

Electromagnetic Radiation and Computers

Computers and electronic devices are an integral part of our work and personal lives. As a result, users are exposed to electromagnetic radiation emitted by these machines. Should we be concerned?

What is electromagnetic radiation?

Electromagnetic fields (EMFs) are invisible lines of force that occur whenever electricity is being conducted. These forces occur from both natural sources such as the sun or atmospheric and solar disturbances, and from man-made sources including electric lighting, microwaves, televisions, cell phones and computers. Computer monitors generally emit an extremely low frequency field, called ELF.

There are two types of electromagnetic fields, ionizing and non-ionizing radiation. Ionizing radiation has enough energy to remove electrons from atoms or molecules (groups of atoms) when it passes through or collides with some material. The loss of an electron with its negative charge causes the atom (or molecule) to become positively charged. The loss (or gain) of an electron is called ionization and a charged atom or ion is called an ion.

Forms of ionizing radiation include:

- Gamma rays
- X rays
- Alpha particles
- Beta particles
- Neutrons.

X rays refer to a kind of electromagnetic radiation generated when a strong electron beam bombards metal inside a glass tube. The frequency of this radiation is very high - 0.3 to 30 Ehz (exahertz or million gigahertz). By comparison, FM radio stations transmit at frequencies around 100 MHz (megahertz) or 0.1 Ghz (gigahertz).

Non-ionizing radiation is described as a series of energy waves composed of oscillating electric and magnetic fields traveling at the speed of light. Non-ionizing radiation includes the spectrum of ultraviolet (UV), visible light, infrared (IR), microwave (MW), radio frequency (RF), and extremely low frequency (ELF). Non-ionizing radiation is found in a wide range of occupational settings and can pose a health risk to exposed workers if not properly controlled.

Extremely low frequency (ELF) fields include alternating current (AC) fields and other electromagnetic, non-ionizing radiation ranging from 1 Hz to 300 Hz. ELF fields at 60 Hz are produced by power lines, electrical wiring, and electrical equipment including computers. Some epidemiological studies have suggested increased cancer risk associated with estimates of magnetic field exposure near electric power lines.

Computers emit non-ionizing radiation. Multiple studies have been completed by the Food and Drug Administration (FDA), Center for Radiological Health and Devices, Bell Laboratories, and The National Institute of Occupational Safety and Health. The data from their work indicates that computer VDTs "...emit little or no harmful ionizing (e.g., x-rays) or non-ionizing (e.g., infrared) radiation under normal operating conditions." (See <http://www.cdc.gov/niosh/pdfs/99-135.pdf>).

What are the effects of electromagnetic fields?

High level exposure to ELF magnetic fields has the potential to do the following:

- Affect the growth of developing tissue
- Contribute to miscarriage or birth defects
- Promote the growth of cancer cells
- Interfere with the cell processes and functions
- Alter neurological functions
- Alter the production of neurohormones
- Affect the function of the pineal gland and its hormone, melatonin
- Influence the dopamine, opiate, and pineal systems, which in turn interact with the immune system

There is no scientific proof that these biological effects will happen to people using a computer in everyday situations. Computers are just one of the many sources of electromagnetic fields that we are exposed to everyday. However, you should take steps to reduce your exposure whenever possible.

How can I protect myself?

- If you use a CRT display, select one that conforms to MPRII and TCO guidelines established by the Swedish National Board of Testing. These standards set low limits for electromagnetic fields.
- Magnetic field strength diminishes rapidly the farther you move from the VDT. Sit at least an arm's length away from your screen (28-30 inches). Adjust your font size if necessary to view text comfortably.
- Avoid sitting or standing near the sides and back of monitors since fields are stronger there. Try to keep 3-4 feet away. Remember that walls or partitions do not block these fields.

- Turn monitors off when not in use to reduce EMF exposure.
- Consider use of liquid-crystal displays (LCDs) that do not emit radiation.
- Use electromagnetic shields over the screens of cathode ray tube displays (CRTs) to reduce rays emitted from the front.
- Consider reducing your exposure to any electromagnetic fields if you are pregnant or trying to become pregnant. Although no studies have directly linked miscarriages to VDT use, it is better to err on the side of caution. Some guidelines suggest limiting computer use to 20 hours per week if you use a CRT display.
- Try to limit any stress this issue causes you by becoming as informed as possible. The psychological stress can cause you more harm than the radiation itself.