Educational Short Course 2: EMI: Theory, Coupling Mechanisms, Equivalent Circuits, and Solutions

Thursday, September 8, 2011, 8:30 AM – 12:00 Noon

Speaker: Dr. Michael Schutten, General Electric Global Research Center

Short Biography: Dr. Schutten received his Ph.D. and Masters degrees in Electric Power Engineering from Rensselaer Polytechnic Institute, and his M.S.E.E and B.S.E.E. from Marquette University. From 1983 to 1987 he worked for General Electric Medical Systems where he developed high frequency X-ray and CT generators. For the last 24 years he has been a member of the technical staff at General Electric Global Research Center in upstate New York. He is actively involved with industrial, commercial, and military EMI topics. Mike is a former member of the CISPR 11 working group. His experience includes development of novel EMI testing and injection equipment to isolate, quantify, decouple, and improve electronic system EMI performance. Mike has developed several high density, low noise power converters for consumer, industrial and military applications. His areas of expertise include electromagnetic interference, power electronics, nonlinear control theory, and analog electronics. Mike has 23 issued patents, with several additional pending. He has authored several conference and transactions papers.

Short Course Description: This short course is intended as a comprehensive introduction for engineers wishing to obtain a fundamental understanding of EMI issues, and experienced engineers with a desire for a thorough understanding of electromagnetic interference (EMI) issues. This short course introduces the concept of electromagnetic energy coupling between electronic circuits. The fundamentals of EMI are presented including terminology, energy transfer mechanisms, equivalent circuits, and EMI circuit fixes. The short course provides several examples of how one electronic circuit has the ability to corrupt or damage a different circuit. The characteristics and electrical symptoms of the four methods of EMI energy transfer are presented: Common impedance coupling, magnetic field coupling, electric field coupling, and radiation coupling. Simple methods for approximating the equivalent circuit, and low cost solutions at the board or component level are provided. PWB layout and IC decoupling procedures are derived from fundamental EMI concepts. Several videotaped experiments demonstrate fundamental EMI coupling techniques and electrical fixes.