

Glossary of Terms

Electrical

Absorption Loss: Attenuation of an electromagnetic wave or energy encountered in penetrating a shield caused by the induction of current flow in the barrier and the resulting I^2R loss. Usually stated in dB (decibels).

Ambient Electromagnetic Environment:

That electromagnetic field level existing in an area and emanating from sources other than the system under test.

Attenuation: A reduction in energy. Attenuation occurs naturally during wave travel through transmission lines, waveguides, space or a medium such as water, or may be produced intentionally by inserting an attenuator in a circuit or a shielding absorbing device in the path of radiation. The degree of attenuation is expressed in decibels or decibels per unit length.

Attenuator: An arrangement of fixed and/or variable resistive elements used to attenuate a signal by a desired amount.

Cross Coupling: Coupling of the signal from one channel to another where it becomes an undesired signal.

Conductivity: Capability of a material to conduct electrical currents.

Decibel (dB): A convenient method for expressing voltage or power ratios in logarithmic terms. The number of such units of attenuation, N is

$$N \text{ (dB)} = 10 \log \frac{P_1}{P_2}$$

where

P_1/P_2 is a unitless power ratio. N can also be expressed in terms of a voltage ratio E_1/E_2 as follows:

$$N \text{ (dB)} = 20 \log \frac{E_1}{E_2}$$

Degradation: An undesired change in the operational performance of a test specimen. Degradation of the operation of a test specimen does not necessarily mean malfunction.

Depth of Penetration: Distance which a plane wave must travel through a shield to be attenuated $1/e$, or approximately 37 percent of its original value. (Also called "skin depth"). It is a function of the shield's conductivity and permeability and the wave's frequency.

Electrical or E-Field: A field induced by a high impedance source, such as a short dipole.

Electromagnetic Compatibility

(EMC): A measure of an equipment's ability to neither radiate nor conduct electromagnetic energy, or to be susceptible to such energy from other equipment or an external electromagnetic environment.

Electromagnetic Interference (EMI):

Undesired conducted or radiated electrical disturbances, including transients, which can interfere with the operation of electrical or electronic equipment. These disturbances can occur anywhere in the electromagnetic spectrum.

Emanation: Undesired electromagnetic energy radiated or conducted from a system.

Gasket-EMI: A material that is inserted between mating surfaces of an electronic enclosure to provide low resistance across the seam and thereby preserve current continuity of the enclosure.

Ground: A reference plane common to all electronic, electrical, electro-mechanical systems and connected to earth by means of a ground rod, ground grid, or other similar means.

Hertz: An international designation for cycles per second (cps).

Insertion Loss: Measure of improvement in a seam, joint or shield by the addition of a conductive gasket. Usually stated in dB.

Interference: Any electromagnetic phenomenon, signal or emission, man-made or natural, which causes or can cause an undesired response, malfunctioning or degradation of performance of electrical or electronic equipment.

Internal Loss: Attenuation of electromagnetic energy by the reflection and re-reflection of electromagnetic waves within a shield or a barrier. Usually stated in dB.

Magnetic or H-Field: An induction field caused predominantly by a current source. Also called a low impedance source, such as may be generated by a loop antenna.

Malfunction: A change in the equipment's normal characteristics which effectively destroys proper operation.

Permeability: The capability of a material to be magnetized at a given rate. It is a non-linear property of both the magnetic flux density and the frequency of wave propagation.

Plane Wave: An electromagnetic wave which exists at a distance greater than a wavelength from the source, where the impedance of the wave is nearly equal to the impedance of free space – 377 ohms.

Radio Frequency (RF): Any frequency at which coherent electromagnetic radiation of energy is possible. Generally considered to be any frequency above 10 kHz.

Radio Frequency Interference (RFI):

Used interchangeably with EMI. EMI is a later definition which includes the entire electromagnetic spectrum, whereas RFI is more restricted to the radio frequency band, generally considered to be between the limits 10 kHz to 10 GHz.

Reflection Loss: Attenuation of the electromagnetic wave or energy caused by impedance mismatch between the wave in air and the wave in metal.

Relative Conductivity: Conductivity of the shield material relative to the conductivity of copper.

Relative Permeability: Magnetic permeability of the shield material relative to the permeability of free space.

Shield: A metallic configuration inserted between a source and the desired area of protection which has the capability to reduce the energy level of a radiating electromagnetic field by reflecting and absorbing the energy contained in the field.

Shielding Effectiveness: A measure of the reduction or attenuation in electromagnetic field strength at a point in space caused by the insertion of a shield between the source and that point. Usually stated in dB.

Shielding Increase: The difference of an electromagnetic field amplitude emanating through a seam (measured under fixed test conditions) with and without the gasket in the seam, with the force joining the seam remaining constant. The difference is expressed in dB based on voltage measurements.

Skin Effect: Increase in shield resistance with frequency because of crowding of current near the shield surface because of rapid attenuation of current as a function of depth from the shield surface.

Surface Treatment: Coating or plating of mating surfaces of a junction.

Susceptibility: Measure of the degradation of performance of a system when exposed to an electromagnetic environment.

Total Shielding Effectiveness: The difference of an electromagnetic amplitude emanating from a source within an enclosure, and that from a source in free space. The difference is expressed in dB based on voltage measurements.

Wave Impedance: The ratio of electric field intensity to magnetic field intensity at a given frequency expressed in ohms.

Mechanical

Abrasion Resistance: The resistance of a material to wearing away by contact with a moving abrasive surface. Usefulness of standard tests very limited. Abrasion resistance is a complex of properties: resilience, stiffness, thermal stability, resistance to cutting and tearing.

Cold Flow: Continued deformation under stress.

Compression Set: The decrease in height of a specimen which has been deformed under specific conditions of load, time, and temperature. Normally expressed as a percentage of the initial deflection (rather than as a percentage of the initial height).

Durometer: An instrument for measuring the hardness of rubber. Measures the resistance to the penetration of an indenter point into the surface of the rubber.

Elasticity: The property of an article which tends to return to its original shape after deformation.

Elastic Limit: The greatest stress which a material is capable of developing without a permanent deformation remaining after complete release of the stress. Usually this term is replaced by various load limits for specific cases in which the resulting permanent deformations are not zero but are negligible.

Elastomer: A general term for elastic, rubber-like substances.

Elongation: Increase in length expressed numerically as a fraction or percentage of initial length.

Hardness: Relative resistance of rubber surface to indentation by an indenter of specific dimensions under a specified load. (See Durometer). Numerical hardness values represent either depth of penetration or convenient arbitrary units derived from depth of penetration. Devices for measuring rubber hardness are

known as durometers and plastometers. Durometers are used most commonly. The higher the durometer number, the harder the rubber, and vice versa.

Hardness Shore A: Durometer reading in degrees of hardness using a Type A Shore durometer. (Shore A hardness of 35 is soft; 90 is hard).

Permeability: A measure of the ease with which a liquid or gas can pass through a material.

Permanent Set, Stress and Strain Relaxation: Permanent Set is defined as the amount of residual displacement in a rubber part after the distorting load has been removed. Stress Relaxation, or Creep, is a gradual increase in deformation of an elastomer under constant load with the passage of time, accompanied by a corresponding reduction in stress level.

Resilience: The ratio of energy given up on recovery from deformation to the energy required to produce the deformation – usually expressed in percent.

Tear Strength: The force per unit of thickness required to initiate tearing in a direction normal to the direction of the stress.

Tensile Strength and Elongation: Tensile Strength is the force per unit of the original cross sectional area which is applied at the time of the rupture of the specimen during tensile stress. Elongation is defined as the extension between benchmarks produced by a tensile force applied to a specimen, and is expressed as a percentage of the original distance between the marks. Ultimate elongation is the elongation at the moment of rupture. Tensile Stress, more commonly called “modulus,” is the stress required to produce a certain elongation.