Presentation to the City Administrators and Citizens of Queens, NYC

January 25, 2023

by:
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Fulbright Distinguished Chair
Dept. of Electrical & Computer Engineering
University of New Hampshire
International Commission on the Biological Effects of Electromagnetic Radiation
Vice Chair

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Conflict-of-Interest Statement

- My position at the time I joined the New Hampshire State Commission was Professor & Chair of the Dept. of ECE at UNH
- Since leaving the university, I am working as a founder in a high-tech startup
- My bias was and is generally in favor of technological developments
  - I also served on the InterOperability Laboratory Advisory Board, which is an international evaluator of wireless technologies
  - Was active in Project 54, addressing the communications needs of police and first responders
  - I am serving as Chair of the Virtual Learning Academy Charter School Board of Trustees and have served on other educational boards
- I served on the New Hampshire Commission without any compensation, including travel expenses
- Because of my service on the Commission, I am asked to present to various groups, including your group, none of which involve compensation
- I present to you today as a fellow citizen, with no realized or expected financial rewards

2

NH Commission on the Health and Environmental Impacts of 5G and Wireless Technology

- The Commission was convened through bipartisan legislation that was passed by both houses of the legislature and signed by the Governor
  - This is the first legislation passed in the United States calling for the formation of a state commission to explore the health effects of microwave radiation
- The 13 Commission members had backgrounds that included medicine, physics, toxicology, electromagnetics, epidemiology, biostatistics, occupational health, public health policy, business, and law

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Process and Findings of the Commission (Fall 2019 to Fall 2020)

We vetted and reviewed peer-reviewed publications relating to microwave radiation

- We identified hundreds of top-tier publications that showed harm from low-level microwave radiation exposure.
- As of 2020, the vast majority of peer-reviewed publications showed harm from exposure.
  - The primary mechanism by which exposure causes harm are oxidative changes, which can lead to an increase in free radicals (which can lead to chronic inflammation and a host of adverse outcomes including **Alzheimer's disease**, **cancer**, **cardiovascular disease**, **diabetes**, **chromosome damage**, **neuropsychiatric effects**, **and** **sperm quality**

We brought in recognized experts in fields related to microwave radiation and health

- All but one of the experts were unpaid, except for the expert hired by the Telecom Industry; that expert was the only one who said that there were no harms associated with radiation from wireless devices

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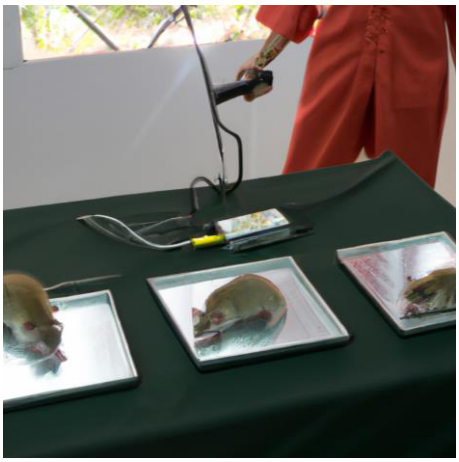
Assessing How the Current FCC Exposure Guidelines Were Set

- Current limits were set in the 1980s and were based on short-term (around an hour) behavioral studies on 8 rats and 5 monkeys (reference)
  - The assumption with these limits is that if a radio signal is not strong enough to warm tissues, it will not cause harm
  - The animals were food-deprived, and their task was to press a lever to receive food pellets
  - The animals were exposed to increasing levels of radiation until they could no longer perform their task; that level was designated as the upper exposure limit
  - A safety factor of 50 was then applied to that number to come up with a radiation threshold for the general public



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Process and Findings of the Commission (continued)

- Communicating with regulatory agencies (FCC, FDA, EPA)
  - They were asked to meet with the commission, but none did
  - Our communications with them did not answer our questions
  - Such a lack of responsiveness is something one might expect from a Captured Agency
- Writing the Final Report
  - Included 15 recommendations, some of which we are trying to get made into law

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Example of What Can Happen When People Are Exposed to Strong Wireless Radiation

(but far below the FCC threshold)

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What happened when the cell towers were turned on?

Within a week of installation many firefighters developed unusual symptoms of headaches, fatigue, insomnia, memory loss, confusion, nausea and weakness. After a time, firefighters in stations with adjacent cell towers were found to have forgotten CPR or became lost responding to a fire in a city they grew up in.

Physicians for Safe Technology

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Article Title: Microwave frequency electromagnetic fields (EMFs) produce widespread neuropsychiatric effects including depression

Firefighters' Symptoms Consistent With Laboratory Findings

Quote from article: "Non-thermal microwave/lower frequency electromagnetic fields (EMFs) act via voltage-gated calcium channel (VGCC) activation. … Among the more commonly reported changes are sleep disturbance/insomnia, headache, depression/depressive symptoms, fatigue/tiredness, dysesthesia, concentration/attention dysfunction, memory changes, dizziness, irritability, loss of appetite/body weight, restlessness/anxiety, nausea, skin burning/tingling/dermographism and EEG changes."

Pall, Martin L., Journal of Chemical Neuroanatomy, Volume 75, Part B, 2016, Pages 43-51, ISSN 0891-0618

https://www.sciencedirect.com/science/article/pii/S0891061815000599

9

Solution(s)

- Fiber To The Premises (FTTP) addresses all the problems identified in this presentation
  - Significant reduction in radiation exposure
  - Far "Greener" than wireless
  - Much, much faster (≈100x)
  - Much, much more secure
  - Eliminates/reduces the need for towers
  - Future Proof

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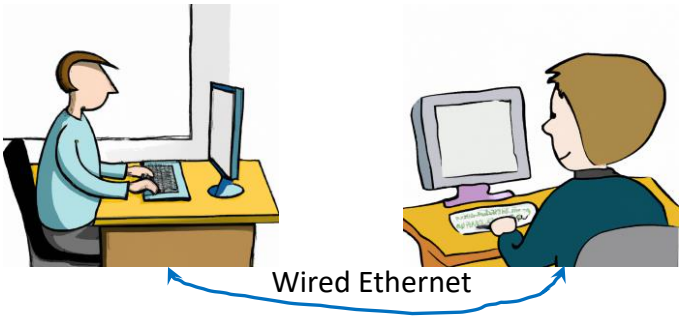
Power Consumption and Cybersecurity



Wireless: The signal being sent by the cell tower is available to all users in the service area. Most of the power and information radiated do not go to its intended recipient, resulting in wasted power and vulnerability to hacking.

Wired: Information-carrying signals can have very low power because they travel on wires and/or fiber optical cable and do not radiate. Most of that signal goes to the recipient (very efficient) and it is difficult for others to hack into (much more secure)

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Concluding Remarks

- A formal state commission of unbiased experts, formed through bipartisan legislation, concluded that low-level microwave radiation is harmful to human health and the environment
- Technological developments should be pursued to lessen exposure levels while continuing to provide connectivity
  - Migration to fiber connections and wired connections is a good start
- Those in a position to do so are strongly encouraged to enact protections against microwave radiation, which includes delaying the rollout of 5G in its present form

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Appendix

The slides that follow are slides that have been used in earlier presentations, and they are made available in this appendix because they contain information that is relevant but could not be shown in this presentation because of time constraints.

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Results from One of the Studies in the Meta Study

- Mortality by neoplasia [cancer] and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais State, Brazil
  - Explored the relationship between cancer rates and the distance people lived from a cell tower
  - Study investigated a large number of cancer deaths (7,191) and a large number of cell towers (856)
  - Performed during a time when few people had personal electronic devices (1996-2006)
    - Results of study revealed the effects of living near a cell tower

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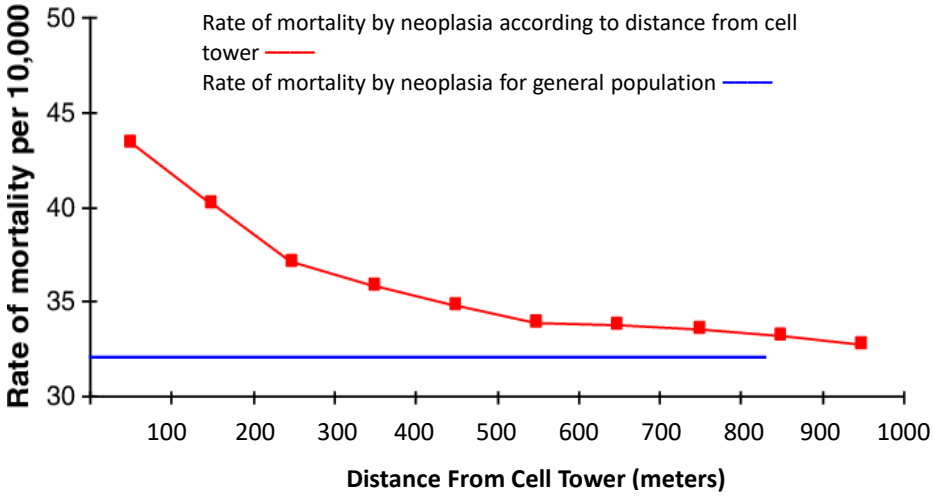
Take-Away from Article Referenced on Previous Slide



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Schools and Cell Tower Setback Examples

Many communities have policies, ordinances or zoning that ensures cellular antennas are restricted to a specific minimum distance from schools.

Copake, New York: No telecommunication facility or tower … shall be located "Closer than 1,500 feet horizontally to any structure existing at the time of application which is used as a primary or secondary residence; to the property of any school (both public and private); to any church; or to any other public building."

Palo Alto, California: Be it resolved: "That the Board supports the City of Palo Alto ("CPA") immediately establishing local municipal zoning setback rules of 1500 feet or more from an operating wireless transmitter and a school site"

Shelburne, Massachusetts: "All new CRS [communications radio service] facilities shall be at least a distance of 3000 feet from the property line of any school." "All new CRS facilities shall be at least a distance of 1500 feet from any residential structure."

Walnut City, California: "Telecommunication towers and antennas shall not be located within one thousand five hundred feet of any school (nursery, elementary, junior high and high school), trail, park or outdoor recreation area, sporting venues and residential zones"

Bar Harbor, Maine: "No [communications] facility shall be located within 1,500 feet of a municipal school, private compulsory school or child-care center as defined in this chapter, at the time of application."

Sallisaw, Oklahoma: No commercial wireless telecommunications towers within 1,500 of homes

Stockbridge, Massachusetts: No personal wireless service facility shall be located "Within 1000 feet horizontally from any school buildings, playgrounds and athletic fields; and within 600 feet horizontally from any residential structure."

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Cybersecurity

- Security breaches are real, and wireless connections are inherently vulnerable to hacking
  - The NotPetya attack in 2017 [which] caused $10 billion in corporate losses (WITA)
- 5G is more vulnerable than 4G
  - 5G uses short-range, low-cost and small-cell physical antennas within the geographic area of coverage. ***Each antenna can become a single point of control. Botnet and denial of service (DDoS) type attacks can bring down whole portions of the network simply by overloading a single node*** (Forbes)

The world's hackers (good and bad) are already turning to the 5G ecosystem, as the just concluded DEFCON 2019 (the annual ethical 'hacker Olympics') illustrated. The targets of this year's hacker villages included key parts of the 5G ecosystem such as: ***aviation, automobiles, infrastructure control systems, privacy, retail call centers and help desks, hardware in general, drones, IoT, and voting machines*** (Tom Wheeler)

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Insurance Companies Won't Insure Against RFR

- *The Nation* has not been able to find a single insurance company willing to sell a product-liability policy that covered cell-phone radiation. "Why would we want to do that?" one executive chuckled before pointing to more than two dozen lawsuits outstanding against wireless companies, demanding a total of $1.9 billion in damages. Some judges have affirmed such lawsuits, including a judge in Italy who refused to allow industry-funded research as evidence.

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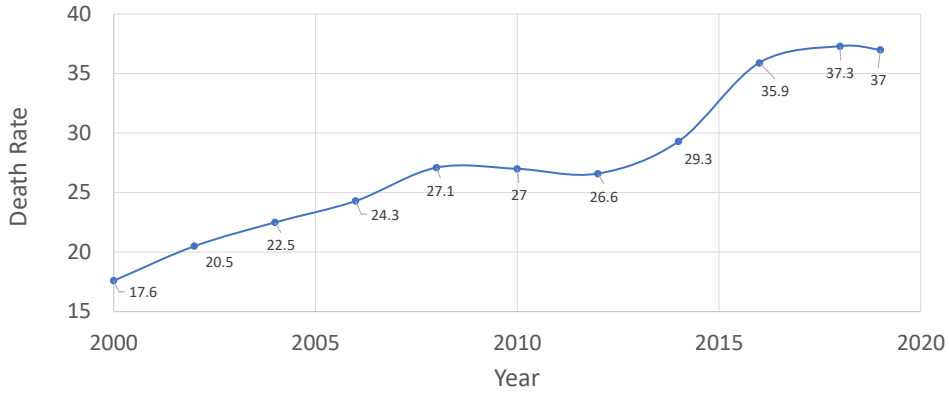
U.S. Alzheimer's Death Rate (per 100,000 people)



https://www.alz.org/media/Documents/alzheimers-facts-and-figures.pdf

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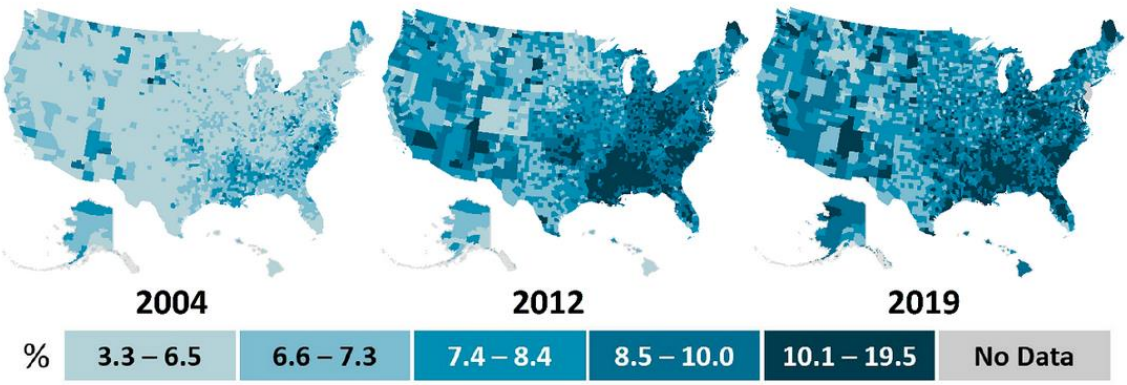
Age-adjusted prevalence of diagnosed diabetes among adults aged 20 years or older, United States, 2004, 2012, and 2019



Data sources: US Diabetes Surveillance System; Behavioral Risk Factor Surveillance System.

https://www.cdc.gov/diabetes/data/statistics-report/diagnosed-diabetes.html

20

Article Title: Radiofrequency radiation injures trees around mobile phone base stations

Quote from article: "Statistical analysis demonstrated that electromagnetic radiation from mobile phone masts is harmful for trees. These results are consistent with the fact that damage afflicted on trees by mobile phone towers usually start on one side, extending to the whole tree over time."

Waldmann-Selsam C Balmori-de la Puente, A Breunig H et al., Science of the Total Environment (2016) 572 554-569, DOI: 10.1016/j.scitotenv.2016.08.045

https://www.sciencedirect.com/science/article/pii/S0048969716317375?casa_token=MQA3pRiHm0IAAAAA:Dyxz-gx8Lsdf2aWs9kbmQb7E8Hne11dbc_oUABdB8VgEsLGopSgtz7LubafACe_QQJAWy8RR7w

21

Article Title: Electromagnetic radiation as an emerging driver factor for the decline of insects

Quote from article: "The extent that anthropogenic electromagnetic radiation represents a significant threat to insect pollinators is unresolved and plausible."

Alfonso Balmori, Science of The Total Environment, Volume 767, 2021, 144913, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2020.144913

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Commonly-Asked Questions

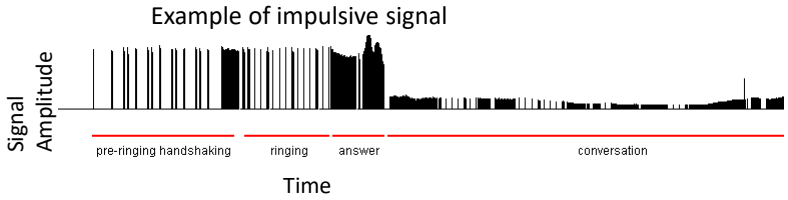
- Why are we concerned about the placement of cell towers?

  There is a large and growing body of evidence demonstrating that exposure to cell-phone type radiation is harmful to humans and the environment

  - Other types of radiation, such as radiation from radio and TV stations have also been shown to be harmful, but the impulsiveness of cell-phone radiation coupled with the number of transmitters makes them particularly harmful

- What is meant by "cell-phone type" radiation?

  High-frequency devices that transmit digital information fall into this category. These devices include: cellphones, cell towers, Bluetooth, baby monitors, smart meters, cordless phones, WiFi (wireless routers) and IoT devices



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Commonly-Asked Questions

- What are the differences between signals from different wireless devices?

  They are all transmitted in high frequency bands (600 MHz to 5 GHz) but frequency varies from device to device

  - 5G will extend the upper frequency to around 40 GHz

  Different device types use different protocols to transmit digital information

  - Generally, devices of the same type (such as cellphone and cell tower) use the same protocol when communicating. Because of this, cellphones and cell towers radiate the same types of signals, although at different powers and different periods of time.

  Different device types transmit at different power levels

  - Bluetooth & WiFi (up to 100 mWatts)
  - Smart Meter (≤ 1 Watt)
  - Cellphone (600 mWatts – 3 Watts)
  - Cell Tower (typically 10 Watts, but can go as high as 50 Watts)

Radiation from all these devices pose health harms

Notes:

1 Hz = 1 cycle/second
1 MHz = 1,000,000 Hz
1 GHz = 1,000,000,000 Hz

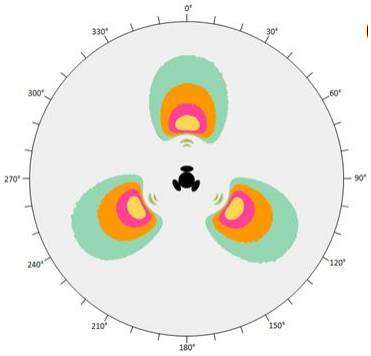
1 mWatt = 0.001 Watt

24

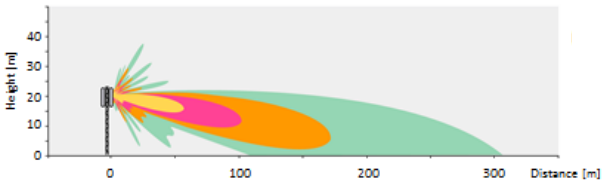
Commonly-Asked Questions

- What does an antenna do to a cellphone signal?
  - An antenna can focus signal energy in a particular direction, just like a flashlight can focus light in a particular direction; it enables the signal to be concentrated in the direction of the user
  - An antenna does not change the frequency or information contained in a signal

Example: top-view of 3 directional antennas (horizontal, or azimuthal, pattern)



Example: side-view of directional antenna (vertical, or elevation, pattern)



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Commonly-Asked Questions

- How does power density from an antenna vary with distance?
  - Power density varies as inverse square (Power Density = P_0/R^2)

As reference, assume power density at 1 meter is 1 mW/m^2

If phone is moved to a distance of 0.5 m, P = 4 mW/m^2

In this case, distance is equal to fabric thickness (0.2 mm), so P = > kW/m^2

Definitely not a good idea!

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What Power Density Is Needed for Cellphone Reception?

(calculated for highest required power density; 2100 MHz)

Notes:

1 µWatt = 1 micro-Watt
= 0.000001 Watt

1 nWatt = 1 nano-Watt
= 0.000000001 Watt

1 pWatt = 1 pico-Watt
= 0.000000000001 Watt

Great Signal (4 to 5 bars)
-50 to -79 dBm or 6.16 to 0.0078 µW/m^2 or one-millionth of FCC limit

Good Signal (3 to 4 bars)
-80 to -89 dBm or 6.16 to 0.775 nW/m^2 or one-billionth of FCC limit

Average Signal (2 to 3 bars)
-90 to -99 dBm or 616 to 77.5 pW/m^2 or 0.1 billionths of FCC limit

Poor Signal (1 to 2 bars)
-100 to -109 dBm or 61.6 to 7.75 pW/m^2 or 0.01 billionths of FCC limit

Very Poor Signal (0 to 1 bars)
-110 to -120 dBm or 6.16 to 0.775 pW/m^2 or one-trillionth of FCC limit

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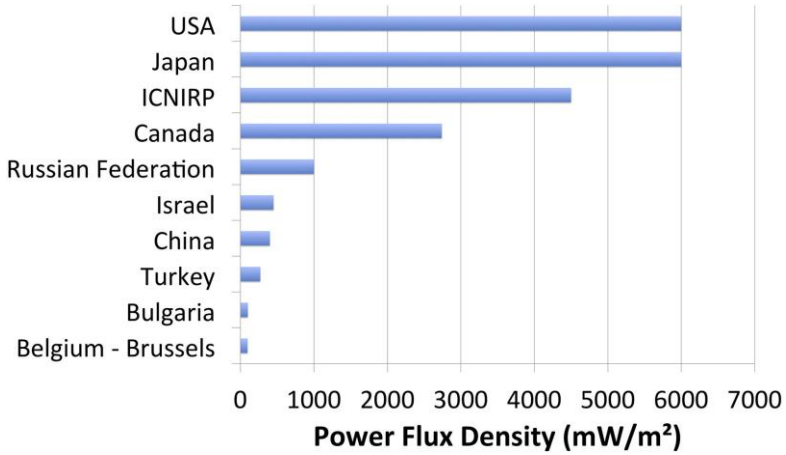
How Do FCC Limits Compare Internationally?



The above limits are for 900 MHz; USA limits increase to 10,000 mW/m^2 at higher frequencies. These limits do not consider modulation.

Frank M. Clegg, Margaret Sears, Margaret Friesen, Theodora Scarato, Rob Metzinger, Cindy Russell, Alex Stadtner, Anthony B. Miller, Building science and radiofrequency radiation: What makes smart and healthy buildings, Building and Environment, Volume 176, 2020, 106324, ISSN 0360-1323, https://doi.org/10.1016/j.buildenv.2019.106324

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Electromagnetic-Sensitivity Is recognized by the ADA

By the Center for Electrosmog Prevention, 2019

- The following ADA Accommodations Request Packet may be used by ES (electrosensitivity) sufferers to apply for reasonable accommodations to help avoid RF radiation from "small cells" and wifi *in public government areas*, related to accessibility or any other Title II application. "Title II of the Americans with Disabilities Act applies to State and Local Governments.

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Electromagnetic-Sensitivity Is Recognized by Medicare

Medicare Accepted ICD-10 codes

•Billable - W90.0XXA Exposure to radiofrequency, initial encounter
•Billable - W90.0XXD Exposure to radiofrequency, subsequent encounter
•Billable - W90.0XXS Exposure to radiofrequency, sequela
•Billable - W90.1XXA Exposure to infrared radiation, initial encounter
•Billable - W90.1XXD Exposure to infrared radiation, subsequent encounter
•Billable - W90.1XXS Exposure to infrared radiation, sequela
•Billable - W90.2XXA Exposure to laser radiation, initial encounter
•Billable - W90.2XXD Exposure to laser radiation, subsequent encounter
•Billable - W90.2XXS Exposure to laser radiation, sequela
•Billable - W90.8XXA Exposure to other nonionizing radiation, initial encounter
•Billable - W90.8XXD Exposure to other nonionizing radiation, subsequent encounter
•Billable - W90.8XXS Exposure to other nonionizing radiation, sequela

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Harvard Report Shows Wireless Industry Using a Playbook Similar to the One Used by Big Tobacco

- To ensure its access on Capitol Hill, the wireless industry made $26 million in campaign contributions in 2016, according to the Center for Responsive Politics, and spent $87 million on lobbying in 2017.
- The playbook's key insight is that an industry doesn't have to win the scientific argument about safety; it only has to keep the argument going.
  - As recently as 1998, even as evidence of tobacco toxicity grew overwhelming, cigarette maker Phillip Morris was writing newspaper advertorials insisting there was no proof smoking caused cancer: page 20 of Harvard Report

31

CTIA Sues Berkeley, CA Over Ordinance Requiring Retailers to Warn Cellphone Users

Berkeley Ordinance: "To assure safety, the Federal Government requires that cell phones meet radio frequency (RF) exposure guidelines. If you carry or use your phone in a pants or shirt pocket or tucked into a bra when the phone is ON and connected to a wireless network, you may exceed the federal guidelines for exposure to RF radiation. This potential harm is greater for children. Refer to the instructions in your phone or user manual for information about how to use your phone safely."

Similar information is contained in all cellphones or in their manuals
-For iPhone, go to Settings/General/Legal & Regulatory/RF Exposure

A federal judge ruled in favor of a wireless communication trade group five years after they claimed the city of Berkeley's law that required retailers to warn customers about cellphone radiation violated their First Amendment rights. *July, 26, 2021*

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Verizon Acknowledges the Risks of Wireless Radiation to its Shareholders

From page 17 of Verizon's 2022 10-K Report:

- "...our wireless business also faces personal injury and wrongful death lawsuits relating to alleged health effects of wireless phones or radio frequency transmitters. We may incur significant expenses in defending these lawsuits. In addition, we may be required to pay significant awards or settlements."

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"Doubt is our product since it is the best means of competing with the "body of fact" that exists in the minds of the general public. It is also the means of establishing a controversy." **Tobacco executive (22) in Doubt is Our Product by David Michaels**

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"Doubt is our product"

- Carlo's October 7, 1999, letters to wireless-industry CEOs are the smoking-gun equivalent of the November 12, 1982, memo that M.B. Glaser, Exxon's manager of environmental-affairs programs, sent to company executives explaining that burning oil, gas, and coal could raise global temperatures by a destabilizing 3 degrees Celsius by 2100. For the tobacco industry, Carlo's letters are akin to the 1969 proposal that a Brown & Williamson executive wrote for countering anti-tobacco advocates. "Doubt is our product," the memo declared. "It is also the means of establishing a controversy…at the public level."

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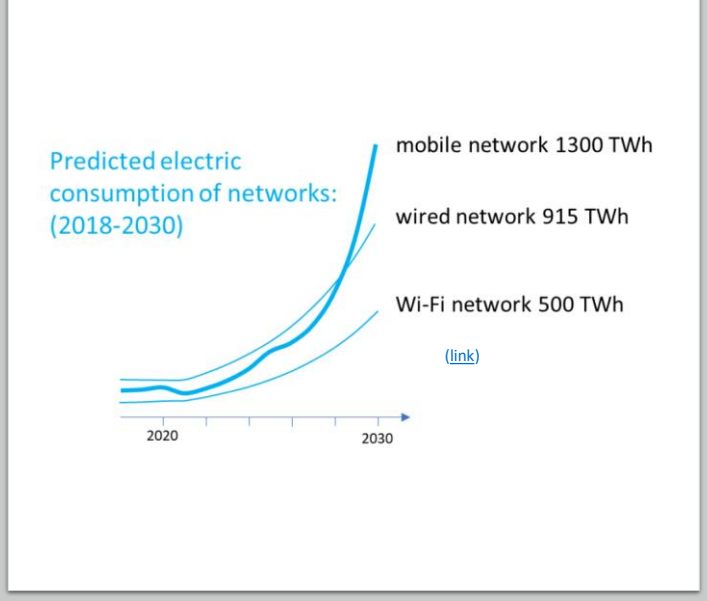
Wireless Communications in General, and 5G in Particular, Is Not "Green"

- The digital information-communication-technologies (ICT) industry already emits three percent of global greenhouse gases (GHGs), making its footprint much higher than aviation's two percent of global GHG emissions (link)
- 5G is "set to carry many more bits over more cell sites powered by energy-hungry Massive MIMO antennas, so 5G-era operators could face up to 2-3 times higher energy costs versus 4G" (link)



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Property Values Decrease near Cell Towers

- "Cellphone towers bring extra tax revenue and better reception to a section of the city, but many are skeptical because of the potential health risks and the impact on property values. Increasing numbers of people don't want to live near cell towers. In some areas with new towers, property values have decreased by up to 20%."
- "If your home is near a cell antenna, the value of your property is going down at least 4 percent. Depending on the size of the tower and the proximity, it is going down 10 percent." Andrew Campanelli
- *The Impact of Cell Phone Towers on House Prices in Residential Neighborhoods* study found that buyers would pay as much as 20 percent less, as determined at that time by an opinion survey in addition to a sales price analysis.

Note: the studies linked above are not from peer-reviewed journals

39

Article Title: Low intensity microwave radiation induced oxidative stress, inflammatory response and DNA damage in rat brains

Quote from article: "In conclusion, the present study suggests that low intensity microwave radiation induces oxidative stress, inflammatory response and DNA damage in the brain by exerting a frequency dependent effect."

Megha K, Deshmukh P, Banerjee B, et al., NeuroToxicology (2015) 51 158-165,

https://DOI: 10.1016/j.neuro.2015.10.009

40

Article Title: Exposure to non-ionizing electromagnetic fields emitted from mobile phones induced DNA damage in human ear canal hair follicle cells

Quote from article: "Results of the study showed that DNA damage indicators were higher in the RFR exposure groups than in the control subjects. In addition, DNA damage increased with the daily duration of exposure."

Mehmet Akdag, Suleyman Dasdag, Fazile Canturk & Mehmet Zulkuf Akdag (2018), Electromagnetic Biology and Medicine, 37:2, 66-75, DOI: 10.1080/15368378.2018.1463246

41

Article Title: Exposure to Global System for Mobile Communication (GSM) Cellular Phone Radiofrequency Alters Gene Expression, Proliferation, and Morphology of Human Skin Fibroblasts

Quote from article: "These findings show that these electromagnetic fields have significant biological effects on human skin fibroblasts."

Stefania Pacini, Marco Ruggiero, Iacopo Sardi, Stefano Aterini, Franca Gulisano, and Massimo Gulisano, Oncology Research, 2002, Vol. 13, pp. 19–24

DOI: 10.3727/096504002108747926

https://pubmed.ncbi.nlm.nih.gov/12201670/

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Article Title: Radiation and Male Fertility

Quote from article: "From currently available studies it is clear that radiofrequency electromagnetic fields (RF-EMF) have deleterious effects on sperm parameters (like sperm count, morphology, motility), affects the role of kinases in cellular metabolism and the endocrine system, and produces genotoxicity, genomic instability and oxidative stress."

Kesari et al., Reproductive Biology and Endocrinology https://doi.org/10.1186/s12958-018-0431-1, (2018)

43

Article Title: Association of Exposure to Radio-Frequency Electromagnetic Field Radiation (RF-EMFR) Generated by Mobile Phone Base Stations with Glycated Hemoglobin (HbA1c) and Risk of Type 2 Diabetes Mellitus

Quote from article: "The findings of this study show that the students who were exposed to high RF-EMF had significantly higher HbA1c than the students who were exposed to low RF-EMF."

Meo SA, Alsubaie Y, Almubarak Z, Almutawa H, AlQasem Y, Hasanato RM., *Int J Environ Res Public Health*. 2015;12(11):14519-14528, Nov 13, 2015 doi:10.3390/ijerph121114519

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4661664/

44

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https://www.sciencedirect.com/science/article/pii/S0048969716317375?casa_token=MQA3pRiHm0IAAAAA:Dyxz-gx8Lsdf2aWs9kbmQb7E8Hne11dbc_oUABdB8VgEsLGopSgtz7LubafACe_QQJAWy8RR7w

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