

**Elektroonika- ja elektriseadmete  
iseloomustus inimesele toimivate  
elektromagnetväljade (0 Hz kuni 300 GHz)  
piiramise järgi**

Assessment of electronic and electrical  
equipment related to human exposure  
restrictions for electromagnetic fields (0 Hz - 300  
GHz)

**EESTI STANDARDI EESSÕNA****NATIONAL FOREWORD**

<p>Käesolev Eesti standard EVS-EN 62311:2008 sisaldab Euroopa standardi EN 62311:2008 ingliskeelset teksti.</p>	<p>This Estonian standard EVS-EN 62311:2008 consists of the English text of the European standard EN 62311:2008.</p>
<p>Standard on kinnitatud Eesti Standardikeskuse 20.02.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.</p>	<p>This standard is ratified with the order of Estonian Centre for Standardisation dated 20.02.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.</p>
<p>Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 31.01.2008.</p>	<p>Date of Availability of the European standard text 31.01.2008.</p>
<p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>The standard is available from Estonian standardisation organisation.</p>

**ICS** 97.030

**Võtmesõnad:**

**Standardite reprodutseerimis- ja levitamiseõigus kuulub Eesti Standardikeskusele**

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:  
Aru 10 Tallinn 10317 Eesti; [www.evs.ee](http://www.evs.ee); Telefon: 605 5050; E-post: [info@evs.ee](mailto:info@evs.ee)

English version

**Assessment of electronic and electrical equipment  
related to human exposure restrictions  
for electromagnetic fields (0 Hz - 300 GHz)  
(IEC 62311:2007, modified)**

Evaluation des équipements  
électroniques et électriques  
en relation avec les restrictions  
d'exposition humaine  
aux champs électromagnétiques  
(0 Hz - 300 GHz)  
(CEI 62311:2007, modifiée)

Bewertung von elektrischen  
und elektronischen Einrichtungen  
in Bezug auf Begrenzungen  
der Exposition von Personen  
in elektromagnetischen Feldern  
(0 Hz - 300 GHz)  
(IEC 62311:2007, modifiziert)

This European Standard was approved by CENELEC on 2007-12-04. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

**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 document 106/129/FDIS, future edition 1 of IEC 62311, prepared by IEC TC 106, Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure, was submitted to the IEC-CENELEC parallel vote.

A draft amendment, prepared by the Technical Committee CENELEC TC 106X, Electromagnetic fields in the human environment, was submitted to the Unique Acceptance Procedure.

The combined texts of IEC 62311:2007 and the draft amendment prAA were approved by CENELEC as EN 62311 on 2007-12-04.

This European Standard supersedes EN 50392:2004.

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) | 2009-01-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn   | (dow) | 2011-01-01 |

Annex ZA has been added by CENELEC.

---

## Endorsement notice

The text of the International Standard IEC 62311:2007 was approved by CENELEC as a European Standard with agreed common modifications as given below.

### COMMON MODIFICATIONS

## 2 Normative references

### Add:

Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz), Official Journal L 199 of 30 July 1999

## 3 Definitions

3.4 Replace "current density" by "induced current density".

Replace the whole Clause 4 by:

## 4 Compliance criteria

The electronic and electrotechnical apparatus shall comply with the basic restriction as specified in Annex II of Council Recommendation 1999/519/EC.

NOTE 1 The time averaging in the EU-Recommendation applies.

The reference levels in the Council Recommendation 1999/519/EC on public exposure to electromagnetic fields are derived from the basic restrictions using worst-case assumptions about exposure. If the reference levels are met, then the basic restrictions will be complied with, but if the reference levels are exceeded, that does not necessarily mean that the basic restrictions will not be met. In some situations, it will be necessary to show compliance with the basic restrictions directly, but it may also be possible to derive compliance criteria that allow a simple measurement or calculation to demonstrate compliance with the basic restriction. Often these compliance criteria can be derived using realistic assumptions about conditions under which exposures from a device may occur, rather than the conservative assumptions that underly the reference levels.

NOTE 2 The limit is the basic restriction.

If the technology in the apparatus is not capable of producing an E-field, H-field or contact current, at the normal user position, at levels higher than 1/2 the limit values then the apparatus is deemed to comply with the requirements in this standard in respect of that E-field, H-field or contact current without further assessment.

## Bibliography

Add the following note for the standard indicated:

ISO/IEC 17025	NOTE	Harmonized as EN ISO/IEC 17025:2005 (not modified).
---------------	------	---

-----

## **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 When 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 60050-161	– <sup>1)</sup>	International Electrotechnical Vocabulary (IEV) - Chapter 161: Electromagnetic compatibility	–	–

---

<sup>1)</sup> Undated reference.

## CONTENTS

FOREWORD.....	4
1 Scope and object.....	6
2 Normative references .....	6
3 Terms and definitions .....	6
4 Compliance criteria.....	10
5 Assessment methods .....	10
6 Evaluation of compliance to limits.....	11
7 Applicability of compliance assessment methods.....	12
7.1 General.....	12
7.2 Generic procedure for assessment of equipment.....	14
8 Sources with multiple frequencies .....	17
8.1 Introduction .....	17
8.2 Frequency range from 1 Hz – 10 MHz (ICNIRP-based).....	17
8.2.1 Frequency domain assessment.....	17
8.2.2 Time domain assessment .....	19
8.3 Frequency range from 100 kHz – 300 GHz (ICNIRP-based) .....	21
8.4 Frequency range from 0 kHz – 5 MHz (IEEE-based).....	22
8.4.1 Frequency domain assessment.....	22
8.4.2 Time domain assessment .....	22
8.5 Frequency range from 3 kHz – 300 GHz (IEEE-based) .....	23
9 Assessment report.....	23
9.1 General.....	23
9.2 Items to be recorded in the assessment report .....	24
9.2.1 Assessment method .....	24
9.2.2 Presentation of the results.....	24
9.2.3 Equipment using external antennas .....	24
10 Information to be supplied with the equipment.....	24
Annex A (informative) Field calculation .....	25
Annex B (informative) <i>SAR</i> compliance assessment .....	30
Annex C (informative) Information for numerical modelling.....	32
Annex D (informative) Measurements of physical properties and body currents .....	61
Annex E (informative) Specific absorption rate ( <i>SAR</i> ) .....	65
Annex F (informative) Measurement of <i>E</i> and <i>H</i> field.....	67
Annex G (informative) Source modelling .....	70
Bibliography.....	73
Figure 1 – Assessment flowchart .....	16
Figure 2 – Schematic of “weighting circuit”.....	19
Figure 3 – Dependency on frequency of the reference levels <i>V</i> plotted with smoothing edges .....	19
Figure 4 – Transfer function <i>A</i> .....	20

Figure A.1 – Geometry of antenna with largest linear dimension $D$ .....	25
Figure A.2 – Current element $Id/\sin(\omega t)$ at the origin of spherical coordinate system .....	26
Figure A.3 – Ratio of $E^2$ , $H^2$ , and $E \times H$ field components .....	27
Figure A.4 – Ratio of $E \times H$ field components for three typical antennas.....	28
Figure A.5 – Far-field = straight line, radiated near-field = lower line & all near-fields = other line .....	29
Figure C.1 – Numerical model of a homogenous ellipsoid .....	34
Figure C.2 – Numerical model of a homogenous cuboid.....	35
Figure C.3a — Description of the whole body .....	36
Figure C.3b — Details of the construction of the head and shoulders.....	37
Figure C.3 – Numerical model of a homogenous human body .....	37
Figure C.4 – Schematic of straight wire.....	41
Figure C.5 – Schematic of circular coil .....	42
Figure C.6 – Block diagram of the method .....	43
Figure C.7 – Test situation for validation – Current loop in front of a cuboid.....	45
Figure C.8 – Distribution of the electric current density $J$ in the planes $x = + 0,20$ m (left) and $y = 0,0$ m (right) .....	46
Figure C.9 – Helmholtz coils and prolate spheroid .....	47
Figure C.10a – Magnetic field .....	47
Figure C.10b – Induced current density .....	48
Figure C.10 – Modelling results for a 60 cm by 30 cm prolate spheroid.....	48
Figure C.11 – Induced current density .....	48
Figure C.12a – Magnetic field .....	49
Figure C.12b – Induced current density .....	49
Figure C.12 – Modelling results for a 160 cm by 80 cm prolate spheroid .....	49
Figure C.13 – Distribution of induced electric current density.....	50
Figure C.14 – Schematic position of source $Q$ against model $K$ .....	51
Figure C.15 – Position of source $Q$ , sensor and model $K$ .....	52
Figure C.16 – Hot spot.....	54
Figure C.17 – Gradient of flux density and area $G$ .....	55
Figure C.18 – Equivalent coil .....	55
Figure C.19 – Gradients of flux density and coil .....	56
Figure C.20 – Measurement distance and related distances.....	58
Table 1 – Characteristics and parameters of the equipment to be considered .....	13
Table 2 – List of possible assessment methods .....	14
Table B.1 – Determining whole-body $SAR$ implicit compliance levels .....	30
Table C.1 – Conductivity of tissue types .....	38
Table C.2 – Relative permittivity of tissue types .....	40
Table C.3 – Summary of results .....	50
Table C.4 – Values $G[m]$ of different coils with radius $r_{coil}$ and distance $d_{coil}$ .....	56
Table C.5 – Coupling factor $k \left[ \frac{A/m^2}{T} \right]$ at 50 Hz for the whole body.....	57



# ASSESSMENT OF ELECTRONIC AND ELECTRICAL EQUIPMENT RELATED TO HUMAN EXPOSURE RESTRICTIONS FOR ELECTROMAGNETIC FIELDS (0 Hz – 300 GHz)

## 1 Scope and object

This International Standard applies to electronic and electrical equipment for which no dedicated product- or product family standard regarding human exposure to electromagnetic fields applies.

The frequency range covered is 0 Hz to 300 GHz.

The object of this generic standard is to provide assessment methods and criteria to evaluate such equipment against basic restrictions or reference levels on exposure of the general public related to electric, magnetic and electromagnetic fields and induced and contact current.

NOTE This standard is intended to cover both intentional and non-intentional radiators. If the equipment complies with the requirements in another relevant standard, e.g. EN 50371 covering low power equipment, then the requirements of this standard (IEC 62311) are considered to be met and the application of this standard to that equipment is not necessary. See also Clause 7.2.

## 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 60050-161, *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions contained in IEC 60050-161 as well as the following terms and definitions apply.

### 3.1 averaging time

$t_{\text{avg}}$   
appropriate time over which exposure is averaged for purposes of determining compliance

### 3.2 basic restriction

maximum exposure level that should not be exceeded under any conditions

NOTE Examples of basic restrictions can be found in Annex II of the Council Recommendation 1999/519/EC [6]<sup>1)</sup>, ICNIRP Guidelines [1] IEEE Std C95.6™ [2] and IEEE Std C95.1™ [3].

---

<sup>1)</sup> Figures in square brackets refer to the Bibliography.