

Human exposure to electromagnetic fields — Low-frequency (0 Hz to 10 kHz)

Committees responsible for this Draft for Development

The preparation of this Draft for Development was entrusted by Technical Committee GEL/111, Human exposure to electromagnetic fields, to Subcommittee GEL/111/1, Human exposure to low-frequency and high-frequency radiation, upon which the following bodies were represented:

- Association of Manufacturers of Domestic Electrical Appliances
- British Broadcasting Corporation
- British National Committee for Electroheat
- Department of Health
- Department of Trade and Industry
- Department of Trade and Industry (Electricity Division)
- ERA Technology Ltd.
- Electricity Association
- Federation of the Electronics Industry
- Health and Safety Executive
- Induction and Dielectric Heating Manufacturers' Association
- Institute of Physical Sciences in Medicine (IPSM)
- Lighting Industry Federation Ltd.
- Mercury Communications Limited
- Ministry of Defence
- National Air Traffic Services
- National Radiological Protection Board
- Radiocommunications Agency

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National foreword

This Draft for Development has been prepared by Subcommittee GEL/111/1 and is the English language version of ENV 50166-1:1995 *Human exposure to electromagnetic fields — Low-frequency (0 Hz to 10 kHz)*, published by the European Committee for Electrotechnical Standardization (CENELEC).

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because it is not possible to determine the biologically relevant quantities directly.

It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the European organization responsible for its conversion to a European Standard. A review of this publication will be initiated 2 years after its publication by the European organization so that a decision can be taken on its status at the end of its three-year life. The commencement of the review period will be notified by an announcement in BSI News.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into a European Standard, to extend the life of the prestandard or to withdraw it. Comments should be sent in writing to the Secretary of BSI Subcommittee GEL/111/1 at 389 Chiswick High Road, London W4 4AL giving the document reference and clause number and proposing, where possible, an appropriate revision of the text.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the ENV title page, pages 2 to 16 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

English version

Human exposure to electromagnetic fields Low-frequency (0 Hz to 10 kHz)

This European Prestandard (ENV) was approved by CENELEC on 1994-11-30 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).

CENELEC members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and 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

This European Prestandard has been prepared by SC 111A, Low-frequency EM radiation, of Technical Committee CENELEC TC 111, Electromagnetic fields in the human environment.

The text of the draft was voted on and accepted during the combined meeting of CENELEC TC 111 and its SCs on 1994-11-30.

The following date was fixed:

- latest date of announcement of the ENV at national level (doa) 1995-03-01

Documents referred to in this Prestandard are indicated by a number between square brackets and are listed in Annex D, *References*.

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1 Introduction

This Prestandard, which is divided into two parts, deals with the exposure of persons to electromagnetic fields and radiation at all frequencies from 0 up to 300 GHz (Part 1: 0 to 10 Hz and Part 2: 10 kHz to 300 GHz). Electromagnetic fields interact with the human body and other biological systems through a number of physical mechanisms. This Prestandard is based on well-established short-term effects, which, depending on the frequency, include the stimulation of electrically-excitable cells in nerve and muscle tissue and heating.

Basic restrictions are given to prevent any adverse consequences of these effects. They are specified in terms of biologically relevant quantities, typically induced current density and specific absorption rate. These quantities cannot be determined directly so the standard specifies a set of more-readily-measurable reference levels, in terms of external electric and magnetic field strengths and power density, derived from the basic restrictions.

Pulsed electromagnetic fields may produce other effects, such as the auditory perception of microwave pulses, in addition to those associated with continuous wave radiation. For these, restrictions in terms of specific energy absorption and energy flux density are given.

Electromagnetic fields can also interact indirectly when a person touches a conductive object in a field. If the field is sufficiently intense, the person may experience a shock or burn. To control these effects, limits are specified for the contact current.

This Prestandard has a two-tier structure in which lower levels are specified for the general public than for workers. For the general public, allowance has to be made for all likely activities and for all ages and states of health. Such persons may be unaware of some of the effects of exposure to electromagnetic fields, whereas appropriate information and training can be provided for workers.

There are reports that electromagnetic fields of lower intensity than the reference levels specified in this standard may have long-term effects on health. Currently available research however has not established adverse effects and does not provide a basis for restricting exposure.

Cardiac pacemakers and other active implantable devices are designed to cope with the typical levels of electromagnetic interference encountered in daily life. However, some devices — and also some metallic prosthetic implants — may be affected below the reference levels given in this Prestandard. When necessary, advice should be sought from the manufacturer of the device and from the medical authority which implanted it. A CENELEC Standard concerning interference and implantable cardiac pacemakers is available [EN 50061:1988/A1:1995].

This Prestandard sets basic restrictions and reference levels that have been derived in a documented way. It is recognized that additional considerations may lead some countries to regard the reference levels as minimum requirements in certain frequency ranges and add further margins.

This Prestandard is issued as a prospective standard for provisional application so as to gain experience in its use. It may be modified in the light of that experience or new scientific data before conversion to a full standard, or it may be withdrawn.

The present document is regarded as a basic standard. Further standardization work should include the development of product and product family standards, based on this document, which define precisely the measurement method in each case. This additional work should be done in the coming years in parallel with the review of ENV 50166.

2 Scope

This part of the Prestandard deals with the prevention of adverse short-term effects of human exposure to static and low-frequency electric and magnetic fields in the frequency range from 0 to 10 kHz. In this region of the electromagnetic spectrum, the electric and magnetic fields must be considered separately. The rationale is set out in Annex A.

This Prestandard does not apply to the deliberate exposure of persons to electric or magnetic fields during medical research, diagnosis or treatment.

Safety hazards which may be associated with the ignition of flammable materials or the triggering of explosive devices in strong fields are not covered.

Compliance with this Prestandard may not exclude interference with or effects on some examples of implants such as cardiac pacemakers.