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Elektromagnetna združljivost (EMC) in zadeve v zvezi z radijskim spektrom (ERM) - Oprema za telekomunikacijska omrežja - Zahteve za elektromagnetno združljivost (EMC)

Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements

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Candidate Harmonized European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Telecommunication network equipment;
ElectroMagnetic Compatibility (EMC) requirements**

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Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [46] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility ("the EMC Directive") (89/336/EEC [44] as amended).

Technical specifications relevant to the EMC Directive are given in annex A.

| SIST EN 300 386:2001 National transposition dates | |
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1 Scope

The present document covers the EMC requirements for equipment intended to be used within a telecommunications network (as defined in clause 3). Examples of such equipment are:

- **Switching equipment.** Such equipment includes:
 - local telephone exchanges;
 - remote switching concentrators;
 - international switches;
 - telex switches;
 - network packet switches.
 - General purpose equipment which is used as a part of a switching system may be covered by the scope of other standards. For such equipment, if those other standards fully cover all the requirements of the present document, no further requirements are necessary. Switching equipment can also contain transmission functions, and this has to be recognized during testing.
 - **Non-radio transmission equipment and ancillary equipment.** Such equipment includes:
 - multiplexers;
 - line equipment and repeaters, e.g. equipment for:
 - Synchronous Digital Hierarchy (SDH);
 - Plesiochronous Digital Hierarchy (PDH);
 - Asynchronous Transfer Mode (ATM);
- such as:
- Digital Cross Connect systems;
 - network terminations;
 - transmission equipment used in the access network like XDSL.
- **Power supply equipment.** Such equipment includes:
 - central power plant;
 - end of suite power supplies;
 - uninterruptible power supplies;
 - stabilized AC power supplies;
 - and other dedicated telecommunication network power supplies;

but excludes equipment which is uniquely associated with or integrated in other equipment.
- **Supervisory equipment.** Such equipment includes:
 - network management equipment;
 - operator access maintenance equipment;
 - traffic measurement systems;
 - line test units;

- functional test units.

The function of *supervision* may either be performed by independent equipment or form part of other telecommunication equipment. If the function of supervision forms part of a telecommunication equipment, the performance may be evaluated simultaneously with other functions (such as switching and transmission) during EMC testing.

Supervisory equipment may also be used in conjunction with radio equipment.

The environmental classification used in the present document refers to TR 101 651 [45].

The requirements of the present document have been selected to ensure an adequate level of immunity for the apparatus covered by the scope of the present document. The levels do not, however, cover extreme cases which may occur at any location but with a low probability of occurrence. In special cases, situations may arise where the levels of disturbance may exceed the immunity test levels specified in the present document. In these instances, special mitigation measures may have to be employed.

Equipment for cabled distribution systems intended only for television and sound signals as defined in EN 50083-2 [4] and optical amplifiers as defined in ITU-T Recommendations G.661 [24] and G.662 [25] are outside the scope of the present document.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

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- [1] CISPR 16-1: "Specifications for radio interference measuring apparatus and measurement methods".
- [2] EN 45001: "General criteria for the operation of testing laboratories".
- [3] EN 50082-1: "Electromagnetic compatibility - Generic immunity standard; Part 1: Residential, commercial and light industry".
- [4] EN 50083-2: "Cabled distribution systems for television and sound signals; Part 2: Electromagnetic compatibility for equipment".
- [5] EN 55022: "Limits and methods of measurement of radio disturbance characteristics of information technology equipment".
- [6] EN 61000-3-2: "Electromagnetic compatibility (EMC); Part 3: Limits; Section 2: Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)".
- [7] EN 61000-3-3: "Electromagnetic compatibility (EMC); Part 3: Limits; Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16 A".
- [8] EN 61000-4-2: "Electromagnetic compatibility (EMC); Part 4: Testing and measurement techniques; Section 2: Electrostatic discharge immunity test".
- [9] EN 61000-4-3: "Electromagnetic compatibility (EMC); Part 4: Testing and measurement techniques; Section 3: Radiated, radio-frequency, electromagnetic field immunity test".

- [10] EN 61000-4-4: "Electromagnetic compatibility (EMC); Part 4: Testing and measurement techniques; Section 4: Electrical fast transient/burst immunity test".
- [11] EN 61000-4-5: "Electromagnetic compatibility (EMC); Part 4: Testing and measurement techniques; Section 5: Surge immunity test".
- [12] EN 61000-4-6: "Electromagnetic compatibility (EMC); Part 4: Testing and measurement techniques; Section 6: Immunity to conducted disturbances, induced by radio-frequency fields".
- [13] EN 61000-4-11: "Electromagnetic compatibility (EMC); Part 4: Testing and measuring techniques; Section 11: Voltage dips, short interruptions and voltage variations immunity tests".
- [14] ETSI ETR 238: "ETSI/CENELEC standardization programme for the development of Harmonized Standards related to Electro-Magnetic Compatibility (EMC) in the field of telecommunications".
- [15] ETSI ETS 300 011: "Integrated Services Digital Network (ISDN); Primary rate user-network interface; Layer 1 specification and test principles".
- [16] ETSI ETS 300 012: "Integrated Services Digital Network (ISDN); Basic user-network interface; Layer 1 specification and test principles".
- [17] ETSI ETS 300 132-1: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 1: Operated by alternating current (ac) derived from direct current (dc) sources".
- [18] ETSI ETS 300 132-2: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)".
- [19] ETSI ETS 300 166: "Transmission and Multiplexing (TM); Physical and electrical characteristics of hierarchical digital interfaces for equipment using the 2 048 kbit/s - based plesiochronous or synchronous digital hierarchies".
- [20] ETSI ETS 300 232: "Transmission and Multiplexing (TM); Optical interfaces for equipments and systems relating to the Synchronous Digital Hierarchy [ITU-T Recommendation G.957 (1993), modified]".
- [21] IEC 60050-161: "International Electrotechnical Vocabulary; Chapter 161: Electromagnetic compatibility".
- [22] IEC 60050-714: "International Electrotechnical Vocabulary - Chapter 714: Switching and signalling in telecommunications".
- [23] ISO/IEC 8802-3: "Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks; Specific requirements; Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications".
- [24] ITU-T Recommendation G.661: "Definition and test methods for the relevant generic parameters of optical amplifiers devices and subsystems".
- [25] ITU-T Recommendation G.662: "Generic characteristics of optical fibre amplifier devices and sub-systems".
- [26] ITU-T Recommendation G.712: "Transmission performance characteristics of pulse code modulation channels".
- [27] ITU-T Recommendation G.812: "Timing requirements of slave clocks suitable for use as node clocks in synchronization networks".
- [28] ITU-T Recommendation G.813: "Timing characteristics of SDH equipment slave clocks (SEC)".
- [29] ITU-T Recommendation G.958: "Digital line systems based on the synchronous digital hierarchy for use on optical fibre cables".

- [30] ITU-T Recommendation G.961: "Digital transmission system on metallic local lines for ISDN basic rate access".
- [31] ITU-T Recommendation K.20: "Resistibility of telecommunication switching equipment to overvoltages and overcurrents".
- [32] ITU-T Recommendation K.21: "Resistibility of subscribers' terminals to overvoltages and overcurrents".
- [33] EN 300 127: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Radiated emission testing of physically large telecommunication systems".
- [34] ITU-T Recommendation O.41: "Psophometer for use on telephone-type circuits".
- [35] ITU-T Recommendation O.150: "General requirements for instrumentation for performance measurements on digital transmission equipment".
- [36] ITU-T Recommendation Q.552: "Transmission characteristics at 2-wire analogue interfaces of digital exchanges".
- [37] ITU-T Recommendation V.10: "Electrical characteristics for unbalanced double-current interchange circuits operating at data signalling rates nominally up to 100 kbit/s".
- [38] ITU-T Recommendation V.11: "Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s".
- [39] ITU-T Recommendation V.24: "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)".
- [40] ITU-T Recommendation V.28: "Electrical characteristics for unbalanced double-current interchange circuits".
- [41] ITU-T Recommendation V.36: "Modems for synchronous data transmission using 60 - 108 kHz group band circuits".
- [42] ITU-T Recommendation X.24: "List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) on public data networks".
- [43] ITU-T Recommendation X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- [44] 89/336/EEC: "Council Directive of 3 May 1989 on the approximation of the laws of the member states relating to electromagnetic compatibility".
- [45] ETSI TR 101 651: "Electromagnetic compatibility and radio spectrum matters (ERM); Classification of the electromagnetic environment conditions for equipment in telecommunication networks".
- [46] 98/34/EC: "Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply. The definitions taken from the IEC 60050-161 [21] have reference in parentheses:

AC secondary interface: output port of a AC power supply

AC secondary voltage: output of the AC power supply at the AC secondary interface

NOTE 1: The AC secondary voltage may be either:

- a stabilized AC supply derived from a DC primary supply (e.g. where the power supply is an inverter);
- or
- derived from the AC primary supply (e.g. a stabilized power supply used where the quality of the primary supply is not sufficient to feed telecommunication equipment).

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

connection: temporary association of transmission channels or telecommunication circuits, switching or other functional units set up to provide for the transfer of information between two or more points in a telecommunication network (IEC 60050-714 [22])

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

DC secondary interface: output port of a DC power supply

DC secondary voltage: output of the DC power supply at the DC secondary interface. The DC secondary voltage may be derived from the AC primary supply with or without a buffer battery

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): 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

enclosure port: physical boundary of the Equipment Under Test (EUT) through which electromagnetic fields may emanate or on which they may impinge

environment, environmental conditions: 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 severity's

environmental parameters: present one or more properties of the electromagnetic environment

immunity (to a disturbance) (161-01-20): ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

impulsive disturbance (161-02-09): electromagnetic disturbance which, when incident on a particular device or equipment, manifests itself as a succession of distinct pulses or transients

interface "A": terminals at which a power supply is connected to the telecommunications equipment

nominal voltage: nominal value of voltage that designates the type of supply

normal service: service mode where telecommunications equipment operates within its specification

performance criterion: limits of acceptable behaviour of the equipment during and after the application of the electromagnetic phenomenon

NOTE 2: Performance criteria A apply for continuous phenomena; performance criteria B and C apply for transient phenomena; and performance criteria R apply for resistibility phenomena.

port: particular interface of the EUT with the external electromagnetic environment

power supply: power source (within the scope of the present document) to which telecommunications equipment is intended to be connected

primary supply: public mains or a locally generated AC or DC supply

pulse (161-02-02): abrupt variation of short duration of a physical quantity followed by a rapid return to the initial value

Radio Frequencies (RF): frequency range above 150 kHz

resistibility: ability of equipment having one or more telecommunication ports to withstand the effects of electrical, magnetic and electromagnetic phenomena in accordance with a specified criterion

rise time (of a pulse) (161-02-05): interval of time between the instants at which the instantaneous value of a pulse first reaches a specified lower value and then a specified upper value

NOTE 3: Unless otherwise specified, the lower and upper values are fixed at 10 % and 90 % of the pulse magnitude.

secondary supply: supply to the telecommunications equipment (e.g. racks or system blocks), derived from the primary supply

surge (voltage) (161-08-11): transient voltage wave propagating along a line or a circuit and characterized by a rapid increase followed by a slower decrease of the voltage

system block: functional group of equipment depending for its operation and performance upon the secondary power supply

telecommunication network: network operated under a licence granted by a national telecommunications authority which provides telecommunications between network termination points (NTPs) (i.e. excluding terminal equipment beyond the NTPs)

tertiary supply: supply to the telecommunications equipment derived from the secondary supply

transient (adjective or noun) (161-02-01): pertaining to, or designating a phenomenon or a quantity which varies between two consecutive steady states during a time interval which is short compared with the timescale of interest

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|-----------|--|
| AC | Alternating Current |
| AM | Amplitude Modulation |
| AV | Average |
| DC | Direct Current |
| EMC | ElectroMagnetic Compatibility |
| ESD | Electrostatic Discharge |
| EUT | Equipment Under Test |
| N/A | Not Applicable |
| NTP | Network Termination Point |
| PDH | Plesiochronous Digital Hierarchy |
| PRBS | Pseudo Random Bit Sequence |
| QP | Quasi-Peak |
| RF | Radio Frequency |
| rms | root-mean-square |
| SDH | Synchronous Digital Hierarchy |
| T_r/T_h | Rise time (10 % to 90 %) and hold time (50 % to 50 %) of transient signal (see EN 61000-4-4 [10]) |
| U_{pso} | Voltage measured with a psophometer conforming to ITU-T Recommendation O.41 [34] |

4 Installation environment

The installation environments for the equipment covered by the present document are defined in TR 101 651 [45]. The environments defined are either:

- the telecommunication centre (Major and Minor);
- locations other than telecommunication centre e.g. within offices, customers' premises, outdoor locations, etc.

If no restrictions are specified in the product documentation for the installation environment, the equipment shall comply with the requirements of all environments, implying that the more severe test level shall be used when the test is performed. Equipment which meets the (more severe) requirements for "other than telecommunications centres" may be operated in either location.

5 Immunity: test methods

Where reference is made in the present document to specific "test levels" to be used for the tests, it is implicitly required that the EUT shall also fulfil the compliance criteria when tested at "test levels" lower than those specified. This requirement does not apply, however, to tests for immunity to continuous phenomena.

Conducted immunity tests shall be applied to one port at a time.

One signal port of each type found on the equipment shall be tested. If in normal installation practice multi-pair cables (e.g. 64 × balanced pairs) and composite cables (e.g. a combination of fibre and copper) are used, they are to be tested as one single cable. Cables bundled for aesthetic or routing purposes are to be tested individually.

5.1 Electrostatic discharge

The immunity test method and laboratory conditions are described in EN 61000-4-2 [8].

ESD shall be applied only to such points that are accessible to personnel during normal usage. The application of discharges to any point of the equipment other than the electrostatic protection point which is accessible only for maintenance purposes is not allowed unless specified by the manufacturer.

5.2 Electrical fast transients/burst

The immunity test method and laboratory conditions are described in EN 61000-4-4 [10].

5.3 Surges

5.3.1 Outdoor signal line ports

The immunity test method to be used for signal line ports is described in the EN 61000-4-5 [11].

Where normal functioning cannot be achieved because of the impact of the CDN on the EUT, no immunity test shall be required.