In your home

The In your home set of articles article is separated into 9 sections, each of which can be individually downloaded. It is a 'work in progress' incorporating new information whenever time permits.

Section 6
Appliances D-H; dehumidifiers to hearing aids

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, cognitive effects, sleep effects, broadband, computer games consoles, tablets, computers and Electrical Hypersensitivity (EHS), protection devices against EMFs from computers
4. Internet addiction; behaviour changes; cognitive changes; disruption of circadian clock; eating disorders; EEG; gambling; headache and migraine, life satisfaction; limiting use; links to depression and suicide; parental effects; purpose in life
5. Cooking; electric ovens and hobs, microwave cooking, barbecues, deep fat fryers
6. 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
7. 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
8. 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

9. Grounding & 172 references

Dehumidifier

They work like a 'back-to-front' refrigerator. They cool the air from the room, forcing the water vapour in the air to condense out on the cooling coils and collect in a water container placed underneath. They have electric motors, with a magnetic field of 0.3μT at 50 cm. Chairs and beds should be at least 1.2 metres away. The water reservoir inside needs to be regularly cleaned and disinfected, as these reservoirs are particularly prone to contamination by bacteria, fungi and moulds. These can produce runny noses, breathing problems and headaches.

One dehumidifier that was measured broadcast RF radiation every 5 or 6 seconds, to a remote screen to let the user know how full the water bucket is, so they will know when to empty it. Even when the dehumidifier is turned off it still broadcasts at the same rate. It has to be unplugged to stop it.

Dimmer switches

See 'Your low EMF Home 3. Lighting'

Dishwashers

Heating the water and drying the dishes is energy-intensive, generating high field levels when the machine is operating. Small children should keep at least one metre away while the dishwasher is working. The only way to be sure where the fields have fallen to a 'safe' level is to measure them, using a meter such as the EMFields pocket PF5 meter. Use a timer so you can use night-time off-peak electricity, keeping EMF exposure to a minimum.

Doorbell

If this is battery operated then it will not give any EMF problems. If run from mains electricity then they often have a cheaply constructed transformer which gives off high fields within about half a meter or so of it.

Wireless doorbells only give off a small pulse when the button is pushed. It is not an RF problem.

Electric Blankets

Underblankets and **overblankets** give off high magnetic fields that penetrate about 6 or 7 inches into the body. Some "low-magnetic field" models have been introduced, and some using DC electricity. Although these models reduce or eliminate magnetic fields, the blanket may still produce electric fields. The hot plastic coated wires release chemical fumes, which are themselves toxic.

Electric blankets commonly cause cramp. The rate of miscarriage has been found to be higher in women who use electric blankets (Belanger 1998). Pregnant women using blankets increase the risk of the child they carry developing childhood cancer (Hatch 1998). It seems that the most critical exposure time for pregnant women might be the first trimester. More children develop

cancer whose mothers used electric blankets during the first three months of pregnancy, compared with when they used an electric blanket later on in pregnancy.

Two studies showed up to a five-fold increase in leukaemia for children that had themselves used electric blankets (Hatch 1998, Dockerty 1998).

The long-term use of electric blankets (20 years or more) has been linked by Abel (2007) with an increased risk of endometrial cancer. There was a slight increase in risk for women who had used electric blankets at all in comparison to women who had never used them.

Premenopausal and postmenopausal women who used an electric blanket, were found to have an increased risk of developing both oestrogen positive and oestrogen-negative breast tumours (K Zhu 2003), O'Leary 2004, Zhu 2004). The risk increased with increasing number of years of use and for keeping the blanket on most of the time, instead of using it to warm the bed only.

p53 mutations may be connected to environmental carcinogens, including breast carcinogens. Users of electric blankets, water beds, or mattresses were more likely to have p53 changes than non-users (Gammon 1999).

Associations with non-specific physical symptoms were observed for use of an electric blanket and close distance to an electric charger during sleep (Baliatsas 2015).

All blankets should be switched off before getting into bed. Unless you have 3-core screened cable attached to the blanket, it should be switched off at the wall. Electric overblankets which are left turned on overnight are usually run from a low voltage transformer. The transformer and blanket give off even higher magnetic fields than underblankets. Do not use such a blanket if you are concerned about EMFs.

One person offers his experience of using a dual control electric blanket: "*If my wife and I lay on the bed with either one, or both, sides of the blanket switched on (even if we were well insulated from the blanket by the duvet, etc) and touched each other, we received quite an electric shock, sufficient to cause us to jump. This can be repeated continually whenever a blanket is switched on and is not just a static charge. I also have brass light switches above the bed, which are earthed, and if I lie on the bed with the blanket on and run the back of my finger over a light switch, I can feel and* ***hear*** *a 50 Hz discharge between my finger and the light switch – this can be felt at any time when the blanket is on, proving that my body is charged via induction from the electric blanket.*"

Electric can opener

These give off high EMFs of over a microtesla (1.3μT), at half a metre.

Electric clock

These tend to be placed quite high on the wall, likely to be more than half a metre away. Battery-powered clocks do not give off high fields.

Electric drill

Electric drills will expose you to high magnetic and electric field exposure while in use. There is nothing you can do about this and short term occasional exposure should not cause any EMF related problems.

Electric guitar

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.

Electric kettle

Both the older style kettles and the more modern jug-type ones create high EMFs when in use. Keep the kettle at a reasonable distance when heating. Heating water using electricity can change its molecular structure. Electrically sensitive people can react badly to this change, so to neutralise this effect, stand the mug, cup or glass on a strong magnet while you pour the water into it.

Electric knife

The motor gives off fields of just over 0.1μT. Reducing the number of electric gadgets you use reduces your cumulative exposure to EMFs.

Electric lawn mowers

Electric lawn mowers give off EMFs. Short term occasional exposure should not cause any EMF related problems. The motors of some lawn mowers are further away from your body when in use and so the fields your body is exposed to are lower.

Electric shavers

An electric razor plugged into the mains produces an extremely high AC magnetic field, as high as 20 - 40 microtesla (μT) a centimetre away from the cutting edge as well as electric fields of many hundreds of volts per metre. We don't know if this is worse (or better) than exposure to a 0.2 - 0.3μT field (the level linked to increased risk of childhood cancer). Meningioma (a type of brain tumour) has been associated with electric shaver use (Kleinerman 2005). If exposure to such high fields is a problem, the duration of the exposure might lessen the effects. Short-term exposure to harmful influences can produce dramatically different results to longer exposure. If this is true of EMF, (which is not as yet known), since an electric razor is used only a few minutes each day, it may be safe. The data on short-term exposure to high-strength fields is incomplete, and the use of non-electric razors will eliminate all EMF risks. The fields, close to the brain, could influence production of melatonin, if the razor is used in the evening. Use re-chargeable battery shavers. These still give off mixed frequency pulsed magnetic fields, but are likely to be safer.

Electric shower

The powerful water-heater element gives off several microtesla 30 cm away. Do not stand too close to the control unit, especially in the evening, due to the pineal gland effect.

Some areas in the UK have high radon levels. This radioactive gas, formed by the decay of uranium, can enter your water supply. It is then dispersed and inhaled in the form of hot steam from the shower or bath. EMFields sells easy to use radon meters if you want to check your radon levels, especially if there is a smoker in the family. Radon exposure is the second most frequent cause of lung cancer after smoking.

Electric toothbrush

The charger unit is unlikely to be kept, when being used, in a place which will give EMF problems. Battery-powered toothbrushes give off mixed frequency pulsed magnetic fields, the same as battery shavers.

Electric toothbrushes generated low-frequency magnetic fields (MFs) and induced electric currents in orthodontic appliances, which accelerated corrosion in stainless steel (SUS) appliances (Kameda 2013). It was felt that this may trigger metal allergies in patients.

Electric vehicles

Cars

Electric vehicles can produce VERY high magnetic fields from the large battery currents and the electric motor. Starting and stopping currents produce very high magnetic field pulses. This may become an increasing problem with car companies and customers seeking more environmentally friendly vehicles and looking at all electric, or dual fuel cars.

Many electric cars use VLF switching to control the motor's speed and power. We believe that magnetic fields in electric cars should be measured and published as a matter of priority.

The Nissan LEAF electric car has its features controlled by a smartphone. Air conditioning and cockpit temperature can be programmed; you can check the battery levels and set the vehicle to send a message to say it has full power if you left it charging. The navigation system provides an up to date list of public charging spots. The car has a 100-mile range and a top speed of 90 mph (Daily Mail 2010). The Nissan Leaf, in common with other electric vehicles, has limitations of battery efficiency in extremes of temperature. Both high and low temperatures reduce the range of travel, and greenhouse gas emissions can vary up to 22% due to temperature variation (Yuksel & Michalek 2015).

Wireless charging of electric vehicles has been introduced into Coventry and Birmingham. The charging starts automatically when the electric car is driven over a pad containing an induction coil which charges the coil in a pad in the body of the car.

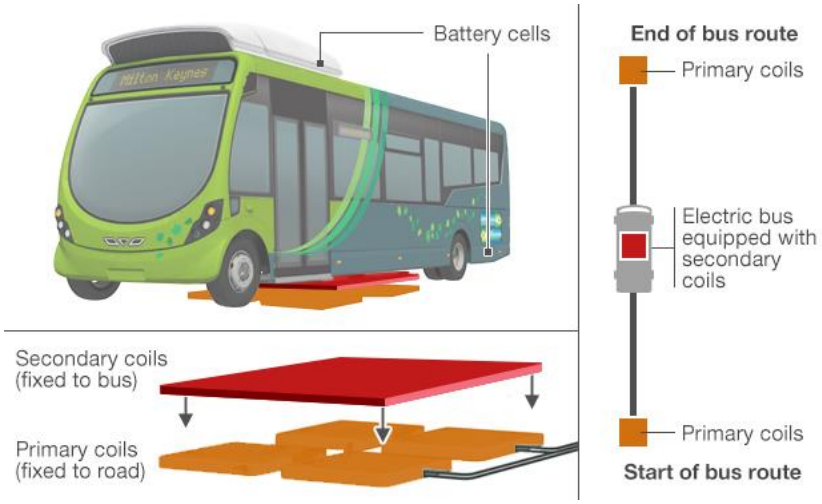
Controlled electric vehicle charging can reduce associated generation costs by 23%-34% in part only by shifting loads to lower-cost, higher-emitting coal plants. This shift results in increased costs of health and environmental damages from increased air pollution. We find that controlled charging of electric vehicles produces negative net social benefits but could have positive net social benefits in a future grid with fewer coal-fired power stations and more electricity generated by wind turbines (Weis 2015).

Hybrid cars

Many hybrid cars can give off high levels of magnetic fields. In 2007, the Prius had no fields over 0.08 microtesla (μT), and then only during hard acceleration or battery charging. Hybrid cars tend to have more pulses in the kHz range due to the switching between gas and electric operation. The Israeli government cancelled an order of 200 hybrid Toyotas for their police after measuring high levels of electromagnetic radiation from the batteries and electronic systems (August 2010). The Israeli government said that any more than 4 hours a day in the car would constitute a health risk. Toyota took legal steps to stop the Israeli government from releasing the radiation measurements. In the US purchasers of the Prius with solar roof cells are reporting headaches and nausea. The Prius is sensitising some drivers to EMFs, resulting in a more generalised ES.

Hareuveny (2015) looked at magnetic field exposure in hybrid cars. On all four seats under various driving scenarios the fields were between 0.06-0.09 µT. Hybrid cars had an especially large percentage of measurements above 0.2 µT. These field levels were higher for moving conditions compared to standing while idling or revving at 2500 RPM and higher still at 80 km/h compared to 40 km/h. Fields in hybrid cars were higher on the back seats, particularly the back right seat where 16%-69% of measurements were greater than 0.2 µT. As our results do not include low frequency fields (below 30 Hz) that might be generated by tyre rotation, we suggest that net currents flowing through the cars' metallic chassis may be a possible source of magnetic fields.

Electric bus



The magnetic fields in the bus whilst it was charging were measured and the highest level was 0.3 µT (Tell 2014).

Fork-lift trucks

Men who drive electric fork-lift trucks as a job seem to be at greater risk of testicular and other cancers, especially where the batteries are under the driver's seat and the driver's lower trunk is quite highly exposed for hours on end - especially to starting transients. Women drivers may also be at greater risk of developing colon and gynaecological cancers.

Electric bikes

E-bikes in China are the single largest adoption of alternative fuel vehicles in history, with more than 100 million e-bikes purchased in the decade previous to 2011. In 34 major cities in China, CO_2 emissions were measured (Ji 2011) and though they vary, they are an order of magnitude greater for e-cars and conventional vehicles than for e-bikes. For most cities, the net result is that primary environmental health impacts per passenger-km are greater for e-cars than for petrol cars (3.6 x on average), lower than for diesel cars (2.5 x on average) and equal to diesel buses. E-bikes yield lower environmental health impacts per passenger-km than the three conventional vehicles investigated. The authors highlighted the importance of considering exposures, and especially the proximity of emissions to people, when evaluating environmental health impacts for electric vehicles.

Electricity meter

The meter, time switches, 'consumer units' or fuse boxes, and the bulk of their associated cables give off quite high levels of electric and magnetic fields. If your meter is outside the house, the house wall will give protection from high electric fields, but not magnetic fields. If the meter is high up on the inside wall, the fields can radiate upwards, as well as sideways and downward. It is worth remembering that walls and floors do ***not*** shield magnetic field levels.

If the meter cupboard is in the hallway with a room on the other side of the wall, the magnetic fields in that room will be high close to where the meter is located. Chairs which elderly or disabled people sit in for long periods of time - (longer than about an hour sitting without moving away), should be at least 1.5 metres away from the meter position on the other side of the wall.

If your meter is on the other side of a bedroom wall, as can be the case in bungalows and flats, bedheads should be sited at least 1.5 metres away from the meter position. This is especially true of anyone who is suffering from an acute or chronic immune-system deficiency. The bed of a young leukaemia victim was located immediately the other side of the wall from the meter, which resulted in his sleeping in quite high levels of magnetic fields through the night. If the meter is high up on the wall, close to the ceiling, and there is a bedroom directly above it, it is a good idea not to place the head of a bed there.

All-electronic meters give off lower levels of magnetic fields than the older, 'spinning disc' electro-mechanical meters. If your electricity supplier wants to change your meter, you may want to ask which system they will be replacing it with, as some suppliers are installing 'smart' meters which can give off microwaves. These latest design meters are intended to be remotely read without entering the house and, in some cases, to be able to adjust the charge rates for what they call 'demand-side' management purposes. See the EMFields library article 'Your low EMF Home Section 4. Smart Meters'.

Radio teleswitches are a type of electricity meter control switch used for measuring off-peak consumption and those made after 1992 do not emit anything significant at all.

In flats or apartment or tenement blocks there is always a 'mains services riser' where electricity, gas, drains, etc., travel up the building. Areas near the riser can have significantly elevated magnetic fields which get larger towards the ground floor of the building.

Electricity consumer unit or fusebox

Magnetic fields are produced by the layout of the cables and the currents they are supplying. Chairs and beds should be at least a metre away. There is no advantage in using circuit breakers over simple wire fuses, however it is good practice to use circuit breakers or cartridge fuses on all new or upgraded installations as they operate more reliably. Mechanical time-switches contain a small motor. Half a metre is enough distance for these.

It is a good idea to have the light next to the consumer unit on a circuit that supplies little else (maybe a couple of other corridor lights) so that if a trip goes, you still have some light to see what you are doing.

Exercise machines

These are generally not a problem. Motors (such as those used to power treadmills etc.) give off high magnetic fields close to.

Extractor fan

Motors generate high EMFs, up to 0.5μT at 50 cm. If it is at head-height, reduce time spent nearer than one metre when it is on, especially when it is dark, when the fields could inhibit melatonin production.

Fan

Desk fans contain an electric motor which gives off quite high magnetic fields. Some only have a two-wire lead and are not 'earthed,' so they also give off high electric fields. **Ceiling fans** contain an electric motor which will give off quite high magnetic fields resulting in a magnetic 'hotspot', extending outwards and upwards (depending on the strength of the motor) into the room above. Young children can play for long periods of time on the floor, so it is worth bearing this in mind, depending on whose bedroom may be above the fan. Check accommodation on holiday in hot weather. The room below will be fine.

Fax machines

They give off high magnetic fields from internal transformers. If they have only two-wire mains leads, they can give off high electric fields at the keyboard.

Fire Alarm

There are many types of these. 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.

Central fire alarm systems often have both temperature detectors and infra-red detectors built in. These are quite safe and do not give off EMFs.

Fitness devices

The Fitbit device, worn on the wrist to give feedback about GPS, continuous heart rate, all-day activity stats and sleep has been found to give off levels of RF similar to those of a mobile phone on standby, measuring over 6 V/m continuously. Many people with skin sensitivities have developed a severe rash after wearing it, and if the product is held near sensitive parts of the body, including breasts, testicles, heart, unborn children, etc. it could be exposing them to levels of RF that have been found to be associated with health, neurological, cardiovascular, cognitive and behavioural impairments.

From an EMFields customer "*I've had the ACOM2 a few years now, and it's been indispensable for me. I was given a FitBit Surge to monitor steps, and immediately turned off Bluetooth in the settings, thinking that was sufficient. It turns out that there aretwo BT radios in it, and one of them can't be turned off. I would have never known about that until I was testing something else with the ACOM2 and it was giving off high level pulses from it. The FitBit has since been given away*!"

Floor polisher

Floor polishers have motors which give off high fields. Keep your feet at least half a metre away when they are in use.

Food processor

The motor will give off EMFs of up to 0.2μT at 50 cm. The fields drop away quite rapidly and short periods of use should be no problem. If pregnant, it will be worth limiting time using electric appliances giving off this level of fields at work top height.

Foot spa

Foot spas have a motorised pump and usually an electric heater - and will generate EMFs. Feet seem relatively insensitive to EMFs so there are unlikely to be any problems unless they are used frequently.

Foot & hand warmer

Foot and hand warmers which are used for outdoor pursuits, including motorbiking, use DC electricity to provide the heat. They are unlikely to have any adverse effects unless used for prolonged periods. Mains electricity powered units may give off both electric and magnetic fields at significant levels. Use 12 volt DC powered ones intended for motor-bike use and run them from a battery charger positioned at least one metre away from the wearer.

Freezer

To reduce EMF exposure and improve energy efficiency, site a chest freezer in an unheated garage. Defrost regularly for greater energy efficiency. EMFs are unlikely to be a problem.

Fridge

Keep away from the cooker to avoid the motor having to work too hard to keep the inside temperature down. A well-stocked fridge uses less power than a poorly-stocked one, since more energy is needed to cool empty space. Keep the freezer compartment of your fridge clear of ice. The motor is likely to be at the base at the back of the fridge.

Fridge / Freezer

An upright freezer is not as energy efficient as a chest freezer. The motors give off reasonably low levels of EMFs. Keep away from the cooker to avoid overworking the motor. Regularly defrost the freezer for greater energy efficiency.

Hair curlers / tongs

The units heating the curlers will give off significant EMF levels. When the curlers are removed for use, switch the heating unit off at the wall. If you might want to re-heat the curlers, sit away from the heating unit whilst it is still working.

Curling tongs are a self-contained, heated unit giving off quite high fields, depending on the heat setting. The metal construction will distort the magnetic field, which can increase the effects. We do not recommend their use, especially after 7.00 p.m. High magnetic fields near the head in the evening are known to interfere with the production of melatonin by the pineal gland.

Hair Dryers

These are a source of extremely high AC magnetic fields because they require high currents to produce heat. A 1600-watt model will produce 10 - 20μT near the handle, and 1 - 5μT at normal drying distances (15 to 45 cm). When it is operated on its "high heat" setting, it will draw more current and generate a higher magnetic field than when it is operated on its "low heat" setting. Metal hair clips, retaining the hair in the curlers, can 'perturb' or distort the magnetic field. The fact that a hairdryer is only used for a few minutes each time, is not as significant as the fact that the user is exposed to very high fields indeed while it ***is*** working. Hairdressers who use a hand-held hair dryer repeatedly each workday may want to bear this in mind, especially if pregnant, being careful of the position in which they hold the hairdryer, and therefore, the position of the motor, with respect to the body. Holding the hairdryer at chest level (depending on Salon equipment design and arrangement, and the height of the hairdresser), may be problematical if the person has a family tendency to develop breast cancer. In a study carried out in 1998, the use of hair dryers was associated with increased risk of leukaemia in children (Hatch 1998), and glioma (a type of brain tumour) in adults (Kleinerman 2005).

High magnetic fields near the head in the evening are known to interfere with the production of melatonin by the pineal gland. We recommend that hair dryers are not used after 7.00 p.m. at the very latest because of this pineal gland effect. It is best to wash your hair in the morning and allow it to dry naturally.

Hood hairdryers give off a very high field; the higher the heat setting, the higher the field level. Sitting under the hood regularly may have an adverse effect. You should certainly not do so after 7.00 p.m. Any metal securing curlers, or metal parts of curler construction etc. will increase the harmful effect.

Wall mounted hairdryers which supply the hot air through a vacuum cleaner type tube are by far the best from the EMF point of view.

Headphones

Headphones attached by a lead to the musical equipment 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.

Hearing aids

The power used by hearing aids is very small, we do not know of any EMF problems associated with their use.

Induction Loops amplify sound for the hard of hearing in their own home for watching TV, or in public places, like theatres, meeting rooms, etc. Sound is amplified and transmitted using a large loop of wire wound around the room or building. This sound cannot be heard directly but is

picked up by a special loop and receiver worn by the person who is hard of hearing, and fed to a hearing aid. This can result in very high fields close to the wires. This induction loop system causes quite high levels of EMFs but as they change continually with the broadcast sound, there is no evidence of any harm. In fact, one American researcher found that such varying signals can actually reduce danger from the background EMFs found in buildings, by effectively neutralising them to some extent. This is a bit like the effect that playing real audio hiss or low level background music in a restaurant has on decreasing people's hearing sensitivity.

Magnetic fields from an induction loop pad designed for hearing aid assistance were measured by Hansson Mild (2017). The field was high, up to 70% of international guidelines. However, in view of the many reports indicating health effects of low-level exposure we recommend that the precautionary principle is applied when such pads are given to people that might be especially vulnerable. This is relevant for children, pregnant women and women on breast cancer medication.

These next two systems are primarily used in people's homes rather than in public places.

Infra-red systems work by transmitting the sound signal using an infra-red beam, from the television or hi-fi to a head set worn by the person who is hard of hearing. This use of infra-red light uses very low power and is free of any electromagnetic hazard.

Microwave systems have a microwave transmitter attached to the television set or hi-fi. The receiver is in the headset worn by the person listening. The headsets are safe, but the transmitter gives off high fields. You should sit a reasonable distance away from the transmitter unit.