# Electromagnetic Compatibility



Electromagnetic Compatibility (EMC) may be a new term to some. However, it has been important for many years and actually predates World War II. For several decades, three agencies have been driving forces behind EMC: the U.S. Military; Europe's Special International Committee on Radio Perturbations (Interference), CISPR; and the U.S. Federal Communications Commissions (F.C.C.).

**Open Area Test Site (O.A.T.S.).** Used for 3- and 10-meter testing. It is F.C.C. listed and NVLAP accredited. In addition, the site was assessed by ACEMARK Europe, LTD which is recognized by numerous European competent bodies.

### History

EMC first began to be an issue in the military environment particularly on broad ships where many types of electronic equipment had to successfully operate in close proximity to each other. In such an environment, communication, navigation and data processing electronics all need to function simultaneously in the presence of strong radio frequency (RF) fields. Such RF fields are produced by two-way communications equipment, radar transmitters and microprocessor controlled devices. Added to this "mix," on board a military ship is the presence of ordinance or explosives and aircraft fuel. In such an environment it becomes transparently clear that each device needs to be Electromagnetically Compatible with its environment and not be rendered inoperative or unsafe by this environment. Also each device added to this milieu must not unnecessarily or unintentionally contribute spurious emissions that do not perform any particular function. From the preceding, the origin of the two major aspects of EMC, emissions and immunity, can be seen.

Due to the global proliferation of electronic devices in non-military living, it is becoming increasingly important that EMC be maintained in civilian settings as well. Residential and commercial environments may contain dozens of appliances that are controlled by microprocessors, i.e., kitchen stoves, video cassette recorders, TV's, breadmakers, personal computers, etc. All electronic devices utilizing microprocessor technology generate radio frequencies. For example, a 100 MHz computer contains an electronic clock that steps the microprocessor through its program. In this case, the clock frequency falls within the frequency spectrum allocated in the U.S. for FM radio broadcasting. If precautions were not taken by PC manufacturers, interference to nearby radio receivers would result. Harmonics or multiples of this frequency could, if not subdued, cause interference to other radio receivers; such as those used by emergency medical personnel and to television receivers. It is therefore incumbent upon manufacturers of digital electronic devices to guarantee their products will not be incompatible with or a nuisance to other electronic devices.

### EMC and the USA

Because of the proliferation of Information Technology Equipment (ITE) and other microprocessor-controlled electronic equipment, in the 1970's the F.C.C. (as the authority having jurisdiction in the U.S.) implemented limits on RF emissions from digital devices. Digital devices that are intended to be used in residential environments are classified as Class "B" devices. All such Class "B" devices must comply with limits set forth in part 15 of the F.C.C. rules for radiated and conducted emissions. Before Class "B" devices may be sold in the U.S., it must conform to the requirements of the F.C.C. rules. Currently there are no U.S. requirements for immunity testing. Products destined for use in the U.S. industrial, scientific and medical fields have, to this point, been exempt from compliance with these limits. Such devices are classified as Class "A" devices and may not be used in residential environments.

### EMC and the European Union

Products sold in the European Union must carry the "CE" mark that constitutes a declaration by the manufacturer of the products' compliance with all applicable Harmonized Directives and Standards. Electronic devices are subject to EMC Directive, 89/392/EEC. Article 4 of this document states: "The apparatus...shall be so constructed that (a) the EMC disturbance it generates does not exceed a level allowing radio and telecommunications equipment and other apparatus to operate as intended; (b) the apparatus has an adequate level of intrinsic immunity of EMC disturbance to enable it to operate as intended." Clearly, complying with the essential requirements of the European EMC

Directive requires evaluation of a product's emission and immunity characteristics. Notably, products used in commercial, light industrial and heavy industrial environments are not exempt from compliance.

The Intrinsic Immunity requirement dictates that an electronic apparatus be so constructed that its performance will not be degraded by its normal electromagnetic environment. For example, a consumer in Europe has a right to expect that the digital security system monitoring his home will not malfunction if a nearby ambulance crew talks to their local dispatcher via two-way radio communications equipment. The directive implies that manufacturers will design products to possess immunity not only to radiated RF fields, but to other electromagnetic phenomena as well.

Specific immunity tests are itemized by generic and product-specific European norms or standards. Minimally, this means that a device's performance will not be adversely effected by: (1) RF fields, such as radio and TV broadcast stations, and licensed two-way radio equipment; (2) Electrostatic Discharge events (ESD); (3) and Electrical Fast Transients (EFT). Testing of products for immunity in simulation of real-world environments allows manufacturers to demonstrate compliance with Article 4, clause (b) of the EMC Directive. Additional immunity testing is required by certain specific standards and the new 1997 generic immunity standard. These additional tests include: Conducted RF Immunity; Surge Immunity; Power Frequency Magnetic Fields Immunity; Voltage Dips and Interrupts Immunity; and Pulsed RF Fields Immunity.

**CE Conformity**

Conformity to the essential requirements of the EMC Directive must be declared by the manufacturer or his authorized representative. This is done by issuing a document called a "Declaration of Conformity" (DOC). It is the manufacturer's responsibility to procure and maintain technical evidence supporting all claims of product "conformity". This supporting evidence is assembled in a Technical Construction File (TCF). A TCF will exist for each product sold in the European Union. Verification of compliance (testing) may be performed by the manufacturer or a third-party test house. In all cases though, tests must be performed in harmony with International IEC Test Standards. Results of EMC testing, such as the Test Report issued by a testing laboratory, shall be included in the TCF.

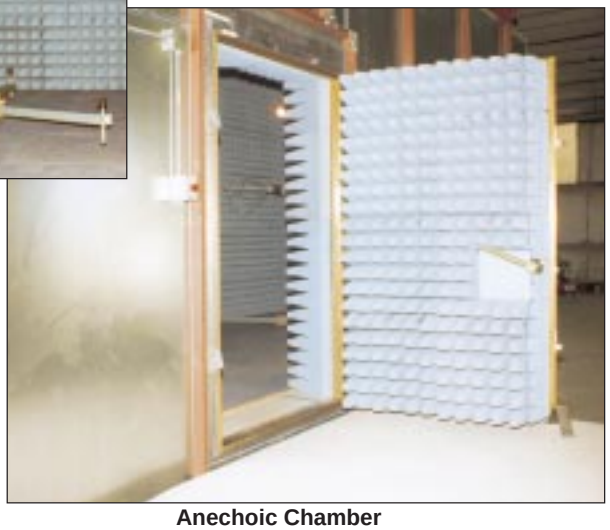
A product that meets the requirements of an appropriate "product specific standard," or in lieu of a "product specific standard" the generic standard, is presumed to meet the essential requirements of the EMC Directive. In addition to the EMC Directive, other directives may be applicable to an electronic device. Conformity with all applicable directives must be verified and documented. Having met all requirements, the "CE" mark may then be applied. For a period of ten years after being placed on the European Market, the supporting technical documentation (TCF) must be kept on file and be accessible by an authorized representative within the European Union.

**Benefits**

Compliance with the European Union's EMC Directive leads to increasingly robust products, improvements in quality and increased customer satisfaction. For example, ESD (electrostatic discharge) Immunity Testing quickly reveals any latent vulnerability a product might have to such standards and promotes corrective measures that render the product immune to such real world occurrences. The result is improved customer satisfaction realized from reliable, solid products that provide years of trouble free service.

C.R.S. 26-Jan-98

**Biconical Antenna**



**Anechoic Chamber**