

## 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 8

## Grounding & references

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 &amp; 92 references

**Grounding****The grounding of electrical appliances with two-wire mains leads**

Many electrical appliances now come with two-wire mains leads or adapters and are often described as being double-insulated. This is done for a variety of reasons, including protecting against electric shock. It is cheaper to cover metal objects in plastic than it is to ensure good electrical earthing of exposed metal parts. Also, if you are holding a plastic object it doesn't provide an electrical return path to earth in the most unlikely event of your also happening to touch a 240v live electrical conductor, so you will not get a severe electrical shock.

The downside is that the 'workings' of all these appliances tend to 'float' to half the electrical supply voltage (i.e. to about 120 volts) and this causes them to radiate very high electric fields (often several hundreds of volts per metre nearby).

**The worst offenders that we have found are televisions, electronic organs, some Hi-Fi units, laptop computers when run off their mains adapter / charger units, and battery chargers.**

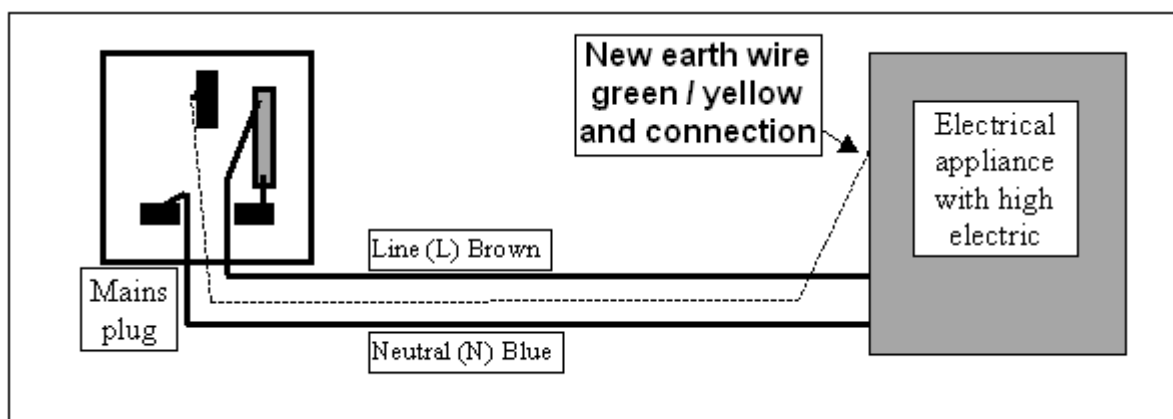
Most of these can be cured of giving off high electric fields by taking an 'earthing' wire from their mains plug to an exposed screw or piece of metal on the appliance.

In the case of an organ, or Hi-Fi unit, the braid screen of one of the audio cables is normally suitable as this is connected to the '0 volt' rail inside the unit.

In the case of a television, the braid (or outside of the co-ax connector) of the aerial lead usually makes a suitable connection point. As the television and DVD player are usually connected together it is not necessary to earth both units.

In the case of a laptop computer, any metal connector shell on the back of the computer will do. It is often convenient to use a 'crocodile' clip on the earth lead so that it is easy to attach and detach when you need to move the computer. If you have an internet connection through a dLAN (through the house wiring, rather than a telephone or wireless system), it is important to earth the laptop even if you run it off batteries, as it will pick up and re-radiate electric fields from the house wiring through the dLAN connection. We have measured 400 V/m at the keyboard of one model.

It is also possible for a qualified electronics engineer to modify the mains charger unit so that it has a three-wire mains lead and the internal 'zero volt' power supply line is connected to the electrical mains safety earth.



Fields from transformers and motors etc., fall off approximately with the cube of the distance, i.e. the field at twice the distance should be about one eighth of the value. There is little you can do to reduce these other than use low-field designs (e.g. torroidal transformers) or increase the distance between you and the source. Steel magnetic screening can be used at the equipment but is rarely economic to do this other than at the time of the manufacture of the appliance.

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