Mr. Juntao YAO

juntaoyao@ufl.edu

PhD Candidate, Focusing on Power Electronics and EMI Solutions 001-3523285405

Research Assistant, Power Electronics and Electrical Power Research Lab (PEEPRL),

Address: 111, Larsen Hall, ECE Department, University of Florida, Gainesville, FL, 32611

Education

- PhD, Electrical Engineering, University of Florida, 2017-2021, Advisor: Dr. Shuo Wang
  Thesis: Modeling and Reduction of Radiated Electromagnetic Interference in Power Converters
- MS, Electrical Engineering, Wuhan University, 2013-2016, Advisor: Dr.Fei Liu & Dr.Xiaoming Zha
  Thesis: Operational Control for Photovoltaic-Storage based DC Microgrid
- BS, Electrical Engineering, Wuhan University, 2009-2013, GPA 3.66/4 (89/100), Ranking 22/392
  Thesis: Compound Repetitive Control for LCL-filter based Active Power Filter

Skills

- **EMI Solutions for Power Electronics Systems** including conducted and radiated EMI in non-isolated and isolated power converters, in consumer electronics and automotive electronics, by improving the component (e.g. switching transformers, EMI filters) design and the PCB layout
- **Hardware**-PCB design in Altium Designer, design of switching power supplies and components, and testing using vector network analyzer, impedance analyzer, spectrum analyzer, power analyzer, oscilloscope, signal generator, etc.
- **Finite Element Simulation** in ANSYS Q3D, HFSS, and CST
- **Circuit Simulation** in Matlab Simulink, PSPICE, Saber, PSIM, and SIMPLIS
- **Programming** in Matlab, Code composer studio, Latex, and GitHub for web development

Research Experiences

Power Electronics and Electrical Power Research Lab (PEEPRL), University of Florida

- **EMI in Power Converters in Automotive Applications** Aug. 2018 -Present
  Sponsored by ***Monolithic Power Systems, Inc. San Jose, CA, USA***
  - Developed EMI models for automotive DC-DC power converters including switching noise sources, components, PCB layouts, and antennas
  - Developed a virtual lab for EMI predictions. With the PCB file imported to ANSYS/Q3D and ANSYS/HFSS, the parasitics in the power converter and the coupling parasitics between power converter and power cables are extracted. The radiation characteristics of the antenna consisting of power cables are extracted. The radiated EMI of the power converter system is predicted to emulate the testing in a semi-anechoic chamber
  - Proposed EMI solutions by improving PCB layouts, improving capacitor applications, and mitigating near field couplings
- **Radiated EMI in GaN IC-based Active Clamp Flyback Adapters** Mar. 2018 - Oct. 2019
  Sponsored by ***Navitas Semiconductor, Inc. El Segundo, CA, USA***
  - Developed radiated EMI models for GaN IC-based active clamp flyback adapters
  - Built a finite element simulation model of a planar transformer based on ANSYS HFSS
  - Analyzed and mitigated near field couplings' impact on the radiated EMI
  - Proposed radiated EMI solutions by improving shielding and EMI filter techniques, and PCB layouts
- **EMI in Flyback Adapters** Jan. 2017 - Dec. 2017
  Sponsored by Huawei Technologies
  - Developed conducted and radiated EMI models for flyback adapters including switching noise sources, transformers, EMI filters, and antennas

- Improved the transformer winding structure based on the coaxial shielding technique
- Improved snubbers and EMI filters

Center for Grid Power Electronics, Wuhan University

- **DC Microgrid** Sep. 2014 - June 2016
  Sponsored by Smart Grid Research Institute of State Grid
  - Built a simulation model including grid-connected converters, solar cells, batteries, and interface power converters
  - Designed the PCB layout of a grid connected converter
- **Regenerative Bidirectional Cascaded Multilevel Converter** June 2013 - June 2015
  Sponsored by National Natural Science Foundation of China
  - Designed power cell configurations for a hybrid power converter including unidirectional and bidirectional rectifiers
- **Shunt Active Power Filter** Nov. 2012 - Aug. 2013
  Bachelor thesis (Province-wide honor)
  - Built an APF simulation model with an LCL filter
  - Innovated a multi-internal-model based repetitive controller robust to frequency fluctuation

Publications

Journal papers

1. **J. Yao**, Y. Li, S. Wang, X. Huang, and X. Lyu, "Modeling and Reduction of Radiated EMI in a GaN IC-based Active Clamp Flyback Adapter," IEEE Transactions on Power Electronics, 2020.
2. **J. Yao**, S. Wang, and H. Zhao, "Measurement Techniques of Common Mode Currents, Voltages, and Impedances in a Flyback Converter for Radiated EMI Diagnosis," IEEE Transactions on Electromagnetic Compatibility, vol. 61, no. 6, pp. 1997-2005, Dec. 2019.

Conference papers

1. **J. Yao**, Y. Li, Z. Ma, and S. Wang, "Advances of Modeling and Reduction of Conducted and Radiated EMI in Flyback Converters," in 2020 IEEE Energy Conversion Congress and Exposition (ECCE), 2020.
2. **J. Yao**, S. Wang, and Z. Luo, "Near Field Coupling's Impact on Radiated EMI and Mitigation Techniques for Power Converters in Automotive Applications," in 2020 IEEE Energy Conversion Congress and Exposition (ECCE), 2020.
3. **J. Yao**, S. Wang, and Z. Luo, "Radiated EMI Reduction by Layout Improvement in Power Converters in Automotive Applications," in 2020 IEEE 9th International Power Electronics and Motion Control Conference (IPEMC2020-ECCE Asia), 2020, pp. 1-6.
4. **J. Yao**, Y. Li, S. Wang, X. Huang, and X. Lyu, "Analysis and Reduction of Radiated EMI in High-Frequency GaN IC-based Active Clamp Flyback Converters," in 2020 IEEE Applied Power Electronics Conference and Exposition (APEC), 2020, pp. 664-671.
5. **J. Yao**, S. Wang, and Z. Luo, "Modeling and Reduction of Radiated EMI in Non-isolated Power Converters in Automotive Applications," in 2020 IEEE Applied Power Electronics Conference and Exposition (APEC), 2020, pp. 385-392.
6. **J. Yao**, M. El-Sharkh, Y. Li, Z. Ma, S. Wang, and Z. Luo, "Investigation of Radiated EMI in Non-isolated Power Converters with Power Cables in Automotive Applications," in 2019 IEEE Energy Conversion Congress and Exposition (ECCE), 2019, pp. 6957-6964.
7. Z. Ma, **J. Yao**, Y. Li, and S. Wang, "Comparative Analysis of Magnetic Core Loss Measurement Methods with Arbitrary Excitations," in 2019 IEEE Energy Conversion Congress and Exposition (ECCE), 2019, pp. 4125-4130.
8. Y. Li, **J. Yao**, and S. Wang, "Increase High Frequency Impedance of Ferrite Toroid Inductors Based on Electromagnetic Energy Analysis," in 2019 IEEE Energy Conversion Congress and Exposition (ECCE), 2019, pp. 6184-6191.
9. **J. Yao**, Y. Li, H. Zhao, and S. Wang, "Design of CM Inductor Based on Core Loss for Radiated EMI Reduction in Power Converters," in 2019 IEEE Applied Power Electronics Conference and Exposition (APEC), 2019, pp. 2673-2680.
10. H. Zhao, **J. Yao**, and S. Wang, "A Universal DM/CM Physical Model for Power Transformer EMI Analysis within both Conducted and Radiated Frequency Ranges," in 2018 IEEE Energy Conversion Congress and Exposition (ECCE), 2018, pp. 6592-6599.
11. **J. Yao**, Y. Li, H. Zhao, S. Wang, Q. Wang, Y. Lu, and D. Fu, "Modeling and Reduction of Radiated Common Mode Current in Flyback Converters," in 2018 IEEE Energy Conversion Congress and Exposition (ECCE), 2018, pp. 6613-6620.

12. **J. Yao**, S. Wang, H. Zhao, Y. Zhang, Q. Wang, Y. Lu, and D. Fu, "Measurement Techniques of CM Currents, Impedance and Voltages for Radiated EMI in Isolated Power Converters," in 2018 IEEE Symposium on Electromagnetic Compatibility, Signal Integrity and Power Integrity (EMC, SI & PI), 2018, pp. 438-443.
13. **J. Yao**, F. Liu, J. Gong, and X. Zha. "Power Recovery and Cost Reduction Oriented Optimization of Regenerative Cells Embedded in Cascaded Multilevel Converter", in Energy Conversion Congress and Exposition (ECCE), 2015, pp. 5117 - 5123.
14. **J. Yao**, F. Liu, J. Gong, and S. Li. "A Novel Partial Units Energy Feedback Cascaded Multilevel Inverter with Bypass Control", in International Future Energy Electronics Conference (IFEEC), 2013, pp. 494-499.

Patents

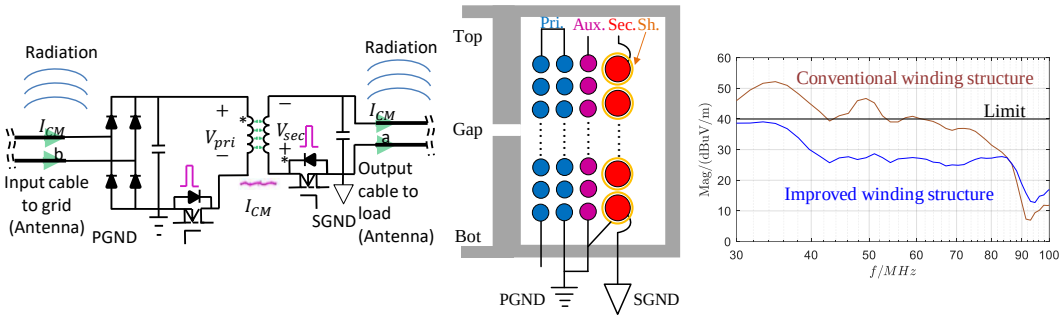
1. S. Wang, **J. Yao**, and Y. Li, "Common Mode (CM) Electromagnetic Interference (EMI) Filters for Reducing Radiated EMI in Power Converters," U.S. Patent, 62/950,268, Dec. 19, 2019. (Pending, U.S. patent)
2. Y. Xiong, F. Zhu, **J. Yao**, H. Yang, and F. Liu. "A Recitifier-fed Cascaded Multilevel Converter for Dual Motor Drive," China Patent, CN204859024U, Aug. 24, 2015. (Issued)
3. F. Zhu, Y. Xiong, **J. Yao**, H. Yang, and F. Liu. "A Symmetrical Three Port Cascaded Power Converter for Dual High Power Motor Drive," China Patent, CN204906233U, July 28, 2015. (Issued)
4. F. Liu, **J. Yao**, Y. Wang, K. Feng, C. Huang, and X. Zha. "A Repetitive Controller with Multiple Internal Models Considering the Frequency Deviation of the Power System," China Patent, CN104836233A, May. 25, 2015. (Issued)
5. **J. Yao**, K. Deng, F. Liu, J. Gong, L. Xiong, and X. Zha. "Partial Bidirectional Cells based Regenerative Cascaded Multilevel Converter and the Optimized Configuration of the Regenerative Cells", China Patent, CN104104240B, July 25, 2014. (Issued)
6. F. Liu, X. Lai, K. Deng, **J. Yao**. J. Sun, and Y. Li. "A Solide-state Electronic Switch Based Short Circuit Protection Method for DC Microgrids," China Patent, CN103928912B, May. 8, 2014. (Issued)
7. F. Liu, X. Zha, K. Deng, **J. Yao**, and J. Gong. "A Cascaded Multilevel Converter without Active Front for Dual Motor Drives," China Patent, CN103944439A, Apr. 28, 2014. (Issued)
8. **J. Yao**, G. Huang, C. Liu, W. Lyu, Y. Li, F. Liu, and X. Zha. "A DC Microgrid," China Patent, CN202586339U, May. 18, 2012. (Issued)
9. G. Huang, **J. Yao**, C. Liu, W. Lyu, Y. Li, F. Liu, and X. Zha. "Low-voltage Bipolar DC Micro-power Grid," China Patent, CN202586340U, May. 18, 2012. (Issued)
10. J. Sun, X. Zha, Y. Li, W. Lyu, C. Liu, G. Huang, and **J. Yao**. "A Three Wire DC Microgrid System and Control Method for Modern Buildings," China Patent, CN102593832B, Mar. 15, 2012. (Issued)

Honors and Awards

- Outstanding Master Graduate (Top 3%) , Wuhan University, 2016
- First-class Scholarship, Wuhan University, 2014
- Exceptional Bachelor Thesis in Hubei Province, China (Top 2%), 2013
- Outstanding Bachelor Graduate (Top 3%) , Wuhan University, 2013
- Honorable Mention, US Mathematical Contest in Modeling/Interdisciplinary Contest in Modeling (US ICM/MCM), 2012
- All-round Excellent Student (Top 5%), Wuhan University, 2012
- Exemplary Student Leader, Wuhan University, 2012
- National Encouragement Scholarship (Top 5%), 2012
- Third Prize in the National Electrical Mathematical Contest in Modeling, 2011
- Award for Creative Researcher, Wuhan University, 2011
- National Encouragement Scholarship (Top 5%), 2011

Appendix: Innovation Highlights

Project I: In Flyback Converters, Transformer Structure Optimization for Radiated EMI Reduction



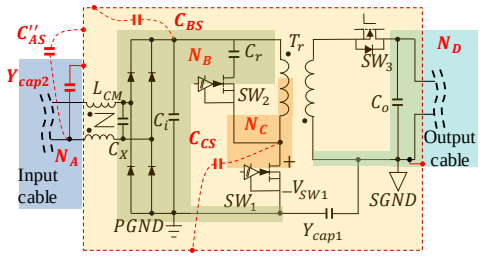
Radiated EMI in the flyback converter with power cables attached

Optimized transformer structure with improved coaxial shielding

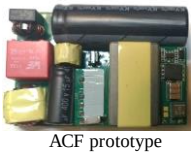
Radiated EMI

With the transformer optimized, radiated EMI is brought to compliance with the standard.

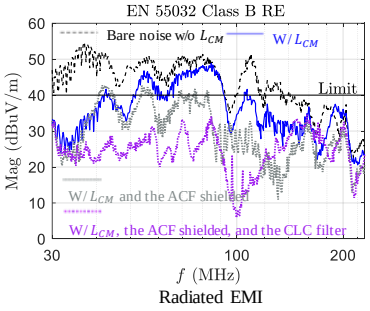
Project II: Radiated EMI in GaN IC-based Active Clamp Flyback Adapters



The proposed CLC filter combined with the shielding technique



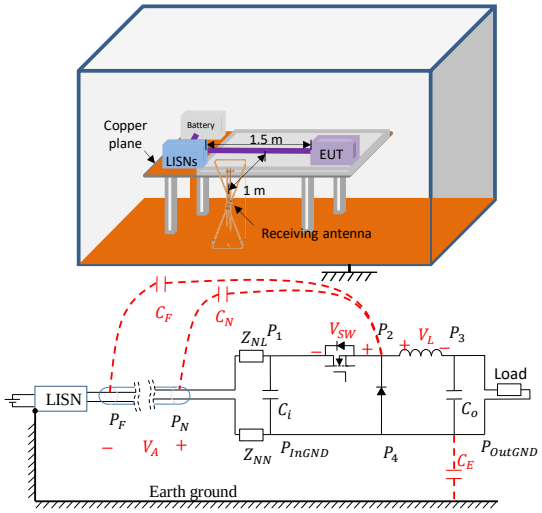
ACF prototype



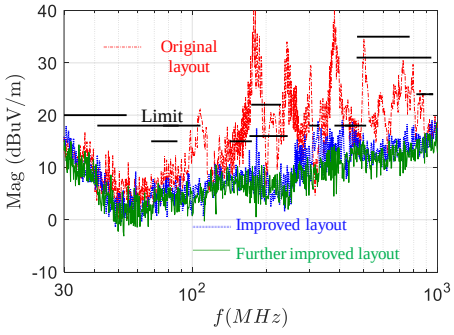
Radiated EMI

In GaN IC-based ACF power adapters, the radiated EMI is brought into compliance by applying the proposed CLC filter combined with the shielding technique.

Project III: EMI in Power Converters in Automotive Applications



EMI compliance testing of automotive power converters



Radiated EMI

In automotive power converters, the radiated EMI is brought into compliance by improving the layout of components and traces.