

Edward Wheeler

Associate Professor

Electrical and Computer Engineering Department

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Education

Ph.D., Electrical Engineering, University of Missouri-Rolla (1996)

M.S., Electrical Engineering, University of Missouri-Rolla (1993)

B.S., Electrical Engineering, Rose-Hulman Institute of Technology (1982)

Academic Experience

2004- associate professor of electrical and computer engineering, *RHIT*

- electromagnetics fields, electromagnetic waves, introduction to micro-electromechanical systems (MEMS), advanced MEMS, electrical systems, junior and senior design

Student advisees regularly contribute to regional and national meetings/conferences

- *2007 and 2008 EMC Consortium Meetings*: Chris Valenta, Gareth Shields, Dan Baker on "EMI Control in IGBT Motor Starters,"
- 2nd prize in *2008 IL/IN ASEE Section Conference*: Chris Valenta, Gareth Shields, Dan Baker on "EMC Modeling of AC Motor Drive"
- *2008 Indiana RF Alliance* student poster: Chris Valenta, Gareth Shields, Dan Baker on "EMC Modeling of PCB Parasitics"

The above three papers concern work with Rockwell Automation and Missouri S&T EMC Laboratory to reduce EMI on IGBT motor drives. Partial funding provided by NSF. Chris Valenta is pursuing his Ph.D. at Georgia Tech.

- 3rd prize in *2008 IL/IN ASEE Section Conference*: Victor Sung on "Lumped Parameter Modeling of the Ideal Railgun: Examining Maximum Electromechanical Energy Conversion Efficiency"

Victor Sung is pursuing his Ph.D. researching advanced design of railguns at Virginia Tech.

- *2008 EMC Consortium Meeting*: Russell Jackson and Brandon Finan on "EMC Measurement and Modeling in PCBs"
- *2009 IL/IN ASEE Section Conference*: Russell Jackson and Brandon Finan "EMC Measurement and Modeling"
- *2009 GWEC Summit*: Russell Jackson and Brandon Finan "EMC and Signal Integrity"

The above three papers concern work with IBM Research Triangle Park and Missouri S&T EMC Laboratory on validating a high-speed design strategy. Partial funding provided by NSF. Russell Jackson is pursuing his Ph.D. at Case Western.

- 2009 IEEE EMC Symposium: Amendra Koul, Andrew Conrad, Russell Jackson, Alex Packard, Jianjian Song, Edward Wheeler, and James L. Drewniak, "Developing an SI tool set for engineering design discovery, physical insight, and education."

The above three papers concern work with IBM at Research Triangle Park and Missouri S&T EMC Laboratory on validating a high-speed design strategy. Partial funding provided by NSF. Russell Jackson is pursuing his Ph.D. at Case Western.

- 2009 RF Alliance meeting at Ohio State University: Andrew Anderson, Ben Cook, Blake Marshall, Ryan White, Cliff Bullmaster, Vasu Chakravarthy, James Drewniak and Ed Wheeler, "Low-Energy Intentional Electromagnetic Interference."

- 2010 RF Alliance meeting at Purdue University: Andrew Anderson, Ben Cook, Blake Marshall, Ryan White, Matt Halligan, Matt Schepers, Cliff Bullmaster, Vasu Chakravarthy, James Drewniak and Ed Wheeler, "Low-Energy Intentional Electromagnetic Interference."

The above two posters concern work administered by the Air Force Research Laboratory on explored a low-energy means to disrupt a variety of electronics and is being pursued in collaboration with Missouri S&T EMC Laboratory. Ben Cook and Blake Marshall plan to pursue graduate work.

- 2009 RF Alliance meeting at Ohio State University: Michael Fiedeldey, Michael Fuson, Morgan Roddy, Jonathan Turpen, Eric Wandel, Chris Holloway and Ed Wheeler, "Incident angle-independent reflection from metamaterial film."
- 2010 RF Alliance meeting at Purdue University: Michael Fiedeldey, Michael Fuson, Morgan Roddy, Jonathan Turpen, Eric Wandel, Chris Holloway, Azad Siahmakoun, and Ed Wheeler, "Incident angle-independent reflection from metamaterial film."

The above two posters concern work to confirm published theoretical predictions by Chris Holloway of the National Institute of Standards and Technology and represents a collaboration between Electrical and Computer Engineering and Physics and Applied Optics. Morgan Roddy plans to pursue graduate work.

- 1999–2004 assistant professor of electrical and computer engineering, *RHIT*
- electromagnetics fields, electromagnetic waves, introduction to micro-electromechanical systems (MEMS), advanced MEMS, electrical circuits, electrical systems, engineering systems
 - a student team under my direction co-authored a paper presented in the *2002 International TIROS Operational Vertical Sounder Conference*
- 1996–1999 assistant professor of electrical engineering, *Virginia Military Institute*
- electromagnetics, solid state materials & devices, optoelectronics, electrical circuits.
 - students under my direction regularly presented papers in various student research activities—1999, 3rd Prize in the *IEEE VMS Project Night* at Virginia Tech; in 1998, poster presentation at the *Blue Ridge Mountain Section of the American Chemical Society Undergraduate Research Symposium*; 1998, *First Prize* in the *VMS IEEE* student paper competition; and, in 1997 a paper in the *VMS IEEE* student paper competition
- 1993 - 1995 taught lecture courses in semiconductor devices, linear systems, and electrical circuits at the University of Missouri-Rolla
- nominated by department chair and engineering school dean for an award from ASEE recognizing excellence in teaching as a graduate assistant
- 1991 - 1994 research fellowship from the U.S. Department of Education
- 1989 - 1991 linear systems and electrical circuits at the University of Missouri-Rolla

Service

- committees: 1) *admissions & standing*, 2) *graduate studies*, 3) *employee relations*, 4) *athletic Hall-of-Fame*, 5) *computer use* 6) *departmental communications*, 7) *departmental curriculum*, 8) *career achievement awards committee* 9) *departmental electromagnetics area committee chair*
- search committees: 1) *director of career services (chair)*, 2) *reference librarian*, 3) *VP for development*, 4) *institute librarian*
- served on several graduate thesis committees
- member of Rose-Hulman team for *Special Olympics* (2000, 2001)
- Rose-Hulman's *United Way* campaign (2003-2005)
- *Wabash Valley United Way* funding panels (2003-2005, 2007, 2009), panel co-chair (2005, 2007, 2009)
- member of *Wabash Valley United Way* fund distribution committee (2005, 2007, 2009)

- Memorial United Methodist – Trustees (2005-2007), Endowment (2006-2009), Staff-Parish Relations (2009-2012)
- reviewer for RHIT Lilly faculty success proposals (2006, 2009)
- reviewer for RHIT faculty summer professional development grants (2009)
- *IEEE Student Chapter* faculty advisor (2000-2004)
- Sigma Nu chapter faculty co-advisor

Awards and Honor Society Memberships

- *IEEE Third Millennium Medal* (2000)
- *VMI Distinguished Teaching Award* (1999)
- *Tau Beta Pi, Eta Kappa Nu, Phi Kappa Phi, Blue Key*

Professional Activities and Memberships

- member of the planning committee for the 2008 IEEE EMC Symposium, served as experiments and demonstrations co-chair
- session chair at *ICONIC 2007*, an international conference on near-field scanning of electromagnetic fields
- IEEE EMC Society education and student activities committee (2002-), Experiments chair (2005-)
- instructor for course on electromagnetic compatibility (EMC) at University of Missouri-Rolla (2002, 2003)
- reviewer for *NSF Review Panel* for the Electronics, Photonics, and Device Technologies program in the Electrical and Communications Systems Division of NSF
- reviewer in *NSF Review Panels* for the CCLI program in the Division of Undergraduate Education of NSF
- reviewer for 2001 *National Science Foundation* proposal on the use of advanced technology in engineering education
- reviewer for *IEEE EMC Symposia* (2008, 2009)
- reviewer for the *Journal of Engineering Education*

- reviewer for *Inverse Problems in Science and Engineering*
- reviewer for the *Journal of Applied Physics*
- reviewer for book proposal on micro-machined resonant devices, *Springer-Verlag* (2006)
- reviewer for book proposal on RF MEMS switches, *Springer-Verlag* (2006)
- reviewer for *McGraw-Hill* (Measurement and Data Analysis, Patrick Dunn 2003, 2008)
- reviewer for book entitled "Fundamentals of Wave Behavior," *SciTech Publishing* (2009)
- reviewer for *ASEE Annual Conference & Exposition*
- reviewer for *ASEE/IEEE Frontiers in Education Conference*
- 1999-2000 chair, 1998-1999 vice-chair, 1997-1998 secretary/treasurer, and 1997-2000 executive committee member of the *Virginia Mountain Section of IEEE*
- 1997-1999 treasurer and 1999-2001 secretary of the *IEEE Virginia Council*
- 1998-1999 member of the *IEEE Virginia Coordinating Council*
- participant in the *1998 National Effective Teaching Institute (NETI)* held in Seattle, Washington
- reviewer and technical program committee member for the *1997 IEEE Region 3 Conference* held in Blacksburg, Virginia
- senior member *IEEE, IEEE EMC Society, IEEE MTT Society, American Society for Engineering Education (ASEE)*

Industrial Experience

- 1982 - 1988 Marathon Oil Company:
 Associate Engineer (1982-1984), Pipeline
 Engineer (1984-1985), Pipeline
 Project Engineer (1986-1988), Terminal & Transport

Research Projects

Total grants: \$2,726,575 \$863,329 (EDW credit)

Project Descriptions

- Low-energy intentional electromagnetic interference, a RAPCEval/NEWSTARS project administered by the *Air Force Research Laboratory* (2008-2009, \$139,560, PI)
- Collaborative research with Missouri University of Science & Technology on NSF CCLI Phase II grant to integrate electromagnetic compatibility, signal integrity, and high-speed design into engineering education (2006-2010, \$494,627, co-PI)
- With Azad Siahmakoun, Scott Kirkpatrick, Tom Adams, Elaine Kirkpatrick, and Dan Morris on DOE project to establish a center at Rose-Hulman for MEMS and nanotechnology (\$855,000 Azad Siahmakoun PI)
- With Jianjian Song and Dave Voltmer on the *NSF CCLI A&I project DUE-0410845* to introduce electromagnetic compatibility and signal integrity into undergraduate education (2004 – 2006, \$101,994, PI)
- With Cliff Grigg of the Rose-Hulman and Don Millard of Rensselaer Institute of Technology on an *NSF CCLI EMD project DUE-0088904* to bring effective practices to the engineering service course. (2000-2004, \$218,194, PI)
- With several colleagues on a project funded by the Keck Foundation for an undergraduate course on micro-electromechanical system (MEMS) at Rose-Hulman. (2002, \$400,000, Azad Siahmakoun PI)
- With Cliff Grigg on grant from Caterpillar to include data acquisition, measurement, and control systems in ECE 207. (2002, \$100,000, PI)
- With Cliff Grigg and Zac Chambers on a supplemental grant from NSF's *Foundation Coalition*. (Summer 2001, \$42,000, PI)
- Served as research consultant on *NSF research project DMR-9633107* investigating compensation mechanisms in wide bandgap semiconductors. We employed neutron transmutation to decouple doping and growth in ZnSe in order to probe doping processes in ZnSe far-from-equilibrium. (1996-2000, \$340,000, Jack Boone PI)
- With colleagues in chemistry and electrical engineering in an investigation of applications for transparent, conductive films. This project involved the deposition of ZnO and ITO layers on a glass petri dish to allow adherent cells to be electrostatically removed in order to minimize cell damage. (1998-2000, \$9,850, Co-PI)

- With colleagues in psychology at VMI investigating the treatment of ADHD via neuron-feedback. Extending previous work performed at the University of Tennessee-Knoxville, this project resulted in significant improvements in subject EEG beta/theta ratio. (1999-2001, \$15,350,PI)

Book and Journal Publications

- Edward Wheeler, Jianjian Song and David R. Voltmer, "Transmission line time-domain analysis and signal integrity," to be published in *IEEE Industrial Electronics Handbook*, 2nd edition, J. David Irwin and Bogdan M. Wilamowski editors, 2010.
- Jianjian Song, Keith Hoover, and Edward Wheeler, Effectiveness of PCB Simulation in Teaching High-Speed Digital Design, *EMC Newsletter*, **Winter 2008**, pp. 80-84 (INVITED)
- J.W. Farmer, Jack L. Boone, Nickolas L. Brakensiek, E.D. Wheeler, C.H. Chandrasekhar, and C.M. Martin, "Incorporation of As_{Se} centers in ZnSe far-from-equilibrium," *J. Phys. Chem. Solids* **63**, 1921 (2002)
- Edward Wheeler and Robert L. McDonald, "Writing in Engineering Courses," *J. Engineering Education* **89**, 481 (2000)
- E.D. Wheeler, Jack L. Boone, J.W. Farmer, and H.R. Chandrasekhar, "Incorporation of Cu_{Zn} centers in ZnSe far from equilibrium," *J. Phys. Chem. Solids* **58**, 79 (1997)
- E.D. Wheeler, Jack L. Boone, J.W. Farmer, and H.R. Chandrasekhar, "Neutron transmutation doping as an experimental probe for Cu_{Zn} in ZnSe," *J. Appl. Phys.* **81**, 524 (1997)
- E.D. Wheeler, Jack L. Boone, J.W. Farmer, and H.R. Chandrasekhar, "Neutron transmutation doping as an experimental probe for As_{Se} in ZnSe," *Phys. Rev. B* **53**, 15617 (1996)
- Edward D. Wheeler, Jack L Boone, and James L. Drewniak, "A contactless method for measuring the bulk resistance of II-VI compound semiconductors," *Rev. Sci. Instrum.* **65**, 3844 (1994)

Conference Publications

- Amendra Koul, Andrew Conrad, Russell Jackson, Alex Packard, Jianjian Song, Edward Wheeler, and James L. Drewniak, "Developing an SI tool set for engineering design discovery, physical insight, and education." *2009 IEEE EMC Symposium*
- Jianjian Song, Edward Wheeler, David Pommerenke and James L. Drewniak, "Development of a Concept Inventory Test for Signal and Power Integrity in Electronic Design," *2009 ASEE/IEEE Frontiers in Education*

- Keith Hoover, Jianjian Song, Edward Wheeler and James L. Drewniak, "Three Practical and Effective RF and EMC Experiments for a Computer Engineering Course on Electromagnetics and EMC," *2009 ASEE Annual Conference and Exposition*.
- Jianjian Song, Edward Wheeler and Keith Hoover, "Effectiveness of PCB simulation in teaching high-speed digital design," *2007 IEEE EMC Symposium*
- Edward Wheeler, Thomas Werne, and Azad Siahmakoun, "Contactless method of measuring resistivity and loss," *2007 ICONIC Conference*
- Edward Wheeler, Jianjian Song, and David Voltmer, "Effective integration of electromagnetic compatibility and signal integrity in electrical and computer engineering curricula," *2006 ASEE Annual Conference & Exposition*
- Jianjian Song and Edward Wheeler, "Teaching Signal Integrity for High-Speed Digital Systems with Hyperlynx," *2006 IEEE EMC Symposium*
- Deckert, M., Kirkpatrick, S., Adams, T., Wheeler, E. and Siahmakoun, A., (2006), "SMA Energy-Scavenger MEMS Device," *Proceedings of SEM 2006*, St Louis, MO, June 4-7, 2006
- Siahmakoun, A., Adams, T. Wheeler, E. and Kirkpatrick, S., (2006), "Undergraduate MEMS-Nano Courses for Everyone," *Proceedings of MRS 2006 Conference*, San Francisco, CA, April 17-21, 2006
- Ed Wheeler, Dave Voltmer and Jianjian Song, "Effective Integration of Electromagnetic Compatibility and Signal Integrity in Electrical and Computer Engineering Curricula," *2005 EEC NSF Grantees Conference*
- Jianjian Song, Dave Voltmer, and Ed Wheeler, "A Required EMC Course for Computer Engineering Undergraduates," *2005 IEEE EMC Symposium*
- Tina Hudson and Ed Wheeler, "Interdisciplinary Laboratory-Based Advanced MEMS Course for Undergraduates," *2004 Frontiers in Education Conference*
- Edward Wheeler and Cliff Grigg, "Improving the electrical engineering service course," *2003 ASEE Annual Conference & Exposition* in Nashville
- E.D. Wheeler, Jack L. Boone, Nickolas L. Brakensiek, J.W. Farmer, C.H. Chandrasekhar, and C.M. Martin "A study of far-from-equilibrium doping in ZnSe, extended abstracts *2002 U.S. Workshop on the Physics and Chemistry of II-VI Materials*, San Diego, CA
- Edward Wheeler, Cliff Grigg, Zachariah Chambers, and Richard A. Layton, "Effective Practices in the Electrical Systems Service Course," *2002 ASEE Annual Conference & Exposition* in Montreal
- Edward Wheeler and Cliff Grigg, "Improving the Effectiveness of the Electrical Engineering Service Course," *2002 ASEE Annual Conference & Exposition* in Montreal

- Julia M. Williams and Edward Wheeler, "Using Audience Accommodation for Effective and Ethical Communication," *Proceedings of the 2000 ASEE/IEEE Frontiers in Education Conference*, IEEE catalog number 00CH37135
- Jack L. Boone, Nickolas L. Brakensiek, J.W. Farmer, H.R. Chandrasekhar, Shu-Chun Yang, and E.D. Wheeler, "An investigation in ZnSe via far-from-equilibrium dopant incorporation," *Bulletin of the American Physical Society*, ISSN number 3-0503, March 1999
- Edward Wheeler and Robert L. McDonald, "Using writing to enhance collaborative learning in engineering courses," *Proceedings of the 1998 ASEE/IEEE Frontiers in Education conference*. IEEE catalog number 98CH36214, page 236
- Robert Johnson and Edward Wheeler, "Detailed assessment of engineering curricula," *Proceedings of the 1998 ASEE/IEEE Frontiers in Education Conference*, IEEE catalog number 98CH36214, page 778
- H.R. Chandrasekhar, Shu-Chun Yang, Nickolas L. Brakensiek, Jack L. Boone, J.W. Farmer, and E.D. Wheeler, "Photoluminescence of homoepitaxial films grown from non-stoichiometric mixtures of Zn and Se," *Bulletin of the American Physical Society*, ISSN number 3-0503, March 1998, page 378
- Nicholas L. Brakensiek, Shu-Chun Yang, Jack L. Boone, J.W. Farmer, H.R. Chandrasekhar, and E.D. Wheeler, "Transmutation doping of ZnSe homoepitaxial films using the single isotope Se-74," *Bulletin of the American Physical Society*, ISSN number 3-0503, March 1998, page 718
- E.D. Wheeler and Jack L. Boone, "The Origin of the I_1^d excitonic emission in ZnSe," *Proceedings of the 1998 IEEE Southeastcon*, IEEE catalog number 98CH36170, page 275
- E.D. Wheeler, G.G. Balazs, and Robert L. McDonald, "Writing as a teaching and learning tool in engineering courses," *Proceedings of the 1997 ASEE/IEEE Frontiers in Education Conference*, IEEE catalog number 97CH36099, page 1538
- Nickolas L. Brakensiek, Jack L. Boone, E.D. Wheeler, J.W. Farmer, and H.R. Chandrasekhar, "Homoepitaxial growth of ZnSe by PVT of the elements in a sealed ampoule," *Bulletin of the American Physical Society*, ISSN number 3-0503, March 1997, page 515
- E.D. Wheeler, Nicholas L. Brakensiek, Jack L. Boone, and Gene Cantwell, "Doping ZnSe far from equilibrium," *Proceedings of the 1997 IEEE Southeastcon*, IEEE catalog number 97CH36044, page 267
- E.D. Wheeler, Jack L. Boone, J.W. Farmer, and H.R. Chandrasekhar, "Neutron transmutation doping as an experimental probe for As_{Se} in ZnSe," *Bulletin of the American Physical Society*, ISSN number 3-0503, March 1996, page 715

Conference Presentations

- "Transmission line fundamentals," EMC Fundamentals Workshop at *2009 IEEE EMC Symposium*, Austin, Texas. (INVITED)
- "Contactless method of measuring resistivity and loss," *2007 ICONIC Conference*, St. Louis, Missouri
- "A study of far-from-equilibrium doping in ZnSe, *2002 U.S. Workshop on the Physics and Chemistry of II-VI Materials*, San Diego, California
- "Using audience accommodation for effective and ethical engineering," Session **S1F**, *2000 ASEE/IEEE Frontiers in Education Conference*, Kansas City, Kansas
- "An investigation in ZnSe via far-from-equilibrium dopant incorporation," Session **JC22**, *1999 American Physical Society March Meeting*, Atlanta, Georgia
- "Using writing to enhance collaborative learning in engineering courses," Session **T2H**, *1998 ASEE/IEEE Frontiers in Education Conference*, Tempe, Arizona
- "Writing as a teaching and learning tool in engineering courses," Session **S4F**, *1997 ASEE/IEEE Frontiers in Education conference*, Pittsburgh, Pennsylvania
- "The origin of the I_1^d excitonic emission in ZnSe," Session **18**, *1998 IEEE Southeastcon*, Orlando, Florida
- "Doping ZnSe far from equilibrium," Session **B7**, *1997 IEEE Southeastcon*, Blacksburg, Virginia
- "Neutron transmutation doping as an experimental probe for As_{Se} in ZnSe," Session **Q26**, *1996 American Physical Society March Meeting*, St. Louis, Missouri