

# The EC Directive on EMC for Information Technology Equipment

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## INTRODUCTION

All information technology equipment (ITE) which will be sold in the single market of the European Community after January 1, 1996 must meet the protection requirements of the EMC directive. Both EMC emissions and immunity testing must be carried out according to Section 4 of the Directive on EMC but the application of EMC Directive 89/336/EWG to ITE is not as simple as one might believe. This article offers some suggestions on how to apply the EC Directive on EMC to ITE.

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feature ground planes is highly recommended. The preferred measuring distance for radiated emission measurements is 10 meters. Thus, test sites must be quite large in size.

affixing of the CE mark will continue to be somewhat problematic.

On the other hand, the EMC community is expecting the completion of a dedicated product family standard for ITE immunity testing in the foreseeable future. This standard will be EN 55024. EN 55024 is currently being developed in CENELEC TC 110 but it has not yet been published in the *Official Journal of the European Community*. Several parts of EN 55024 have been released as preliminary working papers. These parts show a close parallel to the corresponding IEC 801 papers.

## STANDARDS USED FOR ITE EMISSIONS TESTING

The term ITE applies to both data processing equipment and telecommunication equipment. The emissions standard to be used for ITE is EN 55022, published in the *Official Journal of the European Community* No. 92/C44/10, which covers the emission measurements on ITE. EN 55022 is a product family standard, and covers both conducted emission and radiated emission limits.

The measurements must be carried out in such a manner that environmental disturbances do not influence the measured results. This can be problematic, especially for radiated emission measurements. Today, state-of-the-art testing is frequently conducted in open area test sites, which are vulnerable not only to ambient noise influencing measured results, but also to weather conditions. Therefore, testing in semi-anechoic chambers which

## IMMUNITY

Immunity testing for ITE is not yet covered by a published product family standard, so the generic standard EN 50082-1 can be used. This standard has been published in the *Official Journal of the European Community* No. 92/C90/02. EN 50082-1 covers equipment which is connected to the public mains network. In other words, it is applied to non-industrial equipment, including devices used in residential areas, light industry workshops and office areas.

No generic standard has yet been published to cover industrial equipment supplied by special industrial mains networks. However, some standards are in preparation. EN 50082-2, the generic immunity standard for industrial equipment, is being prepared but an official publication date has not been set. As long as there is no dedicated standard applicable to immunity on ITE in the industrial area, the

## HOW TO PERFORM EMC TESTING ON ITE SINGLE APPARATUS

In this article the term "single apparatus" applies to devices which have an intrinsic function. They perform a certain task independently from other equipment. Typical examples are mains-driven laptop and pocket computers. Such devices can be tested without any other components. Both emission and immunity tests must be performed.

## SYSTEM CONFIGURATIONS

A more typical ITE system comprises a personal computer with all auxiliary equipment connected to it. Such a system could include a mainframe, a CRT, a keyboard, a printer and/or a plotter, storage devices like plated media or floppy disk drives which

are possibly contained in their own housings, scanners, magnetic card readers and modems for connection to the telecommunication network.

Large systems such as the computer installation in a large office building may consist of up to several hundred PCs. It is not possible to test such a system under laboratory conditions. It is sufficient to define a configuration which is independently usable. That often means that each type of device has to be tested in the EC mark configuration (one keyboard, one CRT, one mainframe and so on). If this system meets all requirements of EN 55022 and EN 50082-1, it can be labeled with the CE mark. With such a procedure it is quite easy to add an additional device to this minimum configuration (for instance, a printer or a scanner). Test personnel can quickly determine whether the newly added device has emission or immunity problems. If no new emission or immunity problems occur, the additional device can be marked with the CE symbol. This is also allowed if the additional device does not function independently, such as is the case with many printers.

#### TEST SETUP

It is important that the test setup used in the EMC test laboratory mirrors the real installation conditions as closely as possible regardless of whether it is a pretest or a final test for the CE mark. For example, floor-standing equipment has to be tested standing on the floor of the test room, and table-top equipment has to be tested standing on a wooden table 80 cm high. The EUT has to be rotated for radiated emission and immunity testing. This is necessary to obtain accurate readings of the maximum emission and to identify the most vulnerable areas for immunity. A turntable is highly recommended for these tests.

#### CABLES

It is useless to perform EMC testing on ITE with cables which are not used in the final installation. Cable performance is at least as important as the EMC performance of device housings. For this reason, the proper cables and plugs must be selected for EMC testing on ITE. The placement of cables may be important due to the effect of cable-to-cable coupling. Depending on the shielding, the positioning may affect the EMC performance of an ITE. During EMC tests, cables must be installed as closely as possible to end environment conditions. This applies to internal cables within the housing of a device and to external cables connecting the devices to each other.

#### COMBINATION OF ITE APPARATUS AND SYSTEMS

A particular problem encountered with ITE apparatus and systems is equipment which was tested according to the EC Directive on EMC and later reconfigured. The following statement is generally valid: *If an ITE device has been tested according to the EC Directive on EMC, it can carry the CE marking. It makes no difference whether the particular device is a stand-alone unit with an intrinsic function to be used independently or if the device was tested in a system. Such a device which has been tested and has been found to meet the requirements of the EC Directive on EMC can be combined with any other device or system without retesting, if the other device or system meets the Directive itself.*

This conclusion is very important. It implicitly recognizes that it is impossible to test all configurations of today's ITE systems, and confirms what manufacturers of ITE have always claimed. In keeping with the EC Directive on EMC, it is, of course, possible to combine different types of equipment in real installations

even if the different units have never before been tested for EMC with each other. Of course, experts realize the spuriousness of the assumption that an ITE device which was once tested according to the EC Directive on EMC would also meet the protection requirements in all other possible configurations. Different EMC hardening techniques make some components incompatible. On the other hand, chances are much greater that a combination of previously tested ITE meets the protection requirements of the Directive than if untested equipment is incorporated. (Note: these statements apply to equipment manufactured by a single manufacturer as well as to devices originating from different manufacturers).

#### IN SITU TESTING OF ITE

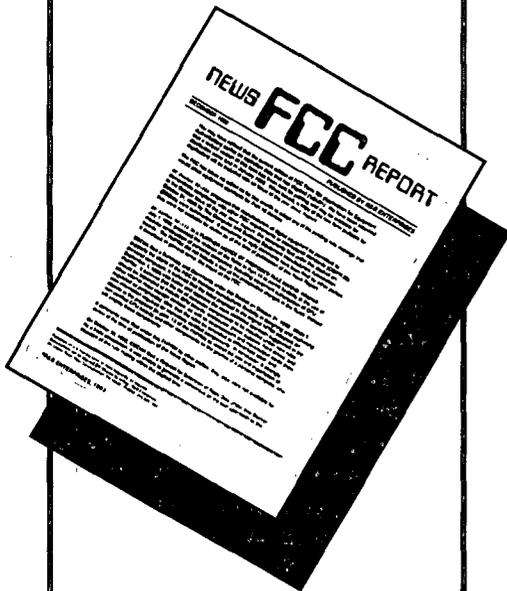
Another question which has often been raised is the usefulness of in situ testing of ITE according to the EMC Directive. The need to perform in situ testing is based on the knowledge that testing in a laboratory may not represent end environment conditions. For smaller or medium-sized systems it is usually possible to create real installation conditions in the test labs. For large, extensive and highly complex ITE systems this can be quite difficult. Yet, some doubt always persists if in situ testing is not performed.

According to the protection requirements of the EMC Directive, in situ testing always implies emission and immunity testing. Emission testing in situ is difficult because emissions from other devices in close proximity will often mask emissions from the ITE under test. In addition, there is always ambient noise around the test site. VHF, UHF, FM and AM transmitters and mobile phones are likely sources.

Immunity tests for ESD, bursts, surges and RFI testing are not recommended for performance in

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**THE EC DIRECTIVE ON EMC . . . Continued**

situ. These immunity tests create aging problems in the devices tested. In situ testing on ITE should be limited to the absolute minimum. Designers should bear in mind that it is often possible to simply test components of a large system which can easily fit into the test labs.

**THE CE MARK ON ITE  
MODULES AND  
SUBASSEMBLIES**

Many manufacturers are not producing complete systems but they want to use the CE mark for their products, which may be modules and subassemblies for ITE. Typical examples of such products are mains supply boards, CRTs, printer driver boards, line driver boards and main processor boards. These modules and subassemblies can be plugged into almost every mainframe computer and auxiliary device.

Manufacturers can affix the CE mark to their product if the module or subassembly has been tested in a representative configuration. This test configuration should be illustrated to the system integrator so variations which could change the EMC performance are apparent. Manufacturers of modules and subassemblies should prepare a statement which details the requirements necessary for their equipment to meet the protection requirements of the EMC Directive (e.g., a specific earth connection or a special type of shielding).

Modules and subassemblies freely circulated on the market should always carry a CE mark. Manufacturers who use modules and subassemblies to fabricate their final products must always ensure that their products meet the protection requirements of the EC Directive on EMC. This responsibility also applies if they have used only modules and subassemblies with CE marks.

One exception is notable.

Modules and subassemblies sold exclusively to companies experienced in EMC and which are not available on the open market do not need a CE mark. The company with EMC experience is assumed to be concerned that the final product meets the protection requirements of the EC Directive on EMC.

**ITE SYSTEMS IN THE  
ENVIRONMENT**

ITE systems treated in accordance with the EC Directive on EMC give the operator/user maximum protection against emission and immunity problems. However, this does not mean that the ITE is not susceptible to electromagnetic ambients. The emission limits, while quite strict, do not ensure that other electrical and electronic equipment in very close proximity will function as intended. A TV may still be disturbed by a computer standing very close to it and hearing aids are disturbed by mobile phones. Technological advances will hopefully improve this situation.

**CONCLUSION**

ITE testing according to the EC Directive on EMC can be performed today. It is required for any type of equipment sold within the market after January 1, 1996. Manufacturers have more to learn in both emission and immunity testing. Products of manufacturers who do not address EMC today will not be on the market in the future.

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