

Radiofrequency Protection for You and Your Family

This article is separated into 6 sections, each of which can be individually downloaded. It is a 'work in progress' incorporating new information whenever time permits.

Section 1

Introduction

1. Introduction; health effects associated with RF radiation; TV and radio; mobile phone masts or base stations; graphs showing change of symptoms experienced according to RF exposure levels; other sources of RF radiation
2. Sources outside the home; mobile phone masts (base stations); Televisions and TV transmitters; WiFi; interactive whiteboards in classrooms; kindergartens; hospitals; wLANs in offices; railway stations; rubbish tagging; transport; internet cafés; WiMAX; street lighting; bus stops; radar; amateur radio enthusiasts; local radio communication services; local broadband services; military equipment; police surveillance
3. Sources inside the home; mobile phones; digital cordless (DECT) phones; wired telephones; television; lighting; computer monitors; wireless mice; computer broadband connections; laptop computers; computer wireless LAN (local area network) broadband connections; dLANs/Homeplug devices; microwave ovens; baby monitors; alarm buttons; children's games; burglar alarms; 'smart' utility meters; hearing aids; dental work; de-humidifiers
4. Measuring exposure, screening and protection; How does microwave radiation get in from outside? Windows; the glass; windowfilm; curtains; bed canopies; shielding sleeping bag; earthed grounding sheets; walls; paint; skirting boards and curtain battens; ceilings; doors; Why, when I screen out the fields, does my phone still work? insulation; phones; mains filters; dirty electricity; lighting; ELF noise to reduce RF effects
5. Personal Screening; shielding clothing; phone pouches and headsets
6. 58 references

Introduction

Since the beginning of the twentieth century, our exposure to radiofrequency (RF) radiation has increased dramatically.

The first people who were exposed to RF were primarily those whose occupations brought them into contact with radar and military communications. In the latter part of the 20th century and the beginning of the 21st, the general public has become increasingly exposed, as a result of the expansion of RF transmitters used in a range of communications. Some people live near radar installations (at civil and military airfields and sea and river ports), some near military communications bases using radiofrequency signals, or near TV and radio transmitters (including the new digital systems that are replacing the older analogue transmitters).

There has been a phenomenal increase in RF exposure from mobile phones; the network of base stations that support their use; wireless networking, increasingly used in offices, schools, libraries, etc., WiMAX systems blanketing our towns and cities, enabling us to use our laptops 'on the move' and the new Bluetooth technology, which is already invading our homes and emitting pulsed microwaves from our 'white goods' - fridges, freezers, cookers, etc. Even new cars come with microwave control technology that adds to the soup of 'electrosmog' accompanying us at all times. Planes and trains also allow, or even encourage, WiFi use by passengers.

In the home there are several sources of microwave (RF) radiation; microwave ovens, mobile phones providing many leisure opportunities, increasing music and films, most types of cordless (DECT) phones (there are exceptions, see section 3. Sources inside the home); wireless internet access and bluetooth facilities on our computers and laptops (WiFi); wireless burglar alarm systems, 'smart' meters monitoring electricity (and other utilities) use, cordless baby monitors, children's games, smart appliances, etc. Outside the home some people use laptop computers wirelessly everywhere they go.

The main contribution to environmental exposure (calling by participant not included) is from calling with mobile phones (37.5%), from cordless DECT phones and their base units (31.7%), and from the mobile phone base stations (12.7%). The exposure to mobile phone base stations increases with the percentage of urban ground use, which is an indication for high people density. In agreement, the highest mean exposure relates to the activities with high people density, such as travelling by public transport, visiting social events, pubs or shopping malls. Exposure at home depends mainly on exposure from people calling in the neighbourhood of the participant and thus on the number of persons in a household. In addition just the possession of DECT base units leads to exposure as most models transmit continuously in stand-by. Also wireless internet routers continuously transmit in the WiFi band. Though the highest exposure peaks in the WiFi band come from stray radiation of microwave ovens. The mean total exposure largely depends on phone calls of a high exposure level and short duration (Bolte & Eikelboom [2012](#)).

Whether we have adapted to exposure from these RF transmissions or not, the way the signals are sent has changed and is continuing to change. In the late 1980s, mobile phone base stations began to be erected to serve the needs of the small number of people owning the new 'gadgets'. Since then, the number of masts has multiplied beyond anyone's expectations, with the arrival of 4G to add to 3G and 2G availability. New digital TV and radio broadcasts are also filling the former gap in the electromagnetic spectrum.

The first radiofrequency transmissions that were made, for most of the 20th century were not digital and did not "pulse regularly" and therefore they were not directly comparable to the

modern digital technology. It is the pulsing quality of these modern transmissions that many scientists believe are responsible for the ill-health effects reported by people who live near the transmitters, especially mobile phone masts which are so much more common than other transmitting towers.

Our article [Radiofrequency EMFs and Health Risks](#) in 8 sections, details the reported health effects that have been studied and the scientific findings. We believe that a significant number of people are likely to experience health affects as a result of exposure to RF EMFs, which is why we believe it is necessary to check your exposure using an appropriate meter such as the EMFields [Acoustimeter](#) or [Acousticom 2](#), identify the source(s) and reduce the RF radiation should you decide you need to.

The majority of the exposure is from mobile phone masts, DECT phones and WiFi, but there are significant numbers of other sources. Many of the [screening products](#) sold by EMFields will help protect you from these emissions. They will also screen against TV and radio transmissions, which, as they change to the new digital technology, may provoke ill-health symptoms in people who were able to live with the older style analogue technology without consequences. The new WiMAX systems, for people wanting internet access on the move, will also irradiate residential areas. The frequencies they use are higher than the current telecommunications frequencies. EMFields attempts to keep a range of products that will screen against the new frequencies as and when details become available and appropriate products can be found.

It is universally agreed that the power levels coming from *all* mobile phone masts are *relatively* low and from the large majority *very* low. However, power isn't all of the story and there is a significant body of researchers who believe that it is not the *power*, it is the *pulsing information* that is likely to cause most of the problems. Such pulsing may disrupt our biological systems, causing reactions that are very difficult to predict in a living system, which has an amazing ability to recuperate from even major trauma, but which does have its limits - especially as regards a long slow "poisoning" of our bodies. The mobile phone network operators frequently say the signal does not pulse, but Public Health England (PHE), one of the most conservative advisory bodies in the world show in their documentation that they clearly do pulse. Most signals 'measured' by operators are 'averaged over time' and therefore do not *show* the pulsing, but that is not the same as pulsing not being present.

Digital TV and radio is resulting in pulsed signals being added to the existing TV and radio signals, and we believe that some people are particularly susceptible to the pulsed radiation from the new style transmitters. Dr Bill Curry in the US suggested in the 1970s that it is possible that pulsed microwaves (normally penetrating very little distance into the body) might 'hitch a ride' on lower-frequency RF signals, thus penetrating more deeply into the body, and potentially affecting the body in different, perhaps more serious, ways.

We surveyed an area in the Midlands which had a TV mast, local radio masts and a mobile phone mast nearby. There were more cancers and blood abnormalities in this area than would be expected statistically. This could be coincidental, and nothing to do with the number of frequencies causing deeper penetration of RF into the body. It is clear that research needs to be done to compare areas with a combination of signals, and areas with only one to see if there is a difference in health patterns. Finding areas with only one radiofrequency emission source is getting harder to find, as more and more sources come online. We are also exposed at work, at home (with our own equipment) and at school, often when travelling and in the community generally. This is likely to distort any epidemiological findings.

Living systems, including human beings, like other systems in nature, are non-linear and their response also varies from individual to individual and within one individual over time. Anticipating how one person will respond to a given stimulus is like trying to base a long-range

weather forecast for the UK upon one drop of rain in East Anglia. The weather is an example of a non-linear system. Despite the addition of a battery of very expensive equipment, weather forecasters can still get it wrong, sometimes very wrong. Here we are trying to predict future health outcomes many years into the future. Many serious cancers are triggered up to 20 years before they are detected by doctors, or even by the patient themselves.

The way we experience the electromagnetic energy that interacts with our bodies is similarly complex. Some frequencies we experience as light, some as heat, some we are not apparently consciously aware of (e.g. X-rays) yet they have a significant impact on our bodies. From our evolutionary experience, our sense organs react more to a changing stimulus than to one which stays the same, as originally one that changes would have been more related to 'threat'. Our nervous system, for example, expresses this bias for change by tiring of sensing the same old thing. Most nerve cells can't fire time after time in quick succession. It's called fatigue. Mast and phone emissions are all composed of two types of signals; one type which does not vary much over time, and another which can change rapidly and over quite a wide range. We can assume that the organs and systems in our bodies are likely to respond quite differently to these two types of incoming signals. A lot of research and scientific theory is based on averaging out our exposure, reducing it to the 'same old thing' mentioned earlier. This is likely to reveal less than if we look at the changes.

The [Acoustimeter](#) (see Section 4), developed by Alasdair Philips, of Powerwatch, measures both average levels and peak levels of radiation, as discussed above. The [Acousticom 2](#) (also in section 4), measures peak signal levels as we believe these are most likely to be what is affecting people who are sensitive to RF.

It has been suggested that if we expose a human living system to a very weak EM signal, and if the signal is appropriately 'tuned,' it could interfere with the body's normal functions; so that an electromagnetic signal could cause our bodies, or individual systems within them, to 'resonate' at this man-made imposed signal and that this could lead to our naturally functioning biology departing from a healthy homeostasis.

However, Yao shows ([2008a](#), [2008b](#)) that microwave radiation-induced DNA damage to the eyes can be blocked by superposed electromagnetic noise, which effectively 'de-tunes' the problem radiation.

Sir William Stewart, chair of the Independent Expert Group on Mobile Phones (IEGMP) which reported in May 2000, said *"It is simply not possible to say that there are no potential effects on the human population. It is difficult to talk about the population because populations vary. Antibiotics do a wonderful job for the general population, but there is a subgroup in the population that is allergic to antibiotics; they cannot take them. There is a sub-group in the general population who cannot eat nuts because they are allergic to them. That is why we refer to the general population. On the basis of discussions such as those we came to advise on the need for a precautionary approach."*

John Peterson Myers, a Senior Advisor to the United Nations Foundation concluded in an article written for San Francisco Medicine November 2002, *"The effects of low level, background exposures are likely to be far more widespread than acknowledged, and involve many more health effects than traditionally considered, yet these new mechanisms of toxicity thwart the epidemiological tools now available to establish human harm."*

So, despite being surrounded by microwave radiation, we do not have the complexity needed in epidemiology to discover whether our health is being damaged by that exposure. However, there is a growing body of evidence covered in detail in our 8-section article [Radiofrequency EMFs and Health Risks](#) that is showing that human, and other living systems' biology, is being affected by microwave radiation, even at very low levels. Some people seem to be more susceptible than

others, but, like those referred to by Sir William Stewart, who these susceptible people are, is impossible to predict.

We can minimise our exposure to many of the sources of microwave (radiofrequency) radiation; careful selection of appliances in the home, mobile phones, etc. Some sources we can avoid when we make decisions about where to live, if we have a choice. So we take into consideration proximity to radiofrequency transmission sources such as existing mobile phone base stations, TV and radio masts, military establishments, radar sources, etc. Many of these will be visible, some may turn up in surveyor's searches; information about some of them may be easily available, and for some we may have to do a bit of detective work, such as if we are thinking of buying a flat in a multi-occupancy building. If we are renting, we do not have a surveyor's report to help identify any of them. We may need to do some serious research ourselves. If we are renting our home through councils or housing associations, our freedom to choose may be restricted considerably.

Frei (2010) explained the problems of estimating personal exposure. Her study concluded that *"personal exposure measured with exposimeters correlated best with the full exposure prediction model and spot measurements. Self-estimated exposure and geo-coded distance turned out to be poor surrogates for personal exposure."* All you can do is make the best guesstimate, probably using an 'exposimeter', like an [Acoustimeter](#), or [Acousticom 2](#).

Sometimes, we choose the perfect place, and perhaps years later, a power station, waste dump, a motorway, chemical or cement factory or mobile phone base station may appear, sometimes overnight. We may have little choice in the matter, or our wishes may be ignored.

This series of articles has been written to help people protect themselves and their families, as a precautionary measure, in case ongoing research proves that our exposure to radiofrequency radiation causes health problems.

Health effects associated with RF radiation

We have written a fully referenced article in 8 sections in the EMFields library, entitled [Radiofrequency EMFs and Health Risks](#), which details the health effects associated with radiofrequency radiation exposure since early occupational exposure through to modern scientific research showing the health effects on the general population as a result of exposure to ever-increasing levels of 'electrosmog'. Here, we summarise the main findings of the research.

What is interesting and somewhat disturbing about earlier scientific findings is that in many cases where people's health was affected by RF exposure *medical tests (including blood pictures and biochemistry) showed no significant abnormalities*. The symptoms the people were suffering from often persisted for several months, even years, after the exposure, and some of the people who had been exposed were never able to regain the level of good health they had experienced beforehand. As the biological markers are not present, it does complicate the process of finding a causal relationship between exposure and symptom.

What the research clearly demonstrates is that body tissues respond to electromagnetic fields at very low levels indeed, and that the response is non-linear. That is, biological systems may react at some low levels and not others, they may not react at all to high levels, and very differently to different frequencies. We believe that, rather than there being a general threshold below which no ill-health symptoms occur, people are very variable, having their own individual thresholds that can, in an increasing minority of the population, be exceeded at low levels of exposure. Various hypotheses, covered in the article referred to, have been put forward about how radiofrequency exposure may create the effects reported.

The late Professor Ross Adey, who made fundamental contributions to the emerging science of the biological effects of EMFs, said that research was hampered because of public pressure for rapid answers to very complex biological and physical issues, and only limited short-term research programmes were being funded to answer specific questions about certain health risks. What cannot be conceived of simplistically just does not get investigated.

Dr Curry's theory (p. 3 above), suggests that the situation is more complex than the simple view of one environmental exposure resulting in one health effect. We know that the interaction between living systems and external factors is complex and the interaction between different forms of environmental pollutants is so difficult to establish, it is ignored by many bodies making health and safety recommendations.

TV and Radio

An increase in the number of cancer cases (including brain tumours), and changes in blood cell composition, has been found near TV and radio masts, including decreased survival rates after cancer treatment. A radio station in Switzerland was shut down because of the ill-health effects experienced by people living nearby.

Radar

People living near radar stations have reported major changes in fertility and the health of the children in the population.

Mobile phone masts or base stations

In many of the studies assessing microwave exposure levels from mobile phone base stations, people begin to report symptoms of ill health when background levels exceed 0.05 V/m. The following symptoms are the ones reported by people exposed to microwave sources.

Headaches; concentration difficulties; learning and memory problems; chronic fatigue; sleep problems; depression; changes in blood pressure; heart arrhythmia; nosebleeds; initiation or increase in number of epileptic seizures; dizziness; irritability; general vitality problems; behavioural problems; migraine, nausea and some studies even show the risk of cancer increases; especially in women, so there may be some hormonal interaction.

In many of the studies, the seriousness of the condition, or the number of people reporting the effect, increased either with proximity to the source, or a higher level of microwave radiation.

The studies showing these effects are identified in detail in the article [Radiofrequency EMFs and Health Risks](#), together with its appendix.

Some of the scientific researchers involved in reporting these findings have been told that their funding would be discontinued should they do further research into the subject. It is very difficult to get an accurate picture of the extent of the problem, when funding is unavailable. For this reason, many of the studies quoted in the article are carried out by doctors, or concerned residents, rather than universities or institutional research bodies. The results are not treated by governmental and scientific standard-setting bodies as true 'scientific' works and thus are given less credence by the organisations whose responsibility it is to monitor and safeguard the health of communities.

There have been various appeals launched in different countries, since the Freiburger Appell in 2002, for precautionary action and legislation to protect people from excessive radiofrequency radiation. These have arisen as a result of medical practices reporting dramatic upsurges in the number of patients reporting ill health symptoms such as the ones listed earlier, without any other apparent cause, and often on a time scale coincidental with the erection of a nearby telecommunications transmission mast, or the appearance of some other source of RF emitter. Some of the appeals were written at the end of scientific conferences where independent scientists expressed their deepening concern about the need for much more precautionary guidelines than the International Commission for Non-Ionising Radiation Protection (ICNIRP)'s widely adopted ones, to protect members of the general population from the levels of microwave radiation associated with health problems.

The following are extracts from the Freiburger Appell:-

Out of great concern for the health of our fellow human beings do we - as established physicians of all fields, especially that of environmental medicine - turn to the medical establishment and those in public health and political domains, as well as to the public. We have observed, in recent years, a dramatic rise in severe and chronic diseases among our patients.

Since the living environment and lifestyles of our patients are familiar to us, we can see - especially after carefully-directed inquiry - a clear temporal and spatial correlation between the appearance of disease and exposure to pulsed high-frequency microwave radiation (HFMR), such as:

On the basis of our daily experiences, we hold the current mobile communications technology (introduced in 1992 and since then globally extensive) and cordless digital telephones (DECT standard) to be among the fundamental triggers for this fatal development. One can no longer evade these pulsed microwaves. They heighten the risk of already-present chemical/physical influences, stress the body's immune system, and can bring the body's still-functioning regulatory mechanisms to a halt.

Pregnant women, children, adolescents, elderly and sick people are especially at risk. Our therapeutic efforts to restore health are becoming increasingly less effective: the unimpeded and continuous penetration of radiation into living and working areas in particular bedrooms, an essential place for relaxation, regeneration and healing - causes uninterrupted stress and prevents the patient's thorough recovery. In the face of this disquieting development, we feel obliged to inform the public of our observations - especially since hearing that the German courts regard any danger from mobile telephone radiation as "purely hypothetical".

What we experience in the daily reality of our medical practice is anything but hypothetical! We see the rising number of chronically sick patients also as the result of an irresponsible "safety limits" policy, which fails to take the protection of the public from the short- and long-term effects of mobile telephone radiation as its criterion for action. Instead, it submits to the dictates of a technology already long recognized as dangerous. For us, this is the beginning of a very serious development through which the health of many people is being threatened. We will no longer be made to wait upon further unreal research results - which in our experience are often influenced by the telecommunications industry - while evidential studies go on being ignored.

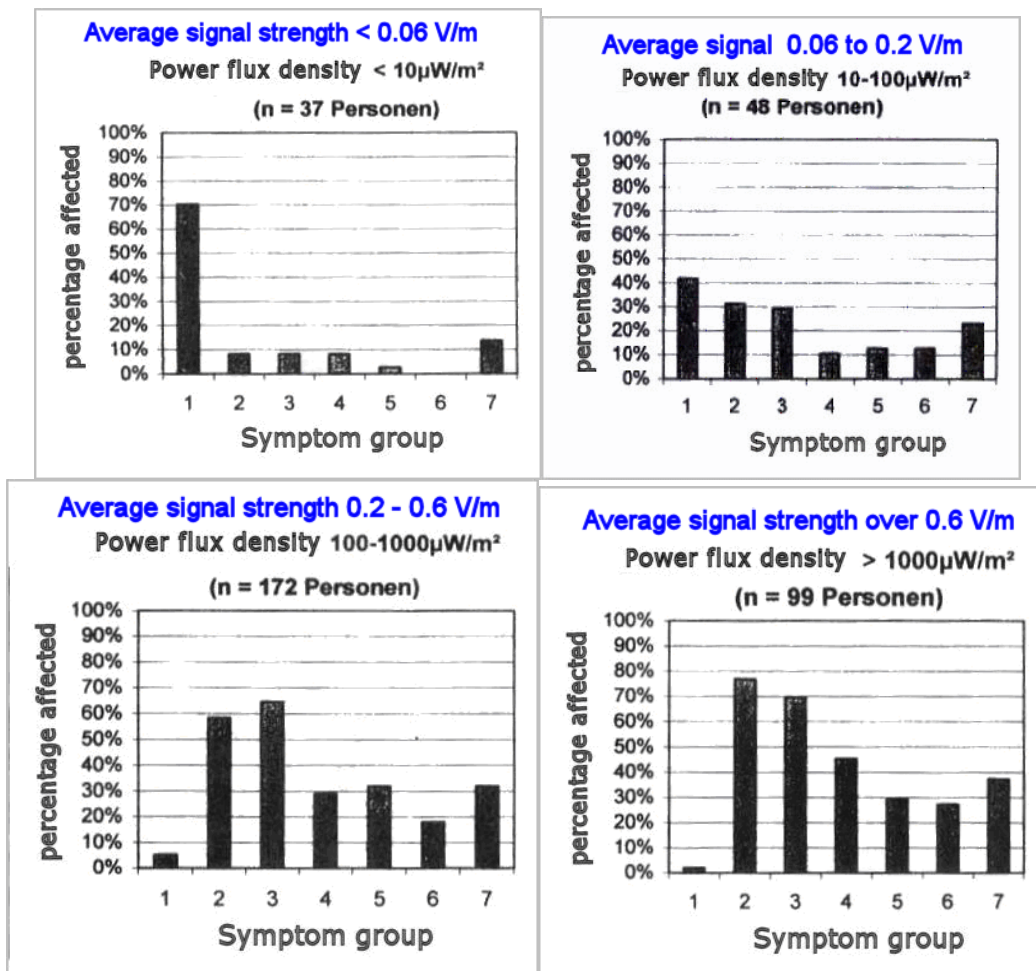
We find it to be of urgent necessity that we act now! Above all we are, as doctors, the advocates for our patients. In the interest of all those concerned, whose basic right to life and freedom from bodily harm is currently being put at stake, we appeal to those in the spheres of politics and public health".

This was written in 2002, and the 'electrosmog' has not become less. It has grown beyond imagining with the increasing exposure to WiFi, WiMAX, RFID and many other developments which are invading our homes, workplaces, travel and leisure facilities.

Another group of medical doctors in Germany expressed their concern to the president of Bavaria after their research showed the change in health and wellbeing of their patients as the levels of microwave radiation in their homes increased.

The doctors found that 0.05 V/m was the level at which symptoms start to show. This is shown graphically below. Though the numbers involved in the study were small, they point out that where the signal strength is less than 0.06 V/m, 70% of people did not experience adverse health effects, whereas in levels of 0.2 V/m and above only 5-6% of the population did *not* experience health effects. It is important to remember when looking at these graphs that microwave signals from mobile phone masts are often above **0.6 V/m** at up to 400 metres distance!

Here are the graphs that accompanied the German Doctors' letter:



Group 1 no symptoms

Group 2 sleep disturbance, tiredness, depressive mood

Group 3 headaches, restlessness, dazed state, irritability, disturbance of concentration, forgetfulness, learning difficulties, difficulty finding words (Very undesirable for our children trying to make the most of their education possibilities)

Group 4 frequent infections, sinusitis, lymph node swellings, joint and limb pains, nerve and soft tissue pains, numbness or tingling, allergies

Group 5 tinnitus, hearing loss, giddiness, impaired balance, visual disturbances, dry eyes, eye inflammation

Group 6 tachycardia, episodic hypertension, collapse

Group 7 other symptoms: hormonal disturbances, thyroid disease, night sweats, frequent urge to urinate, weight increase, nausea, loss of appetite, nose bleeds, skin complaints, tumours, diabetes

Some of the responses by the telecommunications companies to the suggestion that RF radiation causes health problems is that it is a psychosomatic problem (that is, *perception* of the mast creates negative mental states that lead to physical changes in the body which then result in adverse health effects), caused by people's fears when they see or are told about the mast. Some bird and animal studies in section 6 of [Radiofrequency EMFs and Health Risks](#) that show behavioural and fertility effects, seem to rule out this explanation.

Other sources of RF radiation

External sources of RF are covered in detail in the second section of this article, including the new digital TV service which some people are reacting very badly to, and internal ones (those that may be found in the home) in the third section. All transmitting devices, and this includes DECT cordless phones and WiFi computer connections, such as the BT Homehub, give off varying levels of RF radiation, which can be quite high.

Most of these have not been researched in their own right, though work from Sweden, detailed in [Radiofrequency EMFs and Health Risks](#) in the library of articles have suggested a firm link between cordless phone use and an increased risk in brain tumours after 10 years or so.

It is not necessarily the transmitter that is the problem, but the overall level of exposure to RF fields. This may mean several sources; masts, WiFi next door, DECT phones at work, mobile phones on trains, etc. Most of the time our bodies can withstand environmental pollution and repair the damage in ways which are hardly short of miraculous. However, for everybody there comes a time of overload, when a new exposure is 'the straw that breaks the camel's back'. Individuals vary as to when this point is reached. Protecting yourself from RF is often the best way of enabling your body to cope better.

Meanwhile, the RF radiation from wireless devices both inside and outside the home is increasing. Whilst we retain some degree of control within our own home environment once we have the knowledge about which appliances are the culprits, we do not have that same control over our neighbours and the wider environment. RF radiation goes through most substances, so even our neighbour's WiFi can radiate us highly.

Sections 2 and 3 deal with the different sources of RF. You can identify whether you may be exposed or not or to help you identify, with the aid of an instrument such as the [Acoustimeter](#) or [Acousticom 2](#) (details in section 4), where any exposure may be coming from. Section 4 also contains practical solutions to reducing your exposure, if necessary.