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Equipment Engineering (EE); Telecommunication network equipment; Electro-Magnetic Compatibility (EMC) requirements; Part 1: Product family overview, compliance criteria and test levels

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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 is Part 1 of a 2 part ETS. Part 2 of this ETS is currently being drafted and is further divided into 5 parts as follows:

Part 1: **"Product family overview, compliance criteria and test levels".**

Part 2-1: "Product specific compliance criteria and operating conditions - Switching equipment" (DE/EE-04003-2-1).

Part 2-2: "Product specific compliance criteria and operating conditions - Transmission equipment" (DE/EE-04003-2-2).

Part 2-3: "Product specific compliance criteria and operating conditions - Power supply equipment" (DE/EE-04003-2-3).

Part 2-4: "Product specific compliance criteria and operating conditions - Supervisory equipment" (DE/EE-04003-2-4).

Part 2-5: "Product specific compliance criteria and operating conditions - Tariff and billing equipment" (DE/EE-04003-2-5).

Transposition dates	
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Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	30 September 1995
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Introduction

The purpose of testing is to ascertain whether the equipment will perform satisfactorily in its electromagnetic environment. Hence, testing requirements need to relate to actual electromagnetic environmental conditions. The statistical nature of the environment as well as the equipment's response to stress needs to be taken into account.

This is done by introducing the concepts of "environmental classes", "priorities of service", and graded "compliance criteria" described in more detail below.

Part 1 of this ETS specifies all parameters that are not specific to a particular equipment. These are:

- general operating conditions;
- test levels for immunity (tables 2, 3, 4 and 5) and associated general compliance criteria. Test levels are specified according to environmental class and according to priority of service;
- emission limits related to an environmental class.

Dedicated product-specific EMC requirements are being developed in the planned part 2 of this ETS (i.e. parts 2-1 to 2-5).

Environmental classes

The electromagnetic environment varies from time to time and from place to place in a very complicated manner. The concept of environmental classes introduced by the IEC, (IEC Publication No. 721 [2]) and also implemented by ETSI, (ETS 300 019 [11]) for climatic and mechanical environments takes these aspects into account.

An environmental class is an envelope of the environments encountered in a group of locations with similar properties. This ETS defines environmental classes for public telecommunication equipment:

- telecommunication centres, classes 1 and 2;
- locations other than telecommunication centres, classes 3 and 4.

The characteristics of the environmental classes are given in annex B.

Determination of limits

Immunity limits have been set considering that:

- the purpose of testing is to reveal potential failure mechanisms by means of well-defined exposures under controlled laboratory conditions;
- the test does not attempt to reproduce the exposures experienced in practice, but to reproduce the effects of real life exposure;
- the test needs to be conclusive even though it is normally based on only a few samples;
- there is a finite probability that equipment in practice will experience more severe stresses than those considered as being characteristic of the environmental class; it would mean over specification if 100 % performance was required in all cases;
- a safety margin between full performance and loss of function can be established.

A graded test is introduced which operates with three levels of performance. In order of increasing exposure, these levels are designated:

- normal performance (within specified limits);
- reduced performance;
- loss of function.

Each level of performance corresponds to a certain accepted degradation, i.e. an immunity threshold.

The compliance criteria are precisely defined in each individual equipment specification (being developed in part 2 of this ETS).

Finally, considering that all kinds of equipment are not equally important, it is recommended that the equipment is rated and tested according to the priority of the service performed, i.e. according to its main purpose.

The priority of service may be assessed by evaluating the consequences of:

- loss of service;
- loss of equipment;
- loss of revenue;
- loss of reputation.

Two equipment categories and associated EMC requirements are introduced which, in order of increasing requirements, are designated:

- normal priority of service (see tables 2 and 4);
- high priority of service (see tables 3 and 5).

Which requirements apply to a specific piece of equipment are defined in part 2 of this ETS (under development).

Emission limits are set considering that:

- emissions should not disturb the normal performance of co-located electronic equipment for communications or other purposes;
- emissions shall not interfere with the licensed use of the radio spectrum.

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1 Scope

This European Telecommunication Standard (ETS) specifies the essential Electro-Magnetic Compatibility (EMC) requirements for non-radio equipment used within the **public** telecommunications network. It covers both the emission and immunity requirements of the equipment.

This ETS is applicable to all equipment types, examples of which are listed below. The test methods to be used are also described together with the failure criteria:

- switching equipment which includes trunk and local telephone exchanges, remote switching concentrators, international switches, telex switches and network packet switches;

- transmission equipment which includes multiplexers, line equipment and repeaters, Synchronous Digital Hierarchy (SDH), Digital Cross Connect (DXC), Asynchronous Transfer Mode (ATM) and network terminations;

- power supply equipment which includes central power plant, end of suite power supplies, power management systems and other dedicated telecommunications network power supplies;

- supervisory equipment and dedicated Operation And Maintenance (OAM) equipment;

- tariff and billing equipment.

2 Normative references

This ETS incorporates by dated and 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.

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

[2] IEC Publication No. 721 (Series): "Classification of environmental conditions".

[3] EN 60801-2: "Electromagnetic compatibility of industrial-process measurement and control equipment; Part 2: Electrostatic discharge requirements".

[4] ENV 50140: "Electromagnetic compatibility - Basic Immunity standard; Radiated, radio-frequency electromagnetic field - Immunity test".

[5] IEC 801-4 (1988): "Electromagnetic compatibility for industrial-process measurement and control equipment; Part 4: Electrical fast transient/burst requirements".

[6] ENV 50142: "Electromagnetic compatibility - Basic immunity standard; Surge immunity test".

[7] ENV 50141: "Electromagnetic compatibility - Basic immunity standard; Conducted disturbances induced by radio-frequency fields; Immunity test".

[8] CCITT Recommendation K.20 (1991): "Resistibility of telecommunication switching equipment to overvoltages and overcurrents".

[9] CCITT Recommendation K.21 (1988): "Resistibility of subscribers' terminals to overvoltages and overcurrents".

[10] CCITT Recommendation K.22 (1988): "Overvoltage Resistibility of Equipment connected to an ISDN T/S bus".

[11] ETS 300 019: "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".

[12] ETS 300 127: "Equipment Engineering (EE); Radiated emission testing of physically large telecommunication systems".

[13] ETS 300 132: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment"; Part 1 - Interface operated by alternating current (AC) Part 2 - Interface operated by direct current (DC).

[14] CISPR Publication No. 16 : "Specifications for radio interference measuring apparatus and measurements methods".

[15] ENV 55102-1: "Electromagnetic Compatibility requirements for ISDN Terminal Equipment - Part 1: Emission requirements".

[16] ETS 300 046-1 (1992): "Integrated Services Digital Network (ISDN) primary rate access; Safety and protection; Part 1: general".

[17] EN 61000-4-11: "Electromagnetic compatibility (EMC), Part 4 Testing and measurement techniques, Section 11: Voltage dips and short interruptions and voltage variations".

[18] EN 60555-2: "Disturbances in supply systems caused by household appliances and similar electrical equipment; Part 2: Harmonics".

[19] EN 60555-3: "Disturbances in supply systems caused by household appliances and similar electrical equipment; Part 3: Voltage fluctuations".

[20] IEC Publication No. 50 (161): "International Electrotechnical Vocabulary; Chapter 161: Electromagnetic compatibility".

3 Definitions and abbreviations

3.1 Definitions

For the purpose of this ETS, the definitions in IEC Publication No. 50 (161) [20] apply. In addition, the following definitions apply:

priority of service: Measures on a relative scale how important it is that the equipment operates as specified.

Two levels of priority are standardized: They are designated as **normal** and **high**.

Normal priority of service should be assumed unless special circumstances are indicated.

The priority is **normal** if the equipment has **moderate failure consequences**. An equipment has moderate failure consequences when:

- a failure causes limited inconvenience;
- repairs may be made without compromising the responsibilities of the network operator.

The priority is **high** if the equipment has **severe failure consequences**. An equipment has severe failure consequences when:

- failure compromizes the function of vital, centralized systems, or services of commercially sensitive or security related nature;
- repair or restoration costs are high, or the time the equipment is out of service is unacceptably long;
- corruption of charging or billing information occurs.

The following definitions apply only in the context of this ETS, except where the reference to the IEC Publication No. 50 (161) [20] is given adjacent to the subclause title, in parentheses:

Audio (low) Frequency (AF): The frequency interval from 0 Hz to 20 kHz. It may sometimes be convenient to extend the use of this term to include the range of frequencies up to 150 kHz.

burst (161-02-07): A sequence of a limited number of distinct pulses or an oscillation of limited duration.

characteristic severity: The characteristic severity for a certain detail parameter in an environmental class states a severity which has only a low probability (generally less than 1 %) of being exceeded. The term relates to duration, rate of occurrence or location. It applies to requirements on the environment and to immunity requirements.

continuous disturbance (161-02-11): Electromagnetic disturbance the effects of which on a particular device or equipment cannot be resolved into a succession of distinct effects.

Discontinuous interference (161-02-13): Electromagnetic interference occurring during certain time intervals separated by interference-free intervals.

duration (of a voltage change) (161-08-03): Interval of time for the voltage to increase or decrease from the initial value to the final value.

duration (of a pulse): The interval of time between the instants at which the instantaneous value of a pulse reaches 50 % of the pulse magnitude for the first and last time.

environment, environmental conditions: The electromagnetic conditions external to the equipment, to which it is subjected at a certain time. The environmental conditions comprise a combination of single environmental parameters and their severities.

environmental class: A representation of the environment on locations with similar properties. They are specified and standardized to provide an operational frame of reference for: