

# Mostak Mohammad

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## EXPERIENCE

### 1. Oak Ridge National Laboratory, TN, USA

- *R&D Associate* *August 2021 - Present*
- *Postdoctoral Research Associate* *August 2019 – July 2021*
- *ASTRO Internship* *May 2018 - January 2019*
  - High-fidelity FEA modeling of wireless charging system (11-300 kW) and electric machine for EV.
  - Rotary transformer (5-10 kW) design for wound field traction motor
  - Electromagnetic shield design and thermal Analysis of 50-300 kW wireless charging systems.

### 2. The University of Akron, OH, USA

*Graduate Research and Teaching Assistant*

*June 2014 – May 2019*

### 3. Robi Axiata Limited, Dhaka, Bangladesh

*Specialist, Radio Network Planning*

*July 2009 - June 2014*

## EDUCATION

### The University of Akron, Ohio, USA

PhD in Electrical Engineering

*June 2014 – August 2019*

### Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

B.Sc. in Electrical and Electronic Engineering

*March 2004 – March 2009*

## AREAS OF EXPERTISE

■ Wireless power transfer ■ Rotary Transformer ■ Planar Magnetics ■ EM Shielding ■ Electric Machines

## HARDWARES AND SOFTWARES

- **Hardware:** High-power (3-300 kW) wireless charging system and rotary transformer prototyping and testing.
- **Software:** COMSOL Multiphysics, ANSYS Maxwell, MATLAB, Simulink, and PLECS.

## AWARDS

- **Prize Paper Award**, IEEE Wireless Power Conference and Expo, June 2023
- **Significant Performance Award**, Oak Ridge National Laboratory, Dec. 2021, Dec. 2022
- **Prize Paper Award**, IEEE Transaction on Transportation Electrification, 2022
- **Technology Transfer Award**, Oak Ridge National Laboratory, Dec. 2021
- **Best Paper Award**, IEEE Workshop on Control and Modeling of Power Electronics (COMPEL), Nov. 2020
- **Best Paper Award**, IEEE IAS Transportation systems Committee, Sept. 2019
- **Outstanding Researcher Award**, University of Akron, June 2019
- **Paper Presentation Award**, IEEE Applied Power Electronics Conference (APEC), March 2016

## PATENTS

- **M. Mohammad, et al.**, “Rotor current prediction in an electric motor drive having an only-stationary-side compensation network”  
Publication of US20230344321A1
- **M. Mohammad, et al.**, “Rotary transformer with integrated power electronics”, Publication of US20230344317A1
- **M. Mohammad, et al.**, “Only-stationary-side compensation network”, Publication of US20230344315A1
- **M. Mohammad, et al.**, “PCB-based stranded, twisted excitation windings in rotary transformers”, Publication of WO2023205516A1
- **M. Mohammad, et al.**, “Shield Design for Wireless Charging System”, Patent # US20220242258A1, 2022.
- V. Rallabandi, **M. Mohammad, et al.**, “In-wheel motor with integrated wireless charging”, Filed with BMW. Appl. No: 18/205,289
- **M. Mohammad, et al.**, “Unipolar polyphase wireless charging system”, Filed jointly with BMW.
- **M. Mohammad, et al.**, “Wireless power transfer system [Triple Layer Coil]”, Filed, U.S. Prov. Appl. No. 63/414,969, Oct. 2023.
- **M. Mohammad, et al.**, “Wireless power system [Resonant Tuning Network]”, Filed, WNJ Ref: 138974.202070-US

## PUBLICATIONS

### Journals:

- [1] **M. Mohammad**, O. Onar, J. Pries, Veda P. Galigekere, Gui-Jia Su, and J. Wilkins, "Magnetic Shield Design for Double-D Coil-based Wireless Charging System", in *IEEE Transaction of Power Electronics*, July. 2022.
- [2] **M. Mohammad**, J. Pries, O. Onar, Veda P. Galigekere, Gui-Jia Su, and J. Wilkins, "Bidirectional LCC-LCC Compensated 20 kW Wireless Power Transfer System for Medium-Duty Vehicle Charging", *IEEE Transactions on Transportation Electrification*, Jan. 2021. (**Prize Paper**)
- [3] **M. Mohammad**, E. T. Wodajo, S. Choi, M. Elbuluk, "Modeling and Design of Passive Shield to Limit EMF Emission and Minimize Shield Loss in Unipolar Wireless Charging System for EV," in *IEEE Transaction on Power Electronics*, Mar. 2019.
- [4] **M. Mohammad**, S. Choi, "Loss Minimization Design of Ferrite Core for Double-D Coil Wireless Charging System for Electrical Vehicles," in *IEEE Transaction on Transportation Electrification*, Oct. 2019.
- [5] **M. Mohammad**, S. Choi, M. Z. Islam, S. Kwak, and J. Baek, "Core Design and Optimization for Better Misalignment Tolerance and Higher Range Wireless Charging of PHEV," in *IEEE Transactions on Transportation Electrification*, Feb. 2017.
- [6] A. Aktas, O. Onar, E. Asa, **M. Mohammad**, B. Ozpineci, LM Tolbert, "Sensitivity Analysis of a Polyphase Wireless Power Transfer System under Off-Nominal Conditions" in *IEEE Transactions on Transportation Electrification*, Dec. 2023.
- [7] L. Xue, V. Galigekere, E. Gurpinar, G. Su, S. Chowdhury, **M. Mohammad**, O. Onar, "Modular Power Electronics Approach for High Power Dynamic Wireless Charging System", in *IEEE Transactions on Transportation Electrification*, April 2023.

### Selected Conference Papers:

- [8] **M. Mohammad**, V. Rallabandi, L. Xue, G. Su, V. Galigekere, S. Chowdhury, J. Wilkins, "Self-Resonant Coil Design for High-frequency High-Power Inductive Wireless Power Transfer" IEEE Wireless Power Technology Conference and Expo (WPTCE), June 2023. (**Best Paper Award**)
- [9] **M. Mohammad**, O. Onar, J. Pries, V. P. Galigekere, G. Su, and J. Wilkins, "Thermal Design and Optimization of High-Power Wireless Charging System", in *IEEE Applied Power Electronics Conference (APEC)*, March 2022.
- [10] **M. Mohammad**, O. Onar, J. Pries, V. P. Galigekere, G. Su, and J. Wilkins, "Thermal Analysis of 50 kW Three-Phase Wireless Charging System", in *IEEE Transportation Electrification Conference (ITEC 2021)*.
- [11] **M. Mohammad**, O. Onar, G. Su, J. Pries, V. P. Galigekere, and J. Wilkins, "Magnetic Field Emission and Shield Requirements for Interoperating High-Power EV Wireless Charging System," accepted in *IEEE Applied Power Electronics Conference (APEC 2021)*.
- [12] **M. Mohammad**, O. Onar, G. Su, J. Pries, V. P. Galigekere, and J. Wilkins, "Three Phase LCC-LCC compensated 50 kW Wireless Charging System with Non-Zero Interphase Coupling," accepted in *IEEE Applied Power Electronics Conference (APEC 2021)*.
- [13] **M. Mohammad**, J. Pries, O. Onar, Veda P. Galigekere, "Shield Design for 50 kW Three-Phase Wireless Charging System", *IEEE Energy Conversion Congress and Exposition (ECCE)*, Oct. 2020.
- [14] **M. Mohammad**, J. Pries, O. Onar, Veda P. Galigekere, Gui-Jia Su, and J. Wilkins, "Comparison of Magnetic Field Emission from Unipolar and Bipolar Coil-Based Wireless Charging Systems", *IEEE Transportation Electrification Conference and Expo, (ITEC)*, June 2020.
- [15] **M. Mohammad**, J. Pries, O. Onar, Veda P. Galigekere, Gui-Jia Su, S. Anwar, J. Wilkins, Utkarsh D. Kavimandan, and D. Patil, "Design of an EMF Suppressing Magnetic Shield for a 100-kW DD-Coil Wireless Charging System for Electric Vehicles", *IEEE APEC*, Mar. 2019.
- [16] **M. Mohammad**, J. Pries, O. Onar, V. P. Galigekere, Gui-Jia Su, S. Anwar, J. Wilkins, "Sensitivity Analysis of an LCC-LCC Compensated 20kW Bidirectional Wireless Charging System for Medium-Duty Vehicle", *IEEE Transportation Electrification Conf and Expo*, June 2019.
- [17] **M. Mohammad**, J. Pries, O. Onar, S. Anwar, V. P. Galigekere, Gui-Jia Su, J. Wilkins, "Comparison of Leakage Magnetic Field from Matched and Mismatched Double-D Coil based Wireless Charging System for Electric Vehicles" *IEEE Energy Conversion Cong and Exp (ECCE)*, 2019.
- [18] **M. Mohammad**, M. S. Haque, S. Choi, "A Litz-Wire Based Passive Shield Design to limit EMF Emission from Wireless Charging System" *IEEE Energy Conversion Congress and Exposition (ECCE)*, Sept. 2018. (**Best Paper Award**)
- [19] **M. Mohammad**, S. Choi, "Optimization of Ferrite Core to Reduce the Core Loss in Double-D Pad of Wireless Charging System for Electric Vehicles," *IEEE Applied Power Electronics Conference (APEC)*, Mar 2018.
- [20] **M. Mohammad** and S. Choi, "Sensor-less estimation of coupling coefficient based on current and voltage harmonics analysis for wireless charging system," *IEEE Energy Conversion Congress and Exposition (ECCE)*, Sept. 2017.
- [21] **M. Mohammad**, S. Kwak, and S. Choi, "Core Design for Better Misalignment Tolerance and Higher Range of Wireless Charging for HEV," *IEEE Applied Power Electronics Conference (APEC)*, 2016. (**Paper Presentation Award**)
- [22] A. Foote, D. Costinett, R. Kusch, J. Pries, **M. Mohammad**, B. Ozpineci, "Fourier Analysis Method for Wireless Power Transfer Coil Design", *IEEE 21st Workshop on Control and Modeling for Power Electronics (COMPEL)*, Nov. 2020. (**Best Paper Award**)
- [23] M. S. Haque, **M. Mohammad**, S. Choi, "Sensitivity Analysis and Controller Design of High Power LCC-LCC Compensated Wireless Battery Charging for Electric Ship Applications", *IEEE Applied Power Electronics Conference and Exposition (APEC)*, Mar. 2020.
- [24] M. S. Haque, **M. Mohammad**, S. Choi, "Comparison of 22 kHz and 85 kHz 50 kW Wireless Charging System using Si and SiC Switches for Electric Vehicle," *IEEE Workshop on Wide Bandgap Power Devices and Applications (WIPDA)*, Oct 2018.
- [25] A. Scher, **M. Mohammad**, O. Onar, and B. Ozpineci, "Design and Optimization of Cancellation Coil Topologies for a Ferrite-less Wireless EV Charging Pad", in *IEEE Transportation Electrification Conference (ITEC 2021)*.
- [26] E. Asa, **M. Mohammad**, O. Onar, J. Pries, Veda P. Galigekere, and Gui-Jia Su, "Review of Safety and Exposure Limits of Electromagnetic Fields (EMF) in Wireless Electric Vehicle Charging (WEVC) Applications", *IEEE Transportation Electrification Conf and Expo*, June 2020.
- [27] B. Zheng, et al., **M. Mohammad**, "Quasi-dynamic Electromagnetic Field Safety Analysis and Mitigation for High-Power Dynamic Wireless Charging of EVs", in *IEEE Transportation Electrification Conference (ITEC 2021)*.
- [28] U. Kavimandan, V. Galigekere, O. Onar, **M. Mohammad**, et al., "The Sensitivity Analysis of Coil Misalignment for a 200-kW Dynamic Wireless Power Transfer System with an LCC-S and LCC-P Compensation", in *IEEE ITEC*, 2021.
- [29] E. Gurpinar, **M. Mohammad**, et al., "Failure Modes and Effects Analysis for Wireless and Extreme Fast Charging," Department of Transportation. National Highway Traffic Safety Administration, United States, [Online]: <https://rosap.ntl.bts.gov/view/dot/57152>, 2021.

- [30] O. Onar, G. Su, **M. Mohammad**, *et al*, "A 100-kW Wireless Power Transfer System Development Using Polyphase Electromagnetic Couplers", IEEE Transportation Electrification Conference & Expo (ITEC), June 2022.
- [31] L. Xue, V. P. Galigekere, G. Su, R. Zeng, **M. Mohammad**, *et al.*, "Design and Analysis of a 200 kW Dynamic Wireless Charging System for Electric Vehicles", IEEE Applied Power Electronics Conference and Exposition (APEC), March 2022.
- [32] E. Asa, L. Xue, **M. Mohammad**, V. P. Galigekere, O. Onar, B. Ozpineci, "A 1MHz Oak Ridge AC/DC Converter for UAV Contactless Charger Implementation", IEEE Applied Power Electronics Conference and Exposition (APEC), March 2022.
- [33] R. Zeng, O. Onar, **M. Mohammad**, G. Su, E. Asa, V. Galigekere, "Modeling and Analysis of a Polyphase Wireless Power Transfer System for EV Charging Applications", IEEE Applied Power Electronics Conference and Exposition (APEC), March 2022.