



SLOVENSKI STANDARD
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**Kabelska omrežja za televizijske in zvokovne signale ter interaktivne storitve - 2-4.
del: Filtri za dušenje motenj LTE (4G), ki delujejo v pasovih 700 MHz in 800 MHz**

Cable networks for television signals, sound signals and interactive service - Part 2-4:
LTE (4G) Interference Mitigation Filters operating in the 700 MHz and 800 MHz bands

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Réseaux de distribution par câbles pour signaux de télévision, signaux de radiodiffusion
sonore et services interactifs - Partie 2-4: Filtres d'atténuation de brouillage LTE (4G)
fonctionnant dans les bandes 700 MHz et 800 MHz

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**Cable networks for television signals, sound signals and
interactive service - Part 2-4: LTE (4G) Interference Mitigation
Filters operating in the 700 MHz and 800 MHz bands**

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télévision, signaux de radiodiffusion sonore et services
interactifs - Partie 2-4: Filtres d'atténuation de brouillage
LTE (4G) fonctionnant dans les bandes 700 MHz et 800
MHz

To be completed

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2019-01-25.

It has been drawn up by CLC/TC 209.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CENELEC in three official versions (English, French, German).
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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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European Committee for Electrotechnical Standardization
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39 **European Foreword**

40 This document (prEN 50083-2-4:2018) has been prepared by CLC/TC 209 "Cable networks for television
41 signals, sound signals and interactive services".

42 This document is currently submitted to the CENELEC Enquiry.

43 The following dates are proposed:

- latest date by which the existence of this (doa) dor + 6 months
document has to be announced at national
level
- latest date by which this document has to be (dop) dor + 12 months
implemented at national level by publication of
an identical national standard or by
endorsement
- latest date by which the national standards (dow) dor + 36 months
conflicting with this document have to be (to be confirmed or
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46 Introduction

47 Standards and deliverables of EN 60728 series and EN 50083 series deal with cable networks including
48 equipment and associated methods of measurement for headend reception, processing and distribution of
49 television and sound signals and for processing, interfacing and transmitting all kinds of data signals for
50 interactive services using all applicable transmission media. These signals are typically transmitted in
51 networks by frequency-multiplexing techniques.

52 This includes, for instance:

- 53 a) regional and local broadband cable networks;
- 54 b) extended satellite and terrestrial television distribution systems;
- 55 c) individual satellite and terrestrial television receiving systems;

56 and all kinds of equipment, systems and installations used in such cable networks, distribution and receiving
57 systems.

58 The extent of this standardization work is from the antennas and/or special signal source inputs to the
59 headend or other interface points to the network up to the terminal input of the customer premises
60 equipment.

61 The standardization work will consider coexistence with users of the RF spectrum in wired and wireless
62 transmission systems.

63 The standardization of any user terminals (i.e. tuners, receivers, decoders, multimedia terminals etc.) as well
64 as of any coaxial, balanced and optical cables and accessories thereof is excluded.

65 This document introduces the requirements for the LTE filters that cover the 700 MHz and 800 MHz bands.
66 These filters are to be used in individual and MATV antenna installations for reception of DTT signals when
67 the 700 MHz band will be used by telecommunication services (LTE) in addition to the 800 MHz band.

68 These requirements extend those of CLC/TS 50083-2-3 for mitigation filters for LTE services operating in the
69 800 MHz band only and ETSI EN 303 354 V.1.1.1 (2017-03), that deals with "Amplifiers and active antennas
70 for TV broadcast reception in domestic premises; Harmonized standard covering the essential requirements
71 of article 3.2 of Directive 2014/53/EU". The ETSI document is mainly applicable to new equipment available
72 on the market, while this document has the purpose to allow the existing individual and MATV antenna
73 installations as well as amplifiers designed for the full spectrum of band 4 and 5 for reception of DTT signals
74 to avoid or mitigate the interference due to the new telecommunication services (LTE) when the 700 MHz
75 band is added to the 800 MHz band already used.

76 1 Scope

77 This document provides requirements to passive filters intended to reduce RF interference from LTE Base
78 Stations (LTE-BS) and LTE User Equipment (LTE-UE) to receiving equipment and cable distribution systems
79 of broadcast DVB-T and DVB-T2 signals in the VHF and UHF bands. While primarily intended to be used
80 with VHF/UHF DVB-T and DVB-T2 receivers and signal distribution systems, filters can also be useful for
81 mitigation of interference to VHF FM or DAB radio.

82 2 Normative references

83 The following documents are referred to in the text in such a way that some or all of their content constitutes
84 requirements of this document. For dated references, only the edition cited applies. For undated references,
85 the latest edition of the referenced document (including any amendments) applies.

86 EN 50083-2:2012, *Cable networks for television signals, sound signals and interactive services - Part 2:*
87 *Electromagnetic compatibility for equipment*

88 EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

89 EN 60728-11, *Cable networks for television signals, sound signals and interactive services – Part 11: Safety*
90 *(IEC 60728-11)*

91 EN 61169-2, *Radio-frequency connectors - Part 2: Sectional specification - Radio frequency coaxial*
92 *connectors of type 9,52 (IEC 61169-2)*

93 EN 61169-24, *Radio-frequency connectors - Part 24: Sectional specification - Radio frequency coaxial*
94 *connectors with screw coupling, typically for use in 75 ohm cable networks (type F) (IEC 61169-24)*

95 3 Terms, definitions and abbreviations

96 3.1 Terms and definitions

97 For the purposes of this document, the following terms and definitions apply.

98 ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- 99 • IEC Electropedia: available at <http://www.electropedia.org/>
- 100 • ISO Online browsing platform: available at <http://www.iso.org/obp>

101 3.1.1

102 **bandwidth**

103 width of a frequency band over which a given characteristic of an equipment or transmission channel does
104 not differ from its reference value by more than a specified amount or ratio

105 3.1.2

106 **pass-band**

107 frequency band throughout which the attenuation is less than a specified value

108 3.1.3

109 **stop-band**

110 frequency band throughout which the attenuation is greater than a specified value

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111 **3.2 Abbreviations**

112 For the purposes of this document, the following abbreviations apply.

BS	base station
DC	direct current
EMC	electromagnetic compatibility
LTE	long term evolution
MATV	master antenna television
RF	radio frequency
TV	television
UE	user equipment
UHF	ultra-high frequency
VHF	very high frequency

113 **4 LTE filter characteristics**114 **4.1 General**

115 To comply with this specification a filter shall pass a range of frequencies (the pass-band) which includes a
 116 number of VHF and UHF TV channels and shall attenuate a range of LTE frequencies (the stop-band). In all
 117 cases the stop-band lies above the pass-band.

118 **4.2 Pass-band and stop-band of a LTE filter (700 MHz and 800 MHz bands)**

119 **Pass-band** (terrestrial broadcasting service):

- 120 a) the lower boundary of the pass-band shall lie between 0 Hz (DC) and 174 MHz;
- 121 b) the upper boundary of the pass-band shall lie on the upper edge of a TV channel, UHF channel N , such
 122 that the pass-band upper bound frequency is $(8*N+310)$ MHz. The value of N shall be in the range 47 to
 123 48.

124 It should be noted that a filter of the band-stop (or band-reject) type can be used to meet this specification.
 125 Where this type of filter is used, the range of frequencies lying above the defined stop-band is not considered
 126 to be part of the pass-band for the purpose of this specification.

127 **Stop-band**: shall be from 703 MHz to 1 006 MHz, divided in four parts:

- 128 1) **Stop-band 1**: 703 MHz to 733 MHz (LTE User Equipment (LTE-UE))
- 129 2) **Stop-band 2**: 738 MHz to 821 MHz (LTE Base Station (LTE-BS))
- 130 3) **Stop-band 3**: 832 MHz to 862 MHz (LTE User Equipment (LTE-UE));
- 131 4) **Stop-band 4**: 862 MHz to 1006 MHz (other services)

132 **4.3 Types of standard for a LTE filter**

133 Three types of standard for a LTE filter are defined, considering the stop-band attenuation performance, as
 134 defined below.

- 135 a) Standard 1 LTE filter

136 "Professional" filter for use in large cable systems incorporating distribution amplifiers and/or where
 137 greater attenuation of LTE interference is required in the case that channel 60 is not distributed.

- 138 b) Standard 2 LTE filter
- 139 "Consumer" filter intended for use with a single receiver or a number of receivers fed via a passive
140 distribution network.
- 141 c) Standard 3 LTE filter
- 142 "Typical" filter for use in MATV systems incorporating distribution amplifiers and/or where a typical
143 attenuation for LTE interference mitigation is required.

144 4.4 LTE filter specifications

145 The nominal characteristic impedance for the LTE filters is 75 Ω , to be used also in measurements. The main
146 LTE filter characteristics are specified in Table 1.

147 **Table 1 — LTE filter specifications**

Parameter	Requirement			Note
	Standard 1 filter	Standard 2 filter	Standard 3 filter	
Pass-band (excluding any band edge relaxation)				1
UHF channel <i>N</i>	47	48	48	
Insertion loss from 174 MHz to	≤ 1,5 dB	≤ 2,0 dB	≤ 1,5 dB	2
Input/output return loss from 174 MHz to channel <i>N</i> UHF	≥ 16 dB	≥ 14 dB	≥ 16 dB	3
Maximum amplitude response variation	4 dB	6 dB	4 dB	4
Maximum group delay variation within channel <i>N</i> UHF	250 ns	250 ns	250 ns	4
Pass-band (upper band edge ^a or other parameters optional relaxation)				
UHF channel <i>N</i>	48	48	48	
Insertion loss in channel <i>N</i> UHF	≤ 3,0 dB	≤ 4,0 dB	≤ 3,0 dB	2
Input/output return loss from 174 MHz to channel <i>N</i> UHF	≥ 12 dB	≥ 10 dB	≥ 12 dB	3
Maximum amplitude response variation	6 dB	8 dB	6 dB	4
Stop-band1 (703 MHz to 733 MHz)(LTE-UE)				
Insertion loss	≥ 30 dB	≥ 15 dB	≥ 15 dB	2
Stop-band 2 (738 MHz to 821 MHz)(LTE-BS)				
Insertion loss	≥ 55 dB	≥ 25 dB	≥ 30 dB	2
Stop-band 3 (832 MHz to 862 MHz)(LTE-UE)				
Insertion loss	≥ 30 dB	≥ 15 dB	≥ 15 dB	2

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Parameter	Requirement			Note
	Standard 1 filter	Standard 2 filter	Standard 3 filter	
Stop-band 4 (862 MHz to 1006 MHz)(other services)				
Insertion loss above 862 MHz	≥ 30 dB	≥ 15 dB	≥ 15 dB	2
^a The extent of the relaxed band, if used, shall not exceed 8 MHz.				
NOTE 1: The pass-band is defined less the amount of any upper band edge relaxation used (see footnote ^a). NOTE 2: Insertion loss is measured between a matched source and load (impedance 75 Ω), equivalent to $- S_{21} $ in S-parameter terms. NOTE 3: Return loss (equivalent to $- S_{11} $ or $- S_{22} $) is measured at the input and output ports; the output port is intended to be connected to the receiver. NOTE 4: The maximum variation is intended in the 8 MHz band around the centre frequency of the relevant UHF channels.				

148 **4.5 Connections, EMC, environmental and other factors**149 **4.5.1 Connections**

150 A Standard 1 filter and a Standard 3 filter shall be fitted with two female 'IEC type' connectors complying with
151 EN 61169-2 or two female Type-F connectors complying with EN 61169-24. A screw terminal capable of
152 accepting a 4 mm² stranded conductor shall also be provided to facilitate protective equipotential bonding in
153 accordance with EN 60728-11.

154 A Standard 2 filter shall have an input port marked with the letter 'A' and an output port marked with the letter
155 'B' intended for direct connection to a receiver or similar equipment. The 'A' port may be either a female
156 Type-F connector complying with EN 61169-24, or a female 'IEC type' 9,52-connector complying with
157 EN 61169-2. The 'B' port shall consist of a male 'IEC type' 9,52-connector complying with EN 61169-2 and
158 mounted on a flexible coaxial cable tail of length (150 ± 10) mm, measured between the body of the filter and
159 the extremity of the connector outer conductor. This tail shall be permanently attached to the body of the
160 filter.

161 **4.5.2 EMC – Screening effectiveness**

162 The screening effectiveness of a Standard 1 filter and a Standard 3 filter shall comply with EN 50083-2:2012,
163 Class A.

164 The screening effectiveness of a Standard 2 filter, including the output tail shall comply with
165 EN 50083-2:2012, Class B.

166 **4.5.3 DC and 50 Hz line power considerations**

167 The LTE filter should precede any active equipment in a system, so a line power-pass facility is not usually
168 required. However this feature can be provided, if desired. If a pure low-pass filter structure is used it will
169 occur naturally unless one or more blocking capacitor(s) are included.

170 To avoid the risk of inadvertent damage to other equipment neither port of a filter shall present a DC short-
171 circuit between the inner and outer conductors.

172 Each port of a filter shall have an internal high-value resistor connected between the inner and outer
173 conductors, to prevent any build-up of atmospheric 'static' charge in thundery weather conditions. The value
174 of this resistor shall be in the range from 100 kΩ to 1 MΩ. Only one resistor is required where the filter
175 provides a DC through-path.

176 **4.5.4 Climate and operating temperature range**

177 Filters intended for outdoor use shall meet the specifications in Table 1 over the temperature range -10 °C to
178 $+50$ °C and shall be protected against the ingress of dust and water to EN 60529:1991, IP54.

179 Filters intended for indoor use only, which is deemed to include use in roof spaces, shall meet the
180 specifications in Table 1 over the temperature range -5 °C to $+45$ °C.