

**Majapidamis- ja muude taoliste seadmete
elektromagnetväljade mõõtmine nende inimesele
toimiva mõju arvestamiseks**

Measurement methods for electromagnetic fields of
household appliances and similar apparatus with
regard to human exposure

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 62233:2008 sisaldab Euroopa standardi EN 62233:2008 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 28.04.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on .

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 62233:2008 consists of the English text of the European standard EN 62233:2008.

This standard is ratified with the order of Estonian Centre for Standardisation dated 28.04.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text .

The standard is available from Estonian standardisation organisation.

ICS 97.030

Võtmesõnad: elektriseadmed, kodumasinad

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Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:
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**Measurement methods for electromagnetic fields of household appliances
and similar apparatus with regard to human exposure**
(IEC 62233:2005, modified)

Méthodes de mesures des champs
électromagnétiques des appareils
électrodomestiques et similaires
en relation avec l'exposition humaine
(CEI 62233:2005, modifiée)

Verfahren zur Messung
der elektromagnetischen Felder
von Haushaltgeräten und ähnlichen
Elektrogeräten im Hinblick
auf die Sicherheit von Personen
in elektromagnetischen Feldern
(IEC 62233:2005, modifiziert)

This European Standard was approved by CENELEC on 2007-12-01. 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.

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

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

Foreword

The text of the International Standard IEC 62233:2005, prepared by IEC TC 106, Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure, together with common modifications prepared by a Joint Editing Group of the Technical Committee CENELEC TC 61, Safety of household and similar electrical appliances, and CENELEC TC 106X, Electromagnetic fields in the human environment, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 62233 on 2007-12-01.

This European Standard supersedes EN 50366:2003 + A1:2006, to which it is technically equivalent.

The following dates are applicable:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2008-12-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2012-12-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62233:2005 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS

Contents

p Delete “and limit sets” from the title of Clause 4.

p Add:

Annex ZA (normative) Normative references to international publications with their corresponding European publications

1 Scope

Add the following note:

NOTE The methods are not suitable for comparing the fields of different appliances.

3 Definitions

p **3.2.1** Delete “(basic limitations)” in the term.

Add:

3.2.Z1

operator distance

distance between the surface of the appliance and the closest point of the head or torso of the operator

4 Choice of test method and limit sets

p Replace the title by:

4 Choice of test method

p Delete the first and third paragraphs.

p In the fifth paragraph, replace “alternative test methods” by “simplified test methods”.

5 Measuring methods

5.5.1 General

p Delete the second sentence of the first paragraph.

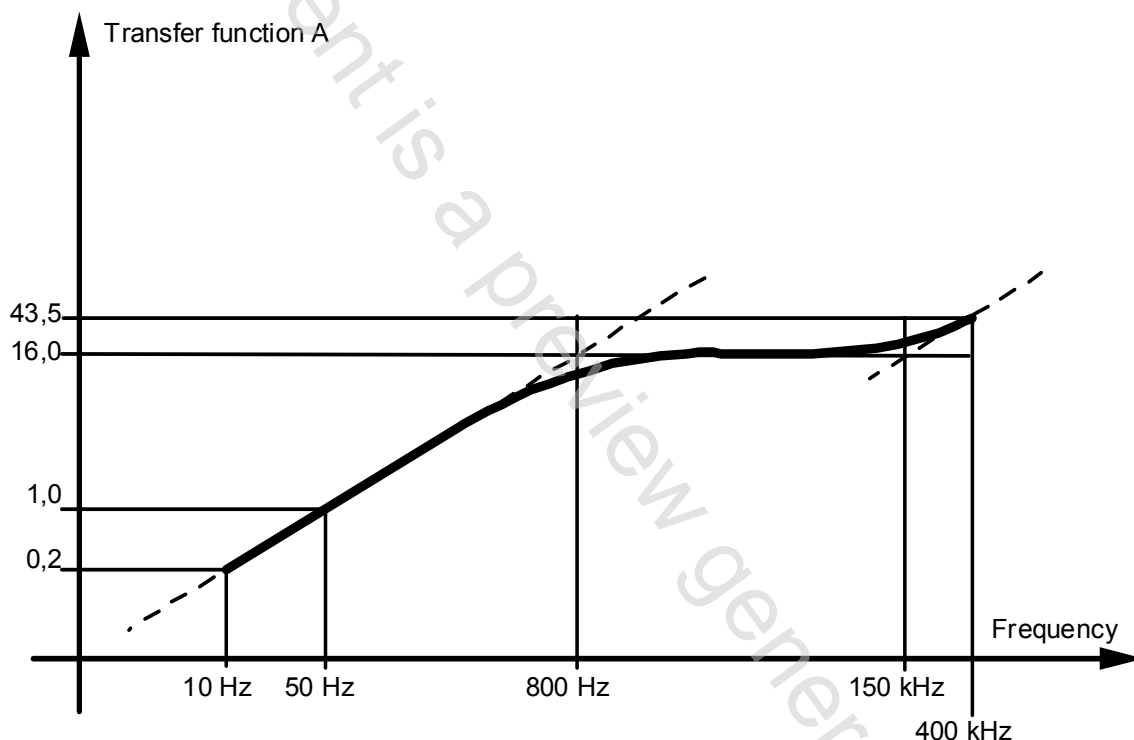
5.5.2 Time domain evaluation

p Replace the entire subclause by:

This is the reference method and is used in case of doubt.

Independent of the type of the signal, a time domain measurement of the value of the magnetic flux density can be carried out. For fields with several frequency components, the dependency on frequency of the reference levels is taken into account by implementing a transfer function A which is inverse of the reference level expressed as a function of the frequency.

The transfer function is to be established using a first order filter and shall have the characteristics shown in Figure Z1.



NOTE Logarithmic scales are used for both axes.

Figure Z1 - Transfer function

The following sequence is used for the measurements:

- perform a separate measurement of each coil signal;
- apply a weighting to each signal using the transfer function;
- square the weighted signals;
- add the squared signals;
- average the sum;
- obtain the square root of the average.

The result is the weighted r.m.s. value of the magnetic flux density.

This procedure is shown schematically in Figure Z2.

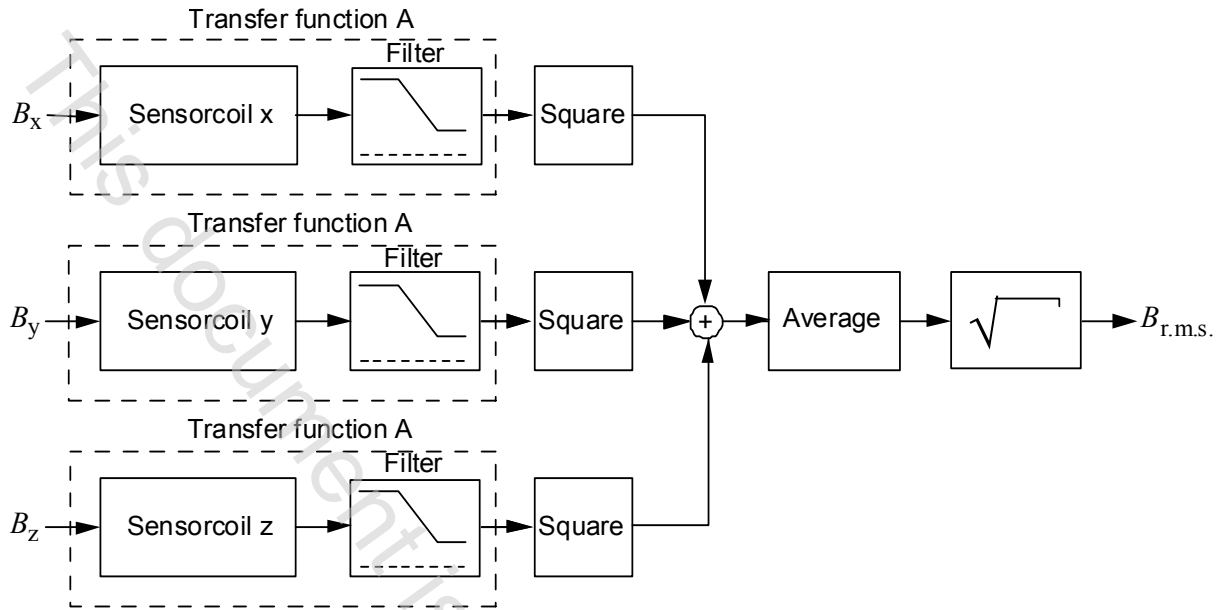


Figure Z2 - Schematic diagram of the reference method

NOTE Different ways that the transfer function can be applied to a time domain signal include: analog filter in an electronic circuit, pre-programmed DSP chip, a signal analyser, or a digital computer calculation with a spreadsheet package or a custom-written program.

The actual measured value shall be compared directly with the reference level B_{RL} of the flux density at 50 Hz. With appliances with highly localized fields, this has to be performed after taking the coupling factor $a_c(r_1)$ given in Annex C into account. The final weighted result, W , can be derived as follows:

$$W_n = \frac{B_{r.m.s.}}{B_{RL}}$$

or applying the coupling factor $a_c(r_1)$

$$W_{nc} = a_c(r_1) \cdot W_n$$

where

W_n weighted result for one measurement;

$B_{r.m.s.}$ r.m.s. value of the magnetic flux density;

B_{RL} reference level of the magnetic flux density at f_{C0} ;

$a_c(r_1)$ coupling factor according to Annex C or Table D.3.

W_{nc} weighted result for one measurement taking the coupling of the inhomogeneous field into account by applying $a_c(r_1)$.

The determined weighted result W shall not exceed the value 1.

5.5.3 Line spectrum evaluation

- p Delete the paragraph starting with “For drawing a comparison...” just before the last note.

5.5.4 Alternative test methods

- p Replace the entire subclause by:

5.5.4 Simplified test methods

Appliances that are constructed so that they can only produce magnetic fields at mains frequency and its harmonics need only be tested in the frequency range below 2 kHz.

Appliances are considered to meet the requirements of this standard when all the following conditions are fulfilled:

- the currents, including the harmonic currents, generating the magnetic fields are known;
- all harmonic currents with amplitudes higher than 10 % of the amplitude of the mains frequency decrease continuously over the frequency range;
- the magnetic flux density measured at mains frequency is less than 50 % of the reference level specified for the mains frequency;
- the magnetic flux density measured during a broadband measurement over the frequency range, with the mains frequency suppressed, is less than 15 % of the reference level specified for the mains frequency.

NOTE An active notch filter is a suitable means for suppressing the mains frequency. If the conditions are not fulfilled another measurement according to the reference method is recommended.

Appliances that are constructed so that they only produce very weak magnetic fields, when the mains frequency is dominating, are considered to meet the requirements of this standard when all the following conditions are fulfilled:

- the currents, including the harmonic currents, generating the magnetic fields are known;
- all harmonic currents with amplitudes higher than 10 % of the amplitude of the mains frequency decrease continuously over the frequency range;
- the magnetic flux density measured over the whole frequency range is less than 30 % of the reference level specified for the mains frequency.

5.6 Measurement uncertainty

- p Delete NOTE 2.

5.7 Test report

- p Delete the bullet 'applied limit set'.

Figures

- p In Figure 1 replace "5.5.4 Alternative test methods" by "5.5.4 Simplified test methods".

Annex A, Test conditions for the measurement of magnetic flux density

A.1 General

- p Delete the second paragraph and the NOTE.

A.1.1 Operating condition

- p Replace the title by:

A.1.1 Operating conditions, if not specified in Table A.1

- p Replace the last-but one paragraph by:

Controls are adjusted to the highest setting. However, pre-set controls are used in the intended position. The measurements are made while the appliance is energized.

A.1.2 Measuring distance

- p Replace the title by:

A.1.2 Measuring distance, if not specified in Table A.1

A.1.3 Sensor location

- p Replace the title by:

A.1.3 Sensor location, if not specified in Table A.1

A.2.3 Measuring distance and sensor location

- p Replace the first two paragraphs and Table A.1 by:

NOTE The measuring distances in Table A.1 have been defined based upon the expected location of the operator during normal operation, to protect against effects on central nervous system tissues in the head and trunk of the body.

Table A.1 - Measuring distances, sensor locations, operating conditions and coupling factors

Type of appliance	Measuring distance r_1 cm	Sensor locations	Operating conditions	Coupling factor $a_c(r_1)$ $\sigma = 0,1 \text{ S/m}$ 8 Hz .. 800 Hz ^a
Appliances not mentioned in the table	Operator distance	All surfaces	As specified in EN 55014-1	See Annex C
Air cleaners	30	All surfaces	Continuously	0,17
Air conditioners	30	Around	Continuously. When cooling lowest temperature setting. When heating highest temperature setting	0,18
Battery chargers (including inductive)	30	All surfaces	Charging a discharged battery having the highest capacity specified by the manufacturer	0,15
Blankets	0	Top	Spread out and laid on a sheet of thermal insulation	0,19
Blenders	30	Around	Continuously, no load	0,16
Citrus presses	30	Around	Continuously, no load	0,15
Clocks	30	Around	Continuously	0,15
Coffee makers	30	Around	As specified in 3.1.9 of EN 60335-2-15	0,16
Coffee mills	30	All surfaces	As specified in 3.1.9.108 of EN 60335-2-14	0,15
Convactor heaters	30	Around	With highest output	0,20
Deep fat fryers	30	Around	As specified in 3.1.9 of EN 60335-2-13	0,16
Dental hygiene appliances	0	All surfaces	As specified in 3.1.9 of EN 60335-2-52	0,19
Depilators	0	Against cutter	Continuously, no load	0,30
Dishwashers	30	Top, front	Without dishes in the washing mode and drying mode	0,18
Egg boilers	30	Around	As specified in 3.1.9 of EN 60335-2-15	0,15
Electric and electronic controls for track sets	30	All surfaces	Continuously	0,17
Facial sauna appliances	10	Top	Continuously	0,12
Fans	30	Front	Continuously	0,16
Fan heaters	30	Front	Continuously, highest heat setting	0,16
Floor polishers	30	All surfaces	Continuously without any mechanical load on the polishing brushes	0,19
Food processors	30	Around	Continuously without load, highest speed setting	0,17
Food warming cabinets	30	Front	Continuously without load, highest heat setting	0,15

Type of appliance	Measuring distance r_1 cm	Sensor locations	Operating conditions	Coupling factor $a_c(r_1)$ $\sigma = 0,1 \text{ S/m}$ 8 Hz .. 800 Hz ^a
Foot warmers	30	Top	Continuously without load, highest heat setting	0,15
Gas heating appliances, wall mounted	30	Front, left and right side	Continuously, highest heat setting with pump in operation	0,16
Gas heating appliances, floor standing	30	Front, left and right side	Continuously, highest heat setting with pump in operation	0,20
Gas igniters	30	All surfaces	Continuously	0,15
Grills	30	Around	Continuously without load, highest heat setting	0,16
Hair clippers	0	Against cutter	Continuously without load	0,30
Hairdryers	10	All surfaces	Continuously, highest heat setting	0,12
Heat pumps	30	Around	Continuously. When cooling lowest temperature setting. When heating highest temperature setting	0,17
Heating mats	30	Top	Spread out and laid on a sheet of thermal insulation	0,15
Heating pads	0	Top	Spread out and laid on a sheet of thermal insulation	0,14
Hobs	30	Top, front	As specified in 3.1.9 of EN 60335-2-6 but with highest setting, each heating unit separately	0,18
Hotplates	30	Around	As specified in 3.1.9 of EN 60335-2-9 but with highest setting, each heating unit separately	0,17
Icecream makers	30	Around	Continuously without load, lowest temperature setting	0,18
Immersion heaters	30	Around	Heating element fully submerged	0,16
Induction hobs and hotplates	See A.3.1	See A.3.1	See A.3.2.	
Irons	30	All surfaces	As specified in 3.1.9 of EN 60335-2-3	0,15
Ironing machines	30	All surfaces	As specified in 3.1.9 of EN 60335-2-44	0,19
Juice extractors	30	Around	Continuously without load	0,17
Kettles	30	Around	Half-filled with water	0,17
Kitchen scales	30	Around	Continuously without load	0,14
Knives	30	All surfaces	Continuously without load	0,16
Massage appliances	0	Against the massage head	Continuously without load, highest speed setting	0,21

Type of appliance	Measuring distance r_1 cm	Sensor locations	Operating conditions	Coupling factor $a_c(r_1)$ $\sigma = 0,1 \text{ S/m}$ 8 Hz .. 800 Hz ^a
Microwave ovens	30	Top, front	Continuously with highest microwave power setting. Conventional heating elements, if available, are operated simultaneously at their highest setting. The load is 1 l of tap water, placed in the centre of the shelf. The water container is made of electrically non-conductive material such as glass or plastic.	0,17
Mixers	30	All surfaces	Continuously without load, highest speed setting	0,16
Oil filled radiators	30	Around	Continuously, highest heat setting	0,20
Ovens	30	Top, front	Oven empty with door closed, thermostat being at the highest setting. Also in the cleaning mode, if available, as described in the instructions for use.	0,20
Ranges	30	Top, front	Each function separately	0,20
Range hoods	30	Bottom, front	Controls at highest setting	0,19
Refrigeration appliances	30	Top, front	Continuously with the door closed. The thermostat is adjusted to lowest temperature setting. The cabinet is empty. The measurement is made after steady conditions have been reached but with active cooling in all compartments.	0,18
Rice cookers	30	Around	Half-filled with water, without lid and highest heat setting	0,16
Shavers	0	Against cutter	Continuously without load	0,30
Slicing machines	30	All surfaces	Continuously without load, highest speed setting	0,17
Solaria				
- parts touching the body	0	Around	Continuously, highest settings	0,18
- other parts	30	Around	Continuously, highest settings	0,20
Spin extractors	30	Top, front	Continuously without load	0,18
Storage heaters	30	Around	Continuously, highest heat setting	0,20
Tea makers	30	Around	Continuously, no load	0,16
Toasters	30	Around	Without load, highest heat setting	0,16
Tools, hand-guided	30	Around, unless the same side is always towards the user	No-load, all settings e.g. speed set to maximum.	0,15
Tools, hand-held	30	Around, unless the same side is always towards the user	No-load, all settings e.g. speed set to maximum.	0,15

Type of appliance	Measuring distance r_1 cm	Sensor locations	Operating conditions	Coupling factor $a_c(r_1)$ $\sigma = 0,1 \text{ S/m}$ 8 Hz .. 800 Hz ^a
Tools, transportable	30	Top and side towards the user	No-load, all settings e.g. speed set to maximum.	0,16
Tools with heating elements	30	Around, unless the same side is always towards the user	Highest temperature setting. Glue guns with glue stick in working position	0,15
Tumble dryers	30	Top, front	Drum filled with textile material having a mass in the dry condition of 50 % of the maximum load. The textile material consists of pre-washed double-hemmed cotton sheets approximately 70 cm x 70 cm having a mass between 140 g/m ² and 170 g/m ² in the dry condition. The material is soaked with water of a mass of 60 % of that of the textile material.	0,18
Vacuum cleaners, handheld	30	All surfaces	As specified in 3.1.9 of EN 60335-2-2	0,16
Vacuum cleaners, body sling	0	All surfaces	As specified in 3.1.9 of EN 60335-2-2	0,13
Vacuum cleaners, others	30	Around	As specified in 3.1.9 of EN 60335-2-2	0,16
Washing machines and washer dryers	30	Top, front	Without textiles, in the spinning mode at highest speed	0,18
Water-bed heaters	10	Top	Spread out and laid on a sheet of thermal insulation	0,14
Water heaters	30	Around	Controls at highest setting, with water flowing, if necessary	0,17
Whirlpool baths	0	Around	Continuously	0,18
- inside	30	Around	Continuously	0,20
^a The worst case coupling factors have been calculated for frequencies up to 800 Hz. For fundamental operating frequencies greater than 800 Hz and lower than 150 kHz, the coupling factor is $a_c(r_1) \times 1,25$.				

p **A.3.2** Add after the fifth paragraph:

NOTE Z1 Stable operating conditions are reached after the water starts to boil and when the magnetic field or the power on the mains supply is stabilized.

Annex B

p Replace by:

Annex B
(informative)**Basic restrictions and reference levels**

The following basic restrictions and reference levels of 1999/519/EC apply.

**Table B.1 - Basic restrictions for electric, magnetic and electromagnetic fields
(0 Hz to 300 GHz)**

Frequency range	Magnetic flux density mT	Current density mA/m ² r.m.s.	Whole body average SAR W/kg	Localized SAR (head and trunk) W/kg	Localized SAR (limbs) W/kg	Power density, S W/m ²
0 Hz	40					
> 0 - 1 Hz		8				
1 - 4 Hz		8/f				
4 - 1 000 Hz		2				
1 000 Hz - 100 kHz		f/500				
100 kHz - 10 MHz		f/500	0,08	2	4	
10 MHz - 10 GHz			0,08	2	4	
10 - 300 GHz						10

f is the frequency in Hz.

**Table B.2 - Reference levels for electric, magnetic and electromagnetic fields
(0 Hz to 300 GHz, unperturbed r.m.s. values)**

Frequency range	E-field strength V/m	H-field strength A/m	B-field μT	Equivalent plane wave power density S _{eq} W/m ²
0 Hz - 1 Hz	-	$3,2 \times 10^{-4}$	4×10^{-4}	-
1 Hz - 8 Hz	10 000	$3,2 \times 10^{-4} / f^2$	$4 \times 10^{-4} / f^2$	-
8 Hz - 25 Hz	10 000	$4 000 / f$	$5 000 / f$	-
0,025 kHz - 0,8 kHz	$250 / f$	$4 / f$	$5 / f$	-
0,8 kHz - 3 kHz	$250 / f$	5	6,25	-
3 kHz - 150 kHz	87	5	6,25	-
0,15 MHz - 1 MHz	87	$0,73 / f$	$0,92 / f$	-
1 MHz - 10 MHz	$87 / f^{1/2}$	$0,73 / f$	$0,92 / f$	-
10 MHz - 400 MHz	28	0,073	0,092	2
400 MHz - 2 000 MHz	$1,375 f^{1/2}$	$0,003 7 f^{1/2}$	$0,004 6 f^{1/2}$	$f / 200$
2 GHz - 300 GHz	61	0,16	0,20	10

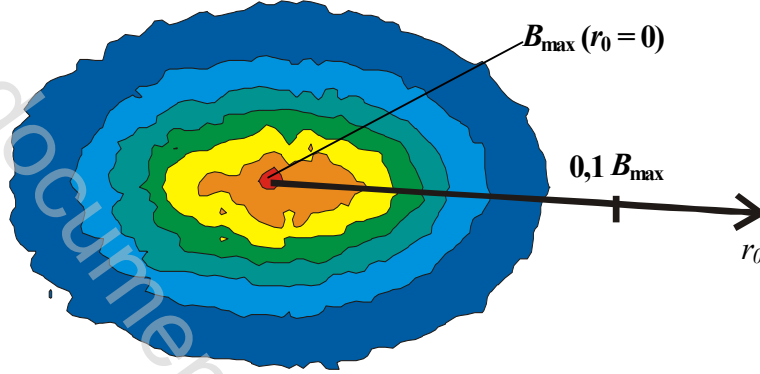
f is as indicated in the frequency range column.

NOTE These limits do not apply for the protection of workers against exposure to electromagnetic fields.

Annex C, Determination of coupling factors

Step 1 Evaluation of the extent of the hot spot

Replace Figure C.1 by:



Step 4 Calculation of the coupling factor

Replace the complete text by:

The coupling factor $a_c(r)$ is the result of the re-scaled factor k and can be determined as followed:

$$a_c(r, r_{\text{coil}}, f, \sigma) = k(r, r_{\text{coil}}, f, \sigma) \cdot \frac{B_{\text{RL}}(f)}{J_{\text{BR}}(f)} \quad (\text{C.7})$$

NOTE 1 The term $B_{\text{RL}}(f)/J_{\text{BR}}(f)$ is proportional $1/f$ from 8 Hz up to 800 Hz and from 1 kHz to 100 kHz. In consequence the factor $a_c(r)$ is frequency independent within these ranges (see Figure C.5).

In case of measuring according to 5.5.2 and 5.5.3 a f_{c0} equivalent is used. Therefore the coupling factor $a_c(r)$ evaluates to:

$$a_c(r, r_{\text{coil}}, f_{\text{c0}}, \sigma) = k(r, r_{\text{coil}}, f_{\text{c0}}, \sigma) \cdot \frac{B_{\text{RL}}(f_{\text{c0}})}{J_{\text{BR}}(f_{\text{c0}})} \quad (\text{C.8})$$

NOTE 2 The coupling factor $a_c(r_1)$ can be determined from Figure C.5 using equation C.4.

Example for the re-scaling applying 1999/519/EC at $f = 50\text{ Hz}$ and $\sigma = 0,1\text{ S/m}$ for the whole body and a coil of $r_{\text{coil}} = 10\text{ mm}$ in a distance $r = 50\text{ cm}$.

$$\begin{aligned} a_c(r = 50\text{ cm}, r_{\text{coil}} = 10\text{ mm}, f = 50\text{ Hz}, \sigma = 0.1\text{ S/m}) &= \\ k(r = 50\text{ cm}, r_{\text{coil}} = 10\text{ mm}, f = 50\text{ Hz}, \sigma = 0.1\text{ S/m}) \cdot \frac{B_{\text{RL}}(f = 50\text{ Hz})}{J_{\text{BR}}(f = 50\text{ Hz})} &= \\ 3.271 \frac{\text{A/m}^2}{T} \frac{100\mu\text{T}}{2\text{mA/m}^2} &= 0.1635 \end{aligned}$$

C.2 Graphical evaluation of coupling factors

Replace the first paragraph by:

The coupling factor can be determined from Figure C.5 using equation (C.4). This method provides a value for the coupling factor depending on the radius of the equivalent coil.

Annex D, Examples using the limits of Annex B

D.3 Example for determining the coupling factor

Step 2 Determination of the equivalent coil

Replace Figure D.2 by:

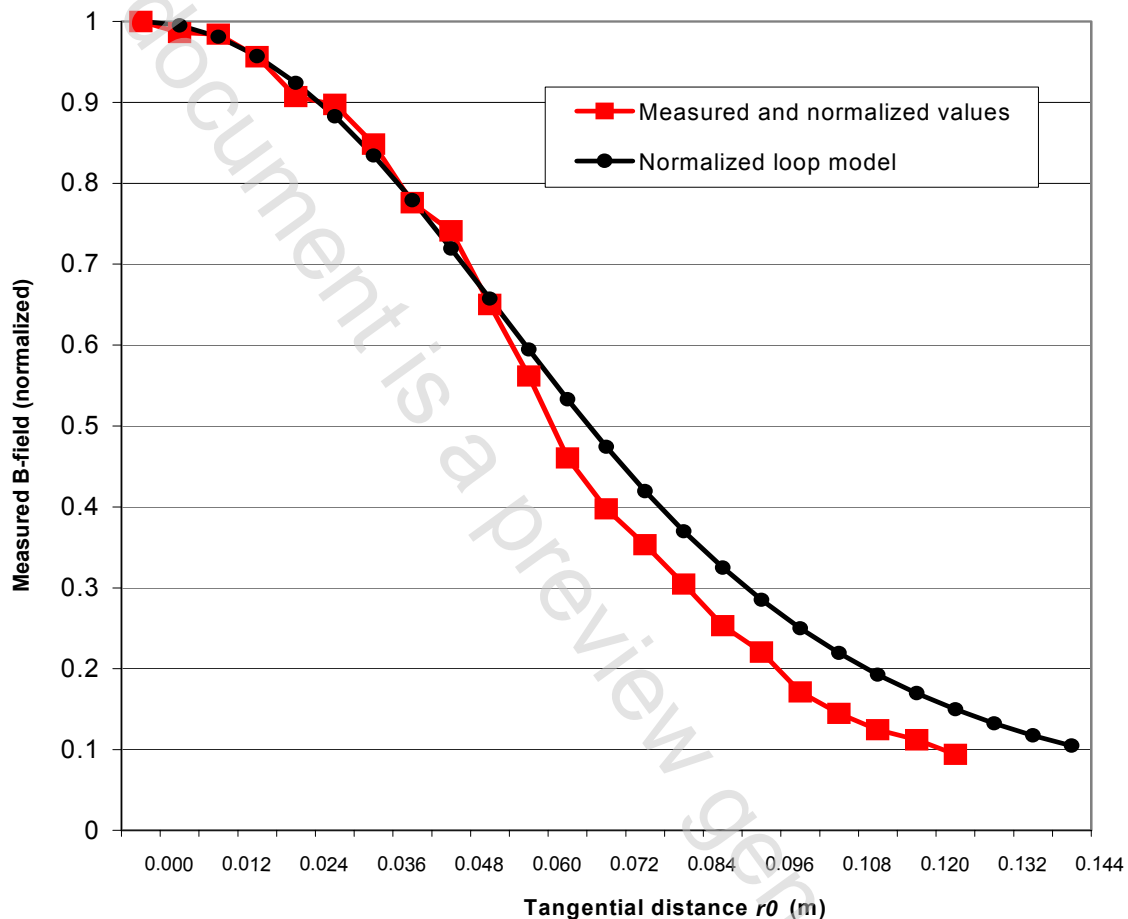


Figure D.2 - Normalized field distribution along the tangential distance r_0

Step 3 Determination of factor k

Replace in the first paragraph “Having determined the value of G ” by “With the value of G from step 2”.

D.4.1 Numerical models for the homogeneous human body

Add after the first paragraph:

NOTE Based on the German Standard DIN 33 402, Part 2, 1986.

D.4.2 Different sources of non-uniform magnetic fields and calculation of the factor k

Delete the paragraph starting with “The necessary factor used...” and the related equation (D.4).

Delete EXAMPLE 2.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE Where an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60335 (mod)	Series	Household and similar electrical appliances – Safety	EN 60335	Series
IEC 61786	– ¹⁾	Measurement of low-frequency magnetic and electric fields with regard to exposure of human beings – Special requirements for instruments and guidance for measurements	–	–
IEC 62311 (mod)	– ¹⁾	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz)	EN 62311	2008 ²⁾
CISPR 14-1	– ¹⁾	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission	EN 55014-1	2006 ²⁾

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

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INTRODUCTION

La présente norme établit une méthode d'évaluation appropriée pour la détermination des champs électromagnétiques dans l'environnement autour de l'équipement mentionné dans le domaine d'application, et elle définit des conditions opératoires et des distances de mesure normalisées.

Ce document est conçu comme une méthode de mesure et d'évaluation des champs électromagnétiques (EM) et de leur effet potentiel sur le corps humain, par référence à des normes d'expositions. Les normes d'exposition existantes, par exemple ICNIRP'98 [11]¹⁾, IEEE C95.1-1999 [22] et IEEE C95.6-2002 [12], présentent des règles pour l'exposition du corps humain aux champs EM. Les limites les plus simples et les plus pratiques avec lesquels la conformité doit être établie sont des limites (moyennes temporelles applicables dans certains cas) de champs électriques (E) et magnétiques (B), mesurés en l'absence du corps humain qui sera exposé à ces champs. Ces limites sont appelées niveaux maximaux d'exposition permis, niveaux basés sur l'IEEE, ou niveaux de référence (ICNIRP). Des définitions appropriées et des techniques de mesures spécifiées sont appliquées à toutes les mesures ou évaluation de conformité à une exposition. La conformité avec les niveaux d'exposition maximaux permis ou les niveaux de référence est suffisante pour confirmer le respect de ces niveaux tels que spécifiés dans la norme d'exposition appropriée.

Ce document traite des mesures et des techniques de calcul complémentaires qui permettent de déterminer la conformité sous un ensemble de circonstances spécifiées, sans faire référence à la durée d'exposition ou aux conditions d'exposition réelles. Ce document n'est pas destiné à remplacer des définitions et des procédures spécifiées dans les normes d'exposition mais son objectif est de compléter la procédure par ailleurs spécifiée pour la conformité avec une exposition.

¹⁾ Les chiffres entre crochets renvoient à la bibliographie.

INTRODUCTION

This standard establishes a suitable evaluation method for determining the electromagnetic fields in the space around the equipment mentioned in the scope, and defines standardized operating conditions and measuring distances.

This document is designed as one method for measurement and assessment of electromagnetic (EM) fields and their potential effect on the human body by reference to exposure standards. Existing exposure standards, e.g. ICNIRP'98 [11]¹⁾, IEEE C95.1-1999 [22] and IEEE C95.6-2002 [12], present rules for the exposure of humans to EM fields. The simplest and more practical levels [limits] with which to comply are limits (suitably time-averaged in some cases) on the electric (E) and magnetic (B) fields, measured in the absence of the human to be exposed to these fields. These limits are called maximum permissible exposure levels, IEEE-based levels, or reference levels (ICNIRP). Suitable definitions and specified measurement techniques are applied in any exposure compliance measurement or assessment. Compliance with maximum permissible exposure or reference levels is sufficient for positive assessment of meeting these levels as specified in the appropriate exposure standard.

This document addresses the additional measurement and calculation techniques which permit determination of compliance under one set of specified circumstance, without reference to time of exposure or actual exposure conditions. This document is not meant to supplant definitions and procedures specified in exposure standards but is aimed at supplementing the procedure already specified for compliance with exposure.

¹⁾ Figures in square brackets refer to the Bibliography.

MÉTHODES DE MESURES DES CHAMPS ÉLECTROMAGNÉTIQUES DES APPAREILS ÉLECTRODOMESTIQUES ET SIMILAIRES EN RELATION AVEC L'EXPOSITION HUMAINE

1 Domaine d'application

La présente Norme Internationale traite des champs électromagnétiques jusqu'à 300 GHz et elle définit des méthodes pour l'évaluation des amplitudes des champs électriques et des densités de flux magnétique autour des appareils électrodomestiques et similaires, incluant les conditions pendant les essais aussi bien que les distances et les positions de mesures.

Les appareils peuvent contenir des moteurs, des éléments chauffants ou une combinaison des deux, des circuits électriques ou électroniques, et peuvent être alimentés par le secteur, par batteries ou par toute autre source d'énergie électrique.

Parmi les appareils concernés, figurent des équipements tels que des appareils électrodomestiques, des outils électriques et des jouets électriques.

Les appareils non destinés à un usage domestique normal mais qui néanmoins peuvent être approchés par le public, ou peuvent être utilisés par des usagers non avertis, sont compris dans le domaine d'application de la présente norme.

Cette norme ne s'applique pas:

- aux appareils conçus exclusivement pour l'industrie lourde;
- aux appareils destinés à constituer une partie fixe de l'installation électrique d'un bâtiment (tels que les fusibles, les disjoncteurs, les câbles et les commutateurs);
- aux récepteurs de radio et de télévision, les équipements audio et vidéo, et les instruments de musique;
- aux appareils électriques pour usage médicale;
- aux ordinateurs personnels et équipements similaires;
- aux émetteurs de radio;
- aux appareils conçus pour une utilisation exclusivement à bord d'un véhicule.

Les champs d'un équipement multifonction qui est soumis simultanément à différents articles de cette norme et/ou à d'autres normes doivent être évalués par rapport aux dispositions de chaque article /norme pour les fonctions concernées en utilisation.

Les utilisations anormales des appareils de doivent pas être prises en considération.

Cette norme inclut des éléments spécifiques pour l'évaluation de l'exposition humaine:

- définition des sondes;
- définition des méthodes de mesure;
- définition du mode opératoire pour les appareils en essai;
- définition des distances et des positions de mesure.

Les méthodes de mesure spécifiées sont valables de 10 Hz à 400 kHz. Dans la gamme de fréquence au-dessus de 400 kHz et au-dessous de 10 Hz, les appareils entrant dans le domaine d'application de cette norme sont jugés être conformes sans essai, sauf mention contraire spécifiée dans la série de normes CEI 60335.

MEASUREMENT METHODS FOR ELECTROMAGNETIC FIELDS OF HOUSEHOLD APPLIANCES AND SIMILAR APPARATUS WITH REGARD TO HUMAN EXPOSURE

1 Scope

This International Standard deals with electromagnetic fields up to 300 GHz and defines methods for evaluating the electric field strength and magnetic flux density around household and similar electrical appliances, including the conditions during testing as well as measuring distances and positions.

Appliances may incorporate motors, heating elements or their combination, may contain electric or electronic circuitry, and may be powered by the mains, by batteries, or by any other electrical power source.

Appliances include such equipment as household electrical appliances, electric tools and electric toys.

Appliances not intended for normal household use but which nevertheless may be approached by the public, or may be used by laymen, are within the scope of this standard.

This standard does not apply to:

- apparatus designed exclusively for heavy industrial purposes;
- apparatus intended to be part of the fixed electrical installation of buildings (such as fuses, circuit breakers, cables and switches);
- radio and television receivers, audio and video equipment, and electronic music instruments;
- medical electrical appliances;
- personal computers and similar equipment;
- radio transmitters;
- apparatus designed to be used exclusively in vehicles;

The fields of multifunction equipment which is subjected simultaneously to different clauses of this standard and/or other standards shall be assessed using the provisions of each clause/standard for the relevant functions in operation.

Abnormal operation of the appliances is not taken into consideration.

This standard includes specific elements to assess human exposure:

- definition of sensor;
- definition of measuring methods;
- definition of operating mode for appliance under test;
- definition of measuring distance and position.

The measurement methods specified are valid from 10 Hz to 400 kHz. In the frequency range above 400 kHz and below 10 Hz appliances in the scope of this standard are deemed to comply without testing unless otherwise specified in IEC 60335 series.

2 Références normatives

Les documents de référence suivants sont indispensables pour l'application du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

CEI 60335 (toutes les parties), *Sécurité des appareils électrodomestiques et similaires*

CEI 61786, *Mesure de champs magnétiques et électriques à basse fréquence dans leur rapport à l'exposition humaine – Prescriptions spéciales applicables aux instruments et recommandations pour les procédures de mesure*

CEI 62311: *Évaluation des équipements électronique et électrique en relation avec les restrictions d'exposition humaine aux champs électromagnétiques (0 Hz – 300 GHz²)*

CISPR 14-1, *Compatibilité électromagnétique – Exigences pour les appareils électrodomestiques, outillages électriques et appareils analogues – Partie 1: Emission*

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions suivants s'appliquent. Le système d'unités utilisé dans cette norme est le Système International d'unité (SI).

3.1 Grandeurs physiques et unités

Grandeur	Symbole	Unité	Dimension
Conductivité	σ	Siemens par mètre	S/m
Densité de courant	J	Ampère par mètre carré	A/m ²
Amplitude du champ électrique	E	Volt par mètre	V/m
Fréquence	f	Hertz	Hz
Amplitude du champ magnétique	H	Ampère par mètre	A/m
Densité de flux magnétique	B	Tesla	T (Wb/m ² ou Vs/m ²)

3.2 Termes et définitions

3.2.1

restriction de base (limites de base)

restrictions à l'exposition aux champs électriques, magnétiques, et électromagnétiques alternatifs, qui sont basées sur des effets biologiques reconnus et incluant un facteur de sécurité. La restriction de base pour la densité de courant est J_{BR} , la restriction de base pour l'amplitude du champ électrique interne est E_{BR}

²) A publier.

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.

IEC 60335 (all parts), *Safety of household and similar electrical appliances*

IEC 61786, *Measurement of low-frequency magnetic and electric fields with regard to exposure of human beings – Special requirements for instruments and guidance for measurements*

IEC 62311, *Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz)²⁾*

CISPR 14-1, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

3 Terms and definitions

For the purpose of this standard the following terms and definitions apply. Internationally accepted SI-units are used throughout the standard.

3.1 Physical quantities and units

Quantity	Symbol	Unit	Dimension
Conductivity	σ	Siemens per metre	S/m
Current density	J	Ampere per square metre	A/m ²
Electric field strength	E	Volt per metre	V/m
Frequency	f	Hertz	Hz
Magnetic field strength	H	Ampere per metre	A/m
Magnetic flux density	B	Tesla	T (Wb/m ² or Vs/m ²)

3.2 Terms and definitions

3.2.1

basic restriction (basic limitations)

restrictions on exposure to time-varying electric, magnetic and electromagnetic fields that are based on established biological effects and include a safety factor. The basic restriction for the current density is J_{BR} , the basic restriction for the internal electric field strength is E_{BR}

²⁾ To be published.