



Electric and Magnetic Fields (EMF) Facts

What are Electric and Magnetic Fields (EMF)?

EMF are naturally present in the environment and are present wherever electricity is used. The earth has both a magnetic field produced by currents in the molten core of the planet and an electric field produced by electrical activity in the atmosphere, such as thunderstorms. The flow of electricity along transmission lines also produces low levels of EMF.

What is the difference between Electric and Magnetic Fields?

Electric fields are produced by voltage, which is the pressure behind the flow of electricity. Voltage creates electric fields around any electrical device that is plugged in even if it is not operating. Magnetic Fields are produced by current, which is the flow of electrons when the device is operating. Electric fields are measured in volts per meter (V/m). Magnetic fields are measured in milligauss (mG) or microTeslas (uT).

What are typical exposure levels to Electric and Magnetic Fields?

Everyone is constantly exposed to about 500 mG from the earth's magnetic field and 100 V/m from the earth's electric field. However, thunderstorms can temporarily increase the electric field in a given location to several thousand V/m. In addition to the earth's natural fields, according to the Electric Power Research Institute (EPRI) the average household background magnetic field is between 0.5 and 4 mG with an average of 0.9 mG, and the average electric field is 1 to 20 V/m.

What are some of the things in my home and at work that produce EMF?

Anything that generates, distributes, or uses electricity creates electric and magnetic fields. Below is a list of some appliances and machines commonly found in homes or offices and the magnetic fields they produce.

	Magnetic field 6 inches from appliance (mG)	Magnetic field 2 feet away (mG)
Electric shaver	100	—
Vacuum cleaner	300	10
Electric oven	9	—
Dishwasher	20	4
Microwave oven	200	10
Hair dryer	300	—
Computers	14	2
Fluorescent lights	40	2
Fax machines	6	—
Copy machines	90	7
Garbage disposals	80	2

Source: Western Area Power Administration. *Electric and Magnetic Fields: The Facts.*

What are typical EMF levels near overhead transmission lines?

The electric power associated with overhead transmission lines is typically a 60-Hertz (Hz) alternating current which is classified as an 'extremely low frequency'. This 'power frequency' produces low levels of EMF. Both the electric and magnetic fields that constitute EMF are strongest directly under the lines and decrease rapidly with distance from the line. Actual field strengths vary with the size of the lines and height of the conductors from the point of measurement. Electric fields from power lines are relatively stable because the voltage does not change. Magnetic fields fluctuate as current changes in response to the changing loads. Tables in the listed reference material show typical values calculated for overhead power lines.

What EMF health research has been done?

Research related to possible adverse health effects from EMF exposure has been in progress for more than 30 years. In 1992, The U.S. Congress directed the National Institute of Environmental Health Sciences (NIEHS) to direct the EMF Research and Public Information Dissemination Program (EMF-RAPID). The EMF-RAPID Program goal was to provide evidence to clarify potential health risks from EMF exposure. To date, the bulk of scientific evidence does not link extremely low frequency or power frequency EMF exposure to health hazards.

Are there state and federal standards for EMF exposure?

There are no standards established for safe levels of exposure to EMF. Some organizations have set advisory limits as a precautionary measure. The International Commission on Non-Ionizing Radiation Protection has established a continuous magnetic field exposure limit of 833 mG and a continuous electric field exposure limit of 4,200 V/m for members of the general public. The American Council of Governmental Industrial Hygienists has set a Threshold Limit Value for occupational exposure to 60 Hz (60 cycles per second) magnetic fields as 10,000 mG and 25,000 V/m for electric fields.

Where can I find more information about EMF health research?

- ▶ The National Institute of Environmental Health Services (NIEHS), *EMF: Electric and Magnetic Fields Associated with the Use of Electric Power, Questions and Answers*.
<http://www.niehs.nih.gov/health/topics/agents/emf/>
- ▶ California Department of Health Services-California EMF Program
<http://www.ehib.org/emf/general.html>
- ▶ World Health Organization
<http://www.who.int/emf>
- ▶ Western Area Power Administration, *Electric and Magnetic Fields Facts*,
<http://www.wapa.gov/newsroom/pdf/emfbook.pdf>