

Modeling and Active Mitigation of EMI for High Power Electronics Converters

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ABSTRACT:

This tutorial focuses on studying of electromagnetic interference (EMI) modeling and active mitigation technology for power electronics converters, especially for the Modular Multilevel Converters (MMC) in smart grid application.

This tutorial begins with the introduction of EMI issue of power electronics converters, illustrating the EMI source, path and impact in high power converters. With regular voltage source converter and complex MMC as target, the modeling of EMI is introduced for the understanding and prediction of EMI. Then the EMI mitigation methods for high power converter are discussed in two parts, focusing on active mitigation methods, including modulation, gate driver, common-mode cancellation and active EMI filters, to achieve EMI mitigation with less passive components. The knowledge introduced in this tutorial can be useful for the engineers and scholars for high power converter design and operation.

This tutorial is based on the Natural Science Foundation of China (NSFC) key project under grant U1866211. This project is a joint project between Huazhong University of Science and Technology and Beijing Jiaotong University, together with State Grid of China. The main tutorial content is based on the research contribution of this project from 2019 to 2022.

TALKS:

Introduction of High Power Electronics Converter and Its EMI Issues.

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Modeling of EMI for High Power Converters

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Active EMI Mitigation for High Power Converters--Part I

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Active EMI Mitigation for High Power Converters--Part II

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Dong Jiang (S05'-M12'-SM16') received the B.S. and M.S. degrees in electrical engineering from Tsinghua University, Beijing, China, in 2005 and 2007, respectively. He received PhD degree from University of Tennessee, Knoxville, TN, USA in power electronics and motor drives in 2011. He was with the United Technologies Research Center, East Hartford, CT, USA, as a Senior Research Scientist/Engineer, from January 2012 to July 2015. He has been with the Huazhong University of Science & Technology, Wuhan, China, as a Professor, since July 2015. His main research interests include power electronics and motor drives, with more than 100 published IEEE journal and conference papers and 50 granted patents in this area. Dr. Jiang is an Associate Editor for the IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS. He was the recipient of several best paper awards in IEEE conferences. He is the chair of IEEE PELS Wuhan Chapter. He is the first author for the book "Advanced Pulse-Width-Modulation: with Freedom to Optimize Power Electronics Converters" in Springer Press.



Hong Li (S'07-M'09-SM15') received the B.Sc. degree in electrical engineering from Taiyuan University of Technology, Taiyuan, China, in 2002, the M.Sc. degree in electrical engineering from South China University of Technology, Guangzhou, China, in 2005, and the Ph.D. degree in electrical engineering from Fernuniversität in Hagen, Germany, in 2009. She is currently a Full Professor with the School of Electrical Engineering, Beijing Jiaotong University, Beijing, China. She has published 1 book, 63 journal papers, and 60 conference papers. She has also authorized 30 patents. Her research interests include nonlinear modeling, analysis and its applications, EMI suppressing methods for power electronic systems, wide bandgap power devices and applications. Dr. Li is an Associate Editor of the IEEE Transactions on Industrial Electronics, an Associate Editor of the IEEE Transactions on Power Electronics, an Associate Editor of the IEEE Open Journal of Industrial Electronics Society, an Associate Editor of the Chinese Journal of Electrical Engineering, the vice chair of IEEE PELS Beijing Chapter and the Vice Chairman of Electromagnetic Compatibility Specialized Committee in China Power Supply Society.



Xuejun Pei (M12'-SM17') received the B.S. degree, the M.S. degree and Ph.D. degree in electrical engineering from Huazhong University of Science and Technology, Wuhan, China, in 1998, 2001, and 2004, respectively. He is now the full professor of School Electrical and Electronics Engineering of at Huazhong University of Science and Technology. His research interest includes the control techniques of power electronic converters, EMI, protection issue, and fault diagnosis in high power converter. He has published over 20 papers in IEEE Transaction journals and 30 papers in IEEE conferences.

He has gained two state and ministry science and technology progress awards. He was awarded 2010 Delta Visiting Scholar and 2016 Delta Young Scholar. He is the reviewer of IEEE Transactions on power electronics, industrial electronics, n industry applications, and IET journals.