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Equipment Engineering (EE); Radiated emission testing of physically large telecommunication systems

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Equipment Engineering (EE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS specifies the technical requirements for the radiated emission measurement procedure for physically large systems used within the public telecommunication network. A minimum representative system is defined, which is used for compliance testing of physically large telecommunication systems.

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1 Scope

This European Telecommunication Standard (ETS) specifies the technical requirements for the radiated emission measurement procedure for physically large systems used within the public telecommunication network, with the exception of radio equipment.

It applies to physically large systems which are comprised of equipments or systems requiring installation documentation specific for those sites at which they are to be installed. In order to demonstrate compliance of such systems, a minimum representative system is defined, which is used for compliance testing. Installations built from units of the complying minimum representative system are deemed to satisfy the radiated emission requirements.

The minimum representative system is representative of installed systems in terms of function (which includes at least one of each functional unit type) and electromagnetic radiation characteristics. The minimum representative system is subsequently referred to in this ETS as the Equipment Under Test (EUT), to be used for compliance testing.

Minimum representative systems shall be tested on an Open Area Test Site (OATS) or in a suitable chamber, the limits to be used are those as specified in EN 55022 [1].

2 Normative references

This ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

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[1] EN 55022 (1987): "Limits and methods of measurement of radio interference characteristics of information technology equipment".

[2] CISPR Publication No. 16: "CISPR/A(Central Office) 48 Revision to CISPR specification for radio interference measuring apparatus and measurement methods".

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[3] IEC 50(161) (1990): "International Electrotechnical Vocabulary. Chapter 161: Electromagnetic compatibility".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions, together with those from IEC 50(161) [3], apply:

System: a set of sub-systems which, when connected together, produce a fully operational product and is intended to be marketed as such.

Sub-system: a grouping of functional units which perform specific functions within the host system and which communicates with other equipment via well-defined interfaces and protocols.

Functional unit: a grouping of electronic hardware which performs specific functions, but may be connected with other functional units to produce the required sub-system.

New functional module: a replacement and/or addition for any grouping or arrangement of electronic hardware (with its associated mechanical packaging and interconnections), which enhances or improves the system operation.

Test site: this should be an OATS, with reflecting ground plane, or a suitable chamber with reflecting ground plane.

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Minimum representative system: the minimum representative system is representative of installed systems in terms of function (which includes at least one of each functional unit type) and electromagnetic radiation characteristics. This shall be equipped to at least the minimum configuration which could be offered for sale for use as an actual system. It excludes any operational equipment connected for the purpose of monitoring or system measurements and which are connected for a temporary period. An example of how the EUT is to be selected is given in figure 1.

Cable distribution point: the cable distribution point is the interface at which cabling shall be terminated; this unit is the point at which cabling from the system is connected to the cabling from external units.

Physically large system: a group of racks functionally connected to form a commercially specified system, which has a total dimension exceeding that which is practical for testing on a conventional 10 m test site.

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

EUT	Equipment Under Test
OATS	Open Area Test Site

4 Requirements

For the purpose of defining the system boundary from which the test distance is taken, the equipment boundary shall be the straight line envelope around the EUT; this includes the cables specified for attachment to the EUT for the purpose of test. Measurement distances are to be taken from this line.

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Physically large systems are modular in nature, i.e. they will generally be increased in size (and operational function) by the addition of like units. To ensure that the EUT is representative of installed systems, in terms of function and electromagnetic radiation, tests shall be repeated with the EUT configured with additional units.

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If, by adding additional units, which generates synchronized noise, the emission levels do not increase 4 dB or more above the original maximum measured values, independent of frequency, then a minimum representative system in terms of radiation has been achieved. The additional units shall be composed to the largest possible extent of highest radiation sources, but they shall be typical of realistic installation.
If, with the increase of additional identical units, the radiation increases by more than 4 dB, then further additional units shall be added until the increase is less than 4 dB.

After the addition of identical units (as shown in figure 2), the measured field levels from the representative system shall not increase beyond compliance limits.

5 General operational conditions

5.1 Equipment configuration

The EUT shall conform to the manufacturer's normal installation practice. There exists for each EUT a minimum set of interface lines which is required for the operation of the system and this number shall be defined for each EUT and identified in the test report.

The sources of maximum emission shall be identified by measuring each functional unit on an individual basis and, where applicable, its position in a rack.

The EUT shall then be assembled in such a way that emissions are maximised within any limitations imposed by normal installation practice.

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5.2 Equipment cable layout

5.2.1 Intra-system cabling

All cables internal to the system, and used for its operation, shall be connected and be of such a length and type required for the normal operation of the system. These shall be routed in accordance with the relevant system installation instructions, such that these are typical of an installed system.

If raised floor or overhead cabling systems are offered, both types of cabling systems shall be characterized by testing the equipment using those cable configurations (raised floor or overhead cabling). The worst case cable configuration shall be used in the EUT tests.

If raised floor systems be characterized as the worst case and used for testing, and if the inter-unit cable routing is into the raised floor system, the effect of the raised floor system shall be examined. The raised floor shall be left in place if it forms part of the system screen, but where the raised floor is not intended to be used as a screen, then in order to prevent incidental screening of emissions, the floor panels shall be removed for the duration of the test.

5.2.2 Interface cabling

Cables between the system, the distribution point and external units, shall be of the type as specified by the system supplier or as detailed by customer requirements, and shall follow the relevant system installation practice. Care must be taken to ensure that noise from the test and exercising equipment does not contribute to the emissions from the representative system. The method of orientating and terminating the cables shall be noted in the test report.

The emission contributions from the system, cables and distribution point (where all of these elements are involved) are difficult to separate; there are two cases to be considered:

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1) unscreened cable systems;

2) screened cable systems.

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Screening is achieved by one of two methods:

a) by use of screened cabling;

b) by the use of a screened floor or ducted systems in which unscreened cabling is run.

Measurement of these installation practices is performed as described in subclauses 5.2.2.1 and 5.2.2.2.

5.2.2.1 Unscreened cable systems

Wherever the distribution point is located, measurement shall be made using a length of unscreened cabling configured as described in subclauses 5.2.2.1.1 and 5.2.2.1.2. Beyond this minimum length, the cabling shall be taken off the measurement site below the ground plane to the exercising equipment. Where this is not practicable, the cabling may run in screened sleeving which is bonded to the measurement site ground plane.

Two types of cable installation practice shall be considered.