## Electromagnetic Interference and Compatibility (RP 4.2.18)

**Introduction To EMI and EMC:-** Definitions, Different Sources of EMI(Electro-magnetic Interference), Victims of EMI, Inter Source and Intra Source s EMI, Electro-static discharge(ESD),Electro-magnetic pulse(EMP), Lightning, Mechanism of Electromagnetic Noise Coupling, Radiated Emission, Radiated Susceptibility, Conducted Emission, Conducted Susceptibility, Differential & Common Mode Noise Coupling. Concepts of EMC, EMC units.

**EMC requirements for electronic systems:-** World regulatory bodies- FCC, CISPR etc. Class-A devices, class-B devices, Regulations of the bodies on EMC issues.

**EMC mitigation techniques:-**

- **Grounding:** Fundamental grounding concepts, Floating ground, Single-point, Multi-point and hybrid ground, advantages & disadvantages of different grounding techniques.
- **Shielding:** Basic concepts of shielding, Different types of shielding, Shielding effectiveness(S.E),S.E of a conducting barrier to a normal incident plane wave, multiple reflection within a shield, mechanism of attenuation provided by shield, shielding against magnetic field & Electric field (E & H Field shielding), S.E for Electronic metal & Magnetic metal, Skin-depth, S.E for far-field sources, shield seams, shielding materials.
- **Noise Coupling,** Capacitive coupling between two conductors, inductive coupling, common impedance coupling, ground loop.
- **Filtering & decoupling.**

**Antennas -** Characteristics of antennas, fields due to short electric dipole & small loop and large loop, near field & Far-field sources & their characteristics. Broadband antenna measurements, antenna factor (transmitting and receiving antenna factors), antenna gain calibration technique.

**Detector:** Quasi peak, peak and average detectors.

**EMI-EMC Measurements -** EMC measurement set, Power losses in cable, Measuring & Test systems, Test facilities, Open area test range and anechoic chamber and their relative advantage and disadvantages, Methodology for measurements of radiated emission and radiated susceptibility, Line Impedance Stabilization network (LISN), Methodology for measurements of conducted emission.

**Non-ideal behavior of different electronic components –** Examples: Personal Computers, Health Hazards-limits, EMC in healthcare environment.

**Time-domain & Frequency-domain Analysis of Different Signals -** Fourier series & Fourier transform of different signals, identifying the frequency, phase & power spectrum of different signals. Time-domain Reflectrometry (TDR) basics for determining the properties of a transmission line.

**Characteristics of Surge, EFT/ Burst, ESD**