

Sound and television broadcast receivers and associated equipment — Immunity characteristics — Limits and methods of measurement

ICS 33.100.20

National foreword

This British Standard is the UK implementation of EN 55020:2007+A12:2016. It is derived from CISPR 20:2006. It supersedes BS EN 55020:2007+A11:2011, which will be withdrawn on 4 January 2019.

Where a common modification has been introduced by CENELEC amendment, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC amendment A12 are indicated by **C₁₂** **C₁₂**.

National Annex NA (informative) reproduces CENELEC interpretation sheets 1 (June 2009) and 2 (August 2010).

CENELEC Interpretation sheet 1 (June 2009) affects Tables 1, 2, 9, 10, 11 and 15 as it provides an interpretation of the immunity requirements for digital only receivers.

CENELEC Interpretation sheet 2 (August 2010) affects Annex I, Clause I.7 of this standard, as it provides an interpretation of the immunity requirements for a receiver with separate RF input parts for Analogue/ Digital Terrestrial and Digital Satellite reception.

CENELEC Interpretation sheet 3 (February 2014) affects Table 15, as it provides an interpretation of the set-up for the RF e.m field immunity test in the frequency range 790-862 MHz.

The content of these interpretation sheets have been appended by way of a National Annex found at the end of this document.

The UK participation in its preparation was entrusted by Technical Committee GEL/210, EMC – Policy committee, to Subcommittee GEL/210/11, EMC – Standards Committee.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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**Sound and television broadcast receivers
and associated equipment -
Immunity characteristics -
Limits and methods of measurement
(CISPR 20:2006)**

Récepteurs de radiodiffusion et de
télévision et équipements associés -
Caractéristiques d'immunité -
Limites et méthodes de mesure
(CISPR 20:2006)

Ton- und Fernseh-Rundfunkempfänger
und verwandte Geräte der
Unterhaltungselektronik -
Störfestigkeitseigenschaften -
Grenzwerte und Prüfverfahren
(CISPR 20:2006)

This European Standard was approved by CENELEC on 2006-12-01. 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.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document CISPR/I/200/FDIS, future edition 6 of CISPR 20, prepared by CISPR SC I, Electromagnetic compatibility of information technology equipment, multimedia equipment and receivers, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 55020 on 2006-12-01.

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This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directives 89/336/EEC, 2004/108/EC and 1999/5/EC. See Annex ZZ.

Annexes ZA and ZZ have been added by CENELEC.

Endorsement notice

The text of the International Standard CISPR 20:2006 approved by CENELEC as a European Standard without any modification.

Foreword to amendment A11

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-

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s), see informative Annex ZZ, which is an integral part of EN 55020:2007.

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SOUND AND TELEVISION BROADCAST RECEIVERS AND ASSOCIATED EQUIPMENT – IMMUNITY CHARACTERISTICS – LIMITS AND METHODS OF MEASUREMENT

1 Scope and object

This standard for immunity requirements applies to television broadcast receivers, sound broadcast receivers and associated equipment intended for use in the residential, commercial and light industrial environment.

This standard describes the methods of measurement and specified limits applicable to sound and television receivers and to associated equipment with regard to their immunity characteristics to disturbing signals.

This standard is also applicable to the immunity of outdoor units of direct to home (DTH) satellite receiving systems for individual reception.

NOTE 1 Receiving systems for collective reception, in particular cable distribution head ends (Community Antenna Television, CATV) and community reception systems (Master Antenna Television, MATV) are covered by IEC 60728-2.

NOTE 2 Broadcast receivers for digital signals are covered by Annex I and Annex J.

Immunity requirements are given in the frequency range 0 Hz to 400 GHz. Radio-frequency tests outside the specified frequency bands or concerning other phenomena than given in this standard are not required.

The objective of this standard is to define the immunity test requirements for equipment defined in the scope in relation to continuous and transient, conducted and radiated disturbances including electrostatic discharges.

These test requirements represent essential electromagnetic immunity requirements.

Test requirements are specified for each port (enclosure or connector) considered.

NOTE 3 This standard does not specify electrical safety requirements for equipment such as protection against electric shocks, unsafe operation, insulation co-ordination and related dielectric tests.

NOTE 4 In special cases, situations will arise where the level of disturbances may exceed the levels specified in this standard e.g. where a hand-held transmitter is used in proximity to an equipment. In these instances special mitigation measures may have to be employed.

The environments encompassed by this standard are residential, commercial and light-industrial locations, both indoor and outdoor. The following list, although not comprehensive, gives an indication of locations which are included:

- residential properties, e.g. houses, apartments, etc.;
- retail outlets, e.g. shops, supermarkets, etc.;
- business premises, e.g. offices, banks, etc.;
- areas of public entertainment, e.g. cinemas, public bars, dance halls, etc.;
- outdoor locations, e.g. petrol stations, car parks, amusement and sports centres, etc.;
- light-industrial locations e.g. workshops, laboratories, service centres, etc.;
- car and boat.

Locations which are characterized by their mains power being supplied directly at low voltage from the public mains are considered to be residential, commercial or light industrial.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CISPR 16-1-3, *Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-3: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Disturbance power*

IEC 60050(161), *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 60268-1:1985, *Sound system equipment – Part 1: General*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*. Basic EMC Publication

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*. Basic EMC Publication

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*. Basic EMC Publication

IEC 61672-1:2002, *Electroacoustics – Sound level meters – Part 1: Specifications*

ETS 300 158:1992, *Satellite Earth Stations and Systems (SES) – Television Receive Only (TVRO-FSS) Satellite Earth Stations operating in the 11/12 GHz FSS bands*

ETS 300 249:1993, *Satellite Earth Stations and Systems (SES) – Television Receive-Only (TVRO) equipment used in the Broadcasting Satellite Service (BSS)*

ITU-R BS.468-4, *Measurement of audio-frequency noise voltage level in sound broadcasting*

ITU-R BT.471-1:1986, *Nomenclature and description of colour bar signals*

ITU-R BT.500-10, *Methodology for the subjective assessment of the quality of television pictures*

ITU-T J.61, *Transmission performance of television circuits designed for use in international connections*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this standard, the definitions contained in IEC 60050(161) as well as the following apply.

A non-exhaustive overview of equipment to which the standard is applicable is given in Table 1. The terminology and abbreviations of Table 1 are also used in other tables.

Table 1 – Survey (non exhaustive) of receiver and associated equipment types, including the appropriate parts of multifunction equipment

Equipment			Intended for mains powering and portable with external power connection facility		Battery powered portable, without external power connection facility (portable)	Car radio
			With a connection facility for an external antenna	Without a connection facility for an external antenna		
Sound broadcast receivers (radio) (including satellite receivers)	FM		FM radio ant. PC FM tuner card	FM radio	Portable radio	Car radio FM
	LW, MW, SW (AM)		AM radio ant. PC AM tuner card	AM radio		Car radio AM
Television broadcast receivers (TV) (including satellite receivers)			TV antenna PC TV tuner card	TV	Portable TV	Car TV
Associated equipment (ass.)	Video tape/disc equipment (recording and/ or play-back)	With tuner	Ass. video tuner antenna	Ass. video Tuner	Portable ass. video	
		Without tuner	Ass. video			
	Audio tape/disc equipment		Ass. audio		Portable ass. audio	
	Other, e.g. audio amplifiers, decoders, electronic organs		Ass. other		Portable ass. other, e.g. infrared devices	

3.1.1 sound receivers

appliances intended for the reception of sound broadcast and similar services for terrestrial, cable and satellite transmissions; these sound receivers can be digital receivers with digital incoming signals or receivers with digital processing of digital or analogue incoming signals

3.1.2 television receivers

appliances intended for the reception of television broadcast and similar services for terrestrial, cable and satellite transmissions; these TV receivers can be digital receivers with digital incoming signals or receivers with digital processing of digital or analogue incoming signals

NOTE 1 Modular units which are part of sound or television receiving systems, like tuners, frequency converters, modulators, etc. are considered to be sound or television receivers respectively.

NOTE 2 Tuners may be provided with a broadcast-satellite-receiving stage and with demodulators, decoders, demultiplexers, D/A converters, encoders (e.g. NTSC, PAL or SECAM encoders) etc.

NOTE 3 Frequency converters may be provided with a broadcast-satellite-receiving stage and with devices which convert the signals to other frequency bands.

NOTE 4 Receivers, tuners, or frequency converters may be tuneable or may only be able to receive a fixed frequency.

3.1.3

associated equipment

appliance either intended to be connected directly to sound or television receivers, or to generate or to reproduce audio or visual information; excluded are information technology equipment even if they are intended to be connected to a television broadcast receiver

NOTE Information technology equipment is defined in CISPR 22.

3.1.4

multifunction equipment

appliances in which two or more functions are provided in the same unit, for instance television reception, radio reception, digital clock, tape-recorder or disc player etc.

3.1.5

disturbance signal

an unwanted signal which may degrade radio reception or cause malfunction in equipment; specific unwanted signals are simulating disturbance signals, generated under laboratory conditions

3.1.6

immunity

ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels

NOTE In this standard the specified performance is:

- a specified sound signal-to-interference ratio and/or
- no greater than just perceptible degradation of the picture when a wanted signal and an unwanted signal occur simultaneously.

3.1.7

input immunity

immunity from unwanted signal voltages present at the antenna input terminal

3.1.8

immunity from conducted voltages

immunity from unwanted signal voltages present at the equipment terminals for audio and mains input and audio output

3.1.9

immunity from conducted currents

immunity from unwanted signal (common mode) currents present in cables connected to the equipment

3.1.10

immunity from radiated fields

immunity from unwanted electromagnetic fields present at the equipment

3.1.11

screening effectiveness

characteristic of a coaxial connector terminal to attenuate the transfer of internal voltages into external fields and vice versa

3.1.12

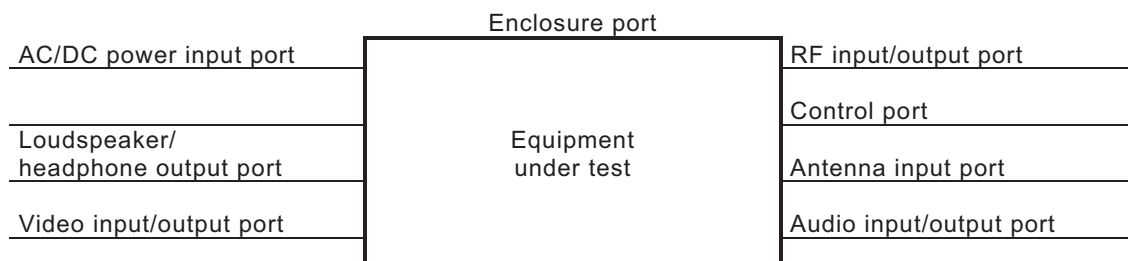
port

particular interface of the specified apparatus with the external electromagnetic environment (see Figure 1)

3.1.13

enclosure port

physical boundary of the apparatus through which electromagnetic fields may radiate or impinge



IEC 446/02

Figure 1 – Examples of ports

3.2 Abbreviations

AC/DC	Alternate Current/Direct Current
AFC	Automatic Frequency Control
AM	Amplitude Modulation
BSS	Broadcast Satellite System
CATV	Community Antenna Television
CD	Compact Disc
DTH	Direct To Home (satellite receiving systems)
e.m.	Electromagnetic (field)
e.m.f.	Electro-motive-force
ESD	Electrostatic Discharge
EUT	Equipment Under Test
FM	Frequency Modulation
FSS	Fixed Satellite System
GSM	Global System for Mobile Communications
ITU-R	International Telecommunication Union – Radiocommunications
LW, MW and SW	Long Wave, Medium Wave and Short Wave
MATV	Master Antenna Television
PC	Personal Computer
RF	Radio Frequency
r.m.s.	Root-mean-square
TEM	Transverse Electromagnetic (cell)

4 Immunity requirements

4.1 Performance criteria

4.1.1 Performance criterion A

The equipment shall continue to operate as intended during the test.

No change of actual operating state (for example change of channel) is allowed as a result of the application of the test.

Multifunction equipment shall for each function meet the relevant requirements.

Evaluation is carried out for audio and video functions.

The equipment is supposed to operate as intended if the criteria of 4.1.1.1 and/or 4.1.1.2 are fulfilled.

4.1.1.1 Evaluation of audio quality

Unless otherwise specified in this standard, the criterion of compliance with the requirement is a wanted to unwanted audio signal ratio of ≥ 40 dB at a wanted audio signal level of 50 mW, or at another audio signal level specified by the manufacturer.

If the S/N ratio is less than 43 dB, the performance criterion for audio assessment is the actual S/N ratio minus 3 dB.

In this case, at the beginning of the audio quality evaluation the actual S/N ratio is measured and noted in the test report as reference value.

For AM sound receivers the criterion is ≥ 26 dB at 50 mW.

For AM and FM car radios and for broadcast receiver cards for computers the criterion is ≥ 26 dB at 500 mW.

4.1.1.2 Evaluation of picture quality

In the evaluation of picture interference the wanted test signal produces a standard picture (in the case of video tape equipment on the screen of the test-tv-set) and the unwanted signal produces a degradation of the picture. The degradation may be in a number of forms, such as a superposed pattern, disturbance of synchronization, geometrical distortion, loss of picture contrast, of colour, etc.

The criterion of compliance with the requirement is just perceptible degradation by observation of the picture. The screen shall be observed under normal viewing conditions (brightness 15 lx to 20 lx), at a viewing distance of six times the height of the screen.

The picture quality can also be evaluated by using objective measurement methods; one such method is described in Annex K.

In the case of video tape equipment the test criteria relate to the picture, assessed on a test-tv-set, which is connected to the video output terminal of the equipment.

4.1.2 Performance criterion B

The equipment shall continue to operate as intended after the test. No loss of function is allowed after the test when the apparatus is used as intended, but failures which are recovered automatically but which cause temporary delay in processing, are permissible. No change of actual operating state for example change of channel or stored data and settings is allowed as a result of the application of the test. During the test, degradation of performance is allowed.

4.2 Applicability

Tests are applied at the relevant connectors and enclosure port of the equipment according to 4.3 through 4.7. Tests shall only be carried out where the relevant port(s) or function exist. If more than one specific function exists, for example audio functions, then all these functions shall be tested.

It may be determined from consideration of the electrical characteristics and usage of a particular equipment that some of the tests are inappropriate and therefore unnecessary. In such a case it is required that the decision not to test and the rationale leading to this decision shall be recorded in the test report.

4.2.1 Multifunction equipment

Multifunction equipment which is subjected simultaneously to different clauses of this standard and/or other standards shall be tested with each function operating in isolation, if this can be achieved without modifying the equipment internally. The equipment thus tested shall be deemed to have complied with the requirements of all clauses/standards when each function has satisfied the requirements of the relevant clause/standard.

For equipment for which it is not practical to test with each function operating in isolation, or where the isolation of a particular function would result in the equipment being unable to fulfil its primary function, the equipment shall be deemed to have complied if the relevant provisions of each clause/standard are taken into account, with the necessary functions operative.

If the test levels for the different functions are not identical, the level for the function under test applies, taking into account the performance criteria for this function.

Example: For a TV receiver provided with a telecommunication function, the requirements for the telecommunication port are verified in accordance with CISPR 24.

4.2.2 PC tuner cards

For PC tuner cards immunity requirements for the antenna input connector are applicable according to Table 2. PC tuner cards which are separately marketed for incorporation in diverse host units shall be tested in at least one appropriate representative host unit (e.g. PC) of the choice of the card manufacturer.

4.2.3 IR units

An IR remote control unit shall be tested together with the main unit.

4.3 Immunity requirements for the antenna input connector

Measurements apply to equipment and with the performance criteria according to Table 2.

Table 2 – Antenna port

Parameter	Test specification	Test set-up	Applicability	Performance criteria
RF voltage Differential mode	See 4.3.1 Tables 3 and 4 and 4.3.2 Tables 5, 5a, 5b, 5c, 5d and 6	See 5.3 (input immunity)	FM radio antenna PC tuner cards for FM and TV Car radio FM Satellite radio TV antenna Satellite TV Ass. video tun. antenna	A
RF voltage Common mode AM modulate carrier	See 4.3.3, Table 8 1 kHz, 80 % depth	See 5.4	FM radio antenna PC tuner cards for FM and TV Car radio FM Satellite radio TV antenna Satellite TV Ass. video tun. antenna AM radio antenna Car radio AM	A
Screening effectiveness	See 4.3.4, Table 8a	See 5.5	FM radio antenna TV antenna Digital radio antenna Digital TV antenna	see Table 8a

4.3.1 Requirements for input immunity to RF voltages (differential mode) of the FM part of sound receivers

Sound receivers with a FM part shall meet the sound criterion of 4.1.1.1 They shall be tested at a tuned frequency f_n and subjected to an unwanted signal of frequency f_f and level n_f as specified in Tables 3 and 4. Receivers with mono/stereo facility shall be tested in stereo mode.

Table 3 – Limits of input immunity from unwanted signals outside the FM range
(see also 5.3.1.2 for the wanted signal)

Wanted signal frequency f_n MHz	Unwanted signal frequency f_f MHz	Level n_f dB(μ V) 1 kHz AM at 80 % depth	
		Mono	Stereo
87,6	66,2 ^a	80	80
	76,9	80	80
	87,1	80	80
	87,2	80	80
	87,25	80	80
	87,30	72,4	69,2
	87,35	64,8	58,4
	87,40	57,2	47,6
	87,45	49,6	36,8
	87,50	42,0	26,0
107,9	129,3 ^b	80	80
	118,6	80	80
	108,4	80	80
	108,3	80	80
	108,25	80	80
	108,20	72,4	69,2
	108,15	64,8	58,4
	108,10	57,2	47,6
	108,05	49,6	36,8
	108,00	42,0	26,0

^a Only applicable for receivers with the local oscillator frequency below the tuned frequency.

^b Only applicable for receivers with the local oscillator frequency above the tuned frequency.

Table 4 – Limits of input immunity from unwanted signals inside the FM range
(see also 5.3.1.3 for the wanted signal)

Wanted signal frequency f_n MHz	Unwanted signal frequency f_f MHz	Level n_f dB(μ V) 1 kHz FM 40 kHz deviation	
		Mono	Stereo
98	97,5 and 98,5	85	85
	97,6 and 98,4	85	85
	97,65 and 98,35	80	80
	97,7 and 98,3	72	72
	97,75 and 98,25	63	63
	97,8 and 98,2	59	58
	97,85 and 98,15	57	47
	97,9 and 98,1	53	32
	97,925 and 98,075	49	20
	97,95 and 98,05	41	14
	97,975 and 98,025	34	14
	98	29	20

4.3.2 Requirements for input immunity to RF voltages (differential mode) of television receivers and associated video equipment with tuner (including satellite television receivers)

Television receivers, video tape equipment with built-in television broadcast receiving facility in the RF recording mode and other associated video equipment with tuner shall be tested at a tuned television channel N and subjected to an unwanted signal in channel M, level n_f , and of the following types. The wanted input signals are specified in 5.3.2.2.

Unwanted signal types:

- A: an unmodulated signal at the picture carrier frequency of the relevant channel M;
- B: two unmodulated signals each at the level as given in the tables, one at the relevant picture carrier frequency +0,5 MHz and the other at the picture carrier frequency -0,5 MHz;
- C: a modulated signal at the relevant sound carrier frequency, 1 kHz FM at 30 kHz deviation;
C shall be applied to receivers for countries in which mono-sound television signals of the systems B and G can be received.
For television receivers for countries, in which also two-sound-channel-television-signals of the systems B and G with two frequency modulated sound carriers can be received (even for one-sound-channel-television-receivers)
 - C1: a frequency modulated signal at the relevant frequency of the first sound carrier, 1 kHz FM at 30 kHz deviation, and
 - C2: a frequency modulated signal at the relevant frequency of the second sound carrier, 1 kHz FM at 30 kHz deviation
 are applied simultaneously.
- D: an amplitude modulated signal at the relevant picture carrier frequency, 1 kHz AM at 80 % depth.
- E: an amplitude modulated signal, 1 kHz AM at 80 % depth.

**Table 5 – Limits of input immunity of television receivers
for systems B, G and I**

Wanted channel N	Unwanted signal in channel M						Type
	Level dB(μV)						
	M = N – 5	N – 1	N + 1	N + 5 ^a	N + 9 ^a	N + 11	
N _I and N _{III} and N _H	–	73	73	–	68 ^b	–	A
	–	61	61	–	56 ^b	–	B
	70	73 – x	73 – x	70	68 – x ^b	68	C or C1
	63	73 – y	73 – y	63	68 – y ^b	61	C2
	70	–	–	70	–	68	D
N _{IV}	–	77	77	80	68	–	A
	–	65	65	68	56	–	B
	74	77 – x	77 – x	80 – x	68 – x	–	C or C1
	67	77 – y	77 – y	80 – y	68 – y	–	C2
	74	–	–	–	–	–	D
N _V	80	77	77	80	–	–	A
	68	65	65	68	–	–	B
	80 – x	77 – x	77 – x	80 – x	62	–	C or C1
	80 – y	77 – y	77 – y	80 – y	55	–	C2
	–	–	–	–	62	–	D
For systems B and G x = 13 dB, y = 20 dB For system I (monophonic only) x = 10 dB							
NOTE 1 “x” is the relative level (dB) of the first sound carrier (mono sound channel) with respect to the picture carrier. “y” is the relative level (dB) of the second sound carrier (stereo sound channel) with respect to the picture carrier.							
NOTE 2 (For China only). For systems D-PAL and K-PAL, Table 5 applies with the addition of channels (M) N – 4 and N + 4, with the same limits of channels N – 5 and N + 5 and x = 10 dB.							
NOTE 3 N ± m indicates the frequency of the picture carrier of the tuned television channel, plus or minus m times the channel frequency bandwidth. The test signal should be applied at this frequency if a limit value is tabulated.							
^a These levels only apply for television systems with a channel spacing of 8 MHz and an IF of 38,9 MHz. For other channel spacing and IF frequencies different image channel or local oscillator interference constraints may apply.							
^b Only for hyperband N _H .							

For the purpose of this standard, a television receiver shall meet the limits of Tables 5, 5a to 5d and 6 as appropriate for all channels for which it is designed.

For tests for conformity of appliances in series production (see Clause 6) a television receiver shall be tested on one channel in each band for which it is designed, using the channel N for which the picture carrier frequency is nearest to the middle frequency of each TV band. For Europe:

Channel N_I in Band I nearest to 55 MHz

Channel N_{III} in Band III nearest to 203 MHz

Channel N_{IV} in Band IV nearest to 503 MHz

Channel N_V in Band V nearest to 743 MHz

Channel N_H in Hyperband nearest to 375 MHz

See also annex H.

Table 5a – Limits of input immunity of television receivers for system L

Wanted channel N	Unwanted signal in channel M				
	Level dB(μ V) n_f (75 Ω)				Type
	M $\leq$ N - 2	N - 1	N + 1	M $\geq$ N + 2	
04	68	–	–	–	D
08	71	68	68	71	D
25	75	72	72	75	D
55	75	72	72	75	D

NOTE For channel N = 04 ($f_V = 63,75$ MHz), the unwanted signal should only be applied in channel M = 02 ($f_V = 55,75$ MHz).

For system L, signal D is an amplitude modulated signal at the relevant picture carrier frequency, 1 kHz at 80 % depth. This signal is also used in a second measurement for simulating the unwanted signal at the sound carrier frequency. In that case the limits indicated in Table 5a have to be reduced by 5 dB.

Table 5b – Limits of input immunity of television receivers for systems D-SECAM, K-SECAM (used in Russia)

Wanted channel N	Unwanted signal in channel M						Type
	Level dB(μV)						
	M = N – 4	N – 1	N + 1	N + 4	N + 8	N + 9	
N _I (Channel 2)	–	73	73	–	–	–	A
	–	61	61	–	–	–	B
N _{II} (Channel 4)	–	73	73	–	–	–	A
	–	61	61	–	–	–	B
N _{III} (Channel 10)	–	73	73	–	–	–	A
	–	61	61	–	–	–	B
	–	63	–	70	–	–	C
	70	–	73	–	–	68	D
N _{IV} (Channel 25)	–	77	77	–	–	68	A
	–	65	65	–	–	56	B
	–	67	–	70	66	–	C
	74	–	70	–	–	–	D
N _V (Channel 55)	80	77	77	–	–	–	A
	68	65	65	–	–	–	B
	–	67	–	70	62	–	C
	–	–	67	–	–	62	D

NOTE The wanted channels in brackets are recommended for measurements within each television band.

**Table 5c – Limits of input immunity of television receivers
for systems PAL D/K (used in central Europe)**

Wanted channel and signal	Unwanted signal in channel M						Type
	Level dB(μV)						
	M = N – 4	N – 1	N + 1	N + 4	N + 8	N + 9	
N							
Channel 3	–	73	73	–	–	–	A
Signal level:	–	61	61	–	–	–	B
77,25 MHz	–	–	–	–	–	–	C
70 dB(μV)	–	–	–	–	–	–	D
Channel 9	–	73	73	–	–	–	A
Signal level:	–	61	61	–	–	–	B
199,25 MHz	–	63	–	70	–	–	C
70 dB(μV)	70	–	73	–	–	68	D
Channel 26	–	77	77	–	–	68	A
Signal level:	–	65	65	–	–	56	B
511,25 MHz	–	67	–	70	66	–	C
74 dB(μV)	74	–	70	–	–	–	D
Channel 55	80	77	77	–	–	–	A
Signal level:	68	65	65	–	–	–	B
743,25 MHz	–	67	–	70	62	–	C
74 dB(μV)	–	–	67	–	–	62	D

**Table 5d – Limits of input immunity of television receivers for system
M-NTSC with a 58,75 MHz IF video carrier
(used in Japan)**

Wanted channel N	Unwanted signal in channel M					
	Level dB(μV)					Type
	M = N – 2	N – 1	N + 1	N + 2	N + 19	
N _{II} , N _{III}	–	–	60	–	70	A
	–	49	–	–	–	C1
	70	–	–	70	–	D
N _{IV}	–	–	64	–	74	A
	–	53	–	–	–	C1
	70	–	–	74	–	D

NOTE 1 Wanted signal: a standard TV signal with vertical colour bar pattern with modulated sound carrier, level 70 dB(μV) in band II and band III or 74 dB(μV) in band IV 1 kHz FM at 15 kHz deviation.

NOTE 2 Sound carrier level: 64 dB(μV) in band II and band III or 68 dB(μV) in band IV.

NOTE 3 C1: a modulated signal at the relevant sound carrier frequency, 1 kHz FM at 15 kHz deviation.

For tests for conformity of appliances in series production (see Clause 6) a television receiver shall be tested on one channel in each band for which it is designed, using the channel N for which the picture carrier frequency is nearest to the following frequencies:

Channel N_{II} in Band II nearest to 98 MHz

Channel N_{III} in Band III nearest to 203 MHz

Channel N_{IV} in Band IV nearest to 623 MHz

See also Annex H.

Table 6 – Limits of input immunity of television receivers

Wanted channel N	Unwanted signal		
	Frequency MHz	Level dB(μ V) n_f (75 Ω)	Type
N_I	26 to 30	89	E
N_{III}	26 to 30	104	E

NOTE 1 The limits for the wanted channel N_I apply also to the wanted channel N_{III} when band II is used for systems D-SECAM, K-SECAM.

NOTE 2 For the wanted audio signal see 5.3.2.2.

For all input immunity measurements on television receivers equipped with a "fine tuning" adjustment, easily accessible to the user, readjustment of the receiver oscillator is allowed (up to ± 250 kHz) referred to its nominal frequency, in order to minimize the interference, while maintaining the quality of picture and sound.

Table 7 – Limits of input immunity of satellite television receivers

Wanted channel N	Unwanted signal in channel M				Wanted and unwanted signal type
	Level dB(μV)				
	N – 2	N – 1	N + 1	N + 2	
N _{min} + 3	70	66	66	70	A1 or A2 or A3
N _{mid}	70	66	66	70	
N _{max} – 3	70	66	66	70	

NOTE 1 N_{min} = lowest channel of the receiver in the relevant band.

NOTE 2 N_{mid} = middle channel of the receiver in the relevant band.

NOTE 3 N_{max} = highest channel of the receiver in the relevant band.

Satellite television receivers shall meet the sound criterion of 4.1.1.1 and the picture criterion of 4.1.1.2. The levels of the unwanted signals are specified in Table 7.

For satellite television receivers the wanted and unwanted signals shall be of the same type and have the same modulation as described in 5.3.2.3. The characteristics are:

- A1: Channel distance 29,5 MHz with a deviation sensitivity of 16 MHz/V and a dispersal of 2 MHz for PAL receivers.
- A2: Channel distance 42 MHz with a deviation sensitivity of 22 MHz/V and a dispersal of 2 MHz for receivers able to receive wide band (33 MHz) signals. A2 type signal applies to SECAM receivers.

A3: Channel distance 50 MHz with a deviation sensitivity of 22,5 MHz/V and a dispersal of 2 MHz for PAL receivers able to receive this wide band signal.

NOTE The deviation sensitivity is defined for the zero dB point of the pre-emphasis network.

Measurements with type A3 need not be carried out if measurements with type A1 have been performed.

**Table 7a – Limits of input immunity of satellite television receivers
(Used in Japan, Korea)**

Wanted Channel N	Unwanted signal in channel M Level dB(μV)		Wanted and unwanted signal type
	N – 2	N + 2	
N _{min} + 2	70	70	B1 or B2
N _{mid}	70	70	
N _{max} – 2	70	70	

B1: Channel distance 19,18 MHz with a deviation sensitivity of 17 MHz/V and a dispersal of 0,6 MHz for NTSC receivers.

B2: Channel distance 19,18 MHz with a deviation sensitivity of 17 MHz/V and a dispersal of 0,6 MHz for high vision (MUSE) receivers.

4.3.3 Requirements for immunity to RF voltages (common mode) at antenna terminals

The requirements for receivers, (including car radios and AM receivers), multifunction equipment and video tape equipment concerning the immunity to RF voltages in common mode are restricted to the antenna terminals and to the frequency range from 26 MHz to 30 MHz.

Requirements are applied to equipment operating in the receiving mode.

Receivers and multi-function equipment shall meet the sound criterion of 4.1.1.1 and the picture criterion of 4.1.1.2 as appropriate for unwanted signals of frequencies and levels as specified in Table 8 applied to the antenna terminal.

Video tape equipment with built in television broadcast receiving facility shall meet in the RF recording mode the sound criterion of 4.1.1.1 at the audio output terminal of the equipment and the picture criterion of 4.1.1.2 on a test-TV-set under the same test conditions as receivers and multifunction equipment.

Table 8 – Limits of immunity to RF voltages (common mode) of antenna terminals

Frequency MHz	Level dB(μV) (e.m.f.)
26 to 30	126
NOTE 1 For system L the test level in the frequency range 28 MHz to 30 MHz is 116 dB(μV) (e.m.f.).	
NOTE 2 According to the measuring procedure the immunity from conducted current is expressed by the e.m.f. level of the unwanted signal generator (Figures 5 and 6).	

4.3.4 Requirements for screening effectiveness

Requirements for screening effectiveness apply to the coaxial antenna terminals, if any.

Measurements shall be made in accordance with 5.5.

Table 8a – Limits of screening effectiveness of the coaxial antenna terminals

Equipment	Signal frequency	Operating mode of the EUT	Level dB
FM radio antenna	Middle channel of each broadcast band the EUT is designed for.	Connected to the high-grade coaxial cable Ca as shown in Figure 7, but disconnected from the power supply.	≥20
TV antenna Digital radio antenna Digital TV antenna	Middle channel of each broadcast band the EUT is designed for.	Connected to the high-grade coaxial cable Ca as shown in Figure 7, but disconnected from the power supply.	≥50
The requirements shall not apply to: – Loop-through UHF and IF terminals as well as RF modulator output terminals. Loop-through UHF- and IF terminals are terminated with a high-grade 75 Ω coaxial termination for the test. – Car radios. – Signal frequencies above 1 000 MHz. Measurements shall be made by using an average detector and the measuring receiver bandwidth shall lie within 8 kHz to 10 kHz.			

4.4 Immunity requirements for audio connectors

4.4.1 Immunity requirements at loudspeaker and headphone output connector

Measurements apply to equipment and with the performance criteria according to Table 9.

Table 9 – Loudspeakers/headphone output port

Parameter	Test specification	Test set-up	Applicability ^a	Performance criteria
RF voltage Differential mode AM modulated signal	See 4.6 Table 12 1 kHz, 80 % depth	See 5.7	Mains powered: – FM radio ant. – TV ant. – Ass. video Tuner. Ant. – Ass. video – Ass. audio – Ass. other (e.g. audio amplifier) – Camcorders, in playback mode, – Satellite TV – Satellite radio	A
^a The requirements shall not apply to: – the equipment functions in the interference frequency ranges listed in Table 14; – AM sound receivers and car radios.				

4.4.2 Immunity requirements for audio input and output connectors (excluding loudspeaker and headphone)

Measurements apply to equipment and with the performance criteria according to Table 10.

Table 10 – Audio input/output port (excluding loudspeaker and headphone)

Parameter	Test specification	Test set-up	Applicability ^a	Performance criteria
RF voltage Differential mode AM modulated signal	See 4.6 Table 13 1 kHz, 80 % depth	See 5.7	Mains powered: – FM radio antenna – TV antenna – Ass. video tun. ant. – Ass. video – Ass. audio, – Ass. other (e.g. audio amplifier) – Camcorders, in playback-mode – Satellite TV – Satellite radio	A
^a The requirements shall not apply to: – the equipment functions in the interference frequency ranges listed in Table 14; – AM sound receivers and car radios.				

4.5 Immunity requirements for AC mains power connectors

Measurements apply to equipment and with the performance criteria according to Table 11.

Table 11 – Power input port

Parameter	Test specification	Test set-up	Applicability ^a	Performance criteria
RF voltage Common mode AM modulated signal	See 4.6 Table 12 1 kHz, 80 % depth	See 5.7	Mains powered: – FM radio antenna – TV antenna – Ass. video tun. ant. – Ass. video	A
Electrical fast transients Common mode	1 kV(peak) Tr/Th: 5/50 ns 5 kHz repetition frequency	IEC 61000-4-4 Direct injection Coupling/decoupling network	– Ass. audio, – Ass. other (e.g. audio amplifier) – Camcorders, in playback-mode, – Satellite TV – Satellite radio	B
^a The requirements shall not apply to: – the equipment functions in the interference frequency ranges listed in Table 14; – AM sound receivers and car radios. The requirements shall apply to: – AC/DC adaptors, when marketed with the host as one commercial unit.				

4.6 Requirements for immunity to RF voltages

4.6.1 Limits of immunity to RF voltages of mains supply terminal and loudspeaker and headphone terminals

Equipment as listed in Tables 9 and 11 shall meet, except as stated in 4.6.3 for each function, the sound criterion of 4.1.1.1 and the picture criterion of 4.1.1.2 as appropriate. They shall be tested using unwanted signals of frequencies and levels specified in Table 12 applied to the mains (in common mode) and loudspeaker and headphone terminals (in differential mode).

Equipment with a DC input power port shall be considered as mains powered equipment. The unwanted signal shall be injected into the AC port of the external power supply provided by the manufacturer/importer. If not provided the test laboratory may use an appropriate power supply with sufficient immunity. The type shall be recorded in the test report.

Table 12 – Limits of immunity to RF voltages of mains, loudspeaker and headphone terminals

Frequency MHz	Level dB(μV) (e.m.f.)
0,15 to 30	130
30 to 100	120
100 to 150	120 – 110 ^a
^a Decreasing linearly with the logarithm of the frequency.	

4.6.2 Limits of immunity to RF voltages of audio input and output terminals (except loudspeaker and headphone terminals)

Equipment as listed in Table 10 shall meet, except as stated in 4.6.3 for each function, the sound criterion of 4.1.1.1 and the picture criterion of 4.1.1.2 as appropriate. They shall be tested using unwanted signals of frequencies and levels specified in Table 13 applied to the corresponding terminal.

Table 13 – Limits of immunity to RF voltages of audio input and output terminals (except loudspeaker and headphone terminals)

Frequency MHz	Level dB(μV) (e.m.f.)
0,15 to 1,6	80 – 90 ^a
1,6 to 20	90 – 120 ^a
20 to 100	120
100 to 150	120 – 110 ^b
^a Increasing linearly with the logarithm of the frequency.	
^b Decreasing linearly with the logarithm of the frequency.	

4.6.3 Exceptions to the limits

The requirements in 4.6.1 and 4.6.2 shall not apply to:

- the equipment functions in the interference frequency ranges listed in Table 14;
- television receivers and associated equipment in the frequency range $f_c \pm 1,5$ MHz, in which f_c is the colour sub-carrier frequency.

Table 14 – Additional unwanted signal frequencies to be excluded in tests on sound and television reception functions.

Function	Frequency range	
	The tuned channel in all cases, plus the IF channel MHz	other frequencies MHz
FM sound receivers	$f_i \pm 0,5$	None
Television receivers	$f_i - 2$ to $f_v + 2$ (for systems B, G, I, L, D, K, M) $f_v - 2$ to $f_i + 2$ (for system L')	$f_s \pm 0,5$
NOTE f_i is the sound intermediate frequency; f_v is the vision intermediate frequency; f_s is the intercarrier sound frequency.		

4.7 Immunity requirements for the enclosure port

Measurements apply to equipment and with the performance criteria according to Table 15.

Table 15 – Enclosure port

Parameter	Test specification	Test set-up	Applicability	Performance criteria
RF e.m. field AM modulated carrier	See 4.7.1 1 kHz, at 80 % depth	See 4.7.1 and 5.8	Mains powered: – FM radio antenna – TV antenna – Ass. video tun. ant. – Ass. video – Ass. audio – Ass. other (e.g. audio amplifier) – Camcorders, in playback-mode, – Satellite TV – Satellite radio	A
RF e.m. field Keyed carrier ^a	900 MHz, 3 V/m, duty cycle 1/8, 217 Hz repetition frequency	EN 61000-4-3 With measurement conditions of 5.8.4. and Table 23. Filter B.2 replaced by B.4.		
RF e.m. field AM modulated carrier	(790-862) MHz: 3 V/m AM: 1 kHz, 80 % depth Except the tuned channel $\pm 0,5$ MHz: 1 V/m AM: 1 kHz, 80 % depth	EN 61000-4-3 With measurement conditions from I.5. For this test, I.7.2 does not apply.	Equipment with tuners suitable for reception of digital TV signals (cable, terrestrial and satellite) operated in each mode.	A
Electrostatic discharge	8 kV air discharge 4 kV contact discharge	EN 61000-4-2	All equipment covered by the scope	B
^a As an alternative method, a non-homogeneous field strength ≥ 3 V/m of similar characteristics as the test specification (e.g. generated by a dummy GSM portable telephone) may be applied in a shielded room. The dummy shall be placed on a non-metallic stand with a height of 80 cm, at a distance of 1 m to the EUT (see Figure 11). The front side of the EUT shall be placed in parallel to the antenna line of sight. The position shall be described in the measurement report. In case of dispute, measurements shall be carried out in accordance with EN 61000-4-3, with measurement conditions given in 5.8.4 and Table 23, and filter B.2 replaced by B.4.				

C12

4.7.1 Requirements for immunity to ambient electromagnetic fields

Requirements apply for immunity from radiated fields for equipment providing audio, video, FM sound, and television functions and associated equipment.

4.7.1.1 FM sound broadcast receivers

For equipment with a FM sound broadcast reception Table 16 applies.

Table 16 – Limits of immunity to ambient electromagnetic fields of FM reception functions of sound receivers

Frequency MHz	Level dB(μV/m)
0,15 to 150	125
Except frequency bands:	
$(f_i - 0,5)$ to $(f_i + 0,5)$	101
$(f_o - 0,5)$ to $(f_o + 0,5)$	109
$(f_{im} - 0,5)$ to $(f_{im} + 0,5)$	109
87,5 to 108 ^a	109
Except the tuned channel $\pm 0,15$	
NOTE f_i is the intermediate frequency (= 10,7 MHz) $f_o = f_t \pm f_i$ is local oscillator frequency $f_{im} = f_t \pm 2f_i$ is the image frequency f_t is the tuned frequency where sign "+" applies when $f_o > f_t$ sign "-" applies when $f_o < f_t$	
^a The frequency range 87,5 MHz to 108 MHz can be varied depending on the use of the FM frequency band on a national basis.	

4.7.1.2 Television broadcast receivers

For equipment with a broadcast television receiver function Table 17 applies.

Table 17 – Limits of immunity to ambient electromagnetic fields of television receivers operating in the reception function

Frequency MHz	Level dB(μV/m)
0,15 to 47 Except frequency bands: $(f_c - 1,5)$ to $(f_c + 1,5)$ $(f_s - 0,5)$ to $(f_s + 0,5)$ $(f_i - 2)$ to $(f_v + 2)$ ^a $(f_v - 2)$ to $(f_i + 2)$ ^b	125 101 101 101 101
For non-European countries and Russia 47 to 150 ^c Except the tuned channel $\pm 0,5$	109 ^d
For European countries 47 to 87 87 to 108 108 to 144 144 to 150 Except the tuned channel $\pm 0,5$	109 125 109 125
NOTE f_i is the sound intermediate frequency f_v is the vision intermediate frequency f_s is the intercarrier sound frequency f_c is the colour subcarrier frequency	
^a For systems B, D, G, K, I, L, M. ^b Only for system L'. ^c The frequency 47 MHz can be varied on a national basis depending on the use of this frequency range. ^d For television receivers with reception function in this frequency range. For television receivers without reception function in this frequency range a level of 125 dB(μV/m) shall apply.	

Receivers and multifunction equipment operating in the monitor mode shall also meet the requirement of 125 dB(μV/m) in the frequency range 150 kHz to 150 MHz. For the frequency range $f_c \pm 1,5$ MHz the limit of 101 dB(μV/m) applies.

4.7.1.3 Associated video tape equipment

Video tape equipment in both recording and playback mode as appropriate shall meet the requirement of:

- Table 17 for equipment with built-in television broadcast receiving facility in the RF recording mode;
- Table 18 for all equipment in the playback mode;
- Table 19 for all equipment in the video recording mode (except for $f_c \pm 1,5$ MHz, for which the limit 101 dB(μ V/m) applies).

Table 18 – Limits of immunity to ambient electromagnetic fields of video tape equipment in the playback mode

Frequency MHz	Level dB(μ V/m)
0,15 to 2,5	125
2,5 to 4,25	120
4,25 to 6,25	115
6,25 to 10	120
10 to 150	125

4.7.1.4 Other associated equipment

For equipment with audio or video functions other than related to broadcast reception, for instance infrared headphones, Table 19 applies. For infrared headphones the frequency band $f_{\text{mod}} \pm f_{\text{diff}}$ is exempted (f_{mod} = internal frequency for the modulation of the IR carrier, f_{diff} = sidebands depending on the kind of modulation).

Table 19 – Limits of immunity to ambient electromagnetic fields of equipment with audio or video functions

Frequency MHz	Level dB(μ V/m)
0,15 to 150	125

For disc equipment in both recording or playback mode the requirements of Table 19 shall be met.

For video disc equipment the limit of 101 dB(μ V/m) applies in the frequency range $f_c \pm 1,5$ MHz.

For outdoor units of Direct to Home satellite receiving systems (FSS and BSS) Table 19 is applicable (see also 5.5.2 of ETS 300 158 and 5.5.2 of ETS 300 249).

Infrared remote controls shall be tested against the same field strength limit as defined for the equipment to which it is intended to signal.

During the test the infrared remote control shall not generate a control signal unintentionally and shall maintain its functions.

For camcorders in playback mode, when powered via the external power connection facility, the requirements of Table 20 shall be met.