

In your home

The In your home set of articles article is separated into 8 sections, each of which can be individually downloaded. It is a 'work in progress' incorporating new information whenever time permits.

Section 6

Appliances H-S; heaters to security systems

1. Introduction; powerfrequency (ELF) EMFs; radiofrequency (RF) EMFs; measuring EMFs; the importance of timing
2. Appliances A-C; air conditioners, amateur radio transmitters, amplifiers, electric guitars and keyboards, aquarium, baby monitors, bath hoists, battery operated equipment, battery re-charging mats, beds, blood glucose monitors, bottle warmer, bra, burglar alarm, camcorder, carbon monoxide detectors, CD player, central heating, motor-controlled chairs, clock radio, clothes dryer, coffee grinder, coffee maker
3. Computers; monitors (Visual Display Units or VDUs), wired and optical mice, health effects, laptop computers, wireless enabled laptop, PDA (Personal digital assistant), computer wireless LAN (local area network), Schools' reactions, parents, broadband, computer games consoles, tablets, computers and Electrical Hypersensitivity (EHS), protection devices against EMFs from computers
4. Cooking; electric ovens and hobs, microwave cooking, barbecues, deep fat fryers
5. Appliances D-H; dehumidifier, dishwasher, doorbell, electric (el) blankets, el can opener, el clock, el drill, el guitar, el kettle, el knife, el lawn mowers, el shavers, el shower, el toothbrush, el vehicles, electricity meter, exercise machine, extractor fan, fan, fax machines, fire alarm, fitness devices, floor polisher, food processor, foot spa, foot & hand warmer, freezer, fridge, hair curlers/tongs, hair curlers/tongs, hair dryers, headphones, hearing aids
6. Appliances H-S; heart pacemakers; heaters, central heating boilers, heating pads, hi-fi, etc., hostess trolleys, immersion heater, iron, Jacuzzi, musical keyboard, lift, loudspeaker, magnetic field therapy mats, meters, mixer & blender, music centre, nightlights, pagers, PDAs, pencil sharpeners, personal alarms, personal radios, pet fences, photocopiers, plasma balls, power tools, printers, projectors, radar, radios, radio transmitters, sandwich maker, sauna, scanner, security systems
7. Appliances S-Z; sewing machines, smoke detector, sockets, solar panel water heating, solar photovoltaic panels, soldering irons, spinners, stairlift, static electricity, sun beds, sun lamp, tea maker, telephone, television, TV and radio transmitters, TENS unit, toaster, toys, transformers, trouser press, tumble drier, typewriters, vacuum cleaners, vagina speakers, washing machines, washer/dryer, waste disposal unit, water filters, water heater, water softener, water supply, wheelchairs, wristwatches
8. Grounding & 93 references

Heart pacemakers

People who visit hospitals should be well informed about the potential sources and risks of electromagnetic interference, but except in a hospital environment, the risk is low (von Olshausen [2016](#)). A personal communication suggested that extra care may need to be taken in GP surgeries as well.

Heaters

Convactor heaters, Infrared heaters, Radiant 'bar' heaters and Oil filled radiators all give off magnetic fields close by. Be careful of chair and bed positions - half a metre away is usually adequate.

Storage heaters. These give off up to $0.3\mu\text{T}$ at 1 metre when charging up. Night storage heaters should always be at least 1 metre away from beds to minimise the magnetic fields in which people sleep. This especially applies to landings where fields can extend through walls.

Most (e.g. Economy 7) electric storage heaters only charge up at night (between mid-night or 1 a.m and 7 or 8 a.m. depending on whether, if you live in the UK, you are on Greenwich Mean Time or British Summer Time) but some electricity tariffs allow one or two extra short charging periods during the day when the heater will also be giving off high magnetic fields. Check with your electricity supplier if you are in doubt.

Fan heaters have electric motors and heating elements with magnetic fields of about $0.22\mu\text{T}$ at 50 cm, and they should be kept at least a metre away from beds and chairs.

Central heating boilers

The pump for the boiler does not normally give off RF emissions. However, some do have wireless heating controllers, which can be significant sources of RF, especially if frequently-occupied chairs are nearby. If you are unsure about your controller, [RF monitors](#) can be hired from EMFields.

Heating Pads

Use of electric heating pads for chronic problems should be discontinued and replaced with hot water bottles.

Hi-fi, music centres, CD players etc.

These can give off high magnetic fields, but the problem is usually high electric fields. Make sure the system has a decent electrical earth connection to the mains supply. This will remove most electric fields.

Hostess trolleys

They use electric warming elements which do not use much power, so EMF hazards are minimal.

Immersion Heater

The heater and its associated wiring will give off high magnetic fields. Bedheads should be at least 1 metre away from the immersion heater cupboard wall. The pumps give off high fields close by - over 20 microtesla (μT) - which typically fall to around $0.5 \mu\text{T}$ at 50 cm. We recommend that chairs and beds are located at least a metre away.

Iron

Electric irons have low fields and are not a problem. Pregnant women should try to keep the iron at least 30 cm. from their body.

Jacuzzi

Some jacuzzis have pumps and motors built in to the base which will result in your being exposed to high EMF exposure. We do not believe that short-term use in a hotel, or leisure centre is a problem, but if the jacuzzi is in your house, then we recommend that the pumps and motors are at least half a metre away from the bath.

Keyboard (Musical)

Musical instruments are usually earthed systems and are not an EMF hazard. The amplifiers contain a transformer which gives off low levels of EMFs. Take care in its placement if used in the home.

Lift

Lift motors give off high fields. If you have a lift in your home because of a disability, the motor will be in a separate housing either at the bottom of the liftwell, at the top, underneath an integral chair, or underneath the lift floor if the lift is used specifically for wheelchairs. The closer the motor is to your body the higher the fields you will experience.

Stairlifts have motors mounted on the actual chair, so you are exposed to high magnetic fields when using it. This probably is not a problem as long as you only use it a few times each day.

In a multi-storey complex (e.g. flats), the lift motors are much larger and if you live in the top apartment then it is wise to find out where the motors are, and either keep at least 3 metres away, or measure the fields to see how far they extend. [EMFields ELF meter](#) can be hired to measure these fields

Lighting

See 'Your low EMF Home 3. Lighting'

Loudspeaker

If the equipment the loudspeakers are attached to is earthed, they do not give off EMFs. They do contain very strong permanent magnets.

Magnetic field therapy mats

In a study by De Santis ([2015](#)), the maximum exposure of one pulsed magnetic field therapy (PMFT) mat exceeds 3.1 times the basic restrictions of ICNIRP 1998 for the central nervous system tissues and 1.36 times the limit of ICNIRP 2010 for the peripheral tissues. Body loops can significantly increase the electric fields close to the skin, e.g., when the hand and thigh are in contact during mat use. In the opinions of the authors, PMFT products are not intrinsically compliant with ICNIRP 1998 and ICNIRP 2010 basic restrictions.

Meters

Utility companies are replacing meters which register usage of electricity, gas and water with 'smart' meters, which can not only be read remotely, but also give information enabling the householder to monitor household usage and therefore control expenditure to a point. See the article 'Your low EMF Home Section 4. Smart Meters' available from the [EMFields library](#). Many of these meters radiate RF, at low levels, and the levels can be quite high depending on how the smart meter network is organised.

Microwave Ovens

See 'In your home 4. Cooking'

Mixer and Blender

The motors will give off high EMFs of up to $0.7\mu\text{T}$ (mixer) and $1\mu\text{T}$ (blender) at half a metre, which drop away quite rapidly. Short periods of use should be all right. If pregnant, it will be worth limiting time using electric appliances giving off this level of fields at work top height.

Mobile Phones

There has been a lot of research into the health effects of using mobile phones. Even the manufacturers recommend using a hands-free headset rather than holding it to your head. Phones radiate RF emissions all the time unless switched off. It gives off higher levels of RF when reception is poor. [Air tube hands-free headsets](#) are safer than wired ones as the RF can travel down the wire to your ear and head.

Mobile Phone masts / base stations

A lot of information about the potential health effects associated with living near masts is in the article 'Radiofrequency EMFs and Health Risks' in 8 sections in the EMFields library. If you are thinking of buying a property near a mast, you might want to look at section 5 of 'Buying an EMF safe property'. To see if there is a mast near you try the [Location Maps](#) article. Finding out whether you are exposed or not from a nearby mast is not always easy to work out, as [this article](#) tells you.

Music Centre

These can give off high magnetic fields, but the problem is usually high electric fields. Make sure the system has a decent electrical earth connection to the mains supply. This will remove most electric fields.

Nightlights

These should not be used unless absolutely necessary, because the pineal gland best produces melatonin, the body's natural anti-cancer hormone, in the dark. If necessary, have a low-wattage bulb, in a unit well away from the bed, keeping the wires away. Blue light affects melatonin production more than red light so if you feel a light is necessary, buy one that gives off light towards the red end of the spectrum. See the article 'Your low EMF home 3. Lighting'.

Pagers / beepers

GSM SMS based pagers apparently answer the person leaving a message and confirm that it has been received and sometimes even read. Of course the pagers will regularly log on to their nearest base station and confirm that they are at that location - so they would best be kept in a bag or case or at least a loose jacket pocket as they would be similar to a GSM phone on standby. Even a pocket may expose vulnerable tissue, such as breasts to RF.

PDA's (Personal Digital Assistants)

PDA's are small handheld computers used for a wide variety of applications. PDA's have many methods of communication with other equipment (PCs, other PDA's, etc), including Cable (usually USB), Bluetooth and WiFi. Some even double as mobile phones.

In a study by Sage (2007) high levels of ELF MFs were measured from a PDA. The authors found that ELF-EMF emissions of 10 μ T were recorded during normal office use over a 24 h test period. *"Email transmit and receive functions produce rapid, short-duration ELF-EMF spikes in the 2-10 microT range, each lasting several seconds to over a minute apparently depending on file download size. Some units produced spikes as high as 30-60 microT during email activities. Cell phone activity on PDA's produced continuously elevated ELF-EMF readings in the 0.5-1 microT range, as opposed to the rapid spiking pattern for email receipt and transmission. Switching the PDA unit from "OFF" to "ON" position resulted in single ELF-EMF pulses of over 90 microT on two units. Email downloads into the PDA can occur randomly throughout the day and night when the unit is "ON"; thus the user who wears the PDA may be receiving high-intensity ELF-EMF pulses throughout the day and night."*

We recommend using those with USB cables, because this is not wireless. Many PDA's come with both wireless capabilities and USB, but you can usually disable the wireless connectivity (which we also recommend; see the manufacturer's Instruction Manual for details / instructions). The power usage of PDA's is very low, so we do not see any problem with electromagnetic fields caused by the device's basic operation.

Pencil sharpeners

Electric ones have motors giving off high EMFs. They are not usually a hazard being used occasionally for short periods.

Personal alarms, as used in warden-controlled accommodation

As far as we know all battery-operated personal alarms are safe.

TeleAlarms, which according to the Swisscom marketing documents emits at 869 MHz has a reach of 50 metres. It gives off RF radiation which can be detected by the [Acoustimeter](#). The hand/body unit emits continuous levels of very high radiation, both average and peak. The

Swisscom documents confirm that the wrist/body unit is continuously active, the body unit being more active than the base unit. It could well flatten batteries very quickly.

Personal radios and stereos

These do not pose an EMF problem when run on batteries. Headphones attached by a lead to radios and stereos are fine as long as the equipment itself is earthed. If it is unearthed the headphones will give off high electric fields.

Remote cordless headphone systems have a microwave transmitter attached to the base unit. The receiver is in the headset worn by the person listening. Headsets are safe, but the transmitter gives off high fields. Sit a reasonable distance away from the transmitting unit.

Pet containment 'fences'

Pet containment fences act as an aerial with a weak signal that is picked up by the pet's collar. The systems use an EMF generated by an alternating current flowing in the long wire loop(s) that is sensed by the receiver on the pet's collar which then emits various sounds that the animal is trained to respond to.

These systems are probably fine as long as the wire loop is kept away from the house and places that you spend lots of time on your boundaries. The feed from the transmitter box should, ideally, be in screened cable out to your perimeter when it turns into a single wire that is run round your property boundary. Done in that way, there are not likely to be any problems even for EMF sensitive people.

Photocopiers

These can give off very high magnetic fields close to the motors. Stand back at least 50 cm. Photocopiers emit ozone, which is affected by the surrounding electric fields. Ensure good ventilation. Toner powder is toxic when inhaled and is attracted to static electricity.

Plasma balls

Plasma balls use high voltage to create ionised light discharges, emitting the highest electrical fields found in our home environment. The recommended guideline levels for the general public are exceeded at distances closer than a metre. The contact currents in the hand may be twice the level recommended by the guidelines (Alanko [2011](#)).

Power tools

All electric power tools give off EMFs; those with motors close to your body (e.g. electric drills and hedgecutters) will expose you to high magnetic and electric fields while they are in use. The motors of some tools are further away from your body when in use and so the fields your body is exposed to are lower.

Printers

Laser printers give off ozone, which is affected by the surrounding electric fields. Ensure good ventilation. Toner powder is toxic when inhaled and is attracted to static electricity.

Inkjet and squirtjet printers are more economical and ecological.

Projectors

Film and slide projectors have motors which give off magnetic fields which fall away within half a metre. They are unlikely to be a problem, but keep your distance to avoid cumulative exposure.

Radar

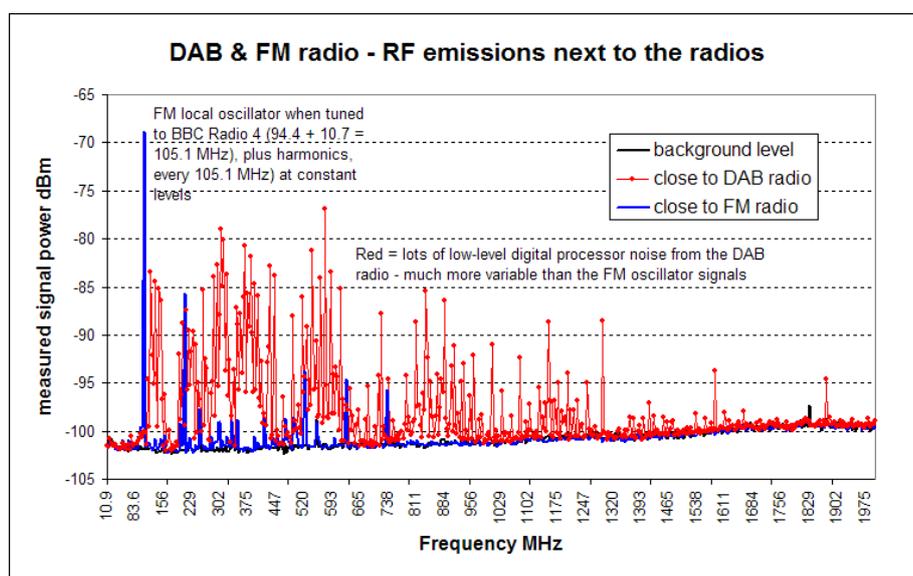
There are a number of radar installations at airports, seaports or river ports. Workers' occupational exposure to radar has been associated with ill-health symptoms and we believe that people with sensitised immune systems may well also have health problems in the vicinity of these installations. Most radars are swept through 360 degrees over several seconds, resulting in short bursts of radiation as the beam passes by where you are. The resulting 'pulse rates' are typically in the range 3 to 10 seconds. Radar sources typically operate at 2.6 GHz for weather radars and 8-10 GHz for airport radars.

Radar gives off very high pulsed fields. These can extend to several miles away in the case of long distance military radar such as at Fylingdales in Yorkshire. Microwave radar levels can also be concerningly high within about half a mile of commercial airports.

Radios

Radios, by their nature, are not transmitting devices, merely receivers. However, mains operated radios give off EMFs from the cables when connected to the mains. Keep the radio at least a metre away when listening and unplug it or switch it off at the wall after use. Battery operated radios are fine.

We have been contacted by people concerned about emissions from Digital Audio Broadcasting (DAB) radios. We have measured one radio using new DAB technology, and compared it with an analogue FM radio of the type that has been used for many decades. We placed them, one at a time, into an EMF shielded container, and measured frequencies emitted from them over a wide frequency (0 Hz to 2.0 GHz) a very short distance away (5 cm).



As can be clearly seen on the graph, the DAB radio emits far more noise over a wide range, although the FM radio peaks at a higher level.

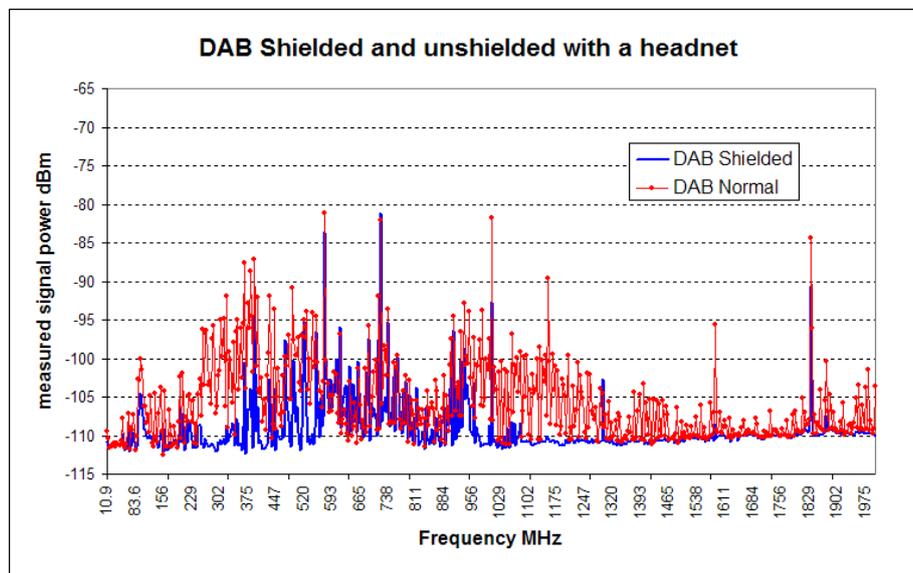
The reason for this is because of the more complex nature of the electronics in the DAB radio. The digital microchips cause a lot more to be emitted, while the simpler nature of the FM radio's electronics means that it has generally lower levels.

The reason for the FM radio's big spike is that it has an oscillator to focus it upon the incoming signal. This will move around as you tune to different stations.

While the differences in emissions are considerable relative to one another, the actual levels given off are very low, and not unusual from a modern electronic device. The low levels recorded here were at very close proximity, and in normal use you would not be exposed to levels this high, unless you held the radio to your head.

Potentially, the DAB radio could affect somebody who is EHS more because of the larger quantity of noise, but it could also potentially affect them less due to a lower peak signal. For non-EHS people, there is no reason to regard a DAB radio any differently to other modern electronic devices.

We also tested the reduction in emissions when we shielded the device (excluding the aerial) with a [headnet](#) made of screening material. These are available from EMFields.



As can be seen, the levels from the device are significantly reduced, but still present.

The scale is logarithmic, so lowering the signal by 3 dBm roughly halves its power, and lowering by 10 dBm reduces the power by a factor of 10; 20 dBm by a factor of 100, etc.

The remaining signals will be travelling up the aerial, which cannot be shielded for the device to continue to function properly. Also worth noting is how different the basic measurement is in comparison to the first graph; the signal strengths/frequencies vary significantly, depending upon where you measure the device.

Radio transmitters

Radiofrequency and microwave signals will increase over the next few years with the replacement of analogue transmissions with digital ones.

Stanislav Szmigielski (1996) monitored the Polish military personnel for over 15 years and found that those occupationally exposed to RF and microwave radiation were 14 times more likely to

develop chronic leukaemia in their old age, 9 times more likely to develop acute leukaemia and 6 times more likely to develop Non-Hodgkin's Lymphoma (NHL). NHL incidence is rising steadily in Western countries for no known reason. The estimated average exposure levels of the people in Szmigielski's study were only about 5 microwatts per square centimetre, a level which can be found near powerful cellular phone base-stations and main TV and radio transmitter masts.

A major investigation was undertaken in the UK following a report by a Birmingham GP that there were high numbers of cancers close to the Sutton Coldfield transmitting mast. The cancer rates in the areas around eleven different masts were looked at, and the only one with significantly more cancers than usual was the one at Sutton Coldfield. The reason for this is still unknown, but it may well have been a combination of microwave radiation and possible cancer-causing chemicals in the air. The researchers concluded that living near TV transmitting masts could not generally be considered an increased cancer risk.

Sandwich maker

Sandwich makers are used only briefly. Switch off at the wall immediately when finished. For many models this is the only option to being fully on, as they do not have an off switch on the machine.

Satellite dishes and receivers

See [Televisions and TV and radio transmitters](#) for further details.

Sauna

Fields measured within a working sauna, where a person would be sitting have been measured by one person as 17 V/m electric fields, and 0.03 – 0.04 microtesla magnetic fields. Despite having been told that saunas generate high EMFs, these readings do not seem to bear it out.

Far infrared saunas heat the person directly rather than the room. They will give off more EMFs than an ordinary sauna and these field levels are likely to be very different depending on the way the heating units are wired. It is cheaper to arrange the wiring in a way that gives off high fields. The only way to know for sure what you are being exposed to, is to measure the fields. One person measured between 1,000 and 1,500 V/m and 0.5 – 1 μ T.

A far infrared sauna blanket, sold for detoxifying the body, bought by one person registered 300 volts/metre electric fields when it was plugged in.

Scanner

Most give off negligible fields, although some have separate mains transformers, which give off high magnetic fields.

Security Systems

Most intruder sensors should not cause EMF hazards outside your home. You should know how to switch off **microwave** sensors when you are in the garden or in other areas the sensors cover. If you do not know, contact the installer and find out how this can be done as most systems leave the sensors active even when the system is not armed.