Dr. Jian Sun

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Contact Information

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Research Areas

Power electronics and energy systems; Specific research interests include

- Energy conversion and control for solar, wind, and other renewable and distributed generation technologies; offshore wind, HVDC and FACTS
- Grid integration of solar and wind energy; stability and power quality of power grid with deep penetration of renewable energy and distributed generation
- Smart grids, micro-grids; mobile and autonomous energy systems (aircraft, ships, ground vehicles); system modeling and control
- Energy storage applications in renewable energy systems
- Modular power conversion and advanced PWM and control techniques for modular power converters
- High-frequency power conversion using wide bandgap semiconductor devices (GaN and SiC); modular power conversion system architecture and control
- Efficient energy utilization; high-efficient power conversion and conditioning for electronics, communication, lighting, and other applications
- Electromagnetic interference (EMI) in power and power electronic systems; high-performance power conversion for aerospace applications
- General power electronic circuit topologies, modeling, and control

Current Research Projects

- Stability and Control of Cluster Converters Connected to Weak Grid
- HVDC Transmission Architecture and Control for Offshore Wind
- Voltage Stability and Control in Smart Grid
- DC Micro Grid for Integration of Renewable Energy and Energy Storage
- Integrated Single-Chip Solid State Lighting Driver Developing Using GaN Devices
- GaN-Based High Frequency Power Conversion for Aircraft Applications
- EMI Modeling and Design Optimization for More Electric Aircraft
- Aircraft Power System Modeling and Simulation
- High Density, High Efficiency Electrical Power Generation System for UAS Applications

Professional Services (Partial List)

- Editor-in-Chief, IEEE Power Electronics Letters
- Guest Editor, IEEE Transactions on Power Electronics, Special Issue on Modeling and Advanced Control
- Administrative Committee (AdCom) Member, IEEE Systems Council
- Chair, IEEE Power Electronics Society Technical Committee on Modeling, Simulation, and Control
- General Chair, 2006 IEEE Workshop on Computers in Power Electronics
- Co-Chair, Technical Program Committee of 4th IEEE Energy Conversion Conference and Exposition (ECCE 2012)
- Vice Chair, Technical Program Committee of 2nd IEEE Energy Conversion Conference and Exposition (ECCE 2010, Atlanta, September 2010)
- Publication Chair, 1st IEEE Energy Conversion Conference and Exposition (ECCE)
- Vice Technical Program Committee Chair, 1st IEEE Energy Conversion Conference and Exposition (ECCE)
- Consultant to a dozen US companies

Teaching

- ECSE/EPOW 4080 • Semiconductor Power Electronics (offered every fall semester)
- EPOW 6820 • Power Quality (offered in the spring semester of odd-numbered years)
- EPOW 6090 • Advanced Power Electronics Lab (offered in the spring semester of even-numbered years)

- Independent Studies on Modeling and Control in Power Electronics, Voltage Source Converters, and Power Electronic Systems

Education and Industry Experience

- Ph.D. in Electrical Engineering, University of Paderborn , Paderborn, Germany, 1995
- MS in Electrical Engineering, Beijing University of Aeronautics and Astronautics , China, 1989
- BS in Electrical Engineering, Nanjing University of Aeronautics and Astronautics , China, 1984
- Post-Doctoral Fellow, School of Electrical and Computer Engineering , Georgia Institute of Technology , 1996-1997
- Senior Engineer, Advanced Technology Center , Rockwell Collins , 1997-1999
- Principal Engineer, Advanced Technology Center , Rockwell Collins , 2000-2002

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Selected Journal Papers

1. M. Cespedes, L. Xing, and J. Sun, •Constant-power load system stabilization by passive damping,• accepted for publication in *IEEE Transactions on Power Electronics*.
2. L. Xing and J. Sun, •Optimal damping of multi-stage EMI filters,• accepted for publication in *IEEE Transactions on Power Electronics*.
3. J. Sun, •Impedance-based stability criterion for grid-connected inverters,• accepted for publication in *IEEE Transactions on Power Electronics*.
4. L. Xing, F. Feng, and J. Sun, •Optimal damping of EMI filter input impedance,• *IEEE Transactions on Industry Applications*, vol. 47, no. 3, pp. 1432-1440, May/June 2011.
5. Z. Bing and J. Sun, •Frequency-domain modeling of multipulse converters by double-Fourier series method,• accepted for publication in *IEEE Transactions on Power Electronics*.
6. Z. Bing, X. Du, and J. Sun, •Control of three-phase PWM rectifiers using a single dc current sensor,• accepted for publication in *IEEE Transactions on Power Electronics*.
7. J. Sun, Z. Bing, and K. Karimi, •Input impedance modeling of multipulse rectifiers by harmonic linearization,• *IEEE Transactions on Power Electronics*, vol. 24, no. 12, pp. 2812-2820, December 2009.
8. R. Redl and J. Sun, •Ripple-based control of switching regulators • an overview,• *IEEE Transactions on Power Electronics*, vol. 24, no. 12, pp. 2669-2680, December 2009.
9. T. Qi and J. Sun, •Dual-boost single-phase PFC input current control based on output current sensing,• *IEEE Transactions on Power Electronics*, vol. 24, no. 11, pp. 2523-2530, November 2009.
10. J. Sun, •Small-signal methods for ac distributed power systems • a review,• *IEEE Transactions on Power Electronics*, vol. 24, no. 11, pp. 2545-2554, November 2009.
11. Z. Bing, K. Karimi, and J. Sun, •Input impedance modeling and analysis of line-commutated rectifiers,• *IEEE Transactions on Power Electronics*, vol. 24, no. 10, pp. 2338-2346, October 2009.
12. J. Sun, D. Giuliano, S. Devarajan, J. Lu, T. P. Chow, and R. Gutmann, •Fully monolithic cellular buck converter design for 3D power delivery,• *IEEE Transactions on VLSI Systems*, vol. 17, no. 3, pp. 447-451, March 2009.
13. J. Sun, •TRU and ATRU analysis by matrix method,• *SAE International Journal of Aerospace*, vol. 1, no. 1, pp. 1046- 1054, January 2009.

Recent Conference Papers

1. L. Xing and J. Sun, •Motor drive common-mode EMI reduction by using a Wheatstone bridge,• to be presented at 2011 *European Power Electronics Conference* (EPE 2011), September 2011.
2. M. Cespedes and J. Sun, •Modeling and mitigation of harmonic resonance between wind turbines and the grid,• to be presented at *IEEE* 2011 *Energy Conversion Congress and Exposition* (ECCE 2011), September 2011.
3. X. Chen and J. Sun, •Characterization of inverter-grid interactions using a hardware-in-the-loop system test-bed,• to be presented at 2011 *International Conference on Power Electronics* (ECCE Asia 2011), May 2011, Jeju, Korea (Invited Paper).
4. T. Beechner and J. Sun, •Optimal interleaved pulse-width modulation considering sampling effects,• in *Proceedings of IEEE* 2011 *Applied Power Electronics Conference*, pp. 1881-1887, March 2011, Ft. Worth, TX.
5. T. Qi and J. Sun, •DC bus grounding capacitance optimization for common-mode EMI minimization,• in *Proceedings of IEEE* 2011 *Applied Power Electronics Conference*, pp. 661-666, March 2011, Ft. Worth, TX.
6. L. Xing and J. Sun, •Optimal damping of multi-stage EMI filters,• in *Proceedings of IEEE* 2011 *Applied Power Electronics Conference*, pp. 1721-1728, March 2011, Ft. Worth, TX.
7. X. Chen and J. Sun, •A study of renewable energy system harmonic resonance based on a DG test-bed,• in *Proceedings of IEEE* 2011 *Applied Power Electronics Conference*, pp. 995-1002, March 2011, Ft. Worth, TX.

8. L. Xing and J. Sun, "Inverter-motor system EMI reduction by impedance balancing," in *Proceedings of SAE* (Society of Automotive Engineers) 2010 *Power Systems Conference*, CD-ROM, Paper # 2010-01-1754, November 2010.
9. T. Qi and J. Sun, "Analysis and reduction of common-mode EMI in electric actuators for VF MEA," in *Proceedings of SAE* (Society of Automotive Engineers) 2010 *Power Systems Conference*, CD-ROM, Paper # 2010-01-1740, November 2010.
10. Z. Bing and J. Sun, "Effects of line and load conditions on TRU and ATRU input current harmonics," in *Proceedings of SAE* (Society of Automotive Engineers) 2010 *Power Systems Conference*, CD-ROM, Paper # 2010-01-1809, November 2010.
11. L. Xing, F. Feng, and J. Sun, "Behavioral modeling methods for motor drive system EMI design optimization," in *Proceedings of IEEE* 2010 *Energy Conversion Congress and Exposition* (ECCE 2010), pp. 947-954, September 2010, Atlanta, GA.
12. Z. Bing and J. Sun, "Input impedance modeling of multipulse rectifiers by double-Fourier series method," in *Proceedings of IEEE* 2010 *Energy Conversion Congress and Exposition* (ECCE 2010), pp. 3754-3761, September 2010, Atlanta, GA.
13. Z. Bing and J. Sun, "Line-frequency rectifier dc-bus voltage instability and mitigation," in *Proceedings of IEEE* 2010 *Workshop on Control and Modeling for Power Electronics* (COMPEL 2010), June 2010.
14. L. Xing and J. Sun, "Motor drive system EMI reduction by asymmetric interleaving," in *Proceedings of IEEE* 2010 *Workshop on Control and Modeling for Power Electronics* (COMPEL 2010), June 2010.
15. P. Wu and J. Sun, "Control design optimization for an asymmetric half-bridge converter," in *Proceedings of IEEE* 2010 *Workshop on Control and Modeling for Power Electronics* (COMPEL 2010), June 2010.
16. M. Cespedes and J. Sun, "Averaged modeling and analysis of multilevel converters," in *Proceedings of IEEE* 2010 *Workshop on Control and Modeling for Power Electronics* (COMPEL 2010), June 2010.
17. Z. Bing and J. Sun, "Modeling and analysis of line-frequency converters by double-Fourier series methods," in *Proceedings of IEEE* 2010 *Workshop on Control and Modeling for Power Electronics* (COMPEL 2010), June 2010 (Best Paper Award)
18. J. Sun, "High-performance power conversion for more-electric aircraft," in *Proceedings of the 9th International PCIM China Conference*, pp. 22-32, June 2010 (Invited Keynote Paper).
19. T. Qi, J. Graham, and J. Sun, "Characterization of IGBT modules for system EMI simulation," in *Proceedings of* 2010 *IEEE Applied Power Electronics Conference*, pp. 2220-2225, February 2010.
20. M. Cespedes, L. Xing, T. Beechner, and J. Sun, "Stabilization of constant-power loads by passive impedance damping," in *Proceedings of* 2010 *IEEE Applied Power Electronics Conference*, pp. 2174-2180, February 2010.
21. Z. Bing and J. Sun, "Minimum-sensing current control of three-phase PFC converters," in *Proceedings of* 2010 *IEEE Applied Power Electronics Conference*, pp. 336-342, February 2010.

Patents

- "Bi-directional dc-to-dc converters for energy storage applications," US Patent # 6,243,277.
- "Integrated magnetic converter circuit and method with improved filtering," US Patent # 6549436.
- "Switching power converter circuits providing main and auxiliary output voltages," US Patent # 6775159.
- "Composite core design for matrix integrated magnetics in high power interleaved dc-dc converters," US Patent #6980077.
- "Vertically packaged switched-mode power converter," US Patent #7012414.
- "Core structure and interleaved dc-dc converter topology," US Patent #7046523.
- "Vertical winding structures for planar magnetic switched-mode power converters," US Patent #7321283
- "Vertical winding structures for planar magnetic switched-mode power converters," US Patent #7554430