

Brian MacKie-Mason <bmackiemason@anl.gov>

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EDUCATION

Doctor of Philosophy Electrical Engineering 2018

University of New Mexico, **Advisor:** Professor Zhen Peng

Novel Algorithms for Ultra Scale Electromagnetic Problems in the Supercomputing Era

Master of Science Nuclear Engineering 2013

University of Wisconsin-Madison

Bachelor of Science in Engineering Nuclear Engineering 2011

University of Michigan

PUBLICATIONS

1. **B. MacKie-Mason** and Z. Peng, "Rapid Antenna Prototyping on Large Platforms via Data-Sparse Schur Complement," (working).
2. **B. MacKie-Mason**, Y. Shao, A. Greenwood, and Z. Peng, "Supercomputing-Enabled First-Principles Analysis of Radio Wave Propagation in Urban Environments," *IEEE Transactions on Antennas and Propagation*, **66**, pp. 6606–6612 (2018). doi:10.1109/TAP.2018.2874674.
3. Z. Peng, R. Hiptmair, Y. Shao, **B. MacKie-Mason**, "Domain Decomposition Preconditioning for Surface Integral Equations in Solving Challenging Electromagnetic Scattering Problems," *IEEE Transactions on Antennas and Propagation*, **64**, pp. 210–223 (2016). doi:10.1109/TAP.2015.2500908.
4. **B. MacKie-Mason**, A. Greenwood, and Z. Peng, "Adaptive and Parallel Surface Integral Equation Solvers for Very Large-Scale Electromagnetic Modeling and Simulation (invited paper)," *Progress in Electromagnetics Research*, **154**, pp. 143–162 (2015). doi:10.2528/PIER15113001.

CONFERENCE & OTHER PRESENTATIONS

1. **B. MacKie-Mason**, P. Velesko, R. Hager, C.-S. Chang, and T.J. Williams, "Performance Optimization of the XGC code on KNL architecture", *Annual Meeting of the APS Division of Plasma Physics*, Nov. 5–9, 2018. <https://goo.gl/wirgSu>
2. **B. MacKie-Mason**, P. Velesko, R. Hager, C.-S. Chang, and T.J. Williams, "Application Study of Gyrokinetic PIC codes on Intel KNL architecture", *IXPUG Annual Fall Conference*, Hillsboro, OR, U.S.A. September 25–28, 2018. <https://goo.gl/iLGnTv>
3. **B. MacKie-Mason**, "What do I do?", *Argonne Computing Coffee & Code*, Argonne, IL, U.S.A., September 12, 2018. <https://goo.gl/AtWQSD>
4. **B. MacKie-Mason** and Z. Peng, "Towards Real-time In-Situ Antenna Analysis and Design on Platforms of 1000 Wavelengths", *IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting*, San Diego, CA, July 9–14, 2017. doi:10.1109/APUSNCURSINRSM.2017.8072714
5. **B. MacKie-Mason** and Z. Peng, "Towards a Real-Time Solution of Extreme-Scale Electromagnetic Problems", *National Radio Science Meeting*, Boulder, CO, U.S.A., January 4–7, 2017. <https://goo.gl/bK4wms>
6. **B. MacKie-Mason**, Z. Peng, and C. Kung, "Extreme Fidelity Computational Electromagnetic Analysis in the Supercomputer Era", *The International Conference for High Performance Computing, Networking, Storage and Analysis*, Salt Lake City, Utah, U.S.A., November 13–18, 2016. <https://goo.gl/jeQSKR>

7. **B. MacKie-Mason** and Z. Peng, "High-fidelity, High-performance Integral Equation Solver for Time-Harmonic Maxwell's Equations", *IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting*, Fajardo, Puerto Rico, U.S.A., June 26–July 1, 2016. <https://goo.gl/fgmgvk>
8. **B. MacKie-Mason** and Z. Peng, "Adaptive and parallel surface integral equation solvers for very large-scale electromagnetic modeling and simulation," *Electrical and Computer Engineering Student Paper Competition*, Albuquerque, NM, April 2016. <https://goo.gl/aK2KUn>
9. Z. Peng and **B. 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 (ACES)*, Honolulu, HI, 22–26, March 2016. doi:10.1109/ROPACES.2016.7465365
10. **B. MacKie-Mason** and Z. Peng, "Adaptive, Scalable Domain Decomposition Methods for Surface Integral Equations," *IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting*, Vancouver, B.C., July 19–25, 2015. doi:10.1109/APS.2015.7305220
11. Z. Peng and **B. MacKie-Mason**, "Integral equation discontinuous Galerkin methods for time harmonic electromagnetic wave problems," *International Review of Progress in Applied Computational Electromagnetics (ACES)*, Williamsburg, VA, March 22–26, 2015. <https://goo.gl/dkiyX>

TECHNICAL SKILLS

- Algorithm Development, Parallel Computing, Electromagnetic Analysis, MPI, OpenMP, Domain Decomposition Methods, Surface Integral Equation Methods, College Instruction, Scientific Computing, Particle-in-Cell
- Languages: C++, MATLAB, Bash shell, Python, C, Fortran
- Software Packages: ViSiT, CUBIT, KDevelop, SolidWorks (CAD), Improved Concurrent Electromagnetic Particle-in-Cell (ICEPIC), Intel VTUNE Amplifier, Intel Advisor
- HPC Platforms: Excalibur (ARL), Topaz (ERDC), Theta (ALCF), Cori (NERSC), JLSE (ALCF)
- Architectures: Intel KNL, Intel's next generation

PROFESSIONAL EXPERIENCE

Postdoctoral Appointee

March 2018 - present

Leadership Computing Facility, Argonne National Laboratory

- Optimize code for Intel KNL architecture.
- Investigate portability and suitability of code for Aurora.
- Present research findings at inter/national conferences and meetings.

Research Assistant

Fall 2013 - Spring 2018

Department of Electrical Engineering, University of New Mexico

Prof. Zhen Peng

- Researched and developed a geometry-aware domain decomposition (GA-IE-DDM) method for the integral solution to 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 distributed memory environment for a scalable solution method to the Electric Field Integral Equation.

- Developed a model order reduction technique for solving electromagnetic radiation problems when M antennas are mounted on very large PEC platforms.

Research Assistant

Summers 2011-13

Air Force Research Lab, Kirtland AFB

Drs. Wilkin Tang, Nathaniel Lockwood & Andrew Greenwood

- Studied the effects of laser-induced field emission (2013), designed diagnostics to improve the study of field emission (2012), and designed validation and verification test suite for ICEPIC (2011).
- Security clearance active through 2022.

PROFESSIONAL SERVICE

International Journal of Antennas and Propagation

Reviewer

AWARDS & HONORS

- UNM Leadership and Involvement Award, 2018.
- GPSA President's Award for Innovative Leadership, 2017.
- ECE Outstanding Graduate Student, 2017.
- ECE Graduate Student Association Student Paper Competition – Journal Paper Section, 3rd prize, 2016.
- Eagle Scout, February 2007

DEPARTMENTAL SERVICE

UNM GPSA

Fall 2015 - Present

- Graduate & Professional Student Association (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 Use Committee (August 2015 - May 2016)
- Legislative Steering Committee Member-at-large (February 2016 - May 2016)

ECE Graduate Student Association (GSA)

Fall 2015 - Spring 2017

- ECE GSA Vice-President (June 2016 - May 2017)