Brian MacKie-Mason <bmackiemason@anl.gov>

http://www.brianmackiemason.com

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/dkiiyX

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: Intel VTUNE Amplifier, Intel Advisor, ViSiT, CUBIT,
- 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 and Computer 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

Reviewer for *International Journal of Antennas and Propagation* *2018*

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 UseCommittee]() (August 2015 - May 2016)
- GPSA [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)