



# SLOVENSKI STANDARD

## SIST EN 50083-2:1999

01-april-1999

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### Cabled distribution systems for television, sound and interactive multimedia signals -- Part 2: Electromagnetic compatibility for equipment

Cable networks for television signals, sound signals and interactive services -- Part 2: Electromagnetic compatibility for equipment

Kabelnetze für Fernsehsignale, Tonsignale und interaktive Dienste -- Teil 2: Elektromagnetische Verträglichkeit von Geräten

Réseaux de distribution par câbles pour signaux de télévision, signaux de radiodiffusion sonore et services interactifs -- Partie 2: Compatibilité électromagnétique pour les matériels

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Ta slovenski standard je istoveten z: **EN 50083-2:1995**

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#### **ICS:**

33.060.40	Kabelski razdelilni sistemi	Cabled distribution systems
33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general

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**en**

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EUROPEAN STANDARD

**EN 50083-2**

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 1995

ICS 29.020; 33.060.40

Descriptors: Telecommunications, television broadcasting, sound broadcasting, communication cables, electronic components, television systems, electromagnetic compatibility

English version

## Cabled distribution systems for television and sound signals Part 2: Electromagnetic compatibility for equipment

Systèmes de distribution par câbles  
destinés aux signaux de radiodiffusion  
sonore et de télévision  
Partie 2: Compatibilité  
électromagnétique pour les matériels

Kabelverteilssysteme für Fernseh- und  
Tonsignale  
Teil 2: Elektromagnetische  
Verträglichkeit von Bauteilen

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# CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

## FOREWORD

This European Standard was prepared by CENELEC Technical Committee TC 109, "Cabled distribution systems for television and sound signals".

After having failed in the UAP, started in October 1992, a reworked draft was submitted to the formal vote and was approved by CENELEC as EN 50083-2 on 1995-07-04.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-09-01

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## 1 Scope

This standard

- applies to the radiation characteristics and immunity to electromagnetic disturbances of active and passive equipment for the reception, processing and distribution of television and sound signals, as dealt with in the following parts of EN 50083 "Cabled distribution systems for television and sound signals" and with the extent from the headend respectively from the interface point to a signal source up to the system outlet or the terminal input, where no system outlet exists:

- EN 50083-3: "Active coaxial wideband distribution equipment"
- EN 50083-4: "Passive coaxial wideband distribution equipment"
- EN 50083-5: "Headend equipment"
- EN 50083-6: "Optical equipment"

- covers the following frequency ranges:

Disturbance voltage injected into the mains	9 kHz to 30 MHz
Radiation from active equipment	(5 MHz) <sup>1)</sup> 30 MHz to 25 GHz
Immunity of active equipment	150 kHz to 25 GHz
Screening effectiveness of passive equipment	(5 MHz) <sup>1)</sup> 30 MHz to 1,75 GHz (25GHz) <sup>1)</sup>

- specifies requirements for maximum allowed radiation, minimum immunity and minimum screening effectiveness;

- describes test methods for conformance testing.

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Coaxial cables for cabled distribution systems do not fall under the scope of this standard. Reference is made to the European Standard series EN 50117 "Coaxial cables used in cabled distribution networks".

The standardization in the field of „Electromagnetic compatibility“ for any user terminals (i.e. tuners, receivers, decoders, multimedia terminals etc.) is excluded from this standard. For this kind of equipment the European Standards EN 55013 and EN 55020:1994 apply.

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<sup>1)</sup> For frequency limits given in brackets the values and/or methods of measurements in this standard are under consideration

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 50083		Cabled distribution systems for television and sound signals
EN 50083-3	1994	Part 3: Active coaxial wideband distribution equipment
EN 50083-4	1994	Part 4: Passive coaxial wideband distribution equipment
EN 50083-5	1994	Part 5: Headend equipment
EN 50083-6	1994	Part 6: Optical equipment
EN 50083-8 (in preparation)		Part 8: Electromagnetic compatibility for installations
EN 55013	1990	Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment (CISPR 13:1975 + A1:1983, modified)
EN 55020	1994	Electromagnetic immunity of broadcast receivers and associated equipment
EN 61079-1	1993	Methods of measurement on receivers for satellite broadcast transmissions in the 12 GHz band - Part 1: Radio- frequency measurements on outdoor units (IEC 1079-1:1992)
HD 481.3 S1	1987	Electromagnetic compatibility for industrial process measurement and control equipment - Part 3: Radiated electromagnetic field requirements (IEC 801-3:1984 <sup>1)</sup> )
IEC 50(161)	1990	International Electrotechnical Vocabulary (IEV) Chapter 161: Electromagnetic compatibility
IEC 728-1 + A1	1986 1992	Cabled distribution systems - Part 1: Systems primarily intended for sound and television signals operating between 30 MHz and 1 GHz
CISPR 16-1	1993	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1: Radio disturbance and immunity measuring apparatus

1) IEC 801-3:1984 has been replaced by IEC 1000-4-3:1995, Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency, electromagnetic field immunity test, which has not yet been endorsed by CENELEC.

### 3 Terms and definitions

For the purposes of this standard, the definitions contained in IEC 50(161) "Electromagnetic compatibility" apply. The most important definitions of IEC 50(161) are repeated hereafter with the IEC-numbering given in brackets. In addition some more specific definitions, used in this standard, are listed.

#### 3.1 radiation (electromagnetic) (161-01-10)

1. The phenomenon by which energy in the form of electromagnetic waves emanates from a source into space.
2. Energy transferred through space in the form of electromagnetic waves.

NOTE: By extension, the term "electromagnetic radiation" sometimes also covers induction phenomena.

#### 3.2 immunity (to a disturbance) (161-01-20)

The ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance.

#### 3.3 internal immunity (161-03-06)

Ability of a device, equipment or system to perform without degradation in the presence of electromagnetic disturbances appearing at its normal input terminals or antenna.

#### 3.4 external immunity (161-03-07)

Ability of a device, equipment or system to perform without degradation in the presence of electromagnetic disturbances entering other than via its normal input terminals or antenna.

#### 3.5 mains immunity (161-03-03)

Immunity to mains-borne disturbance.

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#### 3.6 immunity level (161-03-14)

The maximum level of a given electromagnetic disturbance incident on a particular device, equipment or system for which it remains capable of operating at a required level of performance.

#### 3.7 immunity limit (161-03-15)

The specified minimum immunity level.

#### 3.8 immunity margin (161-03-16)

The difference between the immunity limit of a device, equipment or system and the electromagnetic compatibility level.

#### 3.9 electromagnetic disturbance (161-01-05)

Any electromagnetic phenomenon which may degrade the performance of a device, equipment or system, or adversely affect living or inert matter.

NOTE: An electromagnetic disturbance may be an electromagnetic noise, an unwanted signal or a change in the propagation medium itself.

#### 3.10 screening effectiveness

The ability of an equipment or system to attenuate the influence of electromagnetic fields from outside the equipment or system or to suppress the radiation of electromagnetic fields from inside the equipment or system.



**3.11 well-matched**

The matching condition when the return loss of the equipment complies with the requirements of table 1 of EN 50083-3.

**3.12 well-screened**

A test set-up can be considered "well-screened" if its radiation level, when terminated with a matched load, is at least 20 dB below the expected radiation level of the equipment under test, the test set-up and the equipment being supplied with the same input signal level.

**3.13 electromagnetic interference (EMI)**

Degradation of the performance of an equipment, transmission channel or system caused by an electromagnetic disturbance.

**3.14 operating frequency range**

The passband for the wanted signals for which the equipment has been designed.

**3.15 wanted signal**

During measurements, the wanted signal shall be simulated using a sinewave test signal having the frequency within the operating frequency range and the appropriate level.

**3.16 unwanted signal**

Signals inside and outside of the operating frequency range that are not considered as wanted signals.

When measuring immunity (to unwanted signals), the unwanted signal shall be simulated using two sine-wave test signals.

**3.17 first satellite intermediate frequency range**

The output frequency range of the outdoor unit which is comprised of the frequency band between 950 MHz and at least 1750 MHz or parts thereof.

**3.18 carrier-to-interference ratio**

The minimum level difference measured at the output of an active equipment between the wanted signal and

- intermodulation products of the wanted signal and/or unwanted signals generated due to non-linearities;
- harmonics generated by an unwanted signal;
- unwanted signals that have penetrated into the operating frequency range;
- unwanted signals that have been converted to the frequency range to be protected (operating frequency range).

## 4 Methods of measurements

### General operating conditions

Measurements shall be, unless otherwise specified, carried out with the rated performance of the equipment under test and at a standard room temperature. If required, additional measurements shall be carried out at the highest and lowest rated ambient temperatures.

The equipment shall be tested including all those sub-assemblies with which it would normally be used.

### 4.1 Disturbance voltages from equipment

#### 4.1.1 Disturbance voltages from equipment in the frequency range from 9 kHz to 30 MHz

##### Introduction

The method described is applicable to the measurement of disturbance voltages from equipment in the frequency range of 9 kHz to 30 MHz on the mains line.

The measured voltage includes narrowband interference and broadband interference such as that produced by semiconductor rectifiers.

##### 4.1.1.1 General measurement requirements

Disturbance voltage measurements should be carried out in a screened room according to the method described in EN 55013, with the exception that the wanted signal is a sinusoidal carrier. At all frequencies in the range of interest the disturbance voltage injected into the mains by the equipment under test shall be measured by means of a specified artificial mains network with a measuring receiver having a quasi-peak detector for broadband measurements and an average detector for narrowband measurements.

##### 4.1.1.2 Measurement of mains terminal disturbance voltages

Equipment required: According to EN 55013

Equipment layout and connections: According to EN 55013

##### Operating conditions

The equipment under test shall be operated in accordance with the manufacturers recommendations and tested under conditions which maximise the disturbance voltages.

All RF-ports shall be terminated with non-radiating loads of their nominal impedance. The supply voltage shall be set to a value within the specified rating.

Measuring procedure: According to EN 55013

Presentation of results: According to EN 55013

The results shall be expressed in terms of dB( $\mu$ V) and shall comply with the limits given in table 1.

#### 4.1.2 Disturbance voltages from equipment at the AC mains frequency and its harmonics

Under consideration.

#### 4.1.3 Measurement of input terminal disturbance voltage

##### Method of measurement

The measurement shall be performed according to the method described in EN 55013 where "antenna terminal" should be intended as "input terminal" of the equipment (e.g. channel converter, DBS tuner, ...) under test.

##### Presentation of the results

The disturbance voltage level of the equipment under test at the local oscillator frequency and its harmonics shall be expressed in terms of input terminal disturbance voltage in dB( $\mu$ V) and shall comply with the relevant limits given in table 2.

#### 4.2 Radiation from active equipment

##### Introduction

The methods described are applicable to the measurement of radiation from active equipment at the signal frequencies, at the local oscillator frequencies and their harmonics and at other relevant frequencies.

In the frequency range 5 MHz to 30 MHz the method of measurement is under consideration.

In the frequency range 30 MHz to 1 GHz the "absorbing clamp" method of EN 55013 is used.

In the frequency range 1 GHz to 25 GHz the "substitution" method is used.

##### 4.2.1 General measurement requirements

The measurement cables, coupling devices and terminations shall all be well-matched and well-screened. If these conditions cannot be achieved, appropriate corrections shall be made for the results. Test equipment shall be 75  $\Omega$  impedance or provided with appropriate matching pads.

An indoor, or outdoor, site may be used. When indoors, a room of sufficient size must be chosen, so that any reflecting and absorbing objects may be so positioned or sufficiently removed from the measuring set-up that they do not influence the results.

Measurements shall be made at the following ports:

- all RF-ports;
- the mains lead (if any);
- all single or multiple wire connections (if any).

Measurements shall be made at the following frequencies:

#### Single channel equipment

- at the vision and sound carrier frequencies;
- at any other frequency considered necessary or desirable.

#### Wideband equipment

- at the highest and lowest vision carrier frequencies in each used band and at a selection of intervening frequencies chosen to give a realistic representation of the radiation pattern throughout the operating frequency range.

#### Frequency converters

Output ports and mains lead (if any):

- at the input and output vision and sound carrier frequencies;
- at all local oscillator fundamental frequencies;
- at any local oscillator harmonic, or other frequencies at which interference from the equipment under test might be troublesome.

Input ports:

- at all local oscillator fundamental frequencies;
- at selected local oscillator harmonics, or other frequencies (as above).

### 4.2.2 Methods of measurements

#### 4.2.2.1 Measurement of radiation in the frequency range 5 MHz to 30 MHz

Under consideration

#### 4.2.2.2 Measurement of radiation in the frequency range 30 MHz to 1 GHz using the "absorbing clamp" method

The measurement of radiation using the "absorbing clamp" method is based on the method described in IEC 728-1:1986 for the frequency range 30 MHz to 300 MHz but for use in the extended frequency range 30 MHz to 1 GHz.

#### Equipment required

The equipment required for the "absorbing clamp" method is listed below.

- A signal generator covering the frequency range of interest and of sufficient output power.
- An absorbing clamp conforming to CISPR 16-1.
- A measuring set of appropriate impedance covering the frequency range of interest.

- A measurement cable of length at least  $\lambda/2$  (at the lowest frequency of interest) plus 0,6 m and of appropriate impedance.
- Screened terminating loads of appropriate impedance and design.
- All necessary coupling devices of an appropriate design.
- A mains filter able to remove extraneous noise from the mains supply in the frequency range of interest.
- Absorbing devices such as ferrite rings sufficient to suppress signals from the equipment under test on its input and mains leads.
- A suitable coaxial changeover switch.

#### Equipment layout and connections

The measurement set-up and equipment layout for the "absorbing clamp" method (30 MHz to 1 GHz) is shown in figures 1, 2 and 3.

The equipment under test shall be placed at a height of approximately 1 m above the ground on a non-metallic support on which the absorbing clamp can be accommodated and moved.

The output of the equipment under test shall be connected to a measurement cable of the same characteristic impedance and the cable shall be terminated with the nominal impedance of the output via the coaxial switch.

Well-screened cables shall be connected to the terminals of the equipment under test as specified by the manufacturer. When a direct connection cannot be made due to the dimension of the well-screened cable, an adaptor shall be used.

The unused outputs, if any, of the equipment under test shall be terminated with their nominal impedance by means of non-radiating loads directly connected without any cabling.

The mains lead, if any, shall be placed vertically and connected to the mains outlet through a suitable mains filter. Any excess length of the mains lead shall be coiled up neatly at the filter end.

The mains lead and the signal generator coaxial cable shall be provided with suitable absorbing devices (e.g. ferrite rings), placed close to the equipment under test, to avoid measurement errors.

#### Operating conditions

The equipment under test shall be operated in accordance with the manufacturer's recommendations.

The equipment under test shall be tested under conditions which maximise the radiation. The maximum rated output level shall be used for the test and stated on the equipment or accompanying data sheet by the manufacturer.

The supply voltage shall be set to a value within the specified rating.

Adjustable controls accessible to the user or installer shall be set so as to maximise radiation.