

Brian MacKie-Mason <brimacki@unm.edu>

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EDUCATION

Doctoral Candidate Electrical Engineering

Expected 2017

University of New Mexico

- **(Working) Thesis Title:** A high-fidelity surface integral equation method for solving extreme-scale, real-world electromagnetic scattering problems.
- **Advisor:** Professor Zhen Peng, Department of Electrical & Computer Engineering, University of New Mexico

MS Nuclear Engineering

2013

University of Wisconsin-Madison

BSE Nuclear Engineering

2011

University of Michigan

PUBLICATIONS

1. **B. MacKie-Mason**, Y. Shao, and Z. Peng, "Full-Wave Channel Modeling in Urban Environments for Wireless Communication," (working).
2. **B. MacKie-Mason**, H-W. Gao, and Z. Peng, "Rapid Antenna Prototyping on Large Platforms via Data-Sparse Schur Complement," (working).
3. **Brian MacKie-Mason**, Andrew Greenwood, and Zhen Peng, "Adaptive and parallel surface integral equation solvers for very large-scale electromagnetic modeling and simulation (invited paper)," *Progress In Electromagnetics Research*, vol. 154, pp. 143–162, 2015. doi: 10.2528/PIER15113001
4. **B. MacKie-Mason** and Z. Peng, "Towards Real-time In-Situ Antenna Analysis and Design on Platforms of 1000 Wavelengths", *IEEE AP-S*, San Diego, CA, July 2017.
5. Zhen Peng and **Brian MacKie-Mason**, "High-Performance Surface Integral Equation Solvers Towards Extreme-Scale Electromagnetic Modeling and Simulation," *IEEE International Conference on Wireless Information Technology and Systems (ICWITS) and Applied Computational Electromagnetics Society (ACES)*, Honolulu, HI, U.S.A., March 2016.
6. Zhen Peng, Ralf Hiptmair, Yang Shao, **Brian MacKie-Mason**, "Domain Decomposition Preconditioning for Surface Integral Equations in Solving Challenging Electromagnetic Scattering Problems," *IEEE Transactions on Antennas and Propagation*, vol. 64, no. 1, pp. 210–223, Jan. 2016. doi: 10.1109/TAP.2015.2500908
7. **Brian MacKie-Mason**, Z. Peng, "Adaptive, Scalable Domain Decomposition Methods for Surface Integral Equations," *IEEE International Symposium on Antennas and Propagation*, Vancouver, B.C., Canada, July 2015. doi: 10.1109/APS.2015.7305220
8. Zhen Peng, **Brian MacKie-Mason**, "Integral equation discontinuous Galerkin methods for time harmonic electromagnetic wave problems," *International Review of Progress in Applied Computational Electromagnetics*, Williamsburg, VA, March 2015.

TALKS/PRESENTATIONS

1. **Brian MacKie-Mason** and Zhen Peng, "Towards a Real-Time Solution of Extreme-Scale Electromagnetic Problems", *2017 USNC-URSI National Radio Science Meeting*, Boulder, CO, USA, January 2017.
2. **Brian MacKie-Mason**, Zhen Peng, and Christopher Kung, "Extreme Fidelity Computational Electromagnetic Analysis in the Supercomputing Era", *The International Conference for High*

Performance Computing, Networking, Storage, and Analysis, Salt Lake City, Utah, USA, November 2016.

3. **Brian MacKie-Mason** and Zhen Peng, "High-fidelity, High-performance Integral Equation Solver for Time-Harmonic Maxwell's Equations", *IEEE International Symposium on Antennas and Propagation*, Fajardo, Puerto Rico, USA, June 2016.
4. **Brian MacKie-Mason** and Zhen Peng, "Adaptive and parallel surface integral equation solvers for very large-scale electromagnetic modeling and simulation", *ECE GSA Student Paper Competition*, Albuquerque, NM, USA, April 2016.
5. **Brian MacKie-Mason** and W. Tang, "Modeling of laser-induced field emission", *Air Force Research Lab Annual Scholar Presentation*, Albuquerque, NM, July 2013.
6. **Brian MacKie-Mason**, N. Lockwood, and W. Tang, "Development of single-walled nanotube fiber cathode diagnostics", *Air Force Research Lab Annual Scholar Presentation*, Albuquerque, NM, July 2012.
7. **Brian MacKie-Mason**, A. Greenwood, and N. Lockwood, "Automated Testing of ICEPIC", *Air Force Research Lab Annual Scholar Presentation*, Albuquerque, NM, July 2011.

TECHNICAL SKILLS

- Parallel Computing, MPI, OpenMP, Domain Decomposition Methods, Surface Integral Equation Methods, College Instruction, Scientific Computing
- Languages: C++, MATLAB, Bash shell, Python, C
- Software Packages: ViSiT, CUBIT, KDevelop, SolidWorks (CAD), Improved Concurrent Electromagnetic Particle-in-Cell (ICEPIC)

RESEARCH EXPERIENCE

Department of Electrical Engineering, University of New Mexico

August 2013 - Present

Prof. Zhen Peng

Graduate Research Assistant, Computational Electromagnetics

- Researched and developed a geometry-aware domain decomposition (GA-IE-DDM) method for extreme-scale, multi-scale electromagnetics problems.
- Developed tools to automatically partition mesh files for GA-IE-DDM utilizing a k-way graph partitioning code and creating a global-to-local mapping scheme.
- Parallelized GA-IE-DDM in an MPI architecture with C++ for a scalable solution method to the Electric Field Integral Equation.
- Provided project deliverables for DoD HPC Modernization Program (CEA-KY06-003).

Air Force Research Lab, Kirtland AFB

Summers 2011-13

Drs. Wilkin Tang, Nathaniel Lockwood & Andrew Greenwood

Graduate Research Assistant, Computational Electromagnetics

- Studied the effects of laser-induced field emission (2013).
- Designed diagnostics to improve the study of field emission (2012).
- Designed validation and verification test suite for ICEPIC (2011).

University of Michigan, Ann Arbor

May 2009 - August 2009

Prof. Gary Was

Lab Assistant, Nuclear Materials

- Wrote MATLAB programs to smooth data and extract empirical modeling equations.
- Made schematic drawings of laboratory equipment using SolidWorks.
- Prepared for and attended lab group meetings.

University of Michigan, Ann Arbor

March 2008 - May 2009

Prof. Yan Chen

Undergraduate Research Assistant, School of Information

- Conducted human subject computer laboratory experiments.
- Studied trends of Facebook start-up using SQL.

University of Michigan, Ann Arbor

March 2008 - May 2009

Prof. Yan Chen

Lab Assistant, School of Information

- Assisted graduate students in their human subject computer laboratory experiments.
- Recruited subjects for experiments.
- Edited instructions for experiments.

University of Michigan, Ann Arbor

May 2008 - July 2008

Prof. Yan Chen

REU Student, School of Information

- Investigated trends of Facebook start-up (urTurn.com) using SQL.
- Made a research presentation on urTurn.com.
- Attended career training seminars.

University of Michigan, Ann Arbor

May 2007 - August 2007

Prof. Penner-Hahn

Lab Assistant, Department of Chemistry

- Improved upon MATLAB algorithm that imaged microscopic worms.
- Assisted in series of experiments at Argonne National Laboratory.

University of Michigan, Ann Arbor

June 2006 - July 2006

Prof. Sherman

Lab Assistant, Department of Biology

- Prepared ocean floor samples for discovery of possible bacteria strains.
- Assisted graduate students in preparing laboratory experiments.

TEACHING EXPERIENCE

University of New Mexico

August 2014 - Present

Department of Electrical & Computer Engineering

Albuquerque, NM

Graduate Teaching Assistant

- ECE 561: Engineering Electrodynamics. Provided selected lectures.
- ECE 555: Foundations of Engineering Electromagnetics. Provided selected lectures.
- ECE 563: Computational Electromagnetics. Provided selected lectures.
- ECE 360: Introduction to Electromagnetics
 - Graded bi-weekly homework assignments.
 - Prepared and held weekly office hours.
 - Provided selected lectures.
- ECE 131: Programming Fundamentals
 - Graded bi-weekly homework assignments.
 - Prepared for and held weekly office hours.

University of Wisconsin-Madison
Department of Engineering Physics
Madison, WI

January 2012 - May 2013

Graduate Teaching Assistant, EMA 201: Statics

- Prepared and taught two or three hours of discussion section each week.
- Held weekly office hours.
- Graded tests and assignments.
- Participated in bi-weekly planning sessions with other teaching assistants and lead instructor.

Pioneer High School, Ann Arbor

September 2006 - January 2007

Ms. Hochrein

Teaching Assistant, Mathematics Department

- Graded extra credit assignments.
- Taught lessons on selected topics.
- Answered student questions.

Math Tutor

January 2006 - May 2006

- Provided tutoring for two middle school students in mathematics.
- Developed curriculum for tutoring sessions.

PROFESSIONAL SOCIETIES

IEEE

2015 - Present

SIAM

2016 - Present

CLEARANCES

DoD Secret

2012-2022

AWARDS & HONORS

- ECE Outstanding Graduate Student, 2017.
- Who's Who Among American Colleges & Universities, 2017.
- ECE GSA Student Paper Competition – Journal Paper Section, 3rd prize, 2016.
- Eagle Scout, February 2007
- Michigan Peace Prize, January 2007

OTHER EXPERIENCE

UNM GPSA

Fall 2015 - Present

- GPSA Alternate Representative to Student Fee Review Board (July 2017 - Present)
- Department of ECE Delegate (August 2015 - May 2016, August 2016 - May 2017)
- GPSA Finance Committee Member (August 2016 - May 2017)
- GPSA Representative to Information Technology Committee (August 2015 - May 2016)
- Legislative Steering Committee Member-at-large (February 2016 - May 2016)
- Organized first annual department-wide student paper competition
- Helped arrange for a regular meeting room within the department

ECE Graduate Student Association

Fall 2015 - Present

- ECE GSA Vice-President (June 2016 - Present)
- ECE GSA Volunteer Member (August 2015 - May 2016)

Alpha Sigma Phi*Fall 2007 - Present*

- Grand Chapter Advisor (November 2012 - May 2013).
- Financial Advisor (November 2012 - Present).
- Brotherhood Development Director (January 2011 - April 2011)
- Philanthropy Director (January 2009 - December 2010).
- Treasurer (January 2008 - December 2009).

Study Abroad in Argentina*June 2010 - August 2010*

- Attained an intermediate working knowledge of spoken and written Spanish.
- Gained extensive practice in intercultural interactions.

MPowered Entrepreneurship*September 2009 - December 2009*

- Member of team that planned Global Entrepreneurship week.
- Recruited entrants for 1000 Pitches contest.
- Promoted the philosophy of entrepreneurship throughout campus.

Youth Group of First United Methodist*September 2001 - June 2007*

- Co-leader of high school team that raised \$50,000 to build a church in Bulgaria.
- Part of team that won Michigan Peace Prize (2007) for filming a documentary on religious diversity.
- Participated in multiple service mission trips, including three international locations.

Boy Scouts of America*September 2000 - June 2007*

- Completed an Eagle Scout Service Project.
- Held various leadership positions, including Senior Patrol Leader.
- Participated in outdoor adventure activities with the Venture Patrol.
- Attended the 2001 National Scout Jamboree.
- Completed 25 skills-based merit badges.