



Classification of the electromagnetic environment conditions for equipment in telecommunication networks

Reference

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document should be used by the standardization committees to define the ElectroMagnetic Compatibility (EMC) requirements for the telecommunication equipment, depending by the locations where these are intended to be installed.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document provides information on the electromagnetic environmental conditions encountered where telecommunications equipment is installed and is a compilation of data concerning electromagnetic environmental conditions.

In the present document only locations for equipment that are in the telecommunication network are considered.

Only some of the data is based on comprehensive environmental surveys. Such surveys are rarely reported in available literature. Consequently, estimated values are often used when the electromagnetic environmental conditions are stated. In order to characterize the electromagnetic environment, it is necessary to make certain assumptions on the installation practice. If these assumptions are not satisfied in a particular case, the environmental characteristic may not apply.

Each environment is characterized in two ways:

- by a short verbal description of its assumed attributes;
- by a quantitative statement of the characteristic severities of the crucial environmental phenomena.

It is only possible to specify the appropriate EMC requirements following the assessment of the severity of the electromagnetic environment. This in turn will be helpful in ensuring that the telecommunications network equipment has the sufficient intrinsic immunity to enable it to operate as intended in its environment.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

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NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI ETS 300 132-1 (1996): "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".
- [i.2] ETSI EN 300 132-2 (V2.4.6) (12-2011): "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by - 48 V direct current (dc)".

- [i.3] IEC 60364-1 ed. 5.0 (11-2005): "Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions".
- [i.4] ETSI EN 300 253 (V2.1.1) (04-2002): "Environmental Engineering (EE); Earthing and bonding of telecommunication equipment in telecommunication centres".
- [i.5] Recommendation ITU-T K.27 (05-1996): "Bonding configurations and earthing inside a telecommunication building".
- [i.6] IEC/TR 61000-2-5 ed. 2.0 (05-2011): "Electromagnetic compatibility (EMC) - Part 2-5: Environment - Description and classification of electromagnetic environments".
- [i.7] IEC Publication No. 60050 (161): "International Electrotechnical Vocabulary; Chapter 161: Electromagnetic compatibility".
- [i.8] ETSI EN 300 132-3-1 (02-2012): "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400 V; Sub-part 1: Direct current source up to 400 V".
- [i.9] ETSI EN 301 605 (10-2013): "Environmental Engineering (EE); Earthing and bonding of 400 VDC data and telecom (ICT) equipment".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

NOTE: The definitions taken from the IEC Publication No. 60050 (161) [i.7] have reference in parentheses.

Audio (low) Frequency (AF): frequency interval from 0 Hz to 20 kHz

NOTE: It may sometimes be convenient to extend the use of this term to include the range of frequencies up to 150 kHz.

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

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

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

environment, environmental conditions: electromagnetic conditions external to the equipment, to which it is subjected at a certain time

NOTE: The environmental conditions comprise a combination of single environmental parameters and their severities.

environmental class: representation of the environment on locations with similar properties

NOTE 1: They are specified and standardized to provide an operational frame of reference for:

- requirements on the environment;
- immunity requirements.

NOTE 2: The class is described using an envelope of environmental conditions expressed in terms of a number of environmental parameters and their characteristic severities or other characteristics. The environmental parameters specified for the class are limited to those which may affect equipment performance.

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

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

interface A3: interface, physical point, at which power supply is connected in order to operate the telecommunications and datacom (ICT) equipment with input DC voltage between 260 V and 400 V

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

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

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

shielding effectiveness: for a given external source, the ratio of electric or magnetic field strength at a point before and after the placement of the shield in question

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

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)

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
ASD	Adjustable Speed Drive
CT	Cordless Telephony
CT-2	Cordless Telephone, second generation
DC	Direct Current
DCS	Digital Cellular System
DECT	Digital Enhanced Cordless Telecommunications
EMC	Electro-Magnetic Compatibility
ESD	Electrostatic Discharge
GSM	Global System for Mobile Communications
HV	High Voltage
IEC	International Electrotechnical Commission
IMT	International Mobile Telephone
ISDN	Integrated Services Digital Network
ITE	Information Technology Equipment
ITU-T	International Telecommunication Union-Telecommunication standardization sector
PDC	Personal Digital Cellular
PHS	Personal Handy phone System
RF	Radio Frequency
rms	root-mean-square
TN-C	Terra-Neutral Combined

NOTE: See IEC 60364-1 [i.3].

TN-S Terra-Neutral Separated

NOTE: See IEC 60364-1 [i.3].

4 Application area

The present document applies to telecommunication equipment installed and controlled by the network operator which is installed in telecommunications centres, outdoor locations and customer's premises. It does not make references to equipment dependent details.

5 Characteristics of environments

5.1 Telecommunication and Data centres

5.1.0 General

The internal electrical power distribution is a 48 V DC nominal (alternatively 60 V DC) (according to ETSI EN 300 132-2 [i.2]) and a 230 V/400 V AC nominal 50 Hz (according to ETSI EN 300 132-1 [i.1]). In data centres the power distribution can be 365 V DC \pm 15 V. It is assumed that switching of loads on the DC supply seldom occurs, and therefore, has not been taken into account.

Battery back-up is available at 48 V DC (alternatively 60 V DC) and at 365 V DC \pm 15 V.

NOTE 1: Local emergency generators are not assumed.

Primary protection on incoming cables is not assumed.

NOTE 2: If primary protection is present, differential mode transients could occur.

Internal AC power cables are kept separate at some distance to DC power cables and signal cables in order to reduce mutual coupling. No separation is assumed between DC power cables and signal cables. Normal practice is to use grounded, metallic cable supports.

Cables from telecommunication centres to customers' premises are assumed to be unshielded.

Some Electrostatic Discharge (ESD) preventive measures are either incorporated in the building installation (e.g. charge dissipating floors) or through guidelines for handling and operation of the equipment (e.g. use of wrist-straps, charge dissipating shoes). Some distance to high power broadcast transmitters is assumed. In cases where radio communication transmitters are present on the premises, it is assumed that special precautions are taken in order to prevent exposure to the emitted field.

It is assumed that the building has no external lightning protection system.

NOTE 3: The effects of direct lightning strike to the building are not considered here.

5.1.1 Class 1 - major telecommunication and data centres

This environmental class applies to major telecommunication centres in dedicated locations controlled by the network operator. These would typically be located in urban areas.

The telecommunication centre has its own electricity power transformed from the public distribution network.

The AC power distribution inside the building is of the type TN-S, or IT (defined in IEC 60364-1 [i.3]).

External signal lines may be of any type, size or length normally entering via underground routes. There exists a risk of coupling to high voltage electricity lines or electric traction lines. A dedicated earthing and bonding network is implemented according to ETSI EN 300 253 [i.4] (or Recommendation ITU-T K.27 [i.5]) or ETSI EN 301 605 [i.9].

The shielding effectiveness from the building structure may give a frequency dependent attenuation of about 10 dB provided that the structural reinforcement elements of the building are adequately bonded together to form an integral mesh.

No broadcast receivers are expected at a distance closer than 10 m.

5.1.2 Class 2 - minor telecommunication and data centres

This environmental class applies to telecommunication centres in dedicated locations controlled by the network operator. These would typically be located in rural areas serving the local community, and may often be unmanned.

The telecommunication centre may draw its electrical power from the public supply network either via a dedicated transformer or from a transformer shared with the local community.

The AC power distribution inside the building may be of the type TN-S, TN-C, TT or IT (defined in IEC 60364-1 [i.3]).

External signal lines may be overhead cables of considerable length. There is a high risk of coupling to high voltage electricity lines or electric traction lines.

A dedicated earthing and bonding network is implemented according to ETSI EN 300 253 [i.4] (or Recommendation ITU-T K.27 [i.5]) or ETSI EN 301 605 [i.9].

No shielding effectiveness from the building structure can be assumed.

No broadcast receivers are expected at a distance closer than 10 m.

5.2 Class 3 - outdoor locations

This environmental class applies to an unattended telecommunications site such as street furniture, telephone boxes, repeaters and amplifiers on trunk cables, or to concentrators and cable distribution boxes.

This environmental class may apply also to equipment buried below ground level.

Repeaters on submarine cables are not covered by this class.

DC power may also be supplied from the telecommunication centre 48 V DC, (alternatively 60 V DC) or higher voltages. Voltages up to 120 V DC can be expected for ISDN basic rate remote supply systems. Only the 48 V DC (alternatively 60 V DC) systems are included at present.

Remote supplies of digital transmission systems using ± 110 V DC, of carrier frequency systems using 270 V DC or even ± 600 V DC are considered as being intrinsic to the systems and are not considered as being environmental parameters.

External signal lines may be of any type, size or length. There is a high risk of coupling to high voltage electricity lines and to electric traction lines.

Remote repeaters in rural areas are equipped with overvoltage protection devices. A local ground electrode might not be present in all cases. Other outdoor locations may not be protected.

The class does not apply to installations in areas of high keraunic levels. An external lightning protection system cannot be assumed.

NOTE: The effects of direct lightning strike to the building are not considered here.

The outdoor locations are considered as being low risk areas in terms of electrostatic charges.

The distance to electricity distribution transformers may be small and the mains frequency related magnetic field exposure may be high.

Some distance to high power broadcasting transmitters and amateur radio transmitters are assumed. However, mobile and portable radio transmitters may come very close.

The installation is enclosed in some housing or cabinet for weather protection purposes. The enclosure may be used to shield against electromagnetic fields.

Street furnitures, telephone boxes, repeaters and amplifiers on trunk cables, or concentrators and cable distribution boxes are expected to be installed in area where broadcast receivers may be expected at a distance closer than 10 m.

5.3 Class 4 - customers' premises

This environmental class (location) encompasses the locations that have the attributes defined in clause 6, table 1.

As a first approach to a quantitative characteristic an attempt has been made to fit the "disturbance levels" specified by IEC/TR 61000-2-5 [i.6] into tables 2 to 7. There rarely exists a one-to-one correspondence between the environmental parameters given in the present document and the "phenomena" introduced by IEC. Disturbances neglected by the IEC have been included and vice versa, and even in cases where a certain phenomenon has been included in both places, differences remain in the attributes chosen to characterize the disturbance.

In tables 2 to 7, values given in brackets means that they are not specified by the IEC.

6 Attributes of customers' premises

Table 1

Media	Attributes
Radiated:	<ul style="list-style-type: none"> - no amateur radio closer than 20 m; - no broadcast transmitter closer than 1 km; - paging and portable communication systems; - high concentration of ITE; - possible presence of diathermy therapy equipment; - possible proximity of local substation; - possible presence of audio/hearing aid systems; - broadcast receivers expected at a distance closer than 10 m.
AC power:	<ul style="list-style-type: none"> - relatively high network impedance; - cables or overhead lines; - high harmonic levels (ITE, lighting, ASD); - roof-top mounted equipment (lightning exposure); - significant lightning exposure.
DC power:	- not applicable.
Signal/control:	<ul style="list-style-type: none"> - overhead telecom cables or lines; - cables or short overhead spans; - close coupling between signal systems and switched power systems; - significant lightning exposure; - control lines are usually short, less than 10 m.
Reference earth:	<ul style="list-style-type: none"> - abundant metallic structures which may or may not be bonded, earthed or grounded; - frequent interfaces of power and telecom (including local) systems; - local ground can be absent or present high impedance; - multiple local grounds might not be co-ordinated.
Additional notes:	<ul style="list-style-type: none"> - interfaces with customer systems; - HV lines might be routed over buildings.

7 Notation to tables 2 to 7

In tables 2 to 7, the following notation has been used:

Correlated parameters: correlated parameter values are arranged vertically and separated by ";" e.g.:

A; B; C; ...

a; b; c; ...

Functional relations: functional relations are always piecemeal linear and defined by their break-points. A discontinuity where a parameter changes from a to b is written "a/b" e.g.:

f1 f2 - f3

a1 a2 - a3

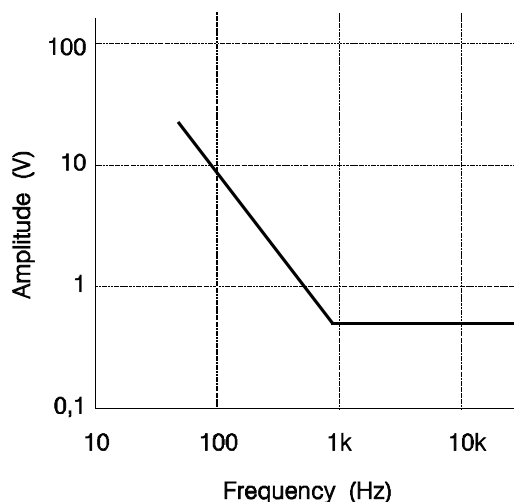
or

f1 f2 - f3

a1 a2/b1 - b2

Such relations state the frequency dependence of a parameter, and in that case, the linear interpolation between break-points is made using logarithmic scales on both axes.

Figure 1 shows an example of frequency dependence.



Audio frequency voltage	Frequency (kHz)	0,05 - 1 - 20
Common mode	Amplitude (V)	20 - 0,5 - 0,5

Figure 1

Universal values: if a single parameter value applies over the whole range, only a single number is stated.

Intervals: where a detail parameter Q may assume any value in an interval, and where it is impossible to state which value constitutes the most severe condition, the parameter is specified by the interval: q1 to q2.

8 Characteristic severities of environmental parameters

In tables 2 to 7, the characteristic severities and other characteristics of the relevant environmental parameters are stated for the environmental class for telecommunication network equipment.

It is often not feasible to model the disturbances/parameters in every detail. For instance the temporal evolution of transients is much too complex to be described realistically. In such cases, simplified models are used which select the characteristic details as appropriate to the standardized test pulses. This approach presumes that the test pulses do emphasize the crucial features.

In case of continuous disturbances, the postulated frequency dependence and modulation mode are gross simplifications of reality. A frequency analysis will show that the disturbances are confined within narrow frequency bands separated by "silent" intervals. This complicated (and time dependent) pattern is replaced by a smooth frequency variation using few levels of amplitude.

The environmental parameters are arranged in tables according to the coupling path. Six coupling-paths are included:

- 1) **signal lines entering the building**, which includes all telecommunications lines of the extended networks where metallic conductors are used;
- 2) **signal lines remaining within the building**, which includes all signal lines in the local installation using metallic conductors. They are of relatively short lengths, and are confined to the local premises;
- 3) **AC power mains** is the low voltage distribution network (230 V/400 V, 50 Hz);
- 4) **DC power** distribution is the local power distribution system at 48 V (alternatively 60 V). DC supplies integrated in the equipment are not included;
- 5) **radiation** covers coupling to the internal wiring of the equipment via electromagnetic fields. Radiation picked up by the connected wires or cables is included in the conducted coupling-paths stated above;

- 6) **discharge of static electricity (ESD)** may take place directly to the equipment or to other metallic objects in its vicinity. ESD is taken into account as a separate parameter.

Table 2: Conducted disturbances on signal lines entering the building

Environmental parameter		Class 1	Class 2	Class 3	Class 4
DC Voltage Common mode (note 1)	Amplitude V		500		(500)
	Impedance MΩ		> 1		(> 1)
16 2/3 Hz voltage common mode (note 2)	Amplitude V rms	20	50		(50)
	Impedance Ω	100	100		(100)
50 Hz voltage differential mode	Amplitude V rms		240		(240)
	Impedance Ω		10 to 600		(10 to 600)
	Duration min		about 10		(about 10)
50 Hz voltage common mode	Amplitude V rms	(note 3)	300		(300)
	Impedance Ω		100		(100)
	Duration s		0,5		(0,5)
Audio frequency voltage common mode	Frequency kHz	0,05 - 1 - 20	0,05 - 1 - 20		
	Amplitude V rms	20 - 0,5 - 0,5	30 - 0,75 - 0,75		
	Impedance Ω	100	100		300
Radio frequency voltage common mode, amplitude modulated (note 4)	Frequency MHz	0,15 to 100	0,15 to 100		0,01 to 0,15
	Amplitude V rms	1	3		1
	Frequency MHz				0,1 to 30
	Amplitude V rms				10
Electrical fast transients Common mode (high frequency, low energy)	Frequency MHz				30 to 150
	Amplitude V rms				3
	Amplitude V peak	250		500	1 000 (note 5)
	Rate of occurrence events/week	Several		Several	Several
Surge common mode (Low frequency, high energy)	Rise time ns	1 to 100		1 to 100	5
	Impedance Ω	40 to 80		40 to 80	50
	Amplitude V peak	300; 1 000 1 to 1 000	300; 1 000; 3 000	300; 1 000; 3 000	500; 1 000 10; 1
Surge common mode (Low frequency, high energy)	Rise time μs		1 to 1 000	1 to 1 000	
	Duration μs	< 3 000	< 3 000	< 3 000	1 000; 50
	Rate of occurrence events/year	6; 0,5	6; 0,5; 0,2	30; 3; 1	Multiple
	Impedance Ω	20 to 40	20 to 40	20 to 40	20 to 300; 1 to 10
NOTE 1: 1MΩ source impedance included in order to take into account e.g. cable fault location equipment. DC power plants for traction systems causing DC potential differences on the telecommunication lines are not take into account. The induced voltages from geomagnetic activity are also not included.					
NOTE 2: Only applicable in Austria, Germany, Norway, Sweden and Switzerland.					
NOTE 3: For Major Telecommunications Centres (Class 1), 50 Hz Common Mode Voltage due to earth faults in nearby high voltage electricity systems is not taken into account. The probability of this phenomena occurring is extremely low.					
NOTE 4: As the primary coupling occurs in the last few metres of the signal line, it takes advantage of the shielding effects in the building (e.g. metallic framework) of the Major Telecommunications Centre (Class 1). Hence, 1V can be assumed. For environmental classes 1, 2 and 3, disturbance in the frequency range 20 kHz to 150 kHz is unlikely.					
NOTE 5: Only specified for close coupling between signal systems and switched power systems.					

Table 3: Conducted disturbances on signal lines remaining within the building

Environmental parameter		Class 1	Class 2	Class 3	Class 4
Audio Frequency Voltage Common mode	Frequency kHz	0,05 - 1 - 20		Not Applicable	0,05 - 1 - 20
	Amplitude V rms	5 - 0,2 - 0,2			10 - 0,5 - 0,5
	Impedance Ω	100			300
Radio frequency Voltage Common mode, Amplitude modulated (note 1)	Frequency MHz	0,15 to 100	0,15 to 100 < 3 (note 2)	Not Applicable	0,01 to 0,15
	Amplitude V rms	1			1
	Frequency MHz				0,1 to 30
	Amplitude V rms				10
Electrical fast transients Common mode (high Frequency, Low energy)	Amplitude V peak	250		Not Applicable	1 000 (note 3)
	Rate of occurrence events/week	Several			Several
Low energy)	Rise time ns	1 to 100			5
	Impedance Ω				50

NOTE 1: For environmental classes 1, 2 and 3, disturbance in the frequency range 20 kHz to 150 kHz is unlikely.
NOTE 2: Value depending on length of cable.
NOTE 3: Only specified for close coupling between signal systems and switched power systems.

Table 4: Conducted disturbances on AC power units

Environmental parameter		Class 1	Class 2	Class 3	Class 4
Voltage variation	Voltage change %	± 10	+10/-15	+10/-15	± 8
Voltage fluctuation	Voltage change %	-50 to -20; +20			10 to 99
	Duration ms	10 to 1500			< 3 000
	Rate of occurrence events/day	100 to 0,01			unspecified
Voltage interruption	Duration ms	10; 20; 40; 100 to 700			< 6 000
	Rate of occurrence events/day	10; 1; 0,1; 0,05			unspecified
Radio frequency Voltage Common mode, Amplitude modulated (note 1)	Frequency MHz	0,15 to 100	0,15 to 100		0,01 to 0,15
	Amplitude V rms	1 (note 2)	3		1
	Frequency MHz				0,1 to 30
	Amplitude V rms				10
Electrical fast transients Common mode and differential mode (High frequency, Low energy)	Amplitude V peak	1 000			(1 000)
	Rate of occurrence events/day	1			(1)
	Rise time ns	1 to 100			(1 to 100)
Surge line/neutral (Low frequency, High energy)	Amplitude kV peak	2	2; 4	2; 4	(2; 4)
	Rise time μ s	0,5 to 10	0,5 to 10	0,5 to 10	(0,5 to 10)
	Duration μ s	< 100	< 100; < 100	< 100	(< 100)
	Rate of occurrence events/year	20	100; 3	100; 3	(100; 3)
Surge line/ground (Low frequency, High energy)	Amplitude kV peak	(note 3)	2; 4	2; 4	(1; 4)
	Rise time μ s		0,5 to 10	0,5 to 10	10; 1
	Duration μ s		< 100; < 100	< 100	1 000; 50
	Rate of occurrence events/year		100; 3	100; 3	Multiple
	Impedance Ω		10 - 20		20 to 300; 1 to 10

NOTE 1: For environmental classes 1, 2 and 3, disturbance in the frequency range 20 kHz to 150 kHz is unlikely.
NOTE 2: It takes advantage of the shielding effects in the building (e.g. metallic framework) of the major telecommunications centre (class 1). Hence, 1 V can be assumed.
NOTE 3: Not applicable because major telecommunications centres (class 1) have their own electricity power transformers.

Table 5: Conducted disturbances on the DC power distribution (48 V nominal assumed)

Environmental parameter		Class 1	Class 2	Class 3 (note 3)	Class 4
Voltage variation (note 4)	Voltage V	40,5/57 (note 5)		40,5/57	(40,5/57)
Voltage fluctuation and interruption (note 4)	Voltage V	0 to 40,5; 57 to 60 (note 5)		0 to 40,5; 57	(0 to 40,5;57 to 60)
	Duration ms	< 50 (note 6)			(< 50)
	Rate of occurrence events/year	3			(3)
Audio frequency Voltage Differential mode	Frequency kHz Amplitude mV rms	0,025 - 0,3 - 1 - 20 - 150 50 - 50 - 7 - 7/50 - 50			(0,025-0,3-1-20-150) (50-50-7-7/50-50)
Radio frequency Voltage Common mode, Amplitude modulated	Frequency MHz Amplitude V rms	0,15 to 100 1	0,15 to 100 < 3 (note 1)	0,15 to 100 1	(0,15 to 100) < 3 (note 1)
Electrical fast transients	Amplitude V peak	250			(250)
Common mode (High frequency, Low energy)	Rate of occurrence events/week	Several			(Several)
	Rise time ns	1 to 100			(1 to 100)
Surge	Amplitude V	200		Not applicable	(200)
Common mode and Differential mode (note 2)	Rise time μ s	5			(5)
	Duration μ s	50			(50)
	Rate of occurrence events/year	3			(3)
NOTE 1: Value depending on length of cable.					
NOTE 2: From fuse blowing.					
NOTE 3: Class 3 does not apply to remote 48 V DC supplies via the signal lines.					
NOTE 4: Not considered by the IEC.					
NOTE 5: For Data Centres with voltage distribution of 365 V DC \pm 15 V, voltage variations are defined in ETSI EN 300 132-3-1 [i.8].					
NOTE 6: Presence of backup battery is not considered.					

Table 6: Radiated disturbances

Environmental parameter		Class 1	Class 2	Class 3 (note 3)	Class 4 (note 4)
Audio frequency Magnetic Field	Frequency Hz Amplitude A/m rms	50 to 20 000 10 to 0,025	50 to 20 000 3 to 0,008	50 to 20 000 10 to 0,025	16;50 to 20 000 1; 0,015
	Frequency Hz Amplitude A/m rms				50; 100 to 3 000 10; 1,8 to 0,6
Radio frequency Electromagnetic field Amplitude modulated	Frequency MHz Amplitude V/m rms	0,15 to 1 000 1	0,15 to 1 000 3	0,15 to 1 000 1	0,15 to 1 000 3
	Frequency MHz Amplitude V/m rms				27 10 (note 2)
Radio frequency Electromagnetic field Pulse modulated (note 1)	Frequency MHz Amplitude V/m peak	0,15 to 6 000 3 V/m at: -10,5 m for GSM -4,7 m for DCS -1,2 m for DECT -0,23 m for CT-2 -3,3 m for PDC -0,66 m for PHS -1,2 m for IMT 2000 10 V/m at: -3,2 m for GSM -1,4 m for DCS -0,35 m for DECT -0,063 m for CT-2 -0,99 m for PDC -0,2 m for PHS -0,35 m for IMT 2000	0,15 to 6 000 3 V/m at: -10,5 m for GSM -4,7 m for DCS -1,2 m for DECT -0,23 m for CT-2 -3,3 m for PDC -0,66 m for PHS -1,2 m for IMT 2000 10 V/m at: -3,2 m for GSM -1,4 m for DCS -0,35 m for DECT -0,063 m for CT-2 -0,99 m for PDC -0,2 m for PHS -0,35 m for IMT 2000	0,15 to 6 000 3 V/m at: -10,5 m for GSM -4,7 m for DCS -1,2 m for DECT -0,23 m for CT-2 -3,3 m for PDC -0,66 m for PHS -1,2 m for IMT 2000 10 V/m at: -3,2 m for GSM -1,4 m for DCS -0,35 m for DECT -0,063 m for CT-2 -0,99 m for PDC -0,2 m for PHS -0,35 m for IMT 2000	0,15 to 6 000 3 V/m at: -10,5 m for GSM -4,7 m for DCS -1,2 m for DECT -0,23 m for CT-2 -3,3 m for PDC -0,66 m for PHS -1,2 m for IMT 2000 10 V/m at: -3,2 m for GSM -1,4 m for DCS -0,35 m for DECT -0,063 m for CT-2 -0,99 m for PDC -0,2 m for PHS -0,35 m for IMT 2000
	Frequency MHz Amplitude mV/m/kHz	0,01 to 300 100 to 1			Not applicable
Pulse Electromagnetic field	Frequency MHz Amplitude dB ref kTB				0,01 to 1 117
	Frequency MHz Amplitude dB ref kTB				1 to 10 77
	Frequency MHz Amplitude dB ref kTB				10 to 100 57
	Frequency MHz Amplitude dB ref kTB				100 to 1 000 37
Lightning Electromagnetic pulse	Amplitude A/m Rise time μ s	Not applicable	500 0,2	Not applicable	Specified by the slew rate 100 V/m/ns
	Duration μ s		100		
	Rate of occurrence events/year		0,1		
NOTE 1: These are average values for modulated radiation from mobile/portable phones. Disturbance levels from base stations are lower in respect to mobile/portable phones (see tables 20 and 21 of IEC/TR 61000-2-5 [i.6] for more details).					
NOTE 2: In the vicinity of radio transmitters.					

Table 7: Electrostatic charge

Environmental Parameter		Class 1	Class 2	Class 3	Class 4
Electrostatic Voltage	Amplitude kV peak	4		2	Slow ESD: < 1 - 8 kV Fast ESD: 8 - 30 kV (note)
NOTE: Slow ESD: Rise time 5 ns, Duration 15 ns, Rate of occurrence: Single, Source: 100 Ω - 500 Ω /100 Ω - 500 pF. Fast ESD: Rise time 0,3 ns, Duration 2 ns, Rate of occurrence: Single, Source: 100 Ω - 500 Ω /100 Ω - 500 pF.					

History

Document history		
V1.1.1	March 1999	Publication
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