

## EU directive for workers

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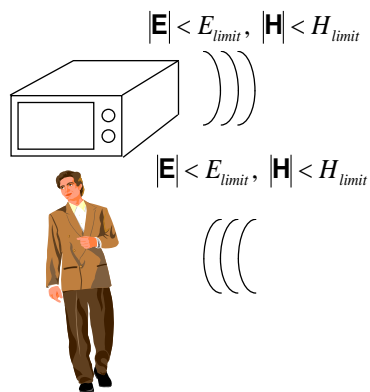


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### What is intention of norms for EM-fields?

#### ■ Classification of norms

- **Emission norms:**  
limits for maximal leakage of radiation transmitted by equipment  
⇒ characteristic of equipment
- **Exposure norms:**  
maximum limits for intensity of electromagnetic radiation where persons under certain conditions are exposed  
⇒ characteristic for an environment



## ■ International

- ICNIRP International Commission on Non-Ionizing Radiation Protection (guidelines 1998, now changes for low frequencies 2010)
- WHO (World Health Association): follows ICNIRP guidelines with some minor deviations
- IARC: International Agency for Research on Cancer
  - ◆ RF class 2B: possible carcinogenic since May 2011

## ■ European

- EU: recommendation of the Council of the member states of the EU (12-07-1999); Follows ICNIRP-recommendation (not European directive!)
- EU directive for workers

## ■ Basic restriction

- Restrictions on exposure that are based directly on established health effects, physical quantity related to biological effect
  - ◆ Current density  $J$ :  $f < 10$  MHz (new: internal E-field)
  - ◆ Current  $I$ :  $f < 110$  MHz
  - ◆ SAR:  $100$  kHz  $< f < 10$  GHz
  - ◆ SA (Specific energy Absorption = SAR x time)  $300$  MHz  $< f < 10$  GHz (pulsed fields)
  - ◆ Power density  $S$ :  $10$  GHz  $< f < 300$  GHz
- Difficult to measure in living beings

## ■ Reference levels

- Physical quantity characterizing exposure in the human body: electric or magnetic field, power density
- Easier to measure than SAR
- Measured value < reference level  
    ➡ basic restrictions satisfied
- Measured value > reference level  
    ➡ Not necessarily that basic restriction is exceeded:  
    e.g., mobile phone (< 2 W/kg), anti-theft gate,....

**ICNIRP norms (1998, 2010)**  
**Used in most EU countries**

### ■ 1 Hz < f < 10 MHz

- Limits for current density (internal electric field since 2010) prevent **effects on the central nervous system** (CNS)

### ■ 100 kHz < f < 10 GHz

- Limits for SAR prevent whole-body heat stress and excessive localized tissue heating: **thermal effects**

### ■ 10 GHz < f < 300 GHz

- Limits for power density prevent **excessive heating in skin** tissues and tissues close to the body surface

### ■ Occupational exposure: adults that are

- exposed occupationally
- generally exposed under known conditions
  - ◊ Healthy and not specially sensitive to EM fields
- and are trained to be aware of potential risk and to take appropriate precautions

### ■ General public: individuals of all ages that

- Have varying health conditions
- Can be sensitive to EM fields
- Are exposed to circumstances that are unknown by the individual
- Do not take appropriate precautions

### ■ Selected safety factors

- 10 for occupational exposure
- 50 for general public

### ■ NOT EU definition of workers....

## European directive for workers

### DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on the minimum health and safety requirements  
regarding the exposure of workers to the risks arising  
from physical agents (**electromagnetic fields**)  
(XXth individual Directive within the meaning of Article  
16(1) of Directive 89/391/EEC)

- In 1989, the European Commission developed a directive to protect workers against “physical agents” : Framework directive 1989/391/EEC
- 4 Directives were developed
  - Vibrations (2002/44/EC)
  - Sound pollution (2003/10/EC)
  - Electromagnetic fields (EMF) (2004/40/EC)
  - Optical radiation (2006/25/EC)

- **Applicable on all 4 directives**
- **Basis principles: obligations for employers**
  - Determination of exposure and assessment of risk
  - Measures to prevent or reduce risks
    - ◆ **Ensure that exposure limits are never exceeded**
  - Information and teaching for employees
  - Health inspection

- **Goal: protection of workers with respect to acute effects of electromagnetic exposure**
- **Defines exposure limits for EMF for frequencies up to 300 GHz**
  - Limits almost identical to ICNIRP guidelines which are based on acute effects (CNS stimulation, temperature effects, etc.)
  - ICNIRP 1998 and 2010
- **Explicite statement: long-term effects (cancer induction) are excluded from the objective of the directive**

- EMF directive started at 30 April 2004. First member states could implement directive until 30 April 2008
- New 2008/46/EC has postponed implementation to 30 April 2012
- **Again postponed to 2013 (now final 2013)**
  - Countries have 3 years to implement legislation: 2016
  - Based on ICNIRP 1998 and 2010 for workers
  - List of sources where no measures are needed
  - Directive 89/391/EEC
  - Probably final version in April 2013
    - ◆ Adopted before October 31, 2013
    - ◆ Transposition in Belgian law before October 31 2016



1. Directive is applicable on all working places, no special exclusions for medical environments
2. Not only occupational exposure as in ICNIRP

- **Protest of MRI (Magnetic Resonance Imaging) industry because MRI would be impossible**
  - **Protest of Armed Forces (NATO)**
  - **Terminology**
    - Exposure limit values (ELV): ICNIRP occupational basic restrictions
      - ◆ **May never be exceeded**
    - Action values (AV): Based on ICNIRP occupational reference values
      - ◆ **Below AV then definitely below ELV**
      - ◆ **Above AV means possibly above ELV**
- Employer must take action**

