University Occupational Health and Safety Standard
ELECTROMAGNETIC FIELDS

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1. PURPOSE

The University is committed to meeting its legal obligations by ensuring that it has adequate arrangements, facilities and trained personnel to reduce the risk of injury or ill health from work activities involving electromagnetic fields.

This document sets out the minimum requirements to control risk associated with work activities involving electromagnetic fields at the University of Strathclyde, in order to comply with relevant legislative obligations and University requirements.

2. SCOPE

This document applies to all staff, post graduate students and visitors (for example visiting academics) who either work with electromagnetic fields or work in areas where electromagnetic fields are used, or have managerial responsibilities for such activities at the University of Strathclyde.

3. ABBREVIATIONS

AL	Action Level
CEMFAW16	The Control of Electromagnetic Fields at Work Regulations 2016
ELV	Exposure Limit Value
EMF	Electromagnetic Field
HoD	Head of Department
HSE	Health and Safety Executive
PI	Principal Investigator
RF	Radiofrequency
SACSOH	Statutory Advisory Committee on Safety and Occupational Health
SHaW	Safety, Health & Wellbeing
USCO	University Secretary and Compliance Officer
URPA	University Radiation Protection Advisor
URPO	University Radiation Protection Officer

4. DEFINITIONS

4.1 **Action Level –** defined quantities created to assist in ensuring that occupational exposures to EMFs are kept below the ELVs. The Action Levels can be found in the CEMFAW16 Regulations.

4.2 **Direct Effects –** the effect on a human from exposure to an EMF. These include sensory effects (e.g. Nausea) and health effects (e.g. Involuntary muscle contractions).

4.3 **Electromagnetic Field –** static electric, static magnetic and time varying electrical, magnetic (radio wave fields) with frequencies up to 300 GHz. They are generated under various scenarios, such as in the presence of a magnet or whenever a piece of electrical equipment is plugged in and turned on.

4.3 **Employee at particular risk –** any employee who has declared a condition which may cause them to be susceptible to the effects of an EMF. Includes those fitted with passive, active or worn medical devices as well as new or expectant mothers.

4.4 **Exposure Limit Values –** the maximum legal level a worker may be exposed to before developing sensory (above the sensory effect ELV) or health (above the health effect ELV) effects. ELVs can be found in the CEMFAW16 Regulations.

4.5 **Indirect Effect -** the physical effects that can be created by an EMF. Includes magnetic attraction, sparks and electrical shocks

4.6 **Indirect Effect Action Level –**the exposure level above which indirect effects may occur.

4.7 **Radiofrequency –** an EMF that is used in the wireless transmission of information via radio, Wi-Fi or microwave applications.

5. ROLES, RESPONSIBILITIES AND DUTIES

The University OHS Standard – Roles, Responsibilities and Accountabilities defines the organisational arrangements necessary to implement the Occupational Health, Safety and Wellbeing Policy statement at each level of the organisation.

Specific roles, responsibilities and duties for the management of EMFs are detailed below:

5.1 Executive Deans

Responsible for performance monitoring of this Standard within their area of control including the University's significant partnerships, collaborations and wholly owned companies. They must ensure that departments are resourced such that this Standard is fully implemented.

5.2 Heads of Department / Heads of School / Professional Services Directors

Responsible for ensuring compliance with this Standard throughout their area of responsibility through provision of adequate resources and performance monitoring. They must ensure:

- Appropriate systems are put in place to ensure compliance with this document and all legislative requirements;
- Sufficient resources are allocated so that the department is compliant with this standard and legislative requirement by ensuring:
  - That all control measures put in place as part of a risk assessment are implemented completely and they are adhered to by all members of staff;
  - That all members of their department receive appropriate training and supervision;
- The security of the all devices that this standard applies to.

5.3 Line Managers / Research Supervisors / Principal Investigators

Responsible, on a day-to-day basis, for ensuring that risks associated with activities involving the use of EMFs are appropriately managed within their area of responsibility. They must ensure:

- A suitable and sufficient risk assessment is completed;
- Where identified by the risk assessment, an exposure assessment is completed, and if necessary, an action plan is put in place to minimise any exposure.
- Any persons working within their area of responsibility receive suitable training and they are competent to carry out the work expected of them;
- All devices that are subject to the requirements of this standard are identified and labelled accordingly;
- Where an EMF action plan is required for their equipment, that the required documentation is submitted for inclusion in the University EMF Risk Register.
- The areas containing devices that this standard applies to are managed in accordance with the access requirements of this standard;
- No harm comes to themselves or others as a result of their work, actions or inactions.

5.4 EMF Workers

All staff engaged with work activities involving EMFs are responsible for complying with the arrangements put in place to prevent or reduce exposure. They must:

- Be familiar with and understand the risk assessments for their work activities;
- Follow the requirements of all safety documentation developed for the work that they are involved in;
- Wear appropriate personal protective equipment;
- Report any incident or accident through the appropriate reporting route;
- Report any defective equipment to their line manager;
- Attend any relevant training courses.
- Ensure that no harm comes to themselves or others as a result of their work, actions or inactions.

5.5 University Radiation Protection Officer

The URPO is appointed by the Head of SHaW and is responsible for aiding departments in achieving and maintaining compliance with all legislative requirements by;

- Providing competent advice and guidance on radiation protection;
- Providing advice on the completion of risk assessments that contain EMF risks;
- Acting as a point of contact for externally appointed experts; and
- Maintaining the EMF Risk Register on behalf of the University.

5.6 Tenants

All third party companies working with EMFs on the University of Strathclyde's premises must adhere to the University of Strathclyde Estates Services Third Party Policy (contact Estates Services for further information).

5.7 All other workers

All other workers are any person(s) who may be affected by a department's use of EMF generating equipment. All workers must:

- Not interfere with any safety signage, equipment or systems intended for the safe use of EMFs;
- Report any unsafe conditions appropriately; and
- Ensure that no harm comes to themselves or others as a result of their work, actions or inactions.

6. WORKING SAFELY WITH ELECTROMAGNETIC FIELDS

6.1 EMF risk assessment process

6.1.1 General Risk Assessment

The general risk assessment process must be used to identify the involvement of EMF generating sources in the work activity before work commences. Risks associated with the use of EMF generating equipment are described in Section 6.2.

Where the general risk assessment identifies EMFs are being used, an exposure assessment must be carried out to determine if an EMF Action Plan is required.

The outcome of the EMF Exposure Assessments (see Section 6.1.2) and Action Plans (see Section 6.1.3) will inform the choice of adequate control measures required which should be identified or referred to in the general risk assessment.

Further information on the EMF risk assessment process can be found in the Information Sheet - Determining the risks from EMF**.**

6.1.2 EMF Exposure Assessment

An EMF Exposure Assessment determines the level of risk presented by an EMF generating device.

The HSE has assessed various pieces of EMF generating equipment commonly found in the workplace. This information can be found in the Information Sheet - Determining the risks from EMF and should be used as part of the risk assessment process**.**

Due to the difficulty and cost involved in measuring EMFs, UK legislation allows for an EMF Exposure Assessment to be made based on information other than direct measurement. This information may come from a variety of internal and external sources, such as:

- The CEMFAW16 Regulations;
- Information from the HSE (e.g. HSG281 Guidance);
- Information from the workplace (e.g. reports, ill health effects etc)
- Manufacturers information;
- Manuals / Technical Documentation;
- Academic / expert information;
- Local records of any measurements;
- Education sector standards or guidelines; and
- Information from professional bodies.

Where information is taken from these sources they must be noted in the general risk assessment or EMF Action Plan where one is required (see Section 6.1.3 EMF Action Plan).

6.1.3 EMF Action Plan

An EMF Action Plan is designed to assist departments in identifying control measures to reduce any potential EMF exposures to less than the ELV.

The EMF Action Plan must be completed using the EMF Action Plan Form.

The EMF Action Plan must include details of:

- Justification for why the department has chosen that particular device;
- All technical measures that are in place to limit the duration / intensity of exposure:
  - Interlocks
  - Shielding
- All measures to be put in place to reduce the likelihood of exposure:
  - Signage,
  - Access controls
  - Floor markings
- Controls in place to prevent sparking or contact currents;
- The proposed maintenance schedule the device;
- How the work area will be designed to reduce the likelihood of exposure;
- Details of personal protective equipment; and
- Emergency response plans.

The general risk assessment must refer to the outcome of the EMF Action Plan and must include, or refer to:

- the ALs and ELVs;
- the frequency of the EMFs, level, duration and type of exposure, including the distribution over the employee's body and the variations between areas in the workplace;
- direct effects; indirect effects;
- employees at particular risk (See Section 6.2.3);
- simultaneous exposure to multiple frequency fields;
- multiple sources of exposure;
- information available from the manufacturer of relevant equipment;
- information obtained from any appropriate health surveillance undertaken;
- the existence of replacement equipment designed to reduce the level of exposure to EMFs;
- other health and safety-related information.

If control measures are not sufficient in reducing exposure to below the ELV URPO must be contacted prior to work commencing.

6.1.4 Exceeding Sensory Effect ELVs

Whilst ELVs are legal maximum limits, sensory effect ELVs may be exceeded in certain situations provided that specific controls (safety conditions) are in place.

For further information on the required safety conditions when exceeding sensory effect ELVs, refer to the Information sheet - Safety Conditions Required for Exceeding Sensory Effect ELV.

6.2 Risks associated with EMFs

There are two main consequences from exposure to EMFs in excess of an ELV: indirect and direct effects. Both indirect and direct effects may have significant health and safety implications. Any worker that experiences any of these phenomena (or any other abnormal scenarios in an area where an EMF is known to be present) should leave the area immediately and report it to the Line Manager / Research Supervisor / Principal Investigator (for further information see Section 6.6).

6.2.1 Direct effects of EMFs: Sensory and health effects

EMFs can potentially have an effect on the human body. In low intensity fields there should be no noticeable effects, however as the intensity of the EMF increases irritating and unpleasant reactions may manifest in persons in the field of exposure. Effects may include:

- Nausea (a sensation that may be noticed whilst present in an EMF);
- Vertigo (a sensation of dizziness);
- Metallic taste in the mouth;
- Auditory effects;
- Flashes in vision (also called magnetophosphenes).

At high levels of EMF intensity workers may experience additional effects, such as:

- Thermal induction in bodily tissues (heating of the tissue);
- Tingling of the skin;
- Involuntary muscle contractions;
- Heart / cardiac arrhythmias (interference of the natural pacemaker of the heart).

6.2.2 Indirect effects of EMFs

EMFs are able to cause indirect effects that manifest as physical reactions that may become the cause of a health and safety hazard. Users should be aware of the following potential hazards:

- Uncontrolled attraction of ferromagnetic materials / equipment;
- Interference with body worn / implanted active of passive medical devices (see Section 6.2.3, Table 1 for examples);
- Electrical shocks; and
- Sparks which may trigger fires / explosions.

6.2.3 Persons at particular risk

Due to the physical properties of EMFs, certain persons may be more at risk of suffering an injury or illness due to exposure to these phenomena.

Whilst there is no requirement for workers to make the Line Manager / Research Supervisor / Principal Investigator aware, persons with any active, passive or body worn medical devices, as listed in Table 1 (please note, these are not exhaustive lists), should be strongly encouraged to make the person responsible for the area aware of this before they enter.

Table 1. Examples of medical devices

Active Implanted Medical Devices	Passive Implanted Medical Devices	Body Worn Medical Devices
Cardiac pacemakers	Surgical implants (Joints, plates etc.)	Insulin or hormone Pumps
Implanted cardiac defibrillators	Surgical staples or slips	Hearing aids
Cochlea implants	Stents	Continuous glucose monitors
Brainstem implants	Heart valve prosthesis	Metallized drug administration patches (Nicotine replacement etc.)
Inner ear prosthesis	Annuloplasty rings	
Neuro-stimulators	Certain contraceptive devices	
Retinal encoders		
Implanted drug infusion pumps		

Should anyone disclose the fact that they have or are wearing any form of medical device or hardware, the Line Manager / Research Supervisor / Principal Investigator should ensure that the general risk assessment ensures that suitable (additional) control measures are put in place.

6.2.4 New and Expectant Mothers

As well as persons who have been fitted with the above devices, any person who has notified the University that they are pregnant should also be considered as a person at particular risk, and a New and Expectant Mothers risk assessment must be carried out.

Sources of EMF which may pose a risk to expectant mothers includes (also refer to Table 2 of Information Sheet - Determining the risks from EMFs:

- Electrical supplies where workers need to be in close proximity to cables carrying high currents;
- Automated induction heating systems involving close proximity to the EMF source;
- Automated welding systems involving close proximity to the EMF source;
- MRI equipment.

Further information can be found in the Local Rule on New and Expectant Mothers.

6.3 Access Control to EMF areas

Access to areas where EMFs in excess of the ELV may be encountered must be well controlled. These areas must not be accessible by any unauthorised personnel.

Suitable access controls and warning signage must be in place, and information should be made readily available to those who may be affected by the device.

Further information on the recommended access controls and hazard warning signage can be found in the Guidance Note - Area requirements for the use of EMF generating equipment.

6.4 Information, Instruction, Training and Supervision

All persons who may be exposed to an EMF on University property or as a result of University work must be provided with sufficient information, instruction, training and supervision to ensure that they are aware of all the risks that an EMF may present, and what measures should in place to control this risk.

Departments must ensure that the information and instructions provided includes the following:

- The significant findings of the general risk assessments including details of the EMF Exposure Assessment and EMF Action Plan;
- An explanation of ALs and ELVs;
- Details of possible sensory or health effects and potential physical effects that may be encountered;
- Details of safe working practices including a copy of any Safe System of Work / Safe Method of Work;
- An explanation of safety signage;
- Details of all control measures including the use of appropriate personal protective equipment; and
- Details of additional controls for any workers at particular risk.

Assistance in determining the appropriate level of training required can be sought from the URPO.

6.5 Health Surveillance

There is currently no well-established scientific evidence of health effects from long term exposure to EMFs. Health surveillance is only likely to be necessary in very limited circumstances. Where this is believed to be necessary, the Line Manager / Principal Investigator / Research Supervisor is to contact the URPO.

6.6 Emergency Procedures

Where anyone believes that they have been exposed to an EMF and have suffered any sensory, health or physical effects, they must be given first aid as necessary and removed from the area. If the effects continue, they must be taken directly to Accident and Emergency.

Following an accident or incident involving EMFs an S1 form must be completed and submitted to SHaW (See Section 8.3).

6.7 EMF Risk Register

To assist in complying with the CEMFAW16 Regulations, the URPO will maintain a register of all EMFs that require an EMF Action Plan to ensure that all exposures are below the ELV.

This risk register will include a copy of:

- The completed EMF Exposure Assessment;
- The completed EMF Action Plan; and
- The applicable general risk assessment.

Where departments have an EMF that requires an EMF Action Plan, the above documents must be submitted to the URPO for inclusion in this register.

6.8 Exemptions

Certain work is exempt from the need to complete an action plan as part of the process of working with EMFs. MRI equipment used on patients in the health sector as well as EMFs used in conjunction with the HM Armed forces are exempt from the need to complete an action plan, but all other requirements must be complied with. Any work being done that may fall into either of these groups must be referred to the URPO.

Whilst it is also possible to apply for an individual exemption from certain aspects of the CEMFAW regulations, the resources involved with this make it an unreasonable option.

No applications for individual exemptions from the requirements of the CEMFAW regulations will be made by the University.

7. DOCUMENTATION AND RECORDS

7.1 The requirements to meet the standard for controlling EMFs are described in this document. Some aspects are covered in more detail in other documents which are referenced throughout.

7.2 Written records to be maintained to comply with this Standard are training records, risk assessments, EMF Exposure Assessments, and EMF Action Plans where relevant. Where an EMF Action Plan is required, copies of all risk assessments, EMF Exposure Assessments and EMF Action Plans in relation to work must be forwarded to the URPO for review and record keeping as part of the EMF Risk Register.

8. COMMUNICATION AND REPORTING

8.1 A copy of the latest Standard will be available on the SHaW website

8.2 Departments are expected to report on compliance with this standard as part of regular OHS performance monitoring. Further information can be obtained from SHaW.

8.3 With regard to this Standard, Departments must report incidents associated with the use of EMFs to the DSC without delay. If appropriate, an S1 form must be completed, signed by the DSC of the department in which the accident took place, and submitted to SHaW. If more than one person is involved, then a separate S1 form should be completed for each individual involved.

Some incidents may be reportable under the Reporting of Injuries, Diseases and Dangerous Occurrence Regulations 2013 (RIDDOR). These regulations require that certain work-related injuries, cases of ill health and dangerous occurrences are reported to the HSE. SHaW manage the reporting of incidents under RIDDOR.

9. TOOLS

9.1 Guidance Notes

- Area requirements for the use of EMF generating equipment

9.2 Information Sheets

- Determining the risk from EMFs
- Safety conditions required for exceeding the sensory effect ELVs

9.3 Forms

- EMF Exposure Assessment and EMF Action Plan template

10. COMPLIANCE

This standard aims to meet the requirements of:

- Health and Safety at Work etc. Act (1974)
- Management of Health and Safety at Work Regulations (1999)
- The Control of Electromagnetic Fields at Work Regulations (2016)
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (2013)
- Electromagnetic Fields at Work: A Guide to the Control of Electromagnetic Fields at Work Regulations 2016.
- Managing for Health and Safety HSG65 (2013)
- USHA Leadership and Management in Health and Safety in Higher Education Institutions (2015)
- USHA Health and Safety Management Profile (HASMAP) (2015)

11. DOCUMENT HISTORY

A record of changes to this document are maintained in the SHaW Document Control Register.