Fundamentals of Applied EMC Engineering
(Two Day Seminar)

DEFINITION OF EMC TERMS
- Basic Aspects of EMC
- Elements of the EMC Environment
- Regulatory Requirements
- International Immunity Requirements
- Performance Criteria for Immunity Tests

WHAT IT TAKES TO BE EMC COMPLIANT
- Areas of Concerns to Achieve EMC
- System Requirements
- North American and International Limits
- Documentation Requirements

FUNDAMENTALS OF SIGNAL INTEGRITY (TIME DOMAIN)
- Signal Integrity Concerns
- Transmission Lines Concepts
- Relative Permittivity (Dielectric Constant)
- Ringing and Reflections
- Identification of Signal Distortion
- Crosstalk
- Transmission Line Effects
- Termination Methodologies

FUNDAMENTALS OF EMC (FREQUENCY DOMAIN)
- Signal Spectra (Fourier Analysis)
- Maxwell Equations Made Simple
- Electric and Magnetic Field Impedance
- Magnetic and Electric Field Representation
- Closed Loop Circuit
- Loop Area Between Components
- Noise Coupling Mechanism
- Common-Mode and Differential-Mode Currents
- Comparison of Radiation Mechanisms
- Basic EMC Suppression Concept

FUNDAMENTALS OF PCB DESIGN AND LAYOUT
- Fundamental Requirements
- Component Characteristics at RF Frequencies
- Image Planes
- RF Current Density Distribution
- Ground Loop Control
- Functional Partitioning
- Component Selection Related to EMC
- Defining Capacitor Usage
- Using Capacitors in Parallel
- Effects of Capacitors in Parallel
- Power and Ground Plane Capacitance
- Microstrip and Stripline Topology
- Impedance Control
- Capacitive Loading
- Calculating Trace Lengths
- Trace Separation and the 3-W Rule
- Routing Layers and Layer Jumping
- Partitioning
- Isolation (Moating) and Bridging
- Image Plane or Moat Violation
- Digital and Analog Partitioning
- Multi-Point Grounding (I/O Connectors)

GROUNDING SYSTEMS
- What is Ground?
- Grounding Hierarchy
- Different Types of Grounds
- Grounding Misconceptions
- Two Reasons for the Need to Ground
- Floating, Single-Point, Multi-Point, Hybrid
- Cable Shield Grounding

FILTERING, SHIELDING AND GASKETING
- Signal and Power Line Filter Configurations
- Basic Filter Component Characteristics
- Capacitive and Inductive Filtering
- Filtering Guideline
- Shielding Effectiveness
- Transmission Line Theory of Shielding
- Losses Achieved with Shielding Material
- Skin Depth and Absorption Loss
- Reflection Loss - Plane Waves/Thin Shields
- Apertures
- Waveguide Below Cutoff
- Common Gaskets and Mechanical Problems

APPROACH TOWARD TESTING, TROUBLESHOOTING AND CERTIFICATION
- International Requirements and Differences
- Testing Methodology and Approach
- Knowing the Test Environment
- Self-Compatibility
- Validation of Measured Data
- Pitfalls and Problems
- Process for Designing Systems to Achieve EMC
- Formal EMC Qualification Tests Requirements
- Strategy for EMI Debugging/Troubleshooting
- Testing and Troubleshooting Concerns
- Emission, Immunity and In Situ Testing
- Systematic Approach for Testing
- Compliance Measurement Procedure
- Performing Testing-Beyond Standard Procedures
- Systematic Approach to Solving Problems