device: Analog Design for Scaled CMOS Electronics”, University of Michigan, March 22, 2007

“Not Your Father’s Circuits: The Changing Face of Modern Electronics”, Plenary Talk, University of Toronto ESCI Conference, Toronto, Canada, February 9, 2007

“From Interconnect to Device: Analog Design for Scaled CMOS Electronics” University of Minnesota, Minneapolis, MN, November 7, 2006

“From Interconnect to Device: Addressing Problems in Scaled CMOS Electronics” Caltech Analog/RF/Microwave Seminar Series, Pasadena CA, October 27, 2006

“Integrated Photonics in Silicon: The Long and the Short of It” Motorola Inc., Schaumburg IL, August 14, 2006

“Circuits for Sensing: Meeting the Demand for Higher Precision, Accuracy, and Sensitivity” DARPA MTO Workshop on Self-Calibrating MEMs Sensors, Santa Barbara, CA, July , 2006

“Integrated Photonics in Silicon: The Long and the Short of It” CIPS Annual Meeting, MIT, Cambridge MA, May 4, 2006.

“ICs at Light Speed? Latency, Bandwidth, and Skew in Electronic/Photonic Hybrid Architectures,” MTO Intra-Chip Communication Workshop, Arlington, VA, March 27, 2006.

“Merging Traditional VLSI with Photonics,” Harvard University, Cambridge MA, March 3, 2006.

“Merging Traditional VLSI with Photonics,” Yale University, New Haven CT, February 16, 2006.

“Integrated Optoelectronic Receivers for Intra-chip Communication,” *Frontiers in Optics 2005* (formerly the Annual Meeting of the OSA), Tucson AZ, Oct. 16-20, 2005

“Merging Traditional VLSI with Photonics,” Analog Devices, Wilmington MA, August 2 2005.

“Merging Traditional VLSI with Photonics,” Lockheed Martin, Owego NY, April 6 2005.

“Merging Traditional VLSI with Photonics,” University of Toronto, Toronto, CA, April 8 2005.

“Photonic VLSI for On-Chip Computing Architectures”, ITCOM, Photonics East, Philadelphia, PA, Oct. 2004.

“Merging Traditional VLSI with Photonics,” Invited Tutorial, IEEE Lightwave Technologies in Instrumentation and Measurement, Palisades, NY, Oct. 2004.

“Merging Traditional VLSI with Photonics,” MIT, Cambridge, MA, Sept 2004.

“Optics within CMOS Microsystems: Design, Analysis and Construction of Short Distance Optical Interconnects,” IEEE LEOS Workshop on Interconnections Within High Speed Digital Systems, Santa Fe, NM, May 2004

“Linking with Light: On and Off-Chip Optical Interconnects for Microsystems ,” IBM, Yorktown Heights, NY, March, 2004

“Optics Within CMOS Microsystems: Design, Analysis, and Construction of Short Distance Optical Interconnects,” Columbia University Electrical Engineering Department, New York, NY, January 2004

“Linking with Light: On and Off-Chip Optical Interconnects for Microsystems ,” MDC Conference, New York, NY, January 2004

“Linking with Light: Design, Analysis, and Construction of Optical Interconnects for Microsystems,” University of Rochester, Rochester, NY, September 2003

“Linking with Light: Design, Analysis, and Construction of Optical Interconnects for Microsystems,” Agilent Laboratories, Palo Alto, CA, August 2003

“Chip-to-Chip interconnects in Optoelectronic VLSI,” Lockheed Martin Seminar Series, Lockheed-Martin, Owego, NY, March 2003.

“Silicon on Sapphire for Optoelectronic VLSI,” Seminar Series in Photonics, Cornell University, Ithaca, NY, September 2002.

“Silicon on Sapphire CMOS for Optoelectronic VLSI”, University of California, Davis, CA, April 2002.

“Silicon on Sapphire CMOS for Optoelectronic VLSI”, North Carolina State University, Raleigh, NC, March 2002.

“Silicon on Sapphire CMOS for Optoelectronic VLSI”, University of Utah, Salt Lake City, Utah, January 2002.

Current Ph.D. Students

Xiao Wang (6th year Ph.D.)

Xuan (Silvia) Zhang (5th year Ph.D.) 2008 Intel Fellowship Winner

Mustansir Mukadam (5th year Ph.D.)

Bo Xiang (4th year Ph.D.)

Carlos I Dorta-Quinones (4th year Ph.D) IGERT Fellow

Wacek Godycki (3rd year Ph.D)

Ishita Mukhopadhyay (2nd year Ph.D)

Bo Sun (1st year Ph.D)

Past Graduate Students and Alumni

Anthony Kopa (Ph.D.-2010) 2008 Analog Devices Outstanding Student Designer, “Low Noise Distributed Amplifiers in Broadband Communication Systems”, Raytheon, MA

Rajeev Dokania (Ph.D.-2010) 2007, 2008 Intel Fellowship Winner, “Ultra-Low-Power UWB Impulse Radio Design: ARCHITECTURE, CIRCUITS, AND APPLICATIONS”, Intel Research, Hillsboro, OR.

Yuan Dong (M.Eng) 2010

Jimmy Da (undergraduate) 2011

Micheal Lyons (REU-undergrad researcher) 2011

Nicholas Kramer (REU) 2010

Joe Vulih (M. Eng) 2009 Cavium Networks

Yuan Ning (M. Eng) 2009 Phillips Semiconductor

Tony Tseng (M. Eng) 2009 Analog Devices

Zhongtao Fu (Ph.D.-2008) 2007 Analog Devices Outstanding Student Designer, “Low Power Frequency Synthesizer Design”, Intel, Hillsboro, OR

Yi Zhang (M. Eng) 2008

Sahil Arora (M. Eng) 2008 , AMD, CA.

Eng Tek Ong (M. Eng) 2007, Return to Singapore

Anand Pappu (Ph.D.-2006), 2006 Analog Devices Outstanding Student Designer – “Short Distance Optical Links: Analysis, Demonstration, and Circuit Design”, Cosmic Circuits, Bangalore, India.

John Haeson Lee (undergraduate) 2006, AMD, CA.

Cheng Po (Paul) Chen (undergraduate, M.S.) 2006, 2008, GE, Albany, NY.

Andre Harrison (M. Eng. and undergraduate) 2006, Johns Hopkins Ph.D. program

Tao Yin (Visiting Scientist/ Postdoctoral Associate) 2003-2005, Intel Research, Santa Clara

Wornadorn Wattanapitch (undergraduate) 2003-2005, MIT Ph.D. program

Tanya Khanna (undergraduate) 2005, MIT Ph.D. program

Aaditya Khimani (M. Eng.) 2004

Chun Wang (M. Eng) 2004 – UC Irvine Ph.D. program

Chak Reungsinpinya (M.Eng) 2004

Zhongtao Fu (M.Eng.) 2003, Cornell Ph.D. program

Betty Luk (M.Eng.) 2003, ATI Toronto

Denis Krot (M.Eng.) 2003, ARL Maryland

Shahab Najmi (M.Eng) 2003, IC Microsystems

Other Graduate Student Defense Committees

Sean Welch, Franklin Baez, Daniel Schuette, Jing-Hong Conan Zhan, Alper Ercan, Lucas Kroemer, Brian Welch, Pukar Malla, Bin Wan, Alper Bozkert, Eric McDonald, Steven Tin, Filip Akopan, Drew Guckenberger, Daniel Kucharski, Jinsook Kim, Fan Yu, Wooram Lee, Omeed Momemi, Albert Wang, Peiyan Cao, Kate Green

Publications

Journal Papers

X. Zhang, M. Mukadam, I. Mukhopadhyay, and A. Apsel, "Process Compensation Loops for High Speed Ring Oscillators in Sub-Micron CMOS", IEEE Journal on Emerging and Selected Topics in Circuits and Systems, accepted, vol. 1, no.1, 2011.

X. Zhang and A. Apsel, "A Low-Power, Process-and-Temperature-Compensated Ring Oscillator with Addition-Based Current Source", IEEE Transactions on Circuits and Systems I, accepted Nov. 2010. Digital Object Identifier: 10.1109/TCSI.2010.2092110

X. Wang, R. Dokania, A. Apsel, "PCO Based Synchronization for Ad-Hoc Duty-Cycled Impulse Radio Sensor Networks", IEEE Sensors Journal Special Issue on Cognitive Sensor Networks, vol. 11, no. 3, Jan. 2011.

B. Xiang, A. Kopa, A. B. Apsel, "A Novel On-chip Active Dispersive Delay Line (DDL) for Analog Signal Processing," IEEE Microwave and Wireless and Component Letters, vol. 20, no. 10, pp. 584-586, Oct. 2010.

R. Dokania, X. Wang, S. Tallur, C. Dorta-Quinones, A. Apsel, "An Ultra-Low-Power Dual-Band UWB Impulse Radio," IEEE Transactions on Circuits and Systems II, Vol. 57, No. 7, July 2010.

Z. Fu and A. Apsel, "A tool for power and phase noise optimization in frequency synthesizers," Analog Integrated Circuits and Signal Processing, Volume 64, Issue 2, pp 91, Jan. 2010.

- S. Manipatruni, R.K. Dokania, B. Schmidt, A. Apsel, and M. Lipson, "Wide Temperature Range Operation of Micron-scale Silicon Electro-optic Modulators," *Optics Letters*, vol. 33, no. 19, October 2008.
- A. Kopa and A. B. Apsel, "Distributed Amplifier with Blue Noise Active Termination," *IEEE Microwave and Wireless Components Letters*, vol. 18, no. 3, pp 203-205, March 2008.
- A. Pappu, X. Zhang, A. Harrison, and A. Apsel, "Process Invariant Current Source Design: Methodology and Examples", *IEEE Journal of Solid State Circuits*, Vol. 42, No. 10, October 2007. pp. 2293 – 2302 (# 6 most downloaded JSSC paper, Oct. 2007)
- N. Kırman, M. Kırman, R.K. Dokania, J. Martínez, A.B. Apsel, M.A. Watkins, and D.H. Albonesi, "On-chip Optical Technology in Future Bus-based Multicore Designs: Opportunities and Challenges," *IEEE Micro*, Special Issue on the Top Picks from Microarchitecture Conferences, Vol. 27, No. 1, January/February 2007. pp. 56-66
- A. Pappu and A. Apsel, "Demonstration of Latency Reduction in Ultra-Short Distance Interconnections Using Optical Fanout", *IEEE Journal of Selected Topics in Quantum Electronics*, Volume 12, Issue 6, Nov. 2006. pp. 1664-1670
- T. Yin, A. M. Pappu, A. Apsel, "Low Cost, High Efficiency and High Speed SiGe Phototransistors in Commercial BiCMOS", *IEEE Photonics Technology Letters*, Volume 18, Issue 1, Jan. 1 2006. pp. 55-57
- A. Pappu and A. Apsel. "Analysis of Intra-Chip Electrical and Optical Fanout." *Applied Optics*, Vol. 44, No. 30, Oct. 2005. pp. 6361-6372
- A. Apsel and A. Andreou. "A Low Power SOS CMOS Optoelectronic Receiver Using Low and High Threshold Devices", *IEEE Transactions on Circuits and Systems I*, Vol. 52, No. 2, Feb. 2005. pp. 253-261
- D. Yan, A. Apsel, and A. Lal, "Fabrication and Electromechanical Characterization of SOI-based Micro-scanner," *Smart Materials and Structures*, 14, 2005, pp. 775-784
- A. Apsel, Z. Fu, and A. Andreou. "A 2.5 milliwatt SOS CMOS Optical Receiver for Chip-to-Chip Interconnect", *IEEE Journal of Lightwave Technology*, Vol. 22, No. 9, Sept. 2004. pp. 2149-2157
- D. Yan, A. Apsel, and J. Chen. "Fabrication of SOI Based Nano-Gratings for Moire Measurement Using Focused Ion Beam". *Sensors and Actuators A*, 115, 2004, 60-66, May 2004.
- J. Liu, Z. Kalayjian, B. Reily, W. Chang, G. Simonis, A. Apsel, A. Andreou. "Multi-channel Ultra-thin Silicon on Sapphire Optical Interconnects", *IEEE Journal of Selected Topics in Quantum Electronics*, Vol. 9, No. 2, March/April 2003. pp. 380-386
- A. Apsel and A. Andreou. "Analysis of data reconstruction efficiency using stochastic encoding and an integrating receiver", *IEEE Transactions on Circuits and Systems II*, Vol. 8, Issue 10, Oct. 2001. pp. 890-897
- A. Apsel and A. G. Andreou. "A 5mW, Gigabit/s Silicon on Sapphire CMOS Optical Receiver", *IEEE Electronics Letters*, Vol. 37, No. 19, Sept. 13, 2001. pp. 1186-1188
- A.G. Andreou, Z. Kalayjian, A. Apsel, P. O. Pouliquen, R. A. Athale, G. Simonis, R. Reedy, "Hybrid Integration of Surface Emitting VCSEL's with Ultra-thin Silicon on Sapphire (SOS) CMOS VLSI circuits", *IEEE Circuits and Systems Magazine*, Vol. 1, Issue 3, third quarter 2001. pp. 23-30

Conference Proceedings and Book Chapters

- C. Dorta-Quinones, R. Dokania, and A. Apsel, "Extending the Dynamic Range of Implantable Real-Time Neurochemical Monitoring Systems", *Proceedings of the International Symposium on Circuits and Systems*

- (ISCAS), Rio de Janeiro, Brazil, 2011.*
- B. Xiang and A. Apsel, "A Distributed Amplifier Based Dispersive Delay Line", Proceedings of the International Symposium on Circuits and Systems (ISCAS), Rio de Janeiro, Brazil, 2011.*
- W. Godycki, R. Dokania, A. Apsel, "A High-Speed, on-Chip Implementation of Teager Kaiser Operator for in-Band Interference Rejection", IEEE Asian Solid-State Circuits Conference, Beijing, China, November 2010*
- R. Dokania, X. Wang, W. Godycki, C. Dorta-Quinones, A. Apsel, "PCO based Event Propagation Scheme for Globally Synchronized Sensor Networks" IEEE Global Communications Conference 2010 (GLOBECOM), Miami, Florida, December, 2010.*
- A. Apsel, R. Dokania, and X. Wang, "Low Power Radio Links", Appearing in 2011 McGraw-Hill Yearbook of Science and Technology.
- R. Dokania, X. Wang, C. Dorta-Quinones, W. Godycki, S. Tallur and A. Apsel, "A 6 μ W, 100Kbps, 3-5GHz, UWB Impulse Radio Transmitter", International Symposium on Low Power Electronics and Design (ISLPED), Austin, TX, August 2010. *
- X. Zhang, R. Dokania, M. Mukadam, and A. Apsel, "A Successive Approximation Based Process-Invariant Ring Oscillator", Proceedings of the International Symposium on Circuits and Systems (ISCAS), Paris, France, May, 2010.*
- M. Mukadam, O. Filho, X. Zhang, and A. Apsel, "Process Variation Compensation of a 4.6 GHz LNA in 65nm CMOS", Proceedings of the International Conference on Circuits and Systems (ISCAS), Paris, France, May 2010.*
- R. Dokania, X. Wang, S. Tallur, and A. Apsel, "A 19 μ W, 100Kbps Impulse Radio Transceiver for Body-Area-Networks", Proceedings of the International Symposium on Circuits and Systems (ISCAS), Paris, France, June 2010.*
- X. Zhang and A. Apsel, "A Low Variation GHz Ring Oscillator with Addition-based Current Source", European Solid-State Circuits Conference, Athens, Greece, (ESSCIRC), September 14th, 2009.*
- R.K. Dokania and A.B. Apsel, "Analysis of Challenges for On-Chip Optical Interconnects", ACM Proceedings of Great Lakes Symposium on VLSI (GVLSI), Boston, May 10-12, 2009.*
- A. Kopa and A. Apsel, "Alternative m-derived Termination for Distributed Amplifiers", Proceedings of the MTT International Microwave Symposium (IMS), Boston, MA, June 2009*
- X. Zhang and A. Apsel, "A Process Compensated 3GHz Ring Oscillator", Proceedings of the International Conference on Circuits and Systems (ISCAS), Taipei, Taiwan, May 2009 *
- X. Wang, R. Dokania, and A. Apsel, "Implementation of a Global Clocking Scheme for ULP Radio Networks", Proceedings of the International Conference on Circuits and Systems (ISCAS), Taipei, Taiwan, May 2009 *
- A. Apsel, R.Dokania, X. Wang, "Ultra-Low Power Radios for Ad-Hoc Networks", Proceedings of the International Conference on Circuits and Systems (ISCAS), Taipei, Taiwan, May 2009 (Invited)
- Z. Fu, X. Wang, E. Minh, A. Apsel, "A fast acquisition Phase Frequency Detector for phase-locked loops", Proceedings of EAMTA, Buenos Aires, Argentina 2008 *
- M. Mukadam, A. Apsel, "A 76dBohm, 2 mW, 10Gbps optical receiver front end in 80nm CMOS", Proceedings of EAMTA, Buenos Aires, Argentina 2008 *

- A. Kopa and A. Apsel, "124dB·Hz² Dynamic range transimpedance amplifier for electronic-photonic channelizer", Proceedings of the International Conference on Circuits and Systems, Seattle, WA. May 2008. *
- P. Chen, A. Pappu, Z. Fu, W. Wattanapanitch, A. Apsel, "A 10 Gb/s optical receiver in 0.25 μm silicon-on-sapphire CMOS", Proceedings of the International Conference on Circuits and Systems, Seattle, WA. May 2008.*
- X. Zhang, A. Pappu, A. Apsel, "Low variation current source for 90nm CMOS", Proceedings of the International Conference on Circuits and Systems, Seattle, WA. May 2008 *
- Z. Fu, J. Lee, A. Apsel, "A 6.8GHz low-power and low-phase-noise phase-locked loop design", Proceedings of the International Conference on Circuits and Systems, Seattle, WA. May 2008 *
- S. Manipatruni, R. Dokania, B. Schmidt, J. Shakya, A. Apsel, M. Lipson, "Wide Temperature Range Operation of Resonant Silicon Electro-Optic Modulators," IPNRA, Boston, MA, July 2008.
- D.M. Gill, M.S. Rasras, K.Y. Tu, Y.K. Chen, A.E. White, S.S. Patel, A. Kopa, A.B. Apsel, D.N. Carothers, A.T. Pomerene, R. Komoscai, J. Beattie, M.A. Beals, J. Michel, J. Liu, and L.C. Kimerling, "Optical Modulation Techniques for Analog Signal Processing," in Proceedings of SPIE Photonics West, vol. 6898, San Jose, CA, January 2008.
- M.A. Beals, J. Michel, J. Liu, D.H. Ahn, D.K. Sparacin, R. Sun, C.Y. Hong, L.C. Kimerling, A. Pomerene, D. Carothers, J. Beattie, A. Kopa, A.B. Apsel, M. Rasras, D.M. Gill, S.S. Patel, K.Y. Tu, Y.K. Chen, and A.E. White, "Process Flow Innovations for Active Photonic Device Integration in CMOS)," in Proceedings of SPIE Photonics West, vol. 6898, San Jose, CA, January 2008.
- X. Wang and A. Apsel, "Pulse Coupled Oscillator Synchronization for Communications in UWB Wireless Transceivers", MWSCAS, Montreal, CA. 2007.*
- Z. Fu, A. Pappu, and A. Apsel, "Beating the Power Limit of LC Oscillators", MWSCAS, Montreal, CA. 2007. *
- C. P. Chen, A. Pappu, A. Apsel, "Monolithic Integrated SiGe Optical Receiver and Detector", CLEO, Baltimore, MD, 2007.*
- N. Kirman, M. Kirman, R. K. Dokania, J. F. Martinez, A. B. Apsel, M. A. Watkins, and D. H. Albonesei, "Leveraging Optical Technology in Future Bus-based Chip Multiprocessors", 39th Annual IEEE/ACM International Symposium on Microarchitecture, Orlando FL, December 2006. (IEEE MICRO "Top Picks") *
- A. Kopa and A. Apsel, "Common-emitter Feedback Transimpedance Amplifier for Analog Optical Receiver", Proceedings of the International Conference on Circuits and Systems, Kos, Greece, 2006. *
- A. Pappu and A. Apsel, "Demonstration of Latency Reduction in Electrical Interconnections Using Optical Fanout", Proceedings of the International Conference on Circuits and Systems, Kos, Greece, 2006. *
- A. Pappu, Tao Yin, and A. Apsel, "A Low-Voltage Supply Optoelectronic Detector-Receiver in a Commercial Silicon-Based Process", Proceedings of the International Conference on Circuits and Systems, Kos, Greece, 2006.*
- A. Pappu and A. Apsel, "Synthesis of Current Source with Improved Current Mirroring Capability", Proceedings of the International Conference on Circuits and Systems, Kos, Greece, 2006.*
- L. C. Kimerling, D. Ahn, A. B. Apsel, M. Beals, D. Carothers, Y. Chen, T. Conway, D. Gill, M. Grove, C.-Y. Hong, M. F. Lipson, J. Liu, J. Michel, S. S. Patel, A. T. Pomerene, M. Rasras, D. K. Sparacin, K. Tu, A. E. White, C. Wong, "Electronic-photonic integrated circuits on the CMOS platform," Proceedings of SPIE, Photonics West, 2006. (Invited)

- F. Akopyan, R. Manohar, and A. Apsel, "A Level-Crossing Flash Asynchronous Analog-to-Digital Converter," Proceedings of the 12th International Symposium on Asynchronous Circuits and Systems (ASYNC). March 2006. (Best Paper Award) *
- A. Apsel, A. Pappu, and T. Yin, "Integrated Optoelectronic Receivers for Intra-chip Communication," Frontiers in Optics (formerly the Annual Meeting of the OSA), Tucson AZ, Oct. 2005. (Invited)
- A. Pappu, A. Apsel, "A Low Power, Low Delay TIA for On-chip Applications", CLEO, Baltimore, MD, 2005.*
- A. Apsel, A. Pappu, and T. Yin, "Merging Traditional VLSI with Photonics", Lightwave Technologies in Instrumentation and Measurement, Palisades, NY, Oct. 2004. (Invited)
- A. Apsel, T. Yin, A. Pappu, "Photonic VLSI for On-Chip Computing Architectures", Proceedings of SPIE, Photonics East, Oct. 2004. (Invited)
- R. Duggirala, H. Li, A. M. Pappu, Z. Fu, A. Apsel and A. Lal, "Radioisotope Micropower Generator for CMOS Self-powered Sensor Microsystems", Power MEMS, Kyoto, Japan, Nov. 2004.*
- A. Pappu and A. Apsel, "Electrical Isolation and Fan-out in Intra-chip Optical Interconnects", Proceedings of the International Conference on Circuits and Systems, Vancouver, Canada, 2004.*
- A. Apsel and Z. Fu, "A 2.5 Milliwatt SOS CMOS Receiver for Optical Interconnect", Proceedings of the International Conference on Circuits and Systems, Vancouver, Canada, 2004.*
- T. Yin, A. Apsel, A. Pappu, "Optical Interconnects for Commercial CMOS Computational Architecture", SPIE Photonics West, 2004.
- J. Liu, A. Apsel, W. Chang, G. Simonis, "Multi-Channel Optical Interconnects for Optical Communications and Processing", Proceedings of the 2003 International Conference on Information Technology and Communication, Orlando, FL, 2003. (Invited)
- A. Apsel, J. Liu, W. Chang, G. Simonis, A. Andreou, "Integrated Arrays of Low Power SOS Chip-to-Chip Interconnects for Efficient Parallel Communication in CMOS", OSA meeting on Optical Computing, Washington DC, 2003. *
- J. Liu, A. Apsel, N. Das, G. Dang, W. Chang, G. Simonis, "High-Speed Multi-Channel Optical Interconnects Applicable to Optical Computing and Processing", OSA meeting on Optical Computing Washington DC, 2003.*
- J. Liu, B. Riely, W. Chang, G. Simonis, A. Apsel, A. Andreou, "Multi-Channel Ultra-Thin Silicon-On-Sapphire Optical Interconnects", Proceedings of the International Conference on Computer, Communication and Control, Orlando, FL, 2003. (Invited)
- A. Apsel, A. Andreou, "Analysis of Short Distance Optoelectronic Link Architectures", Proceedings of the International Symposium on Circuits and Systems, Bangkok, Thailand, 2003.*
- A. Apsel, A. Andreou, "A 10 milliwatt 2 Gbps CMOS Optical Receiver for Optoelectronic Interconnect", Proceedings of the International Symposium on Circuits and Systems, Bangkok, Thailand, 2003.*
- A. Apsel, A. Andreou, "A 7mW 1Gbps CMOS Optical Receiver for Through Wafer Communication", Proceedings of the International Symposium on Circuits and Systems, Bangkok, Thailand, 2003.*
- A. Apsel, E. Culurciello, A.G. Andreou, K. Aliberti, "Thin Film PIN Photodiodes for Optoelectronic Silicon on Sapphire CMOS", Proceedings of the International Symposium on Circuits and Systems, Bangkok, Thailand, 2003.*

- A. Apsel, A. Andreou, J. Liu, "A 6 Channel Array of 500 MHz Optical Receivers in .5 μm Silicon on Sapphire CMOS", Proceedings of the International Symposium on Circuits and Systems, Scottsdale, AZ, 2002.*
- J. Liu, A. Apsel, Z. Kalayjian, W. Chang, G. Simonis, A. Andreou, "Ultra-Thin Silicon-on-Sapphire (SOS) Multi-Channel Optical Interconnects", Proceedings of the Conference on Lasers and Electro-Optics (CLEO) Long Beach, CA, 2002.*
- J. Liu, A. Apsel, Z. Kalayjian, B. Riely, B. Gollsneider, W. Chang, G. Simonis, A. Andreou, "Multi-Channel Ultra-Thin Silicon-on-Sapphire (SOS) Optoelectronic Interconnects", SPIE Photonics West 2002.
- A. G. Andreou, A. Apsel, P. Pouliquen, E. Culurciello, P. Abshire, F. Tejada, "Silicon on Sapphire CMOS Optoelectronic Microsystems", OIDA 2001, Washington DC.
- A. Apsel, A. Andreou, "Quality of Data Reconstruction Using Stochastic Encoding and an Integrating Receiver", Proceedings of the Midwest Symposium on Circuits and Systems, Lansing, MI, 2000. (Best Paper Award)*
- A. Apsel, Z. Kalayjian, A. Andreou, G. Simonis, W. Chang, M. Data, B. Koley, "Orientation Enhancement Using Opto-Electronic VLSI and Asynchronous Pulse Coding", Proceedings of the International Symposium on Circuits and Systems, Geneva, Switzerland, 2000.*
- G. Simonis, Z. Kalayjian, A. Apsel, P. Pouliquen, A. Andreou, R. Athale, R. Reedy, "Silicon-on-Sapphire CMOS for Improved VCSEL/CMOS Optoelectronic Interconnects", LEOS 2000, Puerto Rico. *
- R. A. Athale, Z. Kalayjian, A. Apsel, P. Pouliquen, G. Simonis, A. Andreou, R. Reedy, and W. Chang, "Hybrid OE-Interconnect VCSEL-CMOS Modules Based on Ultra-thin Silicon on Sapphire", OSA Annual Meeting 2000.*
- A. Apsel, T. Stanford, P. Hasler, "An Adaptive Front End for Olfaction", Proceedings of the International Symposium on Circuits and Systems, Monterey, California, 1998.*
- R. Etienne-Cummings, J. Van der Spiegel, N. Takahashi, A. Apsel and P. Mueller "VLSI Implementation of Cortical Visual Motion Detection Using an Analog Neural Computer", Proceedings of the Neural Information Processing Symposium, 1996.*
- J. Van der Spiegel, R. Etienne-Cummings, C. Donham, A. Apsel, P. Mueller and D. Blackman, "A General Purpose Analog Neural Computer for Real-Time Spatiotemporal Pattern Analysis: Visual Motion Estimation", Fuzzy Logic and Neural Networks Handbook-Architectures and Systems, C. H. Chen (Ed.), Chapter 31, McGraw-Hill, New York, NY, 1995.*

Other Publications

Thesis: A. Apsel, Optoelectronic Receivers in Silicon on Sapphire CMOS: Architecture and Design for Efficient Parallel Interconnects, Johns Hopkins University, August 2002.

* Peer reviewed conference paper