As an engineer who performs assessment of Radio Frequency exposure around the country and the world, I have the perspective of someone who has been in areas near powerful antennas, can measure exposure levels, and have studied the effects as part of my work teaching workers how to be safe around transmitters and antennas.

The study of interaction between electromagnetic energy and human health goes back over 100 years. Government regulations protect people from adverse health effects of this energy, and most countries have regulations which are very similar. There is little evidence that people are harmed by exposure to energy when these regulations are followed.

There have been billions of dollars spent and thousands of papers published on the topic, especially relating to exposure from cell phones and their infrastructure. Some of this work is high quality and reproducible while a majority are hard to apply for many reasons. Some don't provide enough information to reproduce, and others don't fully consider the ever-more complicated operation of this technology and hence mischaracterize the exposure or dosimetry.

Radio technology has been used for communications for over 100 years. People have been living near high-powered broadcast stations for generations. Cellular phone networks have been in use for nearly 50 years and now almost everyone has a phone and hence is exposed to radiofrequency (RF) energy from transmitters in their own hands. Other sources of manmade electromagnetic (EM) energy such as power distribution, electric appliances in homes and workplaces, and electric lighting started over 150 years ago. All these forms of electromagnetic energy are non-ionizing, meaning they don't have high enough frequency and hence energy to alter mater at an atomic level, like X-Rays and other ionizing radiation.

Standards bodies and public health agencies are responsible for recommending and adopting regulations on a wide variety of environmental exposures. In the United States congress gave the Federal Communications Commission (FCC) the responsibility to regulate EM exposure and it depends on other government agencies such as the Food and Drug Agency to support them in that effort. The International Committee on Electromagnetic Safety (ICES) – which now operates under the umbrella of the Institute of Electrical and Electronics Engineers (IEEE) Standard Association – published their first standard in 1966 and has continues to revise them with the latest published in 2019. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) published their first guidelines in 1998 and has also updated their recommendations. The National Council on Radiation Protection & Measurements published their Report 86 "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields" in 1986. The FCC adopted current regulations in 1996 with the latest update in 2019.

Standards bodies review the published science in their work. A key part of the process is to determine which studies are informative to determine adverse health effects that may be caused by exposure to EM energy. These reviews consider the breadth of studies available and the entire

population: workers, children, infants, pregnant women, and people with compromised health. Recommendations are then made, which include a safety margin to ensure people are not exposed to EM levels that may cause adverse health effects.

Regulators, such as the FCC in the United States, take these standards body recommendations and then adopt or adapt them based on their own review and in the case of the FCC, comments by other government health bodies and a wide array of scientists, interested parties, and the public.

The current IEEE-ICES and ICNIRP standards have similar exposure levels to each other, Canadian Safety Code 6, NCRP Report 86, and the FCC regulations.

The following government agencies and scientific bodies from around the world continue to state that exposure to EM energy, at levels below limits mostly the same as those in the United States, does not cause adverse health effects. Some of their statements with links include:

The German Federal Office For Radiation Protection / **Bundesamt für Strahlenschutz** (**BfS**) produced Mobile communications, WiFi, and the like – Evaluation of the SCHEER Opinion 2023

The evidence for adverse health effects from chronic or acute exposure to high-frequency electromagnetic fields below the limits is classified as neither moderate nor severe based on the 2018 classification scheme. This means that SCHEER sees no or only unclear or weak evidence in the scientific data for adverse health effects at exposures below the limit values.

Mobile phone base stations: radio waves and health - UK Public Health England (2021)

...although a substantial amount of research has been conducted in this area, there is no convincing evidence that RF field exposures below guideline levels cause health effects in adults or children.

The Government of Canada in their Radiofrequency Energy and Safety page state that:

Scientists have been studying the biological and health effects of RF energy for decades. There are two scientifically-established adverse health effects from exposures to RF energy:

- *at frequencies below 10 megahertz (MHz), nerve stimulation (a tingling sensation) can occur*
- *at frequencies above 100 kilohertz (kHz), tissue heating can occur*

Canadian limits for RF energy exposure are set below the level at which these effects could happen.

In Australia, **ARPANSA** states that 5G and other telecommunications do not affect the immune system (2020)

There is no established evidence that low level radio wave exposure from 5G and other wireless telecommunications can affect the immune system or cause any other long term or short term health effects.

A Radiation literature survey is also maintained by **ARPANSA** which provides *updates on published literature related to radiation (both ionising and non-ionising) and health.*

The weight of scientific evidence has not linked cell phone radio frequency radiation with any health problems.

Recent Research on EMF and Health Risk, (multiple SSM reports) - **Swedish Radiation Safety Authority (SSM)** (2003-2026)

New research on brain tumours and mobile phone use is in line with previous research suggesting mostly an absence of risk.

Measurements and exposure calculations have shown that a person's radiofrequency field exposure is dominated by personal mobile phone use. The exposure from environmental sources such as mobile phone base stations plays a minor role.

No new established causal relationships between EMF exposure and health risks have been identified.

The results of the research review give no reason to change any reference levels or recommendations in the field.

The **Norwegian Institute of Public Health (NIPH)** published a research finding - No health effects from radiation from mobile phones or wireless networks can be documented (2026).

"An overall assessment of the evidence shows that there are no health effects from electromagnetic fields for users of mobile phones and other wireless communication technologies. The environmental exposure is also very low, and the likelihood of health effects from exposure originating from mobile phone base stations and TV or radio transmitters is low," says Ragnar Hovland, Director of the Department of Chemical Toxicology at the Norwegian Institute of Public Health.

The **World Health Organization (WHO)** has been conducting The International EMF Project since 1996. Their Electromagnetic fields page covers EMF in general and they also have a page addressing Radiation: 5G mobile networks and health - (2020)

To date, and after much research performed, no adverse health effect has been causally linked with exposure to wireless technologies.

For even more information, IEEE-ICES maintains a list of current Expert Reviews.

There are areas of study with open questions about human interaction and health effects from EM energy. But it is clear from decades of experience and research that if there is an effect, it does not affect many people.

I am convinced that it is challenging to get funding as well as researcher interest in studying topics, such as health effects from EM exposure, because the outcome has a high chance of not finding a link – i.e., a null result. Institutions, doctors, and scientists prefer to concentrate on using their resources on solving health problems that clearly challenge society and can result in significant health improvements for many people. This is one reason that, with significant exceptions, much of the research on EM and health effects is not well funded and does not contribute to the standards development process.

Sincerely,



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