

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 2

Appliances A-C; air conditioners to coffee maker

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, parental guidelines, 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, fridge, fridge/freezer, 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 & 92 references

Some of the appliances listed below produce powerfrequency EMFs and some radiofrequency or microwave EMFs (RF). If you are concerned about the electromagnetic fields given off by the appliances in your home, you may want to buy a Pocket Powerfrequency Meter (PPF5) or buy an Acoustimeter or an EMFields Acousticom 2, to measure radiofrequency fields <http://www.emfields-solutions.com/detectors/overview.asp>.

Everyday use of electronic media devices is associated with insomnia complaints in adolescents (Lange [2017](#)).

Air Conditioners

Large air conditioning units are likely to be externally mounted, with pumps and motors giving off high levels of magnetic fields. They should be 1.5 metres from anything important. If you have double glazing without windows that open (in many places of work), your air-conditioning system may become clogged with dirt and pollutants, which then re-circulate, increasing the spread of airborne micro-organisms and bacteria, making you more vulnerable to sickness. It is important to keep the system clean and well maintained.

More people are using smaller portable systems, fans, within their homes. These will give off quite high levels of magnetic fields. You may want to measure these, if small children spend a lot of time on the floor next to these fans in the hot summer weather.

Amateur (Ham) radio transmitters

These can emit high levels of radiofrequency and microwave radiation and should not be in the house. Most of the radiation is associated with the aerials and can extend for a considerable distance, including affecting neighbours. Amateur UHF Moon-Bounce transmitters use a highly focused aerial array with extremely high power in the main beam. These arrays should be kept away from children's play areas and neighbouring houses.

Amplifiers, electric guitars and keyboards

The 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.

Aquarium

The pumps that oxygenate most aquariums give off very high magnetic fields, between 0.3 and 0.4 microtesla at half a metre. Keep chairs about a metre away from the pumps. Aquarium heaters are not normally earthed and can leak electricity into the water causing the whole tank to give off surprisingly high electric fields. It is not known what effect this may have on the plants, fishes, etc. in the tank. You may want to measure both electric and magnetic fields from an aquarium.

Baby monitors

Alarms plugged into the mains should be at least 1 metre away from the baby's bedhead. Battery-operated, wire connected, alarms give off virtually zero fields. The walk-about 'freedom' alarms can radiate radio-frequency energy next to the child in order to communicate with the parents' listening unit and should be used with great caution. Sensor pads give off high levels of microwaves.

Digital sensor pads transmit significant levels of microwaves into the baby's body when placed under the mattress as suggested (one person measured 4 volts per metre in the cot). They exchanged it for an analogue type and the child began to sleep better, after having been very fractious during the night. We recommend that you use these pads only with great caution and only if no alternative is available.

Apparently there are now microchip-equipped dummies on the market that tell your phone when your baby has a fever.

Digital Cordless Baby Monitors

Over the past five years we, with the help of parents, have measured a variety of baby monitors and the DECT pulsing ones seem to be far more disruptive of the infant's sleep and state of contentment (causing restlessness, irritability and crying). Wired ones and the plug-in ones (that use the electricity wiring to communicate between units) do not seem to cause the same problems. The older type of analogue ones, that are still available from a number of brands, seem ok if kept at least one metre from the cot / bed.

We have had various reports by parents that their babies did not sleep well and cried a lot when they used DECT monitors but were ok when no baby monitor was used. When they tried a cheaper analogue monitor, the infant then slept as well as they did with no monitor.

All wireless baby monitors should be kept at least 1 metre away from the cot. We would strongly recommend that only low-band (35 to 50 MHz) analogue baby monitors are used. These use analogue frequency modulation (FM, like VHF radio stations) that does not pulse at all. The analogue ones are often identifiable by their low number of channels (typically 2-4).

You can hire or purchase suitable equipment, the [Acoustimeter](#) or [Acousticom 2](#) from EMFields www.emfields-solutions.com, to check out the microwave environment from all sources that may surround your baby.

Most baby monitors are now advertised as using DECT phone technology which runs at 1890 MHz or 2400 MHz, which is 1.89 GHz or 2.4 GHz. 2.4 GHz is the microwave oven frequency. These are identifiable by the large number of claimed channels (usually at least 30 and often up to 120), which DECT automatically switches between. These emit sharply pulsing bursts of microwave radiation 100 times a second all the time they are turned on.

With 'talk back' digital baby monitors, where parents can talk back to the baby, both units continuously emit pulsing radiation (on 2 different frequency channels - one for each way), not just when the baby is making a noise or the parent is talking to them.

The baby monitor mats that check temperature, heartbeat, breathing, etc., should only be used if you have medical reasons to believe that your baby might be in danger of sudden infant death. When used with a wireless baby alarm they carry high levels of microwave radiation (up to 6 volts per metre) right into the cot and we believe that will not do your baby any good at all.

We do not recommend the use of wireless video baby monitors that allow you to see your baby on your TV or a portable TV monitor. They run at 2.4 GHz - the microwave oven frequency.

Since this has to transmit video and sound, it is likely that it would have a higher power output. The manufacturers note that these cannot be used in conjunction with computer wireless networks due to interference. If you really need that level of baby watching, then have a proper wired closed-circuit TV (CCTV) system installed - do not put a TV wireless transmitter in your child's bedroom and irradiate them unnecessarily.

It is important to bear in mind when lighting your baby's room that there is increasingly strong evidence that light-at-night is bad for everybody, especially babies and children. Special cells in the back of the eye detect the light, even when you/they are asleep and it stops the pineal gland producing melatonin. Melatonin is a special chemical that protects the body against damage by "free radicals" that could otherwise cause cancer or other serious developmental damage.

If you, or your child, need some light at night then it should be very dim and red or orange in colour. The plug-top orange-glow-plugs are ideal. They provide enough light to see around the room when you wake up, or once your eyes have become adjusted to the dim conditions, and they do not stop melatonin from being produced.

Please note that your baby/infant in a room with a wireless baby monitor will usually be exposed to stronger signals than $1000 \mu\text{W}/\text{m}^2 = 0.6 \text{ V}/\text{m}$ average, which has been identified in some European studies as increasing the number in people reporting a variety of adverse symptoms. Note that many of the symptoms listed have debilitating and neurological effects that go along with "microwave sickness syndrome" that was first reported in the West by Charlotte Silverman in 1979. More information, including details of scientific papers regarding the effects of RF/microwave exposure, is available in our article in 7 sections, Radiofrequency EMFs and Health Risks in the EMFields library.

Bath Hoists

The motors give off high magnetic fields when in operation. Occasional exposure is unlikely to cause a problem. People operating a bath hoist on a regular basis, e.g. a care assistant in a day centre or residential home, will be exposed to high fields over a much longer period of time, and for women, there may be increased risk of breast cancer if the motor is at chest height. Your employer should enable you to be aware of safe procedures when operating such hoists.

Battery operated equipment

Batteries do not give off high EMFs, though we do not recommend having them close to vulnerable areas of your body. They are not energy-efficient: manufacturing them uses 50 times more energy than they will ever produce. They usually contain mercury, cadmium, lithium and other toxic, non-biodegradable metals that can affect water supplies from land-fill. Re-chargeable batteries should be used and then recycled if possible. It is better to consider your overall use of power-driven appliances, than just replace mains operated equipment with battery ones. Sweden, Finland & Denmark want to prohibit the use of cadmium in batteries, as workplace exposure to cadmium damages the lungs and can be fatal. Even if it is successfully banned, cadmium will still occur in waste for at least 10 years. Long term low level exposure to cadmium residues in air, water and food can cause kidney disease, lung damage and brittle bones. Improvements in battery technology now allow up to 75% of battery cadmium to be substituted.

Battery re-charging mats

Charging plates that can be embedded in walls, counter tops, or furniture are becoming available to re-charge, or power any item placed upon them. The system allows devices with very different voltages to be charged at the same time. Some use RFID tags to identify what is being laid down

to charge. They are likely to vary as to the power- and radio-frequency levels that they will emit into the nearby environment.

Beds

Metal

Springs usually end up magnetised in the manufacturing process. Beds with metal frames and bedsprings can become magnetised due to domestic wiring and electrical appliances in the bedroom. This means that the person lying on the bed is effectively lying on lots of magnets which can produce large field gradients over short distances – like very bad geomagnetic/geopathic stress. There is increasing concern about this. Metal (steel or iron) bed frames can also do this but to a smaller extent as the metal is further away from your body than the springs you lie on. On the mattress, the fields' distortions can be several times larger than the earth's magnetic field (which is about 50 microtesla static field in the UK).

Some mattresses contain individually coiled springs. These can resonate at RF/microwave frequencies and produce 'pools' of increased RF all over the bed.

Bedframes can be de-gaussed, but places capable of doing this are scarce. If concerned, find an alternative bed-base and unsprung mattress, preferably made with natural materials.

Motor-adjustable reclining

They can give off high electric and ENORMOUS magnetic fields, several microtesla (μT), even when still. We have measured up to $20\mu\text{T}$ under a bed, and $0.88\mu\text{T}$ on top of a bed. You need to weigh up the advantages of using this type of bed against the potential damaging effect to a probably already compromised immune system. It is quite easy to design such a bed with almost unmeasurable EMFs other than when actually using the motors to make the mechanical adjustments. If you have one of these beds then we suggest that you measure both the electric and magnetic fields. If they are high, the only easy thing to do is to turn off the power supply at the wall when you are comfortable.

Water beds

These can give high magnetic fields from the water heaters and we suggest that you measure them. Waterbeds should ideally be warmed during the day, and unplugged before going to bed. A thick mattress pad or quilt will help you to stay warm on an unheated water bed.

Bedhead and bedside lights

See our article in the EMFields library, called 'Your low EMF home Section 3. Lighting'.

Blood Glucose Monitor

Self-monitoring of blood glucose can be a beneficial part of diabetes control, so home blood glucose testing kits are very popular. However Mortazavi ([2014](#)) found that electromagnetic interference from mobile phones has an adverse effect on the accuracy of home blood glucose monitors. The authors suggest that mobile phones should be used at least 50 cm away from home blood glucose monitors.

Bottle warmer

Electric bottle warmers for baby bottles give off low levels of EMFs. Some only have a two-wire connection and so give off electric fields. Only use this type when necessary, but not for everyday use.

Bra

Some bras have metal wire to provide the uplift desired by the wearer. This metal can act as an 'antenna' re-radiating EMFs, including microwave radiation from mobile phones, into the body (West [2013](#)). Breast tissue is particularly susceptible to damage by microwaves.

Burglar Alarm

Main control units

These often contain cheap transformers which give off quite high magnetic fields. Typical magnetic field at 50 cm. is around 0.16 microtesla, so ideally keep chairs, etc., at least 1 metre away.

They often have 'double insulated' or otherwise 'isolated' sensing circuit wires which are not referenced to 'earth' and which can therefore give off quite high levels of electric fields. If this is the case then all the wiring to the sensors and alarms will also be giving off high electric fields. If you do measure high fields coming from them you need to consult the manufacturer / supplier of the system and ask them to "reference the secondary circuits to earth". In some systems this only consists of connecting one of the wires to earth inside the alarm box, however some advanced 'tamper proof' sensing circuits will sound the alarm if this is done and then expert advice from the supplier is needed.

Burglar Alarm sensors

Most burglar alarms use simple switch or resistive sensors on doors and windows and passive infra-red sensors for rooms and corridors. These sense the heat given off by a moving body and their sensitivity can usually be adjusted so that cats and dogs do not set them off. Light-beam sensors are rarely used nowadays. None of these sensors give off significant EMFs.

Active microwave sensors are increasingly being used in both domestic and commercial buildings. These usually emit low level microwaves all the time and so we do not recommend their use. If you already have them in your system then you should contact your supplier and discover how to turn off the microwave transmitters in the sensors when you are moving about in the building and garden area and the alarm is not required as they are otherwise often energised 24 hours a day, even when the alarm is apparently turned off.

One person who needed to replace their broken security alarm system was told that it would be impossible to retrofit a wired system.

Camcorder

The motor generates high fields, but is well shielded, so the person doing the filming is ok.

Carbon Monoxide detectors

The most common type are powered by a 9 volt battery and do not give off any EMFs; however they do use a very low level radioactive source and should only be installed on ceilings and disposed of carefully if you renew them.

CD player

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.

Central heating

Central heating **boilers** do not generally give off any EMFs apart from a short burst when the electronic ignition fires if the boiler doesn't have a pilot light which burns continuously. However, most plumbers now fit wireless thermostats to control boilers, as it is cheaper, there are no wires, and no electrician is necessary. This will increase RF exposure.

Central heating **pumps** give off high fields close by - over 20 microtesla - which typically fall to around 0.5 microtesla at 50 cm. We recommend that chairs and beds are located over a metre away from these pumps.

If your central Heating **Timer** is electromechanical and rotates then it will give off a magnetic field at 50 cm of about 0.13 microtesla.

Hot air central heating systems have a fan which will usually be situated near the heat-source (whatever the type of fuel is). The electric motor to the fan will give off significant levels of EMFs nearby.

Some **hot water radiators** and pipes that are part of central heating systems give off EMFs. This occurs when the metal pipes are carrying '**net**' currents causing high magnetic fields of several microtesla. These 'net' currents are due to wiring faults which can be either inside or outside your property. External causes of 'net' currents are discussed in [Buying an 'EMF safe' Property - Section 3, Substations and transformers.](#)

Underfloor heating

See the article in 8 sections, called 'Your low EMF home' Section 6. Underfloor heating.

Chair, motor-adjustable reclining (see also beds p.5)

Some **motor-adjustable reclining chairs** give off ENORMOUS magnetic fields, several microtesla (μT) all the time. They can also have unexpectedly large electric fields. It is just bad design. A chair with almost unmeasureable EMFs, other than when actually using the motors to make the mechanical adjustments, is quite easy to design. If you have a motor-adjustable reclining chair then we suggest that you measure both the electric and magnetic fields. If they are high, switch off the supply at the wall or unplug it once you are comfortable.

Clock radio

Electrically powered clocks and clock-radios should be at least 1 metre from your head at night. Older clocks had a cheap and magnetically leaky transformer and the very early ones even had an a.c. motor to turn the numbers – that was when they got the reputation in the EMF literature for giving off very high EMFs.

Nowadays they emit much lower levels of EMFs, but most mains ones are two-wire and not earthed so they do give off significant electric fields within about half a metre or so. The LCD ones with extra information on a dot matrix screen give off more RF noise than ones with simple large digits.

Battery (only) driven clocks produce negligible fields, but LED ones flatten the batteries quite quickly.

Digital (DAB) clock radios give off low levels of RF noise. This is a very different quality of exposure, and whether you are affected will depend on your sensitivity to RF radiation. So although RF levels are at a very low level, we recommend a DAB radio is situated at least 6-8 feet away from the pillow, twice the distance of a non-DAB radio.

Clothes Dryer

Separate clothes dryers which have an ailer unit attached to a floor-based heater give off quite a high magnetic field, between 0.3 and 0.4 μ T at half a metre away.

Coffee grinder

The motor will give off high EMFs of up to 0.3 μ T at half a metre, which drop away quite rapidly. Short periods of use should be no problem. If pregnant, it will be worth limiting time standing near these electric appliances at work-top height whilst they are in use.

Coffee maker

The heater will give off high EMFs which drop away quite rapidly. Short periods of use should be no problem. If pregnant, it will be worth limiting time near electric appliances giving off these levels of fields at work-top height.