COUNCIL RECOMMENDATION of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC)

THE COUNCIL OF THE EUROPEAN UNION,
Having regard to the Treaty establishing the European Community, and in particular Article 152°, second subparagraph,
Having regard to the proposal from the Commission,
Having regard to the opinion of the European Parliament([1]),
Whereas:
(1) In accordance with point (p) of Article 3 of the Treaty, Community action must include a contribution to the attainment of a high level of health protection; the Treaty also makes provision for protecting the health of workers and of consumers;
(2) In its resolution of 5 May 1994 on combating the harmful effects of non-ionising radiation([2]), the European Parliament called on the Commission to propose legislative measures seeking to limit the exposure of workers and the public to non-ionising electromagnetic radiation;
(3) Community minimum requirements for the protection of health and safety of workers in relation to electromagnetic fields exist for work with display screen equipment([3]); Community measures were introduced to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding([4]) which oblige, inter alia, employers to assess activities which involve a specific risk of exposure to non-ionising radiation; minimum requirements have been proposed for the protection of workers from physical agents([5]) which include measures against non-ionising radiation; whereas, therefore, this recommendation does not address the protection of workers against occupational exposure to electromagnetic fields;
(4) It is imperative to protect members of the general public within the Community against established adverse health effects that may result as a consequence of exposure to electromagnetic fields;
(5) Measures with regard to electromagnetic fields should afford all Community citizens a high level of protection; provisions by Member States in this area should be based on a commonly agreed framework, so as to contribute to ensuring consistency of protection throughout the Community;
(6) In accordance with the principle of subsidiarity, any new measure taken in an area which does not fall within the exclusive competence of the Community, such as non-ionising radiation protection of the public, may be taken up by the Community only if, by reason of the scale or effects of the proposed action, the objectives proposed can be better achieved by the Community than by Member States;
(7) Actions on limiting the exposure of the general public to electromagnetic fields should be balanced with the other health, safety and security benefits that devices emitting electromagnetic fields bring to the quality of life, in such areas as telecommunications, energy and public security;
(8) There is a need to establish by means of recommendations addressed to Member States a Community framework with regard to exposure to electromagnetic fields with the objective of protecting the public;
(9) This recommendation has as its objective the protection of the health of the public and it therefore applies, in particular, to relevant areas where members of the public spend significant time in relation to the effects covered by this recommendation;
(10) The Community framework, which draws on the large body of scientific documentation that already exists, must be based on the best available scientific

data and advice in this area and should comprise basic restrictions and reference levels on exposure to electromagnetic fields; recalling that only established effects have been used as the basis for the recommended limitation of exposure; advice on this matter has been given by the International Commission on Non-Ionising Radiation Protection (ICNIRP) and has been endorsed by the Commission's Scientific Steering Committee; the framework should be regularly reviewed and reassessed in the light of new knowledge and developments in technology and applications of sources and practices giving rise to exposure to electromagnetic fields;
(11) Such basic restrictions and reference levels should apply to all radiations emitted by electromagnetic fields with the exception of optical radiation and ionising radiation; for optical radiation the relevant scientific data and advice still require further consideration, and for ionising radiation Community provisions already exist;
(12) In order to assess compliance with the basic restrictions provided in this recommendation, the national and European bodies for standardisation (e.g. Cenelec, CEN) should be encouraged to develop standards within the framework of Community legislation for the purposes of the design and testing of equipment;
(13) Adherence to the recommended restrictions and reference levels should provide a high level of protection as regards the established health effects that may result from exposure to electromagnetic fields but such adherence may not necessarily avoid interference problems with, or effects on the functioning of, medical devices such as metallic protheses, cardiac pacemakers and defibrillators, cochlear implants and other implants; interference problems with pacemakers may occur at levels below the recommended reference levels and should therefore be the object of appropriate precautions which, however, are not within the scope of this recommendation and are dealt with in the context of legislation on electromagnetic compatibility and medical devices;
(14) In accordance with the principle of proportionality, this recommendation provides general principles and methods for the protection of members of the public while leaving it to the Member States to provide for detailed rules as regards the sources and practices which give rise to exposure to electromagnetic fields and the classification, as work-related or not, of conditions of exposure of individuals, in accordance with Community provisions concerning the safety and health protection of workers;
(15) Member States may, in accordance with the Treaty, provide for a higher level of protection than that set out in this recommendation;
(16) Measures by the Member States in this area, whether binding or non-binding, and the way in which they have taken account of this recommendation should be the object of reports at national and Community level;
(17) In order to increase awareness of the risks of, and measures of protection against, electromagnetic fields, Member States should promote the dissemination of information and rules of practice in this field, in particular with regard to the design, installation and use of equipment, so as to aim at obtaining levels of exposure that do not exceed the recommended restrictions;
(18) Attention should be paid to achieving appropriate communication and understanding regarding the risks related to electromagnetic fields, while taking into account public perceptions of such risks;
(19) The Member States should take note of progress made in scientific knowledge and technology with respect to non-ionising radiation protection, taking into account the aspect of precaution, and should provide for regular scrutiny and review with an assessment being made at regular intervals in the light of guidance issued by competent international organisations, such as the International Commission on Non-Ionising Radiation Protection,

HEREBY RECOMMENDS THAT:

I. For the purpose of this recommendation Member States should assign to the physical quantities listed in Annex I.A the meanings given to them therein.

II. Member States, in order to provide for a high level of health protection against exposure to electromagnetic fields, should:
(a) adopt a framework of basic restrictions and reference levels using Annex I.B as the basis;
(b) implement measures according to this framework, in respect of sources or practices giving rise to electromagnetic exposure of the general public when the time of exposure is significant with the exception of exposure for medical purposes where the risks and benefits of exposure, above the basic restrictions, must be properly weighed;
(c) aim to achieve respect of the basic restrictions given in Annex II for public exposure.

III. Member States, in order to facilitate and promote respect of the basic restrictions given in Annex II:
(a) should take into account the reference levels given in Annex III for exposure assessment purposes or, when they exist, as far as they are recognised by the Member State, European or national standards based on agreed scientifically proven measurement and calculation procedures designed to evaluate compliance with the basic restrictions;
(b) should evaluate situations involving sources of more than one frequency in accordance with the formulae set out in Annex IV, both in terms of basic restrictions and reference levels;
(c) may take into account criteria, where appropriate, such as duration of the exposure, exposed parts of the body, age and health status of the public.

IV. Member States should consider both the risks and benefits in deciding whether action is required or not, pursuant to this recommendation, when deciding on policy or adopting measures on exposure of members of the public to electromagnetic fields.

V. Member States, in order to increase understanding of risks and protection against exposure to electromagnetic fields should provide, in an appropriate format, information to the public on the health impact of electromagnetic fields and the measures taken to address them.

VI. Member States, in order to enhance knowledge about the health effects of electromagnetic fields, should promote and review research relevant to electromagnetic fields and human health in the context of their national research programmes, taking into account Community and international research recommendations and efforts from the widest possible range of sources.

VII. Member States, in order to contribute to the establishment of a consistent system of protection against risks of exposure to electromagnetic fields, should prepare reports on the experience obtained with measures that they take in the field covered by this recommendation and should inform the Commission thereof after a period of three years following the adoption of this recommendation, indicating how it has been taken into account in these measures,

HEREBY INVITES the Commission to
1. Work towards the establishment of European standards as referred to in section III(a), including methods of calculation and measure.
2. Encourage research into long and short-term effects of exposure to

electromagnetic fields at all relevant frequencies in the implementation of the current research framework programme.
3. Continue to participate in the work of international organisations competent in this field and promote the establishment of an international consensus in guidelines and advice on protective and preventive measures.
4. Keep the matters covered by this recommendation under review, with a view to its revision and updating, taking into account also possible effects, which are currently the object of research, including relevant aspects of precaution and to prepare a report, within five years, taking into account the reports of the Member States and the latest scientific data and advice.

Done at Brussels, 12 July 1999.

For the Council
The President
S. NIINISTÖ

([1]) OJC 175, 21.6.1999.
([2]) OJ C 205, 25.7.1994, p. 439.
([3]) OJ L 156, 21.6.1990, p. 14.
([4]) OJ L 348, 28.11.1992, p. 1.
([5]) OJC 77, 18.3.1993, p. 12 and,
OJC 230, 19.8.1994, p.3.

ANNEX I

DEFINITIONS
For the purposes of this recommendation, the term electromagnetic fields (EMF) includes static fields, extremely low frequency (ELF) fields and radiofrequency (RF) fields, including microwaves, encompassing the frequency range of 0 Hz to 300 GHz.

A. Physical quantities
In the context of EMF exposure, eight physical quantities are commonly used:
contact current (I_C) between a person and an object is expressed in amperes (A). A conductive object in an electric field can be charged by the field.
current density (J) is defined as the current flowing through a unit cross section perpendicular to its direction in a volume conductor such as the human body or part of it, expressed in amperes per square metre (A/m^2).
electric field strength is a vector quantity (E) that corresponds to the force exerted on a charged particle regardless of its motion in space. It is expressed in volts per metre (V/m).
magnetic field strength is a vector quantity (H), which, together with the magnetic flux density, specifies a magnetic field at any point in space. It is expressed in amperes per metre (A/m).
magnetic flux density is a vector quantity (B), resulting in a force that acts on moving charges, it is expressed in teslas (T). In free space and in biological materials, magnetic flux density and magnetic field strength can be interchanged using the equivalence $1\ A\ m^{-1} = 4\ \pi\ 10^{-7}\ T$.
power density (S) is the appropriate quantity used for very high frequencies, where the depth of penetration in the body is low. It is the radiant power incident perpendicular to a surface, divided by the area of the surface and is expressed in watts per square metre (W/m^2).
specific energy absorption (SA) is defined as the energy absorbed per unit mass of biological tissue, expressed in joules per kilogram (J/kg). In this recommendation it is used for limiting non-thermal effects from pulsed microwave radiation.
specific energy absorption rate (SAR) averaged over the whole body or over parts of

the body, is defined as the rate at which energy is absorbed per unit mass of body tissue and is expressed in watts per kilogram (W/kg). Whole body SAR is a widely accepted measure for relating adverse thermal effects to RF exposure. Besides the whole body average SAR, local SAR values are necessary to evaluate and limit excessive energy deposition in small parts of the body resulting from special exposure conditions. Examples of such conditions are: a grounded individual exposed to RF in the low MHz range and individuals exposed in the near field of an antenna.
Of these quantities, magnetic flux density, contact current, electric and magnetic field strengths and power density can be measured directly.

B. Basic restrictions and reference levels
For the application of restrictions based on the assessment of possible health effects of electromagnetic fields, differentiation should be made between basic restrictions and reference levels.

Note:
These basic restrictions and reference levels for limiting exposure have been developed following a thorough review of all published scientific literature. The criteria applied in the course of the review were designed to evaluate the credibility of the various reported findings; only established effects were used as a basis for the proposed exposure restrictions. Induction of cancer from long-term EMF exposure was not considered to be established. However, since there are safety factors of about 50 between the threshold values for acute effects and the basis restrictions, this recommendation implicitly covers possible long-term effects in the whole frequency range.
Basic restrictions. Restrictions on exposure to time-varying electric, magnetic, and electromagnetic fields which are based directly on established health effects and biological considerations are termed "basic restrictions". Depending upon the frequency of the field, the physical quantities used to specify these restrictions are magnetic flux density (B), current density (J), specific energy absorption rate (SAR), and power density (S). Magnetic flux density and power density can be readily measured in exposed individuals.
Reference levels. These levels are provided for practical exposure-assessment purposes to determine whether the basic restrictions are likely to be exceeded. Some reference levels are derived from relevant basic restrictions using measurements and/or computational techniques and some reference levels address perception and adverse indirect effects of exposure to EMFs. The derived quantities are electric field strength (E), magnetic field strength (H), magnetic flux density (B), power density (S), and limb current (I_L). Quantities that address perception and other indirect effects are (contact) current (IC) and, for pulsed fields, specific energy absorption (SA). In any particular exposure situation, measured or calculated values of any of these quantities can be compared with the appropriate reference level. Respect of the reference level will ensure respect of the relevant basic restriction. If the measured value exceeds the reference level, it does not necessarily follow that the basic restriction will be exceeded. Under such circumstances, however, there is a need to establish whether there is respect of the basic restriction.
Quantitative restrictions on static electric fields are not given in this recommendation. However, it is recommended that annoying perception of surface electric charges and spark discharges causing stress or annoyance should be avoided.
Some quantities such as magnetic flux density (B) and power density (S) serve both as basic restrictions and reference levels, at certain frequencies (see Annexes II and III).

ANNEX II

BASIC RESTRICTIONS

Depending on frequency, the following physical quantities (dosimetric/exposimetric quantities) are used to specify the basic restrictions on electromagnetic fields:

- between 0 and 1 Hz basic restrictions are provided for magnetic flux density for static magnetic fields (0 Hz) and current density for time-varying fields up to 1 Hz, in order to prevent effects on the cardiovascular and central nervous system,
- between 1 Hz and 10 MHz basic restrictions are provided for current density to prevent effects on nervous system functions,
- between 100 kHz and 10 GHz basic restrictions on SAR are provided to prevent whole-body heat stress and excessive localised heating of tissues. In the range 100 kHz to 10 MHz, restrictions on both current density and SAR are provided,
- between 10 GHz and 300 GHz basic restrictions on power density are provided to prevent heating in tissue at or near the body surface.

The basic restrictions, given in Table 1, are set so as to account for uncertainties related to individual sensitivities, environmental conditions, and for the fact that the age and health status of members of the public vary.

Table 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) (rms)	Whole Body Average SAR (W/Kg)	Localised SAR (head and trunk) (W/kg)	Localised SAR (limb) (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

Notes:
1. *f* is the frequency in Hz.
2. The basic restriction on the current density is intended to protect against acute exposure effects on central nervous system tissues in the head and trunk of the body and includes a safety factor. The basic restrictions for ELF fields are based on established adverse effects on the central nervous system. Such acute effects are essentially instantaneous and there is no scientific justification to modify the basic restrictions for exposure of short duration. However, since the basic restriction refers to adverse effects on the central nervous system, this basic restriction may permit higher current densities in body tissues other than the central nervous system under the same exposure conditions.
3. Because of electrical inhomogeneity of the body, current densities should be averaged over a cross section of 1 cm^2 perpendicular to the current direction.
4. For frequencies up to 100 kHz, peak current density values can be obtained by multiplying the rms value by $\sqrt{2}$ (~1.414). For pulses of duration t_p the equivalent frequency to apply in the basic restrictions should be calculated as $f = 1/(2t_p)$.
5. For frequencies up to 100 kHz and for pulsed magnetic fields, the maximum current density associated with the pulses can be calculated from the rise/fall times and the maximum rate of change of magnetic flux density. The induced current density can then be compared with the appropriate basic restriction.
6. All SAR values are to be averaged over any six-minute period.
7. Localised SAR averaging mass is any 10g of contiguous tissue; the maximum SAR so obtained should be the value used for the estimation of exposure. These 10g of tissue are intended to be a mass of contiguous tissue with nearly homogeneous electrical properties. In specifying a contiguous mass of tissue, it is recognised that this concept can be used in computational dosimetry but may present difficulties for direct physical measurements. A simple geometry such as cubic tissue mass can be used provided that the calculated dosimetric quantities have conservative values relative to the exposure guidelines.
8. For pulses of duration t_p the equivalent frequency to apply in the basic restrictions should be calculated as $f = 1/(2t_p)$. Additionally, for pulsed exposures, in the frequency range 0,3 to 10 GHz and for localised exposure of the head, in order to limit and avoid auditory effects caused by thermoelastic expansion, an additional basic restriction is recommended. This is that the SA should not exceed 2mJ kg^{-1} averaged over 10 g of tissue.

ANNEX III

REFERENCE LEVELS

Reference levels of exposure are provided for the purpose of comparison with values of measured quantities. Respect of all recommended reference levels will ensure respect of basic restrictions.
If the quantities of measured values are greater than the reference levels, it does not necessarily follow that the basic restrictions have been exceeded. In this case, an assessment should be made as to whether exposure levels are below the basic restrictions.
The reference levels for limiting exposure are obtained from the basic restrictions for the condition of maximum coupling of the field to the exposed individual, thereby providing maximum protection. A summary of the reference levels is given in Tables 2 and 3. The reference levels are generally intended to be spatially averaged values over the dimension of the body of the exposed individual, but with the important proviso that the localised basic restrictions on exposure are not exceeded.
In certain situations where the exposure is highly localised, such as with hand-held telephones and the human head, the use of reference levels is not

appropriate. In such cases respect of the localised basic restriction should be assessed directly.
Field levels

Table 2

Reference levels for electric, magnetic and electromagnetic fields (0 Hz to 300 GHz, unperturbed rms 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)
0-1 Hz	—	$3{,}2 \times 10^4$	4×10^4	—
1-8 Hz	10 000	$3{,}2 \times 10^4 / f^2$	$4 \times 10^4 / f^2$	—
8-25 Hz	10 000	$4\,000 / f$	$5\,000 / f$	—
0,025-0,8 kHz	$250 / f$	$4 / f$	$5 / f$	—
0,8-3 kHz	$250 / f$	5	6,25	—
3-150 kHz	87	5	6,25	—
0,15-1 MHz	87	$0{,}73 / f$	$0{,}92 / f$	—
1-10 MHz	$87 / f^{1/2}$	$0{,}73 / f$	$0{,}92 / f$	—
10-400 MHz	28	0,073	0,092	2
400-2 000 MHz	$1{,}375\, f^{1/2}$	$0{,}0037\, f^{1/2}$	$0{,}0046\, f^{1/2}$	$f/200$
2-300 GHz	61	0,16	0,20	10

Notes:
1. *f* as indicated in the frequency range column.
2. For frequencies between 100 kHz and 10 GHz, S_{eq}, E^2, H^2 e B^2 are to be averaged over any six-minute period.
3. For frequencies exceeding 10 GHz, S_{eq}, E^2, H^2 e B^2 are to be averaged over any $68/f^{1.05}$ -minute period (*f* in GHz).
4. No E-field value is provided for frequencies <1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m. Spark discharges causing stress or annoyance should be avoided.

Note:

No higher reference levels on exposure to ELF fields are provided when exposures are of short duration (see Note 2 of Table 1). In many cases, where the measured values exceed the reference level, it does not necessarily follow that the basic

restriction will been exceeded. Provided that adverse health impacts of indirect effects of exposure (such as micro-shocks) can be avoided, it is recognized that the general-public reference levels can be exceeded provided that the basic restriction on the current density is not surpassed. In many pratical exposure situations external ELF fields at the reference levels will induce current densities in the central nervous-system tissues that are below the basic restrictions. It is also recognized that a number of common devices emit localised fields in excess of the reference levels. However, this generally occurs under conditions of exposure where the basic restrictions are not exceeded because of weak coupling between the field and the body.

For peak values, the following reference levels apply to the E-field strength (V/m), H-field strength (A/m) and B-field (μT):

— for frequencies up to 100 kHz, peak reference values are obtained by multiplying the corresponding rms values by $\sqrt{2}$ (~1.414). For pulses of duration t_p, the equivalent frequency to apply should be calculated as $f = 1 / (2t_p)$,

— for frequencies between 100 kHz and 10 MHz, peak reference values are obtained by multiplying the corresponding rms values by 10a, where $a = [0{,}665 \log (f/10^5) + 0{,}176]$, f in Hz

— for frequencies between 10 MHz and 300 GHz, peak reference values are obtained by multiplying the corresponding rms values by 32.

Note:
Generally, with regard to pulsed and/or transient fields at low frequencies, there are frequency-dependent basic restrictions and reference levels from which a hazard assessment and exposure guidelines on pulsed and/or transient sources can be derived. A conservative approach involves representing a pulsed or transient EMF signal as a Fourier spectrum of its components in each frequency range, which can then be compared with the reference levels for those frequencies. The summation formulae for simultaneous exposure to multiple frequency fields can also be applied for the purposes of determining compliance with the basic restrictions.
Although little information is available on the relation between biological effects and peak values of pulsed fields, it is suggested that, for frequencies exceeding 10 MHz, S_{eq} as averaged over the pulse width should not exceed 1000 times the reference levels or that field strengths should not exceed 32 times the fields strength reference levels. For frequencies between about 0,3 GHz and several GHz and for localised exposure of the head, in order to limit or avoid auditory effects caused by thermoelastic expansion, the specific absorption from pulses must be limited. In this frequency range, the threshold SA of 4-16 mJ kg^{-1} for producing this effect corresponds, for 30μs pulses, to peak SAR values of 130-520 W kg^{-1} in the brain. Between 100 kHz and 10 MHz, peak values for the fields strengths are obtained by interpolation from the 1,5-fold peak at 100 kHz to the 32-fold peak at 10 MHz.
Contact currents and limb currents
For frequencies up to 110 MHz additional reference levels are recommended in order to avoid hazards due to contact currents. The contact current reference levels are presented in Table 3. The reference levels on contact current were set to account for the fact that the threshold contact currents that elicit biological responses in adult women and children are approximately two-thirds and one-half, respectively, of those for adult men.

Table 3

Reference levels for contact currents from conductive objects (f in kHz)

Frequency range	Maximum contact current (mA)
0 Hz to 2,5 kHz	0,5
2,5 kHz to 100 kHz	$0{,}2\,f$
100 kHz to 110 MHz	20

For the frequency range 10 MHz to 110 MHz, a reference level of 45 mA in terms of current through any limb is recommended. This is intended to limit the localised SAR over any six-minute period.

ANNEX IV

EXPOSURE FROM SOURCES WITH MULTIPLE FREQUENCES

In situations where simultaneous exposure to fields of different frequencies occurs, the possibility that these exposures will be additive in their effects must be considered. Calculations based on such additivity should be performed separately for each effect; thus separate evaluations shoud be made for thermal and electrical stimulation effects on the body.
Basic restrictions
In the case of simultaneous exposure to fields of different frequencies, the following criteria should be satisfied in terms of the basic restrictions.
For electric stimulation, relevant for frequencies from 1 Hz up to 10 MHz, the induced current densities should be added according to:

$$\sum_{i=1\ \mathrm{Hz}}^{10\ \mathrm{MHz}} \frac{J_i}{J_{L,i}} \leq 1$$

For thermal effects, relevant from 100 kHz, specific energy absorption rates and power densities should be added according to:

$$\sum_{i=100\ \mathrm{kHz}}^{10\ \mathrm{GHz}} \frac{\mathbf{SAR}_i}{\mathbf{SAR}_L} + \sum_{i>10\ \mathrm{GHz}}^{300\ \mathrm{GHz}} \frac{\mathbf{S}_i}{\mathbf{S}_L} \leq 1$$

where

J_i is the current density at frequency i;

$J_{L,i}$ is the current density basic restriction at frequency i as given in Table 1;

SAR_i is the SAR caused by exposure at frequency i;

SAR_L is the SAR basic restriction given in Table 1;

S_i is the power density at frequency i;

S_L is the power density basic restriction given in Table 1.

Reference levels

For application of the basic restrictions, the following criteria regarding reference levels of field strengths should be applied.
For induced current densities and electrical stimulation effects, relevant up to 10 MHz, the following two requirements should be applied to the field levels:

$$\sum_{i=1\,Hz}^{1\,MHz} \frac{E_i}{E_{L,i}} + \sum_{i>1\,MHz}^{10\,MHz} \frac{E_i}{a} \leq 1$$

and

$$\sum_{j=1\,Hz}^{150\,kHz} \frac{H_j}{E_{L,j}} + \sum_{j>150\,kHz}^{10\,MHz} \frac{H_j}{b} \leq 1$$

where

E_i is the electric field strength at frequency i;
$E_{L,i}$ is the electric field strength reference level from Table 2;
H_j is the magnetic field strength at frequency j;
$H_{L,j}$ is the magnetic field strength reference level from Table 2;
a is 87 V/m and b is 5 A/m (6,25 µT).

Compared to the ICNIRP guidelines ([1]), which deal with both occupational and general public exposure, cut off points in the summations correspond to exposure conditions for members of the public.

The use of the constant values (a and b) above 1 MHz for the electric field and above 150 kHz for the magnetic field is due to the fact that the summation is based on induced current densities, and should not be mixed with thermal effect circumstances. The latter forms the basic for $E_{L,i}$ e $H_{L,j}$ above 1 MHz and 150 kHz respectively, found in Table 2.
For thermal effect circumstances, relevant from 100 kHz, the following two requirements should be applied to the field levels:

$$\sum_{i=100\,\text{kHz}}^{1\,\text{MHz}} \left(\frac{E_i}{c}\right)^2 + \sum_{i>1\,\text{MHz}}^{300\,\text{GHz}} \left(\frac{E_i}{E_{L,i}}\right)^2 \leq 1$$

,

$$\sum_{j=100\,\text{kHz}}^{150\,\text{kHz}} \left(\frac{H_j}{d}\right)^2 + \sum_{j>150\,\text{kHz}}^{300\,\text{GHz}} \left(\frac{H_j}{H_{L,j}}\right)^2 \leq 1$$

and where
E_i is the electric field strengthen at frequency i;
$E_{L,i}$ is the electric field reference level from Table 2;
H_j is the magnetic field strength at frequency j;
$H_{L,j}$ is the magnetic field reference level derived from Table 2;
c is $87/f^{1/2}$ V/m and d $0{,}73/f$ A/m.

Again, compared to the ICNIRP guidelines some cut-off points have been adjusted for public exposure only.
For limb current and contact current, respectively, the following requirements should be applied:

$$\sum_{k=10\,\text{MHz}}^{110\,\text{MHz}} \left(\frac{I_k}{I_{l,k}}\right)^2 \leq 1 \qquad \sum_{n>1\,\text{Hz}}^{110\,\text{MHz}} \left(\frac{I_n}{H_{c,n}}\right)^2 \leq 1$$

where
I_k is the limb current component at frequency k;
$I_{L,k}$ is the reference level for limb current, 45 mA;
I_n is the contact current component at frequency n;
$I_{C,n}$ is the reference level for contact current at frequency (see Table 3).
The above summation formulae assume worst-case phase conditions among the fields from the multiple sources. As a result, typical exposure situations may in practice result in less restrictive exposure levels than indicated by the above formulae for the reference levels.

([1]) International Commission on Non-Ionising Radiation Protection. Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz). Health Physics 74(4): 494-522(1998).
Response to questions and comments on ICNIRP. Health Physics 75(4): 438-439 (1998).