

KHURRAM K. AFRIDI

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA, USA

Doctor of Philosophy in Electrical Engineering and Computer Science, February 1998.
Thesis: *A Methodology for the Design and Evaluation of Advanced Automotive Electrical Power Systems*.
Advisor: John G. Kassakian

Massachusetts Institute of Technology, Cambridge, MA, USA

Master of Science in Electrical Engineering and Computer Science, June 1992.
Thesis: *Parallel Operation and Failure Mechanisms of MOS-Controlled Thyristors*.
Advisor: John G. Kassakian

California Institute of Technology, Pasadena, CA, USA

Bachelor of Science with Honors in Electrical Engineering, June 1989.

PROFESSIONAL APPOINTMENTS

University of Colorado Boulder, Boulder, CO, USA

- Assistant Professor, Department of ECEE, January 2014 - Present.

Massachusetts Institute of Technology, Cambridge, MA, USA

- Visiting Associate Professor, Department of EECS, January 2009 – January 2014.
- Visiting Scholar, MIT Energy Initiative, September 2009 – January 2014.

Lahore University of Management Sciences, School of Science and Engineering, Lahore, Pakistan

- Associate Professor of Electrical Engineering (with tenure), June 2008 – January 2014.
- Werner-von-Siemens Chair for Power Electronics, June 2008 – January 2014.
- Associate Dean for Academic Affairs, June 2008 - January 2009.
- Project Director, July 2004 - January 2009.

Techlogix, Woburn, MA, USA

- Chief Operating Officer, March 2000 - March 2010.
- Chief Technology Officer and Managing Director, September 1997 - March 2000.

AWARDS AND HONORS

- Werner-von-Siemens Chair for Power Electronics, LUMS SSE, 2008.
- BMW Scientific Award, BMW AG, Munich, Germany, 1999.
- Carnation Merit Award, Caltech, 1988.
- Elected into the US national electrical engineering honor society, Eta Kappa Nu, 1988.
- Elected into the US national engineering honor society, Tau Beta Pi, 1987.
- Elected into the US national scientific research honor society, Sigma Xi, 1987.
- Summer Undergraduate Research Fellowship, Caltech, 1987.
- Full College Blazer, Aitchison, 1985.

RESEARCH GRANTS

- **Ultra-Efficient High-Power-Density Isolated DC-DC Converters**, Principal Investigator, Huawei, 2014.
- **Non-Electrolytic Capacitor Based Energy Buffers for Long-Life Off-Line LED Drivers**, Principal Investigator, GRE Alpha, 2014.
- **Advanced Technologies for Ultra-Efficient Grid-Level Power Converters**, co-Principal Investigator, National Science Foundation, 2013.
- **Ultra-high Efficiency Power Converter Architecture for DC Distribution Systems**, co-Principal Investigator, MIT Energy Initiative Seed Fund Program, 2012.
- **Ultra-high Efficiency Inverters for Photovoltaic Applications**, co-Principal Investigator, Enphase Energy, 2012.
- **Optimal Architectures for Integrating EVs into the Distribution Grid**, co-Principal Investigator, Siemens Corporate Research, 2011.
- **Integration of PHEVs and EVs into the Electric Grid**, co-Principal Investigator, Siemens Corporate Research, 2010.
- **Grid-Connected Photovoltaic Power Systems: Modeling and Topology Studies**, co-Principal Investigator, MIT/Masdar Institute Program, 2010.
- **Environmental Impacts of Hydropower Projects and Energy Alternatives in a Complex River Basin – A Pilot Study of the Indus Basin in Pakistan**, co-Principal Investigator, Linden Trust for Conservation, 2010.
- **MIT Future of the Electric Grid Study**, co-Investigator, ABB, American Electric Power, Bechtel Foundation, Larry Birenbaum, Cisco Systems, Exelon Corporation, General Electric, Iberdrola, Microsoft, NIST, and Southern California Edison, 2009.

INSTITUTIONAL GRANTS

- **Establishment of the LUMS School of Science and Engineering, Lahore, Pakistan**, Project Director, Government of Pakistan, February 2008.
- **Bio-Nanotechnology Research Initiative between LUMS SSE, Pakistan and MRC National Institute for Medical Research (NIMR), UK**, Assistant Link Coordinator, British Council, November 2006.

COURSES TAUGHT

University of Colorado Boulder, Boulder, CO, USA

DEPARTMENT OF ELECTRICAL, COMPUTER, AND ENERGY ENGINEERING

- **Resonant and Soft-Switching Techniques in Power Electronics** (ECEN5817), Spring 2014
Lecturer for this graduate level advanced power electronics course being taught to 45 students (19 on-campus and 26 off-campus/CAETE). Have made major revisions to this course.

Massachusetts Institute of Technology, Cambridge, MA, USA

MITx / edX

- **Circuits and Electronics** (6.002x), Fall 2012
Instructor responsible for the Fall 2012 offering of this sophomore level electronic circuits course taught through the edX online learning platform to over 46,000 students.

Massachusetts Institute of Technology, Cambridge, MA, USA

DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

- **Power Electronics** (6.334), Spring 2009, Spring 2010 and Spring 2013
Lecturer for this graduate level course in power electronics during Spring 2013. Course enrollment was 45 students. Was co-lecturer of this course in Spring 2009 and Spring 2010. In Spring 2013, the overall course rating was 6.6/7.0 and my teaching evaluation was 6.8/7.0.
- **Advanced Topics in Power Electronics** (6.332), Fall 2013

Co-lecturer for this graduate level course in power electronics taken by 32 students. My teaching evaluation and the overall course rating were both 6.6/7.0.

- **Theory and Application of Circuits and Electronics** (6.169), Spring 2012, Fall 2012 and Fall 2013
Lecturer for this sophomore level electronic circuits laboratory course that focuses on developing circuit design skills. In Spring 2012 the course was offered as a special subject (6.S076) and starting Fall 2012 it has been converted into a regular course (6.169). Spring 2012 course enrollment was 16 students and in Fall 2012 enrollment increased to 26 students. My teaching evaluation in Spring 2012 was 6.6 on a 7.0 scale, and the overall rating of the course was 6.7/7.0. In Fall 2012, my teaching evaluation and the overall course rating were both 6.8/7.0. In Fall 2013, my teaching evaluation was 6.8/7.0.
- **Circuits and Electronics** (6.002), Fall 2009, Fall 2010, Spring 2011, Fall 2011 and Spring 2012
Recitation instructor lecturing two sections of this sophomore level electronic circuits course. Each recitation section has an enrollment of about 25 students. My teaching evaluations during the last four terms have been between 6.4 and 6.7 on a 7.0 scale.
- **Smart Electric Grid** (6.A54), Fall 2009
Co-lecturer for this new freshman level course on smart electric grids that I co-developed. Enrollment was limited to 8 students, each of whom had to do a research project and make a final presentation. Being a seminar style course the course was not evaluated.

PROFESSIONAL EXPERIENCE

University of Colorado Boulder, Boulder, CO, USA

DEPARTMENT OF ELECTRICAL, COMPUTER, AND ENERGY ENGINEERING

Assistant Professor, January 2014 – Present

Established a research group in the area of grid-interfaced power electronics and energy systems.

Massachusetts Institute of Technology, Cambridge, MA, USA

DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Visiting Associate Professor, January 2009 – January 2014

Conducted and supervised research in the area of power electronics and energy systems with applications to smart electric grids. My students' and my research in energy systems resulted in the development of a new optimization methodology for the design of electric vehicle charging infrastructure that also integrated distributed renewable resources. Our research in grid-interfaced power electronics led to the development of an efficient high energy density switched-capacitor energy buffer that utilized film capacitors and overcame the lifetime issues of electrolytic capacitors. Our research also resulted in the development of new resonant converter architectures that achieve zero-voltage switching (ZVS) and near zero-current switching (ZCS) across wide power and voltage ranges. Our research was sponsored by Siemens, Masdar Institute, MIT GaN Energy Initiative and Enphase Energy. On the teaching side I co-developed and co-taught a new freshman seminar course on Smart Electric Grid (6.A54), and taught various Electronic Circuits and Power Electronics courses at the undergraduate and graduate level multiple times. My teaching evaluations were excellent: 6.7, 6.6, 6.5, 6.6, 6.8, 6.6 and 6.8 on a 7.0 scale in the last seven courses taught, and the course that I managed the last two terms (6.S076/6.169) received an overall course evaluation of 6.7/7.0 in Spring 2012 and 6.8/7.0 in Fall 2012. In Fall 2012, I also led MITx's Circuits and Electronics course (6.002x) on the edX online learning platform.

Massachusetts Institute of Technology, Cambridge, MA, USA

MIT ENERGY INITIATIVE

Visiting Scholar, September 2009 – January 2014

As a part of MIT's Future of the Electric Grid Study team, researched the challenges that the US electric grid is expected to face over the next 20 years and developed recommendations for dealing with these challenges. My specific focus was on challenges arising from large penetration of distributed renewable generation and plug-in hybrid electric vehicles. Co-

authored "The Future of the Electric Grid" study report which was launched on December 5, 2011 at the National Press Club in Washington, DC.

Lahore University of Management Sciences (LUMS), Lahore, Pakistan

SCHOOL OF SCIENCE AND ENGINEERING (SSE)

Project Director, July 2004 – January 2009

LUMS School of Science and Engineering (SSE) was an ambitious project to build the first private research oriented school of science and engineering in Pakistan. As its founding Project Director, was responsible for all aspects of its creation, including fund raising, faculty and staff recruitment, curriculum development, design and construction of physical infrastructure, student admissions, and development of policies and procedures. Helped raise \$58 million for SSE, including \$25 million for equipment and research through a peer reviewed grant from the federal government; oversaw the design and construction of a 300,000 sq-ft state-of-the-art laboratory building; helped develop a tenure-track based faculty appointment and promotion system; helped recruit over a dozen high-caliber academics from US and Europe, including the first Dean; developed research linkage with Siemens Corporate Technology and Nestle Research Laboratory; and helped attract over 7,000 top students to apply for 200 positions in the SSE's inaugural freshman class. The school started classes with 180 undergraduate students and 30 faculty members in six disciplines in Fall 2008. It now has roughly 800 students and its first batch graduated in June 2012 with many of its students gaining graduate admission into the top US and European universities.

Lahore University of Management Sciences (LUMS), Lahore, Pakistan

SCHOOL OF SCIENCE AND ENGINEERING (SSE)

Associate Dean for Academic Affairs, June 2008 – January 2009

Werner-von-Siemens Chair for Power Electronics, June 2008 – January 2014

Associate Professor of Electrical Engineering (with tenure)

Led the development of the school's academic policies and procedures and oversaw their implementation. Also refined and implemented the school's science-rich core curriculum. Helped develop the electrical engineering curriculum and the circuits, microelectronics and power electronics related courses. Started a research program in power electronics focused on low cost electronic interfaces for renewable energy sources.

Techlogix, Woburn, MA, USA

Chief Operating Officer, March 2000 – March 2010

Responsible for the strategic direction, business development and management of the company. Helped the company grow from infancy to a profitable 350-person information technology services and consulting company with offices in Boston, Dubai, Karachi, Lahore, Islamabad, Kuala Lumpur and Beijing. Specific accomplishments include acquisition of large customers such as General Electric and MassMutual, establishment of a software development center in Beijing, implementation of quality standards and achievement of ISO 9000 certification at the Lahore development center, and development of partnerships with large software product companies.

Techlogix, Woburn, MA, USA

Chief Technology Officer and Managing Director, September 1997 – March 2000

Led the development and marketing of enhanced versions of MAESTrO – a software tool for the automated synthesis, system analysis and comparative evaluation of advanced automotive electrical systems. MAESTrO came out of my PhD thesis and its unique automated synthesizer capability dramatically shortened the lead-time from concept to a finalized design. MAESTrO was used to design electrical systems for next generation fuel-efficient vehicles by about 20 automotive companies, including AMP, BMW, Bosch, DaimlerChrysler, Delphi Automotive, Dow Automotive, Eaton, Ford, General Motors, Honda, PSA, Renault, Siemens, United Technologies, Visteon, Volvo and Yazaki. Also managed the development of a computer vision based smart air-bag deployment system that could differentiate between different types and orientations of occupants and deploy the air bag accordingly. The work was sponsored by Eaton Corp. The

system met its performance targets in terms of speed and reliability, and it was patented jointly by Eaton and Techlogix in the US and internationally.

Massachusetts Institute of Technology, Cambridge, MA, USA

LABORATORY FOR ELECTROMAGNETIC AND ELECTRONIC SYSTEMS

Research Assistant, March 1993 – August 1997.

Developed a software tool (MAESTrO) for automating the synthesis and analysis of automotive electrical systems. Invented a novel linear growth network analysis algorithm (BNA) that is employed by MAESTrO, and developed cost, weight, efficiency and reliability models for automotive components. MAESTrO was used by the automotive industry to develop the new 42V PowerNet standard. The work was sponsored by Mercedes-Benz. My PhD thesis, based on this work, won the BMW Scientific Award.

Schlumberger, Alexandria, Egypt and Karachi, Pakistan

Field Engineer, December 1992 – February 1993.

Led an oil exploration and well servicing unit. Measured and analyzed rock formation data using wireline logging tools in various oil fields in the Middle East.

Philips Laboratories, Briarcliff, NY, USA

Design Engineer, Summer 1992.

Designed a novel control scheme to reduce the inrush current in the preconditioners of electronic ballasts. The design and analysis was done using SPICE, and the circuit was realized using commercial ICs and discrete components. A patent disclosure was filed on the work.

Massachusetts Institute of Technology, Cambridge, MA, USA

DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Teaching Assistant, Fall 1991 and Fall 1992.

Taught tutorials and review lectures and graded problem sets for the following courses:

1. Electromagnetic Fields and Energy (6.013), Fall 1992.
2. Introduction to VLSI Systems (6.371), Fall 1991.

Massachusetts Institute of Technology, Cambridge, MA, USA

LABORATORY FOR ELECTROMAGNETIC AND ELECTRONIC SYSTEMS

Research Assistant, September 1990 - May 1992.

Designed test circuits to characterize the performance of individual and paralleled MOS-Controlled Thyristors (MCTs). Discovered a unique failure-mode in MCTs. The work is cited in the "MOS Controlled Thyristors User's Guide" published by Harris Semiconductor. The work was sponsored by the General Electric Company.

Lutron Electronics, Coopersburg, PA, USA

Design Engineer, Summer 1990.

Designed and implemented control circuits to minimize distortion in the line current and improve the power factor of fluorescent light dimmers. Compared active power factor correction topologies, including buck, boost and flyback, on the basis of performance and cost.

Massachusetts Institute of Technology, Cambridge, MA, USA

DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Teaching Assistant, Spring 1990.

Taught tutorials and review lectures and graded problem sets for the course: Circuits and Electronics (6.002).

Massachusetts Institute of Technology, Cambridge, MA, USA

RESEARCH LABORATORY OF ELECTRONICS

Research Assistant, September 1989 - December 1989.

Developed simulation models for the onboard electronics of instrument landing systems (ILS) and microwave landing systems (MLS). The work was sponsored by the Federal Aviation Authority.

California Institute of Technology, Pasadena, CA, USA

DEPARTMENT OF ELECTRICAL ENGINEERING

Undergraduate Research Assistant, September 1988 - March 1989.

Designed and fabricated microwave integrated circuits for the transceiver of NASA's Comet Reconnaissance and Asteroid Flyby (CRAF) spacecraft. The work was sponsored by the National Aeronautics and Space Administration.

California Institute of Technology, Pasadena, CA, USA

DEPARTMENT OF ELECTRICAL ENGINEERING

Undergraduate Teaching Assistant, September 1987 - June 1988.

Helped students with course material and graded problems sets for the three quarter sophomore level course: Introduction to Electronic Engineering (EE14abc).

Jet Propulsion Laboratory, Pasadena, CA, USA

Payload Engineer, Summer 1987.

Member of a student team responsible for the design of a beacon satellite (SURFSAT-1) for NASA. Designed the phase modulated dual frequency (X/Ka-band) transmitter for the satellite. SURFSAT-1 was launched into orbit on November 4, 1995 on a Delta II launch vehicle from Vandenberg Air Force Base.

CONSULTING EXPERIENCE

Lutron Electronics, Coopersburg, PA, USA

Instructor, June-July 2012

Taught a 36 contact-hour course on Power Electronics to the engineers of Lutron. Received excellent evaluations for the course: 4.8 out of 5.0.

Lytron, Woburn, MA, USA

Consultant, May-September 2011

Helped design and build a test system that can control the amount of heat dissipated in power device modules. The test system has been successfully deployed and used to evaluate the performance of Lytron's cold plates in effectively cooling IGBT modules.

Lytron, Woburn, MA, USA

Consultant, December 2010

Developed and delivered a two-day course on power electronics for non-electrical engineers. Most of the attendees were mechanical engineers at Lytron, which is a leading manufacturer of high performance custom liquid cooling solutions. The course received excellent evaluations: 4.7 out of 5.0.

INVENTIONS AND PATENTS

1. D.J. Perreault, **K.K. Afridi** and S.J. Gunter, "Systems and Methods for a Variable Frequency Multiplier Power Converter," International Patent Application, No: PCT/US13/67724, Massachusetts Institute of Technology, October 31, 2013.
2. M. Chen, D.J. Perreault and **K.K. Afridi**, "Switched-Capacitor Split Drive Transformer Power Conversion Architecture," United States Provisional Patent Application, No: 61896702, Massachusetts Institute of Technology, October 29, 2013.
3. D.J. Perreault, **K.K. Afridi** and M. Chen, "Multilevel Energy Buffer and Voltage Modulator for Power Converters," United States Provisional Patent Application, No: 61826102, Massachusetts Institute of Technology, May 22, 2013.
4. **K.K. Afridi** and D.J. Perreault, "Resonant Power Converters Using Impedance Control Networks and Related Techniques," International Patent Application, No: PCT/US13/29729, Massachusetts Institute of Technology, March 7, 2013.

5. D.J. Perreault, **K.K. Afridi**, M. Chen, Steven B. Leeb, and Arthur Hsu Chen Chang, "Systems Approach to Photovoltaic Energy Extraction," International Patent Application, No: PCT/US2013/024552, Massachusetts Institute of Technology, February 3, 2013. Licensed by GRE Alpha in November 2013.
6. D.J. Perreault, **K.K. Afridi**, M. Chen, Steven B. Leeb, and Arthur Hsu Chen Chang, "Enhanced Stacked Switched Capacitor Energy Buffer Circuit," International Patent Application, No: PCT/US2013/022001, Massachusetts Institute of Technology, January 17, 2013. Licensed by GRE Alpha in November 2013.
7. D.J. Perreault, **K.K. Afridi**, M. Chen, Steven B. Leeb, and Arthur Hsu Chen Chang, "Stacked Switched Capacitor Energy Buffer Circuit," International Patent Application, No: PCT/US2013/021886, Massachusetts Institute of Technology, January 17, 2013. Licensed by GRE Alpha in November 2013.
8. A.A. Baloch, U. Ahmed, M. Asif and **K.K. Afridi**, "Rules-based Occupant Classification System for Airbag Deployment," United States Patent, No. 6459974 (European Patent No. EP1262376; Japanese Patent No. JP2003025953; Canadian Patent No. CA2387076), Techlogix and Eaton Corp., October 1, 2002.
9. **K.K. Afridi**, "MAESTrO," Massachusetts Institute of Technology, Cambridge, MA. Software Disclosure: May 5, 1997. Licensed by Techlogix in September 1997.

PUBLICATIONS (BOOKS AND BOOK CHAPTERS)

1. J.G. Kassakian, R.L. Schmalensee, G. DesGroseilliers, T.D. Heidel, **K.K. Afridi**, A.M. Farid, J.M. Grochow, W.W. Hogan, H.D. Jacoby, J.L. Kirtley, H.G. Michaels, I. Pérez Arriaga, D.J. Perreault, N.L. Rose and G.L. Wilson, *The Future of the Electric Grid*, Massachusetts Institute of Technology, Cambridge, MA, December, 2011 (ISBN 978-0-9828008-6-7).
2. D.J. Perreault, **K.K. Afridi**, and I.A. Khan, "Automotive Applications of Power Electronics," in *Power Electronics Handbook*, 3rd Edition, Muhammad H. Rashid (Editor), pp. 643-668, Elsevier, 2011.

PUBLICATIONS (JOURNALS)

1. M. Chen, **K.K. Afridi** and D.J. Perreault, "A Multilevel Energy Buffer and Voltage Modulator for Grid-Interfaced Micro-Inverters," *IEEE Transactions on Power Electronics* (accepted).
2. W. Inam, **K.K. Afridi** and D.J. Perreault, "High Efficiency Resonant DC/DC Converter Utilizing a Resistance Compression Network," *IEEE Transactions on Power Electronics*, vol. 29, no. 8, pp. 4126-4135, August, 2014.
3. **K.K. Afridi**, M. Chen and D.J. Perreault, "Enhanced Bipolar Stacked Switched Capacitor Energy Buffers," *IEEE Transactions on Industry Applications*, vol. 50, no. 2, pp. 1141-1149, March/April, 2014.
4. M. Chen, **K.K. Afridi** and D.J. Perreault, "Stacked Switched Capacitor Energy Buffer Architecture," *IEEE Transactions on Power Electronics*, vol. 28, no. 11, pp. 5183-5195, November, 2013.
5. S. Gunter, **K.K. Afridi** and D.J. Perreault, "Optimal Design of Grid-Interfaced PEV Chargers with Integrated Distributed Resources," *IEEE Transactions on Smart Grid*, vol. 4, no. 2, pp. 956-967, June, 2013.
6. A. Siddiqi, J. Wescoat, S. Humair, **K. Afridi**, "An Empirical Analysis of the Hydropower Portfolio in Pakistan," *Energy Policy*, vol. 50, pp. 228-241, November, 2012.
7. **K.K. Afridi** and J.G. Kassakian, "Turn-off Failures in Individual and Paralleled MCTs," *IEEE Transactions on Power Electronics*, pp. 299-304, March, 1996.

PUBLICATIONS (CONFERENCE PROCEEDINGS)

1. M. Chen, Y. Ni, C.M. Serrano, B.J. Montgomery, D.J. Perreault and **K.K. Afridi**, "An Electrolytic-Free Offline LED Driver with a Ceramic-Capacitor-Based Compact SSC Energy Buffer," *Proceedings of the IEEE Energy Conversion Congress and Exposition (ECCE)*, Pittsburgh, PA,

- September, 2014 (accepted).
2. W. Inam, **K.K. Afridi** and D.J. Perreault, "Variable Frequency Multiplier Technique for High Efficiency Conversion Over a Wide Operating Range," *Proceedings of the IEEE Energy Conversion Congress and Exposition (ECCE)*, Pittsburgh, PA, September, 2014 (accepted).
 3. J.A. Santiago-Gonzalez, K.M. Elbaggari, **K.K. Afridi** and D.J. Perreault, "Design of Near Resistive-Input Class E Rectifiers and Evaluation of Diodes for VHF Rectification," *Proceedings of the IEEE Energy Conversion Congress and Exposition (ECCE)*, Pittsburgh, PA, September, 2014 (accepted).
 4. Y. Ni, S. Pervaiz, M. Chen and **K.K. Afridi**, "Energy Density Enhancement of Unipolar SSC Energy Buffers through Capacitance Ratio Optimization," *Proceedings of the IEEE Workshop on Control and Modeling for Power Electronics (COMPEL)*, Santander, Spain, June, 2014 (accepted).
 5. M. Chen, M. Araghchini, **K.K. Afridi**, J.H. Lang and D.J. Perreault, "A Systematic Approach to Modeling Impedances and Current Distribution in Planar Magnetics," *Proceedings of the IEEE Workshop on Control and Modeling for Power Electronics (COMPEL)*, Santander, Spain, June, 2014 (accepted).
 6. M. Chen, **K.K. Afridi** and D.J. Perreault, "A Multilevel Energy Buffer and Voltage Modulator for Grid-Interfaced Micro-Inverter," *Proceedings of the IEEE Energy Conversion Congress and Exposition (ECCE)*, Denver, CO, September, 2013.
 7. J.A. Santiago-González, **K.K. Afridi** and D.J. Perreault, "Design of Resistive-Input Class E Resonant Rectifiers for Variable-Power Operation," *Proceedings of the IEEE Workshop on Control and Modeling for Power Electronics (COMPEL)*, Salt Lake City, UT, June, 2013.
 8. P. Mitros, **K.K. Afridi**, G.J. Sussman, C.J. Terman, J.K. White, L.J. Fischer and A. Agarwal, "Teaching Electronic Circuits Online: Lessons from MITx's 6.002x on edX," *Proceedings of the IEEE International Symposium on Circuits and Systems (ISCAS)*, Beijing, China, May, 2013.
 9. W. Inam, **K.K. Afridi** and D.J. Perreault, "High Efficiency Resonant DC/DC Converter Utilizing a Resistance Compression Network," *Proceedings of the IEEE Applied Power Electronics Conference and Exposition (APEC)*, Long Beach, CA, March, 2013.
 10. S.J. Gunter, D.J. Perreault, S. Suresh and **K.K. Afridi**, "Methodology for the Optimal Design of PEV Charging Systems with Multiple Chargers and Distributed Resources," *Proceedings of the IEEE Innovative Smart Grid Technologies Conference (ISGT)*, Washington, DC, February, 2013.
 11. **K.K. Afridi**, M. Chen and D.J. Perreault, "Enhanced Bipolar Stacked Switched Capacitor Energy Buffers," *Proceedings of the IEEE Energy Conversion Congress and Exposition (ECCE)*, pp. 4209-4216, Raleigh, NC, September, 2012.
 12. M. Chen, **K.K. Afridi** and D.J. Perreault, "Stacked Switched Capacitor Energy Buffer Architecture," *Proceedings of the IEEE Applied Power Electronics Conference and Exposition (APEC)*, pp. 1404-1413, Orlando, FL, February, 2012.
 13. S. Gunter, **K.K. Afridi** and D.J. Perreault, "Optimal Design of Grid-Interfaced EV Chargers with Integrated Generation," *Proceedings of the IEEE Innovative Smart Grid Technologies Conference (ISGT)*, Washington, DC, January, 2012.
 14. **K.K. Afridi**, "Evaluation of Advanced Automotive Electrical System Architectures Using MAESTrO," *Proceedings of the IEEE Workshop on Power Electronics in Transportation*, pp. 85-92, Dearborn, MI, USA, October, 1998.
 15. M. Kokes, W. Appel, W. Schleif, M. Stege, **K. Afridi**, and T. Neff, "MAESTrO (Multi Attribute Extended System Trade-Off Analysis) - Eine Methode zur Konzeption und Bewertung von Elektrik/Elektronik Architekturen in Nutzfahrzeugen," *17th VDI/VW Gemeinschaftstagung Systemengineering in der KFZ-Entwicklung*, Wolfsburg, Germany, December, 1997.
 16. **K.K. Afridi**, "MAESTrO - A Software Tool for the Design and Evaluation of Advanced Automotive Electrical Power Systems," *Proceedings of the IEEE Workshop on Power Electronics in Transportation*, pp. 39-46, Dearborn, MI, USA, October, 1996.
 17. **K.K. Afridi**, R.D. Tabors and J.G. Kassakian, "Alternative Electrical Distribution System Architectures for Automobiles," *Proceedings of the IEEE Workshop on Power Electronics in Transportation*, pp. 33-38, Dearborn, MI, USA, October, 1994.
 18. **K.K. Afridi**, R.D. Tabors and J.G. Kassakian, "Alternative Electrical Power System Architectures for Electric Vehicles," *Proceedings of the Universities Power Engineering Conference*, pp. 63-66, Galway, Ireland, September, 1994.

19. **K.K. Afridi** and J.G. Kassakian, "Turn-off Failures in Individual and Paralleled MCTs," *International Symposium on Power Semiconductor Devices and ICs (ISPSD)*, pp. 60-65, Monterey, CA, USA, May, 1993.

PUBLICATIONS (TECHNICAL REPORTS)

1. **K.K. Afridi**, S. Gunter and D.J. Perreault, *Integration of PHEVs and EVs into the Distribution Grid*, White Paper, Massachusetts Institute of Technology, Cambridge, MA, January, 2011.
2. **K.K. Afridi**, *A Methodology for the Design and Evaluation of Advanced Automotive Electrical Power Systems*, Ph.D. Thesis, Massachusetts Institute of Technology, Cambridge, MA, February, 1998.
3. I.P. Trefz, **K.K. Afridi** and T.M. Jahns, *MAESTrO+ Installation and User's Guide*, LEES Technical Report TR-97-002, Massachusetts Institute of Technology, Cambridge, MA, March, 1997.
4. I.P. Trefz, **K.K. Afridi** and T.M. Jahns, *Structure of the Extended Version of MAESTrO*, LEES Technical Report TR-97-001, Massachusetts Institute of Technology, Cambridge, MA, February, 1997.
5. **K.K. Afridi**, *Modeling of Traveling Wave and Hybrid Transducer Piezoelectric Ultrasonic Motors*, LEES Technical Report TR-96-003, Massachusetts Institute of Technology, Cambridge, MA, September, 1996.
6. **K.K. Afridi**, *MAESTrO - User Manual and Installation Guide*, Massachusetts Institute of Technology, Cambridge, MA, September, 1996.
7. K.H. Yeh, **K.K. Afridi** and J.G. Kassakian, *Implementation of MAESTrO*, LEES Technical Report TR-96-002, Massachusetts Institute of Technology, Cambridge, MA, July, 1996.
8. E.G. Corbett, S.D. Umans, K.K. Afridi, J.G. Kassakian, R.D. Tabors, L.S. Schwartz and C.F. Bruce, *Advanced Motors and Power Electronics*, Project Report VT-2, MIT Lincoln Laboratory, Lexington, MA, April, 1994.
9. **K.K. Afridi**, *Inrush Current Limiting using Controllable Bridge Rectifiers*, Project Report, Philips Laboratory, Briarcliff, NY, July, 1992.
10. **K.K. Afridi**, *Parallel Operation and Failure Mechanisms of MOS-Controlled Thyristors*, Masters Thesis, Massachusetts Institute of Technology, Cambridge, MA, June, 1992.
11. **K.K. Afridi** and J.G. Kassakian, *SPICE Based Model of the MOS-Controlled Thyristor*, LEES Technical Report TR-91-004, Massachusetts Institute of Technology, Cambridge, MA, July, 1991.
12. S. Chakrabarti, S. Wakayama, T. Hochberg, **K. Afridi**, A. Shah, R. Ridenoure, R. Clauss, J. Smith, E. Posner, *KLUDGE - A Satellite Design Study*, SURF Report, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, September, 1987.

INVITED TALKS

1. "Switched Capacitor Energy Buffers," *IEEE Energy Conversion Congress and Exposition (ECCE)*, Denver, CO, September 2013.
2. "Circuits and Systems Education in the Era of the MOOCs," CASEO Workshop, ISCAS, Beijing, China, May 23, 2013.
3. "Converter and System Architectures for Grid-Interfaced Power Electronics," *Department of Electrical and Computer Engineering Colloquium*, Tufts University, Medford, MA, November 2012.
4. "Methodology for the Optimal Design of Grid-Connected PEV Charging Systems with Integrated Distributed Resources," Siemens Corporate Research, Princeton, NJ, July 2012.
5. "Electrification of Transportation," *MIT Future of the Electric Grid Study Advisory Board Meeting*, Cambridge, MA, May 2010.
6. "Electrification of Road Transport and its Impact on the Grid," *MIT Center for Energy and Environmental Policy Research (CEEPR) Workshop*, Cambridge, MA, April 2010.
7. "International Grid Activities," *MIT Future of the Electric Grid Study Advisory Board Meeting*, Cambridge, MA, January 2010.
8. "An Engineering Curriculum for the 21st Century," *International Conference on Emerging*

- Trends in Engineering Education*, Islamabad, December, 2007.
9. "Enhancing University-Industry Collaboration," Higher Education Commission of Pakistan, Islamabad, January, 2003
 10. "Entrepreneurship in the Internet Age," *4th Annual Intercollegiate Arab Students Conference*, Harvard University, Cambridge, MA, October, 2000.
 11. "Hi-Tech Entrepreneurship," *Pakistan Economic and Social Development Conference*, Massachusetts Institute of Technology, Cambridge, MA, March, 1998.
 12. "MAESTrO," Eaton Corporation, Strasburg, France, October, 1996.
 13. "Effects of Higher System Voltage on Semiconductor Switch Attributes," *1st Meeting of the Consortium on Advanced Automotive Electrical/Electronic Components and Systems*, Cambridge, MA, November, 1996.
 14. "MAESTrO - A Software Tool for the Design and Evaluation of Advanced Automotive Electrical Power Systems," Ford Motor Company, Dearborn, MI, September, 1996.
 15. "Ultrasonic Motors," *5th Workshop on Advanced Automotive Electrical Systems*, Cambridge, MA, March, 1996.
 16. "Power Electronics - Technology and Applications," GIKI Institute of Engineering Science and Technology, Topi, Pakistan, October, 1995.
 17. "Evaluation of Advanced Automotive Power System Architectures using MAESTrO," *2nd Meeting of 'Forum Bordnetzarchitektur'*, Hannover, Germany, October, 1995.
 18. "Cost Analysis of a Front-end Converter for an ac Distribution System in Internal Combustion Engine Vehicles," *4th Workshop on Advanced Architectures for Automotive Electrical Distribution Systems*, Cambridge, MA, December, 1995.
 19. "MAESTrO Evaluation of Alternative Power System Architectures," *3rd Workshop on Advanced Architectures for Automotive Electrical Distribution Systems*, Cambridge, MA, September, 1995.
 20. "Motors for Automotive Applications," *2nd Workshop on Advanced Architectures for Automotive Electrical Distribution Systems*, Dedham, MA, March, 1995.
 21. "Communication Strategies for the Control of Power in Automobiles," *1st Workshop on Advanced Architectures for Automotive Electrical Systems*, Cambridge, MA, October, 1994.
 22. "MOS-Controlled Thyristors - A Submicron Technology Power Device," IEEE Student Branch, University of Engineering and Technology, Lahore, Pakistan, November, 1993.
 23. "MOS-Controlled Thyristors," Department of Electronics, Quaid-e-Azam University, Islamabad, Pakistan, June, 1992.
 24. "Parallel Operation and Failure Mechanisms of MOS-Controlled Thyristors (MCTs)," *MIT/Industry Power Electronics Collegium*, Cambridge, MA, December, 1991.

GRADUATE THESIS SUPERVISION

1. Jie Lv, PhD Thesis, Department of Electrical, Computer and Energy Engineering, CU Boulder, (in progress).
2. Saad Pervaiz, PhD Thesis, Department of Electrical, Computer and Energy Engineering, CU Boulder, (in progress).
3. Ashish Kumar, PhD Thesis, Department of Electrical, Computer and Energy Engineering, CU Boulder, (in progress).
4. Yu Ni, MS Thesis, Department of Electrical, Computer and Energy Engineering, CU Boulder, (in progress).
5. Minjie Chen, *VHF Architectures for Micro-Inverters*, PhD Thesis, Department of Electrical Engineering and Computer Science, MIT, (in progress), (co-advisor: Prof. David Perreault).
6. Samantha Gunter, *Ultra-high Efficiency Power Converter Architectures*, PhD Thesis, Department of Electrical Engineering and Computer Science, MIT, (in progress), (co-advisor: Prof. David Perreault).
7. Wardah Inam, *Advanced Resonant Power Converter Architectures*, PhD Thesis, Department of Electrical Engineering and Computer Science, MIT, (in progress), (co-advisor: Prof. David Perreault).

8. Juan Santiago-Gonzalez, *Ultra-high Frequency Power Conversion Architectures*, PhD Thesis, Department of Electrical Engineering and Computer Science, MIT, (in progress), (co-advisor: Prof. David Perreault).
9. Juan Santiago-Gonzalez, *Design of Class E Resonant Rectifiers for Very High Frequency Power Conversion*, SM Thesis, Department of Electrical Engineering and Computer Science, MIT, August 2013, (co-advisor: Prof. David Perreault).
10. Wardah Inam, *High Efficiency Resonant Power Converter for Solar Power Applications*, SM Thesis, Department of Electrical Engineering and Computer Science, MIT, October 2012, (co-advisor: Prof. David Perreault).
11. Minjie Chen, *Stacked Switched Capacitor Energy Buffer Architecture*, SM Thesis, Department of Electrical Engineering and Computer Science, MIT, December 2011, (co-advisor: Prof. David Perreault).
12. Samantha Gunter, *Methodology for Combined Integration of Electric Vehicles and Distributed Resources into the Electric Grid*, SM Thesis, Department of Electrical Engineering and Computer Science, MIT, September 2011 (co-advisor: Prof. David Perreault).

UNDERGRADUATE RESEARCH SUPERVISION

1. Curtis Serrano, *Comparative Evaluation of Alternative Twice-Line-Frequency Energy Buffering Architectures*, Undergraduate Research Opportunities Program (UROP), Department of Electrical Engineering and Computer Science, MIT, August 2013.
2. Cory Harris, *Thermal Balancing of Multiphase dc-dc Converter Controllers*, Undergraduate Advanced Project (UAP), Department of Electrical Engineering and Computer Science, MIT, May 2013.
3. Benjamin Montgomery, *Practical Design Considerations for Stacked Switch Capacitor Energy Buffers*, Undergraduate Advanced Project (UAP), Department of Electrical Engineering and Computer Science, MIT, May 2013.

PROFESSIONAL SERVICE

IEEE

1. Chair, Technical Program Committee, *IEEE Wireless Power Transfer Conference*, Boulder, CO, 2015.
2. Track Chair, Technical Program Committee, *Applied Power Electronics Conference and Exposition (APEC)*, 2014.
3. Vice Chair, Technical Program Committee, *IEEE Energy Conversion Congress and Exposition (ECCE)*, 2014.
4. Session Chair, *Applied Power Electronics Conference and Exposition (APEC)*, 2014.
5. Session Chair, *IEEE Energy Conversion Congress and Exposition (ECCE)*, 2013.
6. Guest Associate Editor, *IEEE Transactions on Power Electronics*, Special Issue on Robust Design and Reliability in Power Electronics, 2014.
7. Reviewer, *IEEE Transactions on Power Electronics*, 2010-2014.
8. Reviewer, *IEEE Transactions on Circuits and Systems*, 1995.
9. Reviewer, *IEEE Electron Device Letters*, 1995.
10. Reviewer, *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2012-2013.
11. Reviewer, *IEEE Energy Conversion Congress and Exposition (ECCE)*, 2009-2014.
12. Member, Expert panel on Automotive E/E Architecture, *IEEE Workshop on Power Electronics in Transportation*, Dearborn, MI, October, 1996.

Other Organizations

1. Expert Reviewer, *SunShot Incubator Program*, US Department of Energy (DOE), 2014.
2. Jury Member, *Siemens Smart Grid Innovation Contest*, 2011.
3. Expert Reviewer, *PTCL R&D Fund*, 2002-2004.
4. Member, Steering Committee, *International Networking and Communications Conference*, Lahore, Pakistan, May 2008.

5. Member, National Organizing Committee, *LUMS 2nd International Conference on Mathematics and its Applications in Information Technology*, Lahore, Pakistan, March, 2008.
6. Member, Conference Organizing Committee, *Pak-Millennium Conference - Higher Education in Pakistan: Challenges for Reform*, Boston University, Boston, MA, April 2002.
7. Session Chair, Information Technology, *Pak-Millennium Conference*, Boston University, Boston, MA, April 1999.
8. Invited Panelist, *Entrepreneurship: Stabilizing Force in the World*, *OPEN Forum*, Mountain View, CA, June 2009.
9. Invited Panelist, Technology and Entrepreneurship, *Pakistan Conference at Harvard*, Harvard University, Cambridge, MA, April 2009.
10. Invited Guest, *Voice of America WorldNet TV*, Washington, DC, April 1999.
11. Co-authored The Boston Group report: *Higher Education in Pakistan - Towards a Reform Agenda*, 2001. The report was incorporated by the Task Force on Improvement of Higher Education in Pakistan in their final recommendations to the President.
12. Mentor for one undergraduate (Seth Hollar, SB, MIT, 1996) and two master's students (Kevin Yeh, MEng, MIT, 1996 and Isaac Trefz, SM, MIT, 1998) under supervision of Prof. Kassakian.

Board Membership and Leadership

1. Member, Board of Directors, Techlogix, 1997-Present.
2. Member, Board of Studies, Computer Science and Engineering Department, University of Engineering and Technology, Lahore, 2009-Present.
3. Member, Engineering Development Board Human Resource Committee, 2007-Present.
4. Member, Board of Management, Engineering Development Board, Government of Pakistan, 2005-Present.
5. Member, Institutional Review Board, Shaukat Khanum Memorial Cancer Hospital and Research Center, 2005-Present.
6. Member, Board of Directors, Pak-Millennium Conference, 1999-2004.
7. Member, Board of Directors, Organization of Pakistani Entrepreneurs of North America (OPEN), 1999-2003.
8. Member, Higher Education Commission (HEC) Committee on Future Technologies, 2003.
9. Member, LUMS Science and Engineering Initiative Committee, 2003.
13. Member, Working Group on Advanced Automotive Electrical Systems, 1994-97. The working group developed a new 42V standard for the automotive electrical system.
14. Treasurer, Pakistan Students Association International (PSAI), 1991-1994.
15. Manager, PSAI 1cent/day literacy campaign for raising funds for primary education in Pakistan, 1991-1993.
16. Boston area reporter, *The Pakistan Journal*, a Los Angeles based newspaper, 1992.
17. Co-editor, *Journal of the Pakistan Study Group*, 1991-1992.
18. Founding President, Caltech's chapter of Eta Kappa Nu, 1988.
19. Executive Secretary, Caltech's chapter of Tau Beta Pi, 1987.
20. Undergraduate Representative, Student Faculty Scholars Committee, Caltech, 1987.
21. Founding President, Caltech's Pakistan Society, 1986-1989.

UNIVERSITY SERVICE

1. Member, CU Boulder ECEE Department Curriculum Committee, 2014-Present
2. Member, LUMS SSE Electrical Engineering Appointments, Promotions and Tenure Committee, 2009-Present.
3. Member, LUMS Provost Search Committee, 2008-2010.
4. Member, LUMS SSE Electrical Engineering Curriculum Committee, 2008-2009.
5. Member, LUMS Core Curriculum Committee, 2008-2009.
6. Co-Chair, LUMS Quarter to Semester Transition Committee, 2008-2009.
7. Member, LUMS SSE Development Committee, 2008-2009.
8. Member, LUMS SSE Admissions Committee, 2007-2009.
9. Member, Search Committee for Associate Dean of Undergraduate Programs, 2007.
10. Member, LUMS BSc (Hons) Admissions Committee, 2007-2008.

11. Member, LUMS Decision Making Process Review Committee, 2007-2008.
12. Member, LUMS Quarter vs. Semester Committee, 2006-2007.
13. Member, LUMS SHSS Faculty Appointment and Promotions Committee, 2006-2007.
14. Member, LUMS Faculty Appointment, Promotion and Tenure Process Development Committee, 2006-2007.
15. Member, LUMS Undergraduate Steering Committee, 2006-2007.
16. Member, LUMS Computer Science and Math Department's Dean's Council, 2006-2007.
17. Chair, LUMS SSE Curriculum Committee, 2006-2007.
18. Member, LUMS Computer Science and Math Dept's Transition to SSE Committee, 2006.
19. Member, LUMS SSE Dean Search Committee, 2005-2007.
20. Member, LUMS SSE Hiring, Promotions and Tenure Process Development Committee, 2005-2006.
21. Chair, LUMS SSE Coordination Committee, 2004-2005.
22. Project Director, LUMS School of Science and Engineering (SSE), 2004-2008.