



Health  
Canada

Santé  
Canada

Your health and  
safety... our priority.

Votre santé et votre  
sécurité... notre priorité.

Electric and Magnetic Fields

Updated: November 2012

Original: November 2001

# IT'S YOUR HEALTH

## Electric and Magnetic Fields from Power Lines and Electrical Appliances

### THE ISSUE

Some people are concerned that daily exposure to electric and magnetic fields (EMFs) may cause health problems.



### ELECTRICITY AND ELECTRIC AND MAGNETIC FIELDS (EMFS)

Electricity delivered through power lines is important in today's society. It is used to light homes, prepare food, run computers and operate other household appliances, such as TVs and radios. In Canada, appliances that plug into a wall socket use electric power that flows back and forth at a frequency of 60 cycles per second (60 hertz). The frequency used with the distribution of electricity from power lines and electrical appliances is different than the frequencies used for [Wi-Fi](#), [cell phones](#), and [smart meters](#).

Every time you use electricity and electrical appliances, you are exposed to electric and magnetic fields (EMFs) at extremely low frequencies (ELFs). The term "extremely low" is described as any frequency below 300 hertz. EMFs produced by the transmission and use of electricity belong to this category.

EMFs are invisible forces that surround electrical equipment, power cords, and wires that carry electricity, including outdoor power lines.

- *Electric Fields:* These are formed whenever a wire is plugged into an outlet, even when the appliance is not turned on. The higher the voltage, the stronger the electric field.
- *Magnetic Fields:* These are formed when electric current is flowing within a device or wire. The greater the current, the stronger the magnetic field.

EMFs can occur separately or together. For example, when you plug the power cord for a lamp into a wall socket, it creates an electric field along the cord. When you turn the lamp on, the flow of current through the cord creates a magnetic field. Meanwhile, the electric field is still present.

Canada

## POWER LINES AND YOUR HOME

EMFs are strongest when close to their source. As you move away from the source, the strength of the fields fades rapidly. This means you are exposed to stronger EMFs when standing close to a source (e.g., right beside a transformer box or under a high voltage power line), and you are exposed to weaker fields as you move away.

When you are inside your home, the magnetic fields from high voltage power lines and transformer boxes are often weaker than those from household electrical appliances.

Electric fields can be shielded using materials such as metal. Things like buildings and trees—and even the ground when power lines are buried—can block electric fields.

## CANADIANS EXPOSURE TO EMFS AT EXTREMELY LOW FREQUENCIES (ELFS)

On a daily basis, most Canadians are exposed to EMFs generated by household wiring, lighting, and any electrical appliance that plugs into the wall, including hair dryers, vacuum cleaners and toasters. In the workplace, common sources of EMFs include computers, air purifiers, photocopiers, fax machines, fluorescent lights, electric heaters, and electric tools in machine shops, such as drills, power saws, lathes and welding machines.

## EXPOSURE IN CANADIAN HOMES, SCHOOLS AND OFFICES PRESENT NO KNOWN HEALTH RISKS

There have been many studies on the possible health effects from exposure to EMFs at ELFs. While it is known that EMFs can cause weak electric currents to flow through the human body, the



intensity of these currents is too low to cause any known health effects. Some studies have suggested a possible link between exposure to ELF magnetic fields and certain types of childhood cancer, but at present this association is not established.

The [International Agency for Research on Cancer \(IARC\)](#) has classified ELF magnetic fields as “possibly carcinogenic to humans”. The IARC classification of ELF magnetic fields reflects the fact that some limited evidence exists that ELF magnetic fields might be a risk factor for childhood leukemia. However, the vast majority of scientific research to date does not support a link between ELF magnetic field exposure and human cancers. At present, the evidence of a possible link between ELF magnetic field exposure and cancer risk is far from conclusive and more research is needed to clarify this “possible” link.

Health Canada is in agreement with both the World Health Organization and IARC that additional research in this area is warranted.

## REDUCE YOUR RISK

Health Canada does not consider that any precautionary measures are needed regarding daily exposures to EMFs at ELFs. There is no conclusive evidence of any harm caused by exposures at levels found in Canadian homes and schools, including those

located just outside the boundaries of power line corridors.

## THE GOVERNMENT OF CANADA'S ROLE

Health Canada, along with the World Health Organization, monitors scientific research on EMFs and human health as part of its mission to help Canadians maintain and improve their health.

International exposure guidelines for exposure to EMFs at ELFs have been established by the [International Commission on Non-Ionizing Radiation Protection \(ICNIRP\)](#). These guidelines are not based on a consideration of risks related to cancer. Rather, the point of the guidelines is to make sure that exposures to EMFs do not cause electric currents or fields in the body that are stronger than the ones produced naturally by the brain, nerves and heart. EMF exposures in Canadian homes, schools and offices are far below these guidelines.

## FOR MORE INFORMATION

- Health Canada’s [Electric and magnetic fields](#) at: [www.hc-sc.gc.ca/ewh-semt/radiation/cons/electri-magnet/index-eng.php](http://www.hc-sc.gc.ca/ewh-semt/radiation/cons/electri-magnet/index-eng.php)
- The World Health Organization – Electromagnetic fields and public health:
  - [Exposure to extremely low frequency fields](#) at: [www.who.int/mediacentre/factsheets/fs322/en/index.html](http://www.who.int/mediacentre/factsheets/fs322/en/index.html)
  - [Extremely low frequency](#) at: [www.who.int/docstore/peh-mf/publications/facts\\_press/efact/efs205.html](http://www.who.int/docstore/peh-mf/publications/facts_press/efact/efs205.html)
  - [Extremely low frequency fields and cancer](#) at: [www.who.int/docstore/peh-emf/publications/facts\\_press/efact/efs263.html](http://www.who.int/docstore/peh-emf/publications/facts_press/efact/efs263.html)



Health  
Canada

Santé  
Canada

Your health and  
safety... our priority.

Votre santé et votre  
sécurité... notre priorité.

Electric and Magnetic Fields

Updated: November 2012

Original: November 2001

# IT'S YOUR HEALTH



## FOR INDUSTRY AND PROFESSIONALS

- The International Agency for Research on Cancer (IARC) *Volume 80 – Non-ionizing Radiation, Part 1: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields* at: <http://monographs.iarc.fr/ENG/Monographs/vol80/volume80.pdf>
- IARC Carcinogen classifications at: <http://monographs.iarc.fr/ENG/Classification/index.php>

## RELATED RESOURCES

- Health Canada, *It's Your Health*:
  - Safety of Wi-Fi Equipment at: [www.hc-sc.gc.ca/hl-vs/iyh-vsv/prod/wifi-eng.php](http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/prod/wifi-eng.php)
  - Safety of Cell Phones and Cell Phone Towers at: [www.hc-sc.gc.ca/hl-vs/iyh-vsv/prod/cell-eng.php](http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/prod/cell-eng.php)
- For safety information about food, health and consumer products, visit the [Healthy Canadians](http://www.healthycanadians.gc.ca) website at: [www.healthycanadians.gc.ca](http://www.healthycanadians.gc.ca)
- For more articles on health and safety issues go to the *It's Your Health* web section at: [www.health.gc.ca/iyh](http://www.health.gc.ca/iyh)

You can also call toll free at  
1-866-225-0709 or TTY at  
1-800-267-1245\*

Updated: November 2012  
Original: November 2001

© Her Majesty the Queen in Right of Canada,  
represented by the Minister of Health, 2012

Catalogue: H13-7/70-2012E-PDF  
ISBN: 978-1-100-21395-8

Canada