

## TITLE:

# EMI IN MOTOR DRIVE SYSTEMS



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## BIO

**Lei Xing** received the B.S. and M.S. degrees in control science and engineering from Tsinghua University, Beijing, China, in 2004 and 2007, respectively and his Ph. D degree in Electric Power Engineering from Rensselaer Polytechnic Institute, Troy, New York, USA, in 2011. He has been worked with Raytheon Technologies Research Center (formerly United Technologies Research Center) since 2011, where he is a Staff Engineer in the power electronics team. His research interests are in EMI filter design and optimization for power converters and power electronics control technologies, particularly in aerospace applications. His research experience focuses on rectifiers and motor drives.

## TUTORIAL ABSTRACT

### EMI in Motor Drive Systems

This tutorial will start with an introduction for basics of electromagnetic interference (EMI), including an overview of EMI issues and the required equipment and procedure for EMI measurements. This is to build up a fundamental understanding for EMI in motor drives systems, especially for audience who are not familiar with this topic. The second topic is EMI modeling. A proper EMI model can help understand the generation and propagation of the EMI noise in a motor drive system and provide a platform for further EMI solution designs.

This section will cover major components in a typical motor drive system, including pulse width modulation (PWM), passive components (capacitors and inductors), semiconductor devices and motors. Both component model and modeling methods will be shown in this section. Next section focuses on EMI mitigation technologies. This section will cover some technologies such as noise cancellation methods (like interleaving, PWM technologies), passive filters design and optimization, such as inductor optimization and filter damper design. Active and hybrid filters will be illustrated as well. Finally, there will be a section for some further discussions. This section aims at providing some thoughts for other related EMI topics for the audience, like a system level EMI design and radiative EMI.

There are several goals of this tutorial. First of all, help the audience understand EMI issues in motor drive systems and the procedure of a correct EMI test, especially for audience not familiar with EMI. This tutorial also introduces EMI modeling methods that can help further EMI solution design and the modeling process should be easy to conduct at a power electronics/motor drive lab. Finally, the tutorial will explain EMI mitigation technologies to the audience to solve EMI issues in practice.