

Exposure assessment / installations

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Electromagnetic sources

■ Electric equipment generates electromagnetic waves

- Equipment for wireless communication



- BUT also other sources generate RF radiation

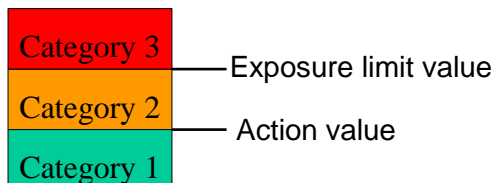


■ Classification of RF sources is required to do a risk analysis

- Assessment of risk
- Define safety rules (e.g. safety distances / desactivation during maintenance)
- Advise employees
- Satisfy EU directive

■ Working environments can be divided into 3 categories (based on a study of Bolte and Pruppers)

- Category 1
 - ◊ Under normal conditions the action values will not be exceeded
- Category 2
 - ◊ Action values can be exceeded but the exposure limit values will not be exceeded under normal conditions
- Category 3
 - ◊ Exposure limit values can be exceeded



Classification

■ Classify equipment in the right category

- 1) Inventory of all equipment
- 2) Exposure assessment around each source
- 3) Risk analysis for each source
- 4) **FINAL GOAL:** DATABASE + SOFTWARE tool to assess the exposure / risks around each kind of source

Inventory of all equipment

- Document ‘Electromagnetic sources’ is available
- Classify equipment in different sectors and subdivide into different categories
 - Industrial sector (electrochemical processes, electric welding, ...)
 - Electricity sector (electricity production, distribution, ..)
 - Broadcasting sector (radio and television)
 - Telecommunications sector (base stations, WiFi, ...)
 - Radar
 - Aviation (surveillance, ...)
 - Medical sector (MRI,...)
 - Trade and services (metal detectors, ...)
 - Public transportation (Transformers in trains, ...)
 - Offices (computer screens, ...)
 - Miscellaneous (electronic ballasts of fluorescent lamps, ...)

TO DO

- Complete the checklist ‘Electromagnetic sources’ (already sent by email) ^{*2.4 - Telecommunications sector†}

Category ^a	Source available ^a	Source ^a	Typical frequency ^a	Other general specifications ^a	Remarks (e.g. actual specifications) ^a
Personal handheld GSM devices ^a	<input type="checkbox"/>	Mobile phones: GSM900, GSM1800, UMTS, LTE ^a	900 MHz / 1800 MHz / 2100 MHz / 2400 MHz ^a	Powers of 2W for GSM900 and 1W for GSM1800 ^a	
Base stations ^a	<input type="checkbox"/>	GSM900 base station ^a	880 MHz - 960 MHz ^a		
	<input type="checkbox"/>	GSM1800 base station ^a	1770 MHz - 1880 MHz ^a		
	<input type="checkbox"/>	UMTS base station ^a	1920 MHz - 2170 MHz ^a		
	<input type="checkbox"/>	LTE base station ^a	2400 MHz - 2483.5 MHz / 1800 MHz band ^a		
Cordless phones ^a	<input type="checkbox"/>	Cordless phones + cordless base stations ^a	1880 MHz - 1900 MHz ^a	Powers 250 mW ^a	
WiFi ^a	<input type="checkbox"/>	WiFi access points ^a	2.4 GHz to 2.5 GHz ^a	Powers 100 mW ^a	
	<input type="checkbox"/>	WiFi access points ^a	5.150 GHz - 5.825 GHz ^a	Powers 200 mW ^a	

- Add the specifications of each available source
 - Input Power
 - Frequency
 - Kind of signal (continuous / pulsed)
 - Provide all technical documents of the present sources

Exposure

■ Exposure around electric equipment

- Measurement projects + Literature
 - ◆ Measurement projects e.g. Belgocontrol, Infrabel, BIM, FOD, LNE, ...
 - ◆ International papers and studies

■ Additional measurements

- New sources
- Sources for which less information is available
- Specific equipment

■ **Two types of measurements**

- **Broadband measurements**
 - ◆ **Frequency range: 100 kHz – 40 GHz**



- **Smallband measurements**
 - ◆ **Frequency range: 5 Hz – 26.5 GHz**
 - ◆ **Using different measurement devices:**

- EHP-50C: 5 Hz – 100 kHz
- EHP-200: 9 kHz – 30 MHz
- Spectrum analyzer + TS-EMF probe: 30 MHz – 3 GHz
- Spectrum analyzer + R&S probe: 2 GHz – 6 GHz
- Spectrum analyzer + HF907OM: 800 MHz – 26.5 GHz



France - Wallonie - Vlaanderen

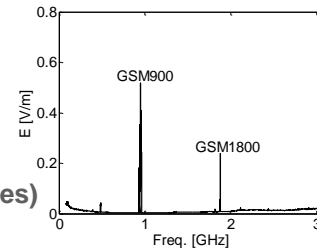
■ **Broadband measurements**

- 1 single value for broad frequency range
- Pro
 - ◆ **Fast, mobile**
 - ◆ **No post-processing**
 - ◆ **User friendly**
 - ◆ **First idea of present field value**
- Contra
 - ◆ **Low sensitivity**
 - ◆ **No identification of the sources**
(no information: frequency \leftrightarrow field value)
 - ◆ **1 Measurement procedure independent of the technology**



■ **Smallband measurements**

- 1 value for each existing signal
- PRO
 - ◆ Settings are adjustable => measurement procedure depend on the procedure
 - ◆ Identification of the source
 - ◆ Field contribution per source
- Contra
 - ◆ Time consuming (measurement of 1 signal takes about 5 minutes)
 - ◆ Complex – no handheld device
 - ◆ No direct result - Post processing needed



- **Identification of sources**
 - Complete check list
 - Send back by email before the end of March?
 - If necessary add sources
- **Suggestions for field measurements**
- **Any remarks are welcome**