Vodafone Policy Detailed Requirements

RF Safety

Policy Owner:	Policy Champion:	Version:	Date:
David Fry	Rob Matthews	V1.3	May 2023

Objective/Risk:	Scope
The purpose of this document is to describe the safe systems of work and the safety standards to be adopted for all categories of work involving actual or potential exposure of employees to radio frequency (RF) energy. This guidance covers the whole spectrum of frequencies emitted at significant energy levels from RF transmitting equipment at telecommunications sites.	Vodafone requires that all colleagues, contractors and subcontractors carrying out work on or near, RF equipment for or on its behalf comply with the safe systems of work and the safety standards detailed in this document. Other parties carrying out work at Vodafone locations must also comply, unless they have their own standards and systems that are at least as rigorous.
Compliance levels are monitored and reviewed by appropriate governance bodies. Any breach will be treated as a serious disciplinary offence and may be subject to disciplinary action.	

Contents

1. Introduction

For many telecommunications applications, RF energy is transmitted at relatively low power levels from our base stations and the microwave point to point dishes that connect them to the network. All of our sites are designed and operated so that maximum RF field, strengths in accessible areas are below the exposure guidelines recommended by UK and international bodies.

Potentially harmful systems with more powerful transmitters may be co-located with Vodafone installations and caution is required when working near them. In these circumstances, it is expected that the landlord will be able to provide a pack of information regarding the control measures that are in place to manage compliance with the relevant exposure guidelines.

1.1. Technical Background

RF transmissions are electromagnetic waves emitted from a power source, usually via an antenna that concentrates the energy into a beam or pattern of a particular shape. The result is an electromagnetic field in which the power density at any point varies according to its distance from the antenna and its position in the radio pattern. A great variety of antenna types exist and it is not necessarily obvious from their appearance whether the fields they transmit represent a safety hazard at locations where individuals may need access.

A transmission is generally referred to as RF if the frequency of the electromagnetic waves is in the range 3 kHz to 300 GHz. The wavelengths corresponding to these frequency extremes are 100 kilometres and 1 millimetre respectively.

Table 1: Spectrum of electro-magnetic emissions

Frequency	Applications	Wavelength	Band
300 to 3000 GHz	Lasers	1 mm to 0.1 mm	Light
30 to 300 GHz	Military radar / Radio astronomy Short link microwave pt to pt	1 cm to 1 mm	EHF
3 to 30 GHz	Satellite Comms. / Radar Microwave Point to Point	10 cm to 1 cm	SHF
0.3 to 3 GHz	TV / Paging / Mobile phones	1 m to 10 cm	UHF
30 to 300 MHz	FM radio / VHF / TV Emergency services mobile radio	10 m to 1 m	VHF
3 to 30 MHz	HF radio / CB radio	100 m to 10 m	HF
0.3 to 3 MHz	AM radio / Radio navigation Ship to shore radio	1 km to 100 m	MF
30 to 300 KHz	LF broadcast and long-range communications radio	10 km to 1 km	LF
3 to 30 KHz	Navigation beacons	100 km to 10 km	VLF
0 to 3 KHz	AC power transmission	over 100 km	ELF

1.2. Definitions

Antenna - A composite structure of elements, which are individually designed to emit, absorb or reflect electromagnetic waves, and whose purpose is either to:

- transmit RF energy into free space and to concentrate it in particular directions, or
- receive RF energy from free space and amplify the signals to usable levels.

Electromagnetic waves - Emissions from an energy source, having electrical and magnetic components fluctuating sinusoidally at a characteristic frequency.

Exclusion zone - An area adjacent to a transmitting antenna in which the RF field strength may exceed relevant exposure guidelines, whether public or occupational.

Feeder - The physical connections between a transmitter and an antenna, which can be waveguide, coaxial cable, or simple electrical conductor.

Field strength - The intensity of the electromagnetic energy at a particular location, which can be expressed as a power density, or in terms of electrical or magnetic field strength.

ICNIRP - International Commission on Non-Ionising Protection (ICNIRP) – Independent body that reviews the body of science surrounding exposure to radiofrequencies and human health and sets relevant reference levels where basic restrictions, designed to protect human health, would not be exceeded.

Ionising (the process of ionisation) - An energy level and frequency which is capable, at molecular level, of changing the balance of charged particles.

Leakage - RF energy, which escapes from an antenna, feeder or transmitter in an unintended manner.

Non-ionising - Incapable of changing the balance of charged particles in the molecular structure of living tissue.

Occupational Exposure guidelines - It is considered that the Occupational Exposure Guidelines would be applied to individuals who are expected to be exposed to RF levels above background as part of their day-to-day activities and have received appropriate training to enable them to fully understand and implement the control measures in place to avoid exceeding these guidelines.

Radio frequency (RF) - The frequency band for electromagnetic waves between 3 kHz to 300 GHz.

Reference level - The level, either Electric/Magnetic Field Strength or Power Density, within the ICNIRP guidelines that ensures that basic restrictions are not exceeded.

Source - A device, usually known as a transmitter, from which RF energy is emitted after having been generated by conversion of conventional electrical power.

2. Health Effects - General

RF transmissions are non-ionising, which means that they are incapable of causing changes to the molecular structure of living tissue through the ejection of electrons.

RF transmissions do not cause the kind of cell damage, or changes in cell function, which result from exposure to ionising radiations such as X-Rays.

Non-ionising transmissions can induce heating within tissues, and this is caused by the absorption of electromagnetic energy. This effect is most pronounced, and most hazardous, when the wavelength of the transmission tends to correspond with the physical dimensions of human body structures. Standards of exposure take account of this fact by reducing the field strength reference level (defined in Section 3 of this document) at wavelengths over a range spanning these dimensions.

Colleagues - special health considerations

The normal function of active implants can be disrupted by certain patterns of RF transmission, whilst unpleasant effects may be experienced when passive implants are subjected to an RF field. Colleagues with implanted heart pacemakers, insulin pumps or passive metal plates such as those used to repair broken bones, should seek the advice of their Surgeon prior to accessing areas where antennas are installed, or working on any element of an RF transmitting system. Always follow any guidance from the landlord and avoid entering

into areas where ICNIRP public exposure guidelines may be exceeded. Special attention needs to be applied when working on rooftops.

ICNIRP and UK H&S guidance recommends that an individual who is pregnant should not be exposed above the ICNIRP public exposure guidelines. If an employee is pregnant, they should let their line manager know and they will be able to manage specific risk assessments to ensure that ICNIRP Public Exposure guidelines are not exceeded.

Vodafone has a duty of care when undertaking works that could be placing employees in proximity of RF fields. Employees need to make their line managers aware of any concerns that they have and seek further advice if necessary. The Health and Safety Team may provide further advice and guidance, if required via the RF Policy Champion.

2.1. Responsibilities

Managers' and Supervisors' Responsibilities

Vodafone, and our suppliers, are legally required, through its managers and supervisors, to take all reasonable steps to ensure the safety of its colleagues and of others who may be put at risk by its activities.

The key elements of this responsibility comprise:

- the assessment of risk;
- the design of safe systems of work for areas of risk;
- the provision of measurement equipment, when necessary, for monitoring RF field strengths; and
- management arrangements to ensure supervision of, and compliance with the systems of work by colleagues and contractors under their control.

To ensure that RF safety is properly managed in Vodafone, managers, supervisors and suppliers must arrange for risk assessments to be carried out for:

- colleagues whose work may expose them to RF fields;
- the design of installations involving RF transmitters and antennas capable of producing field strengths above the reference levels;
- work locations where reference levels may be exceeded.

General information for managers and supervisors

The following will assist managers and supervisors as they manage the activities of their colleagues with respect to exposure to RF fields:

- RF fields at transmitting sites may be complex, particularly where they are made up of elements from a variety of radiofrequency sources. Measurements of field strength at multi-user sites, using suitable measuring equipment, may therefore be the only way to assess the associated RF risk, but see Section 4 of this document for further guidance. The Health and Safety Team/Policy Champion can advise on the choice of appropriate systems and measuring methods - these are described in Section 2.2 of this document.
- Since it is not practically possible to provide personal protection against the absorption of electromagnetic energy, the RF hazard will need to be controlled where fields are determined as being in excess of the relevant reference level. The preferred controls are the elimination or reduction of the RF field or the establishment of exclusion zones, where access is controlled to avoid exposures above reference levels

- Not all sites are the same in that capacity, or amount of radio frequencies installed at a site, will differ based on the location. For example, a rooftop in a major city will have more capacity, or radio channels, installed at a site, than that of a rural site. This will lead to a variation in the dimensions of any exclusion zone. Whilst generic sizes of exclusion zones are given in this document, it is possible, due a lower radio configuration at a particular site, that the site is compliant with the relevant guidelines even if it appears that there is access to a generic exclusion zone. If personnel have questions on a particular site, they should contact HSE.Helpline@vodafone.com / Tel: 03333 04 6666 to gain this assistance from the Policy Champion.
- Where work within an Occupational exclusion zone is unavoidable, arrangements MUST be made either for the antenna to be powered down, or for its field strength to be reduced below the reference level. These measures must be associated with secure locking of the associated power controls and continuous monitoring of field strength whilst work is in progress. (The Health and Safety Team or Networks department will assist with liaison with other Operators for this purpose – Process is defined in **TORO500 – Site Access Arrangement Management)**
- Any work in areas assessed as presenting an RF hazard can only be carried out by, or under the supervision of, a competent person. For this purpose, competence must be assessed by the manager directly responsible for the work, based on the employee's knowledge and experience of RF work in general, and of the particular systems involved. Competence is defined in Section 7 of this document.
- Safety information, instruction and training must be provided to colleagues required to operate in work locations with an assessed risk of RF exposure. Further information on training requirements for those working within RF fields is given in Section 7 of this document.
- Managers and supervisors must arrange for contractors and third parties working at sites under Vodafone control, where there is access to areas with RF levels above relevant guidelines, to be given comprehensible information on the risks and the safe systems of work that Vodafone has adopted for their protection.
- Managers must be aware of the special health considerations for colleagues with surgical implants or are pregnant.

The Vodafone Property department, through Cornerstone Telecommunications Infrastructure Limited (CTIL), keep appropriate records of RF safety information at transmitter sites owned or controlled by Vodafone and will provide, with the support of the Health and Safety Team/Policy Champion, any available information to other parties who may be exposed to risk at these sites. Those sites owned by other suppliers, such as Cellnex, will need the owner to be contacted for such information prior to work commencing.

REMEMBER: Managers and supervisors must ensure that appropriate levels of supervision are provided to ensure that colleagues and others under their control are adequately protected against the hazards arising from RF fields.

The Control of Electromagnetic Fields at Work Regulations (CEMFAW) (2016)

In 2016, the CEMFAW Regulations were introduced to ensure that employers do not allow their employees to be exposed above Exposure Limit Values (ELV). The regulations, for the frequencies that VF use, defined the ELV to match the occupational reference levels as defined in the ICNIRP Guidelines. Vodafone Policy is that employees are not to be exposed above these values and therefore this ensures that the ELV's are not exceeded, thus meeting the requirements of CEMFAW 2016.

Employee responsibilities

It is the duty of colleagues to co-operate with their manager or supervisor in implementing the requirements of this guidance and of the safe systems of work that have been specified for their protection.

For their own protection, colleagues are responsible for ensuring that they do not work within areas that may be subject to RF above the relevant reference levels. Access to areas of possible risk, such as those detailed within Appendix A of this document, must be avoided if suitable measuring equipment is not available, or if the results of any measurements are unsatisfactory.

Person of particular risk, namely those with pacemakers/surgical implants or are pregnant, should let their line manager know so that appropriate risk assessments can be undertaken.

It should be remembered that these distances are based on theoretical maximum configuration at a site, and often, radio capacity is lower than the assumed capacity for compliance purposes, resulting in actual exclusion zones that are smaller than the generics. This could mean that the site does not actually have access to an actual exclusion zone. If anyone identifies sites of this type, they should contact HSE.Helpline@vodafone.com / Tel: 03333 04 6666 to gain this assistance from the Policy Champion.

Colleagues must also;

- report to HSE.Helpline@vodafone.com / Tel: 03333 04 6666 any instances they discover where antennas (whether operated by Vodafone or not) are installed in positions that might compromise the RF safety of Vodafone colleagues or others. Examples include the installation of antennas in positions where the relevant exclusion zones might encroach upon access routes or such that they might increase the cumulative RF field in access areas. The Competent persons will then check the actual compliance distances at the site to determine whether there is the potential to exceed ICNIRP Occupational guidelines and further actions, such as site shut down required to access the site. Alternatively, raise the issue directly on EcoOnline and the situation will be fully investigated.
- notify their manager if they have an active surgical implant such as a heart pacemaker or insulin pump, or any passive metallic implant, such as the plates and pins used to repair broken bones, or if they are pregnant, if their work involves exposure to RF fields.
- be responsible for the care and correct use of personal monitors or any other RF measurement equipment which has been issued to them for safety reasons. Specific training is available - this is detailed in section 7 of this document. In particular, colleagues must note that personal monitors are directional and need to be used as handheld measuring devices when approaching unknown and potentially dangerous RF sources.

Additionally, colleagues working as designers must ensure that all installations of new RF transmitters are designed so that either:

a) the fields they generate do not exceed the reference level in any area accessible to relevant groups of individuals (either public or occupational); or

b) accessible areas where the reference levels are exceeded are identified as exclusion zones by warning signs, by conspicuous marking and preferably by physical barriers to entry.

REMEMBER: Never work on or near RF equipment unless you have received training, you are authorised to undertake the work, and you know that the RF field strength is below the reference level.

2.2. RF Field Strength Measurement

Where the risk assessment of a location indicates that RF field strengths may approach or exceed the occupational reference level, measurement of actual field strength will be required. The following types of equipment are available - a competent person should select these:

Personal monitors

Personal monitors provide a means of continuously monitoring the RF field to which an individual is actually exposed. They provide broadband coverage of a range of frequencies. More than one monitor could be required to cover all the frequencies present at multi-user locations where a mixture of Microwave, Cellular Telephone and VHF/UHF transmitters is present.

Personal monitors are ideally suited to multi-user sites as they automatically provide a summation of the field components over the range of frequencies for which they are designed, and therefore provide an alarm trigger based on the equivalent power density of the combined fields. This eliminates the need for any complex measurements or calculations.

Procedures for the use of personal monitors are detailed in this document at Appendix B.

Survey instruments

Instruments can be obtained which independently measure the electrical and magnetic components of RF fields, and display them as Power Density. Using probes that permit measurements in relatively inaccessible places can be used to pinpoint RF leakage from feeder cables and other sources. They also allow the detector to be physically separated and, if necessary, electrically de-coupled from the meter. As with other types of monitor, these detectors can provide a broadband response, weighted to reflect the different reference levels at different frequencies.

The operation of this type of equipment, and the interpretation of the measurements obtained from it, requires some skill, experience and knowledge on the part of the operator. It is therefore important that measurements should only be undertaken by persons who have been trained in the use of the equipment and assessed as competent.

Summary

All sites, no matter the owner of the source of radiofrequencies, should follow a mantra of compliance by design, wherever practicable, where sites are designed to be compliant without control measures. Where control measures are required, the implementation of these should be designated in the landlord information packs and any guidance within these should be complied with at all times.

Any of the systems described above could be used to establish that the RF field strength in a working location is below the reference level. Selection of the correct type to give adequate coverage of the required range of power levels, frequencies and circumstances of use will be the key issue. For this reason, no recommendations of specific manufacturers products are made here, although further information on personal monitors is given at Section 4 of this document.

In general, neither alternative methods for cross checking the results of RF field strength measurements, nor any tangible indication of high levels are available locally. It is therefore vitally important that monitoring equipment is used and re-calibrated strictly in accordance with the manufacturer's instructions, and that it is only used by competent persons.

For most colleagues who are likely to work in areas of possible risk from RF fields, the personal monitor will be the most convenient and trustworthy option. This is because the user can move freely through areas of varying and unknown RF field strength, secure in the knowledge that the monitor will provide a warning whenever the reference level is exceeded. On receiving an alarm, the user can withdraw immediately to a safe area, and in general there should be no doubt about the interpretation of the event.

RF alarms

The Health and Safety Team/Policy Champion will give assistance in investigating RF sources and levels at installations where personal and area monitors are triggered or where survey instruments indicate that reference levels are exceeded. Colleagues should immediately leave the area and contact HSE.Helpline@vodafone.com / Tel: 03333 04 6666 to gain this assistance. Where possible, the incident should be raised on EcoOnline for further investigation.

3. Reference Levels

Standards

The relevant international safety standard is the guidance published by the International Commission for Non-Ionizing Radiation Protection (ICNIRP) in 2020. The adoption of these guidelines are supported by the World Health Organisation and UK PHE.

Graphical representations of electrical and magnetic field strengths and of power density provide the easiest means of understanding the complex standards. Power density is not directly measurable, although it is often quoted and is displayed on instrumentation as an equivalent to the electric or magnetic field that is actually being measured.

The data is presented as a reference level, which varies with the frequency of the field. This will be interpreted as an action level for limiting exposure, meaning that people can safely work for indefinite periods in fields that are below the reference level.

There are two reference levels; Occupational and General Public. For the purposes of this document, it is assumed that all relevant VF employees that undertake work around RF sources will be appropriately trained and therefore ICNIRP Occupational Reference Levels will apply. (N.B. persons of particular risk (pacemaker/pregnant will need further risk assessment))

Where a field is found to be above the Occupational reference level, it is possible that harm could occur to those exposed. The basic safety restrictions must then be considered.

Reference levels are set to ensure that none of the basic restrictions on specific absorption rates, magnetic flux density, power flux density and induced current density are exceeded.

REMEMBER: Transmissions at different frequencies can combine to produce harmful effects. Personal monitors measure the total field from all sources within their frequency range.

Marking and Signage

RF sources normally have a simple warning sign on the front or rear of the antenna, making those that are accessing the site aware that it is an RF Source. An example of the sign is in Figure 1.

Figure 1: RF Hazard warning sign

The UK Mobile industry have agreed a staged approach for warning signs at Mobile base station sites.

The first sign is normally at the entry of the site and can be found in Figure 2. It is designed to inform visitors of:

- Cell Site reference and Operator:

- What form or type of hazard exists on the site that they could be exposed to;
- What actions they need to take to avoid or minimise such exposure;
- Who operates the equipment that is producing the hazard;
- How to contact the site operators present on site.

Figure 2 – Example of signage at entry point of site

The last sign is to located that boundary of any Exclusion Zone and gives clear instruction not to proceed beyond this point. If access is required to this area, the site must be shut down and the antenna isolated. An example of the sign is presented at Figure 3.

Figure 3 – Exclusion zone signage

4. Safe Systems of work

Safe systems of work should be prepared for all activities that bring people into an environment where they may be exposed to RF fields above the reference levels. The basic elements of any system comprise the following:

Risk assessment - method 1

a) Assemble all available information on field strength levels likely to be encountered in the work area and in the access ways that approach it. If the information is incomplete or too old to be trustworthy, seek new information from appropriate technical authorities, which may be site owners or their management agents, licensed operators or equipment suppliers.

b) If reliable information is not available and cannot be obtained, consider whether the circumstances would justify an RF survey, and if so, implement this to obtain first hand information on field strengths.

c) Where field strengths are known, compare them with the reference levels given in Appendix A and decide whether there will be a risk to people at work.

d) If access is required to an area defined by the generic dimensions in Appendix A, and signage on site, then check with HSE.Helpline@vodafone.com / Tel: 03333 04 6666 to understand whether there is the potential to exceed relevant guidelines on that particular site.

e) If it is certain that there is no risk, work may proceed without control measures.

f) In borderline cases, or where field strengths are unknown but not thought to be high enough to justify a survey or pose a risk, personal monitors must be used by those working at the site.

g) If there is a definite risk, suitable controls must be in place before work commences.

Risk assessment - method 2

The second approach to risk assessment is to assume that there is always a potential to exceed relevant exposure guidelines arising from exposure to RF fields at sites equipped with radio transmission equipment. On this assumption, it will be adequate to:

a) identify the range of frequencies to be found at the site;

b) select and issue appropriate personal monitors for every employee likely to be exposed; and

c) operate a “stop work and review” policy to cover the occasions when an alarm is triggered on any monitor.

Control of risks

Control measures must be formally established for situations in which work areas are subjected to RF fields above the reference levels. This can best be accomplished by the operation of a risk assessment of the site which contains clear guidance on exclusion zones.

The control measures would normally comprise either reduction of output power, or switching off one or more of the transmitters producing the high field levels. In either case, the manager or supervisor must establish a secure means of maintaining control for the duration of the work. This would typically be achieved by isolation of the power supply to a transmitter or locking of its power output control at the required level.

The Vodafone policy for isolating base stations is defined in **TORO500 – Site Access Arrangements Management**

Safe systems of work require a process that includes risk assessment, planning of work activities, assessment of competence, monitoring and supervision and the provision of information, instruction and training.

The effectiveness of the systems adopted will be determined by the thoroughness of these activities and by the application of management controls in their definition, monitoring and review.

Personal monitors

It has already been noted that personal monitors are advised for situations of uncertainty and for borderline cases. It is a simple step from this position to recommend that personal monitors should always be worn in work areas where RF fields of significant strength can exist and no controls are in place to reduce exposure to an acceptable level.

Vodafone provides personal monitors, predominantly covering the frequency band 100kHz and 50 GHz. This range encompasses the principal systems, which may have exclusion zones, such as the following, typically found on multi-user sites:

- Amateur radio
- Automobile Association systems
- Virgin Media O2 (formerly Telefonica O2)
- DECT
- FM Radio broadcast
- In flight phones
- Ministry of Defence
- Three
- Everything Everywhere
- Paging systems
- Police transmissions
    - Securicor and others
- Taxi firms
- Terrestrial Flight Systems
- TV Broadcast
    - Vodafone

5. Antennas

Appendix B illustrates the exclusion zones for the main types of antenna which are commonly found on sites used by Vodafone.

Exclusion zones should be indicated by warning signs (figure 3) and markings on a roof or on the structure around an antenna. Ideally there would also be physical barriers against entry into the risk area, but these are not common, because of practical difficulties in their construction. Care should be taken when working around the antennas using a climbing aid such as a cherry picker.

Not all sites are the same in capacity, or the amount of radiofrequencies installed at a site will differ based on the location. For example, a rooftop in a major city will have more capacity, or radio channels, installed than that of a rural site. This will lead to a variation in the dimensions of any exclusion zone. Whilst generic sizes of exclusion zones are given in this document, it is possible, due a lower radio configuration at a particular site, that the site is compliant with the relevant guidelines even if it would appear that there is access to a generic exclusion zone. If any personnel have questions on a particular site, they should contact the site owner or Policy Champion to gain assistance.

If work within an antenna exclusion zone is required, the RF power source must either be switched off (See TORO 500) or reduced in output to below the investigation level. On/off and reduction controls must be securely isolated or locked to prevent re-connection, accidental or otherwise, without the knowledge of those at work.

Antennas should only be approached where it is absolutely necessary. The absence of barriers or markings does not indicate safe conditions in an area close to an antenna.

Where it is essential to approach a powered antenna, for instance to align it or to carry out signal measurements, this should be done only after establishing that the work can be affected from a position of

safety. Particular care should be taken during such work to avoid direct contact with the radiating elements of the antenna.

Personal monitors should be worn by persons undertaking work on powered antennas, unless it has been clearly established that there is no possibility of the reference level being exceeded in any area to which access is required.

Transmitters

Power sources designed to generate RF signals for transmission to a remote receiver are known as transmitters. It is important to understand that the output from a transmitter, presented at an unterminated waveguide or coaxial cable port, gives a concentrated local RF field, which is likely to exceed the reference levels. It is therefore essential that work should only be carried out in the vicinity of powered transmitters when output ports are terminated by connection to a feeder, test connector or blanking device which prevents the emission of high levels of RF energy into the surrounding airspace.

REMEMBER: Work should only be carried out on unterminated transmitters if the power source is switched off and securely isolated.

6. Feeders

Feeders are the physical connections between a transmitter and an antenna. The types of feeder most commonly found on Vodafone sites are elliptical waveguide and coaxial cable, but square, circular and rectangular waveguide are also used.

Feeders channel RF signals from a transmitter to an antenna and the RF energy within the feeder is virtually the same as that at the transmitter output port. The energy will obviously be released into the surrounding air space if there are any breaks in the feeder or leakages from it. Mechanical damage is often the cause of RF leakage from feeders. The system is designed so that the site should automatically shut down in this situation.

Since this usually results in a degradation or disruption of service, maintenance engineers called out to investigate the fault are inevitably drawn towards this potential danger, whilst inspecting the feeder. RF measuring equipment should be used for this type of work, both for the protection of colleagues, and to indicate the location of a leak. This equipment must cover the frequency being carried by the feeder. The leaking feeder must be disconnected from power before any repair work is carried out.

Any operation involving the disconnection of a feeder joint may only be carried out after the power source is switched off and securely isolated

Other work which may allow accidental leakage of RF energy from a feeder should be similarly controlled. If this is not possible, the RF field in the region of the work site must be continuously monitored.

In some cases feeders are labelled to indicate their function. A typical example of feeder labelling is found at cellular telephone base stations, where feeders are marked at each end to show the base station identity and with TX or RX (or both) to indicate whether the feeder is carrying transmit power. A feeder bearing no labelling must be assumed to be carrying RF power unless and until it is proven that no live transmitter is connected to it.

7. Training

An e-Learning course for RF workers is available to provide basic training in the safe systems of work detailed in this document. Colleagues who work with RF systems also require technical training to provide specific knowledge of the equipment, which must include training in the correct use of personal monitors, or any other measuring equipment required as identified on the safe systems of work.

Colleagues who work with antennas and feeder systems also require training for working at heights. A variety of courses is available to cover the different categories of climbing and working situations.

These training arrangements, combined with relevant engineering skills, qualifications and experience, constitute safety competence for RF workers.

Further details can be found in document UK Health, Safety and Environment Training.

8. Exceptions

Any exception or exemption to the controls set out in this document must be agreed by the health and safety team by contacting HSE.Helpline@Vodafone.com.

9. Supporting Documents

These detailed policy requirements are made under the Vodafone UK Health, Safety and Wellbeing Policy.

Useful relevant documents include;

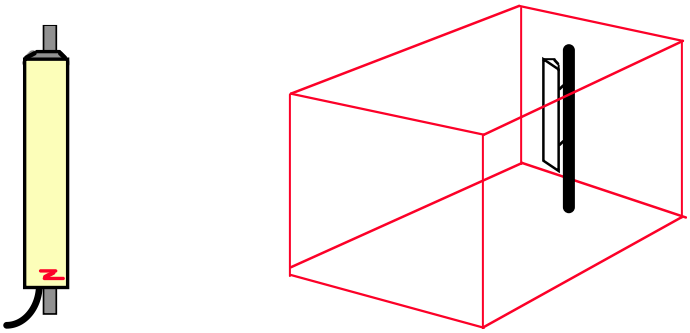
- UK Health, Safety and Environment Training
- e-Learning course for RF workers
- Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic field (up to 300 GHz)
- Health, Safety and Environment Helpline – HSE.Helpline@Vodafone.com
- Group EMF Policy (Group RF Policy)
- TORO 500

10. Document history

Version	Date	Changes	Other standards affected	Approved by
HSE 020 V3	24/6/2019	RF Safety Information being updated by Rob Matthews		Eileen Roddis
HSE 020 V3	9/7/2019	Document transferred to New Policy Format		Eileen Roddis
UK RF Safety Detailed Policy Requirements V1.0	October 2019	Reformatted, updated links.		Alex Clark
UK RF Safety Detailed Policy Requirements V1.1	November 2021	Updated to reflect ICNIRP 2020 guidance		Rob Matthews
UK RF Safety Detailed Policy Requirements V1.2	January 2023	Updated Policy – minor changes to exclusion zones, pregnancy and pacemaker requirements.	TORO 500 linked/ published externally	Rob Matthews
UK RF Safety Detailed Policy Requirements V1.3	May 2023	Updated formatting and defined reporting requirements	None	Zoe Alder

Appendix A – Antenna types and exclusion zones

1 Sector antennas



The signals from mobile telephony sector antennas form a rectangular exclusion zone which extends above, below and behind the antenna as well as to the front and sides.

All Operator's sector antennas have different size exclusion zones. Guidance on generic occupational exclusion zone dimensions are:

Above / below	1.5 metres	Sides	2.0 metres
Behind	0.5 metres	Front	13.5 metres (16m if all operators present)

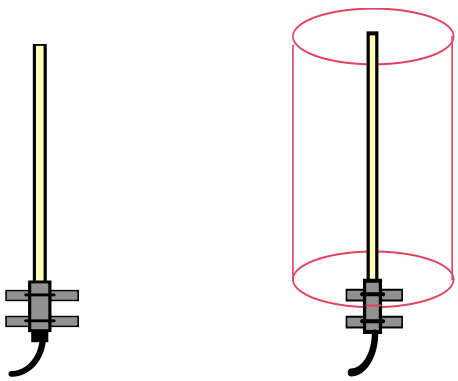
These measurements represent the largest of the sector antenna exclusion zone dimensions (in each plane) notified to the Health and Safety Team by any of the major operators. Working to these measurements will therefore ensure that no exclusion zone is breached by persons working for or on behalf of Vodafone.

Notes:

- Colleagues must not work within an antenna exclusion zone without arranging for it to be powered down or reduced in output.
- If access is required to this generic zone, Colleagues much check with HSE.Helpline@vodafone.com / Tel: 03333 04 6666 or Site Owner to determine the actual size of the exclusion zone at that site
- Colleagues should not approach a sector antenna without using a personal monitor.
- Sector antennas may be found in a range of colours and may be either solid, or formed from a wire mesh or grid. All variants will be oblong in shape when viewed from the front.

2 Omni antennas

The signals from mobile telephony, paging and other omni antennas form a cylindrical exclusion zone, which extends above and below the antenna as well as in a radius around it.



These measurements represent the largest of the omni antenna exclusion zone dimensions (in each plane notified to the Health and Safety Team by any of the major operators. Working to these measurements wil therefore ensure that no exclusion zone is breached by persons working for or on behalf of Vodafone.

All Operator's omni antennas have different size exclusion zones. Guidance exclusion zone dimensions are:

Above / below	0.5 metres
Radius	4.0 metres

Notes:

- Colleagues must not work within an antenna exclusion zone without arranging for it to be powered down or reduced in output.
- Colleagues should not approach an omni antenna without using a personal monitor.
- Omni antennas may be found in a range of colours and may be thicker, thinner, longer or shorter than that illustrated above.

3 Microwave antennas

The signal from a microwave antenna emerges as a "pencil beam" from the centre of the antenna - the power transmitted from microwave links operated by Vodafone and other fixed and mobile telephony Operators does not exceed reference levels.

However, individuals must not pass in front of a microwave antenna since this will break or interrupt the communications link

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Notes

- There are no exclusion zones set for safety reasons.
- Exclusion zones using barriers to deter access in front of antennas serve the purpose of preventing obstruction of the communications link.

4 Satellite stations (dish or bowl antennas)

Large diameter earth station antennas, such as those found at the satellite earth stations operated by Vodafone, BT and the Ministry of Defence, will have systems that prevent access to the reflector bowl during transmission activity. Access is normally controlled by mechanical interlocks (Castell keys) between the entry door and the transmitter.

VSAT earth station antennas, such as those operated by news agencies or incorporated within navigation and paging systems, have no exclusion zones for safety reasons but may have a designated exclusion zone immediately in front of the antenna to prevent disruption of signals.

Appendix B - Procedures for the use of personal monitors

Introduction

Any RF equipment other than Vodafone point-to-point microwave must be treated as a potential hazard. Personal monitors **must** be used whenever approaching an RF antenna, or group of antennas, unless:

a) they can be identified and assessed as not exceeding the reference level; or

b) access is not required closer than the boundaries of exclusion zones as described in Appendix A of this document; or

c) the associated transmitters are switched off and safety interlocked; or

d) the power levels of the associated transmitters are reduced and confirmed by their operators as not exceeding the investigation level.

Contract climbers and others carrying out tasks for Vodafone in areas where they may be exposed to RF fields must provide their own personal monitors or make their own arrangements for the assessment and control of RF safety hazards.

2 Use of monitors

The following basic rules should always be applied when using personal monitors.

- Switch on the monitor before approaching the hazard area, and ensure that it emits an audible and visible signal to indicate adequate battery condition. If not, replace the batteries before proceeding further.
- Clip the monitor on the outside of the clothing. Do not cover the monitor with any additional layers of protective clothing.
- Monitors are directional, and need to precede the wearer's body into the hazard area. For instance, if the approach was vertical, via a ladder, the monitor should be clipped on or hand held to point upwards or downwards towards the antenna(s) in question. When moving forward, it should be pointing ahead and is normally best positioned high on the body. The detection face of the monitor is the one opposite the attachment clip.
- A real alarm is one which causes the monitor to lock into the alarm condition, that is, the audible and visual alarm will be continuous and remain on until the monitor is reset. Any other fleeting audible and visual signals indicate a condition in which the monitor has been subjected to a voltage gradient. This can occur when the monitor is moved rapidly in a low level RF field, brought up to an electrostatic field emitted by a computer monitor or nylon based clothing, or placed next to a sending mobile telephone.
- If a monitor locks into the alarm condition, it indicates that the alarm threshold has been exceeded. For Narda monitors, the threshold is set at 50% of the reference level, and so the user will not have been subjected to an unsafe RF field provided that, they withdraw immediately from the hazard area. The next step is to advise the HSE Helpline on 03333 04 6666 or Policy Champion for advice. The area should not be entered again until this has been done. The same procedure should also be adopted for any situation in which individuals feel unsure about RF hazards.
- Monitors are relatively robust, but care should be taken to avoid them being dropped, severely jolted or vibrated, overheated or immersed in any form of liquid. If a monitor is known to have been subjected to such treatment, or appears to be damaged or suspect in any other way, it should be taken out of service and sent to a specialist testing house for inspection and re-calibration.

- All persons using monitors should be given elementary training in their use. This will take the form of practical demonstrations to give an appreciation of the points listed above.