

# Brian MacKie-Mason <brimacki@unm.edu>

<http://brianmackiemason.com>

## EDUCATION

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### 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

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1. **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
2. **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 (accepted).
3. 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.
4. Zhen Peng, Ralf Hiptmair, Yang Shao, **Brian MacKie-Mason**, "Domain Decomposition Pre-conditioning 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
5. **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
6. 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

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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**

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- 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**

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**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**

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**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**

*January 2012 - May 2013*

**Department of Engineering Physics**

**Madison, WI**

**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**

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**IEEE**

*2015 - Present*

**SIAM**

*2016 - Present*

## **CLEARANCES**

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**DoD Secret**

*2012-2022*

## **AWARDS & HONORS**

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- 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**

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**UNM GPSA**

*Fall 2015 - Present*

- Department of ECE Delegate (August 2015 - May 2016, August 2016 - Present)
- GPSA Finance Committee Member (August 2016 - Present)
- 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.