

**OHIO DEPARTMENT OF HEALTH
ELECTROMAGNETIC FIELDS (EMF)
SUMMARY AND ASSESSMENTS**



**Department
of Health**

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Introduction

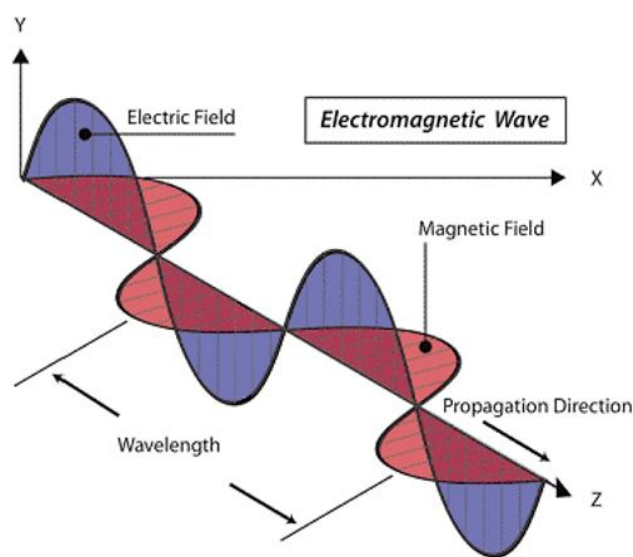
The Ohio Department of Health's (ODH) role in the Ohio Power Siting Board has historically been to assess cases to determine whether the construction, alteration, operation, or decommissioning of any power-generating structure or facility will have an impact on the health and wellness of the public. ODH works in partnership with fellow state agencies, including the Ohio Department of Natural Resources (ODNR), which assesses ecological impacts, and the Ohio Environmental Protection Agency (OEPA), who is responsible for environmental licensing and regulation, to provide a robust, holistic assessment.

The purpose of this document is to assess, based upon existing research, whether low to mid-frequency electromagnetic fields (EMFs) emitted from common technologies have the potential to cause harm to human health. ODH has developed this document at the request of the Ohio Power Siting Board.

The determinations within this document were made based upon a review of literature available at the time of its original publication. As scientific information changes over time, and as more studies become available, ODH will reevaluate these conclusions as needed. ODH did not conduct independent, peer-reviewed research to produce this document.

Electromagnetic Fields (EMFs) Overview

Electromagnetic radiation has both electric and magnetic fields that travel together in waves and therefore the terms electromagnetic radiation and electromagnetic fields are often used interchangeably. Electromagnetic fields (EMFs) can vary in strength from low energy (low frequency) to high energy (high frequency). There are two main categories of EMFs. High-frequency EMFs, or ionizing radiation, includes x-rays and gamma rays. Low-to mid-frequency EMFs, or non-ionizing radiation, includes EMFs generated by power lines, wi-fi routers, microwaves, and visible light. Within the general public, the common term EMFs usually refers to low to mid-frequency EMFs generated by common technologies such as radios, cell phones power lines, energy storage systems, solar power systems and wind farms. Please see the chart of the electromagnetic spectrum and EMF frequencies on page four.

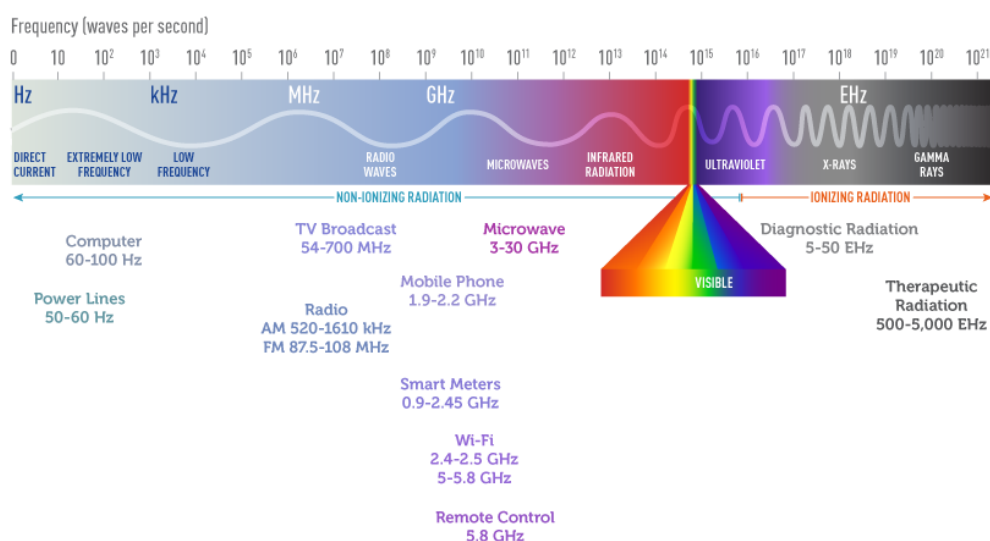


(RF Cafe, 2020)

Ionizing vs Non-ionizing Radiation

Ionizing radiation has enough energy to remove electrons from atoms causing atoms to become ionized. Ionizing radiation causes structural changes in the atoms and molecules within cells and can produce harmful biological effects. Therefore, sources of ionizing radiation are regulated. Permission to use, process, manufacture and dispose of sources of ionizing radiation is granted through licensing and regulated through inspections from the state or federal regulating agency. (National Cancer Institute, 2019)

ELECTROMAGNETIC SPECTRUM



Non-ionizing radiation deposits energy in the materials through which it passes, mostly in the form of heat and does not have enough energy to break molecular bonds or remove electrons from atoms. There are both natural and human-made sources of non-ionizing EMFs. The earth's magnetic field, which causes the needle on a compass to point North, is one example of a naturally occurring EMF. Human-made EMF sources include power lines, electrical wiring, and electrical appliances such as electric razors, hair dryers, and electric blankets. Sources of radiofrequency radiation are wireless telecommunication devices and equipment, including cell phones, smart meters, and portable wireless devices, such as tablets and laptop computers. (National Cancer Institute, 2019)

Studies about Possible Associations between Non-ionizing EMFs and Cancer

Numerous epidemiologic studies have evaluated possible associations between exposure to non-ionizing EMFs and risk of cancer in children. Most of the research has focused on leukemia and brain tumors, the two most common cancers in children. Studies have examined associations of these cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. No consistent evidence for an association between any source of non-ionizing EMF and cancer has been found. See reference below for more information about the following studies and other available studies. (National Cancer Institute, 2019)

Exposure to Wi-Fi

In view of the widespread use of Wi-Fi in schools, the UK Health Protection Agency (now part of Public Health England) has conducted the largest and most comprehensive measurement studies to assess exposures of children to radiofrequency electromagnetic fields from wireless computer networks. This agency concluded that radiofrequency exposures were well below recommended maximum levels and that there was “no reason why Wi-Fi should not continue to be used in schools and in other places.” A review of the published literature concluded that the few high-quality studies to date provide no evidence of biological effects from Wi-Fi exposures. (National Cancer Institute, 2019)

Exposure to Cell Phones

As part of ongoing monitoring activities, the U.S. Food and Drug Administration (FDA) analyzes published epidemiological studies for specific outcomes including brain and other tumors as well as for any evidence of other adverse events. No clear and consistent pattern has emerged from epidemiological studies. Based on the evaluation of the currently available information, the FDA believes that the weight of the scientific evidence does not support an increase in health risks from radio frequency exposure from cell phone use at or below the radio frequency exposure limits set by the Federal Communications Commission (FCC).

The FDA also monitors the Surveillance, Epidemiology, and End Results (SEER) database maintained by the National Cancer Institute (NCI) at the National Institutes for Health (NIH). The SEER data show that brain cancer rates are not increasing in the United States despite the significant increase in the number of cell phone users. (FDA, 2020)

Exposure to Cell Phone Base Stations

Few studies have examined cancer risk in children living close to cell phone base stations or radio or television transmitters. None of the studies that estimated exposures on an individual level found an increased risk of pediatric tumors. (National Cancer Institute, 2019)

Residential Exposures

Most epidemiologic studies have shown no relationship between breast cancer in women and exposure to extremely low frequency (ELF) EMFs in the home. Although a few individual studies have suggested an association, only one reported results that were statistically significant. (National Cancer Institute, 2019)

Workplace Exposures to Extremely Low Frequency EMFs

Recent studies that considered exposure measurements and job titles have generally not shown an increasing risk of leukemia, brain tumors, or female breast cancer with increasing exposure to magnetic fields at work. (National Cancer Institute, 2019)

Extremely Low Frequency EMFs (ELF-EMFs)

In 2002, the International Agency for Research on Cancer (IARC), a component of the World Health Organization, appointed an expert working group to review all available evidence on static and extremely low frequency electric and magnetic fields. The working group classified ELF-EMFs as “possibly carcinogenic to humans,” based on limited evidence from human studies in relation to childhood leukemia. Static electric and magnetic fields and extremely low frequency electric fields were determined “not classifiable as to their carcinogenicity to humans”. (National Cancer Institute, 2019)

Electromagnetic Fields in General

In 2015, the European Commission Scientific Committee on Emerging and Newly Identified Health Risks reviewed electromagnetic fields in general, as well as cell phones in particular. It found that, overall, epidemiologic studies of extremely low frequency fields show an increased risk of childhood leukemia with estimated daily average exposures above 0.3 to 0.4 μT , although no mechanisms have been identified and there is no support from experimental studies that explains these findings. It also found that the epidemiologic studies on radiofrequency exposure do not show an increased risk of brain tumors or other cancers of the head and neck region, although the possibility of an association with acoustic neuroma remains open. (National Cancer Institute, 2019)

Summary and ODH Assessment

A review of scientific literature concurs with the Health Physics Society’s conclusion in regard to health risks associated with low-level EMFs near power lines: ‘There are no known health risks that have been conclusively demonstrated to be caused by living near high-voltage power lines. However, science is unable to prove a negative, including whether low-level EMFs are completely risk-free. Most scientists believe that exposure to the low-level EMFs near power lines is safe, but some scientists continue research to look for possible health risks associated with these fields. If there are any risks such as cancer associated with living near power lines, then it is clear that those risks are small.’ (Zeman, G.) ODH has not seen evidence contradictory to this statement.

A review of scientific literature concurs with the U.S. Food and Drug Administration’s conclusion in regard to health risks associated with EMFs emitted from cell phones in its statement: ‘To date, there is no consistent or credible scientific evidence of health problems caused by the exposure to radio frequency energy emitted by cell phones.’ (FDA, 2020) ODH has not seen evidence contradictory to this statement.

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