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**Sound and television broadcast receivers and
associated equipment - Radio disturbance
characteristics - Limits and methods of measurement**

声音和电视广播接收机及有关设备

无线电骚扰特性 限值和测量方法

(IEC/CISPR 13:2009, MOD)

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Table of Contents

Foreword.....	4
1 Scope.....	5
2 Normative references.....	6
3 Terms, definitions, abbreviations.....	7
3.1 Terms and definitions	7
3.2 Abbreviations	8
4 Disturbance limits.....	9
4.1 Overview	9
4.2 Disturbance voltage at the power supply terminal.....	9
4.3 Disturbance voltage at the antenna.....	10
4.4 Useful signal and disturbance signal voltage at RF output of equipment with integrated or additional RF image modulator	11
4.5 Disturbance power	11
4.6 Radiated disturbance	12
4.7 Radiated power	12
5 Measurement method	13
5.1 Overview	13
5.2 Test signal	13
5.3 Disturbance voltage at the power supply terminal in the frequency range of 150 kHz ~ 30 MHz.....	15
5.4 Measurement of disturbance voltage at the antenna end of receivers and related equipment with RF input in the frequency range of 30 MHz ~ 2.15 GHz	18
5.5 Measurement of useful signal and disturbance voltage at the RF output of relevant equipment with RF image modulator in the frequency range of 30 MHz ~ 2.15 GHz	19
5.6 Measurement of disturbance power of related equipment (except video recorders) in the frequency range of 30 MHz ~ 1 GHz	20
5.7 Measurement of radiation field strength by 3m method in the frequency range of 30 MHz ~ 1 GHz.....	22
5.8 Radiation measurement in the frequency range of 1 GHz ~ 18 GHz.....	26
5.9 Measurement of local frequency power at the input of outdoor unit.....	29
6 Explanation of CISPR radio disturbance limit.....	29
6.1 Standard compliance.....	29
6.2 Significance of limits.....	29
6.3 Compliance limit values on a statistical basis	29
Appendix A (Normative) Digital signal broadcasting receiver	37

Appendix B (Informative) Basic information of digital television useful signals)	42
Appendix C (Informative) Settings of flat-panel TV receiver.....	44

Sound and television broadcast receivers and associated equipment - Radio disturbance characteristics - Limits and methods of measurement

1 Scope

This standard specifies the measurement methods for sound and television receivers and related equipment, as well as the limits for the control of harassment from such equipment.

For multifunctional equipment, it shall meet the requirements of this standard and/or other standards, see 4.1.

This standard is applicable to the electromagnetic energy generated by the sound of broadcasting and similar transmissions and television receivers and related equipment; the frequency range is 9 kHz ~ 400 GHz.

Frequencies without specified limits do not need to be measured.

The receiving system used for collective reception, especially the front end of the cable distribution system (shared antenna TV, CATV) and the shared receiving system (main antenna TV, MATV) belong to the category of GB 13836.

See Appendix A and Appendix B for the requirements of broadcast receivers for receiving digital signals.

It does not include information technology equipment (ITE), even if it is connected to a television receiver.

The telecommunications port connecting the broadcast receiver to the telecommunications network belongs to the scope of GB 9254.

In addition, when the telecommunication port has a broadcast receiving function, the broadcast receiving function that can be independent of the telecommunication function shall be measured separately, meanwhile the telecommunication function does not work during the measurement.

The PC tuner card shall be measured in accordance with the corresponding clauses of this standard.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

GB/T 3174 PAL-D system TV broadcasting technical specification

GB/T 4365 Electrotechnical terminology - Electromagnetic compatibility (GB/T 4365-2003, IEC 60050 (161):1990, IDT)

GB 4824-2004 Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement (IEC/CISPR 11:2003, IDT)

GB/T 6113.101 Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus (GB/T 6113.101-2008, IEC/CISPR 16-1-1: 2006, IDT)

GB/T 6113.102 Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbance (GB/T 6113.102-2008, IEC/CISPR 16-1- 2:2006, IDT)

GB/T 6113.103 Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-3: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Disturbances power (GB/T 6113.103-2008, IEC/CISPR 16-1- 3:2004, IDT)

GB/T 6113.104 Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Radiated disturbance (GB/T 6113.104-2008, IEC/CISPR 16-1- 4:2005, IDT)

GB/T 6113.202 Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-2: Methods of measurement of disturbances and immunity - Measurement of disturbance power measurement (GB/T 6113.202-2008, IEC/CISPR 16-2-2 :2004, IDT)

GB/Z 6113.403 Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-3: Uncertainties statistics and limit modelling - Statistical considerations in the determination of EMC compliance of bulk products (GB/Z 6113.403-2007, IEC/CISPR 16-4-3:2004, IDT)

GB 9254 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (GB 9254-2008, IEC/CISPR 22:2006, IDT)

GB 13836 Distribution systems for television and sound signals - Part 2: Electromagnetic compatibility of equipment (GB 13836-2000, IEC 60728-2:1997, NEQ)

GB/T 17309.1-1998 Methods of measurement on receivers for television broadcast transmissions Part 1: General considerations Electrical measurements at radio and video frequencies and measurements on display performance (idt IEC 60107-1:1995)

SJ/T 11348-2006 Methods of measurement for digital television flat panel displays

3 Terms, definitions, abbreviations

3.1 Terms and definitions

The terms and definitions as defined in GB/T 4365 as well as the following terms and definitions apply to this document.

3.1.1

Sound broadcast receivers

The equipment used for receiving terrestrial, cable and satellite transmission of sound broadcasting and similar services, the input signal of which may be analog or digital.

3.1.2

Television receivers

The equipment used for receiving terrestrial, cable and satellite television broadcasting and similar services, the input signal of which can be analog or digital.

3.1.3

Associated equipment

A device directly connected to a sound or television receiver, or a device capable of generating or reproducing audio or video information.

ITE: Information technology equipment

ITU-R: International telecommunication union-radio

LW, MW and SW: Long wave, medium wave and short wave

MATV: Main antenna TV

PC: Personal computer

RF: Radio frequency

4 Disturbance limits

4.1 Overview

When the method given in Chapter 5 is used for measurement, the RF disturbance level shall not be greater than the limit specified in 4.2 ~ 4.7. At the boundaries of the two frequency ranges overlap, the lower limit shall be used. For mass-produced equipment, at least 80% of the products meet the limit requirements with 80% confidence (see Chapter 6).

At the same time, the multi-function equipment that belongs to the requirements of different clauses of this standard and/or other standards can realize each function without changing the inside of the equipment, the test shall be carried out independently under each function. When each function of the equipment meets the requirements of the corresponding clauses/standards, the equipment is considered to meet the requirements of all clauses/standards.

For equipment that cannot achieve independent operation of each function during the test, or the independent operation of a special function will cause the basic functions of the equipment to be impossible, at this time, if the basic operating functions necessary for the equipment meet the requirements of the corresponding clauses/standards, the equipment is considered to meet the requirements.

The RMS-average limit is newly introduced. In case of dispute, the quasi-peak/quasi-peak and average measurement results shall prevail.

4.2 Disturbance voltage at the power supply terminal

It shall be measured according to 5.3. The limits are as shown in Table 1.

frequency shall meet the requirements of the corresponding system.

For teletext, preferably use several rows of digital graphics that fill the screen, as shown in Figure 2. If there is no such graphic, the main index page of the national teletext broadcasting service shall be used as the test figure when measuring, which shall be indicated in the measurement result.

For radio receivers, the standard test signal is:

- a) FM: RF mono signal, 1 kHz, FM, frequency deviation 37.5 kHz;
- b) LW/MW/SW: RF signal, 1 kHz, AM, modulation degree 50%;

For related equipment, the standard test signal is:

- a) Audio amplifier and infrared headphones: 1 kHz sinusoidal signal;
- b) Audio-related equipment, such as tape recorders, audio players, CD players: pre-recorded tapes or records with 1 kHz audio signals, the standard sound signal level is in accordance with the requirements of the manufacturer of the tested equipment;
- c) Video-related equipment, such as video recorders, cameras, laser video disc players and other video disc players: pre-recorded tapes or video discs with standard color bar TV signals with 1 kHz audio signals; the standard sound signal level is based on the requirements of the tested equipment manufacturer;
- d) Electronic musical instrument: Use the signal generated by pressing the high-pitched C key (about 523 Hz);
- e) Infrared remote control: The typical control function continuously emits.

For the equipment for which this standard does not clearly specify its useful signal (for example, digital signal broadcast receivers, decoders, etc.), the nominal signal as specified in the product standard or equipment manufacturer shall be used during the test. The manufacturer shall specify the input signal used for the test in its technical report.

The infrared remote-control device shall be tested together as a part of the main equipment. The infrared remote control sold separately only measures the radiation disturbance (see Table 5).

Adjust the control buttons such as contrast, brightness and color saturation, to produce a standard image.

The brightness values are as follows:

Black bar: 2 cd/m²

Magenta bar: 30 cd/m²

White bar: 80 cd/m²

Note 1: If the brightness value of the magenta strip in the test pattern does not reach the specified value, its brightness shall be set as large as possible, meanwhile the actual brightness value shall be indicated in the measurement result.

Note 2: Refer to Appendix C for the display settings of the flat-panel TV receiver.

A television receiver with a teletext device shall be tested in a teletext mode; the receiver displays a teletext image.

5.3.3 Sound receiver

The standard test signal used for the sound receiver is as specified in 5.2.

AM sound receivers are equipped with ferrite antennas or whip antennas. At this time, the radiating antennas in Figures 5 and 6 shall be replaced with loop radiating antennas or rod-shaped radiating antennas.

The volume control of the receiver under test shall be adjusted to 1/8 of the rated audio output power; other controllers shall be placed in the middle or neutral position; the output end shall be terminated with a resistor equal to the rated load impedance.

When the rated load impedance of the equipment under test has a certain range, select the rated load value that maximizes the output power of the device.

AM/FM sound receiver shall be measured in FM mode.

5.3.4 Related equipment

The standard test signal of the relevant equipment shall be as specified in 5.2.

For the relevant equipment with RF input, measure it according to the corresponding TV or sound receiver.

The module unit (for example, tuner, frequency converter, RF amplifier, RF equalizer, monitor, etc.) used to realize the unique functions of sound or TV

has a ground terminal, the terminal shall be grounded for measurement.

5.4 Measurement of disturbance voltage at the antenna end of receivers and related equipment with RF input in the frequency range of 30 MHz ~ 2.15 GHz

5.4.1 Overview

When measuring the disturbance voltage at the antenna end of the equipment under test, an auxiliary signal generator is used to feed the RF signal (see 5.2) to the receiver under test or the RF input of the relevant equipment; the frequency is tuned to make the equipment under test in a normal working state.

According to the provisions of GB/T 6113.101, use a measurement receiver with a quasi-peak detector, or as an alternative method, use a measurement receiver with an RMS-average detector for measurement.

Adjust the output level of the auxiliary signal generator to correspond to 75 Ω impedance, so that the signal level at the FM receiver antenna input end is 60 dB μ V, meanwhile the signal level at the TV receiver antenna input end is 70 dB μ V.

For FM receivers, the auxiliary signal shall be an unmodulated carrier.

5.4.2 Measurement of receiver or related equipment with coaxial antenna input connector

Use a coaxial cable and a resistive hybrid network which has a minimum attenuation of 6 dB to connect the antenna end of the equipment under test, the auxiliary signal generator and the interference measuring instrument, as shown in Figure 7.

The impedance seen from the equipment under test to the hybrid network shall be equal to its nominal antenna input impedance.

Tune the equipment under test to receive useful signals.

Tune the interference measuring instrument to the corresponding disturbance frequency; the measured disturbance level shall consider the attenuation value from the antenna end of the equipment under test to the input end of the interference measuring instrument.

Note 1: Measures shall be taken to prevent the RF current flowing from the housing of the equipment under test to the surface of the outer conductor of the

5.5.2 Measurement method

Use a coaxial cable and a matching network (if necessary) to connect the RF output end of the equipment under test with the input end of the interference measuring instrument, as shown in Figure 9. The characteristic impedance of the coaxial cable shall be the same as the nominal output impedance of the equipment under test.

According to the provisions of GB/T 6113.101, use a measurement receiver with a quasi-peak detector, or as an alternative method, use a measurement receiver with an RMS-average detector for measurement.

The equipment under test shall generate an RF modulated carrier; its video modulated signal is a vertical color bar signal (see Figure 1).

The indication value of the interference meter (tuned to the image carrier and its harmonics) or the spectrum analyzer plus the insertion loss value of the matching network is the RF output level.

5.6 Measurement of disturbance power of related equipment

(except video recorders) in the frequency range of 30 MHz ~ 1

GHz

5.6.1 Overview

Generally, when the frequency exceeds 30 MHz, the disturbance energy generated by the device is transmitted to the disturbed receiver through radiation.

Experience has shown that most of the energy is radiated from the power cords and other connections close to the equipment. Therefore, the disturbance power on the power cord of the equipment under test and other connections can be used to define its disturbance level.

This power is approximately equal to the measured value at the position where the absorbed power is the maximum by the suitable absorbing clamp fitted on these wires.

5.6.2 Measurement method

The method is suitable for measuring the disturbance power generated by the terminals of the related equipment; the measurement result is expressed by the effective power; the frequency range is 30 MHz ~ 1 GHz.

For those interconnection wires whose original length is less than half the wavelength of the lowest frequency measured, and the end of the wire is connected to the unit without any additional wires, the moving distance of the absorbing clamp is limited to the length of the original wire.

According to the manufacturer's instructions, only the interconnection wires longer than the absorption clamp are required to be tested.

Note: When starting the measurement, the absorption clamp can be determined at a certain position, then the measuring instrument can be adjusted to find the frequency point with particularly strong disturbance.

5.6.4 Presentation of measurement results

The measurement result is expressed in dBpW. It depends on the maximum value indicated by the interference meter and the calibration curve of the insertion loss of the absorbing clamp.

The disturbance power level shall be the maximum value measured on the power line or other connection at each measurement frequency.

5.7 Measurement of radiation field strength by 3m method in the frequency range of 30 MHz ~ 1 GHz

5.7.1 Overview

The method is suitable for measuring the radiation of FM receivers, television receivers, video recorders, etc. (see Table 5), expressed in terms of electric field strength. This method is used for measurements in outdoor or indoor venues with specialized facilities.

Here, the measurement method can be done in a large room without reflection treatment or in an outdoor field with a non-metallic weather protection cover (for example, a radome or a closed plastic cover, etc.); these fields shall meet the requirements of 5.7.2.

During rain or snow, the outdoor climate protection site cannot be used, unless the site attenuation test is passed, to prove that there is no significant change in the site's RF conditions under such weather conditions.

Note: It is necessary to re-test the site attenuation regularly (appropriate period), to determine the impact of air pollution on the RF characteristics of the outdoor site covered by the plastic cover.

It is also possible to complete the measurement and confirm the measurement

levels of the interference meter (or the absolute value of the difference between the two output levels of the signal generator in decibels, corresponding to a suitable reading level V_r of the interference meter), corresponding to a suitable output level V_g of the signal generator. Record the measured values of the following two situations:

- a) Two coaxial cables are separately connected to the transmitting and receiving antennas;
- b) Two coaxial cables are removed from their antennas and connected together.

At the measured frequency, a_t and a_r are the attenuation expressed in decibels of the balun and matched attenuator at the transmitting and receiving ends, respectively. They are only included in a) test, not included in b) test.

For sites that meet the requirements, the deviation of the measured site attenuation from the theoretical curve as shown in Figure 13 shall not exceed ± 3 dB.

Note 2: On the high-sensitivity range, errors may be caused due to the mismatch of the input of the interference measuring instrument, internal noise, irrelevant signals. Therefore, the radiated power shall be high enough, so that the interference measuring instrument used is within its sensitivity range and the reading error does not exceed ± 1.5 dB.

5.7.3 Arrangement of the equipment under test

The equipment under test is placed on a bench of non-metallic materials; the height from the ground is 0.8 m. The equipment under test shall be able to rotate in the horizontal plane, as shown in Figure 14.

The center of the measuring antenna and the center of the equipment under test shall be in the same vertical plane.

As shown in Figure 14, the power cords shall be placed on the same plane. The long power cords shall be folded back and forth in parallel with a length of 0.3 m ~ 0.4 m, fixed in a horizontal bundle at one end of the power plug.

In order not to affect the measurement accuracy, a filter that meets the requirements shall be connected to the power supply.

Appropriate test signals are provided by a signal generator placed on the floor below the receiver under test; the vertical cable is as short as possible to connect to the antenna end of the receiver under test.

The interference measuring instrument shall be placed at a suitable height.

5.7.5 Measurement procedure

Starting from the front panel of the receiver under test facing the receiving antenna, adjust the receiving antenna to a horizontally polarized position. The height of the antenna changes within 1 m ~ 4 m, until the measuring instrument obtains the maximum reading.

Then, rotate the equipment under test horizontally around its center, until the measuring instrument obtains the maximum reading. Change the height of the receiving antenna again within 1 m ~ 4 m; record the final measured maximum value.

Turn the receiving antenna to the vertical polarization position and repeat the above measurement steps, but the height of the antenna changes from 2 m to 4 m.

The highest value of field strength at each frequency point is measured by the above measurement steps; which is defined as the radiation value of the receiver under test at that point.

If the ambient signal field strength is high at the location where the receiving antenna is located at certain frequencies, use one of the following methods to determine whether the equipment under test meets the requirements.

- a) When the frequency band of the high-level environmental signal is narrow, the disturbance value can be interpolated according to the adjacent values; the interpolated value shall be on the continuous function curve of the disturbance value of the adjacent environmental noise;
- b) In other cases, follow the method described in Appendix C of GB 4824-2004.

5.8 Radiation measurement in the frequency range of 1 GHz ~ 18 GHz

5.8.1 Measuring device

The equipment under test is placed on a non-metal turntable, 1 m above the ground.

For the equipment under test that needs input signal, use a suitable signal generator to feed the input signal to the device through a "well-shielded" cable.

placed in the same position as the actual measurement; the two antennas shall have the same polarization and be orthogonal to the imaginary line between them. The test shall be performed on both horizontal and vertical polarization planes.

When the center of the transmitting antenna moves 0 cm ~ 15 cm in any direction from its original position, if the change in the indication value of the measuring instrument does not exceed ± 1.5 dB, it is considered that the frequency measurement site is in compliance with the requirements.

Note: Between 1 GHz and 4 GHz, the transmitting antenna shall use a half-wave dipole or horn antenna; when above 4 GHz, it shall use a horn antenna. When using a horn antenna, the gain higher than the half-wave dipole shall be considered.

5.8.3 Measurement procedure

Use an antenna with horizontal polarization and vertical polarization and a rotatable turntable on which the equipment under test is placed. Use the substitution method for measurement. Record the maximum radiation level measured at each frequency as a reference indication value.

Then, replace the equipment under test with a transmitting antenna (half-wave dipole or horn antenna) with the same characteristics as the receiving antenna, so that its center is at the original center of the equipment under test; the transmitting antenna is connected to the standard signal through a coaxial cable generator.

At each measuring frequency, adjust the output level of the standard signal generator, to make the measuring instrument get the reference indication value. At this time, the effective output power level of the standard signal generator plus the antenna gain of the relative half-wave dipole is used as the radiation power level of the equipment under test at the corresponding frequency.

It shall be determined that when the equipment under test is shut down, the background noise is at least 10 dB lower than the corresponding limit, otherwise it will affect the reading data.

When using a horn antenna instead of a dipole antenna, the measurement result shall be expressed as the effective radiated power (ERP) of the relative half-wave dipole.

5.8.4 Presentation of results

Use the replaced effective power to indicate the radiation level of the equipment under test, expressed in dBpW.

Appendix A

(Normative)

Digital signal broadcasting receiver

A.1 Introduction

This Appendix gives additional information concerning measurement methods for digital signal broadcasting receivers.

The receiver may have telecommunications or data connection ports; meanwhile it may have storage and return channel devices.

For the measurement of non-broadcast function ports, such as telecommunications ports or local area network (LAN) ports, measurement shall be made with reference to corresponding standards, such as GB 9254.

A.2 Normative references

See Chapter 2 of this standard.

A.3 Terms and definitions

The following terms and definitions apply to this Appendix.

A.3.1

Digital sound receiver

Equipment used to receive digital sound broadcasting, related data and similar services transmitted by terrestrial, cable and satellite.

A.3.2

Digital television receivers

Equipment used to receive digital television broadcasting, data and similar services transmitted by terrestrial, cable and satellite. The receiver can have a display (function); a receiver without a display (function) is usually called a "set-top box".

A.3.3

Digital sound signals

A radio frequency signal modulated with a digital data stream containing

When measuring with a spectrum analyzer or a calibrated receiver, the signal power within the nominal bandwidth shall be integrated.

A.5.3.2 Digital sound signal

The digital sound signal level is 50 dB μ V.

The reference level of all sound channels is -6 dB at 1 kHz full scale.

A.5.3.3 Digital TV signal

During the test, the digital TV signal level is:

- Terrestrial system: VHF 50 dB μ V, UHF 54 dB μ V;
- Cable system: 60 dB μ V;
- Satellite system: 60 dB μ V.

The standard signal is composed of vertical color bar graphics with small motion graphics that meet the requirements of GB/T 3174; the video bit rate is 6 Mbit/s.

The reference level of all sound channels is -6 dB at 1 kHz full scale.

For further instructions, see Appendix B.

Note: There are currently many forms of digital broadcasting (such as CMMB). This standard does not clearly specify its useful signal. During the test, the product standard or the nominal signal specified by the manufacturer of the equipment under test is used. The manufacturer shall specify the input signal used for the test in its technical report.

A.5.4 Digital and analog signal receivers

All measurements shall be performed in digital mode. When separate tuners are used to receive digital and analog signals, the local frequency and its harmonic emission measurements in the analog receiving mode shall be added.

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