

# AIHA Position Statement on Extremely Low Frequency (ELF) Fields

## AMERICAN INDUSTRIAL HYGIENE ASSOCIATION

### EXPANDED POSITION STATEMENT ON EXTREMELY LOW FREQUENCY ELECTRIC AND MAGNETIC FIELDS

Excessive exposure to nonionizing electromagnetic radiation at high frequencies (e.g. radio frequency, microwaves, and optical radiation) has long been acknowledged as a potential health hazard. This has resulted in nonionizing radiation exposure limits being established for these frequencies by the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), the American Conference of Governmental Industrial Hygienists (ACGIH), and other organizations. The American Industrial Hygiene Association (AIHA) has published a series of "Nonionizing Radiation Guides" providing information and guidance on the safe use of sources of nonionizing radiation.

The proven effects of exposure to these higher frequencies of nonionizing radiation are primarily thermal or photochemical in nature. Adverse health effects may occur when exposures exceed certain thresholds. However, in the extremely low frequency, or ELF range (300 Hz and below) of electromagnetic energy, the uncoupled electric and magnetic fields do not cause photochemical reactions or tissue heating and so have not generally been considered capable of causing similar adverse health effects.

However, ELF electric and magnetic fields can induce currents in the body, and at high ELF field intensities these induced current densities can exceed the naturally occurring current densities typically found in the body. The ELF exposure limits of the ACGIH and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) are based on avoiding the effects first noticed as current densities increase above endogenous levels (10 mA/m<sup>2</sup>), such as magnetophosphenes, electrophosphenes, direct nerve and muscle stimulation, and changes in brain cognitive function. For power-frequency fields in North America (60 Hz), the ACGIH exposure limits are 25 kilovolts per meter (kV/m) for the electric field and 1 millitesla (mT; where 1 mT = 10 Gauss, G) for the magnetic field. These ACGIH exposure limits are ceiling values. For power-frequency fields, ICNIRP has established guidelines for both occupational and general public exposures to both electric and magnetic fields. For 60 Hz fields, the ICNIRP electric field guidelines for occupational and residential exposures are 8.3 kV/m and 4.2 kV/m respectively. For 60 Hz magnetic fields the ICNIRP guideline for occupational and residential exposures are 0.417 mT (4.17 G) and 0.083 mT (0.83 G) respectively. Fields of the magnitude addressed by these guidelines are typically found only in limited occupational settings and for very limited periods of time for the general public.

Since the late 1970's there has been scientific interest in characterizing potential health effects of ELF electric and magnetic fields of a strength that can be routinely encountered by various occupations and the general public. This interest can be attributed primarily to limited occupational and residential epidemiology studies that are suggestive of a cancer risk (particularly leukemia, breast and brain cancer) and to a lesser degree on laboratory studies of whole animals and tissue cultures. While there continues to be some controversy regarding potential health effects at such low field strengths, there is still no clear, convincing evidence of an actual health risk. This conclusion is supported by a number of expert reports published in recent years such as the National Institute of Environmental Health Sciences (NIEHS) Working Group Report published in 1998, the NIEHS report to Congress published in 1999, the United Kingdom's National Radiological protection Board's Advisory Group on Non-Ionizing Radiation (AGNIR) 2001 report, and the International Agency for Research on Cancer Monograph Volume 80 Non-Ionizing Radiation, Part1: Static and Extremely-Low Frequency (ELF) Electric and Magnetic Fields scheduled to be released in 2002.

The AIHA, through its Nonionizing Radiation Committee, is closely following developments in the area of exposure to ELF fields and health effects. At present, the AIHA finds insufficient evidence of any human health risk at field strengths below those addressed in the above-mentioned ACGIH and ICNIRP guidelines. However, good industrial hygiene and public health practice suggests that when there are significant questions about potential health risks a cautious approach is recommended.

In the opinion of the AIHA a cautious approach may include: characterizing exposure levels in industrial environments, providing workers with education and training on the potential effects of exposure to ELF fields and

current exposure guidelines, and following the exposure guidance developed by the ACGIH or ICNIRP. In addition, the AIHA supports the need for more research to close the current information gaps regarding potential health effects.

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