IOSH Webinar

Control of Electromagnetic Fields at work regulations 2016

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• All employers have a duty to assess risks arising from work undertaken and to put in place protective or preventive measures to reduce the risks they identify.

• The EMF Directive and resulting Control of EMF at Work regulations (CEMFAW regs) are intended to help employers comply with these duties for the specific case of EMF in the workplace.

• EMF are defined as static electric, static magnetic and time varying electric, magnetic and electromagnetic fields with frequencies up to 300 GHz.
Time varying EM wave (far field)

Vertical polarisation shown
The electromagnetic spectrum
What are EMF?

- Electromagnetic Fields (EMF) are defined by the EMF Directive as static electric, static magnetic and time-varying electromagnetic fields with frequencies up to 300 GHz.

Frequency

<table>
<thead>
<tr>
<th>Electricity</th>
<th>Radio</th>
<th>Microwave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance welding</td>
<td>Medical equipment</td>
<td>Radar</td>
</tr>
<tr>
<td>Induction heating</td>
<td>Dielectric welding</td>
<td>Microwave heating/drying</td>
</tr>
<tr>
<td>Electric trains &amp; trams</td>
<td>Semiconductor processing</td>
<td></td>
</tr>
<tr>
<td>Electrical circuits &gt;100A</td>
<td>Telecommunications</td>
<td></td>
</tr>
</tbody>
</table>

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## Power

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Power Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction heating</td>
<td>1200kW</td>
</tr>
<tr>
<td>TV transmitter</td>
<td>50 - 500kW</td>
</tr>
<tr>
<td>FM national broadcast radio</td>
<td>250kW</td>
</tr>
<tr>
<td>Industrial dielectric heater</td>
<td>20kW</td>
</tr>
<tr>
<td>DAB</td>
<td>0.1 - 10kW</td>
</tr>
<tr>
<td>Domestic microwave oven</td>
<td>800W</td>
</tr>
<tr>
<td>Macrocell Base Station</td>
<td>25 - 70W</td>
</tr>
<tr>
<td>Mobile radio</td>
<td>5 - 50W</td>
</tr>
<tr>
<td>CB radio</td>
<td>4W</td>
</tr>
<tr>
<td>Smart meter</td>
<td>1W</td>
</tr>
<tr>
<td>Telecoms microwave link</td>
<td>0.1 - 1W</td>
</tr>
<tr>
<td>GSM mobile phone</td>
<td>0.002 – 0.25W</td>
</tr>
<tr>
<td>Wi-Fi</td>
<td>0.1W</td>
</tr>
<tr>
<td>DECT handset</td>
<td>0.01W</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>0.0025W</td>
</tr>
</tbody>
</table>

All values are approximate
Intentional and unintentional emitters

• Intentional: Where the EMF is the product you require and use; Broadcasting, Telecommunications, Radar, RFID, Wi-Fi,

• Organisations that create and use these sources of EMF have typically managed them well in the past, good technology available to assist for example Nardalerts (Personal RF monitors)

• Unintentional: Where the EMF is a by product and not wanted or needed. Often Magnetic field produced by high electrical current flow; Welding, Electricity supply and distribution, chemical processes,

• EMF may have been overlooked in the past and not assessed or considered.
Direct effects

- Vertigo & nausea with movement
- Sensory, nerve & muscle stimulation
- Heating of whole body or localised tissues
- Heating of surface tissues

Note the biological response is non-stochastic i.e. effects occur at relatively high field intensities and will not be apparent below certain thresholds.
Indirect effects

Indirect effects occur where the presence of an object within an electromagnetic field may become the cause of a safety or health hazard:

- interference with medical electronic equipment
- interference with active implanted medical devices (AIMD) such as pacemakers or defibrillators
- interference with passive implants e.g. artificial joints, metallic plates, pins etc.
- effects on shrapnel, body piercings etc.
- projectile risk (typically around MRI equipment)
- electric shocks or burns from contact currents when a person touches a conductive object in an electromagnetic field (when one is grounded and the other is not)
- EEDs & flammable atmospheres
Articles of the EMF Directive

Start

Article 4
Assessment of risks & determination of exposure

Are EMF a risk to health & safety?

Yes

Article 5
Provisions aimed at reducing or avoiding risks

No

Article 3
Exposure Limit Values & Action Levels

No further action under the EMF Directive

Article 6
Worker information & training

Article 7
Consultation & participation of workers

General duties under the Framework Directive

Article 8
Health surveillance (according to national law & practice)
Introduction; Practical Guide

• Provides a list of generic work activities where fields are so weak that there is no risk so once employers have performed an initial risk assessment no further action will be required.

• Lists work activities that are likely to require more detailed assessments for workers and workers considered to be at particular risk i.e. those with body worn medical devices and pregnant workers.
Workers at particular risk

- Workers wearing active implanted medical devices
- Workers with passive implanted medical devices
- Workers with medical devices worn on the body e.g. hormone infusion pumps
- Pregnant workers
- Workers in any of these groups may be at greater risk from EMF than the general working population and should be subject to a specific risk assessment.
- In considering whether workers may be at particular risk, employers should give consideration to the frequency, level and duration of exposure
Practical Guide

• There will be some potential exposure scenarios that are highly specific or very complex that are beyond the scope of the guide.

• Use of the non-binding Practical Guide does not necessarily ensure compliance with statutory EMF protection requirements in EU member states. The rule of law by which member states have transposed the EMF Directive take precedence. So check for differences between this and UK regs CEMFAW.
UK regulations

UK – Control of EMF at Work Regulations. Employers are able to refer to ‘any credible information’ to help with their exposure assessments e.g.

- Emission information from manufacturers
- Industry standards and guidance
- EU Practical Guide
- Guidance produced by the HSE

For workers at particular risk it is implied that the employer can only manage particular risks if informed about them i.e. workers at particular risk should know to declare relevant information.

HSE are minded to allow exemptions (derogations) as long as risk is being managed. Eg MRI, Military, General Exemption (needs to be applied for)
### Examples of possible outcomes & severities

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Severity</th>
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<tr>
<td>Feelings of vertigo &amp; nausea</td>
<td>Minor</td>
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<tr>
<td>Perceived light flashes (phosphenes)</td>
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<tr>
<td>Tingling feeling or pain (nerve stimulation)</td>
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<td>Small increase in tissue temperature</td>
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<td>Microwave hearing</td>
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<td>Movement of ferromagnetic projectiles in static magnetic fields</td>
<td>Serious</td>
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<tr>
<td>Interference with implanted medical devices</td>
<td></td>
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<tr>
<td>Large increases in tissue temperature</td>
<td></td>
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<tr>
<td>Ignition of flammable atmospheres</td>
<td>Fatal</td>
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<td>Initiation of detonators</td>
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</table>
The assessment process

• If risks from EMF in the workplace are low then no further action is required. Employers should record that they have reviewed their workplace and reached this conclusion.
• If risks from EMF are not low, or the risk is unknown, employers should follow a process to assess the risk and implement appropriate precautions, if necessary.
• It is possible that the conclusion is that there is no significant risk. In this case the assessment should be recorded and the process goes no further.
• To assist with the risk assessment generally and specifically to assess compliance with ALs or ELVs values, employers may need information on the level of EMF. This may be available from databases or manufacturers or it may be necessary to perform calculations or measurements.
• Preventative and protective measures may need to be taken where it is necessary to reduce the risk.
EMF Directive magnetic field (1Hz to 10 MHz)

- EMF Directive low Als (µT)
- EMF Directive high Als (µT)
- Als for limbs, localised Magnetic Field (µT)
- Council Recommendation 1999/519/EC (µT)

Frequency (Hz) vs. µT

LinkMicrotek logo
Electric field ALs 100 kHz to 300 GHz

![Graph showing electric field strength ALs(E) and Electric field strength Low ALs (to 10 MHz)](chart)

- **Electric field strength ALs(E)**
- **Electric field strength Low ALs (to 10 MHz)**

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>100000</th>
<th>1000000</th>
<th>10000000</th>
<th>400000000</th>
<th>2000000000</th>
<th>6000000000</th>
<th>3E+11</th>
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<tbody>
<tr>
<td>V/m</td>
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<td>1</td>
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<td>3</td>
<td>30</td>
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Specific assessments

• Examples of equipment likely to require specific assessment for workers with active implanted medical devices (AIMD):
  DECT cordless phones, mobile phones, walkie talkies, electrical garden appliances, article surveillance/RFID systems, work on generators, work on wind turbines, electrostatic painting equipment, glue guns.....

• If a situation is identified that is not covered by the practical guide the first step is to gather as much information as possible from equipment manuals etc. or by contacting equipment manufacturers and trade associations (manufacturers are obliged to consider EMF as part of the CE marking process).

• If it is not possible or easy enough to obtain sufficient information it may be necessary to perform an assessment by measurement or calculation.
Exposure assessments

• You don’t always need to perform measurements but if you do the process is often surprisingly easy.

• Equipment can often provide a readout in % of the Action Level automatically taking frequency into account.

• Personal monitors are often used to reduce risk of over exposure.
Summary

- Some action is necessary, but usually risk assessments will be simple & most if not all requirements will already be in place.
- Make sure you obtain as much information as possible, measurements (or calculations) are not always required but can be fairly straightforward if they are.
- Remember to consider workers at particular risk.
- Remember to consider indirect effects, can be catastrophic.
- Preventive and protective measures are often common sense, don’t overlook the obvious.
- Make sure risk assessment, procedures etc. are well documented, communicated and applied by workers i.e. workers know their obligations.
- Ensure assessments are reviewed and updated as required.
Last but not least

• EMF safety issues are usually easy to resolve, rather than rely on external advice try to take some ownership in-house, we are more than happy to help that process.
• Guide for SMEs is an excellent place to start.
• If necessary, most measurements are easy to perform.
• Remember that basic risk assessment (sanity check); is the equipment high power, how close to people have to get to the source, how long to they have to be there.
• Remember to consider workers at particular risk
Any Questions?

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