Lawrence E. Larson, Ph.D.
Interim Provost
Sorensen Family Dean of Engineering – Emeritus
Professor of Engineering
School of Engineering
Brown University
Providence, RI 02906
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Education

1996 M.B.A.(Exec.) University of California – Los Angeles

1986 Ph.D. Electrical Engineering University of California – Los Angeles

1980 M. Eng. Electrical Engineering Cornell University

1979 B.S. Electrical Engineering Cornell University

Professional Appointments

1/2023 – 7/2023 Interim Provost, Brown University

The Provost is Chief Academic Officer and Chief Budget Officer for Brown University and is responsible for academic and research excellence; sound budgetary practices; and oversight for all programs in all academic departments, research centers, and interdisciplinary institutes. The annual budget for Brown is $1.5B, with 10,000 students, 1600 faculty and 3200 staff. The Provost also oversees the academic and fiscal operations of the Undergraduate College, Graduate School, Warren Alpert Medical School, School of Public Health, School of Engineering and School of Professional Studies. The Provost's Office pursued a significant expansion of Brown's research profile through increased collaborative partnerships, research funding from corporations and new strategic directions.

1/2021– Present Chairman of the Board, Slater Technology Fund, Providence, Rhode Island

The Slater Technology Fund is an evergreen not-for-profit venture development seed fund dedicated to advancing early-stage technology ventures in Rhode Island, with the overall objective of economic growth and workforce development. Slater has invested nearly $50M in recent years, with follow-on funding raised by portfolio companies close to $1B.

7/2011 – 8/2022 Sorensen Family Dean and Founding Dean, School of Engineering, Brown University and Professor of Engineering.

The Brown School of Engineering was created in 2010 from the historic Division of Engineering. I was recruited as Founding Dean in 2011, and in that role accomplished the following:

- **Growth of Faculty and Research** – Grew research funding in the School of Engineering from ~$13M/yr. in 2010 to ~$27M/yr. in 2022. Led diversification of funding sources from the NSF only

to include the DoD, NIH, NIST, DoE, DoT and foundations. Doubled external corporate support for research in the SoE. Grew the tenured/tenure-track faculty from 39 FTE to 56 FTE from 2011-2022. Recruited and hired almost 50% of the current faculty in all areas of the School. Doubled the number of women faculty and recruited the first tenure-track Black and Hispanic faculty in the 150+ year history of engineering at Brown University.

- **Fundraising, Design and Construction of New Engineering Research Building** – Led the fundraising, design, architect selection, planning and construction of $88M, 80,000 sq. ft. laboratory building, doubling the research capacity of the School of Engineering. The building was occupied in Oct. 2017 (four months ahead of schedule). The design process was highly collaborative, involving input from students, staff and faculty; and the results have been outstanding – a highly functional building that invites collaboration and engagement with the community. The design and execution were so innovative that it was one of only five buildings in the nation chosen for the annual *Architectural Record* "Colleges and Universities" issue in Nov2018. This was the first new engineering building in over 50 years on the Brown campus.

- **Growth of Fundraising** – Built the entire School of Engineering fundraising organization "from scratch," including alumni outreach, targeted communications, campaign development, and donor engagement. Led the team that raised over $160M as of 10/2022, including entire funding of an $88M laboratory building, and gifts/pledges for ten endowed Chairs and the Nelson center for Entrepreneurship. Increased the number of annual donors to Brown engineering from ~30 per year in 2011 to over 600 per year in 2022.

- **Growth of the Graduate Program –** Dramatically increased the size of the Engineering Master's degree program, from 40 students per year to nearly 200 students per year) led PhD program growth of roughly 30%; and created three successful new Master Programs:

  - Master in Technology Leadership (MTL) – Led the development and launch (March 2017) of the Brown Master in Technology Leadership. This "blended" transformational executive course provides leadership training for mid-career professionals in science and technology, grounded in an ethos of liberal learning with a global perspective.

  - Joint Brown-Rhode Island School of Design (RISD) Master Program in Design Engineering (MADE) - Led the creation of the first joint Brown-RISD degree program in the history of the two institutions. This unique program brings together the strengths of the two institutions to train students in the emerging field of Design Engineering. The first cohort started in June of 2021.

  - Master in Data-Enabled Computational Engineering and Science (DECES). - Created a program that provides students with understanding of the significant role that advanced data-driven simulation plays in industry and national laboratories. Students gain technical knowledge of the foundational subjects in computational engineering, including nonlinear finite element analysis and the integration of machine learning and data science. The first cohort started in June of 2022

- **Creation of Innovative Co-Curricular Programs**

  - Led the creation of the Brown Design Workshop (BDW) – one of the leading "maker spaces" in the nation, which has over 1,800 members from Brown and RISD and occupies over 8,000 square feet of workspace. The BDW is a campus hub for innovation, entrepreneurship, hacking and exploring new ideas. Faculty and students from across the campus use the

Brown Design Workshop and it is an integral part of courses taught in engineering (8 courses), computer science, visual arts, music, English, history of art and architecture, and American studies.

- Led the creation of the Nelson Center for Entrepreneurship – which coordinates and enables entrepreneurial efforts in all areas of campus: science, technology, the arts, social sciences, graduate, undergraduate and faculty. Developed the initial proposal as part of a multi-year campus-wide planning, which resulted in a $25M gift, recruitment of a founding director and launch of the Center in fall 2015.

- Rejuvenation of Student Organizations in the School of Engineering – Doubled funding for student co-curricular funding from 2011-2018, in support of 17 student organizations. Led the efforts to create Brown student chapters of National Society for Black Engineers (NSBE) and Society of Hispanic Professional Engineers (SHPE), which are thriving and serve as important support networks.

• **Creation of a Supportive Environment for Diversity, Equity and Inclusion**

- Faculty – Initiated a vigorous program for recruiting and retaining a more diverse faculty in engineering. We more than doubled the number of women faculty in engineering, recruited two Black faculty (the first two in Brown engineering history) and three Hispanic faculty members. We fundraised for the first endowed Chairs in Brown's history for three of our distinguished women faculty.

- Graduate Students – We created one of the most diverse engineering student bodies in American academia. ASEE reported in 2017 that the gender balance of our MS program was the best in the nation. The gender balance of our PhD program is roughly 34% women compared to the national average of roughly 20%. We more than doubled the diversity of our PhD population from historically underrepresented groups (from 3% to 7%).

- Undergraduate Students – We created a welcoming and supportive environment for all students, and increased the fraction of undergraduates from diverse backgrounds from 10% in 2012 to 28% in 2018 (tops in the Ivy League). And the gender balance has risen to well over 40%. Both of these figures are roughly double the national average.

• **Enhanced Operational Excellence**

- New Business Model - I developed a completely new business model for the School of Engineering - creating greater incentives for research excellence, more efficient use of research space, and transparent and collaborative budget planning. We did this while maintaining the close and collaborative ties between the School of Engineering and the rest of Brown, and maintained a budget surplus during all subsequent years of operation.

- School of Engineering Strategic Plan – Developed new five-year plan for the School of Engineering in 2015. Engaged all stakeholders (faculty, staff, alums, industry partners, administration, students) to develop a complete vision of the direction for the School. Identified key areas for School growth and new technical directions for collaborative research at Brown.

- Staff Reorganization – conducted a thorough staff review and overhaul of the entire School of Engineering in 2013-2014. Realigned administrative responsibilities, removed redundancies, improved customer service and reduced costs.

- **Developed External Partnerships** – Created the School of Engineering Industrial Advisory Board (IAB), with roughly 20 members. The IAB provides strategic advice for the School, research engagement with our faculty, and job and internship opportunities for our students. Created an annual Engineering Career Fair to provide networking and career opportunities for engineering students.

7/2011 – Present Professor of Engineering – Brown University

My research program at Brown University developed integrated circuits and systems for next-generation wireless brain-computer interfaces. Early versions of these devices are in clinical trials; recent versions have achieved unprecedented data rates and functionality. During my career: published ~400 papers in journals, refereed conference proceedings, graduated 31 PhD students, received 43 US patents, and earned a current H-index of 75 (Google Scholar).

7/2007 - 7/2011 Chair, Department of Electrical and Computer Engineering (ECE) – University of California – San Diego, Jacobs School of Engineering

The ECE Department at UCSD is the largest graduate program on the UCSD campus, with over $25M in funding (2011), 500 graduate students and 600 undergraduates.

- Oversaw faculty development (hiring, promotion and tenure process), educational policy and teaching, a successful accreditation review, resource allocation, and external relations (including fundraising for one endowed chair).

- Led the development (with Computer Science) of the new Executive Master of Advanced Study in Embedded Wireless Systems program.

7/2001 -7/2006 Director – UCSD Center for Wireless Communications

The UCSD Center for Wireless Communications is the largest industry-funded university research centers in the nation. The CWC conducts research in all areas of wireless communications, from fundamental devices and materials to software applications

- I supported the work of over 20 professors and roughly 50 PhD graduate students per year during my tenure, and with an annual budget in excess of $3M..

- During my tenure as Director we received support from more than 18 corporate members - both domestic and international. I was responsible for all aspects of the Center, from new member development and fundraising, to financial management and establishing the research direction.

7/1996 - 7/2011 CWC Industry Chair Professor in Wireless Communications, Department of Electrical

and Computer Engineering, University of California - San Diego.

Research Program at UCSD for Professor Larson:

- I developed improved integrated circuit techniques and novel semiconductor device structures for wireless communications applications. This required development of high-frequency integrated circuits, devices, and packaging techniques for ultra-wide bandwidth telecommunications applications, and development of novel data converter and analog-signal processing architectures that are matched to communications applications. Many of these technologies were licensed to commercial wireless companies.

- Graduated 30 UCSD PhD students since arriving at UCSD in 1996. Published over 350 papers during this period and over 40 US patents.

2004-2005 Distinguished Visiting Professor – TU Delft, Netherlands (on sabbatical from UCSD)

Developed novel new microwave tuning technology, with unparalleled linearity and performance

2000-2001 Director – IBM Research West Coast Design Center of Excellence (on leave from UCSD)

- Led the international team that developed a complete Wideband CDMA chip set for several "first tier" cellular telephone providers, in partnership with Mitsubishi Electric, Osaka, Japan • Directed development of SiGe Radio Frequency ICs for third-generation wireless cellular applications

1994-1996 Manager, Telecommunications Technology Department, Microwave Devices and Circuits Laboratory, Hughes Research Laboratories, Malibu, CA

- Directed research and development of integrated circuits for commercial RF and microwave communications applications, including DBS, cellular telephone, Very Small Aperture Terminal (VSAT) and PCS

- At Hughes Network Systems (Germantown, MD), I led the development of an RFIC design center for communications applications, including the first high volume DirecTV satellite receiver

- Responsible for the technical direction of the corporate partnership with IBM on Si/SiGe HBT technology. This partnership led to multiple system insertions in defense and commercial systems in subsequent years.

- Led the team that demonstrated the first microwave ICs in SiGe HBT technology (amplifiers, mixers, VCOs, frequency dividers) in the 5-25 GHz frequency range.

1988 – 1994 Manager, HEMT Technology Department, Microwave Devices and Circuits Laboratory, Hughes Research Laboratories, Malibu, CA

Directed research in high-speed III-V materials, devices, and circuits, and was responsible for approximately $4M/yr. in Corporate IR&D and Government Research Contracts.

- Developed the first space-qualified InP low-noise millimeterwave HEMT. This effort was awarded the

1996 Lawrence Hyland Award - the highest technical achievement award at Hughes Electronics. These devices are still used (2024) in defense satellite crosslink communications systems.

- Developed the first micromachining (RFMEMS) switch and tuner applications for RF and microwave applications (1991). This technology has now become an extremely active area of worldwide research and development, is a common feature in many high-end cellular telephones, and I hold many fundamental patents in the field. The market for RF MEMS devices now exceeds $1B (FY22)
- I established and ran a state-of-the-art InP HEMT MMIC foundry at HRL – from materials growth, lithography, device fabrication, process development, packaging and text. Devices and circuits from this foundry had many aerospace and research system insertions, and the foundry continues operation today.

- Developed some of the first advanced RF/Microwave CMOS technology with performance comparable to III-V technology (1991).

- Directed the research program that demonstrated HEMTs with record fT's and fMAX's above 300 GHz (1993). This produced the highest frequency room temperature integrated circuit ever reported - a 210 GHz VCO (1994).

1992– 1994 Assistant Manager - DARPA / Hughes MIMIC Program

Responsible for Program Management of Advanced Technology Portion of DARPA/Hughes MIMIC Program, with a budget of approximately $8M/yr. I led the systems insertions research roadmap of GaAs PHEMT and MESFET technology into airborne phased-array radar applications.

1988 – 1992 Adjunct Associate Professor – UCLA

Responsible for senior level digital and analog integrated circuit design courses and graduate analog MOS integrated circuit design course; supervised student PhD research

1980– 1988 Member of Technical Staff, Hughes Research Laboratories, Malibu, CA

Responsible for development of CMOS and III-V analog and digital integrated circuits, modeling and characterization of MESFETs and HEMTs, and development of improved III-V process techniques.

<u>Primary Published Work</u>

Refereed Journal Articles

1 W. W. Cheng and L. E. Larson, "A Low-Frequency CMOS Triangle Wave Generator", IEEE J. Solid-State Circuits, SC-20 (2), 649-652 (1985).
2 L. E. Larson, R. J. Burns, M. E. Levy, and W. W. Cheng, "An Analog CMOS Autopilot", IEEE J. Solid State Circuits, SC-20 (2), 571-578 (1985).
3 L. E. Larson, J. F. Jensen, and P. T. Greiling, "GaAs High-Speed Digital IC Technology: An Overview", (invited) IEEE Computer – special issue on GaAs computer architecture, pp. 85-94 (1986). 4 L. E. Larson, G. C. Temes, and S. Law, "Comparison of Amplifier Gain Enhancement Techniques for GaAs MESFET Analogue Integrated Circuits", Electronic Letters, 22 (21), 1138-1139 (1986). 5 L. E. Larson and G. C. Temes, "Switched-Capacitor Gain Stage with Reduced Sensitivity to Finite Amplifier Gain and Offset Voltage", Electronic Letters, 22 (24), 1281-1283 (1986).
6 L. E. Larson, "An Improved GaAs MESFET Equivalent Circuit Model for Analog Integrated Circuit

Applications", IEEE J. of Solid-State Circuits, SC-22 (4), 567-574 (1987).
7 L. E. Larson, K. W. Martin, and G. C. Temes, "GaAs Switched-Capacitor Circuits for High-Speed Signal Processing", IEEE J. of Solid-State Circuits, SC-22 (6), 971-981 (1987).
8 L. E. Larson, T. Cataltepe, and G. C. Temes, "Multibit Oversampled ∑-Δ A/D Converter With Digital Error Correction", Electronics Letters, 24 (16), 1051-1052 (1988).
9 L. E. Larson, C. S. Chou, and M. J. Delaney, "An Ultrahigh-Speed GaAs MESFET Operational Amplifier", IEEE J. Solid-State Circuits, 24 (6), 1523-1528 (1989).
10 A S. Brown, U. K. Mishra, C. S. Chou, C. E. Hooper, M. A. Melendes, M. Thompson, L. E. Larson, S. E. Rosenbaum, and M. J. Delaney, "AlInAs-GaInAs HEMTs Utilizing Low-Temperature AlInAs Buffers Grown by MBE", IEEE Electron Devices Letters, 10 (12), 565-567 (1989).
11 M. J. Delaney, C. S. Chou, L. E. Larson, J. F. Jensen, D. S. Deakin, A. S. Brown, W. W. Hooper, M. A. Thompson, L. G. McCray, and S. E. Rosenbaum, "Low-Temperature Buffer GaAs MESFET Technology for High-Speed Integrated Circuit Applications", IEEE Electron Device Letters, 10 (8), 355-357 (1989).
12 R. H. Walden, A. E. Schmitz, A. R. Kramer, L. E. Larson, and J. Pacsiecznik, "A Deep-Submicrometer Analog-to-Digital Converter Using Focused Ion Beam Implants", IEEE J. of Solid-State Circuits, 25 (2), 562-571 (1990).
13 A. E. Schmitz, R. H. Walden, L. E. Larson, S. E. Rosenbaum, R. A. Metzger, J. R. Behnke, and P. A. MacDonald, "A Deep –Submicrometer Microwave/Digital CMOS/SOS Technology", IEEE Electron Device Letters, 12 (1), 16-17 (1991).
14 G. M. Atkinson, R. L. Kubena, L. E. Larson, L. D. Nguyen, F. P. Stratton, L. M. Jelloian, M. V. Le, and H. McNulty, "Self-Aligned High Electron Mobility Transistor Gate Fabrication Using Focused Ion Beams, J. Vac. Sci. Technol. B, 9 (6), 3506-3510 (1991).
15 L. D. Nguyen, A. S. Brown, M. A. Thompson, L. M. Jelloian, L E. Larson, and M. Matloubian, "650-Å Self-Aligned-Gate Pseudomorphic Al0.48In0.52As/Ga0.20In0.80As High Electron Mobility Transistors", IEEE Electron Device Letters, 13 (3), 143-145 (1992).
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27 S. E. Rosenbaum, B. K. Kormanyos, L. M. Jelloian, M. Matloubian, A. S. Brown, L. E. Larson, L. D. Nguyen, M. A. Thompson, L. P.B. Katehi, and G. M. Rebeiz, "155- and 213- GHz AlInAs/GaInAs/InP HEMT MMIC Oscillators", IEEE Transactions on Microwave Theory and Techniques, 43 (4), 927-932 (1995).

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243 Chul Kim; Joshi, S.; Thomas, C.; Sohmyung Ha; Akinin, A.; Larson, L.; Cauwenberghs, G., "A CMOS 4-channel MIMO baseband receiver with 65dB harmonic rejection over 48MHz and 50dB spatial signal separation over 3MHz at 1.3mW," in VLSI Circuits (VLSI Circuits), 2015 Symposium on , vol., no., pp.C304-C305, 17-19 June 2015.
244 Larson, L., "RF and microwave technology challenges for Internet-of-Things applications," in Silicon Monolithic Integrated Circuits in RF Systems (SiRF), 2015 IEEE 15th Topical Meeting on , vol., no., pp.61-62, 26-28 Jan. 2015
245 C. M. Thomas, T. Quach, I. Telliez, T. Nakatani, D. Kimball and L. E. Larson, "A 250 nm GaN N-Path Filter IC with +27 dBm Blocker Tolerance," 2016 IEEE Compound Semiconductor Integrated Circuit Symposium (CSICS), Austin, TX, 2016, pp. 1-4.
246 L. Larson and A. Nurmikko, "Microwave communication links for brain interface applications," 2016 IEEE 16th Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems (SiRF), Austin, TX, 2016, pp. 73-76.
247 A.R. Wichman; L. E. Larson, “Background measurement of RF system nonlinearity using spread-spectrum methods,” 90th ARFTG Microwave Measurement Symposium (ARFTG), 2017, pp. 1-4. 248 J. Lee et al., "Wireless Power and Data Link for Ensembles of Sub-mm scale Implantable Sensors near 1GHz," 2018 IEEE Biomedical Circuits and Systems Conference (BioCAS), Cleveland, OH, 2018, pp. 1-4. 249 V. W. Leung; J. Lee; S. Li; S. Yu; C. Kilfovle; L. Larson; A. Nurmikko; F. Laiwalla., "A CMOS Distributed Sensor System for High-Density Wireless Neural Implants for Brain-Machine Interfaces," ESSCIRC 2018 - IEEE 44th European Solid State Circuits Conference (ESSCIRC), Dresden, 2018, pp. 230- 233.
250. J. Lee; F. Laiwalla; J. Jeong; C. Kilfoyle; L. Larson; A. Nurmikko; S. Li; S. Yu; V. W. Leung, “Wireless

Power and Data Link for Ensembles of Sub-mm scale Implantable Sensors near 1GHz," 2018 IEEE Biomedical Circuits and Systems Conference (BioCAS), 2018, pp.1-4.

251. J. Lee; E. Mok; J. Huang; L. Cui; A. Lee; V. Leung; P. Mercier; S. Shellhammer; L. Larson; P. Asbeck; R. Rao; Y. Song; A. Nurmikko; F. Laiwalla, "An Implantable Wireless Network of Distributed Microscale Sensors for Neural Applications,"9th International IEEE/EMBS Conference on Neural Engineering (NER) 2019 pp. 871-874.
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Patents

1 U.S. Patent # 4,682,149: "High Resolution Pipelined Digital-to-Analog Converter" (July 1987). 2 U.S. Patent # 4,872,010: "Analog-to-Digital Converter Made with Focused Ion Beam Technology", with J. Jensen, R. Walden, and A. Schmitz (October 1989).

3 U.S. Patent # 4,896.121: "Current Mirror for Depletion-Mode Field Effect Transistor Technology" (January 1990).

4 U.S. Patent # 4,951,303: "High Speed Digital Programmable Frequency Divider" (August 1990). 5 U.S. Patent # 4,977,403: "Digital Correction Circuit for Data Converters" (December 1990). 6 European Patent #E91303050.8: "HEMT Structure with Passivated Donor Layer", with M. Delaney, U. Mishra, and L. Nguyen (June 1991).

7 U.S. Patent # 5,049,522: "Semiconductive Arrangement Having Dissimilar, Laterally Spaced Layer Structures, and Process for Fabricating the Same", with W. Stanchina (September 1991). 8 U.S. Patent # 5,087,482: "Improved Electrostatically Movable Planar Transmission Line for Microwave Integrated Circuits" (March 1992).

9 U.S. Patent # 5,121,089: "Micro-Machined Switch and Method of Fabrication" (June 1992). 10 U.S. Patent # 5,146,117: "FET Logic Gate Whose Function is Determined by Ion Implantation" (September 1992).

11 U.S. Patent # 5,164,688: "Miniature Microwave and Millimeter Wave Tuner" (November 1992). 12 U.S. Patent # 5,168,249: "Miniature Microwave and Millimeter Wave Tunable Circuit" (December 1992). 13 U.S. Patent # 5,172,197: "HEMT Structure With Passivated Donor Layer" (December 1992). 14 U-.S. Patent # 5,175,521: "Miniature Dynamically Tunable Microwave and Millimeter Wave Device" (December 1992).

15 "Hybrid Bipolar/Field-Effect Power Transistor in Group III-V Material System" with P. Asbeck and J. Brown (September 1994).

16 U.S. Patent # 5,420,422: "N-Type Antimony-Based Strained Layer Superlattice", with T. Hasenberg and A. Brown (May 1995).

17 U.S. Patent # 5,489,549: "Method of Fabricating N-Type Antimony-Based Strained Layer Superlattice", with T. Hasenberg, A. Brown (February 1996).

18 U.S. Patent # 5,528,209: "Monolithic microwave integrated circuit and method for fabricating same," with P. MacDonald, M. Case, M. Chen, and D. Rensch (July, 1996).

19 U.S. Patent # 5,757,074: "Microwave/millimeter Wave Circuit Structure with Discrete Flip-Chip Mounted Elements" (1998). (From A.IV.20)

20 U.S. Patent # 5,629,241: "Microwave/millimeter Wave Circuit Structure with Discrete Flip-Chip Mounted Elements, and Method of Fabricating the Same" (1998). (From A.IV.21)

21 U.S. Patent # 5,835,128: "Wireless redistribution of television signals in a multiple dwelling unit" (1998). (From A.IV.22)

22 U.S. Patent # 5,554,865: "Integrated transmit/receive switch/low noise amplifier with dissimilar

semiconductors devices" (1996). (From A.IV.19)
23 U.S. Patent # 6,310,906: “Chaotic Carrier Pulse Position Modulation Communication System and Method” H. Abarbanel, N. Rulkov, M. Suschik, L. Tsimring, L. Larson and A. Volkovskii (2001). 24 U.S. Patent # 6,304,623: “Precision timing generator system and method” (2001). J. Richards; P. Jett; L. Fullerton; W. Larry; L. Larson and D. Rowe.
25 US Patent #6,396,347: “Low-Power, Low-Noise Dual-Gain Amplifier Topology and Method,” (2002), D. Lie and L. Larson
26 US Patent #6,421,389: “Baseband signal converter for a wideband impulse radio receiver”, (2002)P. Jett, L. Larson, B. Pollack and D. Rowe.
27 United States Patent 6,504,447, “Microelectromechanical RF and microwave frequency power limiter and electrostatic device protection,” D. Laney; M. Matloubian and L. Larson (2003)
28 US Patent 6,577,691, “Precision timing generator apparatus and associated methods,” J. Richards, P. Jett, L. Fullerton, L. Larson, and D. Rowe (2003)
29 US Patent 6,636,573, “Precision timing generator system and method,” J. Richards, P. Jett, L. Fullerton, L. Larson and D. Rowe, (2003)
30 US Patent 6,735,424, “S-band low-noise amplifier with self-adjusting bias for improved power consumption and dynamic range in a mobile environment,” L. Larson and W. Xiong (2004)
31 US Patent 6,847,266, “Microelectromechanical RF and microwave frequency power regulator,” D. Laney, M. Matloubian, and L. Larson (2004)
32 US Patent 6,915,117, “Multistage modulation architecture and method in a radio,” P. Chominski; J. Kennedy, L. Larson; J. Park, (2005)
33 US Patent 6,917,268, “Lateral microelectromechanical system switch,” H. Deligianni; C. Jahnes, J. Lund, L. Larson (2005)
34 US Patent 6,937,663, “Baseband signal converter for a wideband impulse radio receiver,” P. Jett, L. Larson, B. Pollack; D. Rowe (2005)
35 US Patent 6,950,485, “Precision timing generator apparatus and associated methods,” P. Jett, L. Larson, B. Pollack; D. Rowe (2005)
36 US Patent 6,977,569 “Lateral microelectromechanical system switch,” H. Deligianni; C. Jahnes, J. Lund, L. Larson, (2005)
37 US Patent 7,567,123, “Adaptive bias current circuit and method for amplifiers,” V. Leung, P. Gudem, and L. Larson, (2010)
38 US Patent 7,652,532, “Correlation method for monitoring power amplifier,” M. Li, P. Asbeck, I. Galton, and L. Larson, (2010)
39 US Patent 6,828,858, “CMOS class AB power amplifier with cancellation of nonlinearity due to change in gate capacitance of a NMOS input transistor with switching,” L. Larson, C. Wang, (2008) 40 US Patent 7,902,585 “Linear variable voltage diode capacitor and adaptive matching networks”, L. Larson and LC deVreede.
41 US Patent 8,242,868 “Multiple sub-carrier selection diversity architecture and method for wireless OFDM, L. Larson, Y. Sun and P. Gudem (2013)
42 US Patent 9,876,518: “Capactive Passive Mixer Baseband Receiver with Harmonic Rejection,” C. Kim, G. Cauwnbergh, C. Thomas and L. Larson. 2018
43 US Patent 9,853,623, “High-Selectivity Passive Low-Loss Duplexer Filter.” 2018, L.

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Other Conference Proceedings Unpublished Plenary Talks

L. Larson, D. Kimball, and P. Asbeck, "Intelligent Transmitter Technology for Next Generation Wireless Transceivers," IEEE 2008 International Gigahertz Conference, Chalmers, Sweden, 4 pages, INVITED PLENARY TALK

Abstracts of Non-refereed Conference Proceedings (research workshops or talks where a full proceedings is not published)

1 M. Iwamoto, J. Arun, G. Hanington, A. Abellora, P. Asbeck, and L. Larson, "Class S Delta-Sigma Amplifiers for Linear Applications: Efficiency Considerations," *Proc. 1999 IEEE Topical Workshop on Power Amplifier for Wireless Communications,* Sept. 13-14, 1999.

2 C. Wang and L. Larson, "Analysis of a Microwave Class-E Power Amplifier with Finite Switching On Resistance," *Proc. 1999 IEEE Topical Workshop on Power Amplifier for Wireless Communications,* Sept. 13-14, 1999.

3 W. T. Thornton, D. Morgan, and L. Larson, "Results Presented for a Novel Predistortion Linearizer Designed for Use in the LMDS Transmit Band," *Proc. 1999 IEEE Topical Workshop on Power Amplifier for Wireless Communications,* Sept. 13-14, 1999.

4 X. Zhang and L. Larson, "Gain and Phase Error Free LINC Transmitter," *Proc. 1999 IEEE Topical Workshop on Power Amplifier for Wireless Communications,* Sept. 13-14, 1999.

5 H. Kobayashi, J. Hinrichs, L. Larson, and P. Asbeck, "The current-mode Class-D amplifier for microwave frequencies: fundamental analysis and simulations," *2000 IEEE Topical Workshop on Power Amplifiers for Wireless Communications*, Sept. 11-12, 2000.

6 C. Wang, L. Larson, and P. Asbeck, "Linear Class-AB power amplifier with nonlinear capacitor compensation," *2000 IEEE Topical Workshop on Power Amplifiers for Wireless Communications*, Sept. 11-12, 2000.

7 M. Iwamoto, J. Hinrichs, J. Arun, L. Larson, and P. Asbeck, "A push-pull bandpass delta-sigma class-S amplifier," *2000 IEEE Topical Workshop on Power Amplifiers for Wireless Communications*, Sept. 11-12, 2000.

8 M. Iwamoto, P. Chen, H. Kobayashi, L. Larson, P. Asbeck, "950 MHz HBT Extended Doherty for Wireless Handstes: Linearity Characteristics and CDMA Operation," *2001 IEEE Topical Workshop on Power Amplifiers for Wireless Communications*, Sept. 10-11, 2001.

9 M. Iwamoto, A. Williams, C. Wang, L. Larson, and P. Asbeck, "Analysis of Doherty amplifiers with finite output impedance effects," *2000 IEEE Topical Workshop on Power Amplifiers for Wireless Communications*, Sept. 11-12, 2000.

10 P. Asbeck, H. Kobayashi, M. Iwamoto, G. Hanington, S. Nam, and L. Larson, "Augmented Banp-pass nonlinearity model for power amplifier charachterization, Wa. *2001 IEEE Topical Workshop on Power Amplifiers for Wireless Communications*, Sept. 10-11, 2001.

11 Y. Zhao, M. Iwamoto, P. Asbeck, and L. Larson, "Using DSP to Improve PA Performance," *IEEE Topical Workshop on Power Amplifiers for Wireless Communications, Sept. 2002.*

12 J. Deng, P. Gudem, L. Larson, and P. Asbeck, "High-Efficiency SiGe BiCMOS WCDMA Power Amplifiers with Dynamic Biasing Techniques," *IEEE Topical Workshop on Power Amplifiers for Wireless Communications, Sept. 2003.*

13 Feipeng Wang, Donald Kimball, Lawrence Larson, and Peter Asbeck, "Envelope Tracking Efficiency Enhancement for 802.11 g Power Amplifier", *2003 IEEE Topical Workshop on Power Amplifiers for Wireless Communications, San Diego, CA, 2003.*

14 Y. Zhao, M. Iwamoto, D. Kimball, L. E. Larson, and P. M. Asbeck, "A 900MHz Doherty Amplifier Implemented with Lumped Elements," *2003 IEEE Topical Workshop on Power Amplifiers for Wireless Communications, San Diego, CA, 2003.*

15 M. Ranjan, S. Rosenbaum, J. Pusl, B. Coy, L. Larson, “A 5.2GHz SiGe Power Amplifier for Wireless Data and Media Applications ,” *2003 IEEE Topical Workshop on Power Amplifiers for Wireless Communications, San Diego, CA, 2003.*

16 V. Leung, P. Gudem, L. Larson, “Dynamically-Biased Driver Amplifier for W-CDMA Mobile Phone Transmitter Applications,” *2003 IEEE Topical Workshop on Power Amplifiers for Wireless Communications, San Diego, CA, 2003.*

17 J. Deng, P. Gudem, and L. Larson, “Intermodulation Distortion Analysis in SiGe HBT Amplifiers Using a Power-Dependent Coefficient Volterra Technique,” *IEEE Topical Workshop on Power Amplifiers for Wireless Communications, Sept. 2004.*

18 M. Li, I. Galton, L. Larson and P. Asbeck, UCSD, “Power Amplifier Nonlinearity Estimation and Predistortion with Correlation Techniques,” *IEEE Topical Workshop on Power Amplifiers for Wireless Communications, Sept. 2004.*

19 T. Hung, L. Larson, P. Asbeck, “CMOS Outphasing Class-D Power Amplifiers with Chireix Combiners” *IEEE Topical Workshop on Power Amplifiers for Wireless Communications, Sept. 2007* 20 Y. Hong, J. Jeong, D. Kimball, J. Yook, P. Asbeck, L. Larson, "Two-Stage Envelope Tracking Power Amplifiers for Basestation Application," *IEEE Topical Workshop on Power Amplifiers for Wireless Communications, Sept. 2009*

Other Presentations/Works (invited workshops, presentations, or short courses of a tutorial or overview nature)

1. L. Larson, "Research directions in chaotic digital communications devices," *SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 2001. WORKSHOP PRESENTATION 2. L. Larson, “The Impact of Semiconductor Technology Evolution on Communication Systems,” Plenary Talk, International High-Tech Forum, Zhuhai, China, 2002 Plenary Speech

3. L. Larson, “The role of power amplifier in wireless telecommunications,” IEEE International Solid-State Circuits Conference Short Course Presentation, 2000. Short Course Presentation at International Conference

4. L. Larson, “Emerging Semiconductor Technologies and their Effect on the Communications Industry, Presentation to San Diego Telecom Council, June 2002. Industry Group Presentation 5 L. Larson, "Implementation of VCO design*," 2000 IEEE Radio Frequency Integrated Circuit Symposium*, Anaheim, CA, June 13-19, 2000. WORKSHOP PRESENTATION

6 L. Larson, “Improved Techniques Utilizing Harmonic Termination Methods for Microwave and RF Circuit Design,” at “Introducing New Concepts in Nonlinear Network Design,” Workshop at 2002 IEEE MTT-S International Microwave Symposium, Seattle, WA. WORKSHOP PRESENTATION

7 L. Larson, “RF and Microwave Oscillator Design,” Workshop at 2003 IEEE International Microwave Symposium, Philadelphia, Pennsylvania. WORKSHOP PRESENTATION

8 L. Larson, “Next Generation Transmitter Architecture and Design,” Workshop at 2003 IEEE International Microwave Symposium, Philadelphia, Pennsylvania. WORKSHOP PRESENTATION 9 L. Larson, “Wireless System Design and Measurement Accuracy: State-of-the-Art and Future Needs for the Communications”, Workshop at 2004 IEEE International Microwave Symposium, Fort Worth, Texas. WORKSHOP PRESENTATION

10 L. Larson, “Analog/RF design in SiGe Processes,” IEEE International Solid-State Circuits Conference Short Course Presentation, 2004. Short Course Presentation at International Conference

11 P. Asbeck, J. Rode, I. Galton and L. Larson, “Algorithms and Amplifiers for Digital Generation of Microwave Signals with Time-varying Envelope” Workshop at 2005 IEEE International Microwave Symposium, Long Beach, CA WORKSHOP PRESENTATION

12 “Enabling RF Technologies for Software Defined /Cognitive Radios” Larry Larson, Workshop Presentation at International European Solid-State Circuits Research Conference, 2006 WORKSHOP PRESENTATION

13 “Power Supply Modulation Techniques for Power Amplifier Efficiency Enhancement,” Larry Larson, Feipeng Wang, Donald Kimball, and Peter Asbeck,” Workshop Presentation at International Microwave

Symposium (IMS) 2006. WORKSHOP PRESENTATION

14 "Multi-Standard RFIC Transmitter Technology," Lawrence Larson, Peter Asbeck, and Donald Kimball, Workshop Presentation at International Microwave Symposium (IMS) 2006. WORKSHOP PRESENTATION

15 "Efficiency Enhancement Techniques for WiMAX Power Amplifiers," Lawrence Larson, Peter Asbeck, and Donald Kimball, Workshop Presentation at International Microwave Symposium (IMS) 2007. WORKSHOP PRESENTATION

16 "Software Defined /Cognitive Radios: RF and System Considerations" Lawrence Larson, Workshop Presentation at International Microwave Symposium (IMS) 2007. WORKSHOP PRESENTATION 17 "Reconfigurable Transmitters and Power Amplifiers" Lawrence Larson, Peter Asbeck, and Donald Kimball, Workshop Presentation at IEEE Radio Frequency Integrated Circuit Symposium (2007) WORKSHOP PRESENTATION

18 "Linearization of Highly-Efficient Monolithic Class E SiGe Power Amplifiers with Envelope-Tracking (ET) and Envelope-Elimination-and-Restoration (EER) at 900MHz," D. Lie, J. Popp, F. Wang, D. Kimball, and L. Larson, 6th IEEE Dallas Circuits and Systems Workshop on System-on-Chip, 2007. DCAS 2007. WORKSHOP PRESENTATION

19 "Digital-Assisted Compensation of RF-Front-end Limitations," Larry Larson Workshop Presentation at IEEE International Solid-State Circuits Conference (2008) WORKSHOP PRESENTATION 20 "Digitally Enhanced" RF Circuits, Lawrence Larson, Peter Asbeck, and Donald Kimball, Panel Presentation at IEEE International Solid-State Circuits Conference (2007) WORKSHOP PRESENTATION 21 "Power Supply Modulation Techniques for Power Amplifier Efficiency Enhancement," Lawrence Larson, Peter Asbeck, and Donald Kimball, Workshop Presentation at IEEE International Solid-State Circuits Conference (2007) WORKSHOP PRESENTATION

22 "Digital Signal Processing Techniques for Linearity and Efficiency Enhancement of Envelope Tracking, EER, and Doherty Amplifiers," Lawrence Larson, Peter Asbeck, and Donald Kimball, Workshop Presentation at IEEE Radio Frequency Integrated Circuit Symposium (2008) WORKSHOP PRESENTATION

23 "Low-Power Reconfigurable Transmitter Architectures" Lawrence Larson, Peter Asbeck, and Donald Kimball Workshop Presentation at IEEE Radio Frequency Integrated Circuit Symposium (2008) WORKSHOP PRESENTATION

24 "Bipolar-Based Power Amplifier Design Beyond Handsets and into MMIC: Design, Modeling, Characterization, Packaging, Reliability," Larry Larson, Workshop Presentation at IEEE Bipolar Circuits and Technology Meeting (2007) WORKSHOP PRESENTATION

25 "Digitally Enhanced" RF Circuits" Lawrence Larson, Peter Asbeck and Don Kimball, Workshop Presentation at International Microwave Symposium (IMS) 2009. WORKSHOP PRESENTATION 26 "Packaging Options for Wireless Systems-on-a-Chip" Lawrence Larson, Workshop Presentation at International Microwave Symposium (IMS) 2009. WORKSHOP PRESENTATION

27 "Power Amplifier Integration Challenges for Highly Integrated Multi-Mode Transceivers," L. Larson, Workshop Presentation at International Microwave Symposium (IMS) 2009 WORKSHOP PRESENTATION

28 "Power Amplifiers" Lawrence Larson, Peter Asbeck and Don Kimball, Workshop Presentation at IEEE Custom Integrated Circuits Confrence (CICC) 2009. WORKSHOP PRESENTATION 29 "Packaging Options for Wireless Systems-on-a-Chip", Lawrence Larson, Panel Presentation, IEEE International Solid-State Circuits Conference (2009) WORKSHOP PRESENTATION 30 "Ubiquitous Wireless Communications," L. Larson, Presentation to La Jolla Venture Capital Forum, April 2009 PRESENTATION

31 "Ubiquitous Wireless Communications," June, 2009, SPAWAR TechBoard Presentation, PRESENTATION

32 "Design Techniques for Broadband Efficient Linear Power Amplifiers for Multi-Mode Wireless Applications" Lawrence Larson, Workshop Presentation at International Microwave Symposium (IMS) 2010 WORKSHOP PRESENTATION

33 “Low-Power Transmitters in Nanoscale CMOS ”Lawrence Larson, Peter Asbeck, and Donald Kimball, Workshop Presentation at IEEE Radio Frequency Integrated Circuit Symposium (2010) WORKSHOP PRESENTATION

34 “Ubiquitous Wireless Communications,” Presentation to Qualcomm Ventures 5/28/09 PRESENTATION 35 “Digital Signal Processing Techniques for Linearity and Efficiency Enhancement of Envelope Tracking, EER, and Doherty Amplifiers” Presentation at UCSB, April 2008 PRESENTATION 36 “Linearization of Power Amplifiers,” Csics 2010 Short Course WORKSHOP PRESENTATION 37 “Improving RF Transmitter Energy Efficiency for Future Generation Wireless Systems” Presentation to UC Irvine ECE Department Irvine, May, 2010. PRESENTATION

38 “RF and Microwave Challenges for Cognitive Radio and TV White Space Devices,” Presentation at GHz Center, annual Review, Chalmers University, Sweden, November, 2009. PRESENTATION 39 “Power Amplifier Technology” Panasonic 7/20/09 PRESENTATION

40 “Power Amplifier Technology” Huawei 7/28/09 PRESENTATION

41 “RF and Microwave Challenges for Cognitive Radio and TV White Space Devices” Huawei Cognitive Radio Panel 4/17/09 PRESENTATION

42 “Improving RF Transmitter Energy Efficiency for Future Generation Wireless Systems” Presentation to UC Riverside ECE Department 2/17/09 PRESENTATION

43 “Low-Power RF Circuit Trends for Wireless Communications” Broadcomm, 4/20/09. PRESENTATION 44 “RF and Microwave Challenges for Cognitive Radio and TV White Space Devices,” Presentation at California Institute of Technology, December, 2009. PRESENTATION

45: Wouk Lecture – Cal. Tech. June 2013. This is the main invited lecture given by the Division of Engineering at Cal Tech every year. PRESENTATION

46: “Envelope Tracking Power amplifiers for wireless Communications,” Huawei Power Amplifier Workshop, May, 2014.

47:"RF and microwave technology challenges for Internet-of-Things applications" was an invited talk at the 2015 IEEE 15th Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems, Jan., 2015. 48: "RF and Microwave Challenges for Future Radio Spectrum Access", Northeastern ECE Distinguished Speaker Series, December 3, 2015.

49: "RF and Microwave Challenges for Future Radio Spectrum Access" Invited talk at the Radio Club of America's Technical Symposium, San Jose, CA, Nov. 2015.

50: "Overview of the School of Engineering at Brown," Presentation to Rhode Island Professional Engineers, Nov. 4, 2015

51: TBP Annual National Convention - Overview of the School of Engineering at Brown, Oct. 30, 2015 52: "Design Fundamentals for RF Receivers and Transmitters," IEEE BCTM short course, Oct. 2015 53: "Transformer-based duplexers for wireless communications," Presentation to Skyworks, Woburn, Mass, May, 2015,

54: "Internet-of-Things" IMS Panel Discussion, May, 2015.

<u>Contracts and Grants (period 7/1/11- 2/1/23) Brown University</u>

		Funding Agency	Total Funding	Period of Performance		Percent Effort
1	Efficient Linear All-Silicon Transmitter IC’s (ELASTX)	**DARPA**	$1,550,000	3/11-12/13	Co-PI	20%
2	Cognitive radio Low-energy signal Analysis Sensor ICs (CLASIC)	**DARPA/SAIC**	$350,000	1/12-1/15	PI	100%
3	Wide Tuning Range RF Front-End	**DARPA/Maxcentric**	$30,000	7/12-7/13	PI	100%
4	Neural Engineering System Design	**DARPA**	~$1,300,000	4/17-10/18	Co-PI	~10%

	(Nurmikko PI)					
5	NIST Prep - Boulder	**NIST**	~$6,600,000	1/18-1/22	PI	5%

Service

University Service

Brown University Committees:

- Knowledge District Working Group: Fall 2011
- COE Review Committee: Fall 2011
- Nelson Center RPG Fall 2015
- Ex-Officio Member of President's Cabinet, Provost Senior Deans, Capital Planning, Tenure and Promotion, University Resource Committee and Academic Planning Committee
- Provost Search Committee, Fall 2022

University of California (system-wide) Committees:

- UCSD representative on the UC MICRO Steering Committee from 1999-2000. This group met three times per year in Oakland to establish MICRO policy, review proposals, and plan MICRO strategy for the future.
- UCSD representative on the UC Discovery Grant "Communications and Networking" Steering Committee 2001-2006. This group met three times per year in Oakland. Reviewer of Discovery Grant proposals.

University of California – San Diego Committees:

- Department representative to the Academic Senate (1999-2000)
- Member of the *ad-hoc* committee to review Professor Craig as provost of the Eleanor Roosevelt College (2000).
- Member of the *ad-hoc* ethics review committee for Professor Michael Karin (1997-2000). •

Member of the UCSD Institute for Nonlinear Studies Steering Committee (1999-2005). •
Member of Five-Year Review Committee for Rady School Dean Sullivan (2008)

UCSD Jacobs School of Engineering Committees:

- Representative of Center for Wireless Communications to Jacobs School Council of Advisors, 2002- 2006.
- Chair of the committee that nominated Professor Peter Asbeck for the Conexant Chair of Electrical and Computer Engineering (2002).
- Member of the Chair committee for Professor Rajesh Gupta (2002)
- Member of the Chair committee for Professor Larry Smarr (2002).
- Member of SAIC Chair Committee for Professor Ahmin Vahdat (2008)
- Chair of CMRR Chair Committee for Professor Paul Siegel (2007)
- UCSD JSOE Diversity Advisory Council – Chair of Working Group on Student Recruiting 2010-2011

UCSD California Institute for Telecommunications and Information Technology Committees:

- Member of the CALIT^2 Communications committee (2005) .

• Member of the CALIT^2 Building Dedication committee (2005) .
• Member of CALIT NRI Committee (2006-2008)
• Member of CALIT Steering Committee (2005-2007)

UCSD Center for Wireless Communications:

• Director, July 2001-July 2006. Co-Director January 2000-July 2001. The Director of the CWC is responsible for all aspects of Center operation, including budgeting, resource allocation, interaction with member companies, recruiting new members, organizing technical reviews, and helping to determine technical direction. The CWC had roughly 12 Member Companies, 25 faculty members, and an annual budget of approximately $2.5M and supported roughly 45 PhD students during my tenure as Director. The Center Director is responsible for organizing the semi-annual research review, as well as hosting the semi annual Board meeting. I was also responsible for member interactions and recruitment, which typically involved meetings with over 40 companies per year, as well as many visits to our Member companies. • Member, CWC Executive Steering Committee for 1998-2000.
• CWC Entre/Intra-preneurship Workshop Organizer (w. Professor Alon Orlitsky). Nov. 2007. Professor Orlitsky and I organized this highly successful CWC Workshop. It required solicitation of distinguished international invited speakers, organizing the venue location, promotion of the event, etc.

UCSD ECE Department Committees:

• Member Department Space Committee(1998-2000)
• Member Graduate Affairs Committee (2000-2001)
• Member Faculty Council (1997-1999 and 2001-2003)
• Member Center for Wireless Communications Five Year Review Committee (2000) • Host ECE294 Friday Lecture series: Fall 1999.
• Chair Search Committee for Prof. G. Rebeiz (2003)
• Chair Search Committee for Prof. B. Song. (1999)
• Member Search Committee for Prof. J. Buckwalter (2006)
• Member Search Committee Computer Engineering (2007)
• Chair, ECE Space Committee (2007)
• Chair and/or Member of Five Department Ad-Hoc Review Committees (2005-2008) • MS and M.Eng Advisor: Electronic Circuits and Systems : (2005-2011)

UCSD ECE Department Service:

• ECE Department Vice Chair (2007)
• ECE Department Chair (2007-2011)

Host of Visiting Scholars and Professors at UCSD:

I have acted as host to several visitors, who were resident Visiting Scholars or Visiting Professors, including Mr. Eriji Iriyama from Matsushita Electric Works(1998-2000), Professor Leo DeVreede from Technical University Delft (1999), and Professor KH Koo from the University of Inchon (2000), and Mr. Thomas Johansen, from TU Copenhagen (2001-2002) Prof. Hyun-Chang Park from Dongguk University (2002-2003), Professor Carlo Samori: Politechnico Milano (2006-2007) and Professor Jong-Gwan Yook: Yonsei University (2007-2008). As Director of the UCSD CWC, I played official host to approximately 10 CWC visiting scholars.

Professional Service

Editor:

• Associate Editor IEEE Transactions on Circuits and Systems (2008-2010)

Guest Editor:

• Guest Editor of the August 1999 Issue of the *IEEE Transactions on Microwave Theory and Techniques*. This involved solicitation of manuscripts, and coordinating the review and publication process. • Guest Editor of the October 2000 Issue of the *IEEE Journal of Solid-State Circuits*. This involved solicitation of manuscripts, and coordinating the review and publication process.

• Guest Editor Special Issue on Multifunctional Circuits and Systems for Future Generations of Wireless Communications, with A. Tasic, and W Serdijn, 2009 *IEEE Transactions on Circuits and Systems II*, Volume: 55 , Issue: 4

IEEE Committees:

• Member Program Committee for the 1999 IEEE Custom Integrated Circuits Conference (CICC). • Member Program Committee for the 1997-2002 IEEE Bipolar Circuits and Technology Meeting (BCTM) (Chair of the RF committee and panel session organizer)

• Member Program Committee for the 1999 IEEE Radio Frequency Integrated Circuits Conference, • Member Program Committee for the 1998 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits.

• Founding Chairman, 1998 UCSD Center for Wireless Communications Conference in cooperation with the IEEE.

• Technical Program Chair 1999(founding), 2001, and 2003 IEEE Workshop on Power Amplifiers for Wireless Communications.

• General Chair 2000, 2002, 2004 and 2006 IEEE Workshop on Power Amplifiers for Wireless Communications.

• Member Program Committee for the 2004 IEEE Radio and Wireless Conference. • Member Program Committee for the 2004 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits.

• Member Program Committee for the 2007 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits.

• Member Program Committee for the 2008 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits.

• Member Program Committee for the 2009 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits.

• Member Program Committee for the 2009 IEEE International conference on Ultra-Wideband • IEEE Communications Society 2009 Administrative Committee Member – Technical Directions Sub Committee

• Member Program Committee for the 2010 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits

• Member Program Committee for the 2011 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits

• Member Program Committee for the 2012 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits

• Member Program Committee for the 2013 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits
• Member Program Committee for the 2014 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits
• Member Program Committee for the 2015 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits
• Member Program Committee for the 2016 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits
• Member Program Committee for the 2017 IEEE Topical Symposium on High-Frequency Silicon Devices and Circuits

NAE Committees:

• National Academy of Engineering Computer Science and Telecommunications Board's Committee on Wireless Technology Prospects and Policy Options. (2003-2011). This study committee was established by the National Academies at the request of the National Science Foundation to conduct a comprehensive assessment of wireless technology and service and application trends and their implications for wireless spectrum management and policy, and published its final report in 2011.
• A member (2019) of the NAE visiting committee reviewing the NIST Boulder Communications Laboratory, whose findings were published January 2020. I led the Metrology Section group during the review, and drafted that Section of the final report

Paper and Proposal Reviewer:

• Paper Reviewer (1998-Present):
  ▪ IEEE Transactions on Microwave Theory and Techniques,
  ▪ IEEE Microwave and Guided Wave Letters,
  ▪ IEEE Transactions on Vehicular Technology,
  ▪ IEEE Communications Letters,
  ▪ IEEE Journal of Solid-State Circuits,
  ▪ IEEE Transactions on Circuits and Systems,
  ▪ IEEE Transactions on Electron Devices,
  ▪ IEE Electronics Letters.
• NSF Proposal Reviewer: (2003, 2004, 2009, 2010, 2011, 2012)
• NSF ECCS Program Review Panel Member 2011

Diversity Training

Attended the NSA ADVANCE/PAID Chair Retreat, October 10 to 12, 2007. This three day event provided me with intensive training on removing bias and promoting diversity in the recruiting, tenure and advancement process. I took the lessons of this training back to the ECE department and used it to implement improved recruitment and promotion policies.

<u>Other Activities (Entrepreneurship, Consulting, etc).</u>

Co-Founder: Aethercomm, Inc. (1999-Present, BOD Member). Co-Founder Renaissance Wireless (2004-2007), Co-Founder Nurlink (2017-2021)

Technical Advisory Board Member: Resonant Communication (2020-2022), LintrinsicIC

(2021-present). Consultant to Sierra Monolithics (1996-2011), Consultant for Qualcomm in 2015-2016.

I also taught several short courses (1988-2011) through UCLA Extension, UCSD Extension, Mead Microelectronics, and Besser and Associates.

Academic Honors, Fellowships, and Honorary Societies

Memberships

Fellow, IEEE -1999, Life Fellow, IEEE - 2022
Member, Eta Kappa Nu, Sigma Xi, Tau Beta Pi

Honors and Awards

Howard Hughes Doctoral Fellow: 1982 - 1986.
Hughes Research Laboratories Sector Patent Award: 1995 for my work on RF MEMS technology. Co-Recipient of Lawrence Hyland Award - 1996: This is the highest technical achievement award at Hughes Electronics, for development of InP-based low-noise HEMTs for satellite communications in the years 1989-1994.
IBM Faculty Development Award: 2002
Co-Recipient of IBM Microelectronics General Managers Excellence Award (1999) for Development of Si/SiGe HBT Technology. This was for my research on the development of Si/SiGe HBT technology during the years from 1993-1998.
"Wireless Influencers 2002" one of the top 200 people selected internationally as the top influencers in the wireless industry for 2002. One of only 11 people selected from academia.
Co-Recipient (w. D. Jessie): IEEE Custom Integrated Circuits Conference: Best Invited Paper 2003
Co-Recipient (w. V. Leung and P. Gudem): 2nd place Semiconductor Research Corporation SiGe Design Competition 2003
Co-Recipient (w. V. Aparin): Best Student Paper Award – 1st place: IEEE Radio Frequency Integrated Circuits Conference 2004
Co-Recipient (w. F. Wang, P. Asbeck and D. Kimball): Best Student Paper Award – 2nd place: IEEE International Microwave Symposium 2004
Co-Recipient (w. Yiping Han) Best Student Paper Award – 3rd Place: 2006 Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems
Co-Recipient (w. Yiping Han) Best Student Paper Award – 3rd place: IEEE Radio Frequency Integrated Circuits Conference 2007
Co-Recipient (w. Rahul Kodkani) Best Student Paper Award – 3rd Place: 2007 Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems
Co-Recipient (w. Mohammad Farazian) Best Student Paper Award – 2nd Place: 2010 Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems
Mohammad Farazian (PhD Student) – Analog Devices Best Student Designer Award 2008
Ali Afsahi (PhD Student) – Analog Devices Best Student Designer Award 2010
Co-Recipient (w. Mahdi Bagheri) Best Student Paper Award – 3rd Place: 2011 Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems

Teaching

Regular Courses and Enrollment Figures at Brown University

Engn 0020 – Spring 2013 (w. Prof. E. Powell). Enrollment was 131. Score on "Teaching Effectiveness" was 1.71 (1 being best and 5 being worst).
ENGN 0020 Spring 2014 (w. Prof. E. Powell). Enrollment was 125. Score on "Teaching Effectiveness" was 1.75 (1 being best and 5 being worst).
ENGN 0020 Spring 2016 (w. Prof. Jason Harry). Enrollment was 108. Score on "Teaching Effectiveness" was 1.9 (1 being best and 5 being worst).
ENGN 0020 Spring 2017 (w. Prof. Jason Harry). Enrollment was 118. Score on "Teaching Effectiveness" was 2.17 (1 being best and 5 being worst).
ENGN 0520 Spring 2018 (w. Professor Jacob Rosenstein) Enrollment was 94. Score on "Teaching Effectiveness" was 1.75 (1 being best and 5 being worst).
ENGN 0520 Spring 2019 (w. Professor Jacob Rosenstein) Enrollment was 98. Score on "Teaching Effectiveness" was 1.69 (1 being best and 5 being worst).
ENGN 0520 Spring 2020 (w. Professor Farah Laiwalla) Enrollment was 97. Score on "Teaching Effectiveness" was 1.62 (1 being best and 5 being worst).
ENGN 0520 Spring 2021 (w. Professor Farah Laiwalla) Enrollment was 92. Score on "Teaching Effectiveness" was 1.46 (1 being best and 5 being worst).
ENGN 2110 Summer 2021
ENGN 2110 Summer 2023
ENGN 1620 Spring 2024

Independent Studies at Brown University

- Three independent studies projects advised in Fall Semester 2011.
- One independent studies project advised in Fall Semester 2012.
- I supervised one undergraduate student research during 2013 and 2014 – Mr. Subhradip Sarkar. He also did an Honor's thesis with me in 2015.

Honors, Master's and PhD theses directed

- Master's Students Completed: 24 (UCSD) One (Brown University)
- Doctoral Students Completed: 30 (UCSD) One (Brown University)

S. Vora Thesis and Research Advisor MS (Degree Granted 98) R. Langridge Thesis and Research Advisor MS (Degree Granted 99) K. Yang Thesis and Research Advisor MS (Degree Granted 99) W. Sun Thesis and Research Advisor MS (Degree Granted 00) Y. Song Research Advisor (w. B. Song) MS (Degree Granted 01) J. Roan Research Advisor MS (Degree Granted 02) P. Nanawa Research Advisor MS (Degree Granted 02) R. Apte Research Advisor MS (Degree Granted 03) H. Ghajari Research Advisor MS (Degree Granted 03) S. Sivakumar Research Advisor MS(Degree Granted 03) Dayo Ojo Research Advisor MS(Degree Granted 04) P. Sagazio Research Advisor MS(Degree Granted 04) A. Ebaad Research Advisor MS(Degree Granted 04) A. Yang Research Advisor MS(Degree

Granted 04) H. Ng Research Advisor MS(Degree Granted 04) P. Lee Research Advisor MS(Degree Granted 04) P. Yu Research Advisor MS(Degree Granted 04) R. Pera Research Advisor MS (Degree Granted 05) D. Cheng Research Advisor MS(Degree Granted 07) John Keeler Research Advisor MS(Degree Granted 07) Javier Molina Research Advisor MS (Degree Granted 09) Howard Liu Research Advisor MS (Degree Granted 09) Tony Lo Research Advisor MS (Degree Granted 09) Anton Arrigada Research Advisor MS (Degree Granted 10) Akaninyene Umoh Research Advisor MS (Degree Granted 11) C. Kilfoyle Research Adviser ScM (Degree Granted 2017 Brown)

Doctoral Students:
Name of Student/Your Role (thesis adviser, research adviser, etc.)

X. Zhang Dissertation and Research Advisor PhD (Degree Granted 2001) C. Wang Dissertation and Research Advisor PhD(Degree Granted 2003) D. Jessie Dissertation and Research Advisor PhD(Degree Granted 2003) D. Laney Dissertation and Research Advisor PhD(Degree Granted 2003) J. Fairbanks Dissertation and Research Advisor PhD (Degree Granted 2003)
K. Gard Dissertation and Research Advisor PhD(Degree Granted 2003) L. Sheng Dissertation and Research Advisor PhD(Degree Granted 2003) R. Tenny Dissertation and co-Advisor (w/ H. Abarbanel) PhD(Degree Granted 2003) V. Leung Dissertation and Research Advisor PhD(Degree Granted 2004) V. Aparin Dissertation and Research Advisor PhD(Degree Granted 2005) J. Jensen Dissertation and Research Advisor PhD(Degree Granted 2005) J. Deng Dissertation and Research Advisor PhD(Degree Granted 2005) M. Ranjan Dissertation and Research Advisor PhD(Degree Granted 2006) F. Wang Dissertation and Research Advisor PhD (Degree Granted 2006) J. Jamp Dissertation and Research Advisor PhD (Degree Granted 2007) R. Kodkani Dissertation and Research Advisor PhD (Degree Granted 2009)
H. Khatri Dissertation and Research Advisor PhD (Degree Granted 2009) M. Farazian Dissertation and Research Advisor PhD (Degree Granted 2009) H. Pan Dissertation and Research Advisor PhD (Degree Granted 2010) N. Kim Dissertation and Research Advisor PhD (Degree Granted 2010) S. Kim Dissertation and Research Advisor PhD (Degree Granted 2010) S. Park Dissertation and Research Advisor PhD (Degree Granted 2010) M. Kwak Dissertation and Research Advisor PhD (Degree Granted 2011) M. Hassan Dissertation and Research Advisor PhD (Degree Granted 2012) A.Kheirkhi Dissertation and Research Advisor PhD (Degree Granted 2013) A. Afsahi Dissertation and Research Advisor PhD (Degree Granted 2013) A. Agah Dissertation and Research Advisor PhD (Degree Granted 2013) S. Abdelhalem Dissertation and Research Advisor PhD (Degree Granted 2013) C. Thomas Dissertation and Research Advisor PhD (Degree Granted 2015) M. Bagheri Dissertation and Research co-Advisor PhD (Degree Granted 2018) A. Wichman Dissertation and Research Advisor PhD (Degree Granted 2018 Brown)