



Maryland Children's Environmental Health and Protection Advisory Council

Guidelines to Reduce Electromagnetic Field Radiation

December 2022

Introduction

The Maryland Children's Environmental Health and Protection Advisory Council (CEHPAC) identifies environmental health issues that impact children and seeks to protect them from exposure to environmental hazards. Under Md. Code Ann., Health-General §13-1506, CEHPAC is directed to:

(4) Gather and disseminate information to the public, including the research and medical communities, community-based organizations, schools, and State agencies, on how to reduce, treat, and eliminate children's exposures to environmental hazards to further the public's understanding of the environmental hazards that may potentially affect children; and

(5) Recommend uniform guidelines for State agencies to follow to help reduce and eliminate children's exposure to environmental hazards, especially in areas reasonably accessible to children...

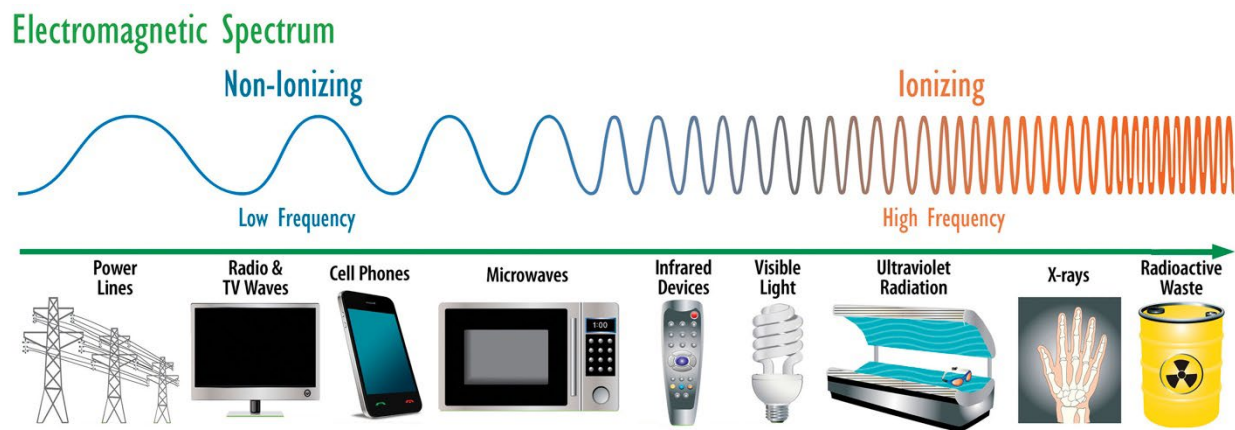


Figure 1. Source: [National Institute of Environmental Health Sciences](#)

In 2016, CEHPAC adopted a report on [WiFi Radiation in Schools in Maryland](#) to examine questions related to potential health outcomes linked to exposures associated with WiFi technology. This report expands on that work by compiling information on how families can reduce their daily exposure to non-ionizing electromagnetic fields. If you are interested in a more detailed analysis and policy recommendations please see the [2016 WiFi Radiation in Schools in Maryland Final Report](#).

What are electromagnetic fields?

“Electromagnetic fields are a combination of invisible electric and magnetic fields of force. They are generated by natural phenomena like the Earth’s magnetic field but also by human activities, mainly through the use of electricity. Mobile phones, power lines and computer screens are examples of equipment that generates electromagnetic fields.” - [European Commission’s Directorate General for Health & Food Safety](#)

How do wireless devices work?

Cell phones and wireless devices use a type of non-ionizing electromagnetic field called radiofrequency radiation to transmit information.

“Radiofrequency (RF) energy is a type of electromagnetic radiation. It is used to transmit signals carrying information in the form of radio waves. Radio waves are broadcast using a transmitter. When the radio waves reach a receiver, the signal is converted back into the information that was originally sent by the transmitter. When you talk on a cell phone, your cell phone acts as a transmitter and your voice is carried on radio waves to the person you are calling. Their phone acts as the receiver and converts the signal back into your voice. In addition to cell phones, other wireless devices such as radios, Wifi routers, satellites, radars and pacemakers can send or receive RF energy waves.” - [US EPA’s RadTown](#)

Are there health concerns about exposure to RF energy from cell phones and wireless technologies?

For a more detailed analysis, please see the [2016 WiFi Radiation in Schools in Maryland Final Report](#), which examined the current evidence linking radiofrequency radiation to health outcomes, including cancer. While the science is still evolving, there are broad concerns about exposure to RF radiation.

According to the [California Department of Public Health](#), “...some laboratory experiments and human health studies have suggested the possibility that long-term, high use of cell phones may be linked to certain types of cancer and other health effects, including:

- brain cancer and tumors of the acoustic nerve (needed for hearing and maintaining balance) and salivary glands,
- lower sperm counts and inactive or less mobile sperm,
- headaches, and
- effects on learning and memory, hearing, behavior, and sleep”

There are no definitive studies establishing a causal link in humans, and scientists disagree about whether cell phones cause these health problems and how great the risks might be.

Children may be at greater risk than adults from exposure to RF energy. Their bodies and brains are still developing and are more vulnerable to exposures that could cause harm. Because their skulls are thinner and their heads are smaller than those of adults, children have a relatively greater risk of exposure to the RF energy of cell phones. Children also will accumulate many more years of cell phone and wireless exposure than adults. Animal research has also shown the potential for health effects of RF radiation to a developing fetus.

In 2011, the International Agency for Research on Cancer (IARC) [classified](#) wireless radiofrequency radiation as a Class 2B possible carcinogen based on research that found long term cell phone use associated with a form of brain cancer.

The [2016 WiFi Radiation in Schools in Maryland Final Report](#) recommended “...limiting exposures as much as feasibly practical, without negatively impacting education.” The Department of Connecticut Department of Health takes this a step further and states, “It is wise to reduce children's exposure.”

Sources of Children’s Exposure to Wireless Radiofrequency Radiation

Common sources of radiofrequency radiation exposure to children include:

- Cell phones
- Cordless phones and their base station
- Tablets, laptops, and computers
- WiFi routers and hotspots
- Wireless video game consoles/handsets
- Wireless Baby monitors
- Signal boosters
- Wireless headphones, printers, speakers, keyboard, mouse
- Wearable wireless tech including “smart” watches and fitness wristbands
- Wireless “smart” appliances
- Wireless utility meters
- WiFi or Bluetooth toys

The Basics of Reducing RF Exposure

Increase Your Distance

The closer you are to a cell phone or wireless device, the higher the exposure to your brain and body. The further away you are, the lower the radiation your body absorbs. Notice how close children are to you when you are using a cell phone or wireless device, and minimize their exposure. For example, do not rest a cell phone on your baby or hold a transmitting device near their bodies.

Minimize Time on Wireless

A child's daily exposure adds up over time. Every time you reduce your child's exposure, even in small ways, you can decrease the overall cumulative exposure to mitigate risk.

Choose Safer Technology Solutions

As consumers, parents and caregivers have safer options when it comes to connecting to the internet or choosing which electronics to purchase. Once you are aware of this issue, you can make low RF radiation choices and choose corded connections whenever possible. Take a look at what you have in your home and swap wireless devices with corded connections if possible. For example, use a corded keyboard or earbuds with a wire.

Recommendations to Reduce Cell Phone and Wireless Device Radiation Exposure

Cell phones, wireless devices, and WiFi routers emit RF radiation all the time, even when you are not using them. Even in standby mode, your phone emits RF radiation because it is constantly searching for service or new messages. If you do not need your cell phone, simply turn it off or put it in airplane mode. This applies to all other wireless devices, including laptops, tablets, video gaming consoles and smart speakers. Additional recommendations are provided below as general guidelines.

Around the Home¹

- Replace cordless phones with corded home phones.
- Unplug cordless phones when not in use (if you have at least one corded telephone in the house, you can always be reached, even if the cordless phone is off at night).
- Remove electronics from the bedroom and especially around your bed and the crib.
- Avoid sleeping with electric blankets and heating pads; if you use an electric blanket to preheat your bed, unplug it before sleeping. If you only turn it off, the electromagnetic field will still be present.
- Do not stand close to a microwave oven when it is on or let your child press their face up to it watching the food cook.

Cell Phones

- Try to keep devices, especially cell phones, away from the head and body. Keeping them an arm's distance away significantly reduces exposure.²
- When you are talking on a cell phone, use the speakerphone to reduce exposure to your head.²
- Avoid carrying your phone against the body like in a pocket, sock, bra, or spandex pants. Cell phone manufacturers cannot guarantee that the amount of radiation you are absorbing will be at a safe level.²
- Make only short or essential calls on cell phones so that you minimize your daily exposure.²
- Use text messaging rather than voice calls when possible.²

Laptops and Computers

- Choose wired Internet (ethernet cable modems) at home instead of wireless systems, if possible.³
- Place WiFi routers as far away from children as possible.³
- Consider using a switch to shut down your wireless router when it is not in use.³

¹ These recommendations are based on a [Fact Sheet by the Collaborative on Health & the Environment](#).

² These recommendations come from the [American Academy of Pediatrics \(AAP\)](#).

³ Based on the [California Department of Health review](#).

- Instead of laps, place electronic devices, tablets, and laptops on desks and tables which can serve to increase the distance between the device and children's bodies.³

Turn Wireless Antennas Off

- Airplane mode is a setting that turns transmitting antennas off in wireless devices.
- If you plan to watch a movie on your device, download it first, then switch to airplane mode while you watch to avoid unnecessary radiation exposure.²
- Teach children to turn off WiFi when not in use, especially if they are sleeping (also see bedroom suggestions below).³
- Newer phone models turn most of the wireless antennas off with Airplane mode, but Bluetooth or WiFi may stay on, so check that all antennas are set to off such as 4G, 5G, Bluetooth, WiFi hotspot, location.

Learn About When Your Cell Phone Goes to Highest Exposure

Reduce or avoid use of cell phones and wireless technologies when the devices are going to maximum power, which means the device will result in higher radiation exposures.^{2,3}

- *You are in an area of low signal:* Keep an eye on your signal strength (i.e. how many bars you have). The weaker your cell signal, the harder your phone has to work and the more radiation it emits. It is better to wait until you have a stronger signal before using your device.
- *You are traveling in a car or vehicle:* Avoid making calls in cars, elevators, trains, and buses. The cell phone works harder to get a signal through metal, so the power level increases. When vehicles are traveling, the device also increase power to switch connection to each cell tower the vehicle passes.
- *You are streaming video and large files:* The more streaming data, the higher the radiation exposure.

Helpful Tips

- If your tablet or laptop does not have an ethernet port you can get a special adapter that allows you use ethernet with thunderbolt or USB ports.
- Many cell phones can also be plugged into ethernet port with an adapter made for cell phones.
- Use wired peripherals and accessories (e.g. a wired mouse, wired speakers, and wired printers) rather than wireless.
- Wireless virtual assistants emit RF so choose wired tech whenever possible.
- Wireless gaming consoles emit RF even when not in use so keep these out of the bedroom and choose wired handsets.

In the Bedroom

- Cell phones should be powered off at night.²

- If your child or teen needs an alarm clock, get a battery powered alarm clock for the bedroom.²
- If they must use a cell phone for an alarm clock, teach them to turn the phone to airplane mode with wireless antennas off every night (the alarm will still work).²
- Do not charge a cell phone or wireless devices near your child's bed. Charging creates higher electromagnetic fields even if you are not using the device.
- Children should not sleep with their head near a wall that has the electric panel, electric meter, or appliance on the other side.

Read the Fine Print

Read the “fine print” from the manufacturer’s instruction manual which may tell users to keep a distance between the phone and your head and body. These fine print warnings range from a few millimeters to almost an inch. The fine print warnings on other wireless devices such as WiFi routers, home cordless phone base stations, and baby monitors generally state devices should be at 20 cm, or about 8 inches. If people are closer than the manufacturer-stated separation distance, then they can be exposed to RF levels that violate the US government FCC limits for this type of radiation.

Beware Radiation Protection Devices

Do not rely on a “radiation shield” or other products claiming to block RF energy, electromagnetic fields, or radiation from cell phones. According to the U.S. Federal Trade Commission, products that interfere with the phone’s signal may force it to work harder and emit more RF energy to stay connected, possibly increasing your exposure. There are no standard protocols for testing and comparing devices to ensure they work. It is best to use wired corded electronics to reduce RF radiation rather than rely on an untested product.³

If You are Pregnant

Findings on prenatal impacts have led doctors to sign onto an [EPA-recognized](#) educational campaign called [The BabySafe Project](#)*urging pregnant women to reduce wireless exposure to minimize risks to their babies’ brain development. They recommend many of the same things listed above, including:

- Keep your cell phone away from your body. Never carry it in a pocket or bra.
- Do not sleep with your phone. Switch your phone to airplane mode whenever you are not using it.
- Keep your wireless laptop or tablet away from your body. Never rest your wireless device on your tummy.
- Use a corded landline if at all possible, rather your cell phone or cordless phone.
- Don't sit anywhere close to your router or smart meter. Turn off routers at night.
- Whenever possible, connect to the internet using wired (ethernet) connections.

*The BabySafe Project is a joint initiative of Environmental Health Trust and Grassroots Environmental Education.

References

- American Academy of Pediatrics. Cell Phone Radiation & Children’s Health: What Parents Need to Know (<https://www.healthychildren.org/English/safety-prevention/all-around/Pages/Cell-Phone-Radiation-Childrens-Health.aspx>)
- Maryland Children’s Environmental Health and Protection Advisory Council WiFi Radiation in Schools in Maryland Final Report (2016) https://phpa.health.maryland.gov/OEHFP/EH/Shared%20Documents/CEHPAC/MD_CEHPAC_SchoolWifi_022017_final.pdf
- California Department of Health Recommendations on Cell Phones <https://www.cdph.ca.gov/Programs/CCDCPHP/DEODC/EHIB/CDPH%20Document%20Library/Cell-Phone-Guidance.pdf>
- World Health Organization International Agency for the Research on Cancer Monograph on Radiofrequency Radiation (<http://monographs.iarc.fr/ENG/Monographs/vol102/>)

**CHILDREN'S ENVIRONMENTAL HEALTH & PROTECTION ADVISORY COUNCIL MARYLAND DEPARTMENT
OF THE ENVIRONMENT
REPORT ON WI-FI RADIATION IN SCHOOLS
SUMMARY OF RECOMMENDATIONS OF FINAL REPORT DECEMBER 13, 2016**

The Council recommends that the Maryland Department of Health and Mental Hygiene ask the United States Department of Health and Human Services to formally petition the FCC to revisit the exposure limit to ensure it is protective of children's health and that it relies on current science.

The following recommendations are based on principles of industrial hygiene and occupational health. The Council also recommends that:

The Maryland State Department of Education should recommend that local school systems:

- Consider using wired devices.
 - Where classrooms have internet access with a wireless connection, WiFi can be turned off and wired local area network (LAN) can provide a reliable and secure form of networking for as many wireless devices as necessary without any microwave electromagnetic field exposure.
 - If a new classroom is to be built, or electrical work is to be carried out in an existing classroom, network cables can be added at the same time, providing wired network access with minimal extra cost and time.
- Locate laptops in the classroom in a way that keeps pupil heads as far away from the laptop screens (where the antennas are) as practicable.
- Consider using screens designed to reduce eyestrain.
- Consider using a switch to shut down the router when it is not in use.
- Teach children to turn off WiFi when not in use.
- Consider placing routers as far away from students as possible.
- Share this document with teachers and parents.

- The General Assembly should consider funding education and research on electromagnetic radiation and health.
- The Maryland Department of Health and Mental Hygiene should provide suggestions to the public on ways to reduce exposure:
 - Sit away from WiFi routers, especially when people are using it to access the internet.
 - Turn off the wireless on your laptop when you are not using it.
 - Turn off WiFi on smartphones and tablets when not surfing the web.
 - Switch tablets to airplane mode to play games or watch videos stored on the device.

This report should be posted on the Council website and shared with the United States Department of Health and Human Services, the Federal Communications Commission, the Maryland State Department of Education and the Maryland General Assembly.