

WHAT ARE ELECTRIC AND MAGNETIC FIELDS?

Electromagnetism is one of the fundamental forces of nature. Electric and magnetic fields (EMFs) are invisible forces generated by electric voltage and the flow of electricity.

Where do EMFs come from?

EMFs result from both natural and human-made sources. In nature, for example, electric fields are produced by the buildup of electric charges in the atmosphere associated with thunderstorms. In addition, the Earth's magnetic field causes a compass needle to orient in a north-south direction and is used by birds and fish for navigation.

In our communities, EMFs are produced by any device or wire that generates, transmits, or uses electricity. Human-made sources of EMFs include electric utility lines, TV and radio signals, cellular phones and towers, electric wiring in homes and businesses, and electrical appliances and equipment.

What characteristics define EMFs?

Two key characteristics of EMFs are frequency and field strength.

What is frequency?

Frequency is expressed as the number of cycles per second, or Hertz (Hz). In the U.S., the frequency of the power system – and therefore the EMFs associated with it – is nearly always 60 Hertz. You may be more familiar with kilohertz (1,000 Hz) used for AM radio stations, megahertz (1,000,000 Hz) used for FM radio stations, or gigahertz (1,000,000,000 Hz) used for cell phones.

Electric and magnetic fields at 60 Hz diminish quickly as distance from the source grows, as the table with common examples shows.

What determines field strength of EMFs?

While commonly grouped together, this is one topic where electric fields and magnetic fields need to be addressed individually.

Electric field strength at a given point is governed primarily by the electric potential (i.e., voltage) of the source and the distance from the source. Generally, a higher voltage source will create a greater electric field, while being farther from the source will reduce field strength.

Similarly, magnetic field strength at a given point is governed primarily by the electrical current (i.e., amperage) of the source and the distance from the source. Generally, more current will create a greater magnetic field, while being farther from the source will reduce field strength.

Median Magnetic Field Strength, milligauss (mG)			
Appliance/Device	Distance from Source		
	6 inches	1 foot	2 feet
Electric Range	30	8	2
Copy Machine	90	20	7
Electric Shaver	100	20	--
Electric Drill	150	30	4
Power Saw	200	40	5
Hair Dryer	300	1	--
Vacuum Cleaner	300	60	10
Electric Can Opener	600	150	20

Credit: National Institute of Environmental Health Sciences, 2002

Does higher voltage or more current mean greater field strength?

Neither necessarily means greater field strength. Through careful optimization of transmission line design – elements like wire spacing, height, and structure configuration – today's engineers are able to minimize field strength. In fact, while it may seem counterintuitive at first, field strength at the edge of a right of way can be reduced by adding a line within a corridor. This is possible when the design allows the EMFs of the new line to interact with the EMFs of the existing line(s) in such a way that the fields partially cancel each other.

Are there regulations for EMFs?

New York is one of a few states in the U.S. that provides electric and magnetic field limit guidelines for new electric transmission lines. The suggested maximum field values are as follows, measured at the edge of the transmission right of way:

- Electric fields: 1.6 kV/m
- Magnetic fields: 200 mG

At a distance of 200 feet or more from the proposed transmission lines, the electric and magnetic fields will have diminished to background levels. Magnetic field levels from some typical household appliances, such as hair dryers and vacuum cleaners, can produce higher magnetic field levels in the home than a typical electric transmission line.

Are EMFs from power lines harmful to health?

Over the last 40 plus years, a great deal of scientific research has been conducted worldwide to study potential health effects of EMFs. The accumulated research results have been reviewed and evaluated by a number of national and international scientific organizations. These organizations have consistently concluded that the body of existing evidence does not show that EMFs from electric transmission lines pose a danger to human health.

Where can I go for more information about EMFs?

Information about EMFs and human health is available from national and international scientific and health agencies and organizations. These agencies have reviewed and summarized the large amount of scientific research that has been conducted on EMFs. For more information, visit:

- U.S National Institute of Environmental Health Sciences

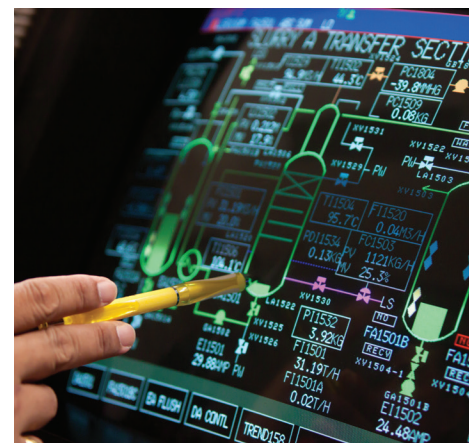
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