Fundamentals of EMC Testing
Approaches and Techniques
(Two Day Seminar)

FUNDAMENTALS OF EMC TESTING
- Definition of EMC Terms
- Basic Aspects of EMC
- Overview on Product Testing
- Time Domain and Frequency Domain Analysis

HOW RF ENERGY EXISTS
- Types of Electromagnetic Fields
- How Transmission Lines Create EMI
- Right Hand Rule
- Maxwell's Equations
- Electric and Magnetic Field Components
- Magnetic and Electric Field Representation
- Closed Loop Circuit
- Low- and High-Frequency Representation of a Circuit
- Radiated Emissions from a Closed Loop Circuit
- Loop Area Causing Radiated Emissions
- Common-Mode and Differential-Mode Currents
- Differential-Mode and Common-Mode Currents in a Chassis
- Coupling Paths (Radiated and Conducted)

POPULAR INSTRUMENTATION
- Time Domain Analyzer (Oscilloscope)
- Characteristics to Consider in Choosing an Oscilloscope
- Oscilloscope Probes
- Frequency Domain Analyzers
- Spectrum Analyzers
- Receivers
- Pre-Compliance versus Compliance Analyzers

TEST FACILITIES
- Open Area Test Site (OATS)
- Chambers
- Screen/Shield Rooms
- Reverberation Chamber
- TEM and Other Specialized Test Cells

PROBES, ANTENNAS AND SUPPORT EQUIPMENT
- Need for Transducers (Probes and Antennas)
- Concerns When Using Transducers
- Voltage Probes
- Current Probes
- LISN/AMN (AC Mains)
- Coupling/Decoupling Networks (CDNs)
- Bulk Current Injection (BCI) - Probe and Insertion Clamp
- Near-Field and Closed-Field Probes
- Sniffer Probes
- Alternate Troubleshooting Devices
- Far Field Antennas

SYSTEMATIC APPROACH TOWARD EMISSION TESTING AND TROUBLESHOOTING
- Formal EMC Qualification Tests
- Emission Testing
- Systematic Approach for Emissions Testing
- Immunity Testing
- Systematic Approach for Immunity Testing
- In Situ Testing
- Considerations Related to In Situ Testing
- Minimum Requirements for Performing EMC Tests
- Compliance Measurement Procedures - Emission Testing
- Potential Problems During Emission Testing
- Testing for Environmental Noise Related to AC/Mains
- Performing Radiated Tests - Beyond Standard Procedures
- Pre-Compliance Testing-Engineering Investigations
- Systematic Approach to Detecting and Locating Problems
- Emergency Debug and Diagnostic Toolkit

PERFORMING EMISSION TESTS
- Typical System Requirements
- Instrumentation Error
- Operating Conditions
- Overview On Performing Conducted Testing
- Common-Mode and Differential-Mode on Wires and Cables
- Determining Coupling Modes
- Coupling Paths for Conducted Emissions
- Conducted Emissions Setup
- Conducted Emissions Testing (AC Power Mains)
- Radiated Emissions
- Test Report Requirements

PERFORMING RADIATED IMMUNITY TESTS
- Overivew on Radiated Immunity Testing
- Concerns Regarding Radiated Immunity Testing
- Electrostatic Discharge (ESD)
- Diagnostics and Fixes
- Power Frequency Magnetic Field Disturbance

PERFORMING CONDUCTED IMMUNITY TESTS
- Most Common Tests Performed for Conducted Immunity
- Electrical Fast Transients / Bursts Testing (EFT/B)
- Surge or High Energetic Line Transients
- RF Current Conducted Immunity
- AC Mains Supply Dips, Dropouts and Interruptions

SIMPLIFIED TESTING AND TROUBLESHOOTING TECHNIQUES
- Quick Fixes and Solutions – Conducted Currents
- Quick Fixes and Solutions – Radiated Fields
- Simplified Troubleshooting Techniques
- Simplified Testing and Troubleshooting Concepts Using Probes
- Switching Power Supply Effects on Common-Mode Conducted Noise
- Enclosure Resonances and Shielding Effectiveness
- Determining if Conducted Emission Noise is Differential or Common-Mode
- Potential Problems When Using Ferrite Clamps
- Measuring Shielding Effectiveness of Materials and Enclosures
- Measuring Noise Voltage Across Seams in Enclosures
- Printed Circuit Board Level Diagnostic Scanners