



## Electro-Magnetic Fields (EMFs) in the Home

( Updated May 2010 )

### A brief overview

It is widely accepted that environmental pollution in buildings can have a significant impact on occupant's health. One of the more controversial pollutants, however, are electromagnetic fields, resulting from our use of electricity. A significant body of evidence now indicates that some people may be sensitive to being adversely affected by EMFs at levels that can be encountered in their environment. However, where these levels are encountered, action can usually be taken to adequately reduce exposures as outlined in this pamphlet.

### Are there adequate exposure standards for EMFs?

Currently the recommended EMF limits in Australia are meant to only protect against immediate adverse health effects, such as induced body currents (shocks) at extremely high levels of exposure. They are not intended to provide protection against cancer and other possible health effects from prolonged environmental exposures. For power frequency magnetic fields these limits are 1,000 milliGauss (mG) for home and 5,000 mG for workplaces. They are based on the limits set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and are designed to provide protection from immediate adverse health hazards. The Australian standard is currently under review.

### What levels are of possible concern?

Compared to the high levels set by ICNIRP a clear scientific consensus has emerged after some 30 years of research

that prolonged exposure to a level of 4 mG doubles the risk of childhood leukaemia. For children with this disease, studies have also shown that recovery was significantly lessened if they were living in homes with EMF levels of over 2 mG. The U.K. Advisory Group on Non-Ionizing Radiation (AGNIR) called a 4 mG level a "relatively heavy" average exposure that is "associated with a doubling of the risk of leukaemia in children under 15 years of age".

In August of 1995 a draft report by the U.S. National Council on Radiation Protection and Measurements (NCRP) recommended a 2 mG exposure limit based on their review of all the available evidence. They concluded that the evidence suggested EMF exposure could block normal biological processes with significant implications for human health.

A Tasmanian study by Ray Lowenthal et al investigated adult leukaemia in relation to residence proximity to high voltage transmission lines. This study found a link between the disease and proximity to transmission lines for individuals who had spent their childhood within 300 metres of a transmission line.

On 18th March 2002, a Queensland judge made a ruling that magnetic fields from a proposed substation next to a residential area, should not exceed a 4 mG level. The judge stated that: "Research now available accepts that a possible risk to the surrounding community may exist".

A major 2007 review of the evidence (the Bioinitiative Report) concluded that research on women in the workplace strongly suggested that powerline EMFs were a risk factor for breast cancer with long-term exposures of 10 mG and higher. This is supported by laboratory studies on human breast cancer cells that have shown that ELF

exposure between 6 mG and 12 mG can interfere with the ability of both the hormone melatonin and cancer drugs to control the growth of cancer cells.

A 1998 Australian study examined the EMF exposures amongst a group of 49 patients suffering chronic fatigue syndrome. The investigators found that reducing EMF exposures at home resulted in a significant improvement in health in the majority of subjects who were found to have EMF exposures averaging 7.1 mG. (See Table 1 for sources of exposure for these 11 people).

Number of Subjects	Source of Exposure
1	Electrical currents on domestic water pipes
1	Electrical currents on domestic water pipes and street power-line
4	Bed-head in close proximity to electrical meter box
2	Sleeping with an energised electric blanket
1	Water-bed heater
1	Water-bed heater and phone-charger by the bed-head
1	Chair placed adjacent to wall with high EMFs from appliance

Table 1: Sources of exposure for a sample of 11 people found to have high exposures at home

Symptoms reported from prolonged EMF exposure: **Anaemia, fluctuating hormone levels, chronic tiredness, insomnia, problems with concentration, facial rashes, listlessness, light headiness, headaches and increased susceptibility to viral infections.**

Considering this body of evidence, it makes sense to ensure that EMF levels in Homes and offices are kept below a 2 - 4 mG level as a precautionary measure.

### Actions to reduce EMF exposure

- 1) **Is proximity to external powerlines the main issue?** Research looking at the incidence of cancer and proximity to powerlines have found that, in many cases, the main sources of EMF exposure were from sources within the home and not external sources such as powerlines. Therefore the absence of nearby powerlines does not necessarily mean an absence of possible risk. The good news here, however, is that sources within the home can usually be easily eliminated or reduced.
- 2) **How do I determine if I have a problem at home or at work?** Sustainable Living Tasmania has an EMF meter and survey instructions for hire that will enable you to do your own survey to determine if this is an issue. If elevated fields are found we can advise you on remedial action. It is important to note that it is **prolonged** EMF exposures that are of concern, not brief exposures, such as using a hair dryer for example. Possible sources of elevated and prolonged EMF fields are as follows:
- 3) **Electrical currents on metal water piping (a common fault).** Research over the past few years has found that high EMF levels in buildings can be generated by the flow of electrical currents on copper and steel water pipe (it has nothing to do with the water). This is because the water pipes are bonded (electrically connected) to the neutral side of the electrical supply in the meter box for electrical safety. Also, up to the 1970s, it was common practice to use the water pipes as an earth stake, a practice now illegal. This means that if your water service uses metal piping it can act

as part of the electrical circuit as it provides an alternative return path back to the street transformer. In simple terms, it is not uncommon for an electrical current to flow from the neutral line, bypassing the normal neutral side of the electrical supply circuit, into the conductive metal water pipe if this route offers the path of least resistance back to the supply transformer. When this happens the electrical circuit is unbalanced thus leading to elevated EMF levels. Fortunately, if you find this an issue in your building, it is easily eliminated by a two step process:

- Have an electrician check to see if you have a proper earth stake installed, if not, have it done.
- Then have a plumber install a short length of poly-plastic water pipe between the water supply tap for the building, and the building itself. This is normally in the front yard of the property. This eliminates that alternative electrical return path thereby forcing the electrical current to return to the street supply transformer via the proper neutral side on the electrical circuit.

**4) In-floor electrical heating.** This type of home heating, where energized electrical wiring is embedded in a concrete floor is of concern, especially if small children who can spend many hours a day crawling on the floor are present. In April 1998, measurements taken of a floor heating unit in a home in Hobart found levels in the order of 100 mG on the floor and 12 mG on the seats of chairs in the living room. The resident reported a worsening of her chronic fatigue syndrome illness when the unit was energized. Measurements by a building consultant in Sydney found one system that was emitting up to 800 mG on the floor and 90 mg at

lap level. Emitted levels very much depend upon how balanced the loads are in the building. If there are electrical currents on the water pipes (see above) EMF's emitted by the heating system may be significantly increased. When shopping around for a floor heating system note that a number of manufacturers now specifically mention the reduction or elimination of EMF levels in their floor heating systems. If this type of heating is going to be used it is advisable to have it so that individual rooms can be individually turned on to heat the area then turned off when occupied, especially by children. A safer alternative, however, would be heating by hot water piping embedded in the floor slab with the water heater placed in an area where no one would be spending time near.

**5) Location of the electrical meter box.** An unfortunate building practice in the past, and still sometimes seen, is the placement of the building's electrical meter box (and distribution boxes) on a wall in close proximity (less than two metres) to where people could be spending many hours daily. This can be an Occupational Health and Safety (OH&S) issue in the workplace but a special concern is when this is found in bedrooms when the bed-head is placed against the meter box located on the opposite side of the wall. As for the prevalence of this situation, an Australian study that examined the home exposures of a group 49 subjects (See **Table 1**) found that 11 had excessive exposure levels (Av. exposure level of 7.1 mG). Of this number the single largest source of exposure (4 individuals) was the bed-head placed up against the meter box on the outside wall (the second main source was electrical currents on water pipes). A simple solution is to maintain at least a two metres distance between the bedhead and

meter/distribution boxes.

- 6) **Beware of what is placed by the bedhead.** Another common source of excessive EMF levels can be appliances, such as clock-radios, phone chargers and analogue cordless phones placed on a night stand by the bedhead, or plugged into an electrical socket behind the bed. At least a one metre distance is recommended for these appliances from the bedhead. An exception to this are the new DECT\* cordless phones and baby monitors. These devices utilize a base station that continuously emits pulsing microwaves at a maximum level. Health effects are being reported from this equipment when the base station is placed by the bedhead. For these devices maintain at least a two metre distance from the bedhead and preferably not at all in the bedroom.
- 7) **Household appliances.** Generally, with the exception of the microwave oven, at a distance of one metre from the appliance no discernable fields are present. As mentioned previously, it is prolonged exposure that is of concern so using washing machines, dryers, etc is not an issue. For microwave ovens the magnetron also emits power frequency EMFs as well as microwaves and at least a two meter distance is required for prolonged use, such as might sometimes occur, especially in take away and fast food shops.
- 8) **Electric blanket use.** Electric blankets are perfectly safe for warming the bed but should be turned off before sleeping. This is because when energized the emitted EMF levels can vary (depending on model) between 8 mG ( lowest setting) to 21 mG (highest setting).

## References

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**Bioinitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields**, Vols 1 – 3, August 2007 <http://www.bioinitiative.org/>

**Medical warnings needed on DECT cordless phone use**, The Australasian College of Nutritional & Environmental Medicine, April 2006. [http://www.emfacts.com/papers/mobile\\_use.pdf](http://www.emfacts.com/papers/mobile_use.pdf)

**EMFacts Consultancy**  
<http://www.emfacts.com>

\* DECT stands for Digital Enhanced Cordless Telecommunications

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