Consultation on the implementation of Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents - electromagnetic fields (EMF)

This consultative document is issued by the Health and Safety Executive (HSE). HSE is undertaking this consultation in compliance with its duty to consult under section 50 (3) of the Health and Safety at Work Act 1974.

Comments should be sent to:

The Radiation Policy Team,
Health and Safety Executive
2.1.42 Redgrave Court, Merton Rd,
Bootle, Merseyside,
L20 7HS

Email: emfconsultation@hse.gsi.gov.uk

To reach there no later than 3 December 2015

The Executive tries to make its consultation procedure as thorough and open as possible. Responses to this consultation document will be lodged in the Health and Safety Executive's Knowledge Centre after the close of the consultation period where they can be inspected by members of the public.

Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004 (EIR)). Statutory Codes of Practice under the FOIA and EIR also deal with confidentiality obligations, among other things.

If you would like us to treat any of the information you provide, including personal information, as confidential, please explain your reasons for this in your response. If we receive a request under FOIA or EIR for the information you have provided, we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will be disregarded for these purposes. Requests for confidentiality should be made explicit within the body of the response.

HSE will process all personal data in accordance with the DPA. This means that personal data will not normally be disclosed to third parties and any such disclosures will only be made in accordance with the Act.

CD276

Consultative Document

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Consultation by the Health and Safety Executive

The Health and Safety Executive (HSE) consults stakeholders to seek their views on its proposals. It believes that public consultation provides an open and transparent approach to its decision-making. Following consultation, HSE will make a recommendation to the Secretary of State on the best way forward.

Code of Practice on Consultation

HSE is committed to best practice in consultation and to the Government's Consultation Principles. The Government is improving the way it consults by adopting a more proportionate and targeted approach, so that the type and scale of engagement is proportional to the potential impacts of the proposal. The emphasis is on understanding the effects of a proposal and focussing on real engagement with key groups rather than following a set process.

Additional guidance can be found at:
https://www.gov.uk/government/publications/consultation-principles-guidance

How to respond

A summary of the proposal and the questionnaire can be found at: http://www.hse.gov.uk/consult/condocs/cd276.htm

Our preferred method for receiving comments is via the online questionnaire. This is the most effective way for us to fully consider and analyse responses.

However, you can also respond by:

- Completing the word questionnaire and sending it by email to: emfconsultation@hse.gsi.gov.uk
- Downloading the word questionnaire and sending a written response to: HSE - The Radiation Policy Team, 2.1.42, Redgrave Court, Merton Road, Bootle, Merseyside, L20 7HS

We would be grateful if you could send an email address when you provide your response. This will allow us to inform you when HSE intends to publish information concerning consultation responses on its websites.

Responses must be received by 3 December 2015.

If you require a more accessible format of this document please send details to creative@hse.gsi.gov.uk and your request will be considered.

What happens next?

We will acknowledge all responses and give full consideration to their substance in the subsequent proposals. We may contact you again if, for example, we have a query in respect of your response.

We will also tell you when we publish information concerning the consultation responses. We will provide a summary of who responded to this consultation and a summary of the views expressed about each question. This information will be placed on the HSE website.

Quality assurance and complaints

If you have any complaints about the consultation process (as opposed to comments about the issues, which are the subject of the consultation) please address them to:

Jason Cole
HSE Consultation Coordinator
7th Floor, Caxton House
6-12 Tothill Street
London
SW1H 9NA
Email: jason.cole@hse.gsi.gov.uk

We aim to reply to all complaints within 10 working days. If you are not satisfied with the outcome, you can raise the matter with HSE's Chief Executive Dr Richard Judge at Health and Safety Executive, Redgrave Court, Merton Road, Bootle, Merseyside, L20 7HS or the Information Commissioner's Office at Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF. You can also write and ask your MP to take up your case with us or with Ministers. Your MP may also ask the independent Parliamentary Commissioner for Administration (the Ombudsman) to review your complaint.

Purpose of this consultation

1 This consultation relates to implementation of Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields). This is known as the EMF Directive within the rest of this document. The Health and Safety Executive (HSE) is proposing to introduce new regulations to transpose this Directive.

2 This Consultation Document seeks your:

- responses to the questions that are at paragraph 24;
- views on the proposed transposition approach;
- feedback on the draft EMF guidance produced to support the new regulations; and
- views on the initial assessment of the costs and benefits of the proposed changes as set out in the Impact Assessment (IA).

3 This consultation relates to regulations that will apply in England, Scotland and Wales. The Department of Enterprise, Trade and Investment Northern Ireland will prepare proposals for implementing the Directive in Northern Ireland. It does not cover any work on the Directive being taken forward by the Maritime and Coastguard Agency.

Background

4 A Directive covering worker exposure to electromagnetic fields (EMF) was first adopted by the European Parliament and the Council of Ministers in 2004. However, following adoption, the manufacturing sector and the medical magnetic resonance imaging (MRI) community (MRI is widely used in medical diagnostics) raised concerns that it contained disproportionate requirements and was overly burdensome. An extension to the transposition deadline to address these concerns was agreed and the 2004 Directive was not transposed into UK law.

5 Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) was adopted on 26 June 2013. It was published in the European Union (EU) Official Journal on 29 June 2013, and must be transposed and implemented (its requirements brought into law) across all Member States by 1 July 2016.

6 Further information on the Directive can be found on HSE's website: http://www.hse.gov.uk/radiation/nonionising/directive.htm.

The Electromagnetic Fields (EMF) Directive

7 The EMF Directive lays down minimum requirements for the protection of workers from risks to their health and safety arising, or likely to arise, from exposure to EMF. It covers EMFs with frequencies up to 300 gigahertz (GHz). The Directive requires that dutyholders assess the levels of EMF to which their workers may be

exposed against a set of specific thresholds. These are called Action Levels (ALs) and Exposure Limit Values (ELVs). Different frequency ranges have different ALs and ELVs. More information about ALs and ELVs can be found in the draft EMF guidance at Annex (i).

Overall the Directive aims to ensure that:

- minimum standards for EMF safety are introduced across all Member States;
- dutyholders minimise the risks from EMF to which workers may be exposed; and
- risks from EMF are controlled so all workers remain protected.

What the Directive does not cover

8 The EMF Directive does not cover:

- suggested long term effects to electromagnetic fields, since there is currently no well-established scientific evidence of a causal relationship.
- risks resulting from contact with live conductors. This is covered by the Electricity at Work Regulations 1989 (SI 635) in Great Britain.

What are EMFs?

9 An EMF is a type of non-ionising radiation that is present in virtually all workplaces and is created whenever electrical energy is used. The EMF Guidance at Annex (i) provides an overview of what EMFs are and highlights the two general types of EMF effects; direct effects on the body and indirect effects caused by the EMF affecting other things in the environment that can create a safety or health hazard.

Current legislative provisions for EMFs in UK

10 At present, there are no specific regulations covering worker exposure to EMFs in UK domestic health and safety law. EMF risks are managed through the general requirements in the Management of Health and Safety at Work Regulations 1999 (MHSWR 1999), and supported by a Public Health England recommendation that the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines be followed. The risks from EMF are generally already well understood and managed in the UK: inspectors do not come across many instances of workers at risk and there have been very few incidents or accidents reported in recent years as a direct result of exposure from EMF.

Transposition approach

11 During the policy development process, HSE considered and analysed a number of legislative approaches. HSE proposes to transpose into stand-alone regulations **only the requirements of the Directive which go beyond or are more specific than those covered by existing UK legislation**.

12 This preferred transposition approach takes account of the Government's policy on transposing EU Directives and its commitment to regulating only where necessary. It does not go beyond the minimum requirements of the Directive. In addition, the approach aligns the transposition of the Directive with current domestic regulation and health and safety policy, avoiding any overlap or contradiction. It also implements the Directive in a way that is proportionate to the risks and takes into account existing controls and therefore minimises the impact on businesses.

13 In order to simplify the requirements of the Directive, and minimise burdens on business, we have introduced into the regulations the concept of 'lower risk work activities'. This combines and simplifies the Directive's various exceptions to the general requirement to ensure the exposure of employees is below the exposure limits, and ensures that obligations are not imposed unnecessarily. We expect a high proportion of duty holders to be carrying out 'lower risk work activities'.

14 As part of the development of this proposal, HSE has worked to minimise unnecessary or additional changes for industry and stakeholders. HSE has actively engaged with representatives from the MRI community, manufacturing and automotive industries, and the broadcast and mobile phone sector. We will continue to do this during transposition, and with other sectors likely to be affected. We have created an on-line Community of Interest (COI), and established a stakeholder Implementation Working Group (IWG), to help implement the Directive in a proportionate manner, which still ensures workers are protected against any adverse health effects and safety risks. The transposition approach will be supported by specific, targeted communications which will explain clearly and simply what action needs to be taken by dutyholders. There will also be on-going collaborative working with stakeholders throughout and beyond the transposition period.

Why are new regulations needed?

15 Whilst existing legislation covers some requirements, the EMF Directive introduces new responsibilities for dutyholders: most notably the requirement to assess the levels of EMF to which their workers may be exposed against a set of specific thresholds.

16 The Directive will be implemented in Great Britain by regulations from two bodies: The Health and Safety Executive (HSE) and the Maritime and Coastguard Agency (MCA) using The Control of Electromagnetic Fields at Work Regulations 2016 and the Merchant Shipping (Health and Safety at Work) Electromagnetic Fields Regulations 2016. This consultation considers only the regulations HSE proposes to introduce.

17 A draft of 'The Control of Electromagnetic Fields at Work Regulations 2016' is at Annex (ii). Please note draft regulations will be subject to legal checks following the consultation which may require amendments to be made.

What will the new regulations mean for stakeholders?

18 Existing legislation used to control the risks from EMFs do not specifically require a determination of EMFs to which workers are being exposed. The regulations will require dutyholders to assess the levels of EMFs their workers are exposed to against a specific set of levels. However, many businesses will not have to significantly add to what they already do. This is either because their workplaces consist only of low level and safe sources of EMFs or because, in those workplaces where workers are exposed to higher levels of EMFs that might cause harm, EMF levels should already be assessed and robustly managed.

Exceptions from the exposure limit requirements of the regulations

19 The EMF Directive contains three derogations from its exposure limit requirements. The regulations make use of these in the following way:

- disapplying the exposure limits in relation to the use of MRI equipment, where certain conditions are satisfied;
- allowing the use of an equivalent or more specific protection system for certain military premises and activities; and
- allowing HSE to exempt employers from the exposure limits in relation to specific work activities, where certain conditions are satisfied.

20 Other requirements in the regulations such as the requirement to assess exposure, are unaffected by the exemptions.

21 HSE will produce a list of activities/sectors where dutyholders can use the general exemption providing they meet the necessary conditions. This avoids the need for a costly and time consuming permissioning regime. It will not be necessary for dutyholders to measure and prove the ELVs are exceeded before using an exemption. HSE is currently working with stakeholders to identify as many situations as possible where an exemption may be appropriate. The exemption list will be developed in such a way that it can be easily and quickly updated when required and a dutyholder will only be able to use an exemption while they are complying with the accompanying conditions.

EMF Guidance

22 Stakeholders have been actively involved in helping HSE formulate and draft the EMF Guidance. This is designed to help all dutyholders particularly small and medium enterprises (SMEs), to comply with the regulations and ensure that work practices are only changed when necessary. EMF guidance will complement the EMF Practical Guide being produced by the European Commission and any specific guidance industry chooses to develop. A copy of the draft EMF Guidance is at Annex (i).

Impact of the Directive on Great Britain

23 A consultation Impact Assessment (IA), see Annex (iii), has been prepared detailing the costs associated with implementing the new requirements of the Directive. Cost details have been provided by the various industries and sectors with whom HSE has engaged. The IA estimates that implementation imposes a ten-year present value cost on society of between around £5.9 million and £6.9 million, with a best estimate of around £6.4 million. All of this cost would be borne by industry. The IA has been considered by the Regulatory Policy Committee (RPC), an independent body responsible for scrutinising the quality of the analysis and evidence presented in IAs. They have given their opinion that the assessment is fit for purpose.

Consultation questions

24 We are seeking answers to questions in a number of areas. The questions we would like you to consider are listed in the table below:

No. 1	Do you agree or disagree with the transposition approach proposed? Agree/Disagree If you disagree please state why?
No. 2	Does the guidance at Annex (i) make it clear what your responsibilities as an employer are under the 'The Control of Electromagnetic Fields at Work Regulations 2016'? Yes/No If no how can this be improved?
No. 3	Does the guidance at Annex (i) help you to find the information that you need to help you assess your workers' potential exposure to EMFs? Yes/No If no how can this be improved?
No. 4	Is it clear from the guidance at Annex (i) that measurement of EMF exposure levels will only be necessary in strictly limited circumstances? Yes/No If no how can this be improved?

No. 5	HSE may exempt work activities from the exposure limits stated in these Regulations. Does the guidance at Annex (i) clearly explain when an exemption applies and the conditions that have to be met? Yes/No If no, how can this be improved?
No. 6	Does your business involve a work activity in respect of which you may find it difficult to meet the exposure limits? Yes/No If yes what activity would this be?
No. 7	Is there any additional information that you would like to see included in the guidance at Annex (i)? Yes/No If yes what would this be?
No. 8	Do you have any comments on the draft 'The Control of Electromagnetic Fields at Work Regulations 2016' at Annex (ii)? Yes/No. If yes please provide details.
No. 9	Do you agree or disagree with the analysis in the impact assessment at Annex (iii)? Agree/Disagree Please state why?
No. 10	Do you have any other comments to make on the impact assessment at Annex (iii)? Yes/No If yes please provide details
No. 11	Are there any further comments you would like to make on the issues raised in this consultative document?

Annex (i)

Draft EMF Guidance

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Electromagnetic Fields at work

A brief guide to the Control of Electromagnetic Fields at Work Regulations 2016

What does this guidance contain?

Information to help you as an employer:

- decide what you may need to do to protect your workers from the risk arising from exposure to electromagnetic fields (EMFs),
- understand what you need to do to comply with The Control of Electromagnetic Fields at Work Regulations 2016,
- identify if EMFs in your workplace could be hazardous and if so, if there could be any risk of harm, and
- assess and control any risks from EMFs in the workplace.

It will also be useful to others with responsibility for health and safety; employees and safety representatives

Note:

Whilst businesses will now have to assess employees' exposure to EMFs, the majority will not need to take any additional action to reduce the risk from EMF. This is because either the levels of EMF are below Action Levels stated in the Regulations, and detailed later in this guide, and employers whose employees may be exposed to higher levels of EMFs should already assess and manage the associated risks.

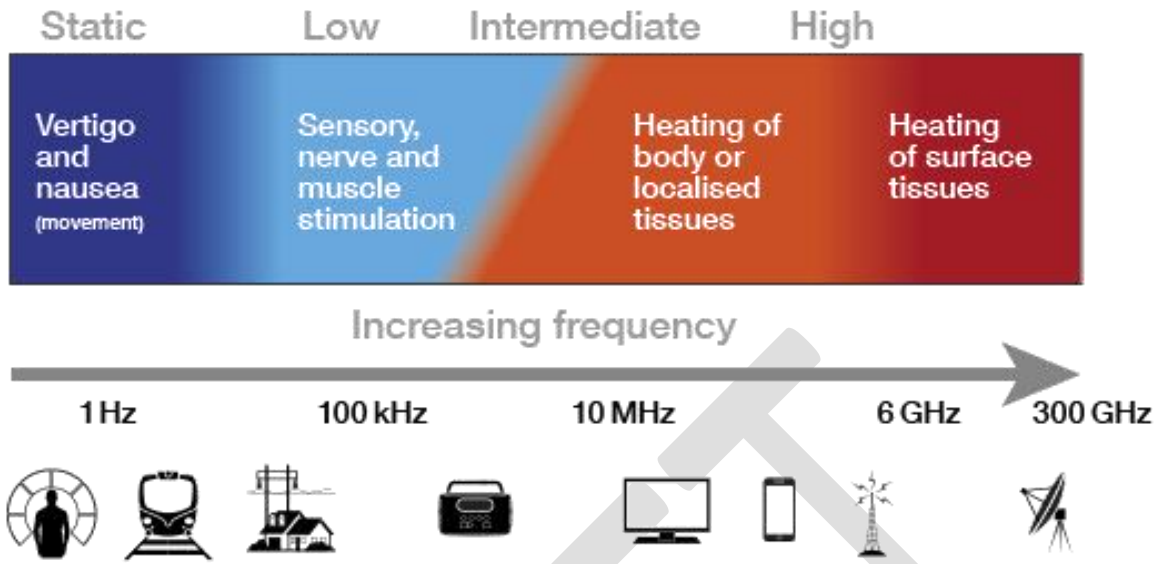
What is an electromagnetic field (EMF)?

An EMF is produced whenever a piece of electrical or electronic equipment (i.e. TV, food mixer, computer mobile phone etc.) is used.

EMFs are static electric, static magnetic and time varying electric, magnetic and electromagnetic (radio wave) fields with frequencies up to 300 GHz.

EMFs are present in virtually all workplaces and if they are high enough, you may need to take action to ensure your workers are protected from any adverse effects.

Effects of EMFs in various frequency ranges and related industries/uses:



Why could EMF be an issue?

Exposure to high levels of EMFs can give rise to short term effects that may be irritating, unpleasant or harmful.

The effects that occur depend on the frequency range and intensity of the EMFs to which a worker is exposed.

What are the effects?

EMFs at different frequencies affect the human body in different ways causing sensory and health effects, indirect effects can also occur; these are caused by the presence of an object in an EMF which may become the cause of a health and safety hazard. See Table 1 below.

Table 1

Field & frequency range	Effects	Examples of activities & equipment
Static Electric & Static Magnetic Fields 0 – 1 Hz	**Indirect effects**: Uncontrolled attraction of ferromagnetic metals i.e. the risk of injury from objects in a large static magnetic field being attracted to magnets in the workplace and flying towards them. **Sensory effects:** Nausea, vertigo, metallic taste in the mouth, flickering sensations (magnetophosphenes) in peripheral vision.	MRI scanners (Main magnet) Electrochemical processes e.g. Industrial electrolysis, aluminium extraction. Nuclear magnetic resonance Spectrometers

Field & frequency range	Effects	Examples of activities & equipment
	Health effects: Micro shocks	Electro–magnetic lifting cranes Electric vehicles (cars, underground trains)
Low frequency magnetic & electric fields 1 Hz – 10 MHZ	**Indirect effects:** Interference with active or passive implanted or body worn medical devices (more information is provided later in this guidance), electric shocks **Sensory effects:** Nausea, vertigo, metallic taste in the mouth **Health effects**: Nerve stimulation, effects on the central & peripheral nervous system of the body. Tingling, muscle contraction, heart arrhythmia. Contact currents caused by a person touching a conductive object in an EMF where one of them is grounded and the other is not which can result in shocks or burns	High voltage power lines; Production and distribution of electricity; Welding (arc & spot) Electrical arc furnaces Industrial induction heating (e.g. large coils used around the site of a weld) AM & FM radio Electric hand-held tools Electric vehicles (cars, trains, trams, metros) MRI (switched gradient fields)
High frequency fields: 100 kHz - 300 GHz	**Indirect effects:** Interference with active or passive implanted or body worn medical devices (more information is provided later in this guidance), electric shocks, causing electro-explosive devices to initiate, i.e. when used in close proximity to explosives that have an electrical means of initiation. Sparks caused by induced fields triggering fires or explosions where flammable fuels, vapours or gasses are present. **Sensory effects:** Auditory effects such as perception of clicks or buzzing caused by pulsed radar systems. **Health effects:** Thermal stress; heating effects leading to a rise in	MRI (RF coils) Broadcasting & TV antennas Radar & radio transmitters Diathermy Dielectric heating (e.g. vulcanising, plastics welding or microwave drying) Anti-theft systems

Field & frequency range	Effects	Examples of activities & equipment
	core body temperature or localised limb heating (e.g. knees or ankles). Contact with charged conducting bodies can lead to RF shock or deep tissue burns.	
Intermediate frequency fields 100kHz – 10 MHz	Effects of both high & low frequencies can be experienced as detailed above.	Surgical diathermy Broadcasting systems & devices (AM radio) Anti-theft devices Military & research radiofrequency systems

EMFs in the workplace

Examples of workplaces and equipment where EMFs are present can be found in tables A - D at Annex A of this guide.

The information contained in these tables is non-exhaustive and should be used as a reference point; the individual circumstances should be considered and judgements made accordingly.

Workplaces where it is unlikely that EMFs will be a risk

Many sources of EMF in the workplace produce such low levels of EMF that it is likely - other than assessing exposure to EMF - the measures you already have in place to manage risks, will be sufficient to ensure workers are protected and meet the requirement of the Regulations.

Table A in Annex A contains a non-exhaustive list of equipment where EMFs are unlikely to pose a risk.

Workplaces where EMFs may be a risk

Table B in Annex A contains a non-exhaustive list of equipment where EMFs may pose a risk

Tables C and D in Annex A provide non-exhaustive lists of equipment where EMFs may pose a risk to workers at particular risk. (See later in this guide).

What the law says

The Regulations require you, as an employer to:

- ensure that exposure is below a set of exposure limit values (ELVs) – detailed later in this guide;
- assess the levels of EMFs to which your employees may be exposed;
- assess the risks of the employees' exposure and eliminate or minimise those risks. You must ensure you take workers at particular risk, such as pregnant workers and workers with active or passive implanted or body worn medical devices, into account. (More information is provided later in this guide);
- provide information and training on the particular risks (if any) posed to employees by EMFs in the workplace and details of any action you are taking to remove or control them. This information should also be made available to their safety representatives as appropriate;
- take appropriate action when employees are exposed to EMFs in excess of the ELVs ; and,
- provide health surveillance as appropriate.

The Regulations also:

- Allow for the sensory effects ELVs to be exceeded when employees are adequately protected; and
- Allow HSE to exempt specific work activities from the ELVs where certain conditions are met. (More information is provided later in this guide).

Action Levels (ALs) and Exposure Limit Values (ELVs)

The requirements in the Regulations are based on two sets of values related to EMFs: action levels (ALs) and exposure limit values (ELVs).

Employers need to ensure that the exposure of employees to EMFs is below the ELVs. ELVs relate to the levels of EMFs in the body; this is often difficult and expensive to measure directly. For this reason, a separate set of exposure values ALs have been produced, which can be measured more easily. ALs have two main purposes:

- <u>Specific ALs may be used to demonstrate that electromagnetic field levels are below particular ELVs</u>

  If the AL is exceeded, it is still possible, and it is often the case, that the corresponding ELV will not be exceeded; further consideration and assessment is required to determine whether the corresponding ELV may be exceeded.

  If the AL is exceeded and compliance with the ELVs has not been demonstrated, you must take action to ensure that, as far as is reasonably practicable, the risk from exposures is eliminated or minimised. Simple measures to reduce exposure may be the easiest way to achieve compliance e.g. by moving the person further away from the EMF source, or by installing screening.

- <u>Other ALs are not tied to a particular ELV; instead they detail the EMF levels above which particular indirect effects may take place</u>.

Exposure Limit Values (ELVs) are limits specified to protect workers from the health and sensory effects of EMFs. Health effect ELVs are used to prevent possible harm from the heating of tissue and electrical stimulation of nerve and tissue caused by exposure to EMFs.

Sensory effect ELVs are used to prevent effects such as a feeling of nausea, vertigo or a metallic taste caused by EMFs.

If exposure to EMFs is below the ALs, the risks of exposure are likely to be very low, though employers must still consider any other risk of indirect effects and the impact of exposure on employees at particular risk, more information on which is provided later in this guide.

Exposure to EMFs above the ALs but below the ELVs will often be safe, but in some circumstances it can present additional risks, which must be considered in the employer's risk assessment.

The tables at Annex A provide:

- A list of equipment where it is unlikely that employees will be exposed to EMFs in excess of any AL or ELV; and
- Lists of equipment which may exceed particular ALs or ELVs, and may need a more detailed assessment of exposure.

Exceeding the ELVs

In certain circumstances the ELVs can be exceeded. In particular:

- Employees may be exposed to EMFs in excess of the sensory effects ELVs while they are undertaking 'lower risk work activities' (see below);
- HSE may exempt specific work activities from the exposure limits stated in the Regulations; you should refer to the list of activities exempted by HSE (at Annex B) to determine if your work activity is included. Any exemption is subject to the employer meeting safety conditions.

More information on exemptions is provided later in this guide.

Lower risk work activities

In these Regulations, lower risk work activities are those activities during which employees are not exposed to EMFs exceeding:

- any AL or ELV at all; or
- any AL or ELV other than those set out in Schedule 2, provided any applicable safety conditions are met.

You will not need to produce an exposure action plan for lower risk work activities and, as mentioned above; your employees may be exposed to EMFs in excess of the ELVs if they are only exceeded during lower risk work activities.

Please note that 'lower risk' does not mean risk free – you will still need to undertake a suitable and sufficient risk assessment.

Assessing the exposure and risk

You should manage all hazards in the workplace, including those from EMFs, through:

- risk assessment,
- adoption of proportionate control measures and
- ensuring risks are eliminated or reduced to as low a level as is reasonably practicable.

You will also need to consider the safety of others who are not directly employed by you but who are working on site, e.g. external equipment maintenance staff; the responsibilities for external staff will depend on who, if anyone, is employing them.

The Management of Health and Safety at Work Regulations 1999 place a duty on employers to cooperate to ensure the safety of all of their employees.

To be able to manage the risks, you will need to determine the potential level of EMFs to which your workers may be exposed. You must then carry out a suitable and sufficient assessment of the risks arising from that exposure.

The risk assessment must include consideration of:

- indirect effects (see Table 1); and
- workers at particular risk (See later in this guide).

Where relevant, the risk assessment must also include consideration of the ALs and ELVs;

- the frequency, level, duration and type of exposure, including the distribution over the employee's body and the variations between areas in the workplace;
- direct effects;
- the existence of replacement equipment designed to reduce the level of exposure to electromagnetic fields;
- appropriate information obtained from the health surveillance;
- information provided by the manufacturer of relevant equipment;
- other health and safety related information;
- multiple sources of exposure; and
- simultaneous exposure to multiple frequency fields.

You can do this in a number of different ways by accessing information already available, for example by referring to:

- emission information and other safety related data provided by the manufacturer or distributor of equipment used by the employer;
- sector or industry standards and guidelines, if available;
- the EU (non-binding) EMF Practical Guide to Good Practice;
- exposure databases, if available; and
- information provided by Trade Associations and other industry bodies.

In most cases, you should be able to find relevant information from these sources. If you cannot find enough information to determine the exposure levels, you may need to undertake measurements or calculations to determine exposure but this will only be as a last resort. You will not need to measure or calculate in respect of any work activity which is exempted from the exposure limits by HSE. Further information on exemption is provided later in this guide.

Controlling the risks

You will need to carry out a suitable and sufficient assessment of the risks to your employees posed by their exposure to EMFs. If exposure is below the ALs, the risks will likely be very low, but you will always need to consider the risks from indirect effects or to workers at particular risk; you are not expected to anticipate unforeseeable risks.

The tables at Annex A provide information to help you in your assessment.

For any work activity which is not classed as a lower risk work activity, or where the exposure assessment demonstrates that the exposure of employees to electromagnetic fields does not exceed any ELV, you must devise and implement an action plan to ensure employees are not exposed to EMFs in excess of the ELVs. You will also need to consult your trade union safety representative or worker representative when deciding risk control measures.

Your action plan must include consideration of:

- other working methods that entail less exposure to electromagnetic fields;
- the choice of equipment emitting less intense electromagnetic fields, taking account of the work to be done;
- technical and/or organisational measures that limit the duration and/or intensity of emission of electromagnetic fields, including, where necessary, the use of interlocks, screening or similar health protection mechanisms. E.g. in many situations ELVs may only be exceeded where the worker is close to the EMF source; this can be easily remedied by moving the person further away from the EMF source, or by installing screening;
- consider the use of signage, access controls and floor markings; If areas are already suitably restricted for other reasons, cannot be entered accidentally, and if workers in the areas are informed of the risks arising from EMF exposure, signs may not be required;
- in the case of exposure to electric fields, measures and procedures to manage spark discharges and contact currents through technical means and through the training of workers;
- ensure appropriate maintenance of equipment and design of workplaces and when replacing or hiring equipment, consider selecting equipment which emits lower levels of EMFs; and
- consider providing personal protective equipment e.g. insulating shoes, gloves and other protective clothing, where appropriate.

For employers with:

- fewer than 5 employees, or
- 5 or more employees where no significant risk of exposure is identified, you will not need to record either the exposure assessment or the risk assessment, however you may find it useful to do this so that you can review the details at a later date, for example if something changes.

Employers with 5 or more employees, where a significant risk of exposure to EMF is identified, must record both the exposure assessment and the risk assessment. The risk assessment should record the significant findings and details of any groups of workers identified by it as being especially at risk.

Your risk assessment should be reviewed at suitable intervals e.g. if working practices change, you are replacing equipment, there have been any other significant changes such as appointment of new workers who may be at particular risk, or if any adverse effects are reported.

You can find general information on how to undertake a risk assessment at: http://www.hse.gov.uk/risk/controlling-risks.htm

Workers at particular risk

You must give special consideration to the safety of workers at particular risk, such as pregnant workers or workers with active implanted medical devices (AIMDs), passive implanted medical devices (PIMD) and body worn medical devices (BWMD) etc. (Examples of devices and implants are provided later in this guide). You must do this even if you are in compliance with the exposure limits.

Refer to the information provided in this guide on controlling the risks, record details of any significant findings from your risk assessment and the controls you have put in place to minimise the risks as appropriate.

Table C in Annex A contains a non-exhaustive list of examples of workplaces and equipment to consider. You will need to consider these in addition to the information contained in Table B.

Pregnant Workers

As working with certain levels of EMFs could result in a greater risk to a pregnant worker, you should encourage your workers to advise you in writing if they become pregnant. You may wish to take a practical approach and limit the exposure of pregnant workers to the public exposure limits. These are stated in Council Recommendation1999/519/EC
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:199:0059:0070:EN:PDF

Table C in Annex A contains a non-exhaustive list of examples of workplaces and equipment to consider. You will need to consider these in addition to the information contained in Table B.

If risks to a worker are identified during pregnancy, you must take appropriate action to eliminate, reduce or control the risks. They must be included and managed as part of the general workplace risk assessment.

You can find more information on 'Workers at particular risk – expectant mothers' at: http://www.hse.gov.uk/mothers/.

Active implanted medical devices (AIMDs), passive implanted medical devices (PIMD) and body worn medical devices (BWMD)

Exposure to EMFs can interfere with the normal operation of active implanted medical devices (AIMDs), passive implanted medical devices (PIMD) and body worn medical devices (BWMD), because some levels of EMFs could cause devices to malfunction or workers to receive injuries.

Tables C and D in Annex A contain non-exhaustive lists of examples of workplaces and equipment to consider. You will need to consider this information in addition to the information contained in Table B.

You should encourage workers to consider the information in Table 2 and advise you if they may be affected.

If they have implants or devices fitted, ask them to obtain information/instructions from the manufacturer of the medical device.

If the device is implanted, they should also obtain advice from the medical professional who completed the implant procedure.

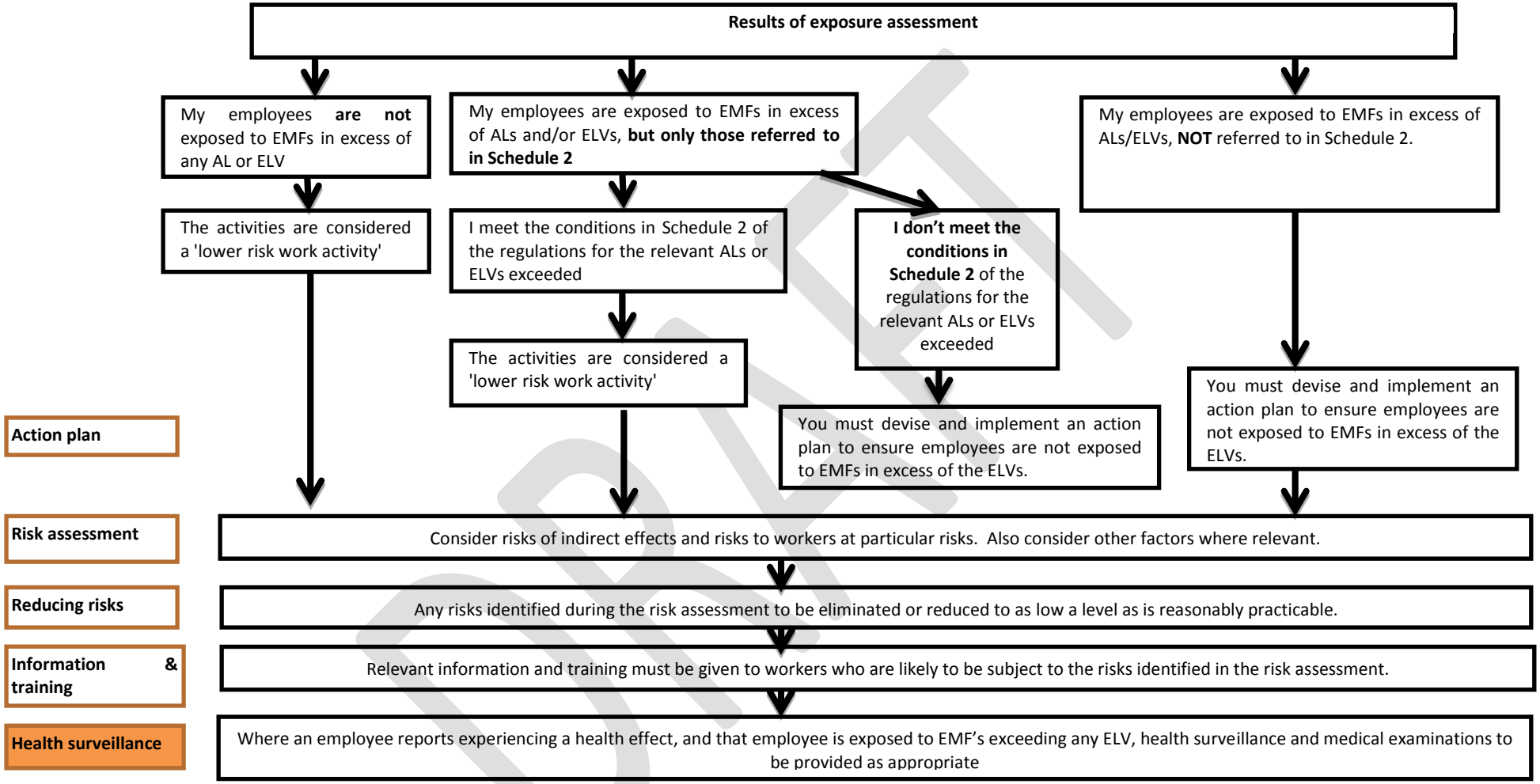
Table 2

Non-exhaustive list of examples of devices, implants and other items for consideration include:

Active implanted medical devices	Passive implanted medical devices	Body worn medical devices	Items that that may contain ferromagnetic materials
cardiac pacemakers	orthopaedic implants or joints	insulin pumps	metallic fragments in or near eyes or blood vessels from industrial (common in people who do welding or metalwork for a living) or military injuries
implantable cardiac defibrillators	pins, plates, screws,	hormone infusion pumps	Semi-permanent make up
cochlea implants	surgical staples & clips i.e. tubal ligation clips – used in female sterilisation & aneurism clips,	hearing aids	jewellery or piercings

Active implanted medical devices	Passive implanted medical devices	Body worn medical devices	Items that that may contain ferromagnetic materials
brainstem implants	stents,	Continuous glucose monitoring systems	body art/tattoos - some tattoo ink contains traces of metal
inner ear prostheses	heart valve prostheses,	metalized drug delivery patches (over the counter or prescription)	
neurostimulators	annuloplasty rings,		
retinal encoders	intrauterine contraceptive device (IUD) or other metallic contraceptive implants		
implanted drug infusion pumps	penile implants –used to treat erectile dysfunction (impotence)		
	dental fillings and bridges		

This flow chart is for work activities in respect of which **HSE have not issued an exemption** from the exposure limits. If your work activity has an exemption, please see the exemption flow chart later in this guide



Exemption

HSE may exempt work activities from the exposure limits stated in the Regulations. An exemption would only be required where ELVs are, or are likely to be, exceeded.

If your work activity is exempt you will not have to comply with the exposure limits in respect of that activity, but you will have to meet the exemption conditions. These include:

- ensuring that you are reducing exposure to the lowest level reasonably practicable; and
- ensuring that your employees are protected against the health effects and safety risks posed by that exposure.

An exemption does not affect your other responsibilities under the Regulations, such as undertaking a risk assessment and providing suitable information and training. However, you will not be required to use measurements or calculations in your exposure assessment, this is because such measurements etc. are only required where it is necessary to demonstrate compliance with the exposure limits.

To decide if you can use an exemption, you will need to refer to the exemption flow chart found later in this guide and the information contained in Annex B. You will not be required to notify HSE before you use an exemption.

Use of magnetic resonance imaging (MRI) for medical purposes

The exposure limit requirements of the Control of Electromagnetic Fields at Work Regulations 2016 do not apply to the installation, maintenance of, or research related to, MRI equipment where it is used for patients in the health sector where:

- it is reasonable in the circumstances that the equipment be used;
- the exposure of employees is reduced to the lowest level reasonably practicable; and
- employees are protected against the health effects and safety risks arising from their exposure to electromagnetic fields

You will need to comply with the other requirements of the Regulations.

Further information can also be found in the EU (non-binding) Practical Guide on EMF.

Use of MRI for other purposes

If MRI is used in any circumstances NOT related to the use of MRI equipment for patients in the health sector, where the ELVs are exceeded, you should consider if HSE has granted an exemption for the activity by referring to the exemption flow chart found later in this guide and the information contained in Annex B.

Military use of EMFs

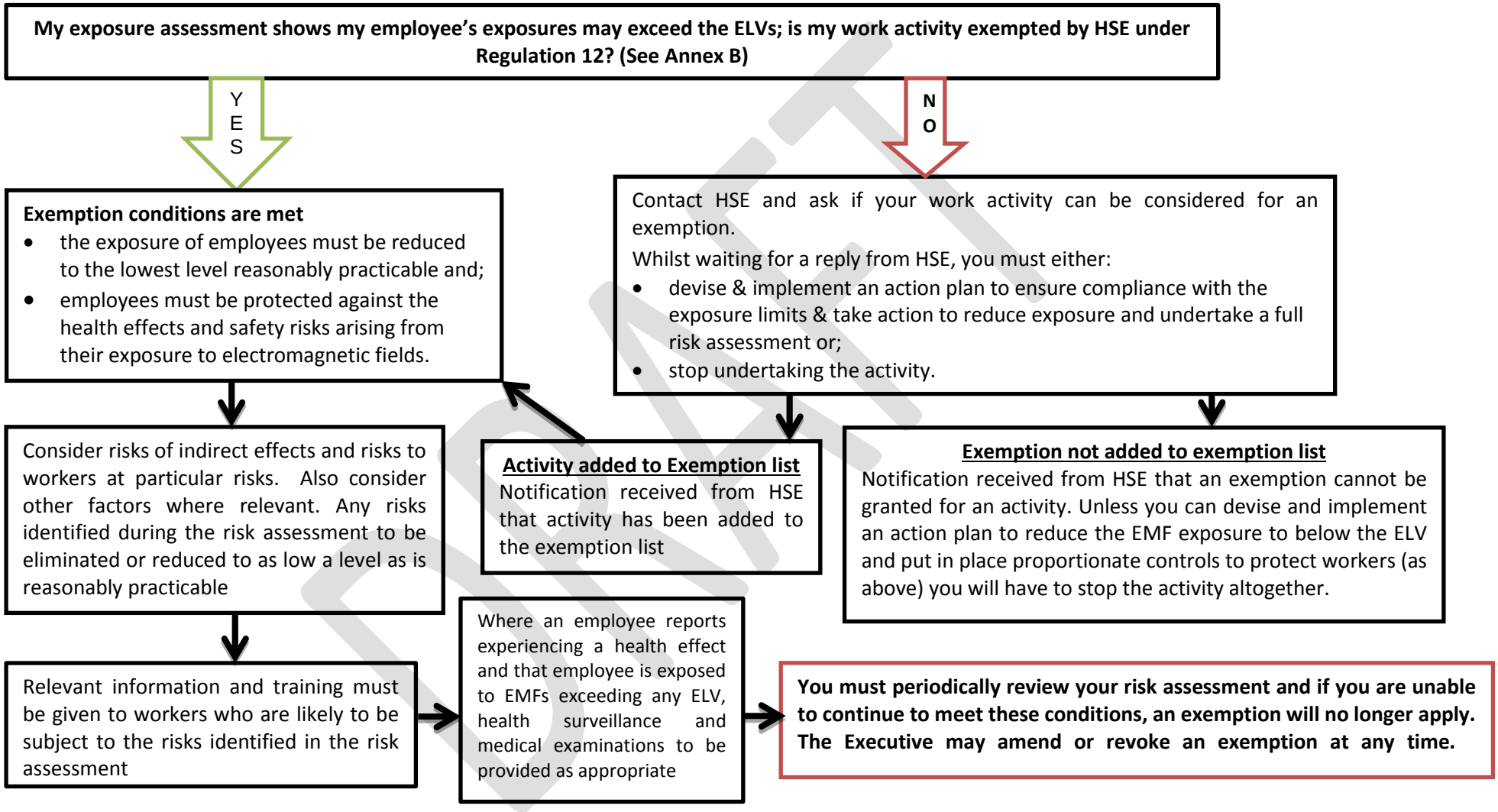
The exposure limit requirements of the Control of Electromagnetic Fields at Work Regulations 2016 do not apply to personnel working in operational military

installations, or involved in military activities, including joint international military exercises.

You will need to comply with the other requirements of the Regulations.

If the ELVs are exceeded in any circumstances NOT related to personnel working in these situations, and it is deemed the circumstances are appropriate, you should consider if HSE has granted an exemption for the activity.

Exemption flow chart:



Information and training

If through your assessment process, you identify that there are risks that need to be managed, you must provide relevant information and training for workers who are likely to be subject to those risks (and/or their representatives).

This information should include:

- an explanation of ALs and ELVs;
- details of possible undesired health, sensory or indirect effects and what to do if these are experienced;
- details of the safe working practices you will adopt to eliminate and reduce risks arising from exposure;
- an explanation of any safety signage used;
- details of appropriate personal protective equipment;
- information for workers at particular risk such as pregnant workers and workers with active implanted medical devices (AIMDs), passive implanted medical devices (PIMD) or body worn medical devices (BWMD); and
- the circumstances in which they may be entitled to a medical examination and/or health surveillance.

Health Surveillance

You may already consider health surveillance for other hazards in your workplace; this provides an early indication of ill health and helps ensure corrective action is taken.

You will only need to carry out health surveillance if a worker is exposed to EMFs above the ELV and reports experiencing an undesired or unexplained health effect which is suspected of being associated with EMF exposure; you must then ensure health surveillance and medical examinations are provided as appropriate. You should note that as the Regulations do not address suggested long-term effects of exposure to EMFs, any health surveillance required should not be burdensome

You should refer to existing HSE guidance on investigating accidents and health surveillance and take action as required.

You can find more information on health surveillance at: http://www.hse.gov.uk/health-surveillance/index.htm

Further reading

You can find more information about:

EMFs and links to other useful documents at: www.hse.gov.uk/radiation/nonionising/

Management of Risk:
http://www.hse.gov.uk/construction/lwit/assets/downloads/hierarchy-risk-controls.pdf

Safety signs & signals: http://www.hse.gov.uk/pubns/books/l64.htm

Useful links:

Directive (2013/35/EU) on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields)
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:179:0001:0021:EN:PDF

Health and Safety at Work Regulations 1999

http://www.legislation.gov.uk/uksi/1999/3242/contents/made

DN: Link to the EU (non-binding) EMF Practical Guide to Good Practice to be included when available.

Council Recommendation1999/519/EC

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:199:0059:0070:EN:PDF

The International Commission on Non-Ionizing Radiation Protection (ICNIRP); as an independent organization ICNIRP provides scientific advice and guidance on the health and environmental effects of non-ionizing radiation (NIR). http://www.icnirp.org/en/home/index.html

Research Report 1018 – Electromagnetic Fields (EMF) in the welding environment - Prepared by TWI Ltd for the Health and Safety Executive. http://www.hse.gov.uk/research/rrhtm/rr1018.htm

Annex A

Table A – Non-exhaustive list of examples of workplaces and equipment where it is unlikely that EMF would be a risk for most workers. N.B. Tables C and D provide information relating workers at particular risk
Wireless communications
Being in the vicinity of phones,(landlines, mobile phones, cordless, Digital Enhanced Cordless Telephone (DECT) base stations) and fax machines in workplaces
Office
Audio visual equipment; TVs, DVDs etc.
Communication equipment and wired networks
Computer & IT equipment
Electric fans, fan heaters & room heaters
Office equipment i.e. photocopiers, printers, shredders etc.
Buildings and grounds
Workplaces accessible to the general public which meet the exposure limits for the general public specified in Council Recommendation 1999/519/EC
Alarm systems
Base station antennas outside operator's designated exclusion zone
Workplaces containing electric garden appliances
Workplaces containing electric handheld and transportable tools
Household & professional appliances as long as Wireless Local Area Network (WLAN) and Bluetooth are not involved
Lighting including desk lamps
Electrical supply
Overhead bare conductor up to 100kV or overhead line up to 150 kV above the workplace (Exposure to electric fields)
Overhead bare conductor of any voltage (Exposure to magnetic fields)
Underground or insulated cable circuit at any voltage (Exposure to electric fields)
Light Industry
Coating & painting equipment
Control equipment not containing radio transmitter
Measuring equipment & instrumentation not containing radio transmitters
Miscellaneous
Equipment, around which, the exposure limits for the general public specified in Council Recommendation 1999/519/EC are not exceeded. Battery chargers, non-inductive-coupling designed for household use Battery powered portable equipment that do not contain radio frequency transmitters

Workplaces containing glue guns Workplaces containing portable heat guns Hydraulic ramps

Table B - Non-exhaustive list of equipment where EMFs may pose a risk to ALL workers
Infrastructure (buildings and grounds)
Base station antennas, inside operator's designated exclusion zone
Radio frequency or microwave energised lighting equipment
Electrical supply
Electrical circuits where the conductors are close together and have a net current of more than 100 A. (Exposure to magnetic fields)
Electrical circuits within an installation with a phase current rating of more than 100 A for the individual circuit (Exposure to magnetic fields)
Electrical installations with a phase current rating of more than 100 A
These include wiring, switchgear & transformers. (Exposure to magnetic fields)
Overhead bare conductor over 100 kV or overhead line over 150 kV above the workplace (Exposure to electric fields)
Light industry
Dielectric heating and welding
Welding; spot and seam welding
Induction heating
Induction soldering
Magnetic particle (crack) detection
Industrial magnetiser and demagnetisers, e.g. tape erasers
Microwave heating and drying
RF Plasma devices including vacuum deposition and spluttering
Heavy industry
Industrial electrolysis
Furnaces, arc and induction melting
Construction
Microwave drying in the construction industry
Medical
MRI equipment
Medical diagnostic and treatment equipment using EMFs e.g. diathermy and trans cranial magnetic stimulation
Transport
Electrically powered trains and trams (see also Electrical supply re overhead line equipment and third rail)
Radar

Miscellaneous
Radio and TV broadcasting systems and devices
Military activities
Maintenance of radar or high powered communications systems

Table C - Non-exhaustive lists of equipment, in addition to those in table B, where EMFs may pose a risk to workers at particular risk, i.e. pregnant workers or workers with passive implanted medical devices
Electrical supply
Work on wind turbines
Light industry
Electrostatic painting equipment
Automated induction heating systems, fault-finding and repair involving close proximity to the EMF source.
Automated welding systems, fault-finding, repair and teaching involving close proximity to the EMF source.
Medical
MRI equipment

Table D - Non-exhaustive lists of equipment, in addition to those in tables B and C, where EMFs may pose a risk to workers at particular risk, i.e. workers with active implanted and active body worn medical devices
Wireless communications
Use of Wi-Fi or Bluetooth including access points for WLAN
Use of cordless phones, DECT base stations & fax machines
Use of mobile phones
Office
Audio visual equipment containing radiofrequency transmitters
Infrastructure (buildings and grounds)
Use of electric garden appliances
Security
Article surveillance equipment and RFID
Tape or hard drive erasers
Metal detectors
Electrical supply
Work on generators (including wind turbines) or emergency generators
Inverters, including photovoltaic systems
Light industry
Arc welding processes including MIG, MAG & TIG
Industrial and large professional battery chargers
Corona discharge surface treating equipment
Electrostatic painting equipment
Use of heat guns
Use of glue guns
Use of hand held and portable tools e.g. drills, sanders, circular saws and angle grinders.
Furnaces resistively heated
Welding systems – working close to the EMF source; fault finding and teaching
Automated induction heating systems, fault-finding and repair involving close proximity to the EMF source.
Automated welding systems, fault-finding, repair and teaching involving close proximity to the EMF source.
Induction sealing equipment
Machine tools e.g. pedestal drills, grinders, lathes, milling machines, saws.

Medical
MRI equipment
Construction
Construction equipment e.g. working close to concrete mixers, cranes etc.
Transport
Motor vehicles and plant - working close to starter, alternator and ignition systems in motor vehicles and work places
Maintenance of inverters used on mainline trains
Miscellaneous
Battery chargers inductive or proximity-coupling
Equipment generating static magnetic fields greater than 0.5 millitesla e.g. by magnetic chucks, tables and conveyors, lifting magnets, magnetic brackets, nameplates, badges
Headphones producing strong magnetic fields
Professional inductive cooking equipment
Two way radios e.g. walkie-talkies, vehicle radios
Battery powered transmitters
Military activities
Maintenance of radar or high powered communications systems

Annex B: General Exemption List

(DN: This is currently under development)

Static Magnetic Fields (including those around DC applications) Use of MRI NOT related to human health care i.e. in research, by vets etc. (DN: Included for illustrative purposes only).
Extremely Low Frequency Electrical Installations
High Frequency Electromagnetic Fields
Very High Frequency Electromagnetic Fields & Microwave
Pulsed GHz

Annex (ii)

S T A T U T O R Y I N S T R U M E N T S

2016 No.

HEALTH AND SAFETY

The Control of Electromagnetic Fields at Work Regulations 2016

Made - - - -	***
Laid before Parliament	***
Coming into force - -	***

The Secretary of State makes these Regulations in exercise of the powers conferred by sections 15(1), (2), (5), 82(3)(a) of, and paragraphs 8, 9, 11, 13(2) and (3), 14, 16, 18 and 20 of Schedule 3 to, the Health & Safety at Work etc. Act 1974(**a**).

The Regulations give effect without modifications to proposals submitted to the Secretary of State by the Health and Safety Executive under section 11(3) of the 1974 Act.

Before submitting those proposals to the Secretary of State, the Executive consulted the bodies that appeared to it to be appropriate as required by section 50(3) of the 1974 Act.

PART 1

INTRODUCTION

Citation and commencement

1. These Regulations may be cited as the Control of Electromagnetic Fields at Work Regulations 2016 and come into force on 1st July 2016.

Interpretation

2. —(1) In these Regulations—

"ALs" means the action levels set out in Parts 3 and 4 of Schedule 1;

"direct biophysical effect" means an effect in the human body caused by its presence in an electromagnetic field, other than an indirect effect;

"electromagnetic fields" means static electric, static magnetic and time-varying electric, magnetic and electromagnetic fields with frequencies up to 300 GHz;

"ELVs" means the exposure limit values set out in Part 3 of Schedule 1;

"employees at particular risk" includes but is not limited to employees with active or passive implanted medical devices and pregnant employees;

"the Executive" means the Health and Safety Executive

(**a**) 1974 c.37

"health effect" means a direct biophysical effect which is potentially harmful to human health;

"indirect effect" means an effect, caused by the presence of an object in an electromagnetic field, which is potentially harmful to human health;

"lower risk work activity" means a work activity undertaken in accordance with regulation 5;

"sensory effect" means a direct biophysical effect involving a transient disturbance in sensory perception or a minor and temporary change in brain function.

(2) A reference to an employee being exposed to electromagnetic fields is a reference to the exposure which arises while the employee is at work for his or her employer or arises out of, or in connection with, the employee's work for that employer.

Application

3.—(1) These Regulations do not apply in relation to:

(a) any effects caused by repeated exposure to electromagnetic fields; or

(b) any risks caused by contact with live conductors.

(2) These Regulations do not apply to the master or crew of a ship or to the employer of such persons in respect of the normal shipboard activities of a ship's crew which are carried out solely by the crew under the direction of the master, and for the purposes of this paragraph "ship" includes every description of vessel used in navigation, other than a ship forming part of Her Majesty's Navy.

(3) Regulations 4(1) and 7(1) do not apply to the exposure of employees to electromagnetic fields—

(a) in operational military installations or during military activities, including joint international military exercises; or

(b) during the installation, use, development, maintenance of or research related to magnetic resonance imaging equipment for patients in the health sector, where——

(i) it is reasonable in the circumstances that the equipment be used;

(ii) the exposure of employees is reduced to the lowest level reasonably practicable; and

(iii) employees are protected against the health effects and safety risks arising from their exposure to electromagnetic fields.

PART 2

EXPOSURE LIMITS

Limitation on exposure to electromagnetic fields

4.— (1) Subject to paragraph (2), an employer must ensure that employees are not exposed to electromagnetic field levels in excess of the ELVs.

(2) Employees may be exposed to electromagnetic field levels in excess of the ELVs related to sensory effects whilst undertaking lower risk work activities.

Lower risk work activities

5. A work activity is lower risk for the purposes of these Regulations if, whilst undertaking that activity—

(a) employees are not exposed to electromagnetic field levels in excess of any AL or ELV other than those specified in Schedule 2; and

(b) where any of the specified levels are exceeded, the applicable conditions in Schedule 2 are met.

PART 3

EXPOSURE AND RISK

Exposure assessment

6.—(1) An employer must carry out a suitable and sufficient assessment of the potential exposure of employees to electromagnetic fields.

(2) In carrying out the assessment, employers may take into account, where relevant—

(a) emission information and other safety related data provided by the manufacturer or distributor of equipment used by the employer;

(b) industry standards and guidelines;

(c) the [EU practical guide]; and

(d) guidance produced by the Executive.

(3) Where necessary to determine compliance with regulation 4(1), the exposure assessment must include measurements and calculations as appropriate.

(4) The employer must review the exposure assessment when—

(a) there is reason to suspect it is no longer valid; or

(b) there has been a significant change in the matters to which it relates,

and make such changes to it as are necessary to ensure it remains suitable and sufficient.

(5) An employer who employs five or more employees must keep a record of the significant findings from the most recent exposure assessment.

Action plan

7. —(1) An employer must devise and implement an action plan to ensure compliance with regulation 4(1) for any work activity which is not a lower risk work activity.

(2) Paragraph (1) does not apply where the exposure assessment demonstrates that the exposure of employees to electromagnetic fields does not exceed any ELV.

(3) The action plan must include consideration of—

(a) other working methods that entail less exposure to electromagnetic fields;

(b) using equipment emitting less intense electromagnetic fields;

(c) technical measures to reduce the emission of electromagnetic fields, including, where necessary, the use of interlocks, screening or similar health protection mechanisms;

(d) appropriate delimitation and access control measures;

(e) in the case of exposure to electric fields, measures and procedures to manage spark discharges and contact currents through technical means and through the training of employees;

(f) appropriate maintenance programmes for work equipment, workplaces and workstation systems;

(g) the design and layout of workplaces and workstations;

(h) limitations of the duration and intensity of the exposure; and

(i) the availability of adequate personal protection equipment.

(4) If, despite the measures taken in accordance with paragraph (1), the exposure of employees exceeds any ELV the employer must, as soon as is reasonably practicable, identify and implement any changes to the action plan which are necessary to ensure compliance with regulation 4(1).

(5) An employer who employs five or more employees must keep a record of the measures taken in accordance with paragraph (4).

Risk assessment

8. —(1) An employer must carry out a suitable and sufficient assessment of the risks to employees arising from their exposure to electromagnetic fields.

(2) The risk assessment must—

(a) include consideration of indirect effects and employees at particular risk; and

(b) where relevant, include consideration of—

(i) the ALs and ELVs;

(ii) the frequency, level, duration and type of exposure, including the distribution over the employee's body and the variations between areas in the workplace;

(iii) direct biophysical effects;

(iv) the existence of replacement equipment designed to reduce the level of exposure to electromagnetic fields;

(v) appropriate information obtained from the health surveillance referred to in regulation 11;

(vi) information provided by the manufacturer of relevant equipment;

(vii) other health and safety related information;

(viii) multiple sources of exposure; and

(ix) simultaneous exposure to multiple frequency fields.

(3) The employer must review the risk assessment when—

(a) there is reason to suspect it is no longer valid; or

(b) there has been a significant change in the matters to which it relates,

and make such changes to it as are necessary to ensure it remains suitable and sufficient.

(4) An employer who employs five or more employees must keep a record of the significant findings from the most recent risk assessment

Obligation to eliminate or reduce risks

9. —(1) An employer must ensure that, so far as is reasonably practicable, the risks identified in the most recent risk assessment are eliminated or reduced to a minimum.

(2) Measures taken for the purposes of paragraph (1) must—

(a) be based on the general principles of prevention set out in Schedule 1 to the Management of Health and Safety at Work Regulations 1999; and

(b) take into account technical progress and the availability of measures to control the production of electromagnetic fields at source.

PART 4

MISCELLANEOUS

Information and training

10. An employer must provide relevant information and training to any employees who are likely to be subjected to the risks identified in the risk assessment, in relation to—

(a) the measures taken in response to those risks in accordance with regulation 9(1);

(b) the concepts and values of the ELVs and ALs and the possible risks associated with them;

(c) the possible indirect effects of exposure;

(d) the results of the assessment, measurement or calculations of the levels of exposure to electromagnetic fields, carried out in accordance with regulation 6;

(e) how to detect and report sensory and health effects;

(f) the circumstances in which employees are entitled to health surveillance;

(g) safe working practices to minimise risks resulting from exposure; and

(h) any additional measures required in respect of employees at particular risk.

Health surveillance and medical examinations

11.—(1) Where an employee is exposed to electromagnetic field levels in excess of any ELV and reports experiencing a health effect, their employer must ensure that health surveillance and medical examinations are provided as appropriate.

(2) Any health surveillance or medical examination must be provided during hours chosen by the employee.

(3) The employer must keep a record of any health surveillance and medical examinations provided to employees in accordance with paragraph (1).

Exemptions

12.—(1) The Executive may exempt employers from the requirements of regulations 4(1) and 7(1) in relation to one or more work activities.

(2) An exemption under paragraph (1) must be subject to the following conditions—

(i) the exposure of employees must be reduced to the lowest level reasonably practicable; and

(ii) employees must be protected against the health effects and safety risks arising from their exposure to electromagnetic fields.

(3) The Executive may amend or revoke an exemption at any time.

Extension outside Great Britain

13. These Regulations apply to and in relation to any activity outside Great Britain to which sections 1 to 59 and 80 to 82 of the 1974 Act apply by virtue of the Health and Safety at Work etc. Act 1974 (Application Outside Great Britain) Order 2013(**a**) as those provisions apply to Great Britain.

Review

14.—(1) The Secretary of State must from time to time—

(a) carry out a review of these Regulations;

(b) set out the conclusions of the review in a report; and

(c) publish the report.

(2) In carrying out the review the Secretary of State must, so far as is reasonable, have regard to how the Directive is implemented in other Member States.

(3) The report must in particular—

(a) set out the objectives intended to be achieved by the Directive and by these Regulations;

(b) assess the extent to which those objectives are achieved; and

(c) assess whether those objectives remain appropriate and, if so, the extent to which they could be achieved with a system that imposes less regulation.

(4) The first report under this regulation must be published before the end of the period of five years beginning with the day on which these Regulations come into force.

(5) Reports under this regulation must afterwards be published at intervals not exceeding five years.

(**a**) S.I. 2013/240

(6) In paragraphs (2) and (3) "the Directive" means Directive 2013/35/EU of the European Parliament and European Council of 26 June 2013 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (20th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) and repealing Directive 2004/40/EC.

Signed by authority of the Secretary of State for Work and Pensions

Name
Address — Parliamentary Under Secretary of State
Date — Department

SCHEDULE 1

PART 1

Interpretation

The following physical quantities are used to describe exposure to electromagnetic fields:

Electric field strength (E) is a vector quantity that corresponds to the force exerted on a charged particle regardless of its motion in space. It is expressed in volt per metre (Vm^{-1}). A distinction has to be made between the environmental electric field and the internal electric field present in the body as a result of exposure to the environmental electric field.

Limb current (I_L) is the current in the limbs of a person exposed to electromagnetic fields in the frequency range from 10 MHz to 110 MHz as a result of contact with an object in an electromagnetic field or the flow of capacitive currents induced in the exposed body. It is expressed in ampère (A).

Contact current (I_C) is a current that appears when a person comes into contact with an object in an electromagnetic field. It is expressed in ampère (A). A steady state contact current occurs when a person is in continuous contact with an object in an electromagnetic field. In the process of making such contact, a spark discharge may occur with associated transient currents.

Electric charge (Q) is an appropriate quantity used for spark discharges and is expressed in coulomb (C).

Magnetic field strength (H) is a vector quantity that, together with the magnetic flux density, specifies a magnetic field at any point in space. It is expressed in ampère per metre (Am^{-1}).

Magnetic flux density (B) is a vector quantity resulting in a force that acts on moving charges, expressed in tesla (T). In free space and in biological materials, magnetic flux density and magnetic field strength can be interchanged using the magnetic field strength of $H = 1\ Am^{-1}$ equivalence to magnetic flux density of $B = 4\pi\ 10^{-7}$ T (approximately 1.25 microtesla).

Power density (S) is an 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. It is expressed in watt per square metre (Wm^{-2}).

Specific energy absorption (SA) is an energy absorbed per unit mass of biological tissue, expressed in joule per kilogram (Jkg^{-1}). In these Regulations, it is used for establishing limits for sensory effects from pulsed microwave radiation.

Specific energy absorption rate (SAR), averaged over the whole body or over parts of the body, is the rate at which energy is absorbed per unit mass of body tissue and is expressed in watt per kilogram (Wkg^{-1}). Whole-body SAR is a widely accepted quantity for relating adverse thermal effects to radio frequency (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 include: an individual exposed to RF in the low MHz range (e.g. from dielectric heaters) and individuals exposed in the near field of an antenna.

Of these quantities, magnetic flux density (B), contact current (I_C), limb current (I_L), electric field strength (E), magnetic field strength (H), and power density (S) can be measured directly.

PART 2

Introduction to Part 3

1. Except where otherwise indicated:

(a) "f" is the frequency expressed in hertz.

(b) ALs and ELVs relate to exposure in any part of the body.

(c) notes to the tables refer only to the table under which they appear.

2. A reference to electromagnetic field levels is, depending on the quantity in which a particular level is expressed, a reference to electromagnetic field levels in an area where the employee will work or to the internal electromagnetic field levels in all or part of an employee's body.

3. The ALs are defined physical quantities which—

(a) in part 3, are related to the direct effects of exposure to electromagnetic fields and may be used to demonstrate that electromagnetic field levels are below particular ELVs;

(b) in part 4, specify the electromagnetic field levels above which indirect effects of exposure to electromagnetic fields may occur.

4. The ALs and ELVs are grouped according to their potential effects, being:

(a) thermal effects, related to the heating of tissue due to its absorption of electromagnetic fields; and

(b) non-thermal effects, related to the stimulation of muscles, nerves or sensory organs due to the presence of electromagnetic fields.

PART 3

Direct effects of exposure

Action Levels – non-thermal effects

Table AL1 - ALs for exposure to electric fields from 1 Hz to 10 MHz

Frequency range	*Electric field strength Low ALs (E)* $\left[Vm^{-1}\right]$ *(RMS)*	*Electric field strength High ALs (E)* $\left[Vm^{-1}\right]$ *(RMS)*
$1 \leq f < 25$ Hz	2.0×10^4	2.0×10^4
$25 \leq f < 50$ Hz	$5.0 \times 10^5/f$	2.0×10^4
50 Hz $\leq f <$ 1.64 kHz	$5.0 \times 10^5/f$	$1.0 \times 10^6/f$
$1.64 \leq f <$ 3 kHz	$5.0 \times 10^5/f$	6.1×10^2
3 kHz $\leq f \leq$ 10 MHz	1.7×10^2	6.1×10^2
Exposure of employees to EMFs below the ALs will be below the ELVs in:	Tables ELV2 and ELV3	

NOTES

1. Between the low and high ALs, exposure will be below the ELVs but spark discharges may occur. Suitable protection measures referred to in paragraph 1(b)(i) of Part 2 of Schedule 2 will prevent this.

2. The ALs in Tables AL1 and AL2 are root mean square (RMS) values of the electric field strength. These RMS values are equal to the peak values divided by √2 for sinusoidal fields. The corresponding ELVs in Tables ELV2 and ELV3 are peak values in time, which are equal to the RMS values multiplied by √2 for sinusoidal fields. In the case of non-sinusoidal fields the exposure assessment carried out in accordance with regulation 6 must be based on the weighted peak method (filtering in time domain) or on

a scientifically proven and validated exposure evaluation procedure which produces approximately equivalent and comparable results to the weighted peak method.

Table AL2 - ALs for exposure to magnetic fields from 1 Hz to 10 MHz

Frequency range	*Magnetic flux density Low ALs (B)* $[\mu T]$ *(RMS)*	*Magnetic flux density High ALs (B)* $[\mu T]$ *(RMS)*	*Magnetic flux density ALs for exposure of limbs to a localised magnetic field* $[\mu T]$ *(RMS)*
$1 \leq f < 8$ Hz	$2.0 \times 10^5/f^2$	$3.0 \times 10^5/f$	$9.0 \times 10^5/f$
$8 \leq f < 25$ Hz	$2.5 \times 10^4/f$	$3.0 \times 10^5/f$	$9.0 \times 10^5/f$
$25 \leq f < 300$ Hz	1.0×10^3	$3.0 \times 10^5/f$	$9.0 \times 10^5/f$
300 Hz $\leq f <$ 3 kHz	$3.0 \times 10^5/f$	$3.0 \times 10^5/f$	$9.0 \times 10^5/f$
3 kHz $\leq f \leq$ 10 MHz	1.0×10^2	1.0×10^2	3.0×10^2
Exposure of employees to EMFs below the ALs will be below:	Under 400 Hz: the sensory effects ELVs in Table ELV3 Above 400 Hz: the health effects ELVs in Table ELV2		

NOTES

1. Note 2 to Table AL1 applies.

Action levels – thermal effects

Table AL3 - ALs for exposure to electric and magnetic fields from 100 kHz to 300 GHz

Frequency Range	*Electric field strength ALs (E)* $[Vm^{-1}]$ *(RMS)*	*Magnetic flux density ALs (B)* $[\mu T]$ *(RMS)*	*Power density ALs (S)* $[Wm^{-2}]$
100 kHz $\leq f <$ 1 MHz	6.1×10^2	$2.0 \times 10^6/f$	-
$1 \leq f <$ 10 MHz	$6.1 \times 10^8/f$	$2.0 \times 10^6/f$	-
$10 \leq f <$ 400 MHz	61	0.2	-
400 MHz $\leq f <$ 2 GHz	$3 \times 10^{-3}\ f^{½}$	$1.0 \times 10^{-5}\ f^{½}$	-
$2 \leq f <$ 6 GHz	1.4×10^2	4.5×10^{-1}	-
$6 \leq f \leq$ 300 GHz	1.4×10^2	4.5×10^{-1}	50
Exposure of employees to EMFs below the ALs will be below:	Up to 6 GHz: the health effects ELVs in Table ELV4 – whole body heat stress and/or localised heat stress in head and trunk 6 – 300 GHz: the health effects ELV in Table ELV6		N/A

NOTES

1. The squares of the ALs for electric field strength and magnetic flux density are to be averaged over a six minute period.

2. For RF pulses, the peak power density averaged over the pulse width must not exceed 1000 times the respective AL (S) value. For multi-frequency fields, the analysis must be based on summation.

3. The ALs for electric field strength and magnetic flux density represent maximum calculated or measured values at an employee's body position. This results in a conservative exposure assessment and automatic compliance with ELVs even in non-uniform exposure conditions.

4. In the case of a very localised source within a distance of a few centimetres from the body, compliance with ELVs must be determined dosimetrically, case by case.

Table AL4 – AL induced limb currents

Frequency range	*Induced limb current in any limb AL (I_L) $[mA]$ (RMS)*
$10 \leq f \leq 110$ MHz	100
Exposure of employees to EMFs below the AL will be below the ELVs in:	The health effects ELV in table ELV4 - localised heat stress in the limbs

NOTES

1. The square of the AL is to be averaged over a six minute period.

Exposure Limit Values – non-thermal effects

Table ELV1 - ELVs for external magnetic flux density [B_0] from 0 to 1 Hz

	Sensory effects ELVs
Normal working conditions	2 T
Localised limbs exposure	8 T
	Health effects ELV
Controlled working conditions	8 T

NOTES

1. The ELVs are limits for static magnetic fields which are not affected by the tissue of the body.

2. Exposure up to the health effects ELV is only permitted where suitable preventative measures have been taken in accordance with regulation 10.

Table ELV2 - Health effects ELVs for internal electric field strength from 1 Hz to 10 MHz

Frequency range	*Health effects ELVs*
$1 \text{ Hz} \leq f < 3 \text{ kHz}$	1.1 Vm^{-1} (peak)
$3 \text{ kHZ} \leq f \leq 10 \text{ MHz}$	3.8×10^{-4} f Vm^{-1} (peak)

NOTES

1. The ELVs are limits for electric fields induced in the body from exposure to time-varying electric and magnetic fields.

2. The ELVs are spatial peak values in the entire body of the exposed subject.

Table ELV3 - Sensory effects ELVs for internal electric field strength from 1 to 400 Hz

Frequency range	*Sensory effects ELVs*
$1 \leq f < 10$ Hz	$0.7/f$ Vm^{-1} (peak)
$10 \leq f < 25$ Hz	0.07 Vm^{-1} (peak)
$25 \leq f \leq 400$ Hz	$0.0028\ f$ Vm^{-1} (peak)

NOTES

1. The ELVs are spatial peak values in the head of the exposed employee.

Exposure Limit Values – thermal effects

Table ELV4 - ELVs for exposure to electromagnetic fields from 100 kHz to 6 GHz

Health effects ELVs	*SAR values averaged over any six minute period*
ELVs related to the whole body heat stress expressed as averaged SAR in the body	0.4 Wkg^{-1}
ELVs related to localised heat stress in head and trunk expressed as localised SAR in the body	10 Wkg^{-1}
ELVs related to localised heat stress in the limbs expressed as localised SAR in the limbs	20 Wkg^{-1}

NOTES

1. Localised SAR averaging mass is any 10 grams of contiguous tissue with roughly homogeneous electrical properties. The maximum SAR so obtained should be the value used for estimating exposure. In specifying a contiguous mass of tissue, it is recognised that this concept may be used in computational dosimetry but may present difficulties for direct physical measurements. A simple geometry, such as cubic or spherical tissue mass, can be used.

Table ELV5 - Sensory effects ELVs for exposure to electromagnetic fields from 0.3 to 6 GHz

Frequency range	*Localised specific energy absorption (SA)*
$0.3 \leq f \leq 6$ GHz	10 $mJkg^{-1}$

NOTES

1. Localised SA averaging mass is 10 grams of tissue.

Table ELV6 - Health effects ELVs for exposure to electromagnetic fields from 6 to 300 GHz

Frequency range	*Health effects ELVs related to power density*
$6 \leq f \leq 300$ GHz	50 Wm^{-2}

NOTES

1. The power density is to be averaged over any 20 cm^2 of exposed area. Spatial maximum power densities averaged over 1 cm^2 should not exceed 20 times the value of 50 Wm^{-2}.

2. Power densities from 6 to 10 GHz are to be averaged over any six-minute period. Above 10 GHz, the power density is to be averaged over any $68/f^{1.05}$ -minute period (where f is the frequency in GHz) to compensate for progressively shorter penetration depth as the frequency increases.

PART 4

Indirect effects of exposure

Action levels – non-thermal effects

Table AL5 - ALs for contact current I_c

Frequency	*ALs (I_c) steady state contract current $[mA]$ (RMS)*
up to 2.5 kHz	1.0
$2.5 \leq f < 100$ kHz	0.4 f
$100 \leq f \leq 10\,000$ kHz	40

NOTES

1. "f" is the frequency expressed in kHz.

Table AL6 - ALs for magnetic flux density of static magnetic fields

Hazards	*ALs (B_0)*
Interference with active implanted devices, e.g. cardiac pacemakers	0.5 mT
Attraction and projectile risk in the fringe of high field strength sources (> 100 mT)	3 mT

NOTES

1. ALs for exposure to magnetic fields represent maximum values at the employee's body position.

Action levels – thermal effects

Table AL7 - AL for contact currents

Frequency range	*Steady state contact current ALs (I_c) $[mA]$ (RMS)*
100 kHz ≤ f < 110 MHz	40

SCHEDULE 2

Lower risk work activities

PART 1

Introduction

1. Where any of the levels in paragraphs 1, 2, 4 and 5 of Part 2 are exceeded during a work activity, but the conditions attached to the relevant level or levels are met, that work activity is lower risk for the purposes of these Regulations.

2. The AL in paragraph 3 of Part 2 relates to indirect effects, which all employers are required to address under regulations 8 and 9.

3. References to table numbers are references to the tables in Parts 3 and 4 of Schedule 1.

PART 2

Levels

Action levels

1. The low action levels for electric fields in Table AL1, provided:

(a) The sensory effects ELVs in Table ELV3 are not exceeded; or

(b) The health effects ELVs in Table ELV2 are not exceeded and:

(i) Excessive spark discharges are prevented through provision of suitable training in accordance with regulation 10 and the use of suitable technical and personal protection measures;

(ii) Contact current in excess of those in Table AL5 are prevented; and

(iii) Adequate information is provided on the possibility of transient symptoms and sensations related to effects on the central or peripheral nervous system.

2. The low action levels for magnetic fields in Table AL2, provided:

(a) The sensory effects ELVs in Table ELV3 are not exceeded; or

(b) The sensory effects ELVs in Table ELV3 are only exceeded temporarily during the shift; and

(i) The health effects ELVs in table ELV2 are not exceeded;

(ii) Adequate information is provided on the possibility of transient symptoms and sensations related to effects in the central or peripheral nervous system; and

(iii) If transient symptoms related to time varying magnetic fields are reported, the exposure and risk assessments are, where necessary, updated.

3.The action levels for magnetic flux density of static magnetic fields in table AL6.

ELVs

4. The sensory effects ELVs in table ELV1, provided:

(i) They are only exceeded temporarily during the shift;

(ii) Specific protection measures have been adopted to minimise, so far as is reasonably practicable, the sensory effects related to movement in static magnetic fields;

(iii) Adequate information is provided on the possibility of transient symptoms and sensations related to effects in the central or peripheral nervous system; and

(iv) If sensory effects related to static magnetic fields are reported, the exposure and risk assessments are, where necessary, updated.

5. The sensory effects ELVs in Tables ELV3 and ELV5, provided:

(i) They are only exceeded temporarily during the shift;

(ii) Adequate information is provided on the possibility of transient symptoms and sensations related to effects in the central or peripheral nervous system; and

(iii) If transient symptoms related to time varying magnetic fields are reported, the exposure and risk assessments are, where necessary, updated.

Annex (iii)

Title: The Control of Electromagnetic Fields at Work Regulations 2016 IA No: HSE0093 Lead department or agency: Health and Safety Executive (HSE)	**Impact Assessment (IA)** Date: 13/07/2015 Stage: Consultation Source of intervention: European Type of measure: Secondary Legislation
Summary: Intervention and Options	**RPC Opinion: Green**

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANCB on 2009 prices)	**In scope of One-In, Two-Out?**	**Measure qualifies as**
£-6.4m	£-6.4m	£0.55m	No	N/a

What is the problem under consideration? Why is government intervention necessary?

The European Physical Agents (Electromagnetic Fields) Directive 2013/35/EU has to be transposed by member states by 1 July 2016. HSE will implement the Directive through the Control of Electromagnetic Fields at Work Regulations 2016 (the EMF Regulations 2016). An electromagnetic field (EMF) is a type of non-ionising radiation that occurs naturally in the environment and is created whenever electrical energy is used. Exposure to high levels of EMFs can give rise to effects that may be irritating or unpleasant, or sometimes harmful and cause burns. The Directive only deals with short-term/immediate effects of EMFs, as there is no evidence of long-term effects. The risks from EMFs in the UK are currently managed using existing legislation: the Health and Safety at Work Act etc. 1974 and the Management of Health and Safety at Work Regulations 1999 (the Management Regulations 1999). Feedback from stakeholders is that this legislative framework is sufficient, so it is expected that the Directive will deliver few, if any, additional health and safety benefits. Our implementation of the Directive through the EMF Regulations and the EMFs guidance will ensure workers remain protected and the burdens on businesses are minimised through practical assessment of exposure levels, proportionate risk management and exemptions.

What are the policy objectives and the intended effects?

(i) Follow government policy and transpose the Directive in line with EU Treaty obligations; (ii) ensure workers remain protected from adverse health and safety risks; (iii) ensure control measures already in place are taken into account so any burdens on business are minimised. The intended effect is to implement the Directive in a way that is proportionate to the risks and takes into account existing controls and therefore minimises the impact on businesses.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base) Non-regulatory approaches would not fulfil the UK's obligations under EU Law. Our preferred legislative option is to introduce a new set of health and safety regulations that transpose those parts of the Directive not already covered by existing legislation: 'The Control of Electromagnetic Fields at Work Regulations 2016'. It is not proposed to use pure 'copy out' as the topic is complex the Directive is difficult to follow and it could lead dutyholders to believe they have to do more than is necessary to achieve compliance. The EMF Regulations reproduce only the Directive's new requirements in a much less burdensome way.

Will the policy be reviewed? It **will** be reviewed. **If applicable, set review date: July/2021**

Does implementation go beyond minimum EU requirements?			No		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	**Micro** Yes	**< 20** Yes	**Small** Yes	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded: N/a**	**Non-traded: N/a**	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible: ..... Date……

Summary: Analysis & Evidence

Policy Option 1

Description: Do Nothing

FULL ECONOMIC ASSESSMENT

Price Base Year	PV Base Year	Time Period Years	Net Benefit (Present Value (PV)) (£m)		
2014	2016	10	**Low:** Nil	**High:** Nil	**Best Estimate:** Nil

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Nil	Nil	Nil	**Nil**
High	Nil		Nil	**Nil**
Best Estimate	Nil		Nil	**Nil**

Description and scale of key monetised costs by 'main affected groups'

The do nothing option is not a valid option but is used as a notional baseline against which option 2 is compared, hence the costs are set to zero.

Other key non-monetised costs by 'main affected groups'

N/a

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Nil	Nil	Nil	**Nil**
High	Nil		Nil	**Nil**
Best Estimate	Nil		Nil	**Nil**

Description and scale of key monetised benefits by 'main affected groups'

The do nothing option is not a valid option but is used as a notional baseline against which option 2 is compared, hence the benefits are set to zero.

Other key non-monetised benefits by 'main affected groups'

N/a

Key assumptions/sensitivities/risks

N/a

Discount rate 3.5%

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of	Measure qualifies
Costs: Nil	**Benefits: Nil**	**Net: Nil**	No	N/a

Summary: Analysis & Evidence

Policy Option 2

Description: Introduce a new set of health and safety regulations that only transpose those parts of the Directive not already covered by existing legislation.

FULL ECONOMIC ASSESSMENT

Price Base Year	PV Base Year	Time Period Years	Net Benefit (Present Value (PV)) (£m)		
2014	2016	10	**Low:- 6.9**	**High: - 5.9**	**Best Estimate: - 6.4**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	3.8		0.3	**5.9**
High	4.3		0.3	**6.9**
Best Estimate	4.1		0.3	**6.4**

Description and scale of key monetised costs by 'main affected groups'

The main costs are as follows:
Scoping – one-off costs **of £1.7m**
Familiarisation – total costs of **£3.1m - £3.8m over the appraisal period**
Assessment of exposure levels and applying the exemption **£1.1m - £1.4m over the appraisal period**
The total cost to business over the appraisal period is estimated to be £5.9 - £6.9m (costs to the public sector are minor and get lost in the rounding). Approximately 99% of the businesses affected have fewer than 250 employees.
The average cost per business is estimated to be **about £56** (based on the total number of businesses for whom the EMF Regulations will apply, estimated to be 88, 000 businesses) with a further 780,000 businesses incurring costs of just £2 each.

Other key non-monetised costs by 'main affected groups'

N/a

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Nil		Nil	**Nil**
High	Nil	Nil	Nil	**Nil**
Best Estimate			Nil	**Nil**

Description and scale of key monetised benefits by 'main affected groups'

There are no monetised benefits.

Other key non-monetised benefits by 'main affected groups'

None of the key stakeholders have highlighted any benefits to the Directive. Indirect benefits are described in paragraphs **119** to **122**.

Key assumptions/sensitivities/risks — **Discount rate** 3.5%

The detailed assumptions behind the cost estimates are set out in the costs section of this IA and will be tested with industry during consultation. The risks from EMFs are generally well understood and well managed in GB through the use of existing legislation. Costs identified in this IA are the additional costs that the new Regulations impose compared to the current legislative framework.

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			In scope of	Measure qualifies
Costs:	**Benefits: 0**	**Net:**	No	N/a
0.55 (2009 prices)		**0.55 (2009 prices)**		
0.74 (2014 prices)		**0.74 (2014 prices)**		

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The Control of Electromagnetic Fields at Work Regulations 2016

Introduction

1. The Electromagnetic Fields (EMF) Directive 2013/35/EU[1] is the fourth in a sequence of directives that amend the European Commission's original 1993 proposal for a physical agents Directive, regarding the exposure of workers to the risks arising from noise, vibration, artificial optical radiation (AOR) and electromagnetic fields.

2. The first EMF Directive was adopted in 2004. However, following adoption the manufacturing sector, in particular the automotive sector, as well as the magnetic resonance imaging (MRI) community (MRI is widely used in medical diagnostics), raised concerns that it contained disproportionate requirements and was overly burdensome. The obligations in the 2004 Directive never came into effect as it was decided it should be repealed and replaced by Directive 2013/35/EU (Physical Agents (Electromagnetic Fields)) to enable more appropriate and proportionate measures to be introduced to protect workers from the risks associated with electromagnetic fields. Directive 2013/35/EU is intended to ensure that:

    - there is a harmonised regime across all European member states;
    - dutyholders take action to minimise and control the risks from EMFs; and that
    - all workers remain protected.

3. The Directive was officially adopted on 26 June 2013 and published in the EU Official Journal on 29 June 2013 (2013/35/EU). In accordance with current treaty obligations, it must be transposed and implemented into respective domestic laws across all Member States by 1 July 2016.

Electromagnetic fields

4. An electromagnetic field is a type of non-ionising radiation that occurs naturally in the environment and, as it is created whenever electrical energy is used, is present in virtually all workplaces. The vast majority of field strengths are at such a low level that they will not cause undesired or harmful effects. However, there are field strengths in some workplaces that may present a risk. EMFs are not a singular hazard. The term acts as an umbrella title for static, electric, static magnetic and time-varying electric, magnetic and electromagnetic fields with frequencies up to 300GHz. Fields with frequencies higher than 300GHz are considered optical radiation and are not covered in this Directive.

5. Electric fields are associated with voltage differences and magnetic fields are associated with the flow of an electric current. EMFs are made up of an electric field and a magnetic field in a particular arrangement which allows them to travel together away from the equipment that has produced them. They carry power which can be deposited in anything that they intercept. One example of an electromagnetic wave is a radio signal which carries power from a distant transmitter to a radio set.

6. The Directive deals with EMFs with frequencies up to 300GHz. These fields are produced by a wide range of sources that workers may encounter in the workplace, e.g. equipment used in manufacturing processes or forms of communication.

[1] Whenever 'the Directive' is used within this document it is reference to Directive 2013/35/EU – on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields).

7. The Directive considers two general types of risk: direct risks from EMFs' effect on the body and indirect risks by the EMFs affecting other things in the environment that can create a safety or health hazard (see Annex 1 for further details). The risks arising from exposures to EMFs depend on the intensity or strength of the fields and, for some time-varying fields, their frequency as well. (Time-varying means that as time increases, the magnetic field changes). This is explained in more detail in Annex 2.

8. The risks from EMFs are generally already well understood and well managed in Great Britain through the use of existing legislation. Health and safety inspectors do not come across many instances of workers at risk and there have been very few incidents or accidents reported in recent years as a direct result of exposure to EMFs.

The problem under consideration

9. Although HSE is satisfied that the risks are well managed in GB, exposure to EMFs was considered sufficiently serious at a European level for the European Commission to propose a Directive to specify control measures that need to be in place in workplaces across European member states and for arrangements to be made to enforce these controls.

10. The first EMF Directive was adopted in 2004 with an April 2008 transposition deadline. However, following adoption, serious concerns were expressed by stakeholders from the medical community and manufacturing sector. The medical community was concerned certain clinical situations and activities would be inhibited by the restrictive and inflexible limits imposed by the Directive including restricting the use of Magnetic Resonance Imaging (MRI) equipment. This would have wide-ranging ramifications for the application of this technology. MRI is a powerful diagnostic tool that has been in use for the last 30 years in healthcare and for scientific studies. The use of MRI has major benefits for patients. It has become an essential part of the diagnosis and routine treatment of numerous diseases such as cancer, cardiovascular disease and neurological conditions for approximately 1.3 million patient examinations per year. MRI provides a much higher contrast between soft tissues than CT (computer tomography) and unlike CT, does not use ionising radiation. The development of new techniques that would have a significant impact on medical practice that could bring further health and safety benefits for both patients and staff in future would also have been prevented. The automotive sector felt the Directive imposed disproportionate restrictions on certain industrial activities such as welding and would have serious negative economic consequences if this equipment could no longer be used where levels of exposure exceeded the EMF specific values. Welding is used to some degree across almost all sectors and different sized industries, from large automotive manufacturers to small garages, so the impact would have been both far reaching and significant. Subsequently the UK, following extensive stakeholder engagement, successfully argued for an extension to the transposition deadline to ensure these concerns could be addressed.

11. Throughout negotiations the UK maintained that the existing legislative framework was sufficient and specific legislation on EMFs unnecessary, as current evidence suggests EMFs are being managed satisfactorily using the Framework Directive (89/391/EEC) and, in addition in the UK, through the Management of Health and Safety at work Regulations 1999. Dutyholders are already obliged to manage all hazards in the workplace (including those resulting from EMFs) through risk assessment and adoption of proportionate control measures that reduce the risks to as low a level as is reasonably practicable. However as the UK was unable to secure support from other member states, it was unable to completely block a new proposal.

12. It became clear the UK would be unable to secure repeal of the Directive. HSE therefore worked closely with industry stakeholders, the European Commission (EC) and others in Europe, to ensure that the new Directive was more proportionate to the risks and much less burdensome than its predecessor. Due to the emergence of proposals for a new replacement Directive, the 2004 Directive was not transposed into UK law.

13. In 2008 member states agreed to delay transposition of the Directive until October 2013 to give them time to fully consider and resolve industry's concerns. On 14 June 2011 the EC published a proposal to replace 2004/40/EC. This proposal included a number of derogations, including one to protect MRI processes, and a proportionate approach for businesses where there was a low-risk of exposure from EMFs. Extensive negotiations in Council then took place, with the Council agreeing a general approach in December 2012. Negotiations concluded on 26 March 2013 and the Directive was adopted in June 2013.

14. Member states have until 1 July 2016 to implement the Directive.

UK's negotiating objectives

15. The UK's current position, which has not changed since the Directive was negotiated, is that a specific Directive on EMFs is not needed. The European Affairs Committee cleared the UK negotiating strategy on 11 October 2011. In summary, it confirmed the UK could:

- secure a proportionate response to the risk of exposure to EMFs;
- seek to protect the improvements to the old Directive in the new proposal;
- press for the provisions allowing flexibility to exceed exposure limits to be strengthened to ensure they are sufficient for the needs of UK industry;
- press for the removal of those provisions that duplicate existing provisions in other legislation;
- continue to press for non-legislative approaches if, and when, appropriate, recognising that the current negotiating context and position of other member states argues strongly against trying to push against any legislation in this area.

16. During negotiations the UK robustly challenged the content of the Directive, and whilst we did not achieve a complete repeal, we are satisfied that the final Directive does ensure that GB's negotiating objectives have been achieved and represents the considerable improvements we diligently sought to gain.

Key achievements during the extended negotiation period

17. HSE continued to work extensively with stakeholders and achieved the following outcomes and important concessions that not only help minimise the impact and legislative burden on business, but ensure that all essential existing processes across all industries can continue:

- A three-year transposition period instead of the usual two.

- Exemptions and derogation provisions in relation to:

  i. the health sector – 'Exposure may exceed the exposure limit values (ELVs) if the exposure is related to the installation, testing, use, development maintenance of or research related to MRI equipment for patients in the health sector' (provided certain conditions are met);

  ii. personnel working in operational military installations or involved in military activities (including in joint international military exercises) provided an equivalent protection system is put in place and adverse health effects and safety risks are prevented;

  iii. a general derogation that will enable specific sectors or activities to exceed the ELVs in the Directive in 'duly justified circumstances' - and only for as long as they remain duly

justified. The Directive specifies what the 'duly justified' circumstances are, i.e. a set of specific conditions that must be met for a derogation to be applied. ELVs are explained in detail at Annex 3.

- The use of a set of scientific standards for exposure levels (the International Commission on Non-Ionizing Radiation Protection (ICNIRP) recommendations) as the scientific basis for the Directive, providing credibility in the science community.

- A degree of simplification of technical aspects and calculations, making them easier to understand**.**

Scope of the Directive in Great Britain

18. For the purposes of implementing this Directive, Great Britain (GB), Northern Ireland and Gibraltar collectively make up the United Kingdom. The Health and Safety Executive (HSE) takes the lead for Government for ensuring the Directive's requirements come into force in GB.

19. Health and safety law in GB places duties on persons who create risks that relate to work and the workplace, including, in some circumstances, the self-employed.

20. The Directive applies to land-based workers in Great Britain and Northern Ireland as well as to work that is carried out on a ship as part of the normal shipboard activities of the ship's crew (and is carried out under the direction of the Master). The Directive will therefore be implemented by Regulations[2] from two agencies: the Health and Safety Executive (HSE)[3] through the Control of Electromagnetic Fields at Work Regulations 2016 and the Maritime and Coastguard Agency (MCA) through the Merchant Shipping (Health and Safety at Work) Electromagnetic Fields Regulations 2016. NI and Gibraltar will introduce their own regulations.

21. This impact assessment estimates the impact of the Control of the Electromagnetic Fields at Work Regulations 2016.

What is not in the scope of the Directive

22. This Directive and the proposed EMF Regulations 2016 do not address any possible long-term health effects related to EMF exposure. While it is known that exposure to EMFs can produce immediate effects, there is no conclusive or well-established scientific evidence or proof of a causal relationship showing that prolonged or repeated exposure EMF levels below 300GHz, even over a long period of time, causes cancer or has any other adverse health effect. Fields with frequencies higher than 300GHz are considered optical radiation and are not covered in this Directive.

23. This Directive does not cover the risk resulting from contact with live conductors. This is covered by the Electricity at Work Regulations 1989 in Great Britain and is therefore not included in this impact assessment**.**

[2] The options for implementing the Directive are discussed in paragraphs 29 to 31.
[3] NI and Gibraltar will introduce their own regulations.

Rationale for intervention

24. The rationale for the transposition approach takes full account of the UK Government's Guiding Principles for EU Legislation and the Government remains committed to regulating only where it is necessary to do so.

25. The UK is obliged to implement all EU legislation, which includes European Directives. If the UK does not reflect these new requirements in its domestic law, it would not be following current Government policy, nor meeting in full its EU law obligations.

26. The extent of the new regulations is restricted, covering only the requirements of the Directive not already covered by current domestic legislation.

GB policy objectives

27. In considering the best method to transpose the Directive's new requirements into domestic legislation by 1 July 2016, the policy objectives are to:

    - follow government policy and transpose the Directive in line with EU Treaty obligations;
    - ensure workers remain protected from adverse health and safety risks by ensuring exposure to EMFs continues to be assessed and controlled where necessary;
    - ensure existing control measures already in place are taken into account so any burdens on businesses are minimised.

28. The intended effect is to implement the Directive in a way that is proportionate to the risks and takes into account existing controls and therefore minimises the impact on businesses.

Options considered

29. Three options have been considered in the early stages of development of this IA:

    - Option 1: Do nothing. This was not a viable option. The Directive must be transposed into UK law by 1 July 2016 or risk infraction proceedings. The Directive directs member states to provide adequate penalties that must be effective, proportionate and dissuasive. This can only be achieved through use of legislation.

    - Option 2: Transpose the Directive into UK law through a new set of health and safety regulations that only transpose those parts of the Directive not specifically already covered by existing legislation.

    - Option 3: Transpose the Directive into UK law by amending existing legislation to incorporate the new requirements.

30. Option 1 is not a viable option in accordance with Better Regulation guidance on IAs[4] and therefore has not been analysed further in this IA. However, it is used as the notional baseline against which the preferred option is compared.

31. Option 3 would be in line with the Government's policy to reduce the volume of regulation. The existing legislation considered most appropriate was the Control of Artificial Optical Radiation (AOR) at Work Regulations 2010. The main advantage of this approach would be that those

[4] See the Better Regulation Impact Assessment Overview document:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/31606/11-

dutyholders who manage the risks from both AOR and EMFs would have to refer to only one set of regulations and guidance. However, familiarising themselves with the new EMF considerations would inevitably lead dutyholders to read (or, for those who are already familiar with AOR, re-read) the AOR considerations unnecessarily. While this provides the perception of one set of regulations, because AOR and EMF each have specific considerations, they would therefore inevitably have to be presented as separate parts, meaning they are effectively individual sets of regulations anyway. While there are some similarities, the EMF and AOR Directives have some very different considerations, and merging these could lead to dutyholders being confused, muddling them up and even misinterpreting them. This could lead them to take inappropriate or unnecessary actions, thereby increasing the burden on UK businesses and reducing the levels of compliance. For this reason, amending existing legislation has been ruled out as a viable policy option and is not considered further in this IA.

HSE's preferred option

32. There is only one viable policy option remaining, which is Option 2. Option 2 ensures we implement only the necessary changes but fully implements the Directive. This option enables us to transpose the Directive by doing the minimum required to ensure workers remain protected: fully aligning it with current domestic regulation and existing health and safety policies, which minimises the burden on businesses and avoids any overlap or contradiction. With this option, there is no risk that we would 'gold plate' EU legislation and place new and unnecessary burdens on business.

33. In considering Option 2, as the Directive is technically complex, the regulations and supporting guidance have been drafted in such a way that they remove any ambiguity and provide clarity for business, thereby helping reduce the burdens on business. Many businesses will not have to do much more, or anything that is significantly different to what they already do now to comply with the new requirements. This is either because their workplaces have safe sources of EMFs or because, in those workplaces where workers are exposed to higher levels of EMFs that might cause harm, the levels are already being assessed and robustly managed.

34. This approach will be supported by clear and specifically targeted communications with stakeholders in addition to EMF guidance, which will explain clearly and simply what action needs to be taken and by whom to demonstrate compliance. HSE will continue to work collaboratively with stakeholders impacted throughout and immediately after the transposition period.

Summary of work undertaken to inform the consultation-stage IA

35. Work with stakeholders on the topic of EMFs has been on-going since 2002, well before the first Directive was adopted in 2004.

36. Initially, engagement with stakeholders informed negotiation of the Directive in Europe. It is clear there is a wide range of equipment types which produce EMFs and which are used across many industries. The UK worked continuously with stakeholders on determining whether different proposals were workable and proportionate, including through developing costings of particular proposed requirements. Key achievements during the extended negotiation period are detailed in earlier paragraph 17.

37. In the summer of 2013, following the end of the of the extended negotiation period and adoption of the Directive, HSE set up an Implementation Working Group (IWG) of representatives from across all UK industries which might be impacted by the Directive. The main purpose of the group was to work with HSE to estimate the impacts of implementing the requirements of the final

Directive on their individual sectors and help HSE develop EMF guidance. In 2013, HSE also set up and now facilitates an EMF online community of interest (COI), so anyone interested in the transposition of the Directive has the opportunity to provide input. It currently has a total of 239 members. Within the COI, members have the opportunity to join supporting sector-specific subgroups as an additional means of communicating and discussing issues within their own industry, as well as through their usual forums and channels.

38. To estimate the impact of the new Regulations, we have worked with representatives of the main industries that will be impacted to understand the range of equipment they use, the likely associated exposures, what sorts of actions could be reasonably taken to reduce exposures if certain values are exceeded, and whether some activities would necessarily require an exemption to continue to take place.
39. We have worked with stakeholders in a variety of ways; initial work was undertaken and continues through periodic IWG general meetings, but more detailed work has also been undertaken and continues through a series of large and small conferences, both multiple-stakeholder and sector-specific group meetings, and finally an extensive series of sector one-to-one meetings. Members of the IWG represent the views of their sectors and not their individual businesses and as such have undertaken extensive consultation themselves and represented sector and industry views at the meetings. A comprehensive list of all the meetings undertaken is presented in Annex 4

40. The costs presented in this impact assessment have been informed by our discussions with stakeholders over the negotiation and transposition period. Based on this work we have developed our implementation approach. Work will continue during the consultation period to confirm how the proposed approach will impact on the different sectors.

41. Sectors represented have included:

- Automotive
- Energy
- Health
- Metals and manufacturing
- Ministry of Defence
- Plastics
- The railway industry
- Small and medium enterprises
- Telecommunications and broadcasting
- The magnetic resonance imaging (MRI) community
- Other sectors whose activities may be affected by EMFs e.g. induction heating furnaces

42. The EMF stakeholder group has been large, diverse and fully engaged. Some stakeholders have been involved in this process from as far back as the negotiation period (2002-2013), and the group includes over 80 companies, as well as trade associations, regulators and government departments. A full list of the stakeholder group is at Annex 5

Proposed legislation

43. As explained in paragraphs 18 to 20, the Directive will be implemented by HSE using the Control of Electromagnetic Fields at Work Regulations 2016.

Requirements of the Regulations

Current management of risks

44. In the existing regulatory framework, there are no specific regulations for EMFs in Great Britain. However, the Health and Safety at Work Act etc. 1974 and the Management of Health and Safety at Work Regulations 1999 (the Management Regulations 1999) address the general principles of how hazards in the workplace need to be managed, through risk assessment and adoption of proportionate control measures to ensure the risks are reduced to as low a level as is reasonably practicable. The Management Regulations 1999 are therefore routinely already used by all businesses whose work means their workers may be exposed to levels of EMFs that must be managed.

45. There are many sectors that work with types of equipment that emit such low levels of EMFs that dutyholders do not need to take any action now, nor will they as a consequence of the new EMFs Regulations. These include, for instance, any workplaces with computer and IT equipment.

46. There are many other sectors where levels of EMFs are unlikely to cause harm and are already being sufficiently managed, e.g. where traditional activities such as welding have taken place in British workplaces for a great many years, the control measures currently in place are balanced and proportionate to the level of risk. The lack of evidence of harm from these sectors indicates the risks are being managed and workers are protected.

47. For those sectors where exposures to EMFs are at such a level that they might cause harm, e.g. the Telcommunications and Broadcasting and energy sectors, companies in these sectors assess the levels of EMFs in the workplace by measuring them. On the basis of their findings they then develop a proportionate risk management system. In these and similar sectors, the risks are well understood and well managed as evidenced by lack of reports of harm.

48. In addition to the the Management Regulations 1999, these dutyholders currently use the guidelines on EMF exposure published by the International Commission on Non-Ionizing Radiation Protection body (ICNIRP)[5] to help them consider and manage the risks from EMFs. These are purely guidelines i.e. there is currently no legal requirement for dutyholders to assess the level of EMF exposure against any specific values.

49. Some aspects of the EMF Directive mirror those in the the Management Regulations 1999. These include:

- assessing and controlling the risks in the workplace. These would include EMFs, as complying with the requirements in the Management Regulations means that businesses will be ensuring that, if EMFs are a significant risk, exposures are reduced so far as is reasonably practical;
- providing suitable controls, which includes measures such as choice of equipment, technical and/or organisational measures, signage and limiting access to areas where appropriate, maintenance of equipment and design of workplaces, and availability of adequate personal protective equipment;
- consideration of workers at particular risk;
- consultation and participation of workers;
- having competent services or persons;

[5] *ICNIRP is a body of independent scientific experts who develop their guidelines through an extensive process of expert review of the scientific literature and consultation with other experts and professional bodies.*

- provision of information and training for workers. The requirement to provide adequate information and training to workers, and/or their representatives who are likely to be subject to the risks identified during the risk assessment, which includes EMFs, already exists in the Management Regulations 1999. Feedback from stakeholders indicates no additional significant costs would be incurred to update and deliver existing training material to include the EMF Regulations 2016. Essentially this would be a 'business as usual' cost.

- the provision of medical examinations and/or health surveillance where appropriate. The requirement to provide medical examinations and/or health surveillance already exists in the Management Regulations 1999. In the EMF Regulations 2016 health surveillance will only be required where any employee is exposed to EMFs above the health exposure limit value **and** reports experiencing a health effect. This potentially reduces existing legal requirements on business. Given that no reports under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR)[6] have ever been received in relation to EMFs, it is not expected that these circumstances will arise, and therefore no costs are anticipated with this requirement.

New actions employers will be required to take

50. Employers will need to:

    - Assess the levels of EMFs to which workers may be exposed against a set of specific values, called Exposure Limit Values (ELVs – see paragraph 53)
    - Keep exposures below those ELVs. However, in cases where the assessment shows that the level of EMFs is likely to be above the ELV, HSE can exempt dutyholders from the exposure limits (see paragraphs 59 to 62.

51. As explained in paragraph 49, the Directive includes aspects that mirror the requirements of the Management Regulations 1999, but refer specifically to EMFs, whereas the Management Regulations cover all risks, which includes EMFs. The new Regulations will have to cover these aspects specifically for EMFs, but in effect, this will result in no new actions being required by employers, beyond what they are already required to do now. For instance, dutyholders will be required to consider EMFs when they assess the risks to 'employees at particular risk'. However, if EMFs are a risk in that workplace, under the Management Regulations employers will already be required to consider *all* risks, which will include EMFs, when assessing the risks to those employees.

52. One of the new requirements of the Directive is that it directs businesses to 'assess' the levels of EMFs to which workers may be exposed against a set of specific values.

53. These specific values in the Directive are called Action Levels (ALs) and Exposure Limit Values (ELVs). Different frequency ranges have different ALs and corresponding ELVs. ALs (which are mainly external quantities) are used to demonstrate that exposure levels are below the corresponding ELVs (which relate to exposure of EMFs in the body). This is because if an EMF does not exceed the AL, the dutyholder can be sure that the corresponding ELVs will not be exceeded either. Because of their nature, it is easier and cheaper to assess whether an EMF exceeds the AL than whether ELVs are being exceeded. A more detailed explanation of what ALs and ELVs are and how they relate can be found in Annex 3.

54. The AL and ELV values in the Directive are based on the guidelines published by ICNIRP. Dutyholders in those sectors where EMFs could pose a significant risk already refer to these

[6] RIDDOR: more information available at: http://www.hse.gov.uk/riddor/

guidelines to help them manage the risk from EMFs. The specific values are now contained in the Directive (applicable to all Member States) and therefore will need to be covered in domestic law, as they do not exist in current legislation.

55. One method of assessing the levels of EMFs in the workplace is to measure them. Sectors where EMFs could pose a significant risk already choose to periodically assess EMF levels by doing so. Because of this, these sectors will not need to take any additional actions to assess exposure levels, and will therefore incur no additional costs.

56. For other sectors where EMFs are used, the levels of exposure can be easily assessed through the use of existing sources of publicly available information without the need to measure. The types of information dutyholders will be able to refer to as necessary includes:

- instructions provided by equipment manufacturers;
- in 2016 the Euopean Union will publish an 'EMF Non-binding guide to good practice' suitable for all sized industries;
- specific guidance that aready exists in sectors where the risks from EMFs have to be carefully managed;
- other sectors and trade associations have indicated they intend to develop industry-specific information and/or guidance for their members in their 'industry language' to enable them to quickly and simply assess levels of EMFs in their workplace;
- HSE EMF guidance, which has been developed in full consultation with all industries impacted to help them fully understand and comply with the legislative changes;
- key industry-specific research, e.g. welding research documents clearly provide dutyholders with digestable guidance in relation to the different types of equipment and expected levels of emissions.

57. Measuring EMFs is a complex and expensive process and, in the main, is usually performed by a specialist consultant[7]. Based on the feedback of the members of our Working Group, the language of the EU Directive is likely to lead dutyholders to think that measurement will often be required to assess the levels of EMF exposure. The reality is that measurement is a last resort, only required where existing information is not sufficient to assess exposures. Based on our discussions with stakeholders and our knowledge of the information that will be available to dutyholders, we believe that there will be sufficient information available for all the relevant activities and sectors and that, in practice, measurements will not be required. We have made it very clear and explicit in our guidance that measurement is a last resort and that we expect it will not be necessary to carry out precise measurements and calculations to assess the levels of EMF exposure and that dutyholders can simply use the information already available, as detailed in the previous paragraph. By taking this approach we have minimised burdens on business, as the potential costs to UK businesses if a significant number of dutyholders felt they had to 'measure' levels of EMFs to assess exposures would be completely disproportionate to the level of risk.

58. We have further reduced burdens on business by limiting the additional actions dutyholders need to take to manage the risks of EMFs and making this explicit. For those for whom EMF exposures are below the ALs, we clearly state in guidance that they should not need to change the actions they currently take to control risk to comply with the new Regulations. We have done this because there would be no increase in worker protection if these dutyholders had to review how they currently manage and control the risks from EMFs. Such a review could incur significant costs with no benefits.

59. To further minimise the burdens on business the UK secured during negotiations further flexibilities, which include the use of derogations, exemptions in the Regulations from the levels of EMFs specified in the Directive. These are:

7 The charges from consultants could be up to £2,000 per day

- Member States can allow for an equivalent or more specific protection system to be implemented for personnel working in operational military installations or involved in military activities, provided health and safety risks are prevented. The regulation to comply with the ELVs is therefore disapplied to military activities and installations. There is an existing high level of knowledge and understanding of managing EMFs and associated risks for those involved in military activities. We believe they already have an existing equivalent protection system and standards, (IEEE C95.1-2345-2014), which we consider provides the necessary protection. This will be confirmed before the final-stage Impact Assessment.
- The regulation to comply with the ELVs is also disapplied for the use of MRI equipment, where it is used for the benefit of patients in the health sector. There are no known significant issues with MRI scanners when used in accordance with the manufacturer's instructions and with appropriate training and safe working practices in place. The health and safety risks associated with the use of MRI in the health sector are already well managed. This disapplication is subject to the same conditions as the general exemption described below, which we believe are already met. The use of MRI must also be reasonable in the circumstances – HSE have no evidence that MRIs are currently being used unnecessarily in the health sector.

- Member States may exempt specific work activities where the ELVs are exceeded, as long as dutyholders can meet the following conditions:

    - the exposure of employees to EMFs has been reduced to the lowest levels reasonably practicable; and
    - employees are still protected against adverse health effects and safety risks.

60. The specific conditions that must be met for the disapplication for MRI equipment and the general exemption are actually considerations dutyholders must take already as part of existing risk assessment requirements for any hazard in the workplace, and not just the risks from EMF. Therefore, we do not anticipate any additional actions will be required for dutyholders to fulfil the conditions of the disapplication or exemption they wish to make use of, and they will not incur any additional costs for this.

61. To further reduce burdens on business we will maximise use of the exemptions HSE negotiated long and hard for, by providing dutyholders with a list of work activities where an exemption from the exposure limit values can be used. Providing dutyholders with this list avoids the need for a costly permissioning regime. Our extensive stakeholder engagement has allowed us to identify what we believe are most, if not all, the relevant sectors or activities, and public consultation will allow us to test whether there is anything missing. HSE will develop the exemptions list in such a way that it can be easily and quickly updated when necessary.

62. HSE will make it as easy as possible to make use of an exemption by explaining clearly in HSE guidance that dutyholders will not be required to prove the ELVs are exceeded before using an exemption. If their assessment of the exposure levels indicates that it is likely that ELVs might be exceeded, they do not need to undertake measurements to confirm whether this is the case or not. In those cases, as long as the activity being undertaken has been exempted by HSE dutyholders can simply make use of the exemption. Since, as explained in paragraph 60, compliance with current regulatory requirements means that dutyholders will already be fulfilling the necessary conditions to use the exemption, the only action they will need to take is to update their risk assessment with information that they are making use of the exemption.

Monetised costs and benefits of the options

63. Before analysing the costs and benefits of the proposed Regulations, the following section sets out the risks and assumptions underlying the cost estimates.

General Assumptions, Risks and Uncertainties

64. All costs and benefits are appraised over a period of 10 years from the year of implementation 2016 – 2026. This is in keeping with impact assessment guidance that a ten-year period should be used where the lifetime of the policy is not identifiable.

65. The impact assessment includes costs and benefits that extend into the future. Consequently, it is important that any monetised impacts are expressed in present values[8], using a discount rate of 3.5% as per Treasury guidelines to enable comparison over time.

66. Sources from the Office for National Statistics (ONS) have been used for wage information (Annual Survey of Hours and Earnings 2014[9]). ONS data (from the Business Demography 2014[10]) was also used for information on the number of businesses in a sector, based on analysis of Standard Industrial Classification (SIC) codes to identify relevant work activities and use of equipment. Data from the Department for Business Innovation and Skills (BIS), Business Population Estimates for the UK and Regions 2014[11] has been used to estimate the proportion of SMEs and businesses with fewer than 5 employees. The base year for these estimates is 2014.

67. Except when exact information is available, numbers of businesses are presented rounded up. Calculations, however, are made using the ONS estimates without rounding.

68. As described earlier, in paragraph 35 to 42 when preparing the costs in this Impact Assessment, we met with industry in a series of group and one-to-one meetings to discuss likely impacts of the new requirements. The cost estimates are based on these discussions with industry, which informed our approach to implementation. The estimates will be tested with industry during consultation and updated if necessary for the final stage IA.

69. We have prepared this IA following a detailed gap analysis and the cost categories reflect only the additional requirements in the new Regulations.

Costs

70. The costs in this IA are analysed in total and for each of the sectors.

71. The costs generated by the new requirements can be split into three broad categories:
    a. scoping costs:
    b. familiarisation costs; and

[8] The present value is the future value expressed in present terms by discounting see The Treasury Green Book at : https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf

[9] Annual Survey of Hours and Earnings available at: http://www.ons.gov.uk/ons/rel/ashe/annual-survey-of-hours-and-earnings/2014-provisional-results/index.html

[10] Available at: http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-357041

[11] Business Population Estimates, available at: https://www.gov.uk/government/statistics/business-population-estimates-2014

c. assessment of exposure levels and updating of risk assessments.

72. Each of these categories of cost is described in more detail below and total costs summarised. Data from BIS (see footnote 11) shows that 91% of businesses have fewer than 5 employees and 99% of businesses have fewer than 250 employees. The businesses that will be affected by the new Regulations cover a range of businesses that are likely to fall into this distribution, which implies that almost all of the costs estimated will fall to SMEs.

73. A description of the sources of EMFs for each of the sectors analysed is provided in Annex 6. The estimated number of businesses affected per sector is as follows:

- Telecommunications and broadcasting: Approximately 11,500 businesses (source: ONS Business Demography data see footnote.10)
- Health: 483 NHS hospitals and 200 private hospitals in GB will have duties as a result of the new Regulations. The number of hospitals has been taken from a combination of data published by the Health and Social Care Information Centre (HSCIC), Information Services Division (ISD) Scotland and HSE best estimates. The numbers will be refined during consultation.
- MRI sector: There are estimated to be 500 MRI units in GB. While some NHS trusts may have more than one scanner, we do not have detailed information on this at present. We therefore assume that all duties under the regulations are performed per scanner, although this could be an overestimate (for instance, if there is a single risk assessment for several scanners). More information will be sought at consultation, but because the MRI sector is relatively small compared to the other sectors in this IA and the duties on the MRI sector are limited, the total costs estimated in this IA are not sensitive to this assumption. It is also understood that there will be MRI equipment used in research facilities, and more information about this will be sought during consultation.
- Energy: There are approximately 6,200 businesses in the energy sector that use equipment that emits EMFs (source: ONS Business Demography data, see footnote10).
- Welding: There are estimated to be approximately 60,000 businesses using welding equipment (source: ONS Business Demography data see footnote 10). This is based on analysis of the SIC codes to identify industries where welding takes place. This is likely to be an over estimate, because welding will not take place in every business in these SIC codes. However, it should also be noted that the analysis in this IA does not currently specifically identify steel manufacture, induction and small furnaces and non-destructive testing as relevant sectors. It is thought that these activities could be affected by the new Regulations. In this consultation-stage IA, the overestimate for welding is assumed to at least cover the number of businesses that might exist in these smaller sectors. We will work to identify the numbers for the smaller sectors and to refine the numbers for welding during the consultation period.
- Plastics: There are approximately 5,600 businesses in the plastics sector that use equipment that emits EMFs (source: ONS Business Demography data, see footnote 10).
- MOD: The MOD is viewed as just one entity for the purposes of this Impact Assessment.
- Rail industry: There are approximately 4,000 businesses in the railways sector that use equipment that emits EMFs (source: ONS Business Demography data, see footnote 10).
- The total number of businesses in all sectors is approximately 88,000.

Scoping costs

74. As explained earlier, there are many kinds of equipment which emit such low levels of EMFs that dutyholders do not need to take any action. These include, for instance, computer and IT equipment. However, on becoming aware that there is new legislation covering EMFs specifically, organisations which have such equipment (which emit EMFs but does not present a risk) will still need to consider the Regulations and if any new requirements apply to them. These organisations will only spend a very short amount of time checking whether they are in scope of

the new requirements in the Directive. For these purposes, there will be a non-exhaustive list of workplaces and equipment where EMFs are not a risk, and they will be clearly highlighted in the guidance.

75. We have analysed with internal HSE experts a list of industries and judged whether organisations in each are likely to use equipment which would give rise to uncertainty. Based on ONS Business Demography data for 2014[11] approximately 870,000 such organisations operate in GB. They include sectors such as professional services and education.

76. These firms will have to spend a short amount of time checking the status of their equipment. The main way to do this would be by initially referring to HSE's EMF guidance, which will clearly explain what types of equipment produce such low levels of EMFs that businesses will not need to take any action.

77. We expect this to take approximately 5 minutes of the time of a health and safety officer at an average full economic cost of £23 an hour[12]. This represents an average covering situations that will range from dutyholders considering it obvious that any new requirements of the Regulations do not apply to them (e.g. an office where the only potential equipment is computers) to dutyholders reading the initial sections of the guidance. This would result in **one-off costs of present value of £1.69 million** in the first year of the Regulations.

78. We expect that 90% (or 785,000) of these organisations will find that all their equipment is clearly below the AL and will have to take no further action relating to EMFs. The following table shows how the total scoping costs are split between the sectors for which the Regulations will apply (see paragraph 73) and the remaining 90% of businesses who need take no further action.

Table 1 Scoping costs

	Scoping Costs		
Sector	**First year Costs (£'000)**	**Present value of on-going costs (£'000)**	**Total Present Value Costs (£'000)**
Telecoms and broadcasting	20	Nil	20
MRI[13]	Nil	Nil	Nil
Health	1	Nil	1
Energy	10	Nil	10
Welding	11	Nil	11
Plastics	10	Nil	10
MOD[14]	Negligible	Negligible	Negligible
Rail Industry	10	Nil	10
All other businesses	1,520	Nil	1,520
TOTAL SCOPING COSTS	**1,690**	**Nil**	**1,690**

79.

[12] Source: ONS's Annual Survey of Hours and Earnings (ASHE) 2014 (provisional). A Full economic cost of £23 is the average of the full economic cost of the occupations: health and safety officer (£22); manager and director (£29); and the average employee (£18). The full economic cost is the mean wage rate per ASHE 2014, multiplied by 19.8% (in line with EUROSTAT labour costs data, available at http://ec.europa.eu/eurostat/web/labour-market/labour-costs/main-tables) to include non-wage costs of employing that person.

[13] Duty holders in the MRI sector will automatically know that the Regulations will apply to their equipment as they are already aware that MRI equipment emits EMFs at the levels covered by these Regulations and so there wont be any scoping costs for this sector.

[14] The MOD will count as one dutyholder and so the cost of 10 minutes of time is negligible.

Familiarisation costs

80. Those businesses that use equipment that emits EMFs at such levels that they need to be managed will need to spend time understanding the new requirements. HSE has worked to implement the Directive in the least burdensome way possible, with an approach that seeks to minimise the actions that need to be taken by dutyholders and provide explicit certainty whenever possible (e.g. lists of activities and sectors where an exemption may be used). The guidance and Regulations have been written in such a way that it will be easy for a dutyholder to understand their main duties as a result of the Regulations. It is estimated that there will be one-off familiarisation costs for current businesses in the first year of the appraisal period, and then there will be one-off costs for any new businesses being established in each of the subsequent years of the appraisal period, as they will have to familiarise themselves with requirements that would not exist in the baseline.

Current businesses

81. It is estimated that familiarisation with the new requirements will take 30 minutes (+/- 10% to reflect the uncertainty in the assumptions) for dutyholders in sectors where EMFs are a significant risk, and who are therefore already very familiar with the issue. This group comprises dutyholders in the telecommunications and broadcasting sector, MRI, and energy. This is a total of approximately 18,000 businesses.

82. It is estimated that familiarisation will take around 1 hour (+/- 10% to reflect the uncertainty in the assumptions) for dutyholders in sectors where EMFs are not a significant risk and therefore only managed in a general way. These dutyholders will be less well informed about the topic. This group comprises dutyholders in the health sector, welding, plastics, the MOD and the rail sector. This is a total of approximately 70,000 businesses.

83. The MRI sector provided information to HSE about the most appropriate cost of time for their sector. This information is based on published NHS Agenda for Change pay rates[15], with the cost of time for an MRI safety advisor estimated to be between £40 and £48 an hour (assuming 225 working days in a year, 37 hours worked per week and overheads of around 20%). For all other sectors where more detailed information has not been available on pay, the full economic cost of that time is estimated to be £23 an hour[12].

84. Based on the above assumptions, first year costs of familiarisation are estimated to be between **£1.64m and £2.00m**. These are one-off costs.

New Businesses

85. Based on ONS Business Demography data[11], we will assume that the number of new businesses each year is approximately 12% of the total number of businesses in the previous year. We will assume this for all sectors except for MRI and health, where the organisations in question are mainly NHS trusts.

86. Based on this rate, we would expect 2,100 new businesses every year in the sectors where EMFs are a significant risk and the new businesses would be expected to have or acquire good knowledge of the subject already under current requirements. As before, we will assume that familiarising themselves with the additional requirements in the EMF Regulations will take them 30 minutes.

87. We would also expect 8,300 new businesses every year in sectors where businesses would be expected to be less familiar with EMFs. As before, we estimate that these businesses will spend 1 hour familiarising themselves with the additional requirements in the EMF Regulations.

[15] http://www.nhscareers.nhs.uk/working-in-the-nhs/pay-and-benefits/agenda-for-change-pay-rates/

88. It is assumed in this impact assessment that business deaths each year are equivalent to births of new businesses in any year (i.e. that the number of businesses in each sector in any year remains the same over the 10-year appraisal period). This is a simplifying assumption but in the absence of robust predictions about growth over the next 10 years, it is the most reasonable assumption to make. What this means in practice is that the number of businesses each year remains the same over the 10-year appraisal period.

89. Using the same assumptions above about the cost of time and the length of time for familiarisation, the net present value of the estimated one-off costs to new businesses in each of the remaining 9 years of the appraisal period is estimated to be **between £1.47m and £1.80m**. The average annual cost is estimated to be **approximately £220,000**.

90. In summary, the familiarisation costs for each sector and total present value of the cost of familiarisation are estimated to be as follows:

Table 2 Familiarisation

	Familiarisation		
Sector	**First year Costs (£'000)**	**Present value of on-going costs (£'000)**	**Total Present Value Costs (£'000)**
Telecoms and broadcasting	120 - 150	110 - 130	230 – 280
MRI	9 – 14	Nil	9 – 14
Health	10 – 20	Nil	14 – 17
Energy	60 - 80	60 – 70	120 – 150
Welding	1,240 – 1,510	1,100 – 1,400	2,360 – 2,890
Plastics	120 – 140	110 – 130	220 - 270
MOD[16]	Negligible	Negligible	Negligible
Rail Industry	80 – 100	80 - 90	160 – 200
TOTAL FAMILIARISATION COSTS	**1,640 – 2,000**	**1,470 – 1,800**	**3,120 – 3,800**

N.B. Totals may not sum due to rounding

Assessment of exposure levels and updating risk assessments

91. This cost category includes the time spent by dutyholders assessing the levels of EMFs to which their workers may be exposed and updating their risk assessments accordingly.

92. As already explained, those sectors where EMFs are a significant risk already assess levels of EMF through measurement to comply with current requirements. They are likely to continue to do so and this will generate no additional costs. The additional costs for these sectors will be in assessing exposure against the specific values in the new Regulations and updating their risk assessments accordingly (some might be doing this already).

93. Other businesses that currently do not make measurements, but use equipment that will result in EMFs over the ALs, will be able to simply assess the levels of exposure using publicly available information. These businesses will then be able to consider if they need to make use of an exemption and again update the risk assessment accordingly. The costs to business, whether or not they currently take measurements, will be the same. An exposure assessment will have to be undertaken and the risk assessment updated.

[16] The MOD will count as one dutyholder and so the cost of 10 minutes of time is negligible.

First-year costs - current businesses – 5 or more employees

94. It is estimated that the time taken to undertake the exposure assessment, record the findings and update the risk assessment will be around 30 minutes (+/- 10% to reflect the uncertainty in the assumption). The time taken reflects the fact that guidance on exposure levels will be readily available to dutyholders. It also represents an average covering situations that will range from dutyholders who simply need to refer to instructions provided by equipment manufacturers to dutyholders who have to refer to more detailed guidance (e.g. industry guidance) and identify their particular equipment. This assumption will be tested with stakeholders during the consultation period.

95. The costs to the MRI sector are nil because there is a specific disapplication for the use of MRI equipment. The MRI sector is already aware of the level of EMFs emitted by certain equipment and so they won't have to take any actions as a result of the new Regulations.

96. In line with current requirements, only businesses with 5 or more employees will need to record their exposure assessments and record the updates to their risk assessments.[17] Those with fewer than 5 employees will only need to undertake the exposure assessment and update their risk assessments, but won't have to record either of these actions.

97. Data from ONS Business Demography[10] shows that 91% of businesses have fewer than 5 employees and 9% have 5 or more. Based on the sector numbers outlined in paragraph 73 and assuming that all in the health sector have 5 or more employees, this equates to approximately 8,500 businesses to which the regulations apply having 5 or more employees.

98. The full economic cost of time is estimated to be £23 an hour[12]. The total cost of assessing exposure and updating the risk assessments in the first year for businesses with 5 or more employees is estimated to be between approximately **£90,000 and £110,000.**

First-year costs - current businesses – less than 5 employees

99. As mentioned above, businesses with fewer than 5 employees will only need to undertake the exposure assessment and update their risk assessments, but won't have to record either of these actions. It is estimated that the time taken to do this will be around 15 minutes (+/- 10% to reflect the uncertainty in the assumption). As above, the time taken reflects the fact that guidance on exposure levels will be readily available to dutyholders and is an average covering a range of situations

100. Based on the sector numbers outlined in paragraph 73 this equates to approximately 79,000 businesses with fewer than 5 employees. Again, using a full economic cost of time of £23 an hour[12], the total cost to business with more than 5 employees in the first year is estimated to be **between approximately £410,000 and £500,000.**

101. The total cost to businesses for assessing exposure and updating the risk assessments is estimated to be between approximately **£500,000 and £610,000.**

[17] See HSE guidance at: http://www.hse.gov.uk/risk/record-your-findings-and-implement-them.htm

On-going costs - New businesses

102. There will also be on-going costs of exposure assessment for new businesses entering the market. As stated above in paragraph 85, it is assumed that new businesses each year will comprise 12% of the stock of businesses in the previous year. As explained in paragraph 88, the number of new businesses is assumed to be constant each year. The assumptions regarding the time taken to make the assessment and then update risk assessments as necessary are the same as for existing businesses (see paragraphs 91 to 100) in other words 15 minutes for those with fewer than 5 employees and 30 minutes for those with 5 or more employees. The cost of time is also assumed to be £23 an hour, as explained above.

103. So if there are 8,500 businesses with 5 or more employees to which the Regulations apply here (see paragraph 97) then there will be just under 1,000 new businesses with 5 or more employees per year (not including businesses in the health sector, as this number is based on hospitals in GB which is not expected to change substantially over the next 10 years). The total ongoing costs to new businesses with 5 or more employees is estimated to have a present value over 10 years of between £70 000 and £90,000 Average annual costs are estimated to be around £10,000.

104. If there are 79,000 businesses with fewer than 5 employees to which the Regulations apply (see paragraph 100), then the total number of new businesses per annum with fewer than 5 employees is estimated to be just under 9,400. The total ongoing costs to new businesses with fewer than 5 employees, is therefore estimated to have a present value over ten years of between £370,000 and £460,000. Average annual costs are estimated to be around £55,000.

105. The total ongoing costs to new businesses are estimated to have a present value between **£450,000 and £550,000 with a best estimate of £500,000 over 10 years.**

106. This is likely to be an overestimate, as the distribution of new businesses is likely to be more skewed towards the smaller end than that of existing businesses. There will therefore probably be a higher proportion of new businesses with fewer than 5 employees than used in our calculations above. However, we do not have the necessary information to refine these estimates.

Recurring costs

107. Every time a business replaces equipment that emits EMFs, they will have to reassess exposure, record this assessment and update their risk assessment. The time taken for this is assumed to be the same as when the Regulations first applied – i.e. 30 minutes if the business has 5 or more employees and 15 minutes if fewer than 5 employees. This is because the same process will have to be undertaken to gather information about the likely exposure and then to update the risk assessment, recording as necessary.

108. Discussions with the different sectors of industry that will be affected have indicated that we should not expect a high rate of equipment replacement. Welding equipment, in particular, tends to be replaced very infrequently (industry representatives have indicated that equipment being replaced every 40 years is not uncommon), and businesses where welding equipment is used represent approximately 70% of total businesses affected. For the purposes of this consultation-stage IA, we will assume an average rate of equipment replacement of 20 years. This estimate will be refined during consultation.

109. Based on this estimate, there will be costs for 5% of businesses each year. While we assume there will be new businesses coming into operation (see paragraphs 102 to 105), we are also making the simplifying assumption that deaths of businesses will be very similar to the births of these new businesses, so that the total stock of businesses in any year remains constant. So in any year, the stock of businesses is assumed to be 8,500 for those with 5 or more employees and 79,000 for those with fewer than 5 employees). If 5% of these businesses will incur recurring costs each year then this equates to just over 400 businesses with 5 or more employees and just under 4,000 businesses with fewer than 5 employees.

110. Using the same assumptions as above, the total present value of the recurring costs for businesses with 5 or more employees over 10 years is **between £30,000 and £40,000.** Average annual costs are **around £5,000.**

111. Using the same assumptions as above, the total present value of the recurring costs for businesses with less than 5 employees over 10 years **is between £160,000 and £190,000.** Average annual costs are aro**und £25,000.**

112. The total present value of the recurring costs over 10 years is **estimated to be between £190,000 and £230,000.**

Costs of using an exemption

113. It has been assumed that the cost of using an exemption will be zero. The actions required to use the exemption are already costed above. In other words, all dutyholders need to do is assess exposure and then update the risk assessment to say the exemption has been used. There are no other duties associated with using the exemption and so the costs to industry are zero.

Total costs of assessing exposure levels and updating risk assessment

114. The total costs of assessing exposure levels and updating risk assessments (recording both actions) for businesses with 5 or more employees are estimated to **be between £200,000 and £240,000 and with a best estimate of £220,000.**

115. The total costs of assessing exposure levels and updating risk assessments for businesses with less than 5 employees are estimated to **be between £940,000 and £1.15m with a best estimate of £1m.**

116. The following table summarises the costs of assessing exposure and updating risk assessments by sector.

Table 3 Assessment of determining exposure levels, considering an exemption and updating the existing risk assessment

	Exposure and risk assessment		
Sector	**First year costs Costs (£'000)**	**Present value of ongoing costs (£'000)**	**Total Present Value Costs (£'000)**
Telecoms and broadcasting	65 – 80	80 - 100	150 – 180
MRI	Nil[18]	Nil	Nil
Health	7 – 9	3 – 3,2	10 – 12
Energy	35 – 40	45- 55	80 – 100
Welding	340 – 410	430 – 530	770 – 940
Plastics	30 – 40	40- 50	70 – 90
MOD[19]	Negligible	Negligible	Negligible
Rail Industry	20 – 30	30 - 40	50 – 60
TOTAL EXPOSURE ASSESSMENT COSTS	**500 – 610**	**640 - 780**	**1,140 – 1,400**

N.B. Totals may not sum due to rounding

Total Costs

117. The total costs of the new Regulations can be summarised as follows, splitting the costs into those which occur in year one and the total present value of the costs over the rest of the10-year appraisal period:

Table 4 Total costs of the Regulations

	Total costs		
Sector	One off Costs (£'000)	Present value of ongoing costs (£'000)	Total Present Value Costs (£'000)
Telecoms and broadcasting	210 – 250	190 – 240	400 – 480
MRI	9 – 14	Nil	9 – 14
Health	20 - 25	3 – 3.3	25 – 30
Energy	110 – 130	100 – 130	210 – 260
Welding	1,690– 2,040	1,560 – 1,900	3,250- 3,940
Plastics	160– 190	150 - 180	310 – 380
MOD	Negligible	Negligible	Negligible
Rail industry	120 – 140	110 - 130	220 – 270
Scoping costs (for sectors not listed above)	1,520	Nil	1,520
TOTAL COSTS OF REGULATIONS	3,800 - 4,300	2,110 – 2,600	5,900- – 6,900

N.B. Totals may not sum due to rounding

[18] As explained in paragraph 95, the costs to the MRI sector are nil because there is a specific exemption for the use of MRI equipment. The MRI sector is already aware of the level of EMFs emitted by certain equipment and so won't have to take any actions as a result of the new Regulations.

[19] MOD costs will be negligible as its estimated the time required will be just 30 minutes of a civil servant's time, which is less than £100.

Sunk costs

118. Throughout the negotiation and the transposition period, there have been considerable costs incurred by business in several sectors when engaging with the negotiation process and helping HSE think through what will be the impacts of the proposed regulations on businesses. Taking into account the time spent attending HSE-organised meetings and responding to queries, this cost has been very considerable. As the costs have already been incurred, they are not additional costs of the Regulations and so it is not appropriate to include them in this IA for introducing the new Regulations. However, we are very grateful to industry for the time they have spent in discussions that have helped shape the policy approach and ultimately reduced the burden of the Directive on industry.

Benefits

119. All of the key stakeholders and sectors with whom we have engaged with since 2002 have stated there are no direct benefits as a consequence of this Directive. This is because risks are already being controlled under existing health and safety legislation. The new requirement on industry to assess exposure is not expected to bring any direct benefits, because this is not a necessary requirement to control risks appropriately.

120. The telecommunications and broadcasting sector have stated that an indirect benefit of having specific legislation is that it provides clear justification to their customers to either turn off or temporarily reduce power or services so there is safe access to areas on their masts and towers. This is something they are already doing, but their broadcast radio providers (either commercial or independent) worry about potential loss of listeners in these type of circumstances, so having the Regulations will help them settle those discussions more quickly. While the safety regimes in the telecommunications and broadcasting sector will not change or be improved by the new requirements, the existence of the Regulations helps give the issue publicity and increase awareness that EMFs can pose some hazards in specific circumstances.

121. Sectors for whom EMFs can be a significant risk have worked safely to ICNIRP 1998 guidelines for many years. For the telecommunications and broadcasting sector, confusion then arose when ICNIRP updated its low frequency guideline in 2010, which had more restrictive action values in the frequencies (up to 10 MHz) used by medium wave radio. This means that there are two different but still current ICNIRP documents giving conflicting advice. The EMF Directive will ensure there is now a uniform set of values written in law against which all dutyholders will assess exposure, providing a consistent approach across Europe.

122. A couple of stakeholders have stated that having clear EU guidance with sensible limits also discourages organisations and countries from making up their own limits, which may be more restrictive and not based on science, and hence offers a level playing field across EU borders.

Direct costs and benefits to business calculations

123. The total present value of the costs over the 10 - year appraisal period has been estimated to be **between £5.9m and £6.9m** with a **best estimate of £6.4m**. The direct costs to business round up to the same estimate.

124. A small proportion of the total cost falls to the public sector, specifically to hospitals in the health sector and MRI units and the MOD. It is also possible that there could be some public bodies operating in the other sectors we have analysed, (particularly telecoms and broadcasting, energy and railways). However, if there are such public bodies, then these will make up a very small proportion of the nearly 90,000 businesses to which the regulations apply. Similarly, it is assumed that the public sector will account for only a very small proportion of the 800,000

businesses who will incur scoping costs. It has therefore been assumed that all costs other than to MRI sector and the health sector will be costs to business. During consultation, efforts will be made to corroborate the split between public and private sector costs. The following table shows the split of total costs. NB. The total costs to the public sector are low so when the totals are rounded, the costs to business are presented as the same as the total costs.

Table 5 Total costs of the Regulations

		Total costs		
Sector		One off Costs (£'000)	Present value of on-going costs (£'000)	Total Present Value Costs (£'000)
Telecoms and broadcasting		210 – 250	190 – 240	400 – 480
MRI -	Public sector	9 – 14	Nil	9 – 14
	Business	Nil	Nil	Nil
	Total	*9 - 14*	*Nil*	*9 – 14*
Health	Public sector	16 - 20	2 – 2	18 – 22
	Business	7 – 8	1 - 1	7 – 9
	Total	*25 - 30*	*3 - 3*	*25 - 30*
Energy		110 – 130	100 – 130	210 – 260
Welding		1,690– 2,040	1,560 – 1,900	3,250- 3,940
Plastics		160– 190	150 - 180	310 – 380
MOD		Negligible	Negligible	Negligible
Rail industry		120 – 140	110 - 130	220 – 270
Scoping costs (for sectors not listed above)		1,520	Nil	1,520
Total costs to Public Sector		25 - 30	2 - 2	30 - 35
Total costs to Business		3,800 - 4,300	2,110 – 2,600	5,900- – 6,900
Total costs of Regulations		3,800 – 4,300	2,110 – 2,600	5,900 – 6,900

N.B. Totals may not sum due to rounding

125. The equivalent annual net cost to business (EANCB) has been calculated as £0.55m (2009 prices using the most recent available BRE Impact Assessment calculator[20]. The EANCB is £0.74m in 2014 prices.

Wider impacts

Environmental impacts

1. We have considered the criteria for wider environmental impacts and do not consider that there is anything that needs to be addressed.

Health and well-being

2. We have considered the criteria for wider health and well-being impacts. The Directive does not address suggested long-term effects of exposure to EMFs since there is currently no well-established scientific evidence of a causal relationship. Therefore, we do not consider there is anything that needs to be addressed other than the health and safety aspects that are addressed in the main body of the IA and in the benefits section. Many of the Directive's requirements are already met by domestic legislation.

[20] Available at: https://www.gov.uk/government/publications/impact-assessment-calculator--3

Economic and Financial

3. The total cost on business is estimated to be around £6.4m over 10 years. The average cost per business affected has been estimated to be £56 for those businesses to whom the Regulations will apply. It is not expected that the proposed Regulations will impact on competition or limit innovation because the costs per business are low. The impact on the Ministry of Defence is expected to be minimal.

Social

4. It is not expected that the proposed Regulations will have any social impacts.

Impact on small and medium enterprises

5. According to BIS data, see footnote 11, approximately 99% of businesses have fewer than 250 employees (and are therefore small and medium enterprises). The total cost of the proposed Regulations is estimated to be £6.4m over 10 years and therefore £6.36m to SMEs in the same period. It has been estimated that the average cost for all businesses is £56 and that will also be the case for SMEs.

6. As the proposal is implementing an EU Directive it is not subject to the requirements of the Small and Micro Business Assessment.

Summary and preferred option with description of implementation plan

7. The Directive requires member states to implement Directive 2013/35/EU by 1 July 2016. The preferred option (Option 2) is to introduce a new set of health and safety regulations that only transpose those parts of the Directive not already covered by existing legislation and to deviate from strict copy-out in order to minimise impact on business.

8. The implementation plan will reflect HSE's current regulatory regime, which is risk-based. Option 2 imposes a 10-year present value cost on society of **between £5.9m and £6.9m** with a **best estimate of £6.4m.** Around £30,000 of the total is the cost to the public sector. The equivalent annual net cost to business is **around £0.55m (2009 prices)** or £0.74m in 2014 prices. As these measures implement a European Directive they are out of scope of OITO.

Annex 1 - Direct and indirect effects from EMFs on the body

Direct effects

9. The mechanism for interaction between the external environmental field and a person changes according to the type of EMF. The type of effect that EMFs have on people depends primarily on the frequency and intensity: some fields cause stimulation of sensory organs, nerves and muscle, while others cause heating. The effects caused by heating are termed 'thermal effects' while all other effects are termed 'non-thermal'.

10. Extremely low-frequency or pulsed EMFs can create the perception of a flickering effect in the peripheral vision. These are caused by the changing fields interacting with the retina. They are not harmful but may be irritating. The perception disappears when the EMF exposure has ceased.

11. Importantly, all these effects show a threshold below which there is no risk, and exposures below the threshold are not cumulative i.e. it does not get worse over time through additional exposures.

12. The established adverse effects of EMFs on the body are:

    - at low frequencies (i.e. up to 10 MHz) the effects are on the nervous system and (below 1 Hz) the heart;

    - at high frequencies (i.e. 100 kHz and above) there are heating effects on the whole body or parts of it; and

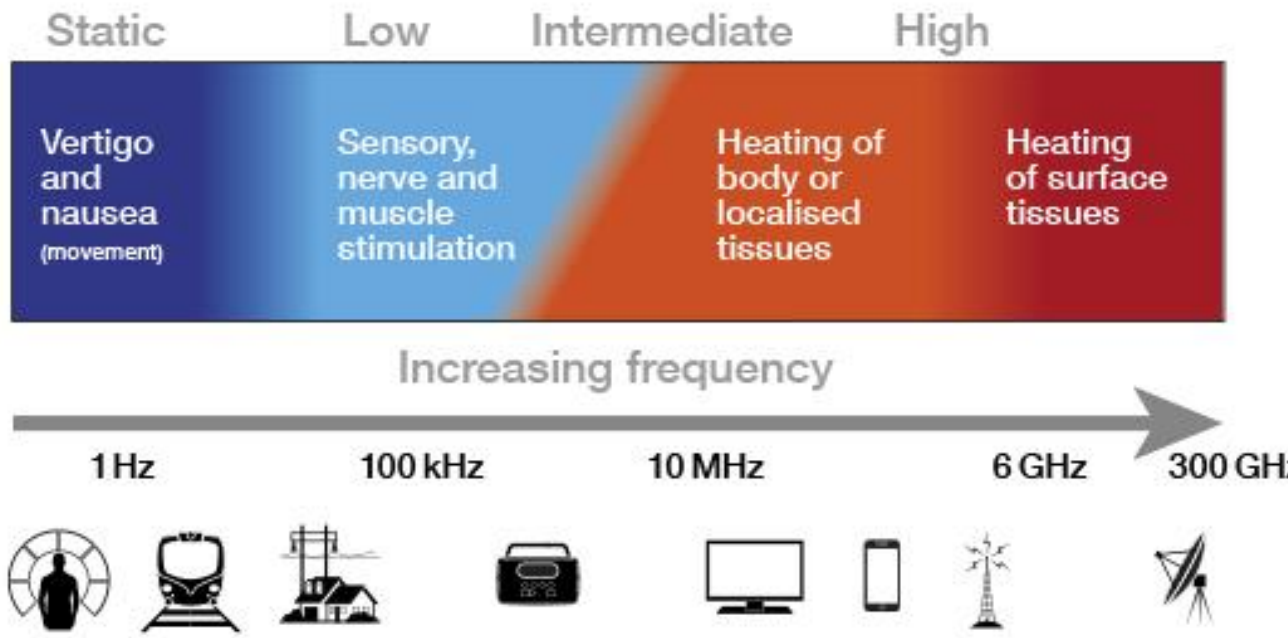
    - at intermediate frequencies (i.e. 100 kHz – 10 MHz) both nervous system effects and heating effects can occur.

    - In addition, while living tissues are largely unaffected by static magnetic fields, movement in strong magnetic fields will induce (extremely low frequency) electric fields in the exposed person which can lead to a metallic taste, or feelings of vertigo or nausea. The latter effects could lead to safety issues, if the affected worker is in a situation where the adverse effects could increase the likelihood of an accident.

    - There is also risk of electric shock or a burn from touching ungrounded conducting objects in an electromagnetic field.

13. These concepts are illustrated in **Figure 1**

Figure 1



Indirect effects

14. Not only may the EMFs interact directly with people, but also with objects, which may then present an indirect risk to people making contact with them or in the vicinity.

15. Potential indirect effects are:

- where the external environmental field interacts with a ferromagnetic object, e.g. an implanted or body-worn active medical device (e.g. cardiac pacemaker or insulin pump) when in certain electromagnetic fields, this may cause a malfunction, or the equipment to operate in a different way than was intended or harm the wearer;
- interference with passive implants (artificial joints, pins, wires or plates made of metal) and effects on shrapnel, body piercings, tattoos and body art where;
    - an external EMF effects a plate or pin causing it to heat by induction;
    - the external magnetic field causes a piece of shrapnel or a passive implant (e.g. a stent or clip) to move, causing internal injury to the worker;
- unintentional initiation of detonators that can cause explosions, e.g. in places such as quarries or ammunition factories and stores;
- creation of incendive sparks that ignite flammable atmospheres causing fires or explosions;
- electric shocks or burns from touching conductive objects in an electromagnetic field where one of them is grounded while the other one is not; and
- there are also risks from flying metallic objects in a strong magnetic field.

16. For more details of the fields and frequency changes and their effects please refer to Annex 2.

Annex 2 Field and frequency ranges and their effects

Field & frequency range	Effects	Examples of activities & equipment
Static electric & static magnetic fields 0 – 1 Hz	**Indirect effects**: Uncontrolled attraction of ferromagnetic metals ie the risk of injury from objects in a large static magnetic field being attracted to magnets in the workplace and flying towards them. **Sensory effects:** Nausea, vertigo, metallic taste in the mouth, flickering sensations (magnetophosphenes) in peripheral vision. **Health effects**: Micro shocks.	MRI scanners (Main magnet) Electrochemical processes, e.g. industrial electrolysis, aluminium extraction Nuclear magnetic resonance Spectrometers Electro–magnetic lifting cranes Electric vehicles (cars, underground trains)
Low frequency magnetic & electric fields 1 Hz – 10 MHZ	**Indirect effects:** Interference with active or passive implanted or body- worn medical devices, electric shocks **Sensory effects:** Flickering sensations (magnetophosphenes) in peripheral vision. **Health effects**: Nerve stimulation, effects on the central & peripheral nervous system of the body. Tingling, muscle contraction, heart arrhythmia. Contact currents caused by a person touching a conductive object in an EMF where one of them is grounded and the other is not which can result in shocks or burns.	High voltage power lines; Production and distribution of electricity; Welding (arc & spot) Electrical arc furnaces Industrial induction heating (eg large coils used around the site of a weld) AM & FM radio Electric hand-held tools Electric vehicles (cars, trains, trams, metros) MRI (switched gradient fields)
High frequency fields: 100 kHz - 300 GHz	**Indirect effects:** Interference with active or passive implanted or body worn medical devices, electric shocks, causing electro-explosive devices to initiate, ie when used in close proximity to explosives that have an electrical means of initiation. Sparks caused by induced fields triggering fires or explosions where flammable fuels, vapours or gases are present. **Sensory effects:** Auditory effects such as perception of clicks or buzzing caused by pulsed radar systems. **Health effects:** Thermal stress; heating effects leading to a rise in core body temperature or localised limb heating (eg knees or ankles). Contact with charged conducting bodies can lead to RF shock or deep tissue burns.	MRI (RF coils) Broadcasting & TV antennas Radar & radio transmitters Diathermy Dielectric heating (eg vulcanising, plastics welding or microwave drying) Anti-theft systems
Intermediate frequency fields 100kHz – 10 MHz	Effects of both high & low frequencies can be experienced as detailed above.	Surgical diathermy Broadcasting systems & devices (AM radio) Anti-theft devices Military & research radiofrequency systems

Annex 3- The specific values: Action Levels and Exposure Limit Values

17. **Action Levels (ALs)** are levels related to the direct effects of exposure to EMFs that can be used to demonstrate that exposure levels are below particular exposure limit values (ELVs). ALs are primarily external quantities, whereas ELVs relate to exposure of EMFs in the body. This makes the former easier to assess (and, if necessary, cheaper to measure) than the latter.

18. If the dutyholder can establish that the fields to which workers may be exposed do not exceed the ALs, they can be certain that the corresponding ELVs for those fields will not be exceeded either. In such cases, all that is left for the dutyholder to do is to ensure that there are no safety risks arising from the indirect effects, which is already a requirement of the current regulations.

19. **The Exposure Limit Values (ELVs)** for health and sensory effects detailed in the Directive are values founded on scientifically well-established short-term and acute direct internal effects on the human body caused by the body being in an EMF.

20. Health effects ELVs are used to prevent possible harm from the thermal effects and electrical stimulation of tissue caused by EMFs. If exposure to EMFs is below the ELVs, most workers, except workers at particular risk, will be protected against any adverse effects.

21. ELVs should not generally be exceeded but the Directive and therefore the Regulations allow an exemption from these levels in specific circumstances and for as long as specific certain conditions are met.

Annex 4 – Meetings held with Stakeholder regarding transposition - April 2013 – June 2015

Summary of number of meetings with each sector	
General collective stakeholder meetings/IWG	5
Automotive	7
Cross cutting	1
Energy	3
Health	1
Metals & manufacturing	3
MOD	7
Plastics	2
The railway industry	3
SMEs	2
Telecoms & broadcasting	4
MRI community	2
MCA	6
PHE	2
The Commission's Advisory Committee on Safety and Health (ACSH)	3
Others	2
Total	54

Summary of numbers and dates of meetings held

General collective stakeholder meetings/IWG	6	6.6.13 24.6.13 30.1.14 5.6.14 19.3.15
Automotive	7	11.6.14 3.10.14 10.10.14 2.12.14 10.2.15 10.12.14 16.12.14
Cross cutting	1	30.9.14
Energy	3	30.5.13 23.9.14 12.6.15
Health	1	22.9.14
Metals & Manufacturing	5	19.12.13 4.3.14 23.6.14 3.10.14 12.12.14
MOD	7	3.12.13 13.8.14 10.11.14 9.1.15 12.2.15 9.3.15

		18.3.15

Plastics	2	19.11.14 2.3.15
The Railway industry	3	4.11.13 20.5.14 30.9.14
SMEs	2	10.10.14 27.5.15
Telecoms & Broadcasting	4	13.11.13 13.11.13 19.9.14 12.11.14
MRI Community	2	17.12.13 15.9.15
MCA	6	10.10.13 28.8.14 17.10.14 6.1.15 4.2.15 8.5.15
PHE	3	19.9.13 5.6.14 12.6.15
The Commission's Advisory Committee on Safety and Health (ACSH)	3	29.4.14 30.6.14 8/9.9.14
Others	3	30.4.14 21.5.14 16.6.15

Meetings & events attended by Non-Ionising Radiation Specialists in HSE

Institute of Physics and Engineering in Medicine (IPEM)		20.5.13 16.9.13 28.1.14 28.2.14 7.7.14 11.11.14 14.11.14 26.6.15
Society of Radiological Protection (SRP)		30.5.13 5.11.13 25.2.14 24.3.15
Association of University Radiation Protection Officers (AURPO) conference		1.9.14
British Industrial Furnace Constructors Association (BIFCA)		16.4.14

RF Register AGM RF steering Group RF Register AGM		13.11.13 26.6.14 12.11.14

Annex 5 - The EMF Stakeholder Group 2004 - 2015:

Access Industry Forum
ACEA (European Automobile Manufacturers Association)
Aluminium Federation
Arqiva
Babcock Communications
BCS Steel
BEAMA
British Chamber of Commerce
British Constructional Steel Association
British Industrial Furnace Constructors
British Institute of Radiology MR Safety group
British Plastics Federation
British Retail Consortium
British Safety Council
Broadcasting Networks Europe
Civil Aviation Authority) CAA
Caterpillar
Cast Metal Federation
CEEMET
CMF Ltd
Commercial Workers Union
Confederation of British Metal forming
Confederation of British Industry
Culham Centre for Fusion Energy
Department for Business Innovation and Skills
Devolved administration for Wales, Scotland, NI and Gibraltar
EEF (Manufacturers Organisation for UK Manufacturers)
EMFields Consultancy
Energy Networks Association
Eurelectric
Euro Chlor
European Broadcasting Union
European Welding Association
Everything Everywhere
Federation of Small Businesses
FIPRA
GMB (General, Municipal, Boilermakers and Allied Trade Union)
Inductotherm Europe Ltd
Ineos Chlor
International Institute of Risk and Safety Management (IIRSM)
IOSH
Jaguar Landrover
Linkmicrotek
Lloyds Rail
Maritime and Coastguard Agency (MCA)
Medicines and Healthcare products Regulatory Agency (MHRA)
Ministry of Defence
MIRA (Vehicle Engineering)
National Air Traffic Services
National Grid
National Register of RF Workers

Nissan
Obara UK
Office for Rail Regulation
Peak Electromagnetics Ltd
Police Federation
Public Health England (formerly Health Protection Agency)
Rail Safety Standards Board (RSSB)
Renewable Energy Systems
Rolls Royce
Safety in Managing Plastics forum (SIMPL)
Sciaky
Small Business Trade Association Forum
Stanners Equipment
Starnet Group
Steel Construction
Tata Steel
The Welding Institute
Toyota
Transport for London (TfL)
Vehicle Builders and Repairers Association (VBRA)
The Energy Institute
The Food and Drink Federation
The Welding Institute (TWI)
The Society of Motor Manufacturers and Traders
UK Renewables
Unite the Union
UYT Ltd
Vehicle Builders and Repairers Association
Vodafone
Weldability (sif)
Welding Manufacturers Association

Annex 6 – Description of how EMFs are generated in various sectors

22. Telecommunications and broadcasting sector: EMFs are emitted from antennas but may also be emitted from other parts of the feeders or transmitter cabinets.

23. Health: EMFs are relevant in the healthcare sector in the following main areas:

    - Physiotherapy – Short wave diathermy devices are used for therapeutic treatment of muscles and joints by physiotherapists. Devices emitting EMFs are also used for transcranial magnetic stimulation (TMS), in which pulses of EMF are intentionally produced for the purpose of inducing currents in the brain. This can be used to diagnose brain disease and injury, as a treatment for depression and even migraine headaches.
    - Surgery – general diathermic cutting and cauterisation. Transurethral resection of the prostate (TURP) is another surgical procedure which requires very powerful machines.

24. MRI sector: MRI machines emit EMFs and are used in the health, veterinarian and research sectors. It is also understood that there will be MRI equipment used in research facilities and more information about this will be sought at consultation.

25. Energy: EMFs are emitted by pylons, cables and onshore and offshore wind farms. Dispersed generating installations like wind or solar farms have numerous smaller generators whose outputs are linked together through substations with increasing power. It is anticipated that the health ELV is likely to be exceeded in emergency situations where faults with supply are detected and fixed.

    Welding: EMFs are emitted by welding equipment. Types of welding carried out include, arc, resistance and stud welding. Other processes involving EMFs in the welding industry include induction heating and magnetic particle inspection.

26. Plastics: EMFs are emitted by dielectric welding equipment

27. MoD: Defence activities use radio frequency sources for communications, target acquisition and guidance control systems. MoD may choose to use an alternative exposure control system (IEEE C95.2345). This will allow inter-service and international cooperation and interoperability during joint operations and training.

28. Rail industry: The electrified rail sector generally has an electrical supply provided at 25 kV. The supply to segments of track is only activated when rolling stock is within that segment to allow efficient power supply management.

Annex (iv)

Glossary of Acronyms

ALs	Action Levels
DPA	Data Protection Act 1998
EIR	Environmental Information Regulations 2004
ELVs	Exposure Limit Values
EMF	Electromagnetic field
EU	European Union
FEC	Full Economic Cost
FOIA	Freedom of Information Act 2000
GB	Great Britain
GHz	Gigahertz
HASWA	Health and Safety at Work Act 1974
HSE	Health and Safety Executive
Hz	Hertz a unit of frequency (cycles per second)
IA	Impact Assessment
ICNIRP	International Commission on Non-Ionizing Radiation Protection
kHz	Kilohertz
MCA	Maritime and Coastguard Agency
MHSWR	Management of Health and Safety at Work Regulations 1999
MHz	Megahertz
MRI	Magnetic Resonance Imaging
NPV	Net Present Value
ONR	Office for Nuclear Regulation
RPC	Regulatory Policy Committee
UK	United Kingdom

* Above glossary currently refers to consultation document only.

HSE

Health and Safety Executive

Consultation on the implementation of Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents - electromagnetic fields (EMF)

The full text of this and other Consultative Documents can be viewed and downloaded from the Health and Safety Executive web site on the internet: www.hse.gov.uk/consult/index.htm

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