

**Daniel Costinett**  
1520 Middle Drive, Suite 504  
Knoxville, TN 37996-2250  
Phone: (865) 974-3572, e-mail: Daniel.Costinett@utk.edu

### EDUCATION

---

PhD, Electrical Engineering	University of Colorado Boulder	June 2013
Dissertation title: "Analysis and Design of High Efficiency, High Conversion Ratio, DC-DC Power Converters"		
MS, Electrical and Computer Engineering	University of Colorado Boulder	May 2011
BS, Electrical and Computer Engineering	University of Colorado Boulder	May 2011

### SELECT EMPLOYMENT

---

Associate Professor	University of Tennessee Knoxville <i>Department of Electrical Engineering and Computer Science</i>	2019-present
Assistant Professor	University of Tennessee Knoxville <i>Department of Electrical Engineering and Computer Science</i>	2013-2019
Joint Faculty	Oak Ridge National Laboratory <i>Power Electronics and Electric Machinery Group</i>	2014-Present
Instructor	Utah State University <i>Department of Electrical and Computer Engineering</i>	2012-2013

### TEACHING EXPERIENCE

---

#### **Circuits II (ECE 202)**

*UTK Department of Electrical Engineering and Computer Science*    Knoxville, TN    Fall 2019  
· Developed new labs including phasor analysis of wireless power transfer systems for sophomore course

#### **Discrete Time Modeling of Power Electronics (ECE 692)**

*UTK Department of Electrical Engineering and Computer Science*    Knoxville, TN    Fall 2019  
· Developed new course in advanced modeling and control techniques for power converters

#### **High Frequency Power Electronics (ECE 581)**

*UTK Department of Electrical Engineering and Computer Science*    Knoxville, TN    Fall 2014/16/18/20  
· Developed new course in the analysis and design of high efficiency, high frequency power converters  
· Established hands-on design competition for students to construct hardware prototypes

#### **Ultra-Wide-Area Resilient Electrical Energy Transmission Networks (ECE 620)**

*UTK Department of Electrical Engineering and Computer Science*    Knoxville, TN    Fall 2014/15  
· Coordinated shared seminar course between UTK, RPI, NEU, and Tuskegee Universities

#### **Power Electronic Circuits (ECE 482/582)**

*UTK Department of Electrical Engineering and Computer Science*    Knoxville, TN    Spring 2014-19  
· Developed a new lab-based power electronics course focusing on practical design of electric drive vehicles

#### **Power Electronics (ECE 481/599)**

*UTK Department of Electrical Engineering and Computer Science*    Knoxville, TN    Fall 2013/15/17  
· Developed new laboratory sequence for undergraduate course

#### **Electric Vehicle Design Laboratory (ECE 5930/6930)**

*USU Department of Electrical and Computer Engineering*    Logan, UT    Spring 2013  
· Developed and taught new laboratory course

#### **Power Electronics for Electric Drive Vehicles (ECE 5930)**

*USU Department of Electrical and Computer Engineering*    Logan, UT    Fall 2012  
· Co-developed and co-instructed

#### **Analog Integrated Circuit Design (ECEN 4827/5827)**

*CU Department of Electrical, Computer, and Energy Engineering*    Boulder, CO    Fall 2011  
· Taught course to graduate, undergraduate, and remote continuing education (online)

## INVITED PRESENTATIONS AND PROFESSIONAL SEMINARS

---

### Power America Technical Webinar

“Multi-Receiver Wireless Power Transfer for Consumer Electronics Leveraging WBG Semiconductors” October 2016

### Masachusetts Institute of Technology, University of Illinois Urbana Champagne

“Designing Power Electronics in Discrete Time” November 2016

### Technov865

“High Precision, Multifunctional Electrosurgical Generators” October 2016

### University of Pittsburgh

“Electric Drive Technologies for Future Electric Vehicles” October 2016

### University of Colorado

“Results of the Google Little Box Challenge,” October 2015

### National Renewable Energy Laboratory

“University of Tennessee Little Box Design” October 2015

### UTK Transportation Seminar series

“Designing Power Electronics to Meet the Demands of Future Electric Vehicles,” March 2014

### Tsinghua University, North China Electric Power University, Southeast University

“Analysis and Design of High Efficiency, High Conversion Ratio, DC-DC Power Converters,” Dec 2013

## STUDENTS SUPERVISED

---

### GRADUATED PH.D. STUDENTS, SERVING AS MAJOR ADVISOR

- |                         |   |                        |
|-------------------------|---|------------------------|
| <b>1. Weimin Zhang</b>  | Now Working at Tesla  | Graduated Aug 2015     |
|                         | Dissertation Title: “ WBG Converters In Data Centers And EV Applications”   | (co-advisor Fred Wang) |
| <b>2. Chongwen Zhao</b> | Now Working at Apple  | Graduated Aug 2018     |
|                         | Dissertation Title: “Multi-Frequency Modulation And Control For DC/AC And AC/DC Resonant Converters”                  |                        |
| <b>3. Ling Jiang</b>    | Now Working at Analog Devices, Inc.   | Graduated Dec 2018     |
|                         | Dissertation Title: “GaN-Based High Efficiency Transmitter For Multiple-Receiver Wireless Power Transfer Application” |                        |
| <b>4. Saeed Anwar</b>   | Now Working at Busek  | Graduated May 2020     |
|                         | Dissertation Title: “Integrated WBG EV Power Electronics”   |                        |

### CONTINUING PH.D. STUDENTS, SERVING AS MAJOR ADVISOR

- |                           |   |  |
|---------------------------|---|--|
| <b>1. Kamal Sabi</b>      | Topic: High Density Inverter Design For Residential Solar Power     | Expected Graduation: May 2021                              |
| <b>2. Ruiyang Qin</b>     | Topic: High Frequency Wireless Power Transfer For Electric Vehicles | Expected Graduation: May 2021                              |
| <b>3. Jared Baxter</b>    | Topic: Computational Optimization Of Power Electronics              | Expected Graduation: May 2021                              |
| <b>4. Andrew Foote</b>    | Topic: Deployment Of Dynamic Wireless Charging To US Roadways       | Expected Graduation: May 2022                              |
| <b>5. Spencer Cochran</b> | Topic: Low-THD Impedance-Controlled Wireless Power Receivers        | Expected Graduation: May 2021                              |
| <b>6. Jie Li</b>          | Topic: Optimization Of Wireless Power Transfer Systems              | Expected Graduation: May 2021                              |
| <b>7. Jingjing Sun</b>    | Topic: Control Of PFC Rectifiers                                    | Expected Graduation: May 2022<br>(co-advisor Leon Tolbert) |

---

GRADUATED M.S. STUDENTS, SERVING AS MAJOR ADVISOR

1. **Tianxiang Chen** Now Working at ORNL Graduated: Dec 2016  
Topic: Faster R-CNN: Deep Learning For Advanced Driver Assistance System
2. **Gabriel Gabian** Now Working at Allegro MicroSystems Graduated: Aug 2017  
Thesis Title: "High-current Integrated Battery Chargers For Mobile Applications"
3. **Spencer Cochran** Continuing as PhD Student Graduated: Nov 2017  
Thesis Title: "A GaN-Based Synchronous Rectifier With Reduced THD For 6.78 MHz WPT Applications"
4. **Jie Li** Continuing as PhD Student Graduated: May 2018  
Thesis Title: "Wireless Power System Design For Maximum Efficiency"
5. **Doug Boulter** Now Working at Texas Instruments Graduated: Aug 2018  
Thesis Title: "GaN-Based Point-of-Load Converters For Data Center Applications"
6. **Maeve Lawniczak** Now Working at Schneider Electric Graduated: Aug 2018  
Thesis Title: "Analysis And Design Of Hybrid Dickson Switched Capacitor For Intermediate Bus Converter Applications"
7. **Jordan Gamble** Now Working at LTK Engineering Services Graduated: May 2018  
Thesis Title: "Design Space Evaluation For Resonant And Hard-charged Switched Capacitor Converters" (co-advisor Ben Blalock)
8. **Quillen Blalock** Now Working at Texas Instruments Graduated: May 2020  
Thesis Title: "Integrated Battery Charger And Balancer"
9. **Peter Pham** Now Working at Analog Devices Graduated: Jul 2020  
Thesis Title: "Control Of GaN-Based 6.78 MHz Wireless Receivers" (co-advisor Leon Tolbert)

---

CONTINUING M.S. STUDENTS, SERVING AS MAJOR ADVISOR

1. **Joseph Setelin** Thesis Option Expected Graduation: May 2022  
Topic: Integrated Battery Charger And Balancer

---

UNDERGRADUATES PARTICIPATING IN RESEARCH

1. **Spencer Cochran** Continuing as MS Student Graduated: Dec 2015  
Topic: Thermal Surgical Power Supply
2. **Doug Boulter** Continuing as MS Student Graduated: May 2016  
Topic: Wireless Power Transfer To Implantable Devices
3. **Maeve Lawniczak** Continuing as MS Student Graduated: May 2016  
Topic: Electropermanent Magnet Applications In Power Electronics
4. **Joey Mann** Now Working at NLogic Graduated: Dec 2016  
Topic: Intelligent E-bike Motor Drives
5. **Jared Baxter** Continuing as PhD Student Graduated: May 2017  
Topic: Energy Harvesting Wearable Device Platform
6. **Kyle Goodrick** Now Pursuing a PhD, University Of Colorado Boulder Graduated: May 2017  
Topic: Automated Design Of Switching Converters
7. **Rafael Camarillo** Now Working at Booz Allen Hamilton Graduated: May 2018  
Topic: Wireless Power Transfer Coil Coupling Analysis
8. **Quillen Blalock** Continuing as MS Student Graduated: May 2018  
Topic: 3D Printed Inductor Design
9. **Dylan Carlson** Graduated: May 2018  
Topic: Monitoring Of E-bike Power Consumption
10. **Alex Bolinsky** Graduated: May 2019  
Topic: Wireless Power Conversion Communication

**11. Matthew Butera**

Graduated: May 2020

Topic: Developing a Design Database For Power Electronic Converters

**SERVICE AND PROFESSIONAL ACTIVITIES****EECS DEPARTMENT**

Faculty Search Committee	Electronics	AY2018-2019
—	Power Electronics	AY2017-2018
Assessment Coordinator	SACS, Grad Power Certificates	2014 - present
Sponsor	EECS Senior Design	(4 teams) AY 2014 - 2018
Member	Graduate Committee	2014 - present
Chair	Graduate Committee	2015

**UNIVERSITY SERVICE**

Co-Director of Education and Diversity <sup>1</sup>	CURRENT	Fall 2014 - present
Executive Committee <sup>2</sup>	Tickle College of Engineering (TCoE) Diversity Action Planning	Spring-Fall 2020
Faculty Advisor Advisor <sup>3</sup>	EcoCAR 3, Electrical Team	Spring 2014 - Summer 2018
Faculty Advisor	HITES <sub>11</sub>	(10 students) Summer 2015, 2016
Exhibitor <sup>4</sup>	GEM GRAD LAB Student Fair	Fall 2016, Fall 2019
—	TLSAMP Research Conference Student Fair	Spring 2016
—	TCoE Engineering Fair	(8 events) Fall 2013-present
Member	TCoE Building Programming Committee	2013

<sup>1</sup> In the Year 8 annual review of the NSF/DOE Engineering Research Center, CURENT, the NSF Site Visit Team (SVT) report stated, in part, “the SVT recognizes the critical and formidable contributions of junior faculty Dr. Daniel Costinett to cultivate a culture of inclusion within the Center”.

<sup>2</sup> Chair of Goal 6: “Prepare graduate students to become teachers and researchers in a diverse world.”

<sup>3</sup> Included advising the Advanced Driver Assistance Systems (first place at national competition) and the Innovation (third place) swimlanes.

<sup>4</sup> Gave keynote speech at UTK-hosted event in 2019; hosted booth at events in 2016 and 2019

**PROFESSIONAL SERVICE**

Panelist	NSF Proposal Review Panel	2020
—	NSF Proposal Review Panel	2019
—	NSF Proposal Review Panel	2018
—	NSF Proposal Review Panel	2016
—	NSF Proposal Review Panel	2015
Invited Participant	NSF ERC Conference on Workforce Development, Inclusion, & Student Leadership	2018
Session Co-Chair	NSF Workshop on Directions in Power Electronics Research	2016
Reviewer	Croatian Science Foundation Proposals	2019

**DISCIPLINARY SERVICE**

Associate Editor	<i>IEEE Transactions on Power Electronics</i>	2017 - present
—	<i>IEEE Journal of Emerging and Select Topics in Power Electronics</i>	2016 - present
—	<i>IEEE Transactions on Industry Applications</i>	2014 - 2018
Awards Committee	<i>IEEE Workshop on Control and Modeling of Power Electronics (COMPEL)</i>	2018
Organizing Committee	<i>IEEE Workshop on Control and Modeling of Power Electronics (COMPEL)</i>	2018
Finance Chair	<i>IEEE PELS Workshop on Emerging Technologies: Wireless Power (WoW)</i>	2016
Local Chair	<i>IEEE Workshop on Wide Bandgap Power Devices and Applications (WiPDA)</i>	2014
Tutorials Chair	<i>IEEE Workshop on Wide Bandgap Power Devices and Applications (WiPDA)</i>	2015
Vice Chair	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2021
Technical Committee	<i>IEEE International Conference on DC Microgrids (ICDCM)</i>	2021
—	<i>IEEE PELS Workshop on Emerging Technologies: Wireless Power (WoW)</i>	2021

—	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2019
—	<i>IEEE Workshop on Control and Modeling of Power Electronics (COMPEL)</i>	2018
—	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2018
—	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2017
—	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2016
—	<i>IEEE Workshop on Control and Modeling of Power Electronics (COMPEL)</i>	2014
Session Chair	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2020
—	<i>IEEE Workshop on Control and Modeling of Power Electronics (COMPEL)</i>	2019
—	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2019
—	<i>IEEE Applied Power Electronics Conference (APEC)</i>	2019
—	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2018
—	<i>IEEE Workshop on Control and Modeling of Power Electronics (COMPEL)</i>	2018
—	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2017
—	<i>IEEE Applied Power Electronics Conference (APEC)</i>	2016
—	<i>IEEE Applied Power Electronics Conference (APEC)</i>	2015
—	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2015
—	<i>IEEE Energy Conversion Conference and Exposition (ECCE)</i>	2014
—	<i>IEEE Workshop on Control and Modeling of Power Electronics (COMPEL)</i>	2014
—	CURRENT Industry Conference	2014

### HONORS AND AWARDS

---

UTK Chancellor's Award for Professional Promise in Research and Creative Achievement	2020
TCE Award for Outstanding Faculty Service to the College	2020
UTRF Innovation Driver Award	2017
UTK CoE Professional Promise in Research Award	2017
Google Little Box Challenge Finalist	2016
<i>IEEE Transactions on Power Electronics</i> Outstanding Reviewer Award	2016
Second Place Prize Paper Award in <i>IEEE Transactions on Power Electronics</i>	2016
UTK CoE Teaching Fellow	2016
UTK CoE Summer Pre-College Service Award	2016
ECE Faculty of the Year	2015
IEEE William M. Portnoy Award	2015
EPRI Outstanding Achievement Award	2015
UTK CoE Summer Pre-College Service Award	2015
Best Presentation Award, APEC 2013 Session T1	2013
Best Paper Award, COMPEL 2012	2012
Best Presentation Award, APEC 2012 Session T28	2012

### AWARDS GIVEN TO STUDENT ADVISEES

---

Ling Jiang	IEEE APEC Best Presentation Award	2019
Chongwen Zhao	IEEE WoW Best Paper Award - 2nd place	2018
Saeed Anwar	EcoCAR 3 NSF Innovation Award - 3rd Place	2018
Kamal Sabi	IEEE APEC Best Presentation Award	2018
Chongwen Zhao	Outstanding Graduate Research Assistant	2017
Chongwen Zhao	IEEE APEC Best Presentation Award	2017
Quillen Blalock	Tech CarniVol Elevator Pitch Competition Winner	2017
Chongwen Zhao	Chancellor's Honor for Outstanding Professional Promise	2016
Saeed Anwar	IEEE APEC Best Presentation Award	2016
Chongwen Zhao	IEEE APEC Best Presentation Award	2016
Chongwen Zhao	Chancellor's Honor for Extraordinary Professional Promise	2016
Maeve Lawniczak	Chancellor's Honor for Extraordinary Academic Achievement	2016

## FUNDED RESEARCH PROJECTS

---

### **Design-Oriented Education and Hands-on Training with WBG Power Electronics for the Next Generation Power Engineering Workforce**

US Department of Energy (DOE)  
*co-Principal Investigator (25.0%)*

Aug 2016 - Jul 2021  
PI: Leon Tolbert, co-PIs: Daniel Costinett, Fred Wang, Ben Blalock

### **CAREER: Unified Design Framework for Advanced Power Electronics**

National Science Foundation (NSF)  
*Principal Investigator (100.0%)*

Jan 2018 - Dec 2022

### **Survey of High Voltage SiC Devices and Applications**

US Department of Energy (DOE)  
*co-Principal Investigator (25.0%)*

Jun 2014 - Jul 2014  
PI: Fred Wang, co-PIs: Leon Tolbert, Daniel Costinett

### **Development of an Energy Storage System for the EcoCAR 3 Vehicle**

Electric Power Research Institute  
*co-Principal Investigator (50.0%)*

Aug 2014 - May 2015  
PI: Dave Irick, co-PIs: Daniel Costinett

### **Exploratory Research on a New Paradigm for Design and Operation of Electric or Hybrid Electric Vehicle Traction Drives for Improved Efficiency, Power Density, and Lifetime**

Volkswagen  
*co-Principal Investigator (33.0%)*

Sep 2014 - Aug 2015  
PI: Fred Wang, co-PIs: Daniel Costinett, Leon Tolbert

### **Combined Ultrasonic and Radio Frequency Bipolar Electrosurgical Power Supply**

Covidien  
*Principal Investigator (100.0%)*

Sep 2014 - Aug 2015

### **Development of a Rolling Hybrid Vehicle Teaching and Research Laboratory**

Volkswagen  
*co-Principal Investigator (50.0%)*

Sep 2014 - Sep 2015  
PI: Dave Irick, co-PIs: Daniel Costinett

### **Wide-BandGap (WBG) Device and System Assessment for Future Automotive Electric Drivetrains**

Oak Ridge National Laboratory (ORNL)  
*co-Principal Investigator (25.0%)*

Jan 2015 - Sep 2015  
PI: Leon Tolbert, co-PIs: Ben Blalock, Fred Wang, Daniel Costinett

### **Designing Beyond the Limits of Modern Power Inverters**

Electric Power Research Institute (EPRI)  
*Principal Investigator (34.0%)*

Dec 2014 - Oct 2015  
co-PIs: Leon Tolbert, Fred Wang

### **Development of High-Density and High-Efficiency Universal Charger Based on Gallium Nitride Devices**

Boeing  
*co-Principal Investigator (50.0%)*

Jun 2014 - Apr 2016  
PI: Fred Wang, co-PIs: Daniel Costinett

**Targeted Drive Train DC-DC Design for Electric Vehicles Using Additive Manufacturing and Wide Bandgap Semiconductors**

Oak Ridge National Laboratory (ORNL)

May 2014 - May 2016

*Principal Investigator (100.0%)*

**Exploring Lean Margin EV Power Electronics Design Utilizing Wide Bandgap Semiconductors for Drastic Improvement of Efficiency, Power Density, and Cost**

Volkswagen

Sep 2015 - Aug 2016

*co-Principal Investigator (33.0%)*

PI: Fred Wang, co-PIs: Daniel Costinett, Leon Tolbert

**Optimized Coil Design for Wireless Power Transfer in Electric Vehicles**

Volkswagen

Sep 2014 - Aug 2016

*co-Principal Investigator (50.0%)*

PI: Dave Irick, co-PIs: Daniel Costinett

**Senior Design Projects 2016**

Electric Power Research Institute (EPRI)

Sep 2015 - Aug 2016

*co-Principal Investigator (10.0%)*

PI: Bill Dunne, co-PIs: Daniel Costinett, et al

**WBG Device Assessment and Characterization**

ORNL - UT-Battelle

Jul 2016 - Sep 2016

*Principal Investigator (50.0%)*

PI: Leon Tolbert, co-PIs: Daniel Costinett

**Magnetic Amplifier for Power Flow Control - Installation**

ARPA-e

Jun 2014 - Dec 2016

*co-Principal Investigator (20.0%)*

PI: Fred Wang, co-PIs: Kevin Tomsovic, Leon Tolbert, Daniel Costinett

**Development of a SiC based high temperature three-phase voltagesource converter with maximum switching speed and adaptive operation capability for high efficiency**

II-VI Foundation

Jul 2014 - Jun 2017

*co-Principal Investigator (25.0%)*

PI: Ben Blalock, co-PIs: Leon Tolbert, Daniel Costinett, Fred Wang

**Series Self-Resonant Wireless Power Transfer Coil with Reduced Electromagnetic Interference**

University of Tennessee Research Foundation (UTRF)

Jan 2017 - Oct 2017

*Principal Investigator (100.0%)*

**High Power Fully Integrated DC-DC Converter**

Texas Instruments

May 2015 - Apr 2018

*Principal Investigator (50.0%)*

co-PIs: Ben Blalock

**EcoCAR 3 ECE GRA Year 4**

American Society for Engineering Education

Aug 2014 - Jun 2018

*Principal Investigator (100.0%)*

**An Ultra-light Highly Efficient MW Class Cryogenically Cooled Inverter for Future All Electric Aircraft Applications**

Boeing

Oct 2015 - Sep 2018

*co-Principal Investigator (25.0%)*

PI: Fred Wang, co-PIs: Leon Tolbert, Daniel Costinett, Ben Blalock

**Efficiency improvement and interference reduction of wireless charging system through system integration**

Intel Corporation

Nov 2015 - Oct 2018

*Principal Investigator (50.0%)*

co-PIs: Aly Fathy

**Low-EMI, High Efficiency WPT Receiver**

Futurwei Technologies Co., Ltd

Sep 2017 - Aug 2019

*Principal Investigator (100.0%)*

**Integrated High Efficiency All-GaN Wireless Power Supply**

DOE - Power America

Jul 2018 - Dec 2019

*Principal Investigator (50.0%)*

co-PIs: Leon Tolbert

**2S Buck/Boost Charger with Integrated Cell Balancing**

Texas Instruments

Jan 2019 - Dec 2019

*Principal Investigator (50.0%)*

co-PIs: Benjamin Blalock

**High Power and Dynamic Wireless Power Transfer**

ORNL - UT-Battelle

Jun 2017 - Dec 2019

*Principal Investigator (100.0%)*

**Wireless power transfer loss simulation and demonstrator for fast charging**

Volkswagen Group of America

Oct 2019 - Dec 2019

*Principal Investigator (50.0%)*

co-PIs: Leon Tolbert

**GOALI: Collaborative Proposal: Novel approaches to model travel behavior and sustainability impacts of e-bike use**

NSF - National Science Foundation

May 2017 - Apr 2020

*co-Principal Investigator (10.0%)*

PI: Chris Cherry, co-PIs: Wei Gao, Paul Frymier, Daniel Costinett

**WBG Device Characterization and Application for Converter Design**

DOE - ORNL - UT-Battelle - Oak Ridge National Laboratory

Jan 2017 - Apr 2020

*Principal Investigator (100.0%)*

**Comprehensive Design Leveraging Wide Bandgap Devices to Enable High Power, High Efficiency Wireless Charging of Electric Vehicles**

II-VI Foundation

Jul 2017 - Jun 2020

*Principal Investigator (25.0%)*

co-PIs: Leon Tolbert, Fred Wang, Ben Blalock



## PUBLICATIONS

### PEER-REVIEWED JOURNAL PUBLICATIONS

- [1] A. D. Scher, M. Kosk, P. Pham, D. Costinett, and E. Hossain, "Stability Analysis and Efficiency Optimization of an Inductive Power Transfer System With a Constant Power Load," *IEEE Access*, vol. 8, pp. 209762–209775, 2020.
- [2] H. Gui, R. Chen, Z. Zhang, J. Niu, L. M. Tolbert, F. Wang, D. Costinett, B. J. Blalock, and B. B. Choi, "Methodology of Low Inductance Busbar Design for Three-Level Converters," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, pp. 1–1, 2020.
- [3] H. Gui, R. Chen, Z. Zhang, J. Niu, R. Ren, B. Liu, L. M. Tolbert, F. F. Wang, D. Costinett, B. J. Blalock, and B. B. Choi, "Modeling and Mitigation of Multiloops Related Device Overvoltage in Three-Level Active Neutral Point Clamped Converter," *IEEE Transactions on Power Electronics*, vol. 35, no. 8, pp. 7947–7959, 2020.
- [4] R. Ren, H. Gui, Z. Zhang, R. Chen, J. Niu, F. Wang, L. M. Tolbert, D. Costinett, B. J. Blalock, and B. B. Choi, "Characterization and Failure Analysis of 650-V Enhancement-Mode GaN HEMT for Cryogenically Cooled Power Electronics," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 8, no. 1, pp. 66–76, 2020.
- [5] H. Gui, Z. Zhang, R. Chen, R. Ren, J. Niu, H. Li, Z. Dong, C. Timms, F. Wang, L. M. Tolbert, B. J. Blalock, D. Costinett, and B. B. Choi, "Development of High-Power High Switching Frequency Cryogenically Cooled Inverter for Aircraft Applications," *IEEE Transactions on Power Electronics*, vol. 35, no. 6, pp. 5670–5682, 2020.
- [6] H. Gui, R. Chen, J. Niu, Z. Zhang, L. M. Tolbert, F. Wang, B. J. Blalock, D. Costinett, and B. B. Choi, "Review of Power Electronics Components at Cryogenic Temperatures," *IEEE Transactions on Power Electronics*, vol. 35, no. 5, pp. 5144–5156, 2020.
- [7] R. Chen, J. Niu, H. Gui, Z. Zhang, F. Wang, L. M. Tolbert, D. J. Costinett, B. J. Blalock, and B. B. Choi, "Modeling, Analysis, and Reduction of Harmonics in Paralleled and Interleaved Three-Level Neutral Point Clamped Inverters With Space Vector Modulation," *IEEE Transactions on Power Electronics*, vol. 35, no. 4, pp. 4411–4425, 2020.
- [8] H. Gui, Z. Zhang, R. Chen, J. Niu, L. M. Tolbert, F. Wang, D. Costinett, B. J. Blalock, and B. B. Choi, "Gate Drive Technology Evaluation and Development to Maximize Switching Speed of SiC Discrete Devices and Power Modules in Hard Switching Applications," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 8, no. 4, pp. 4160–4172, 2020.
- [9] B. Liu, R. Ren, F. F. Wang, D. Costinett, and Z. Zhang, "Capacitive Coupling in EMI Filters Containing T-Shaped Joint: Mechanism, Effects, and Mitigation," *IEEE Transactions on Power Electronics*, vol. 35, no. 3, pp. 2534–2547, 2020.
- [10] B. Liu, R. Ren, F. Wang, D. Costinett, and Z. Zhang, "Winding Scheme With Fractional Layer for Differential-Mode Toroidal Inductor," *IEEE Transactions on Industrial Electronics*, vol. 67, no. 2, pp. 1592–1604, 2020.
- [11] Z. Zhang, L. M. Tolbert, D. Costinett, F. Wang, and B. J. Blalock, "A New Hands-On Course in Characterization of Wide-Bandgap Devices," *IEEE Transactions on Power Electronics*, vol. 34, no. 10, pp. 9392–9403, 2019.
- [12] L. Jiang and D. Costinett, "A High-Efficiency GaN-Based Single-Stage 6.78 MHz Transmitter for Wireless Power Transfer Applications," *IEEE Transactions on Power Electronics*, vol. 34, no. 8, pp. 7677–7692, 2019.
- [13] Z. Zhang, J. Dyer, X. Wu, F. Wang, D. Costinett, L. M. Tolbert, and B. J. Blalock, "Online Junction Temperature Monitoring Using Intelligent Gate Drive for SiC Power Devices," *IEEE Transactions on Power Electronics*, vol. 34, no. 8, pp. 7922–7932, 2019.
- [14] B. Liu, R. Ren, E. A. Jones, H. Gui, Z. Zhang, R. Chen, F. Wang, and D. Costinett, "Effects of Junction Capacitances and Commutation Loops Associated With Line-Frequency Devices in Three-Level AC/DC Converters," *IEEE Transactions on Power Electronics*, vol. 34, no. 7, pp. 6155–6170, 2019.
- [15] B. Liu, R. Ren, Z. Zhang, B. Guo, F. Wang, and D. Costinett, "Impacts of high frequency, high di/dt, dv/dt environment on sensing quality of GaN based converters and their mitigation," *CPSS Transactions on Power Electronics and Applications*, vol. 3, no. 4, pp. 301–312, 2018.
- [16] B. Liu, R. Ren, E. A. Jones, F. Wang, D. Costinett, and Z. Zhang, "A Modulation Compensation Scheme to Reduce Input Current Distortion in GaN-Based High Switching Frequency Three-Phase Three-Level Vienna-Type Rectifiers," *IEEE Transactions on Power Electronics*, vol. 33, no. 1, pp. 283–298, 2018.
- [17] C. Zhao and D. Costinett, "GaN-Based Dual-Mode Wireless Power Transfer Using Multifrequency Programmed Pulse Width Modulation," *IEEE Transactions on Industrial Electronics*, vol. 64, no. 11, pp. 9165–9176, 2017.
- [18] Z. Zhang, J. Dix, F. F. Wang, B. J. Blalock, D. Costinett, and L. M. Tolbert, "Intelligent Gate Drive for Fast Switching and Crosstalk Suppression of SiC Devices," *IEEE Transactions on Power Electronics*, vol. 32, no. 12, pp. 9319–9332, 2017.
- [19] Z. Zhang, H. Lu, D. J. Costinett, F. Wang, L. M. Tolbert, and B. J. Blalock, "Model-Based Dead Time Optimization for Voltage-Source Converters Utilizing Silicon Carbide Semiconductors," *IEEE Transactions on Power Electronics*, vol. 32, no. 11, pp. 8833–8844, 2017.
- [20] Y. Cui, F. Yang, L. M. Tolbert, D. J. Costinett, F. Wang, and B. J. Blalock, "Load-Dependent Soft-Switching Method of Half-Bridge Current Doubler for High-Voltage Point-of-Load Converter in Data Center Power Supplies," *IEEE Transactions on Power Electronics*, vol. 32, no. 4, pp. 2925–2938, 2017.
- [21] W. Zhang, F. Wang, D. J. Costinett, L. M. Tolbert, and B. J. Blalock, "Investigation of Gallium Nitride Devices in High-Frequency LLC Resonant Converters," *IEEE Transactions on Power Electronics*, vol. 32, no. 1, pp. 571–583, 2017.
- [22] R. Ren, B. Liu, E. A. Jones, F. F. Wang, Z. Zhang, and D. Costinett, "Capacitor-Clamped, Three-level GaN-Based DCDC Converter With Dual Voltage Outputs for Battery Charger Applications," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 4, no. 3, pp. 841–853, 2016.
- [23] E. A. Jones, F. F. Wang, and D. Costinett, "Review of Commercial GaN Power Devices and GaN-Based Converter Design Challenges," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 4, no. 3, pp. 707–719, 2016.
- [24] C. Zhao, B. Trento, L. Jiang, E. A. Jones, B. Liu, Z. Zhang, D. Costinett, F. F. Wang, L. M. Tolbert, J. F. Jansen, R. Kress, and R. Langley, "Design and Implementation of a GaN-Based, 100-kHz, 102-W/in<sup>3</sup> Single-Phase Inverter," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 4, no. 3, pp. 824–840, 2016.
- [25] M. Evzelman, M. M. Ur Rehman, K. Hathaway, R. Zane, D. Costinett, and D. Maksimovic, "Active Balancing System for Electric Vehicles With Incorporated Low-Voltage Bus," *IEEE Transactions on Power Electronics*, vol. 31, no. 11, pp. 7887–7895, 2016.
- [26] Z. Wang, X. Shi, L. M. Tolbert, F. Wang, Z. Liang, D. Costinett, and B. J. Blalock, "Temperature-Dependent Short-Circuit Capability of Silicon Carbide Power MOSFETs," *IEEE Transactions on Power Electronics*, vol. 31, no. 2, pp. 1555–1566, 2016.
- [27] Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, and D. J. Costinett, "Evaluation of Switching Performance of SiC Devices in PWM Inverter-Fed Induction Motor Drives," *IEEE Transactions on Power Electronics*, vol. 30, no. 10, pp. 5701–5711, 2015.
- [28] Z. Wang, X. Shi, L. M. Tolbert, F. Wang, Z. Liang, D. Costinett, and B. J. Blalock, "A high temperature silicon carbide mosfet power module with integrated silicon-on-insulator-based gate drive," *IEEE Transactions on Power Electronics*, vol. 30, no. 3, pp. 1432–1445, 2015.
- [29] D. Costinett, D. Maksimovic, and R. Zane, "Circuit-Oriented Treatment of Nonlinear Capacitances in Switched-Mode Power Supplies," *IEEE Transactions on Power Electronics*, vol. 30, no. 2, pp. 985–995, 2015.

- [30] Z. Popovi, E. A. Falkenstein, D. Costinett, and R. Zane, "Low-Power Far-Field Wireless Powering for Wireless Sensors," *Proceedings of the IEEE*, vol. 101, no. 6, pp. 1397–1409, 2013.
- [31] D. Costinett, M. Rodriguez, and D. Maksimovic, "Simple Digital Pulse Width Modulator Under 100 ps Resolution Using General-Purpose FPGAs," *IEEE Transactions on Power Electronics*, vol. 28, no. 10, pp. 4466–4472, 2013.
- [32] D. Costinett, D. Maksimovic, and R. Zane, "Design and Control for High Efficiency in High Step-Down Dual Active Bridge Converters Operating at High Switching Frequency," *IEEE Transactions on Power Electronics*, vol. 28, no. 8, pp. 3931–3940, 2013.
- [33] E. Falkenstein, D. Costinett, R. Zane, and Z. Popovic, "Far-Field RF-Powered Variable Duty Cycle Wireless Sensor Platform," *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 58, no. 12, pp. 822–826, 2011.
- [34] **D. Costinett** and T. P. Horikis, "High-order eigenstate calculation of arbitrary quantum structures," *Journal of Physics A: Mathematical and Theoretical*, vol. 42, p. 235201, 05 2009.

#### PEER-REVIEWED CONFERENCE PUBLICATIONS

- [1] A. Foote, D. Costinett, R. Kusch, J. Pries, M. Mohammad, and B. Ozpineci, "Fourier Analysis Method for Wireless Power Transfer Coil Design," in *2020 IEEE 21st Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2020, pp. 1–8.
- [2] J. A. Baxter and D. J. Costinett, "Steady-State Convergence of Discrete Time State-Space Modeling with State-Dependent Switching," in *2020 IEEE 21st Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2020, pp. 1–8.
- [3] S. Cochran and D. Costinett, "Dual-Loop Frequency Synchronization and Load Regulation using a Discrete Time Model for a 7-Level Switched Capacitor WPT Rectifier," in *2020 IEEE 21st Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2020, pp. 1–8.
- [4] S. Anwar, D. Costinett, S. Mukherjee, and S. Chowdhury, "Control of SiC Based Integrated DC-DC Powertrain Charger for Electric Vehicles," in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2020, pp. 4104–4111.
- [5] J. Sun, J. Li, D. J. Costinett, and L. M. Tolbert, "A GaN-Based CRM Totem-Pole PFC Converter with Fast Dynamic Response and Noise Immunity for a Multi-Receiver WPT System," in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2020, pp. 2555–2562.
- [6] R. Qin, J. Li, and D. Costinett, "A High Frequency Wireless Power Transfer System for Electric Vehicle Charging Using Multi-layer Nonuniform Self-resonant Coil at MHz," in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2020, pp. 5487–5494.
- [7] J. Li, J. Sun, R. Qin, and D. Costinett, "Transmitter Coil Design for Multi-load Wireless Power Transfer Systems," in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2020, pp. 1032–1038.
- [8] P. Pham, S. Cochran, D. J. Costinett, and L. M. Tolbert, "Active Rectifier Design and Synchronization Control for 6.78 MHz Wireless Power Transfer," in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2020, pp. 5501–5508.
- [9] R. Chen, F. Wang, L. M. Tolbert, D. J. Costinett, and B. B. Choi, "Modeling and Analysis of Zero Common-mode Voltage Modulation with Dead-Time for Three-Level Inverter," in *2020 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2020, pp. 2905–2911.
- [10] R. Chen, F. Wang, L. M. Tolbert, D. J. Costinett, and B. B. Choi, "Current Jump Mechanism and Suppression in Paralleled Three-level Inverters with Space Vector Modulation," in *2020 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2020, pp. 3074–3080.
- [11] N. N. Strain, J. Sun, X. Huang, D. J. Costinett, and L. M. Tolbert, "ZVS Analysis of a GaN-Based Series-Parallel Dual Transformer LLC Resonant Converter," in *2019 IEEE 7th Workshop on Wide Bandgap Power Devices and Applications (WIPDA)*, 2019, pp. 398–404.
- [12] F. Wang, R. Chen, H. Gui, J. Niu, L. Tolbert, D. Costinett, B. Blalock, S. Liu, J. Hull, J. Williams, T. Messer, E. Solodovnik, D. Paschedag, V. Khozikov, C. Severns, and B. Choi, "MW-Class Cryogenically-Cooled Inverter for Electric-Aircraft Applications," in *2019 AIAA/IEEE Electric Aircraft Technologies Symposium (EATS)*, 2019, pp. 1–9.
- [13] K. Sabi and D. Costinett, "Design and Implementation of a Bipolar-Unipolar Switched Boundary Current Mode (BCM) Control GaN-Based Single-Phase Inverter," in *2019 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2019, pp. 6473–6480.
- [14] H. Gui, R. Chen, J. Niu, Z. Zhang, F. Wang, L. M. Tolbert, D. J. Costinett, B. J. Blalock, and B. B. Choi, "Design of Low Inductance Busbar for 500 kVA Three-Level ANPC Converter," in *2019 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2019, pp. 7130–7137.
- [15] R. Chen, J. Niu, H. Gui, Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Harmonic Analysis of Common-mode Reduction Modulation for Three-level Inverter," in *2019 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2019, pp. 2286–2293.
- [16] J. Sun, N. N. Strain, D. J. Costinett, and L. M. Tolbert, "Analysis of a GaN-Based CRM Totem-Pole PFC Converter Considering Current Sensing Delay," in *2019 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2019, pp. 4421–4428.
- [17] R. Qin and D. Costinett, "Multi-layer Non-uniform Series Self-resonant Coil for Wireless Power Transfer," in *2019 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2019, pp. 3333–3339.
- [18] K. Sabi and D. Costinett, "Delay Mitigation in High Frequency Dual Current Programmed Mode Control GaN-Based ZVS Inverter," in *2019 20th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2019, pp. 1–7.
- [19] H. Gui, R. Chen, R. Ren, J. Niu, F. Wang, L. M. Tolbert, D. J. Costinett, B. J. Blalock, and B. B. Choi, "Modeling of Multi-Loops Related Device Turn-On Overvoltage in 3L-ANPC Converters," in *2019 20th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2019, pp. 1–6.
- [20] S. Cochran and D. Costinett, "Discrete Time Synchronization Modeling for Active Rectifiers in Wireless Power Transfer Systems," in *2019 20th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2019, pp. 1–8.
- [21] J. A. Baxter and D. J. Costinett, "Converter Analysis Using Discrete Time State-Space Modeling," in *2019 20th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2019, pp. 1–8.
- [22] R. Chen, J. Niu, H. Gui, Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Analytical Analysis of Ac and Dc Side Harmonics of Three-level Active Neutral Point Clamped Inverter with Space Vector Modulation," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 112–119.
- [23] J. Niu, R. Chen, Z. Zhang, H. Gui, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Analysis of Circulating Harmonic Currents in Paralleled Three Level ANPC Inverters using SVM," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 2481–2487.
- [24] H. Gui, Z. Zhang, R. Chen, J. Niu, L. M. Tolbert, F. Wang, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Current Source Gate Drive to Reduce Switching Loss for SiC MOSFETs," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 972–978.
- [25] J. Niu, R. Chen, Z. Zhang, H. Gui, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Design of a Single Controller for Multiple Paralleled Inverters," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 2524–2530.
- [26] B. Liu, R. Ren, F. Wang, D. Costinett, and Z. Zhang, "A Variable Frequency ZVS Control of a Three-level Buck without Zero Crossing Detection for Wide-Range Output Voltage Battery Chargers," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 2311–2316.
- [27] H. Gui, Z. Zhang, R. Chen, R. Ren, J. Niu, B. Liu, H. Li, Z. Dong, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "A Simple Control to Reduce Device Over-Voltage Caused by Non-Active Switch Loop in Three-Level ANPC Converters," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 1337–1343.

- [28] L. Jiang and D. Costinett, "Voltage Slope-sensing Based Zero Voltage Switching Detection for 6.78 MHz Wireless Power Transfer Application," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 678–682.
- [29] C. Zhao, S. Cochran, D. Costinett, and S. Yang, "Design and Evaluation of a Multilevel Switched Capacitor Rectifier for Wireless Fast Charging," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 833–840.
- [30] R. Chen, J. Niu, H. Gui, Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Investigation of Fourth-leg for Common-mode Noise Reduction in Three-level Neutral Point Clamped Inverter Fed Motor Drive," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 2582–2588.
- [31] J. Sun, X. Huang, N. N. Strain, D. J. Costinett, and L. M. Tolbert, "Inductor Design and ZVS Control for a GaN-Based High Efficiency CRM Totem-Pole PFC Converter," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 727–733.
- [32] R. Chen, J. Niu, H. Gui, Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Coupled Inductor Design for Interleaved Three-level Active Neutral Point Clamped Inverters Considering EMI Noise Reduction," in *2019 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2019, pp. 257–264.
- [33] B. Liu, E. Jones, R. Ren, Z. Zhang, F. Wang, and D. Costinett, "Extra Device Capacitance in Three-level Converters and Loss Re-evaluation via Conventional DPT Data," in *2018 1st Workshop on Wide Bandgap Power Devices and Applications in Asia (WiPDA Asia)*, 2018, pp. 193–198.
- [34] J. Sangid, G. Long, P. Mitchell, B. J. Blalock, D. J. Costinett, and L. M. Tolbert, "Comparison of 60V GaN and Si Devices for Class D Audio Applications," in *2018 IEEE 6th Workshop on Wide Bandgap Power Devices and Applications (WiPDA)*, 2018, pp. 73–76.
- [35] R. Ren, H. Gui, Z. Zhang, R. Chen, J. Niu, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Characterization of 650 V Enhancement-mode GaN HEMT at Cryogenic Temperatures," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 891–897.
- [36] H. Gui, Z. Zhang, R. Ren, R. Chen, J. Niu, L. M. Tolbert, F. Wang, B. J. Blalock, D. J. Costinett, and B. B. Choi, "SiC MOSFET Versus Si Super Junction MOSFET-Switching Loss Comparison in Different Switching Cell Configurations," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 6146–6151.
- [37] B. Liu, R. Ren, F. Wang, D. J. Costinett, Z. Zhang, and Y. Ma, "Capacitive Coupling in T-Shape Related EMI Filters: Mechanism, Effects, and Mitigation," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 6404–6409.
- [38] H. Gui, R. Ren, Z. Zhang, R. Chen, J. Niu, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Characterization of 1.2 kV SiC Power MOSFETs at Cryogenic Temperatures," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 7010–7015.
- [39] S. Anwar and D. Costinett, "Modeling Dual Active Bridge Converter Considering the Effect of Magnetizing Inductance for Electric Vehicle Application," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 538–545.
- [40] R. Chen, J. Niu, Z. Zhang, H. Gui, R. Ren, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Zero Sequence Circulating Current Analysis and Reduction in Paralleled Three-level Active Neutral Point Clamped Inverters," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 3024–3031.
- [41] R. Ren, Z. Zhang, B. Liu, R. Chen, H. Gui, J. Niu, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Multi-Commutation Loop Induced Over-voltage Issue on Non-active Switches in Fast Switching Speed Three-Level Active Neutral Point Clamped Phase Leg," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 1328–1333.
- [42] W. Zhang, Z. Zhang, F. Wang, D. Costinett, L. M. Tolbert, and B. J. Blalock, "Characterization and Modeling of a SiC MOSFET's Turn-On Overvoltage," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 7003–7009.
- [43] J. Li and D. Costinett, "Comprehensive Design for 6.78 MHz Wireless Power Transfer Systems," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 906–913.
- [44] R. Chen, Z. Dong, Z. Zhang, H. Gui, J. Niu, R. Ren, F. Wang, L. M. Tolbert, B. J. Blalock, D. J. Costinett, and B. B. Choi, "Core Characterization and Inductor Design Investigation at Low Temperature," in *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018, pp. 4218–4225.
- [45] Z. Zhang, H. Gui, R. Ren, F. Wang, L. M. Tolbert, D. J. Costinett, and B. J. Blalock, "Characterization of Wide Bandgap Semiconductor Devices for Cryogenically-Cooled Power Electronics in Aircraft Applications," in *2018 AIAA/IEEE Electric Aircraft Technologies Symposium (EATS)*, 2018, pp. 1–8.
- [46] S. Cochran and D. Costinett, "Frequency Synchronization and Control for a 6.78 MHz WPT Active Rectifier," in *2018 IEEE 19th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2018, pp. 1–7.
- [47] J. A. Baxter, D. A. Merced, D. J. Costinett, L. M. Tolbert, and B. Ozpineci, "Review of Electrical Architectures and Power Requirements for Automated Vehicles," in *2018 IEEE Transportation Electrification Conference and Expo (ITEC)*, 2018, pp. 944–949.
- [48] C. Zhao, D. Costinett, and S. Yang, "A Seven-Level Switched Capacitor AC-DC Rectifier for Fast Wireless Charging," in *2018 IEEE PELS Workshop on Emerging Technologies: Wireless Power Transfer (Wow)*, 2018, pp. 1–6.
- [49] L. Jiang and D. Costinett, "A GaN-Based 6.78 MHz Single-Stage Transmitter with Constant Output Current for Wireless Power Transfer," in *2018 IEEE PELS Workshop on Emerging Technologies: Wireless Power Transfer (Wow)*, 2018, pp. 1–6.
- [50] B. Liu, R. Ren, Z. Zhang, F. Wang, and D. Costinett, "A sampling scheme for three-phase high switching frequency and speed converter," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 3031–3035.
- [51] L. Jiang and D. Costinett, "A single-stage 6.78 MHz transmitter with the improved light load efficiency for wireless power transfer applications," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 3160–3166.
- [52] G. Gabian, J. Gamble, B. Blalock, and D. Costinett, "Hybrid buck converter optimization and comparison for smart phone integrated battery chargers," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 2148–2154.
- [53] R. Chen, Z. Zhang, R. Ren, J. Niu, H. Gui, F. Wang, L. M. Tolbert, D. J. Costinett, and B. J. Blalock, "Common-mode noise reduction with impedance balancing in DC-fed motor drives," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 2515–2520.
- [54] Z. Zhang, H. Gui, J. Niu, R. Chen, F. Wang, L. M. Tolbert, D. J. Costinett, and B. J. Blalock, "High precision gate signal timing control based active voltage balancing scheme for series-connected fast switching field-effect transistors," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 925–930.
- [55] R. Chen, Z. Zhang, R. Ren, J. Niu, H. Gui, F. Wang, L. M. Tolbert, D. J. Costinett, and B. J. Blalock, "Common-mode inductor saturation analysis and design optimization based on spectrum concept," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 2583–2588.
- [56] J. Dyer, Z. Zhang, F. Wang, D. Costinett, L. M. Tolbert, and B. J. Blalock, "Online condition monitoring based dead-time compensation for high frequency SiC voltage source inverter," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 1854–1860.
- [57] K. Sabi and D. Costinett, "Noise mitigation and delay compensation in high frequency dual current programmed mode control," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 3095–3101.
- [58] J. Li and D. Costinett, "Analysis and design of a series self-resonant coil for wireless power transfer," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 1052–1059.
- [59] Y. Cui, L. M. Tolbert, D. J. Costinett, F. Wang, and B. J. Blalock, "Direct 400 Vdc to 1 Vdc power conversion with input series output parallel connection for data center power supplies," in *2018 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018, pp. 1554–1560.

- [60] J. Dyer, Z. Zhang, F. Wang, D. Costinett, L. M. Tolbert, and B. J. Blalock, "Dead-time optimization for SiC based voltage source converters using online condition monitoring," in *2017 IEEE 5th Workshop on Wide Bandgap Power Devices and Applications (WiPDA)*, 2017, pp. 15–19.
- [61] G. Gabian, J. Gamble, B. Blalock, and D. Costinett, "Modeling high current integrated power converters," in *2017 IEEE 18th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2017, pp. 1–7.
- [62] S. Cochran and D. Costinett, "Modeling a 6.78 MHz synchronous WPT rectifier with reduced THD," in *2017 IEEE 18th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2017, pp. 1–8.
- [63] S. Anwar and D. J. Costinett, "Operating mode transition control of a SiC integrated DC DC powertrain charger for electric vehicles," in *2017 IEEE Transportation Electrification Conference and Expo (ITEC)*, 2017, pp. 152–157.
- [64] L. Jiang, D. Costinett, A. Fathy, and S. Yang, "A single stage AC/RF converter for wireless power transfer applications," in *2017 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2017, pp. 1682–1688.
- [65] G. Gabian, B. Blalock, and D. Costinett, "5V-to-4V integrated buck converter for battery charging applications with an on-chip decoupling capacitor," in *2017 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2017, pp. 178–183.
- [66] Z. Zhang, C. Timms, J. Tang, R. Chen, J. Sangid, F. Wang, L. M. Tolbert, B. J. Blalock, and D. J. Costinett, "Characterization of high-voltage high-speed switching power semiconductors for high frequency cryogenically-cooled application," in *2017 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2017, pp. 1964–1969.
- [67] W. Zhang, Z. Zhang, F. Wang, D. Costinett, L. Tolbert, and B. Blalock, "Common source inductance introduced self-turn-on in MOSFET turn-off transient," in *2017 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2017, pp. 837–842.
- [68] C. Zhao and D. Costinett, "A phase-shift dual-frequency selective harmonic elimination for multiple AC loads in a full bridge inverter configuration," in *2017 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2017, pp. 2880–2887.
- [69] Z. Zhang, F. Wang, D. J. Costinett, L. M. Tolbert, B. J. Blalock, and X. Wu, "Online junction temperature monitoring using turn-off delay time for silicon carbide power devices," in *2016 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2016, pp. 1–7.
- [70] B. Liu, R. Ren, E. Jones, F. Wang, D. Costinett, and Z. Zhang, "A compensation scheme to reduce input current distortion in a GaN based 450 kHz three-phase Vienna type PFC," in *2016 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2016, pp. 1–7.
- [71] R. Ren, B. Liu, E. A. Jones, F. Wang, Z. Zhang, and D. Costinett, "Accurate ZVS boundary in high switching frequency LLC converter," in *2016 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2016, pp. 1–6.
- [72] J. Dyer, Z. Zhang, F. Wang, D. Costinett, L. M. Tolbert, and B. J. Blalock, "Online condition monitoring of SiC devices using intelligent gate drive for converter performance improvement," in *2016 IEEE 4th Workshop on Wide Bandgap Power Devices and Applications (WiPDA)*, 2016, pp. 182–187.
- [73] D. W. Boulter, J. Baxter, and D. Costinett, "Optimization of GaN-based ultra-low power boost converter in far-field energy harvesting," in *2016 IEEE PELS Workshop on Emerging Technologies: Wireless Power Transfer (WoW)*, 2016, pp. 231–237.
- [74] L. Jiang, F. Tamjid, C. Zhao, D. Costinett, A. Fath, and S. Yang, "A GaN-based 100 W two-stage wireless power transmitter with inherent current source output," in *2016 IEEE PELS Workshop on Emerging Technologies: Wireless Power Transfer (WoW)*, 2016, pp. 65–72.
- [75] C. Zhao and D. Costinett, "A dual-mode wireless power transfer system using multi-frequency programmed pulse width modulation," in *2016 IEEE PELS Workshop on Emerging Technologies: Wireless Power Transfer (WoW)*, 2016, pp. 73–80.
- [76] S. Cochran, F. Quaiyum, A. Fathy, D. Costinett, and S. Yang, "A GaN-based synchronous rectifier for WPT receivers with reduced THD," in *2016 IEEE PELS Workshop on Emerging Technologies: Wireless Power Transfer (WoW)*, 2016, pp. 81–87.
- [77] R. Ren, B. Liu, E. A. Jones, F. Wang, Z. Zhang, and D. Costinett, "Dual-output, three-level GaN-based dc-dc converter for battery charger applications," in *2016 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2016, pp. 2441–2448.
- [78] S. Anwar, W. Zhang, F. Wang, and D. J. Costinett, "Integrated DC-DC converter design for Electric Vehicle powertrains," in *2016 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2016, pp. 424–431.
- [79] L. Jiang and D. Costinett, "A triple active bridge DC-DC converter capable of achieving full-range ZVS," in *2016 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2016, pp. 872–879.
- [80] C. Zhao, D. Costinett, B. Trento, and D. Friedrichs, "A single-phase dual frequency inverter based on multi-frequency selective harmonic elimination," in *2016 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2016, pp. 3577–3584.
- [81] E. A. Jones, F. Wang, D. Costinett, Z. Zhang, and B. Guo, "Temperature-dependent turn-on loss analysis for GaN HFETs," in *2016 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2016, pp. 1010–1017.
- [82] Y. Cui, W. Zhang, L. M. Tolbert, D. J. Costinett, F. Wang, and B. J. Blalock, "Soft switching for half bridge current doubler for high voltage point of load converter in data center power supplies," in *2016 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2016, pp. 893–898.
- [83] Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, and D. J. Costinett, "Decoupling of interaction between WBG converter and motor load for switching performance improvement," in *2016 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2016, pp. 1569–1576.
- [84] R. K. Harris, B. M. McCue, B. D. Roehrs, C. Roberts, B. J. Blalock, D. J. Costinett, K. Sariri, G. Megyei, C. Chen, A. Kashyap, and R. Ghandi, "A silicon carbide integrated circuit implementing nonlinear-carrier control for boost converter applications," in *2016 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2016, pp. 3255–3258.
- [85] Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, and D. J. Costinett, "Realization of high speed switching of SiC power devices in voltage source converters," in *2015 IEEE 3rd Workshop on Wide Bandgap Power Devices and Applications (WiPDA)*, 2015, pp. 28–33.
- [86] E. A. Jones, F. Wang, D. Costinett, Z. Zhang, and B. Guo, "Cross conduction analysis for enhancement-mode 650-V GaN HFETs in a phase-leg topology," in *2015 IEEE 3rd Workshop on Wide Bandgap Power Devices and Applications (WiPDA)*, 2015, pp. 98–103.
- [87] S. Zheng, J. Wang, F. Yang, F. Wang, L. M. Tolbert, and D. J. Costinett, "A DC controller for continuous variable series reactors (CVSRs)," in *2015 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2015, pp. 5786–5793.
- [88] E. A. Jones, F. Wang, D. Costinett, Z. Zhang, B. Guo, B. Liu, and R. Ren, "Characterization of an enhancement-mode 650-V GaN HFET," in *2015 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2015, pp. 400–407.
- [89] Z. Wang, X. Shi, L. M. Tolbert, F. F. Wang, Z. Liang, D. J. Costinett, and B. J. Blalock, "Development of a board-level integrated silicon carbide MOSFET power module for high temperature application," in *2015 IEEE International Workshop on Integrated Power Packaging (IWIPP)*, 2015, pp. 123–126.
- [90] W. Zhang, Y. Cui, F. Wang, L. M. Tolbert, B. J. Blalock, and D. J. Costinett, "Investigation of Gallium Nitride devices benefits on LLC resonant DC-DC converter," in *2015 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2015, pp. 146–153.
- [91] Y. Cui, W. Zhang, L. M. Tolbert, D. J. Costinett, F. Wang, and B. J. Blalock, "Efficiency impact of MOSFET output junction capacitance on a high step down ratio phase shift full bridge DC/DC converter," in *2015 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2015, pp. 2083–2089.
- [92] D. Costinett, "Reduced order discrete time modeling of ZVS transition dynamics in the dual active bridge converter," in *2015 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2015, pp. 365–370.

- [93] Y. Cui, W. Zhang, L. M. Tolbert, D. J. Costinett, F. Wang, and B. J. Blalock, "Two phase interleaved ISOP connected high step down ratio phase shift full bridge DC/DC converter with GaN FETs," in *2015 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2015, pp. 1414–1419.
- [94] Y. Long, W. Zhang, D. Costinett, B. B. Blalock, and L. L. Jenkins, "A high-frequency resonant gate driver for enhancement-mode GaN power devices," in *2015 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2015, pp. 1961–1965.
- [95] Z. Zhang, F. Wang, D. J. Costinett, L. M. Tolbert, B. J. Blalock, and Haifeng Lu, "Dead-time optimization of SiC devices for voltage source converter," in *2015 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2015, pp. 1145–1152.
- [96] Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, and D. J. Costinett, "Active gate driver for fast switching and cross-talk suppression of SiC devices in a phase-leg configuration," in *2015 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2015, pp. 774–781.
- [97] Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, and D. Costinett, "Understanding the limitations and impact factors of wide bandgap devices' high switching-speed capability in a voltage source converter," in *2014 IEEE Workshop on Wide Bandgap Power Devices and Applications*, 2014, pp. 7–12.
- [98] W. Zhang, B. Guo, F. Xu, Y. Cui, Y. Long, F. Wang, L. M. Tolbert, B. J. Blalock, and D. J. Costinett, "Wide bandgap power devices based high efficiency power converters for data center application," in *2014 IEEE Workshop on Wide Bandgap Power Devices and Applications*, 2014, pp. 121–126.
- [99] B. Trento, L. M. Tolbert, and D. Costinett, "Grid synchronization using fixed filtering with magnitude and phase compensation," in *2014 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2014, pp. 2641–2647.
- [100] Z. Wang, X. Shi, L. M. Tolbert, F. Wang, Z. Liang, D. Costinett, and B. J. Blalock, "A high temperature silicon carbide MOSFET power module with integrated silicon-on-insulator based gate drive," in *2014 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2014, pp. 4373–4380.
- [101] W. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, and D. Costinett, "Investigation of soft-switching behavior of 600 V cascode GaN HEMT," in *2014 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2014, pp. 2865–2872.
- [102] Z. Zhang, F. Wang, L. M. Tolbert, B. J. Blalock, and D. Costinett, "Evaluation of switching performance of SiC devices in PWM inverter fed induction motor drives," in *2014 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2014, pp. 1597–1604.
- [103] F. J. Azcondo, R. A. Zane, D. Maksimovic, and D. Costinett, "A framework to share courses among universities: The case of a course on power electronics for electric vehicles," in *2014 XI Tecnologías Aplicadas a la Enseñanza de la Electrónica (Technologies Applied to Electronics Teaching) (TAEE)*, 2014, pp. 1–8.
- [104] D. Costinett, K. Hathaway, M. U. Rehman, M. Evzelman, R. Zane, Y. Levron, and D. Maksimovic, "Active balancing system for electric vehicles with incorporated low voltage bus," in *2014 IEEE Applied Power Electronics Conference and Exposition - APEC 2014*, 2014, pp. 3230–3236.
- [105] D. Costinett, R. Zane, and D. Maksimovic, "Discrete time modeling of output disturbances in the dual active bridge converter," in *2014 IEEE Applied Power Electronics Conference and Exposition - APEC 2014*, 2014, pp. 1171–1177.
- [106] D. Costinett, D. Maksimovic, R. Zane, A. Rodriguez, and A. Viquez, "Comparison of reverse recovery behavior of silicon and wide bandgap diodes in high frequency power converters," in *2013 IEEE 14th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2013, pp. 1–8.
- [107] D. Costinett, D. Seltzer, D. Maksimovic, and R. Zane, "Inherent volt-second balancing of magnetic devices in zero-voltage switched power converters," in *2013 Twenty-Eighth Annual IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2013, pp. 9–15.
- [108] D. Costinett, M. Rodriguez, and D. Maksimovi, "Simple Digital Pulse Width Modulator with 60 picoseconds resolution using a low-cost FPGA," in *2012 15th International Power Electronics and Motion Control Conference (EPE/PEMC)*, 2012, pp. LS1e.2–1–LS1e.2–7.
- [109] M. Rodriguez, G. Stahl, D. Costinett, and D. Maksimovi, "Simulation and characterization of GaN HEMT in high-frequency switched-mode power converters," in *2012 IEEE 13th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2012, pp. 1–6.
- [110] D. Costinett, R. Zane, and D. Maksimovi, "Discrete-time small-signal modeling of a 1 MHz efficiency-optimized dual active bridge converter with varying load," in *2012 IEEE 13th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2012, pp. 1–7.
- [111] D. Costinett, R. Zane, and D. Maksimovi, "Circuit-oriented modeling of nonlinear device capacitances in switched mode power converters," in *2012 IEEE 13th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2012, pp. 1–8.
- [112] D. Costinett, R. Zane, and D. Maksimovic, "Automatic voltage and dead time control for efficiency optimization in a Dual Active Bridge converter," in *2012 Twenty-Seventh Annual IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2012, pp. 1104–1111.
- [113] D. Costinett, H. Nguyen, R. Zane, and D. Maksimovic, "GaN-FET based dual active bridge DC-DC converter," in *2011 Twenty-Sixth Annual IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2011, pp. 1425–1432.
- [114] D. Costinett, E. Falkenstein, R. Zane, and Z. Popovic, "RF-powered variable duty cycle wireless sensor," in *The 40th European Microwave Conference*, 2010, pp. 41–44.

## PATENTS AND INVENTION DISCLOSURES

### PATENT APPLICATIONS

- [1] F. Wang, A. Dimitrovski, B. Ozpineci, C. White, D. Costinett, F. Yang, J. Wang, L. Seiber, L. Tolbert, M. Chinthavali, O. Onar, P. Irmingier, S. Zheng, S. Campbell, and Z. Li, "Dc current controller for continuously variable series reactor," US Patent US-10 177 647-B2, Jan. 8, 2019, awarded.
- [2] D. Costinett, C. Zhao, B. Trento, and D. Friedrichs, "System and Method for Harmonic Control of Dual-Output Generators," EP Patent EP-3 216 409-B1, Oct. 24, 2018, awarded.
- [3] R. Zane, M. Evzelman, D. Costinett, D. Maksimovic, R. Anderson, K. Smith, M. S. Trimboli, and G. Plett, "Battery Control," US Patent US-10 063 066-B2, Aug. 28, 2018, awarded.
- [4] R. Zane, M. Evzelman, D. Costinett, D. Maksimovic, R. Anderson, K. Smith, M. S. Trimboli, and G. Plett, "Model predictive control and optimization for battery charging and discharging," US Patent US-10 298 026-B2, May 21, 2019, awarded.
- [5] R. Zane, M. Evzelman, D. Costinett, D. Maksimovic, R. Anderson, K. Smith, M. S. Trimboli, and G. Plett, "omous battery control and optimization," U.S. Patent US-10 277 041-B2, Apr. 30, 2019, awarded.
- [6] D. Costinett and C. Zhao, "Dual-frequency mode transmitter for wireless power transfer," U.S. Patent 15/718,767, Sep. 28, 2017, awarded.
- [7] D. Costinett, C. Zhao, and S. Yang, "Multilevel switched-capacitor ac-dc rectifier for wireless charging with power regulation," WO Patent WO-2019 232 363-A1, May 31, 2019, pending.
- [8] D. Costinett, C. Zhao, B. Trento, and D. Friedrichs, "Electrosurgical generator with an inverter and with a controller for minimizing harmonics," EP Patent EP-3 248 560-A1, May 2, 2017, pending.
- [9] D. Costinett, C. Zhao, B. Trento, and D. Friedrichs, "System and Method for Harmonic Control of Dual-Output Generators," US Patent US-2017 209 202-A1, Jan. 23, 2016, pending.

- [10] D. Costinett, C. Zhao, B. Trento, and D. Friedrichs, "System and Method for Harmonic Control of Dual-Output Generators," JP Patent JP-2018 167 040-A, Jun. 5, 2018, pending.
- [11] D. Costinett, C. Zhao, B. Trento, and D. Friedrichs, "Method for harmonic control of dual-output generators," EP Patent EP-3 434 213-A1, Jan. 20, 2017, pending.
- [12] J. Li, R. Qin, and D. Costinett, "Series self-resonant coil structure for conducting wireless power transfer," WO Patent WO-2019 173 579-A1, Mar. 7, 2019, pending.
- [13] D. Costinett and L. Jiang, "Single-stage transmitter for wireless power transfer," WO Patent WO-2018 169 520-A1, Mar. 14, 2017, pending.

#### PROVISIONAL PATENTS

- [1] C. Zhao, D. Costinett, and S. Yang, "Multilevel Switched-Capacitor AC-DC Rectifier for Wireless Charging with Power Regulation," U.S. Patent 62/679,577, Jun. 1, 2018, filed/to be converted.
- [2] Z. Zhang, F. Wang, L. Tolbert, D. Costinett, and B. Blalock, "Fully decoupled intelligent phase-leg power module and methods thereof," U.S. Patent 62/449,282, Jan. 23, 2017, expired.
- [3] Z. Zhang, F. Wang, L. Tolbert, D. Costinett, and B. Blalock, "Methods for online junction temperature modeling," U.S. Patent 62/394,546, Sep. 14, 2016, expired.
- [4] Y. Cui, F. Wang, L. Tolbert, D. Costinett, and B. Blalock, "Load dependent zero voltage switching on PWM converter," U.S. Patent 62/311,517, Mar. 22, 2016, expired.