SLOVENSKI STANDARD
SIST ENV 50185-1:1999

01-april-1999

Infra-red free air application -- Part 1: General

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Nichtleitungsgebundene Infrarot-Anwendung -- Teil 1: Allgemeines

Application des infrarouges en mode non guidé -- Partie 1: Généralités

Ta slovenski standard je istoveten z: **ENV 50185-1:1995**

ICS:

33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general

SIST ENV 50185-1:1999 **en**

EUROPEAN PRESTANDARD

PRÉNORME EUROPÉENNE

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Descriptors: Transmissions, infra-red, classification, general

English version

Infra-red free air application
Part 1: General

This European Prestandard (ENV) was approved by CENELEC on 1994-09-01 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CENELEC will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard (EN).

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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 Prestandard has been prepared by CENELEC BTTF 71-3, Infrared free air applications.

The text of the draft was voted and approved by CENELEC as ENV 50185-1 on 1994-09-01.

The following date was fixed:

- latest date of announcement of the ENV at national level (doa) 1995-04-15

Contents

1 Scope

Increasing parallel application of different Infra-red (IR) systems can cause mutual interferences. To identify and make transparent these problems, a classification of IR devices into groups and classes is proposed.

The purpose of this European prestandard is to avoid or at least to minimize mutual interferences and to enable coexistence of different IR products. It is intended to mark each IR product with its characteristic parameters according to the classification criteria.

It is not the object of this prestandard to describe the consequences of interferences between IR systems as well as radiation safety aspects of optical radiation.

Due to the physical character of optical emission the possibility of local limitation is a special feature of IR radiation.

In this prestandard the wavelength range from 700 nm to 1600 nm will be considered. Included are all systems based on free air application (see 5.2, Product groups), which send intentionally or unintentionally IR radiation in this range. Excluded is each kind of fiber optics.

In this context "free air" means freely radiated IR in indoor or outdoor applications.

If the IR systems are used for information transmission, this prestandard is only to be seen in connection with the Physical Layer of the ISO-OSI Reference Model (EN 27 498).

2 Normative References

This European Prestandard 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 Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 27 498 Information processing; Open system interconnection; basic reference model; identical with ISO 7498-1984 + A1:1987.

IEC 50 (60) International Electrotechnical Vocabulary; Radio Communications

IEC 50 (845) International Lighting Vocabulary

3 Definitions

For the purposes of this prestandard the following definitions apply:

3.1 bandwidth: Of a receiver, amplifier or network The extent of a continuous range of frequencies over which the gain does not differ from its maximum value by more than a specified amount (electrical and optical).

NOTE: Extended definition of [IEC 50(60): 60-12-025]

3.2 fluorescent lamp: A discharge lamp of the low pressure mercury type in which most of the light is emitted by one or several layers of phosphor excited by the ultraviolet radiation from the discharge.

[IEC 50(845): 845-07-26]

3.3 harmonic: Integral multiple of a basic frequency.

3.4 interference: Disturbance experienced in the reception of a wanted signal, caused by an unwanted signal or noise.

[IEC 50(60): 60-08-025]

3.5 infra-red radiation: Optical radiation for which the wavelengths are longer than those for visible radiation.

NOTE: For infra-red radiation, the range between 780 nm and 1 mm is commonly subdivided into:
IR-A 780 nm to 1400 nm
IR-B 1,4 µm to 3 µm
IR-C 3 µm to 1 mm

[IEC 50(845): 845-01-04]

3.6 infra-red system: System which uses IR radiation in free air application consisting of an IR emitter and an IR receiver.

3.7 modulation frequency: Electrical signal frequency which modulates the IR radiation.

3.8 peak intensity: Maximum intensity I_p [mW/(sr x nm)] of the optical radiation in the direction of maximum emission arround the rated wavelength λ_p.

3.9 radiant intensity: Quotient of the radiant flux $d\Phi_e$ leaving the source and propagated in the element of solid angle $d\Omega$ containing the given direction, by the element of solid angle.

[IEC 50(845): 845-01-30]

I_O (mW/sr) radiant intensity averaged in time of the optical radiation in the direction of maximum emission

3.10 radiation characteristic: Defined by two angles α_1 and α_2 for describing the focussing of IR emission. References are the points of half optical radiant intensity. α_1 is the angle of maximum divergence, α_2 is the angle rectangular to the plane expanded by α_1, where $\alpha_1 > \alpha_2$.

3.11 steradian: SI unit of solid angle: Solid angle that, having its vertex at the centre of a sphere, cuts off an area of the surface of the sphere equal to that of a square with sides of length equal to the radius of the sphere.

[IEC 50(845): 845-01-20]

3.12 subharmonic: Integral divisor of a basic frequency

3.13 wavelength: Distance in the direction of propagation of a periodic wave between two successive points at which the phase is the same.

[IEC 50(845): 845-01-14]

4 Symbols

B_f, B_λ	Bandwith
f	modulation frequency in kHz
fp	frequency at the electrical peak radiant intensity Ipf in kHz
f_l	lower band limiting frequency in kHz
f_u	upper band limiting frequency in kHz
I_o	time averaged total optical radiant intensity in mW/sr
I_p	total optical peak intensity in mW/sr
$I_{p\lambda}$	spectral optical peak intensity in mW/(sr nm)
$I_{e\lambda}$	spectral optical radiant intensity in mW/(sr nm)
I_{ef}	spectral electrical radiant intensity mW/(sr Hz)
I_{pf}	spectral electrical peak intensity mW/(sr Hz)
sr	Steradian
λ	wavelength in nm
λ_p	wavelength at the optical peak intensity $I_{p\lambda}$ in nm
λ_l	lower band limiting wavelength in nm
λ_u	upper band limiting wavelength in nm

5 Classification

The classification considers three main aspects for system description:

- physical parameters;
- product groups;
- user areas.

In a first approach the IR emitters are defined by the physical parameters. In the future the same IR system definitions should include selective IR receivers.

5.1 Parameters

There are 5 criteria on which the physical operating parameters are based on nominal operating conditions given by the manufacturer (see table 1).

5.1.1 Ranges of wavelength (criterion 1)

The lower (λ_l) and the upper (λ_u) optical wavelength describe the optical range of function of an IR radiator.

Both the lower and the upper optical wavelength of an IR radiator are defined by the reduction of the peak intensity I_p by 3 dB, taking into account the effects of temperature and component deviations (see figure 1).

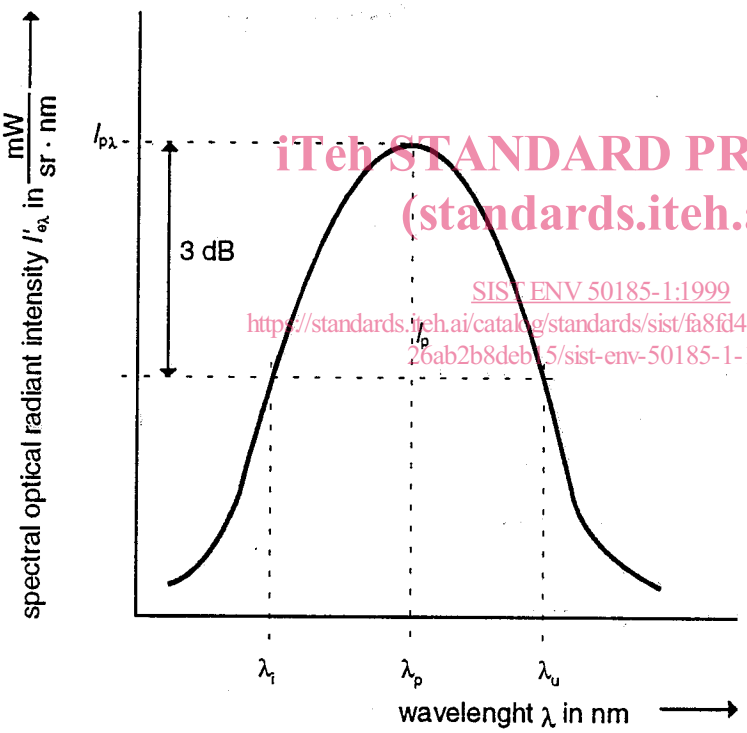

Figure 1: Spectral emission and definition of optical bandwidth

5.1.2 Ranges of frequency (criterion 2)

The lower (f_l) and upper (f_u) frequencies describe the electrical range of function of an IR radiator.

The modulating frequencies of the optical radiation are defined by -10 dB of the maximum intensity I_{pf}.

Harmonics are to be considered with respect to temperature factors and component deviations, too. For the classification criterion 2 it is only important to know the upper and lower band limiting frequency; the possible influence of modulation hasn`t been regarded in this definition.

The upper and lower band limiting frequency is indicated in the following form:

Example: 500 kHz or 5 x 10^2 kHz => 5E2 kHz

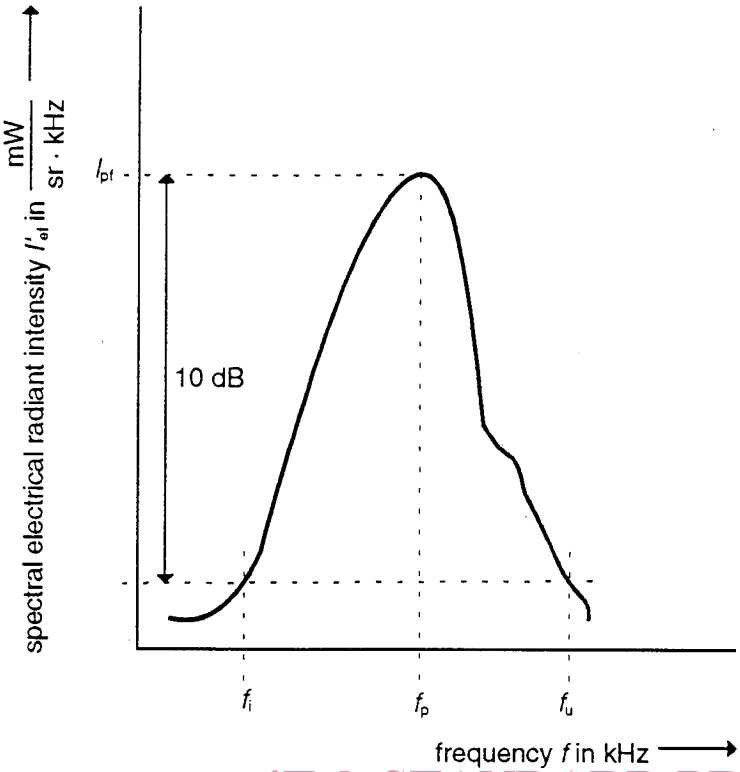

Figure 2: Spectral emission and definition of electrical bandwidth

5.1.3 Radiant intensity (criterion 3)

The intensity of IR radiators is characterized by the radiant intensity I_e (mW/sr) and the peak intensity I_{pf} (mW/sr nm).

5.1.4 Angle of radiation (criterion 4)

The radiant intensity of IR radiators is defined by the angle of half intensity of beam divergence. That means the angle between the directions which are specified by points of half radiant intensity. Two angles lying in two planes rectangular to each other define the radiation characteristics at the IR transmitter.

5.1.5 Duration of IR radiation (criterion 5)

The time characteristics of IR radiation is described by the duration of IR radiation. If an IR transmission is the consequence of a spontaneous operation, the result can be called a short duration radiation (repetition in case of error handling included). Long duration operation is given if the IR system is working in a continuous mode (i.e. switching on in the morning and switching off in the evening).

5.1.6 Identification example

In order to illustrate the application of the parameters introduced in 5.1.1 to 5.1.5, an example for the characterization of Home and Building Electronic System having the following characteristics is given.

Brightness control with
λ = 950 nm
f_u = 60 kHz
f_l = 38 kHz
I_p = 45 mW/sr
I_o = 20 mW/sr
$\alpha_1 = 60^0$
$\alpha_2 = 30^0$
Spontaneous activation of a push button

Characterization according to the classification of table 1:

III - (3E1- 6E1) - (45-20) - (60-30) - S

Table 1: Classification criteria

Criterion 1 (optical level) Ranges of wavelength (nm)	class I 700 to 800	class II 800 to 900	class III 900 to 1000	class IV 1000 to 1100	class V 1100 to 1200	class VI 1200 to 1300	class VII 1300 to 1400	class VIII 1400 to 1500	class IX 1500 to 1600
Criterion 2 (electrical level)	f_l lower frequency [kHz]								
	f_u upper frequency [kHz]								
Criterion 3 (Intensity level) Radiant intensity	I_p peak radiant intensity [mW/sr]								
	I_0 radiant intensity [mW/sr]								
Criterion 4 (radiation characteristic) Angle of radiation (degree)	α_1 maximum divergence								
	α_2 rectangular to maximum divergence								
Criterion 5 (time level) Duration of IR radiation	class S short				class L long				