



SLOVENSKI STANDARD

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Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment

Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment

Grenzwerte und Meßverfahren für die Funkstöreeigenschaften von Rundfunkempfängern und verwandten Geräten der Unterhaltungselektronik

Limites et méthodes de mesure des caractéristiques de perturbations électromagnétiques des récepteurs de radiodiffusion et des appareils associés

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ENGLISH VERSION

LIMITS AND METHODS OF MEASUREMENT OF RADIO
DISTURBANCE CHARACTERISTICS OF BROADCAST
RECEIVERS AND ASSOCIATED EQUIPMENT
(CISPR 13:1975/Amdt 1:1983, modified)

Limites et méthodes de mesure des
caractéristiques de perturbations
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(CISPR 13:1975/Amdt 1:1983, modifiée)

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für die Funkstöreigenschaften
von Rundfunkempfängern
und angeschlossenen
Geräten

(CISPR 13:1975/Amdt 1:1983, modifiziert)

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This European Standard was approved by CENELEC on 1988-12-06.

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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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

This European Standard has been prepared by the Ad Hoc Working Group, installed during the CENELEC/CISPR meeting in November 1985.

The aim of this standard is to prevent receivers and associated equipment causing electromagnetic disturbance and to avoid trade barriers between the CENELEC countries in providing a common standard on limits and methods of measurement of electromagnetic disturbance characteristics of receivers and associated equipment.

This standard is based largely on the recommendations in CISPR 13 (1975) and Amendment No. 1 (1983) to CISPR 13 which are currently being updated.

A draft standard was circulated for vote within the CENELEC countries until September 1988. Thirteen National Committees voted in favour and two National Committees were against approval. All editorial comments which lead to an improvement of this standard have been incorporated.

Following the general policy of CENELEC to stay in line with IEC/CISPR as much as possible the CENELEC Technical Committee recommends that where possible this European Standard should be adapted to the updated CISPR Publication as soon as this international standard comes available.

EN 55013 has been prepared by CLC/CISPR. It is based on CISPR publication 13 (1975) and Amendment No. 1 (1983) to CISPR 13 and contains common modifications. It was approved by CENELEC on 6 December 1988.

The following dates are applicable:

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- latest date of announcement of the EN at national level (doa) : 1989-03-01
 - date of latest publication of a new harmonized standard (dop) : 1989-09-01
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http://standards.iteh.ai/standards/sist(59c-f1989-09-01-2208e57ce6ad/sist-en-55013-1995)
 - date of withdrawal of conflicting national standards (dow) : 1989-09-01

For products which have complied with the relevant national standard before 1989-09-01, as shown by the manufacturer or by a Certification Body, this previous standard may continue to apply for production until 1994-09-01.

Reference documents:

- EN 55 022 (1987) : Limits and methods of measurement of radio interference characteristics of information technology equipment.
- CISPR 16 (1987) : CISPR specification for radio interference measuring apparatus and measurement methods.
- IEC Publication 107-1 (1977): Recommended methods of measurement on receivers for television broadcast transmissions, Part 1: General considerations. Electrical measurements other than those at audio-frequencies.

1. SCOPE

- 1.1 This standard specifies limits and methods of measurement of electromagnetic disturbance caused by sound broadcast receivers, television receivers and associated equipment.
- 1.2 Procedures are given for the measurement of electromagnetic disturbance and limits are laid down in the frequency range 9 kHz to 1000 MHz.

2. DEFINITIONS

For the purpose of this standard, the definitions contained in the IEC Standard Publication 50: International Electrotechnical Vocabulary (IEV), Chapter 161: Electromagnetic Compatibility, apply, extended with the following specific definitions:

- 2.1 Sound broadcast receivers are appliances intended for the reception of sound broadcast radio and similar transmissions.
- 2.2 Television receivers are appliances intended for the reception of television broadcast radio and similar transmissions.

Note: Modular units which perform a part or parts of the functions unique to a television or a sound receiver are considered to be television or sound receivers respectively.

- 2.3 Associated equipment is either intended to be connected directly to sound or television receivers, or to generate or reproduce audio or visual information (for example, audio amplifiers, active loudspeaker units, record players, compact disc players, magnetic recording and playback equipment, electronic organs).

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Information technology equipment are excluded even if it is intended to be connected to a television broadcast receiver.

Connections via the mains plug, local area network or home network are not considered to be direct connections.

Note: Information technology equipment is covered by EN 55 022.

- 2.4 Multifunction equipment has two or more functions which are provided in the same unit, for instance television reception, radio reception, digital clock, tape recording or disc player.

3. LIMITS OF ELECTROMAGNETIC DISTURBANCE3.1 General

The disturbance signal shall not exceed the limits specified in Sub-clauses 3.2 to 3.5 when measured using the methods given in Clause 5. At the transition frequencies, the lower limit applies. For equipment in volume production, it is required that, with 80% confidence, at least 80% of production complies with the limits (see Clause 6).

For receivers intended exclusively for use in motor vehicles (for example car radios), only the limits for FM car radios in Table 2 shall apply.

3.2 Limits of mains terminal disturbance voltage

Measurements shall be made in accordance with Sub-Clause 5.2.

Table 1: Limits of mains terminal disturbance voltage

Equipment type	Frequency range (MHz)	Limits (dB(μV))	
		Quasi-peak	Average
Television and sound receivers and associated equipment	0.009 to 0.15 0.15 to 0.5 0.5 to 5 5 to 30	u.c. 66 to 56* 56 60	u.c. 56 to 46* 46 50

u.c. = under consideration

* Decreasing linearly with the logarithm of the frequency.

If the measurements with the quasi-peak detector give values equal or less than the limits for the measurement with the average detector, then the limit for the measurement with the average detector need not be carried out.

3.3 Limits of antenna terminal disturbance voltage

Measurements of the antenna terminal voltage shall be made in accordance with Sub-clause 5.3.

The limit values specified correspond to a nominal impedance of 75 Ω. The limit values for receivers with nominal impedance other than 75 Ω are calculated according to the following formula:

Limit in R Ω, dB(μV) = Limit in table, dB(μV) +10 lg R/75

Table 2: Limits of antenna terminal disturbance voltage

Equipment type	Source	Frequency MHz	Limit values dB(μ V) in 75 Ω Quasi-peak
Television & VCR channel freq. \leq 300 MHz	local osc.	fundamental	46
		harmonics	30 to 1000
	other	30 to 1000	46
Television & VCR channel freq. $>$ 300 MHz	local osc.	fundamental	46*
		harmonics	30 to 1000
	other	30 to 1000	46
FM sound	local osc.	fundamental	54
		harmonics	30 to 300
		harmonics	300 to 1000
	other	30 to 1000	46
FM car radios	local osc.	fundamental	66
		harmonics	30 to 300
		harmonics	300 to 1000
LF/MF/HF receiver		u.c.	u.c.

u.c. = under consideration

* A value of 54 dB(μ V) will apply until the first of January 1992 for all CENELEC countries.

3.4 Limits of disturbance radiation

Measurements of the radiation due to the local oscillator at its fundamental and harmonic frequencies and due to all other sources shall be made in accordance with Sub-Clause 5.4. Radiation of VCR's shall be measured while operating in the receiving mode.

Note: Radiation limits of VCR's, operating in the playback mode using an RF modulated carrier, are under consideration.

Table 3: Limits of disturbance radiation.

Equipment type	Source	Frequency MHz	Limit values dB(μ V/m) Quasi-peak
Television & VCR channel freq. \leq 300 MHz	local osc.	fundamental	57
		harmonics	80 to 300
		harmonics	300 to 1000
	other	121.5	40
		243	47
		other	u.c.
Television & VCR channel freq. $>$ 300 MHz	local osc.	fundamental	56
		harmonics	80 to 300
		harmonics	300 to 1000
	other	121.5	40
		243	47
		other	u.c.
FM sound	local osc.	fundamental	60
		harmonics	80 to 300
		harmonics	300 to 1000
	other	u.c.	
	u.c.	u.c.	
LF/MF/HF receiver			

u.c. = under consideration

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3.5 Limits of disturbance power

Measurement of the disturbance power shall be made in accordance with Sub-Clause 5.5.

Table 4: Limits of disturbance power.

Equipment type	Frequency MHz	Limit values dB(pW)	
		Quasi peak	Average
Associated Equipment (video recorder excluded)	30 - 300	45 to 55 *	35 to 45 *
	300 - 1000	u.c.	u.c.

u.c. = under consideration

* Increasing linearly with frequency.

4. MEASURING APPARATUS4.1 Measuring receivers

Measuring receivers with a quasi-peak detector facility and/or average detector facility shall be used in the frequency range 9 kHz to 1000 MHz.

4.1.1 Input impedance

The input circuit of measuring receivers shall be unbalanced. For receiver control settings within the "CISPR Indication Range" the input impedance shall be nominally 50 Ω with the Voltage Standing Wave Ratio (VSWR) not to exceed 2.0:1 when 0 dB RF attenuation is applied and not to exceed 1.2:1 when the RF attenuation is 10 dB or more.

4.1.2 Other characteristics

Quasi-peak measuring receivers shall comply with CISPR 16 (1987), Section One. Average measuring receivers shall comply with CISPR 16 (1987), Section Five, Clause 23 for the average detector characteristics, and with Section One of the same Publication for the other characteristics.

4.2 Artificial mains network4.2.1 General

An artificial mains network is required to provide a defined impedance at radio frequencies across the terminals of the equipment under test, and also to isolate the test circuit from unwanted radio-frequency signals on the supply mains.

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The artificial mains network shall be a V-network.

4.2.2 Impedance

In the frequency range 9 kHz to 150 kHz, the impedance characteristic shall be as defined in CISPR 16 (1987), Sub-clause 8.2.1 and Figure 4. The network is known as the 50 Ω /50 μ H + 5 Ω artificial mains V-network.

In the frequency range 0,15 MHz to 30 MHz, the impedance characteristic shall be as defined in CISPR 16 (1987), Sub-clause 8.2.2 item a) and Figure 5. The network is known as the 50 Ω /50 μ H artificial mains V-network.

A 50 Ω /50 μ H + 5 Ω artificial mains V-network may meet the impedance requirement, in which case it may be used in place of the 50 Ω /50 μ H network.

4.2.3 Decoupling

To ensure that disturbance coming from the mains does not influence the measurements, the artificial mains network shall provide a suitable filter to isolate the measuring receiver circuit from the mains.

4.3 Absorbing clamp

An absorbing clamp is required for measuring the disturbance power of associated equipment in the frequency range 30 MHz to 1000 MHz. The absorbing clamp shall comply with CISPR 16 (1987).

5. METHODS OF MEASUREMENT5.1 General5.1.1 Test signal

The standard test signal for television receivers and videorecorders is a standard television colour bar signal and the pattern defined as 100/0/75/0 in the International Radio Consultative Committee (CCIR) Recommendation 471 (see figure A1(b)). This recommendation is reproduced in appendix A. The modulation of the video and the audio signals on the RF carrier shall be according to the system for which the equipment is intended.

The standard test signals for radio receivers are:

- a) band II: an RF mono signal frequency modulated at 1000 Hz with 37,5 kHz deviation;
- b) LF/MF/HF: an RF signal modulated at 1000 Hz with 50% amplitude modulation.

The standard test signals for associated equipment are:

- a) For audio amplifiers: a frequency of 1000 Hz;
- b) For audio tape recorders: a frequency of 1000 Hz pre-recorded on the magnetic tape;
- c) For record players: a frequency of 1000 Hz inductively coupled to the leads connected to the pick-up cartridge or if not possible supplied from a test record;
- d) For compact disc players: an audio frequency of 1000 Hz supplied from a test record;
- e) For electronic organs: An audio frequency to be derived from depressing the upper C note (approx. 523 Hz).

5.1.2 Signals not produced by the equipment under test

Signals not produced by the equipment under test (arising from the supply mains or produced by extraneous fields) shall give an indication on the measuring receiver at least 10 dB below the limit value.

The signals not produced by the equipment under test are measured when the equipment under test is connected but not operated.

5.2 Measurement of mains terminal disturbance voltage in the frequency range 9 kHz to 30 MHz5.2.1 Television receivers and video recorders

5.2.1.1 Measuring set-up

Measurements shall be carried out in a screened room.

The equipment under test and the artificial mains network shall be disposed as shown in figures 1(a) and 1(b).

The mains lead shall be arranged to follow the shortest possible path between the equipment under test and the artificial mains network on the ground. The length of the lead in excess of the 80 cm separating the equipment from the artificial mains network shall be folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 30 and 40 cm.

The controls of the television under test, contrast, brightness and colour saturation, shall be set to produce a normal picture.

This is obtained with the following luminance values:

black part of the test pattern	2 cd/m ²
magenta part of the test pattern	40 cd/m ²
white part of the test pattern	80 cd/m ²

Any set of measuring results shall be accompanied by a complete description of the cable lay-out and equipment orientation. If there are special conditions of use, those conditions shall be specified and documented; e.g. cable length, shielding and earthing.

Note: An additional filter may be required in the case where mains-borne RF disturbance influences the measurements to a substantial extent.

5.2.1.2 Earthing

Earthing of the equipment under test shall be made to the earth terminal provided on the artificial mains network, with the shortest possible lead.

If the equipment under test has a coaxial RF input connector, tests shall be performed with and without an earth connection made to the outer conductor of the coaxial RF input connector. When these tests are carried out no other earth connections to whatever additional earth terminal must be made.

If the equipment under test has no coaxial RF input connector and if it has an earth terminal, tests shall be performed with this terminal earthed.

5.2.1.3 Measurement procedure

The equipment under test shall be tuned and synchronized to the specified wanted test signal (see Sub-clause 5.1.1).

For television receivers, the RF input signal level shall be such that noise is not visible on the screen at normal viewing distance.

For video recorders the RF input signal level shall be 60 dB(μ V).

Note: When the video signal is generated at the intermediate frequency and then converted to the wanted channel, the converter oscillator has the same frequency as the local oscillator of the television receiver under test. In this case care should be taken that the measured voltage at the antenna terminals should not be due to the test generator instead of the television receiver.

5.2.2 Sound-broadcast receivers

5.2.2.1 Measuring set-up

Measurements shall be carried out in a screened room. The receiver under test and the artificial mains network shall be disposed as shown in Figure 1 for FM sound receivers, in Figure 2 for AM receivers with monopole pick-up aerial and in Figure 3 for AM receivers with a built-in ferrite antenna.

The mains lead shall be arranged to follow the shortest possible path between the receiver and the artificial mains network on the ground.

The length of the lead in excess of the 80 cm separating the equipment from the artificial mains network shall be folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 30 and 40 cm.

For audio amplifiers and radio receivers the volume control shall be set for an output level equal to 1/8 of the nominal maximum audio output power.

Any set of measuring results shall be accompanied by a complete description of the cable lay-out and equipment orientation. If there are conditions of use, those conditions must be specified and documented; for example cable length, shielding and earthing.

Note: An additional filter may be required in the case where mains-borne RF disturbance influence the measurements to a substantial extent. (standards.iteh.ai)

5.2.2.2 Earthing

Earthing of the equipment under test shall be made to the earth terminal provided on the artificial mains network, with the shortest possible lead.

If the equipment under test has an earth terminal, tests shall be performed with this terminal earthed.

If the equipment under test has no earth terminal and if it has a coaxial RF input connector, tests shall be performed with and without an earth connection made to the outer conductor of the coaxial RF input connector.

If the equipment under test has no earth terminal and if it has a balanced RF input connector, tests shall be performed without an earth connection.

5.2.2.3 Measurement procedure

The equipment under test shall be tuned to the specified wanted test signal (see Sub-clause 5.1.1). The test signal shall be sufficiently strong to give a noise-free audio signal. Measurements are carried out at one frequency only, within each band available.

5.2.3 Associated equipment excluding video recorders

5.2.3.1 Measuring set-up

The equipment shall be placed 40 cm above an earthed conducting surface of at least 2mx2m in size and shall be kept at least 80 cm from any other earthed conducting surface. If the measurement is made in a screened enclosure, the distance of 40 cm may be referred to one of the walls of the enclosure.

If the equipment is supplied without a flexible lead, it shall be placed at a distance of 80 cm from the artificial mains network and connected thereto by a lead not longer than 1 m.

If the equipment is supplied with a flexible lead, the voltages shall be measured at the plug end of the lead. The length of the lead in excess of the 80 cm separating the equipment from the artificial mains network shall be folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 30 cm and 40 cm.

If the length of the mains supply lead exceeds 6 m, its length shall be reduced to 1 m, or be replaced by a lead of similar quality with a length of 1 m.

5.2.3.2 Earthing

If the equipment is normally required to be operated with an earth connection, the measurements shall be made with the body of the equipment connected to the general mass of the measuring apparatus.

If the equipment is supplied without a flexible lead, it shall be placed at a distance of 80 cm from the artificial mains network and connected thereto by a lead of length not greater than 1 m.

The connection of the equipment case or frame to the general mass of the measuring apparatus shall be made by a lead running parallel to the mains lead and of the same length and at a distance of not more than 10 cm from it.

If this lead includes the earthing conductor, the plug of the earthing conductor shall be connected to the general mass of the measuring apparatus. If an earthing conductor is not included in the flexible lead, the connection to the general mass of the measuring apparatus shall be made by a lead 80 cm to 1 m long in a manner analogous to that specified above for equipment supplied without a flexible lead.

5.2.3.3 Measurement procedure

The equipment shall be operated under normal load conditions as defined in this Sub-clause or, if not defined, as indicated in the manufacturer's instructions.

The equipment shall be operated from a supply having the rated voltage of the equipment.

If the level of disturbance varies considerably with the supply voltage, a test at about 160 kHz and at about 50 MHz for supply voltages over the range of 0.9 to 1.1 times the rated voltage shall be made.

Equipment with more than one rated voltage shall be tested at the rated voltage which causes maximum disturbance.

If the general level of the disturbance is not steady, the reading on the measuring receiver is observed for at least 15 s for each measurement; the highest readings should be recorded with the exception of any isolated spike which shall be ignored.

Audio equipment:

Audio equipment includes such items as audio amplifiers, audio record players, audio tape recorders, electronic organs, sound-film projectors, etc.

Note: With the adoption of this standard "audio equipment" shall fulfil the requirements mentioned.

Sub-clause 5.3.3 "Audio Equipment" of the European Standard EN 55 014 is superseded by the Sub-clauses 5.2.3 and 5.5 of EN 55 013.

Audio record players: to be operated continuously without a disc.

Audio tape recorders: to be operated continuously with a recording tape.

Sound-film projectors: to be operated continuously with a film, the lamp being switched on.

Audio amplifiers.

An audio frequency signal generator shall be connected to an input terminal of the equipment under test via an isolation transformer.

Note: The isolation may be provided by an isolation transformer with a common mode impedance to earth of at least 500 Ω for the frequency range 0,15 MHz to 30 MHz. Alternatively the audio signal should be applied in series with toroidal RF chokes (one in each conductor) of 60 μ H inductance, connected by very short leads to the audio input connectors.

The input terminal to be used, if there is a choice, is the one which uses as many pre-amplifier stages as possible while still allowing the power output stage to deliver its rated output power.

The amplifier output terminals of the equipment under test shall be terminated with a resistive load equal to the rated load impedance. An oscilloscope shall be connected to the output terminals to enable the output waveform to be observed.

The setting of any bass and treble controls shall be a middle or neutral position. Any other control or switch shall be in a normal operating position, for instance the switch for the physiological correction of the frequency response shall be in the off position.

The level of the output signal shall be increased progressively by adjusting the volume control (if present) to maximum and the level of the applied input signal until distortion or clipping is just observable in the output waveform. The volume or the level of the applied input signal shall then be adjusted such that the output power is 1/8 of the output power at which the distortion or clipping was observed.

Measurements of stereophonic or quadrophonic amplifiers shall be made in a similar manner to that detailed above, with all channels terminated with resistive loads of suitable value and with the signal generator connected to the input terminals. The balance control shall be adjusted to produce an equal output power in all channels.

5.3 Measurement of antenna terminal disturbance voltage in the frequency range 30 MHz to 1000 MHz