NORA DIANNE BULL EZELL

Research and Development Engineer – System Integration
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EDUCATION

University of Tennessee, Knoxville EE: Signals and Systems PhD *(2016)*
Dissertation: "An Innovative Approach to Johnson Noise Thermometry by Means of Spectral Estimation"

University of Tennessee, Knoxville EE: Analog Electronics (IC Design) M.S. (2009)
Thesis: "Design and Implementation of a High Temperature Fully-Integrated BCD-on-SOI Under Voltage Lock Out Circuit"

University of Tennessee, Knoxville Electrical Engineering BS (2007)

RELEVANT EXPERIENCE

July 2010 - Present — Oak Ridge National Laboratory, Oak Ridge, TN
R&D Engineer
- Engineer researcher in development of experiments and instrumentation with a focus in advanced nuclear reactors and harsh environments.
- Development of irradiation experiments at NSUF research reactor facilities.
- LSM Materials Irradiation Facility (MIF) at HFIR.

Oct 2009 - July 2010 — Oak Ridge National Laboratory, Oak Ridge, TN
Post Bachelor's → Post Master's
- Assist senior engineer with simulation, building, and testing of analog and RF devices for communication applications, nuclear instrumentation, and high energy physics.

May 2008 - August 2008 — RF Micro Devices, Boston, MA
Intern
- Assist design engineer with testing and simulation of micro devices.

Sept 2006 - Dec 2009 — Department of Electrical Engineering and Computer Science, Knoxville, TN
Undergraduate → Graduate Teaching Assistant
- Assisted in the electronics lab with undergraduate microelectronics classes and performing projects, graded papers, and substitute lecture classes.

January 2006 - Dec 2009 — Department of Electrical Engineering and Computer Science, Knoxville, TN
Research Assistant
- Conducted research in collaboration with peers for multiple projects including: bioluminescent reporter read-out electronics, lock out circuits for hybrid electric vehicles, and e-beam lithography circuit design.

N. Dianne Bull Ezell is a R&D Staff member in the Nuclear Experiments and Irradiation Testing Group, within the Reactor and Nuclear Systems Division at ORNL. She completed a Ph.D. focusing on signal processing of EMI rejection for Johnson Noise Thermometry instrumentation in 2016, from the University of Tennessee. She has focused her research in novel nuclear instrumentation for advanced reactor and irradiation experiments. Dianne has mentored students at many levels of academia and continues to mentor associate staff members within her research programs. She manages several work packages within the molten salt campaign, is the lab space manager of the MIF at HFIR, is the ORNL lead for the NNSA ETI Track 3 program, and serves as the TPOC for several other nuclear, space, and high energy physics programs.

HONORS / AWARDS

- National Academy of Engineering Frontiers of Engineering 2020
- DOE Leaders of Tomorrow in Nuclear Engineering Forum 2019
- National Academy of Engineers Frontiers of Engineering Symposium 2018 Nominee

- YWCA 2017 Tribute to Women Finalist
- Lizzie Crozier French Women's Leadership Award Finalist 2017
- Honorable Mention for the 2016 WIE Inspiring Member Award
- ORNL Education Sabbatical 2014-2015
- Graduate Diversity Enhancement Fellowship for 2007-2008 – D*istinguished Engineering student chosen for GDE Fellowship ($10k/year)*
- Bodenheimer Fellowship for 2008-2009– D*istinguished student chosen by EECS department for this honorary fellowship ($10k/year)*
- EECS Outstanding Graduate Student Teaching Assistant for 2007-2008

PROFESSIONAL SOCIETIES

- IEEE Member (2005-present)
  - East TN Professional Section: Vice Chair (12-13 & 14-15); Chairman (2013-2014); Treasurer (2016-Present)
  - Women in Engineering Member (2012-Present)
  - UT Vice Chair (2006-2007); Graduate Mentor (2007-2009)
- FIRST Robotics Mentor (2013-Present)
- Eta Kappa Nu Member (2007-present)
  - Vice President (2008-2009)
- FCC Licensed Radio Operator – Technical Class (2009)
- Women in Nuclear Member (2011-Present)
- American Nuclear Society Member (2017-Present)
- ORNL: Women in Science and Engineering (WiSE) founder 2017;
  Committee for Women (CFW) 2017-present; Vice-chair 2018; Chair 2019
  Women Leadership Workshop 2019 Planning Committee Chair

PUBLICATIONS

Journal Articles:

[J1] Taylor, N.R., Yu, Y., Ji, M., Aytug, T., Mahurin, S., Mayes, R., Cetiner, S., Paranthaman, M.P., **Ezell, D.**, Cao, L.R. and Joshi, P.C. "Thermal and radiation response of 4H–SiC Schottky diodes with direct-write electrical contacts." *Applied Physics Letters* 116.25 (2020): 252108.

[J2] M. Aggarwal, Charles Britton Jr, Lloyd Clonts, Thomas Cormier, **N Dianne Ezell**, Martin Poghosyan, Joseph Rasson, Kenneth Read Jr, Brennan Schaefer, Nicolas Schmidt, ALICE Collaboration. "Particle identification studies with a full-size 4-GEM prototype for the ALICE TPC upgrade." Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment 903 (2018): 215-223.

[J3] **N. Dianne Bull Ezell**, Chuck Britton, Nance Ericson, David Holcomb, M. J. Roberts, Seddik Djouadi & Richard Wood (2018) A Novel Technique Applying Spectral Estimation to Johnson Noise Thermometry, Nuclear Technology, 202:2-3, 173-179, DOI: 10.1080/00295450.2018.1452498

[J4] S.A. Eliza, S.K. Islam, T. Rahman, **N.D. Bull**, B.J. Blalock, L.R. Baylor, M.N. Ericson, W.L. Gardner, "A Precision Dose Control Circuit for Maskless E-Beam Lithography with Massively Parallel Vertically Aligned Carbon Nanofibers", IEEE Transactions on Instrumentation and Measurement, Volume 60, Issue 4, pp 1132-1140, April 2011.

[J5] R. Vijayaraghavan, S. K. Islam, M. Zhang, S. Ripp, S. Caylor, **Nora D. Bull**, S. Moser, S.C. Terry, B.J. Blalock, and G.S. Sayler, "A Bioluminecsent Bioreporter Integrated Circuit for Very Low-Level Chemical Sensing in Both Gas and Liquid Environments", Sensors and Actuators B, 123, pp 922-928, 2007.

Peer-Reviewed Conference Papers:

[C1] McFarlane, J., G. Del Cul, **D. B. Ezell**, K. Myhre, S. A. Bryan, H. M. Felmy, A. Lines, and B. J. Riley.. "Fission Product Measurement and Off-Gas Scrubbing for Molten Salt Reactors." *Transactions* 121.1 (2019): 707-708.

[C2] **Ezell, N. Dianne Bull**, Joel McDuffee, Stephen Raiman, Dave Bryant, and Josh Schmidlin. "Examination of Corrosion Development in a Chloride Salt Irradiation Experiment." *Transactions* 120.1 (2019): 319-321.

[C3] **Ezell, N. Dianne Bull**, Albright, A., Floyd, D., Clayton, D., & Khazanovich, L., "A novel use of frequency-banded synthetic aperture focusing technique for reconstructions of alkali-silica reaction in thick-reinforced concrete structures." *AIP Conference Proceedings*. Vol. 2102. No. 1. AIP Publishing, 2019.

[C4] **Ezell, N. Dianne Bull**, Venkatakrishnan, S. V., Al Mansouri, H., Santos-Villalobos, H., & Floyd, D., "High fidelity ultrasound imaging of concrete structures." *Smart Structures and NDE for Energy Systems and Industry 4.0*. Vol. 10973. International Society for Optics and Photonics, 2019.

[C5] Mulligan, P. L., **Ezell, N.**, Petrie, C. M., Qualls, A. L., & Taylor, N. R. Development, Fabrication, and Testing of a Prototype High Temperature Fission Chamber. Oak Ridge National Lab. (ORNL), Oak Ridge, TN (United States), 2018.

[C6] **Ezell, N. D. B**., Albright, A., Clayton, D., & Santos-Villalobos, H. "Detecting alkali-silica reaction in thick concrete structures using linear array ultrasound." Nondestructive Characterization and Monitoring of Advanced Materials, Aerospace, Civil Infrastructure, and Transportation XII. Vol. 10599. International Society for Optics and Photonics, 2018.

[C7] **Ezell, N. D. B.**, Hayes, N., Lenarduzzi, R., Clayton, D., Ma, Z. J., Le Pape, S., & Le Pape, Y. "Experimental collaboration for thick concrete structures with alkali-silica reaction." AIP Conference Proceedings. Vol. 1949. No. 1. AIP Publishing, 2018.

[C8] **N. D. B. Ezell**, C. Britton, N. Ericson, D. Holcomb, M. J. Roberts, S. Djouadi, R. Wood, "A Novel Technique Applying Spectral Estimation to Johnson Noise Thermometry", *ANS 10th International Topical Meeting on Nuclear Plan Instrumentation, Control and Human Machine Interface Technologies (NPIC HMIT)*, San Francisco, CA, June, 2017.

[C9] Clayton, D. A., Santos-Villalobos, H., **Ezell, N. D. B.**, Clayton, J., & Baba, J. "Automated Detection of Alkali-Silica Reaction in Concrete Using Linear Array Ultrasound Data." Environmental Degradation of Materials in Nuclear Power Systems. Springer, Cham, 2017.

[C10] M.S. Lyttle, L.R. Baylor, J.R. Carmichael, S.K. Combs, M.N. Ericson, **N.D. Bull-Ezell**, P.W. Fisher1, S.J. Meitner1, A. Nycz1, D.A. Rasmussen, J.M. Shoulders, S.F. Smith, R.J. Warmack, J.B. Wilgen, "Fast Acting Eddy Current Driven Valve for Massive Gas Injection on ITER", *IEEE Symposium on Fusion Engineering (SOFE)*, Austin, TX., May 2015.

[C11] L.R. Baylor, C. C. Barbier, J. R. Carmichael, S.K. Combs, M. N. Ericson, **N. D. Bull Ezell**, P.W. Fisher, M.S. Lyttle, S.J. Meitner, D.A. Rasmussen, S.F. Smith[1], J.B. Wilgen, S. Maruyama, G. Kiss, "Disruption Mitigation System Developments and Design for ITER", *IAEA Fusion Energy Conference*, St. Petersburg, Russia, Oct. 2014.

[C12] M. Nance Ericson, S. Shane Frank, Charles L. Britton, Laura D. Marlino, Devon D. Janke, **Dianne B. Ezell**, "An Integrated Gate Driver in 4H-SiC for Power Converter Applications", *The 2nd IEEE Workshop on Wide Bandgap Power Devices and Application*, Knoxville, TN., Oct 2014.

[C13] Tracey Wellington, Blake Palles, James A. Mullens, John Mihalczo[b], Dan Archer, Thad Thompson, Charles Britton, **Diane Bull Ezell**, Nance Ericson, Ethan Farquhar, Randall Lind, "Recent Fast Neutron Imaging Measurements with the Fieldable Nuclear Materials Identification System", *Conference on Application of Accelerators in Research and Industry*, San Antonio, TX., May 2014.

[C14] Britton, C., **Ezell, N. D. B**., Roberts, M., Holcomb, D., & Wood, R. "Johnson Noise Thermometry for Drift-Free Measurements." *ASME 2014 Small Modular Reactors Symposium*. American Society of Mechanical Engineers, April 2014.

[C15] Eliza, S.A., Islam, S.K., Rahman, T., **Bull, N.D.**, Blalock, B.J., Baylor, L.R., Ericson, M.N. and Gardner, W.L.., "7.4: Dose control circuits for digitally addressable VACNF based maskless lithography," International Vacuum Nanoelectronics Conference, Palo Alto, CA, 2010, pp. 109-110. doi: 10.1109/IVNC.2010.5563200

[C16] **Bull, N. D**., Islam, S. K., Blalock, B. J., Ripp, S., Moser, S., & Sayler, G. S. "Genetically-engineered whole-cell bioreporters on integrated circuits for environmental monitoring." Circuits and Systems, 2008. ISCAS 2008. IEEE International Symposium on. IEEE, 2008.

Book Chapters/Collections:

[B1] James T. Fleming, Syed Islam, **Nora Dianne Bull**, Michael Simpson, Gary Saylor, "Development and Characterization of a Living-Cell Bioluminescent Bioreporter Integrated Circuit (BBIC)", *Luminescent Microbial Biosensor: Design, Construction and Implementation*, Singapore, Pan Stanford Publishing, editor Gerald Thouand, Print, 2015.

[P1] **N Dianne Ezell**, Padhraic Mulligan, "Development and Planned In-situ Testing of a High Temperature Fission Chamber for Molten Salt and High-temperature Gas Reactors", *7th issue of the NEET Advanced Sensors and Instrumentation newsletter, 2017*.

Scholarly Articles:

[S1] **Nora Dianne Bull**, "An Innovative Approach to Johnson Noise Thermometry by Means of Spectral Estimation", PhD diss., University of Tennessee, http://trace.tennessee.edu/utk_graddiss/3897 (2016).

[S2] **Bull, Nora Dianne**, "Design and Implementation of a High Temperature Fully-Integrated BCD-on-SOI Under Voltage Lock Out Circuit", Masters Thes., University of Tennessee, https://trace.tennessee.edu/utk_gradthes/511/ (2009).

Reports:

[R1] **N Dianne Bull Ezell**, Roger A. Kisner, Nicholas Russell, Frederick Reed, James Keiser, Patrick Champlin, Alexander Martin, and David Eugene Holcomb. Development of a Corrosion Monitoring System for Advanced Molten Salt Reactors. No. ORNL/TM-2019/1273. Oak Ridge National Lab. (ORNL), Oak Ridge, TN (United States), 2019.

[R2] Mcfarlane, Joanna, **Ezell, N Dianne Bull**, Guillermo Del Cul, David Eugene Holcomb, Kristian Myhre, Austin Chapel, Amanda Lines, Sam Bryan, Heather M. Felmy, and Brian Riley. Fission Product Volatility and Off-Gas Systems for Molten Salt Reactors. No. ORNL/TM-2019/1266. Oak Ridge National Lab. (ORNL), Oak Ridge, TN (United States), 2019.

[R3] David Mascarenas, Peter Meyerhoffer, **Dianne Ezell**, Pradeep Ramuhalli, Troy Unrun. Micro-Reactor Instrumentation and Control FY2019 Report. No. LA-UR-19-29415. Los Alamos National Lab. (LANL), Los Alamos, NM (United States), 2019.

[R4] **Ezell, N Dianne Bull**, Venkatakrishnan, S.V., Santos-Villalobos, Hector, Albright, Austin. Comparative Analysis of Nondestructive Examination Techniques of Enhanced Model Based Iterative Reconstruction (MBIR) and Frequency-banded Synthetic Aperture Focusing Technique (SAFT) Reconstructions. No. ORNL/SPR-2019/1240. Oak Ridge National Lab. (ORNL), Oak Ridge, TN (United States), 2019.

[R5] **Ezell, N Dianne Bull**, Fabris, Lorenzo, Wunderlich, Richard J., Mulligan, Padhraic L., Petrie, Christian M., and Britton Jr, Charles L. Commercial Design of Custom Front-end Electronics for a High Temperature Fission Chamber. United States: N. p., 2018. Web. doi:10.2172/1479737.

[R6] **N Dianne Ezell**, Padhraic Mulligan, M4NT-18OR070202015: Lessons Learned., Oak Ridge National Lab. (ORNL), ORNL/TM-2018/815, Oak Ridge, TN (United States), 2018.

[R7] McDuffee, Joel Lee, **Ezell, N Dianne Bull**, Smith, Kurt R., Taylor, Neil Rutger, Raiman, Stephen S., and Qualls, A L.. Design and Irradiation of a Molten Salt Corrosion Experiment in the Ohio State University Research Reactor. United States: N. p., 2018. Web. doi:10.2172/1480620.

[R8] McDuffee, Joel Lee, Cetiner, Nesrin Ozgan, **Ezell, N Dianne Bull**, Qualls, A L., and Thoms, Kenneth R.. Evaluation of Flowing Salt Irradiation Facilities with High Neutron Flux. United States: N. p., 2018. Web. doi:10.2172/1474548.

[R9] **Ezell, N. Dianne Bull**, and Cetiner, Nesrin Ozgan. Evaluation of Testing Facilities for a High Temperature Fission Chamber Design. United States: N. p., 2018. Web. doi:10.2172/1460199.

[R10] **N Dianne Ezell**, Lorenzo Fabris, Richard Wunderlich, Padhraic Mulligan, Christian Petrie, Charles Britton Jr, Commercial Design of Custom Front-end Electronics for a High Temperature Fission Chamber., Oak Ridge National Lab.(ORNL), ORNL/TM-2018/991, Oak Ridge, TN (United States), 2018.

[R11] Padhraic Mulligan, **N Dianne Ezell**, Commercial Prototype Design For a High Temperature Fission Chamber., Oak Ridge National Lab.(ORNL), ORNL/TM-2018/984, Oak Ridge, TN (United States), 2018.

[R12] **N Dianne Ezell**, Dan Floyd, Hector Santos Villalobos, Austin Albright, Comparison of Image Reconstruction Techniques Utilized For Nondestructive Evaluation of Thick-Concrete Specimens., Oak Ridge National Lab.(ORNL), ORNL/TM-2018/860, Oak Ridge, TN (United States), 2018.

[R13] **N Dianne Ezell**, Padhraic Mulligan, A Qualls, Richard Mayes, Richard Wunderlich, Neil Taylor, Experimental Results of the High Temperature Fission Chamber Testing in a Harsh Environment., Oak Ridge National Lab.(ORNL), ORNL/TM-2018/802, Oak Ridge, TN (United States), 2018.

[R14] **N Dianne Ezell**, Padhraic Mulligan, A Qualls, Christian Petrie, Kurt Smith, Neil Taylor, Mary Adkisson, High Temperature Fission Chamber: Ohio State University Site Test Plan., Oak Ridge National Lab.(ORNL), ORNL/TM-2017/448, Oak Ridge, TN (United States), 2017.

[R15] **N Dianne Ezell**, Hector Santos Villalobos, Dwight Clayton, Dan Floyd, Lev Khazanovich, Linear Array Ultrasonic Testing for the Detection of Alkali-Silica Reaction in Thick Concrete Specimens., Oak Ridge National Lab.(ORNL), ORNL/TM-2017/393, Oak Ridge, TN (United States), 2017.

[R16] Dwight Clayton, Lev Khazanovich, Mattia Zammerachi, **N Dianne Ezell**., Linear Array Ultrasonic Testing of a Thick Concrete Specimens for Non-Destructive Evaluation., Oak Ridge National Lab.(ORNL), ORNL/TM-2017/156, Oak Ridge, TN (United States), 2017.

[R17] **N Dianne Ezell**, Charles Britton Jr, Michael Roberts, Innovative signal processing for Johnson Noise thermometry., Oak Ridge National Lab.(ORNL), ORNL/TM-2016/301, Oak Ridge, TN (United States), 2016.

[R18] Charles Britton Jr, **N Dianne Ezell**, Michael Roberts, Report of the Final Configuration of the Johnson Noise Thermometry System., Oak Ridge National Lab.(ORNL), ORNL/TM-2014/41, Oak Ridge, TN (United States), 2014.

[R19] Daniel Archer, Jake Carter Jr, Charles Britton Jr, Milton Ericson, **N Dianne Ezell**, Randall Lind, John Mihalczo, James Mullens, Blake Palles, James Radle, Tracey-Ann Wellington, Stakeholder 2014 Annual Report for the Fieldable Nuclear Material Identification System., Oak Ridge National Lab.(ORNL), ORNL/LTR-2014/438, Oak Ridge, TN (United States), 2014.

[R20] **N Dianne Ezell**, Charles Britton Jr, Michael Roberts, Report of the EMI Testing of the Johnson Noise Thermometry System., Oak Ridge National Lab.(ORNL), ORNL/LTR-2014/237, Oak Ridge, TN (United States), 2014.

[R21] Charles Britton Jr, **N Dianne Ezell**, Michael Roberts, Data Acquisition Backend., Oak Ridge National Lab.(ORNL), ORNL/TM-2013/499, Oak Ridge, TN (United States), 2013.

[R22] Charles Britton Jr, Michael Roberts, **N Dianne Ezell**, A Qualls, David Holcomb, Johnson Noise Thermometry System Requirements., Oak Ridge National Lab.(ORNL), ORNL/TM-2013/22, Oak Ridge, TN (United States), 2013.

[R23] Kenneth Read Jr, Terry Awes, Charles Britton Jr, **N Dianne Ezell**, David Silvermyr, Paul Stankus, Robert J Warmack, Prototype of Compact Calorimeter Module for Beam Test., Oak Ridge National Lab.(ORNL), LDRD Report, Oak Ridge, TN (United States), 2013.

[R24] Laura Marlino, Charles Britton Jr, Andrew Wereszczak, Daniel Vuono, Hua-Tay Lin, Zhenxian Liang, Madhu Sudhan Chinthavali, **N Dianne Ezell**, James Moore, Y. Zheng, V. Grosu, J. Wang, Advanced Electric Traction System., Oak Ridge National Lab.(ORNL), ORNL/TM-2011/174, Oak Ridge, TN (United States), 2011.

COMPLETED IRRADIATIONS

[1] NASA Nuclear Thermal Propulsion INSET irradiation: November 2019 – testbed for nuclear fuels and instrumentation in extreme temperatures (OSURR)

[2] Molten Salt irradiation: August 2018 – study of corrosion development due to irradiation effects on structure materials exposed to molten chloride salts at 800C (OSURR)

[3] High Temperature Fission Chamber: October 2017 – performance characterization testing of an ORNL designed and fabricated high temperature fission chamber (OSURR)

MEDIA HIGHLIGHTS

[1] Atomic Wings comes to UT Knoxville"
https://ne.utk.edu/atomic-wings-comes-to-ut-knoxville/

[2] ORNL Research Highlights: "Reactors- Salty scenarios"
https://www.ornl.gov/news/reactors-salty-scenarios

[3] NEET – Advanced Sensors and Instrumentation Newsletter – Issue 7:
https://www.energy.gov/sites/prod/files/2017/09/f37/NEET-%20Advanced%20Sensors%20and%20Instrumentation%20Newsletter%20-%20Issue%207%2C%20September%202017.pdf

[4] First National Laboratory Facebook live interview:
https://www.facebook.com/Oak.Ridge.National.Laboratory/videos/10154162723084171/

[5] ORNL Employee Highlight: "Dianne Ezell: Learning at every opportunity":
https://www.ornl.gov/news/dianne-bull-ezell-learning-every-opportunity

[6] IEEE student branch – Restoration of World's Fair Rubik's Cube (2007):
http://www.knoxvilletn.gov/cms/One.aspx?portalId=109562&pageId=180471

MENTORING

- Brandon Wilson Spring 2020-present – ORNL Postdoctoral Associate: Nuclear Security Modeling Group
- David Sikorski Spring 2020-present – Ph.D. Research Project:
- Dan Floyd Fall 2019-present – Masters Project: A study of nuclear instrumentation for NASA Nuclear Thermal Propulsion
- Hayden Sutton Fall 2019-present – Masters Project: Development of support infrastructure and control hardware for a Mock Reactor test bed

- Alexander Martin Summer 2019 (HERE) – Development and testing of corrosion monitoring system for MSR campaign.
- Dan Floyd Summer 2017 (SULI), 2018 (HERE) – Image reconstruction of data obtained using nondestructive evaluation of thick concrete specimens
- Mary Adkisson Summer 2017 (CCI) – Mentor student for project management and reporting.
- Neil Taylor Summer 2017 (HERE) – Development and testing of support systems for high temperature fission chamber experiment.
- Richard Hale Summer 2017 – Mentor student for development of active shielding for radiation in space. Assist student to gain beam time at Brookhaven National Laboratory.
- Eric Nolan Summer 2016 (CCI) – Enable development of bench top density measurement of carbon fiber structures through software design and experiment set-up.
- Natalie Beitel White Summer 2014 (HERE) – Mentor student on electronic design, pcb layout, development of a bench top experiments, and data acquisition/signal processing and reporting.

PROFESSIONAL SERVICE

2020 Keynote Speaker at Little Systers
2020 Panel Member of Atomic Wings
2019 Technical Seminar: A brief history of Johnson Noise Thermometry (Boise State University)
2019 Caltech Engineering Mechanics Institute Conference Co-Organizer of mini symposium (Pasadena, CA)
2017- 2018 NEET Technical Point of Contact for Advanced Sensors and Instrumentation
2017-2018 SBIR/STTR Proposal Reviewer
2018 IEEE Nuclear Transactions Journal Reviewer
2018 SPIE Smart Structures and Nondestructive Evaluation Session Chair (Denver, CO)
2009 IEEE MTT-S Assistant Volunteer Coordinator (Boston, MA)
2008 IEEE MWSCAS Volunteer Coordinator (Knoxville, TN)