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**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Impact of CENELEC EN 55035 on ETSI EMC Standards**

Reference

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Foreword

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

Modal verbs terminology

In the present document "**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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document is intended to review the impact of CENELEC EN 55035 [i.1] on existing ETSI EMC deliverables and to recommend to ETSI TC ERM as to what (if any) changes should be made to these deliverables.

It should be noted that if changes are made to existing deliverables, then the usual procedures as per the ETSI TWP [i.29] are to be followed.

It should also be noted the present document bases its review around edition 1 of CENELEC EN 55035 [i.1].

2 References

2.1 Normative references

Normative references are not applicable in the present document.

2.2 Informative 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 referenced document (including any amendments) applies.

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] CENELEC EN 55035:2017: "Electromagnetic compatibility of multimedia equipment - Immunity requirements".
- [i.2] CISPR 35 (08-2016): "Electromagnetic compatibility of multimedia equipment - Immunity requirements".
- [i.3] ETSI EN 300 386 (V2.1.1): "Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements; Harmonised Standard covering the essential requirements of the Directive 2014/30/EU".
- [i.4] ETSI EN 301 489 (all parts): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services".
- [i.5] ETSI EN 301 489-1 (V2.1.1): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU".
- [i.6] ETSI ES 201 468: "Additional ElectroMagnetic Compatibility (EMC) requirements and resistibility requirements for telecommunications equipment for enhanced availability of service in specific applications".
- [i.7] ETSI TR 101 651: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Classification of the electromagnetic environment conditions for equipment in telecommunication networks".
- [i.8] CENELEC EN 61000-6-1: "Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments".
- [i.9] CENELEC EN 61000-6-2: "Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments".

- [i.10] CENELEC EN 55020: "Sound and television broadcast receivers and associated equipment - Immunity characteristics - Limits and methods of measurement".
- [i.11] CENELEC EN 55024: "Information technology equipment - Immunity characteristics - Limits and methods of measurement".
- [i.12] CISPR 20: "Sound and television broadcast receivers and associated equipment - Immunity characteristics - Limits and methods of measurement".
- [i.13] CISPR 24: "Information technology equipment - Immunity characteristics - Limits and methods of measurement".
- [i.14] CENELEC EN 55032: "Electromagnetic compatibility of multimedia equipment - Emission Requirements".
- [i.15] CISPR 32: "Electromagnetic compatibility of multimedia equipment - Emission Requirements".
- [i.16] CENELEC EN 61000-4-2 (2009): "Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test".
- [i.17] CENELEC EN 61000-4-3 (2006), A1 (2008) and A2 (2010): "Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test".
- [i.18] CENELEC EN 61000-4-4 (2012): "Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test".
- [i.19] CENELEC EN 61000-4-5 (2006): "Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test".
- [i.20] CENELEC EN 61000-4-6 (2009): "Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields".
- [i.21] CENELEC EN 61000-4-11 (2004): "Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests".
- [i.22] CENELEC EN 61000-4-8 (2010): "Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test".
- [i.23] ISO 7637-2 (2004): "Road vehicles - Electrical disturbances from conduction and coupling - Part 2: Electrical transient conduction along supply lines only".
- [i.24] CENELEC EN 61000-4-20 (2010): "Electromagnetic compatibility (EMC) - Part 4-20: Testing and measurement techniques - Emission and immunity testing in transverse electromagnetic (TEM) waveguides".
- [i.25] CENELEC EN 61000-4-21 (2011): "Electromagnetic compatibility (EMC) - Part 4-21: Testing and measurement techniques - Reverberation chamber test methods".
- [i.26] Recommendation ITU-T K.20: "Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents".
- [i.27] Recommendation ITU-T K.21: "Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents".
- [i.28] ETSI EN 300 132-2: "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.29] ETSI Directives, Technical Working Procedures.
- [i.30] Commission Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast).

- [i.31] Commission Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.
- [i.32] CISPR 16-1-2: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Coupling devices for conducted disturbance measurements".
- [i.33] CENELEC EN 55016-1-2: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Coupling devices for conducted disturbance measurements".
- [i.34] ETSI EN 303 446-1 (DEN/ERM-EMC-348-1): "ElectroMagnetic Compatibility (EMC) standard for combined and/or integrated radio and non-radio equipment; Part 1: Requirements for equipment intended to be used in residential, commercial and light industry locations; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU".
- [i.35] ETSI EN 303 446-2 (DEN/ERM-EMC-356): "ElectroMagnetic Compatibility (EMC) standard for combined and/or integrated radio and non-radio equipment; Part 2: Specific conditions for equipment intended to be used in industrial locations; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU".

3 Definitions and abbreviations

3.1 Definitions

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

audio equipment: equipment which has a primary function of either (or a combination of) generation, input, storage, play, retrieval, transmission, reception, amplification, processing, switching or control of audio signals

broadcast receiver equipment: equipment containing a tuner that is intended for the reception of broadcast services messages and which may be equipped with one or more ports typically for information transfer

entertainment lighting control equipment: equipment generating or processing electrical signals for controlling the intensity, colour, nature or direction of the light from a luminaire, where the intention is to create artistic effects in theatrical, televisual or musical productions and visual presentations

Information Technology Equipment (ITE): equipment having a primary function of either (or a combination of) entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication

Multimedia equipment (MME): equipment that is information technology equipment, audio equipment, video equipment, broadcast receiver equipment, entertainment lighting control equipment or a combination of these

video equipment: equipment which has a primary function of either (or a combination of) generation, input, storage, display, play, retrieval, transmission, reception, amplification, processing, switching or control of video signals

3.2 Abbreviations

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

AC	Alternating Current
AM	Amplitude Modulation
CISPR	Comité International Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference)
CPE	Customer Premise Equipment
CRT	Cathode Ray Tube
DC	Direct Current
DVB-C	Digital Video Broadcasting - Cable
EC	European Commission

EMC	ElectroMagnetic Compatibility
EN	European Norm
ES	ETSI Standard
EUT	Equipment Under Test
ITE	Information Technology Equipment
ITU-T	International Telecommunication Union - Telecommunication sector
MME	MultiMedia Equipment
RF	Radio Frequency
TC	Technical Committee
TWP	Technical Working Procedures
xDSL	x Digital Subscriber Line

4 Introduction to CENELEC EN 55035

4.1 Scope of CENELEC EN 55035

The standard EN 55035 [i.1] is a CENELEC publication that covers the immunity requirements for multimedia equipment. CENELEC EN 55035 [i.1] is based on the CISPR 35 [i.2] with the addition of European Common modifications.

CENELEC EN 55035 [i.1] applies to MME within the scope of CENELEC EN 55020 [i.10] or CENELEC EN 55024 [i.11].

4.2 Scope of CISPR 35

The CISPR 35 [i.2] publication applies to multimedia equipment (MME) having a rated AC or DC supply voltage not exceeding 600 V. MME within the scope of CISPR 35 [i.2] are:

- MME within the scope of CISPR 20 [i.12] or CISPR 24 [i.13].
- MME with a broadcast reception function.
- MME with non-broadcast wireless interfaces.
- MME intended primarily for professional.

4.3 European Common modifications in EN 55035

The European Common modifications in CENELEC EN 55035 [i.1] in respect to CISPR 35 [i.2] are:

- Amendment on the applicability of CENELEC EN 55035 [i.1]: the following sentence is added in the scope of CENELEC EN 55035 [i.1]:

"For multimedia equipment (MME) that falls within the scope of ETSI EN 300 386 or any part(s) of ETSI EN 301 489 series, the requirements within these product specific/product family standards take precedence over the requirements within this publication."

- Modified test level and performance criteria for the broadcast reception function: the following sentence is added in CENELEC EN 55035 [i.1]:

"Except for DVB-C, the tuned channel $\pm 0,5$ MHz (lower edge frequency - 0,5 MHz up to the upper edge frequency + 0,5 MHz of the tuned channel) is excluded from testing. For DVB-C, the disturbance levels are 3 V/m or 3 V, except in the tuned channel $\pm 0,5$ MHz (lower edge frequency - 0,5 MHz up to the upper edge frequency + 0,5 MHz of the tuned channel), where the disturbance level is 1 V/m."

- Normative references: the reference to IEC and CISPR publications are replaced by the corresponding EN standards (e.g. CISPR 16-1-2 [i.32] is replaced by CENELEC EN 55016-1-2 [i.33], etc.)
- Normative annex on the coverage of essential requirements of the EU EMC Directive 2014/30/EU [i.30].

NOTE: Emission requirements for multimedia equipment are covered in CENELEC EN 55032 [i.14] that is based on the Publication CISPR 32 [i.15].

5 ETSI EMC deliverables with immunity requirements

5.1 Harmonised EMC standards with immunity requirements

ETSI currently produces and maintains the following harmonised EMC standards that contains immunity requirements; ETSI EN 300 386 [i.3] and ETSI EN 301 489 series [i.4]. All these standards include immunity requirements.

ETSI EN 300 386 [i.3] is a harmonised standard for the EU Directive 2014/30/EU [i.30] and ETSI EN 301 489 series [i.4] are harmonised standards for the EU Directive 2014/30/EU [i.30] and Directive 2014/53/EU [i.31]. All these standards include immunity requirements.

ETSI is also developing two new harmonised standards for combined and/or integrated radio and non-radio equipment; these standards are ETSI EN 303 446-1 [i.34] and ETSI EN 303 446-2 [i.35]. These standards will be harmonised standards for EU Directive 2014/53/EU [i.31] and they define how to assess the immunity requirements of the combined and/or integrated radio and non-radio equipment.

5.2 Other EMC Standards with immunity requirements

ETSI ERM WG EMC also produces and maintains ETSI ES 201 468 [i.6].

ETSI ES 201 468 [i.6] defines additional immunity and resistibility requirements for telecommunications equipment for enhanced availability of service in specific applications. The immunity requirements defined in ETSI ES 201 468 [i.6] have test levels higher than the harmonised standard ETSI EN 300 386 [i.3].

6 Comparison between CENELEC EN 55035 and ETSI deliverables

6.1 Introduction

For the purposes of the present document, comparisons are between the immunity requirements in CENELEC EN 55035 [i.1] and the ETSI deliverables on EMC.

6.2 Comparison between CENELEC EN 55035 and ETSI EN 300 386

6.2.1 General

ETSI EN 300 386 [i.3] defines the immunity requirements for two environments: telecommunication centres and other than telecommunication centres. CENELEC EN 55035 [i.1] defines only one set of immunity requirements that apply to any environment.

6.2.2 Performance criteria

The general performance criteria in ETSI EN 300 386 [i.3] and CENELEC EN 55035 [i.1] are provided in table 1.

Table 1: Comparison of performance criteria in ETSI EN 300 386 [i.3] and CENELEC EN 55035 [i.1]

	ETSI EN 300 386 [i.3]	CENELEC EN 55035 [i.1]
Performance criterion A	<p>The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the apparatus is used as intended.</p> <p>In some cases the performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.</p>	<p>The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended.</p> <p>The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
Performance criterion B	<p>The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.</p> <p>During the exposure to an electromagnetic phenomenon, degradation of performance is, however, allowed.</p> <p>No change of actual operating state or stored data is allowed.</p> <p>If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.</p>	<p>During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.</p> <p>After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended.</p> <p>The performance level may be replaced by a permissible loss of performance.</p> <p>If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
Performance criterion C	<p>Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or, in the case of switching equipment, by normal subsequent use.</p>	<p>Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.</p> <p>Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

6.2.3 Immunity requirements

The immunity requirements in ETSI EN 300 386 [i.3] and CENELEC EN 55035 [i.1] are defined for each type of ports. In tables 2 to 5 there is the comparison of the immunity requirements defined in these standards for each type of ports.

Table 2: Immunity requirements on enclosure port

Phenomenon	ETSI EN 300 386 [i.3]				CENELEC EN 55035 [i.1]		
	Reference test method	Test level Environment: Telecommunication centres	Test level Environment: Other than telecommunication centres	Performance criterion	Reference test method	Test level	Performance criterion
Electrostatic discharges	CENELEC EN 61000-4-2 [i.16]	Contact: 4 kV Air: 4 kV	Contact: 6 kV Air: 8 kV	B B	CENELEC EN 61000-4-2 [i.16]	Contact: 4 kV Air: 8 kV	B B
Radio frequency electromagnetic field amplitude modulated	CENELEC EN 61000-4-3 [i.17]	80 MHz to 690 MHz 3 V/m (80 % AM modulation at 1 kHz)	80 MHz to 690 MHz 3 V/m (80 % AM modulation at 1 kHz)	A	CENELEC EN 61000-4-3 [i.17] Or CENELEC EN 61000-4-20 [i.24] Or CENELEC EN 61000-4-21 [i.25]	80 MHz to 1 GHz 3 V/m (80 % AM modulation at 1 kHz)	A
		690 MHz to 6 GHz 10 V/m (80 % AM modulation at 1 kHz)	690 MHz to 6 GHz 10 V/m (80 % AM modulation at 1 kHz)	A		Spot frequencies: 1,8 GHz 2,6 GHz 3,5 GHz 5 GHz 3 V/m (80 % AM modulation at 1 kHz)	A
Power frequency magnetic field (CENELEC EN 55035 [i.1]: only applicable to EUT with devices susceptible to magnetic field)		None	None		CENELEC EN 61000-4-8 [i.22]	50 Hz 1 A/m	A

Table 3: Immunity requirements for analogue/digital signal ports

Phenomenon	ETSI EN 300 386 [i.3]				CENELEC EN 55035 [i.1]		
	Reference test method	Test level Environment: Telecommunication centres	Test level Environment: Other than telecommunication centres	Performance criterion	Reference test method	Test level	Performance criterion
Continuous induced RF disturbances	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 80 MHz 3 V	0,15 MHz to 80 MHz 3 V	A	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 10 MHz	A
						3 V	
						10 MHz to 30 MHz	
						3 V to 1 V	
Broadband impulse noise disturbances, repetitive (CENELEC EN 55035 [i.1]: only applicable to CPE)		Not applicable	Not applicable		CENELEC EN 55035 [i.1]	0,15 MHz to 0,5 MHz	A
						107 dB μ V	
						0,5 MHz to 10 MHz	
						107 to 36 dB μ V	
Broadband impulse noise disturbances, isolated (CENELEC EN 55035 [i.1]: only applicable to CPE)					CENELEC EN 55035 [i.1]	10 MHz to 30 MHz	B
						36 to 30 dB μ V	
						Burst duration: 0,7 ms	
						Burst period: 10 ms	
Electrical Fast transients	CENELEC EN 61000-4-4 [i.18]	0,5 kV Rep. freq: 5 kHz and 100 kHz on xDSL ports	0,5 kV Rep. freq: 5 kHz and 100 kHz on xDSL ports	B	CENELEC EN 61000-4-4 [i.18]	0,5 kV	B
						Rep. freq: 5 kHz and 100 kHz on xDSL ports	

	ETSI EN 300 386 [i.3]				CENELEC EN 55035 [i.1]		
Surges (outdoor lines)	CENELEC EN 61000-4-5 [i.19]	Unshielded symmetrical and unsymmetrical lines: Pulse: 10 µs/ 700 µs Lines to Ground: 1 kV without primary protections	Unshielded symmetrical and unsymmetrical lines: Pulse: 10 µs/ 700 µs Lines to Ground: 1 kV without primary protections	B	CENELEC EN 61000-4-5 [i.19]	Unshielded symmetrical lines: Pulse: 10 µs/700 µs Lines to Ground: 1 kV without primary protections Lines to Ground: 4 kV with primary protections	B C
		Coaxial or shielded lines: Pulse: 1,2 µs/50 µs Shield to Ground: 1 kV Line to Line: 0,5 kV	Coaxial or shielded lines: Pulse: 1,2 µs/50 µs Shield to Ground: 1 kV Line to Line: 0,5 kV	B		Coaxial or shielded lines: Pulse: 1,2 µs/50 µs Shield to Ground: 0,5 kV	B
Surges (indoor lines)	CENELEC EN 61000-4-5 [i.19]	All type of lines: Pulse: 1,2 µs/50 µs Shield to Ground: 0,5 kV	All type of lines: Pulse: 1,2 µs/50 µs Shield to Ground: 0,5 kV	B		None	

Table 4: Immunity requirements for AC power ports

Phenomenon	ETSI EN 300 386 [i.3]				CENELEC EN 55035 [i.1]		
	Reference test method	Test level Environment: Telecommunication centres	Test level Environment: Other than telecommunication centres	Performance criterion	Reference test method	Test level	Performance criterion
Continuous induced RF disturbances	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 80 MHz	0,15 MHz to 80 MHz	A	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 10 MHz	A
		3 V	3 V			3 V	
						10 MHz to 30 MHz	
						3 V to 1 V 30 MHz to 80 MHz	
					1 V		
Electrical Fast transients	CENELEC EN 61000-4-4 [i.18]	1 kV Rep. freq: 5 kHz	1 kV Rep. freq: 5 kHz	B	CENELEC EN 61000-4-4 [i.18]	1 kV Rep. freq: 5 kHz	B
Surges	CENELEC EN 61000-4-5 [i.19]	Pulse: 1,2 µs/50 µs Shield to Ground: 1 kV Line to Line: 0,5 kV	Pulse: 1,2 µs/50 µs Shield to Ground: 2 kV Line to Line: 1 kV	B B	CENELEC EN 61000-4-5 [i.19]	Pulse: 1,2 µs/50 µs Shield to Ground: 2 kV Line to Line: 1 kV	B B
Voltage dips	CENELEC EN 61000-4-11 [i.21]		Residual voltage 0 % Number of cycles: 1	B	CENELEC EN 61000-4-11 [i.21]	Residual voltage < 5 % Number of cycles: 0,5	B
			Residual voltage < 70 % Number of cycles: 25	C		Residual voltage < 70 % Number of cycles: 25	C
Voltage interruptions	CENELEC EN 61000-4-11 [i.21]		Residual voltage 0 % Number of cycles: 250	C	CENELEC EN 61000-4-11 [i.21]	Residual voltage 0 % Number of cycles: 250	C

Table 5: Immunity requirements for DC power ports (only applicable to ports with cables that may be longer than 3 m)

Phenomenon	ETSI EN 300 386 [i.3]				CENELEC EN 55035 [i.1]		
	Reference test method	Test level Environment: Telecommunication centres	Test level Environment: Other than telecommunication centres	Performance criterion	Reference test method	Test level	Performance criterion
Continuous induced RF disturbances	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 80 MHz	0,15 MHz to 80 MHz	A	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 10 MHz	A
		3 V	3 V			3 V	
						10 MHz to 30 MHz	
						3 V to 1 V	
					30 MHz to 80 MHz		
					1 V		
Electrical Fast transients	CENELEC EN 61000-4-4 [i.18]	1 kV Rep. freq: 5 kHz	1 kV Rep. freq: 5 kHz	B	CENELEC EN 61000-4-4 [i.18]	0,5 kV Rep. freq: 5 kHz	B
Surges		None	None		CENELEC EN 61000-4-5 [i.19]	Pulse: 1,2 µs/50 µs Line to Ground: 0,5 kV Only applicable to outdoor cables	B

6.2.4 Differences between ETSI EN 300 386 and CENELEC EN 55035

The immunity requirements in ETSI EN 300 386 [i.3] are based on ETSI TR 101 651 [i.7] on the classification of the electromagnetic environment conditions for equipment in telecommunication networks.

The following differences have been identified between ETSI EN 300 386 [i.3] and CENELEC EN 55035 [i.1]:

- Performance criteria: The general performance criteria in the two standards are aligned. Furthermore, CENELEC EN 55035 [i.1] has specific performance criteria for "Networking functions" in annex F and they are aligned with the specific performance criteria provided in ETSI EN 300 386 [i.3] for the various data/traffic ports.
- Test methods: Test methods of ETSI EN 300 386 [i.3] and CENELEC EN 55035 [i.1] are aligned because they refer to the same version of basic standards. However, in CENELEC EN 55035 [i.1] additional alternative test methods are defined for radio frequency electromagnetic field and continuous induced RF disturbances.
- Test levels: there are differences in the test levels as shown in the table 6.

Table 6: Immunity requirements on enclosure port

Phenomenon	Deviations identified	Type of deviation
Electrostatic discharges	Yes	The requirement in ETSI EN 300 386 [i.3], for the environment "Other than telecommunication centres" is more severe than CENELEC EN 55035 [i.1].
Radio frequency electromagnetic field	Yes	The requirement in ETSI EN 300 386 [i.3] is more severe than CENELEC EN 55035 [i.1] in the frequency range of mobile services. Alternative test methods are provided in CENELEC EN 55035 [i.1].
Power frequency magnetic field	Yes	This requirement is only in CENELEC EN 55035 [i.1] and it is applicable to products with devices sensitive to magnetic field like CRT monitors.
Continuous induced RF disturbances on signal ports	Yes	The requirement in ETSI EN 300 386 [i.3] is more severe than CENELEC EN 55035 [i.1]. The requirement in CENELEC EN 55035 [i.1] is also lower than the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9]. Alternative test methods are provided in CENELEC EN 55035 [i.1].
Broadband impulse noise disturbances on signal ports	No	This requirement is not applicable to ETSI EN 300 386 [i.3] because it is only applicable to Customer Premises Equipment in CENELEC EN 55035 [i.1].
Electrical Fast transients on signal ports	No	
Surges on signal ports with outdoor connections	Yes	Requirement on unshielded symmetrical lines are the same except that CENELEC EN 55035 [i.1] requires also the test with primary protections and performance criterion C. ETSI EN 300 386 [i.3] has no the surge immunity test with primary protections because this is a resistibility tests covered by Recommendation ITU-T K.20 [i.26] and Recommendation ITU-T K.21 [i.27]. ETSI EN 300 386 [i.3] has also the surge immunity tests on unsymmetrical lines. Requirement on coax and shielded lines in ETSI EN 300 386 [i.3] has double test level in respect to CENELEC EN 55035 [i.1] for shield to ground coupling mode. ETSI EN 300 386 [i.3] requires also the Line to Line test on shielded cables.
Surges on signal ports with indoor connections	Yes	This requirement is only present in ETSI EN 300 386 [i.3] with a test level of 0,5 kV.
Continuous induced RF disturbances on AC power ports	Yes	The requirement in ETSI EN 300 386 [i.3] is more severe than CENELEC EN 55035 [i.1]. The requirement in CENELEC EN 55035 [i.1] is also lower than the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9]. Alternative test methods are provided in CENELEC EN 55035 [i.1].
Electrical Fast transients on AC power ports	No	

Phenomenon	Deviations identified	Type of deviation
Surges on AC power ports	No	The requirement is the same in respect to ETSI EN 300 386 [i.3] for the environment "Other than telecommunication centres". The requirement for AC power cables within the "Telecommunication centres" is only defined in ETSI EN 300 386 [i.3].
Voltage dips on AC power ports	Yes	ETSI EN 300 386 [i.3] has a voltage dip of 1 cycle of duration instead CENELEC EN 55035 [i.1] has a duration of 0,5 cycles.
Voltage interruption on AC power ports	No	
Continuous induced RF disturbances on DC power ports	Yes	The requirement in ETSI EN 300 386 [i.3] is more severe than CENELEC EN 55035 [i.1]. The requirement in CENELEC EN 55035 [i.1] is also lower than the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9]. Alternative test methods are provided in CENELEC EN 55035 [i.1].
Electrical Fast transients on DC power ports	Yes	ETSI EN 300 386 [i.3] has a test level of 1 kV instead CENELEC EN 55035 [i.1] has 0,5 kV.
Surges on DC power ports	Yes	CENELEC EN 55035 [i.1] has the requirement for DC ports intended to be connected to outdoor environment and that are longer than 3 m. ETSI EN 300 386 [i.3] has no this requirement in the EMC standard because it is included in ETSI EN 300 132-2 [i.28] for power supply interface requirement applicable to all telecommunication network equipment. Furthermore, this requirement is not in ETSI EN 300 386 [i.3] because there are no products in the scope of this standard that may have outdoor DC power cables (they may be inside cabinets or shelters).

6.3 Comparison between CENELEC EN 55035 and ETSI EN 301 489-1

6.3.1 General

ETSI EN 301 489-1 [i.5] defines the general immunity requirements for radio products. The other parts of ETSI EN 301 489 series [i.4] may have deviations from the requirements defined in the part 1. The comparison below is performed between CENELEC EN 55035 [i.1] and ETSI EN 301 489-1 [i.5].

6.3.2 Performance criteria

The general performance criteria in ETSI EN 301 489-1 [i.5] and CENELEC EN 55035 [i.1] are provided in the table 7.

Table 7: Comparison of performance criteria in ETSI EN 301 489-1 [i.5] and CENELEC EN 55035

	ETSI EN 301 489-1 [i.5]	CENELEC EN 55035 [i.1]
Performance criterion A	<p>In ETSI EN 301 489-1 [i.5], this is specified as Performance criteria for continuous phenomena applied to transmitters and receivers.</p> <p><i>During and after the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the equipment is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance. During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.</i></p>	<p><i>The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended.</i></p> <p><i>The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</i></p>
Performance criterion B	<p>In ETSI EN 301 489-1 [i.5], this is specified as Performance criteria for transient phenomena applied to transmitters and receivers.</p> <p><i>During and after the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the equipment is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance. During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.</i></p>	<p><i>During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.</i></p> <p><i>After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended.</i></p> <p><i>The performance level may be replaced by a permissible loss of performance. If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</i></p>
Performance criterion C	None.	<p><i>Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.</i></p> <p><i>Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</i></p>

6.3.3 Immunity requirements

The immunity requirements in ETSI EN 301 489-1 [i.5] and CENELEC EN 55035 [i.1] are defined for each type of ports. In the tables 8 to 11 there is the comparison of the immunity requirements defined in these standards for each type of ports.

Table 8: Immunity requirements on enclosure port

Phenomenon	ETSI EN 301 489-1 [i.5]			CENELEC EN 55035 [i.1]		
	Reference test method	Test level	Performance criterion	Reference test method	Test level	Performance criterion
Electrostatic discharges	CENELEC EN 61000-4-2 [i.16]	Contact: 4 kV	B	CENELEC EN 61000-4-2 [i.16]	Contact: 4 kV	B
		Air: 8 kV	B		Air: 8 kV	B
Radio frequency electromagnetic field amplitude modulated	CENELEC EN 61000-4-3 [i.17]	80 MHz to 6 GHz 3 V/m (80 % AM modulation at 1 kHz)	A	CENELEC EN 61000-4-3 [i.17]	80 MHz to 1 GHz 3 V/m (80 % AM modulation at 1 kHz)	A
				Or CENELEC EN 61000-4-20 [i.24]	Spot frequencies: 1,8 GHz 2,6 GHz 3,5 GHz 5 GHz 3 V/m (80 % AM modulation at 1 kHz)	A
Power frequency magnetic field (CENELEC EN 55035 [i.1]: only applicable to EUT with devices susceptible to magnetic field)		None		CENELEC EN 61000-4-8 [i.22]	50 Hz A V/m	A

Table 9: Immunity requirements for analogue/digital signal ports

Phenomenon	ETSI EN 301 489-1 [i.5]			CENELEC EN 55035 [i.1]		
	Reference test method	Test level	Performance criterion	Reference test method	Test level	Performance criterion
Continuous induced RF disturbances	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 80 MHz 3 V	A	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 10 MHz	A
					3 V	
					10 MHz to 30 MHz	
					3 V to 1 V 30 MHz to 80 MHz	
Broadband impulse noise disturbances, repetitive (CENELEC EN 55035 [i.1]: only applicable to CPE)		Not applicable		CENELEC EN 55035 [i.1]	0,15 to 0,5 MHz	A
					107 dB μ V	
					0,5 MHz to 10 MHz	
					107 dB μ V to 36 dB μ V	
Broadband impulse noise disturbances, isolated (CENELEC EN 55035 [i.1]: only applicable to CPE)				CENELEC EN 55035 [i.1]	10 MHz to 30 MHz	B
					36 dB μ V to 30 dB μ V	
					Burst duration: 0,7 ms	
					Burst period: 10 ms	
Electrical Fast transients	CENELEC EN 61000-4-4 [i.18]	0,5 kV Rep. freq: 5 kHz and 100 kHz on xDSL ports	B	CENELEC EN 61000-4-4 [i.18]	0,15 to 30 MHz	B
					110 dB μ V Burst duration: 0,24 ms, 10 ms, 300 ms	
Surges (outdoor lines)	CENELEC EN 61000-4-5 [i.19]	Symmetrical lines: Pulse: 10 μ s/700 μ s Lines to Ground: 1 kV Unsymmetrical lines: Pulse: 10 μ s/700 μ s Lines to Ground: 1 kV Line to Line: 0,5 kV	B	CENELEC EN 61000-4-5 [i.19]	0,5 kV Rep. freq: 5 kHz and 100 kHz on xDSL ports	B
					Unshielded symmetrical lines: Pulse: 10 μ s/700 μ s Lines to Ground: 1 kV without primary protections	
					Lines to Ground: 4 kV with primary protections	
Surges (indoor lines)	CENELEC EN 61000-4-5 [i.19]	All type of lines: Pulse: 1,2 μ s/50 μ s Shield to Ground or Line to Ground: 0,5 kV	B		Coaxial or shielded lines: Pulse: 1,2 μ s/50 μ s Shield to Ground: 0,5 kV	B
					None	

Table 10: Immunity requirements for AC power ports

Phenomenon	ETSI EN 301 489-1 [i.5]			CENELEC EN 55035 [i.1]		
	Reference test method	Test level	Performance criterion	Reference test method	Test level	Performance criterion
Continuous induced RF disturbances	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 80 MHz 3 V	A	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 10 MHz	A
					3 V	
					10 MHz to 30 MHz	
					3 V to 1 V	
					30 MHz to 80 MHz	
					1 V	
Electrical Fast transients	CENELEC EN 61000-4-4 [i.18]	1 kV Rep. freq: 5 kHz	B	CENELEC EN 61000-4-4 [i.18]	1 kV Rep. freq: 5 kHz	B
Surges	CENELEC EN 61000-4-5 [i.19]	Pulse: 1,2 µs/50 µs Shield to Ground: 2 kV Line to Line: 1 kV	B B	CENELEC EN 61000-4-5 [i.19]	Pulse: 1,2 µs/50 µs Shield to Ground: 2 kV Line to Line: 1 kV	B B
Voltage dips	CENELEC EN 61000-4-11 [i.21]	Residual voltage 0 % Number of cycles: 0,5 and 1	B	CENELEC EN 61000-4-11 [i.21]	Residual voltage < 5 % Number of cycles: 0,5	B
		Residual voltage < 70 % Number of cycles: 25	B		Residual voltage < 70 % Number of cycles: 25	C
Voltage interruptions	CENELEC EN 61000-4-11 [i.21]	Residual voltage 0 % Number of cycles: 250	Functions can be recovered by user	CENELEC EN 61000-4-11 [i.21]	Residual voltage 0 % Number of cycles: 250	C

Table 11: Immunity requirements for DC power ports (only applicable to ports with cables that may be longer than 3 m)

Phenomenon	ETSI EN 301 489-1 [i.5]			CENELEC EN 55035 [i.1]		
	Reference test method	Test level	Performance criterion	Reference test method	Test level	Performance criterion
Continuous induced RF disturbances	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 80 MHz 3 V	A	CENELEC EN 61000-4-6 [i.20]	0,15 MHz to 10 MHz	A
					3 V	
					10 MHz to 30 MHz	
					3 V to 1 V	
30 MHz to 80 MHz						
Electrical Fast transients	CENELEC EN 61000-4-4 [i.18]	0,5 kV Rep. freq: 5 kHz	B	CENELEC EN 61000-4-4 [i.18]	0,5 kV Rep. freq: 5 kHz	B
Surges	ISO 7637-2 [i.23]	Only applicable in the vehicular environment	B	CENELEC EN 61000-4-5 [i.19]	Pulse: 1,2 μ s/50 μ s Line to Ground: 0,5 kV Only applicable to outdoor cables	B

6.3.4 Differences between ETSI EN 301 489-1 and CENELEC EN 55035

The immunity requirements in ETSI EN 301 489-1 [i.5] are based on the environments defined in the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9], on ETSI TR 101 651 [i.7] and on ISO 7637-2 [i.23] for the vehicular environment. The following differences have been identified between ETSI EN 301 489-1 [i.5] and CENELEC EN 55035 [i.1]:

- Performance criteria: The performance criteria in ETSI EN 301 489-1 [i.5] are specific to radio receivers and transmitters but are very similar to the general performance criteria in CENELEC EN 55035 [i.1].
- Test methods: Test methods of ETSI EN 301 489-1 [i.5] and CENELEC EN 55035 [i.1] are aligned because they refer to the same version of basic standards. However, in CENELEC EN 55035 [i.1] additional alternative test methods are defined for radio frequency electromagnetic field and continuous induced RF disturbances.
- Test levels: there are differences in the test levels as shown in table 12.

Table 12: Immunity requirements on enclosure port

Phenomenon	Deviations identified	Type of deviation
Electrostatic discharges	No	
Radio frequency electromagnetic field	Yes	CENELEC EN 55035 [i.1] has test at spot frequency in the range 1 GHz to 6 GHz. Alternative test methods are provided in CENELEC EN 55035 [i.1] Some parts of ETSI EN 301 489 series [i.4] has higher test level of CENELEC EN 55035 [i.1].
Power frequency magnetic field	Yes	This requirement is only in CENELEC EN 55035 [i.1] and it is applicable to products with devices sensitive to magnetic field like CRT monitors.
Continuous induced RF disturbances on signal ports	Yes	The requirement in ETSI EN 301 489-1 [i.5] is more severe than CENELEC EN 55035 [i.1]. The requirement in CENELEC EN 55035 [i.1] is also lower than the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9]. Alternative test methods are provided in CENELEC EN 55035 [i.1].
Broadband impulse noise disturbances on signal ports	Yes	This requirement should be applicable to Customer Premises Equipment with radio interface and xDSL port that are in the scope of ETSI EN 301 489-1 [i.5].
Electrical Fast transients on signal ports	No	
Surges on signal ports with outdoor connections	Yes	Requirement on symmetrical lines are the same. ETSI EN 301 489-1 [i.5] has also the surge immunity tests on unsymmetrical lines with Lines to Ground and Line to Line coupling methods.
Surges on signal ports with indoor connections	Yes	This requirement it only present in ETSI EN 301 489-1 [i.5] with a test level of 0,5 kV.
Continuous induced RF disturbances on AC power ports	Yes	The requirement in ETSI EN 301 489-1 [i.5] is more severe than CENELEC EN 55035 [i.1]. The requirement in CENELEC EN 55035 [i.1] is also lower than the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9]. Alternative test methods are provided in CENELEC EN 55035 [i.1].
Electrical Fast transients on AC power ports	No	
Surges on AC power ports	No	
Voltage dips on AC power ports	Yes	ETSI EN 301 489-1 [i.5] has a voltage dip at 0,5 and 1 cycle of duration instead CENELEC EN 55035 [i.1] has only the duration of 0,5 cycles.
Voltage interruption on AC power ports	No	
Continuous induced RF disturbances on DC power ports	Yes	The requirement in ETSI EN 301 489-1 [i.5] is more severe than CENELEC EN 55035 [i.1]. The requirement in CENELEC EN 55035 [i.1] is also lower than the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9]. Alternative test methods are provided in CENELEC EN 55035 [i.1].
Electrical Fast transients on DC power ports	No	
Surges on DC power ports	Yes	CENELEC EN 55035 [i.1] has the requirement for DC ports intended to be connected to outdoor environment and that are longer than 3 m. In ETSI EN 301 489-1 [i.5] the surge test on DC port applies in the vehicular environment only.

6.4 Comparison between CENELEC EN 55035 and ETSI EN 303 446-1 and ETSI EN 303 446-2

6.4.1 General

ETSI EN 303 446-1 [i.34] and ETSI EN 303 446-2 [i.35] do not define immunity requirements per se but just define how to assess the immunity requirements of the combined and/or integrated radio and non-radio equipment. Therefore, the performance criteria, test methods and test levels are the ones defined in the relevant product or product family standards and the relevant part of ETSI EN 301 489 series [i.4].

Then, the differences between CENELEC EN 55035 [i.1] and ETSI EN 301 489-1 [i.5] are relevant also to ETSI EN 303 446-1 [i.34] and ETSI EN 303 446-2 [i.35].

6.5 Comparison between CENELEC EN 55035 and ETSI ES 201 468

6.5.1 General

ETSI ES 201 468 [i.6] defines the immunity requirements and resistibility requirements for telecommunications equipment for enhanced availability of service in specific applications. This is not a harmonised standard.

The performance criteria in ETSI ES 201 468 [i.6] are the same of ETSI EN 300 386 [i.3] but the test level are higher.

The test methods in ETSI ES 201 468 [i.6] are the same of ETSI EN 300 386 [i.3].

As the immunity requirements in ETSI EN 300 386 [i.3] are in general more severe than CENELEC EN 55035 [i.1], obviously the requirements of ETSI ES 201 468 [i.6] are even more severe in respect to CENELEC EN 55035 [i.1].

7 Impact on specific deliverables and recommendations for action

7.1 Harmonised EMC standards

7.1.1 General

Considering the European Common modifications in CENELEC EN 55035 [i.1] there is no conflicting standard for compliance to the European EMC Directive 2014/30/EU [i.30] and European Radio Equipment Directive 2014/53/EU [i.31] because ETSI EN 300 386 [i.3] and ETSI EN 301 489 series [i.4] take precedence.

However, ETSI ERM EMC WG should consider:

- Inclusion of alternative test methods as defined in CENELEC EN 55035 [i.1].
- Consider the inclusion of Broadband impulse noise disturbances on the xDSL ports of CPE with radio module

7.1.2 ETSI EN 300 386

For the deviation in the requirements between CENELEC EN 55035 [i.1] and ETSI EN 300 386 [i.3] it may be not justified the alignment, because of specific product family covered by ETSI EN 300 386 [i.3] that are the telecommunication network equipment. Furthermore, CENELEC EN 55035 [i.1] has also deviations in respect to the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9] that should be understood the justification of such deviations before to change the requirements in the ETSI standards.

7.1.3 ETSI EN 301 489 series

For the deviation in the requirements between CENELEC EN 55035 [i.1] and ETSI EN 301 489 series [i.4] it may be justified the alignment for certain products, like for instance the CPE with radio interface. However, before to change the requirements in ETSI EN 301 489 series [i.4] it should be understood the reasons for the deviation of CENELEC EN 55035 [i.1] in respect to the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9].

Furthermore, ETSI EN 301 489-1 [i.5] refers to all environments defined in the Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9] but only one set of requirements is defined for all environments. Therefore, it is advisable to consider two set of requirements as defined in the reference Generic immunity standards CENELEC EN 61000-6-1 [i.8] and CENELEC EN 61000-6-2 [i.9].

7.1.4 ETSI EN 303 446-1 and ETSI EN 303 446-2

These standards refer to the performance criteria, test methods and test levels defined in the relevant product or product family standards and in the relevant part of ETSI EN 301 489 series [i.4]. Therefore, there is no need for the alignment of these two standards with CENELEC EN 55035 [i.1].

7.2 Other EMC Standards

7.2.1 ETSI ES 201 468

ETSI ES 201 468 [i.6] has to be maintained in line with ETSI EN 300 386 [i.3] for test methods and performance criteria.

Changes applied in ETSI EN 300 386 [i.3] have to be considered for ETSI ES 201 468 [i.6].

It is not recommended to align ETSI ES 201 468 [i.6] with CENELEC EN 55035 [i.1] because ETSI ES 201 468 [i.6] is specific to certain applications.

History

Document history		
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