

An Invisible Threat: Wireless Radiation Levels Across Greater Hartford

April 2024

**GREATER HARTFORD COALITION FOR SAFE TECHNOLOGY
COMMUNITY ACTION WORKS**

Written by Rachael Stephens on behalf of the Greater Hartford Coalition for Safe Technology (GHC4ST) and with support from Community Action Works. Edited by members of GHC4ST's Steering Committee, particularly Eileen Noonan. Unless noted, design, graphics and photographs by Rachael Stephens.

GREATER HARTFORD
COALITION
FOR **SAFE** TECHNOLOGY

scan here!
(YES, WE RECOGNIZE
THE IRONY)



www.GHC4SafeTech.com



GREATER HARTFORD COALITION FOR **SAFE** TECHNOLOGY

Join our efforts to protect our communities from the health risks of wireless radiation.



www.GHC4SafeTech.com
info@ghc4safetech.com

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	
2. BACKGROUND	
2.1 PEER-REVIEWED SCIENTIFIC RESEARCH ON THE HEALTH RISKS OF WIRELESS RADIATION	7
2.2 WHY DO SOME SAY THERE’S “NO EVIDENCE” THAT TODAY’S RADIATION LEVELS ARE HARMFUL?.....	9
2.3 HOW MUCH RADIATION IS CONSIDERED SAFE? WHAT ARE THE FCC LIMITS?	12
2.4 ARE OTHER COUNTRIES FURTHER LIMITING WIRELESS RADIATION? WHY ISN’T THE FCC? ...	14
2.5 APPEALS FROM SCIENTISTS, DOCTORS, AND MEDICAL BOARDS FOR STRICTER RF LIMITS ..	16
2.6 IF LARGE CELL TOWERS ARE DANGEROUS, WHAT ABOUT “SMALL CELL DEVICES”?	18
2.7 “SAFE TECHNOLOGY” DOES NOT MEAN NO TECHNOLOGY.....	21
3. METHODS	
3.1 BACKGROUND RF MEASUREMENTS.....	24
3.2 ETHNOGRAPHIC METHODS OF PARTICIPANT OBSERVATION.....	26
4. RESULTS	
4.1 WIRELESS RADIATION LEVELS	27
<u>Table 4.1</u> RF level categories (for Safe and Sound Pro II Meter) for all locations	
<u>Table 4.2</u> Examples of “Maximum” and “Average” power densities,	
<u>Table 4.3</u> Distances to nearest macro tower for public spaces where the levels of wireless radiation exceeded a power density of 1,000 $\mu\text{W}/\text{m}^2$.	
<u>Table 4.4</u> Comparison of two school grounds in the suburban Town of Bloomfield, CT.	
<u>Table 4.5</u> Comparison of two school grounds in the suburban Town of Newington, CT.	
5. CONCLUSIONS	
5.1 GREATER HARTFORD’S INEQUITABLE DISTRIBUTION OF WIRELESS RADIATION.....	35
5.2 TELECOM. COMPANIES USE QUESTIONABLE FCC POLICIES TO BULLDOZE STATE & MUNICIPAL RIGHTS.....	36
5.3 DISCOURSES OF “DIGITAL EQUITY” OBSCURE HEALTH RISKS THAT EXACERBATE SOCIOECONOMIC INEQUITY.....	37
6. MOVING FORWARD	
6.1 WE NEED MUNICIPAL & STATE POLICIES TO PROTECT PUBLIC HEALTH.....	39
6.2 EXAMPLES OF POLICIES THAT PROTECT PUBLIC HEALTH	40
6.3 COUNTERING THE STIGMA	41
<u>Works Referenced</u>	

EXECUTIVE SUMMARY

Over the last few decades, wireless technologies – including cell towers, cell phones, Wi-Fi routers, Bluetooth- and WIFI-enabled devices, and more— have become almost ubiquitous. These technologies have saturated our communities in a dangerously invisible form of environmental pollution: wireless (or radiofrequency) radiation. **To highlight the distribution of this wireless radiation in our communities, our organization –Greater Hartford Coalition for Safe Technology—conducted preliminary measurements of the background radiation levels in more than 85 public spaces across 18 municipalities in Greater Hartford, Connecticut.** Our results were highly concerning, and we are calling for policies that better protect the public from these risks.

The rise in wireless radiation is a result of the transition to wireless technologies. As a society, we've done away with many of the wires and cables through which we used to send our messages. When we send our data through the air, those signals can 'bump' into our bodies, and there is increasing scientific evidence showing that it's can cause us harm.

People who warn about the health risks of wireless radiation are often dismissed as “crazy,” and that stigma helps hide a disturbing reality: hundreds of studies suggest that today’s average levels of wireless radiation exposure pose serious health risks (Havas 2013, Pall 2018), *especially* for children (Moon 2020; Morgan et al. 2014; Fernández et al 2018), including increased risks of:

- **cancer & DNA damage** (TP 2018a; NTP 2018b; Falcioni et al 2018);
- **cardiovascular problems** (Saili et al. 2015);
- **neurological, cognitive, and behavioral difficulties** (Pikov et al. 2010; Pakhom et al 1997; Jiang et al. 2024; Zwamborn et al. 2003; Wang et al. 2023; Aldad et al. 2012)
- **fetal maldevelopment and reproductive problems like decreased fertility** (Kesari and Behari 2010; Rago et al. 2013; Baste et al. 2012; Türedi Et al 2014; Aldad et al. 2012)

Thousands of researchers and medical practitioners have called on government officials to protect the public from the dangers of wireless radiation. Legislators in other countries — including Italy, Turkey, Israel, Bulgaria, Switzerland, Chile, France, Greece, and Croatia—have restricted wireless technologies from “sensitive areas” where people spend long amounts of time, including schools, senior centers, parks, and residential areas (Stam 2018). But in the United States, the FCC has maintained “safety” standards that do more to protect telecommunications companies' profits than to protect public health. A [recent Harvard report](#) suggests that the FCC is a “captured agency,” meaning it is “dominated by the industries it presumably regulates” (Alster 2015). In fact, in 2021, a federal court ruled that the FCC failed to adequately respond to “evidence that exposure to radiofrequency radiation at levels below the Commission’s current limits may cause negative health effects.”¹ This is why organizations like the *European Academy for Environmental Medicine* (2016), *Institute of Building Biology* (2008), *BioInitiative Working Group* (2014), and many others are advocating for precautionary guidelines that limit radiation levels to between .1-10 $\mu\text{W}/\text{m}^2$. But while the FCC is being challenged on the *federal* level, telecommunications companies are pressuring *municipal* governments to fast-track the deployment of wireless technologies, including relatively untested 5G technologies. Some

¹ *Environmental Health Trust v. Federal Communications Commission, no. 20-1025 (D.C. Cir. 2021)*. Justia Law. (2021). <https://law.justia.com/cases/federal/appellate-courts/cadc/20-1025/20-1025-2021-08-13.html>

municipalities have tried to pause 5G deployment until there is sufficient evidence of its safety, but telecommunications companies use threats of expensive lawsuits, accusations of “pseudo-science,” promises of “digital equity,” and more to “bulldoze” their resistance (NATO 2021).

As cell towers and antennas are being installed everywhere, our children are facing a particular risk. Children are more vulnerable to wireless radiation, and many are spending 40 hours a week in schools with countless wireless technologies inside the schools *and* with cell towers on or near school grounds. This presents significant health risks for students and educators, including cognitive and behavioral challenges that could threaten academic performance, socio-emotional development, and fertility (Moon 2020; Morgan, Kesari & Davis 2014; Fernández et al 2018). While the radiation produced *inside* public spaces is undeniably important, we chose to first focus on the radiation produced *outside* these spaces. This allowed us to examine how the placement of cell towers relates to background radiation levels. We conducted measurements of the background radiation levels in more than 85 public spaces across 16 municipalities in Greater Hartford. To illuminate some of the political and social dynamics that maintain the distribution of wireless radiation, we complemented these measurements with over 12 months of ethnographic methods of participant observation focused on GHC4ST’s community work. Our measurements and observations are offered as informal, preliminary data gathered by lay people who are trying to illustrate the need for more careful measurement, mitigation, and prevention.

Our RF (radiofrequency) radiation measurements show that:

- Almost all municipalities in Greater Hartford have at least some neighborhoods where background radiation levels are *at least* 10x higher than precautionary guidelines.
- 90% of the public spaces where we conducted measurements had background radiation levels higher than precautionary guidelines, often hundreds of times higher.
- Of the 24 public spaces that consistently exceeded 1,000 $\mu\text{W}/\text{m}^2$ (“Extreme”), at least 22 are within 0.4 mile (~2,000 ft.) of a cell tower.
- “Extreme” and “High” radiation levels were most densely concentrated in urban areas.

Ethnographic methods suggest:

- Telecommunications companies are using questionable FCC Declarations to bulldoze state and municipal rights.
- Discourses of “digital equity” are framing the deployment of wireless technologies as imperative for closing the “digital divide.” This narrative can obscure the health risks of wireless technologies and thus, further entrench existing socioeconomic inequities.
- As wireless radiation levels are increasing in almost *all* communities, including comparatively wealthy suburban towns, the issue of wireless radiation offers a unique opportunity to organize *across* socio-economic divides to protect *all* communities.

We consider our region’s levels of radiation to be an unacceptable risk. **Our coalition is advocating for state and local legislation that prohibits the installation of cell towers and other wireless technologies within at least 1,500-3,000 feet of “sensitive areas” like schools, senior centers, and residences.**² We sincerely hope you will join us in these efforts.

² Researchers suggest at least 1640 ft (500 meters; 0.3 mile) setbacks from schools (Balmori 2022; Pearce 2020), but our data suggests this might not be enough. Towns like Shelbourne, MA have instead selected 3,000 ft (0.5 mile).

BACKGROUND RADIATION LEVELS ACROSS GREATER HARTFORD

These measurements represent a rough approximation of background radiation outdoors. They were taken April 2023–March 2024 with the Safe & Sound Pro II OUTSIDE main entrances (unless noted). They do not reflect radiation levels inside the buildings, which is also critically important. See website for more details.

Bloomfield	RF Level
Bloomfield High	High
Metacomet Elem.	Slight

Bolton	RF Level
Bentley Mem. Library	Slight
Bolton Center	Slight
Bolton High	Slight
Bolton Senior Center	Slight
Herrick Park	Slight
Town Hall	Moderate

Berlin	RF Level
Mary Griswold	Moderate
Richard Hubbard	Moderate

East Hartford	RF Level
Great River Park	Extreme
CREC Acad. of Comp. Sci. & Eng.	High
Sunset Ridge Middle	High
Police Station/Wickham Library	High
Raymond Library	Extreme
Shea Park	Mod/High
Silver Lane Elem.	Moderate

Farmington	RF Level
Farmington High	Extreme

Glastonbury	RF Level
Glastonbury High, Front Entrance	Mod/High
Glastonbury High, Playing Fields	High/Ext.
Riverfront Park	Moderate
Police Station	Extreme
Senior Center (Eastern Entrance)	Moderate
Senior Center (Southern Entrance)	Extreme
Skate Park	Extreme
Town Hall	Extreme

Hartford	RF Level
Annie Fisher Mont./STEM	High
Betances	Mod/High
Breakthrough (North)	High/Ext.
Bulkeley North & South	Mod/High
Burns Latino	High
Classical Magnet	High
Colt Park	High/Ext.
Eliz. Park (Sun. Overlook)	High
GH Acad. of the Arts	Extreme
Hartford City Hall	Extreme
Hartford Public High	High
Jumoke(JAH-HC)	Extreme
Keney Park, Ridgefield	Extreme
Keeney Park, Disc Golf	High
Kinsella Magnet	High
North End Senior Center	High
Prince Tech High	High
Public Library, Albany	Mod/High
Pub. Library, Asylum Ave	Extreme
Rocky Ridge Park	Extreme
South End Senior Center	Extreme
Sports & Med. Sci.	Extreme
Thomas J. Hyland Park	High/Ext.
Weaver High	High
West Middle	Extreme

Manchester	RF Level
Arthur Illing Middle	Extreme
Case Mountain Park	Moderate
Highland Middle	Mod/High
Manchester High	Extreme
Senior Center	Moderate

New Britain	RF Level
Chamberlin Elem.	High
New Britain High	High/Ext.
Northend Elem.	Moderate
Roosevelt Campus	High/Ext.

Newington	RF Level
Elizabeth Green Elem.	Moderate
Martin Kellogg Mid.	Moderate
Newington High	Extreme

Simsbury	RF Level
Simsbury High	Moderate

South Windsor	RF Level
Major M. Donnelly Land Preserve	Moderate
SW High	High

Tolland	RF Level
Tolland High	Extreme
Tolland Middle	Slight/Mod.

Vernon	RF Level
Vernon Senior Center	Extreme

Wethersfield	RF Level
Samuel W. Elem.	Moderate

West Hartford	RF Level
Bristow Middle	Moderate
Charter Oak Int'l	High
Conard High	High
Duffy Middle	Moderate
Elizabeth Park, Rose Garden	Moderate
Morley	Slight/Mod
Noah Webster Library	Extreme
Senior Center	Extreme
Westmoor Park	Moderate
Sedgwick Middle	High/Ext.
Whiting Lane Elem.	High
Wolcott Elem.	Moderate
Webster Hill	Moderate

Willington	RF Level
Hall School	Slight/Mod

Windsor	RF Level
JFK Middle	High
John Fitch Park	Extreme
Sage Park Mid.	High/Ext.
Windsor High	High/Ext.

HOW MUCH RADIATION IS "SAFE"?

The FCC considers wireless radiation (1800 MHz) "safe" up to 10,000,000 $\mu\text{W}/\text{m}^2$. This is based on only 30 min. of exposure for an average-sized adult. Experts are calling for "biologically-based public exposure standards" [vii]. The *European Academy for Environ. Med.* and the *Institute of Building Biology* recommend below 1 $\mu\text{W}/\text{m}^2$ or 0.1-10 $\mu\text{W}/\text{m}^2$, respectively.

Power Density ($\mu\text{W}/\text{m}^2$)	Institute of Building Biology guidelines (long-term exposure)
Slight < .1	No Concern
Slight .1-10	Slight Concern
Moderate 10-100	Severe Concern
High 100-1000	Severe Concern
Extreme > 1000	Extreme Concern

2. BACKGROUND

2.1 PEER-REVIEWED SCIENTIFIC RESEARCH ON THE HEALTH RISKS OF WIRELESS RADIATION

Studies show that **today's average levels of wireless radiation exposure pose serious health risks, especially for children**, including increased risks of:

- **cancer & DNA damage**
 - A two-year study conducted via the National Toxicology Program (an interagency program supported by the NIH, CDC, and FDA) found an association between high exposure to wireless radiation and **tumors in the heart and brain** (NTP 2018; rats, in vivo, experimental study), as well as **DNA damage in the brain and blood cell** (Smith-Roe et al. 2020; rats/mice, in vivo, experimental study).
 - The Ramazzini Institute further verified these risks (Falcioni et al 2018; rats, in vivo, experimental study).
- **cognitive impairment, neuropsychiatric or emotional & behavioral changes, learning, memory and attention issues**
 - increased risk of cognitive challenges including reductions in **memory speed, reaction time, and alertness** (Zwamborn et al. 2003; TNO Study; human, in vivo, experimental study)
 - “in-utero radiofrequency exposure from cellular telephones [not smartphones, which emit more radiation] does affect adult behavior. Mice exposed in-utero were **hyperactive and had impaired memory...**” (Aldad, Gan, Gao, & Taylor 2012; mice, in vivo, experimental study)
 - “long-term microwave exposure could lead to different degrees of **spatial learning and memory impairment**, EEG disturbance, ...” (Wang et al 2023; rats, in vivo, experimental)
 - “cumulative and transient impairments in spatial and non-spatial **memory**” (Ntzouni et al. 2010; mice, in vivo, experimental study)
 - “even at low power levels, MMWs were able to produce considerable changes in neuronal firing rate and plasma membrane properties” (Pikov et al 2010; in vitro, experimental)
- **fetal maldevelopment, decreased fertility, endocrine imbalances, decreased reproductive health**
 - keeping cell phone in a pants pocket is associated with a “higher percentage of **sperm DNA fragmentation**” (Rago et al 2013, human, in vivo, experimental study)
 - “Mice exposed [to radiofrequency radiation from cell phones] in-utero were **hyperactive and had impaired memory...**” (Aldad, Gan, Gao, & Taylor 2012; mice, in vivo, experimental study)
 - “increased risk of aneuploidy [abnormal number of chromosomes]” (Korenstein-Ilan et al 2008; cells in culture, in vitro, experimental study); aneuploidy is a leading cause of **genetic disorders** including genetically caused **miscarriages and congenital birth defects** (Hassold et al. 2007)

- increased risk of **infertility** (Kesari and Behari 2010; rats, in vivo, experimental study) (Baste, Riise, and Moen 2008; human, in vivo, epidemiological study)
- potential association between parental exposure and an increased risk for **congenital birth defects** and having children that are **stillborn** (Mageroy et al 2006; human, in vivo, epidemiological study)
- “exposure to EMF in the **prenatal** period causes oxidative stress and histopathological changes in male rat pup **heart** tissue” (Türedi et al. 2015, rats, in vivo, experimental study)
- **cardiovascular complications including heart problems and elevated blood pressure**
 - acute exposure to WIFI can “affect heart rhythm, blood pressure, and catecholamines efficacy on cardiovascular system...” (Sail et al. 2015; rabbit, in vivo, experimental study)

Importantly, these health risks are non-thermal (Pakhomov et al. 1997abc) and that the mechanism of harm is related to the role of long-term exposure in causing oxidative stress (Sarimov, Malmgren, Markova, Persson, and Belyaev 2004; cells in culture, in vitro, experimental study; Marconi et al. 2015; human, in vivo, experimental study). **This means that the FCC’s technique for measuring health risks in terms of *short-term, thermal damage* is not addressing the problem.**

All the studies referenced above are:

- experimental or epidemiological studies (not meta-reviews or case studies)
- published in well-respected, peer-reviewed scientific journals
- conducted by teams with at least 1 PhD in physics, biology, toxicology, etc.

Each of these studies is available on our website (www.ghc4st.com), where you can also find information about authors’ affiliations/credentials, study funding, and how other scientists reviewed them, and more.

These and other risks have led well-respected experts to assert the following:

- **“The U.S. Government is not protecting us.** The radiation exposure guidelines of the FCC do not protect us because they are outdated and based on a false assumption.”³
 - Dr. Ronald Powell (Ph.D., Applied Physics, Harvard University, 1975), retired Government scientist who worked for the Executive Office of the President of the United States, the National Science Foundation (NSF), and the National Institute of Standards and Technology
- **“Wireless radiation is the new tobacco.** Anyone sincerely reading the science should be deeply, deeply concerned.”
 - Dr. Damien Downing – President of The British Society for Ecological Medicine

Helpful meta-reviews from well-regarded researchers:

³ Power, Ronald. “The Health Argument Against Cell Phones and Cell Towers.” October 30, 2017. Accessed via <https://ehtrust.org/wp-content/uploads/Doctors-Letters-on-Cell-Towers-and-Cell-Towers-at-Schools.pdf>

- After reviewing 1000 recent peer-reviewed scientific studies, the BioInitiative Working Group (2022)—comprised by an international team of researchers and medical doctors, including 21 with PhDs, 10 with MDs, and 3 prior presidents of the Bioelectromagnetics Society—categorized the studies by kind of effect (Oxidative damage, Genetic effects, Neurological Effects) and distinguished between those that showed an effect of RF and those that didn't show an effect (on the specific aspect of health being tested in that study and at a certain frequency/power density/modulation that they used). The BioInitiative Working Group (2022) found that 68-91% of the studies showed that RF radiation had a negative effect on health.⁴
- Also see:
 - Havas M (PhD). (2013). Radiation from wireless technology affects the blood, the heart, and the autonomic nervous system. *Review of Environmental Health*. 2013; 28(2-3):75-84. doi: 10.1515/reveh-2013-0004. PMID: 24192494. https://www.researchgate.net/publication/258313941_Radiation_from_wireless_technology_affects_the_blood_the_heart_and_the_autonomic_nervous_system1
 - Moon JH (MD, PhD). Health effects of electromagnetic fields on children. *Clinical Experiments in Pediatrics*. 2020 Nov; 63(11): 422–428. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7642138/>

2.2 THEN WHY DO OTHERS SAY THERE IS NO “SCIENTIFIC EVIDENCE” THAT TODAY’S LEVELS OF WIRELESS RADIATION CAN POSE HEALTH RISKS?

In the previous section, we referenced dozens of peer-reviewed scientific papers (from well-respected journals) that suggest that today’s average levels of wireless radiation pose significant health risks. Nonetheless, we want to be transparent: we could also curate a list of dozens of peer-reviewed scientific papers (also from well-respected journals) that *seem* to suggest the opposite. Indeed, a quick internet search will likely offer a maddening array of jargon-filled claims that amount to two *seemingly* incompatible facts:

There is scientific evidence that wireless radiation from today’s everyday technologies is harmful.

There is scientific evidence that wireless radiation from today’s everyday technologies is not harmful.

How can we make sense of these seemingly contradictory claims?

To do so, it is helpful to consider the following:

⁴ See <https://bioinitiative.org/research-summaries/>

Oxidative Damage Studies: 91% of 288 total studies showed an effect

Genetic Effects Studies: 68% of 423 total studies showed an effect

Neurological Studies Effects: 74% of 391 total studies

(1) Even an alleged “lack of evidence” does *not* “prove” a lack of potential harm.

- a. Many studies have shown that an independent variable (particular frequencies of wireless radiation, at certain power densities, applied in specific ways) does not affect the dependent variable (whatever particular element of health the experiment happens to be testing). This does *not*, however, prove that wireless radiation cannot harm health, it simply means it didn’t produce risks in that specific way. Suggesting otherwise would assume that scientists are able to both predict *and* reliably measure all the potential ways a variable can harm biology—this is the difficulty of “proving” safety, especially when the list of “unknown unknowns” is nearly infinite.
- b. Importantly, since the health risks of RF are non-thermal (Pakhomov et al. 1997abc), the FCC’s technique for measuring health risks in terms of *thermal damage* (SAR) is simply not addressing the problem. This would be akin to showing that cigarettes don’t immediately cause skin cancer and never testing if they cause lung cancer.

(2) Funding sources significantly bias the research

- a. Recent meta-reviews have revealed that funding source has a significant correlation with study outcomes:
 - i. In their analysis of 59 experimental studies on RF and health, Huss et al. (2007) found that **industry-funded studies are two and a half times less likely to find a health effect of wireless radiation** (Huss et al. 2023). Huss et al. add: “We found that the source of funding explains some of the heterogeneity in the results from different studies... Our study indicates that the interpretation of the results from existing and future studies of the health effects of radiofrequency radiation should take sponsorship into account.”
 - ii. “Our findings add to the existing evidence that single-source sponsorship is associated with outcomes that favor the sponsors’ products ([Bekelman et al. 2003](#); [Davidson 1986](#); [Lexchin et al. 2003](#); [Stelfox et al. 1998](#))... The influence of the tobacco industry on the research it funded has also been investigated ([Barnes and Bero 1996, 1998](#); [Bero 2005](#)).”
- b. In their analysis of mmWave studies exclusively, McCredden (2023) found that **industry-funded studies were 1.5 times less likely to report an effect of RF wireless radiation**

(3) Studies suggest that different people respond differently to RF exposure

- c. Studies suggest that many of the biological responses to RF are frequency dependent (Pakhomov et al. 1997, Markovà 2005, Sarimov et al. 2004) and also “dependen[t] on several genetic, physiological, and physical variables” (Belyaev et al. 2000). This can help explain some of the varied experimental results.

(4) According to numerous meta-reviews (Pinto et al. 2023; Schmiedchen et al. 2019; Karipidis et al. 2021, Huss et al. 2007) many of the experimental studies on wireless radiation are relatively weak, meaning they rely on research designs that do not

properly control for experimental variables or sufficiently protect against bias. This is likely because:

- d. Studying the impacts of wireless radiation on humans requires expertise in both: (a) radiation, dosimetry, biophysics, engineering, and (b), biology, medicine, and epidemiology. Unfortunately, however, research teams often focus on a few of these varied fields. Reading the critical meta-reviews and responses, one will quickly see a pattern where: (a) teams more focused on physics/engineering find flaws in the methods (often the dosimetry) of experiments done by the biologists/medical doctors, and (b) teams more focused on biology/medicine/epidemiology find flaws in the experimental design and analyses of the studies conducted by physicists, engineers, etc.
- e. Many of the studies reviewed in these meta-analyses were downgraded for “poor dosimetry.” Dosimetry is the “science of determining the dose [of radiation] and dose distribution absorbed” (<https://www.sciencedirect.com/topics/medicine-and-dentistry/dosimetry>). According to Foster, Ziskin, and Balzano (2022), there are “major uncertainties in dosimetric modeling/exposure assessment” that are “likely to be related to the inherent variability in real-world exposures.” These authors call for “raising the quality of dosimetry in many RF bioeffects studies” and also advocate for “developing improved exposure/dosimetric techniques for the higher microwave frequencies to be used by forthcoming communications technologies” (Foster, Ziskin & Balzano 2022).

(5) A lack of agreement on what counts as “scientific evidence”

- f. On many websites on either side of this debate, authors will cite numerous published articles as examples of “scientific evidence.” But a mere list of publications can often obscure more than it reveals. Meta-reviews and case reports are not the same as randomized, controlled, and repeatable experimental studies. Similarly, rodent studies and in vitro experiments cannot be automatically applied to human contexts.

(6) Complexity regarding the *kind* of wireless radiation

- g. There are countless variables: frequency, power density, duration/application, modulation, etc. ...it’s enough to make anyone’s head spin, and at the very least, leaves a lot of room for error and potentially, for deception, too.

These facts help explain why experts on both sides of this issue that take such different stances. In reflecting on the *seemingly* contradictory research, McCredden et al. (2023) suggest that the existing research can be summarized with two conclusions:

“For scientists, the understanding of how mmWaves [used in newer technologies like 5G] affect biological systems is still in its early stages, thus there is an urgent need for further focused research;

For policy makers, there is enough smoke to suggest the risk of fire, and therefore there is an urgent need for protective policy.”

(McCredden et al., 2023)

2.3 HOW MUCH RADIATION IS CONSIDERED SAFE? WHAT ARE THE FCC LIMITS?

Levels of wireless radiation are increasing rapidly.⁵ When it comes to determining “safety,” the peer-reviewed research and the federal government are not aligned. To understand their divergences, it’s helpful to ask whom – or what—they are trying to keep “safe.”

When asking what is *safe for children* and other vulnerable populations for long-term exposure, scientific evidence suggests staying under: < 0.1-10 $\mu\text{W}/\text{m}^2$.

After reviewing hundreds of peer-reviewed research studies, the Bioinitiative Working Group established a “scientific benchmark of 30 $\mu\text{W}/\text{m}^2$ (or 0.003 $\mu\text{W}/\text{cm}^2$) for the ‘lowest observed effect level’ for RF radiation”.⁶ Since many of these studies do *not* account for long-term or chronic exposure and focus largely on adults rather than children, the Bioinitiative Working Group reduced this level of radiation ten-fold to 3 $\mu\text{W}/\text{m}^2$ (or 0.0003 $\mu\text{W}/\text{cm}^2$) “as a reasonable, precautionary action level for chronic exposure to pulsed RFR.” It refers to this threshold as a “Biologically-based Public Exposure Standard” for long-term exposure.⁷

Based on the precautionary principle, other international organizations have established similar guidelines:

The *European Academy for Environmental Medicine* (2016) recommends:

below 1 $\mu\text{W}/\text{m}^2$ (microwatts per square meter)

The *Institute of Building Biology* (2008) recommends:

below .1-10 $\mu\text{W}/\text{m}^2$ (microwatts per square meter)

Following these guidelines, GHC4ST would like to see all schools in Greater Hartford in what we call the “green zone”—the “slight” category on the Safe & Sound Pro II RF Meter which corresponds with < 0.1-10 $\mu\text{W}/\text{m}^2$.

⁵ In the 1990s, the radiofrequency radiation levels in US cities and suburbs hovered around 30 $\mu\text{W}/\text{m}^2$ (Mantiply et al., 1997). In our measurements, all but two towns – Bolton and Willington—had background radiation levels in at least one area that exceeded 100 $\mu\text{W}/\text{m}^2$ (a more than 3-fold or 233% increase).

⁶ Peer-reviewed, *in vitro* research studies show *short-term* exposures to wireless radiation at 8,000-300,000 $\mu\text{W}/\text{m}^2$ (Pikov et al. 2010; Pakhomov et al. 1997; Korenstein-Ilan et al. 2008; Shckorbatov et al. 2009) or even well below .0001 $\mu\text{W}/\text{m}^2$ can cause biological harm (Belyaev et al. 1994; Belyaev et al. 1996). After reviewing hundreds of studies, the interdisciplinary BioInitiative Working Group (2012) established a “scientific benchmark of 30 $\mu\text{W}/\text{m}^2$ for the ‘lowest observed effect level’ for RF radiation.” The variance in these levels is likely due to differences in *in vitro* results (e.g., on cell cultures) compared to *in vivo* results, as well as the fact that many of the biological responses to RF are frequency dependent (Pakhomov et al. 1997, Markovà 2005, Sarimov et al. 2004) and also “dependen[t] on several genetic, physiological, and physical variables” (Belyaev et al. 2000).

⁷ “Summary for the Public (2014 Supplement). Bioinitiative Working Group. https://bioinitiative.org/wp-content/uploads/pdfs/sec01_2012_summary_for_public.pdf

When asking what is *safe for telecommunications' profits*, the answer is likely equivalent to the FCC's current limit.

The FCC states that wireless radiation (at 1800 MHz) is "safe":
below 10,000,000 $\mu\text{W}/\text{m}^2$ (microwatts per square meter)

The FCC's determination—first established in 1996—is based on *thermal damage of only 40 minutes of exposure for an average-sized adult*. This focuses on thermal damage (SAR or “specific absorption rate”) during short-term exposures. The FCC limits, therefore, fail to account for recent research which shows that many of the most damaging health impacts are non-thermal (Pakhomov et al. 1997abc).

On August 13, 2021, the U.S. Court of Appeals determined that the FCC was in violation of the Administrative Procedure Act for failing to respond to “evidence that exposure to RF radiation at levels below the Commission’s current limits may cause negative health effects.”⁸ This ruling came out of the *Environmental Health Trust et al. v. the Federal Communications Commission (FCC)* case and was a response to the FCC’s 2019 decision not to update its 1996 exposure limits to account for more recent research. The federal court ruled that the FCC failed to address:

- the impacts of long-term wireless exposure,
- the unique impacts to children,
- the testimony of people injured by wireless radiation,
- the impacts to wildlife and the environment, and
- the impacts to the developing brain and reproduction.

In reflecting on these FCC policies, even those who we might expect to be supportive of the FCC are expressing concerns. For instance, Dr. Joshua Pearce, an academic with a PhD in engineering who owns stock in the American Tower Corporation, recently published a scientific paper (2020) that warns cell phone tower firms from “the failed paths of other industries that have caused unintended human harm (e.g. tobacco).” Pearce describes the current FCC policy as follows:

“Current U.S. law has created a somewhat **peculiar overriding federal preemption that precludes taking the ‘environmental effects’ of RFR into consideration** in cell tower siting (see Section 704 of The Telecommunications Act of 1996). The current, U.S. standards are based solely on thermal effects (which do not appear to be a problem) and thus do not mitigate against non-thermal effects (for which there is a growing litany of concern in the medical/scientific community)... ” (Pearce 2020).

In this sense, highly renowned and respected members of the legal and the scientific communities have challenged the assumption that the FCC limits serve to keep the public safe.

⁸ *Environmental Health Trust v. Federal Communications Commission*, no. 20-1025 (D.C. Cir. 2021). Justia Law. (n.d.). <https://law.justia.com/cases/federal/appellate-courts/cadc/20-1025/20-1025-2021-08-13.html>

2.4 ARE OTHER COUNTRIES FURTHER LIMITING WIRELESS RADIATION? IF SO, WHY ISN'T THE FCC?

In other countries, regulatory agencies have established far more rigorous restrictions for wireless technologies, particularly for “sensitive areas” where people spend more than about 4 hours (e.g., schools, hospitals, residences, senior centers, etc.).

As of 2017, the following countries have RF (radiofrequency) exposure limits (for 1800 MHz) that are *at least* 45% lower (typically more than 90% lower) than the U.S.’s current RF limits (10 W/m² or 10,000,000 μW/m²) for *all* areas of society, including but not limited to “sensitive areas” like schools, hospitals, and residential areas⁹:

- Bulgaria (0.1 W/m² or 100,000 μW/m²)
- India (0.9 W/m² or 900,000 μW/m²)
- Lithuania (0.9 W/m² or 900,000 μW/m²)
- Slovenia (0.9 W/m² or 900,000 μW/m²)

As of 2017, the following countries have RF exposure limits that are *at least* 50% lower than the U.S.’s current RF limits for “sensitive areas” like schools, hospitals, and residential areas¹⁰:

- Croatia (1.4 W/m² or 1,400,000 μW/m²)
- Greece (5.4 W/m² or 5,400,000 μW/m²)
- Italy (0.1 W/m² or 100,000 μW/m²)

The following countries have “setback restrictions” that prohibit the installation of wireless infrastructure on or near “sensitive areas” like schools, hospitals, and residential areas¹¹:

- Chile
- Lithuania
- Bangladesh
- Israel
- Greece

⁹ Stam, R. (2018, January). *Comparison of international policies on electromagnetic fields*. National Institute for Public Health and the Environment. <https://www.rivm.nl/sites/default/files/2018-11/Comparison%20of%20international%20policies%20on%20electromagnetic%20fields%202018.pdf>

¹⁰ Stam, R. (2018, January). *Comparison of international policies on electromagnetic fields*. National Institute for Public Health and the Environment. <https://www.rivm.nl/sites/default/files/2018-11/Comparison%20of%20international%20policies%20on%20electromagnetic%20fields%202018.pdf>

¹¹ “5G, Cell Towers, and Small Cells.” Environmental Health Trust. <https://ehtrust.org/wp-content/uploads/5G-Cell-Towers-Near-Schools-Children-Scientific-Research-Liability-Briefing-1-1.pdf> and Silva, A. “New Communications antenna law in Chile.” Newsletter of the International Car Association Legal Practice Division Vol 20, Issue 2 1. April 2013. [https://www.carey.cl/wp-content/uploads/filebase/newsalert/Communications%20Law%20\(April%202013\).pdf](https://www.carey.cl/wp-content/uploads/filebase/newsalert/Communications%20Law%20(April%202013).pdf)

Wi-Fi or cell phones banned or limited in (some) schools (typically nurseries, kindergartens, or elementary schools)¹²:

- Israel
- France¹³
- Belgium
- French Polynesia
- Cyprus
- Spain

In the United States, however, the FCC sets "safety" standards that protect telecommunications companies' profits over public health (Alster 2015¹⁴). A recent study published via Harvard's Center for Ethics argues that the FCC is a "captured agency," meaning it is "dominated by the industries it presumably regulates" (Alster 2015). One small illustration of how the FCC has been "captured" by telecommunications companies is that in 2013, President Obama appointed Thomas Wheeler—then the head of the CTIA, the major lobbying organization for the wireless industries—as the Chairman of the FCC.

¹² "What's happening internationally." Environmental Health Trust. <https://ehtrust.org/policy/international-policy-actions-on-wireless/>

¹³ Connexion. (2017, February 17). *France bans WIFI in nurseries*. <https://www.connexionfrance.com>. <https://www.connexionfrance.com/article/French-news/France-bans-Wifi-in-nurseries>

¹⁴ Alster, N. (2015). *Captured Agency: How the Federal Communications Commission is Dominated by the Industries It Presumably Regulates*. Edmond J. Safra Center for Ethics, Harvard University. https://ethics.harvard.edu/files/center-for-ethics/files/capturedagency_alster.pdf

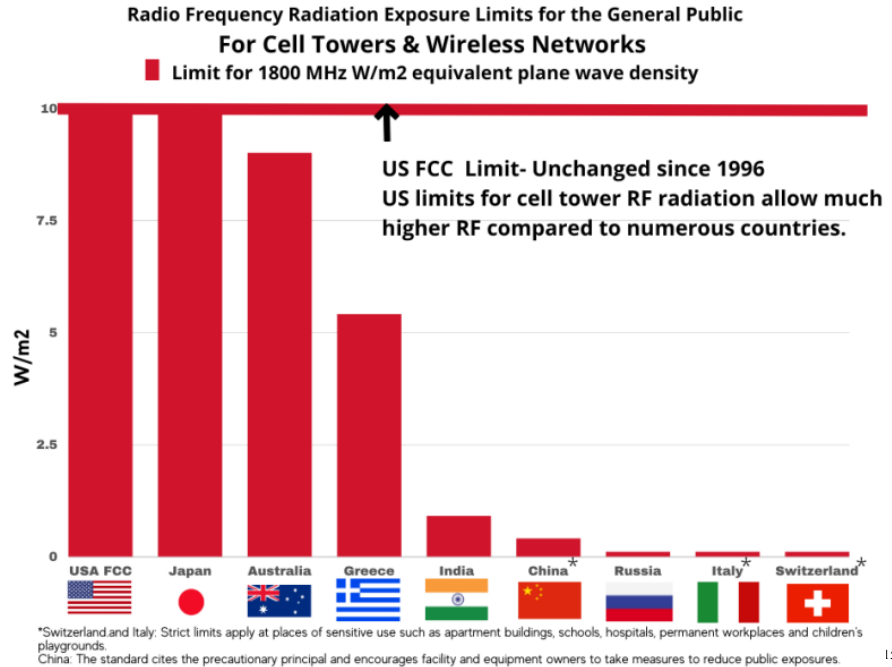


Image courtesy of Environmental Health Trust.

2.5 APPEALS FROM SCIENTISTS, DOCTORS, AND MEDICAL BOARDS FOR STRICTER RF LIMITS

Hundreds of researchers, medical practitioners, policy makers, and international organizations are calling on government officials to better protect the public from the dangers of wireless radiation:

- 2023 International EMF Scientist Appeal <https://emfscientist.org/>
 - Launched in 2015, Revised in 2023
 - As of July 14, 2023, **259 scientists** from 44 nations had signed this appeal to UN and WHO officials, calling for protection from non-ionizing electromagnetic field exposure.
- 2020 Consensus Statement of UK and International Medical and Scientific Experts and Practitioners on Health Effects of Non-Ionizing Radiation (NIR) <https://phiremedical.org/2020-nir-consensus-statement-signatories/>
 - Signed by over **250 individual medical practitioners and researchers** as well as by organizations representing over **4,000 medical practitioners and scientists** (e.g., American Academy of Environmental Medicine, British Society for Ecological Medicine, European Academy for Environmental Medicine)

¹⁵ “What’s Happening Internationally?.” Environmental Health Trust. Accessed 1/24/24. <https://ehtrust.org/policy/international-policy-actions-on-wireless/>

- “Declares current safety levels to be inadequate and highlights some of the disease processes linked with NIR exposure in peer-reviewed publications; it points out the vulnerabilities of children¹⁰ and other hypersensitive groups, whose symptoms may include sleep problems, impaired concentration, headaches, and mood disturbance;¹¹ it also highlights the contravention of Human Rights and Equalities acts and requests urgent responses from governments and health authorities to halt further deployment of emitting technology and address current public health failures.”¹⁶
- 2017 5G Appeal <https://www.5gappeal.eu/the-5g-appeal/>
 - Launched September 13, 2017 . Recommends “a moratorium on the roll-out of the fifth generation, 5G, for telecommunication until potential hazards for human health and the environment have been fully investigated by scientists independent from industry.”
 - As of August 26, 2023 there are **433 signatories (all doctors and scientists)**
- 2012 American Academy of Pediatrics Letter to the FCC Chairman <https://ehtrust.org/wp-content/uploads/American-Academy-of-Pediatrics-letter-to-the-FCC-July-12-2012.pdf>
 - Calls for the FCC to open a review of RF guidelines

Many medical organizations are advocating for safer schools, in particular:

- In 2013, the **American Academy of Environmental Medicine (AAEM)** published a position paper, “Wireless Radiofrequency Radiation in Schools” in which it stated¹⁷:
 - “The AAEM strongly supports the use of wired Internet connections, and encourages avoidance of radiofrequency such as from WiFi, cellular and mobile phones and towers, and “smart meters.”
- In 2022, the **Santa Clara County Medical Association** published “Recommendations for Best Practices for Safe Technology in Schools,” which included¹⁸:
 - “Consider a policy to restrict installation of cell towers on school property.”

The Environmental Health Trust has compiled a list of the hundreds of School Boards, PTOs, and educational/medical institutions calling for policy-makers to protect schools from wireless radiation: <https://ehtrust.org/wp-content/uploads/5G-Cell-Towers-Near-Schools-Children-Scientific-Research-Liability-Briefing-1-1.pdf>

This includes appeals from educational organizations like the National Education Association and dozens of state and local school boards, teachers’ unions, and Parent Teacher Organizations (PTOs, all of which are calling for policies that keep schools safe from wireless radiation. For

¹⁶ <https://phiremedical.org/2020-nir-consensus-statement-press-release/>

¹⁷ “Wireless Radiofrequency Radiation in Schools” (2013). American Academy of Environmental Medicine. <https://www.aemonline.org/wp-content/uploads/2020/12/WiredSchools.pdf>

¹⁸ “Recommendations for Best Practices for Safe Technology in Schools”, Santa Clara County Medical Association, Environmental Health Committee Feb 14, 2022 <https://www.sccma.org/programs/environmental-health.aspx>

instance, in the 2013-2014 Resolutions for the National Educational Association, Resolution C-19 states:

“The National Education Association believes that all educational facilities must have healthy indoor air quality, be smoke-free, be safe from environmental and chemical hazards, and be safe from hazardous electromagnetic fields...Students and/or their parents/guardians, education employees, and the public should be notified of actual and potential hazards.”¹⁹

2.6 IF LARGE CELL TOWERS ARE DANGEROUS, WHAT ABOUT “SMALL CELL DEVICES”?

Historically, cellular towers (macro cells) were anything but inconspicuous. These large macro cell towers have a collection of antennas that both transmit and receive data. As the demand for faster (and larger) data transfer has exploded, telecommunications companies have started to build more localized networks of so called “small cell” base stations that supplement the 3G, 4G, or 5G coverage provided by macro cell towers (Mchangama et al. 2020, Tölli et al. 2016²⁰). These small cells – which often use multiple-input multiple-output (MIMO) technology comprised of panel, sector, rod, and other antennas with omnidirectional and unidirectional directivity capacities²¹²² (Kapilavi 2019, Ghadialy 2016)—are mounted on streetlights, utility poles, rooftops, or other structures. Despite their small size, these devices can transmit concentrated, directional signals. These novel technologies also blur the once-helpful distinction between “towers” and “antennas.” Today, telecommunications and engineering companies often describe “stealth” towers as one of the main type of macro cell towers (Bushan 2020, Foresite

¹⁹ “2013-2014 NEA Resolutions.” National Educational Association. Accessed April 21, 2024.

<https://web.archive.org/web/20150707103747/https://www.nea.org/assets/docs/nea-resolutions-2013-14.pdf>

²⁰ Mchangama, J. Ayadi, V. P. G. Jiménez and A. Consoli, "MmWave massive MIMO small cells for 5G and beyond mobile networks: An overview," 2020 12th International Symposium on Communication Systems, Networks and Digital Signal Processing (CSNDSP), Porto, Portugal, 2020, pp. 1-6, doi: 10.1109/CSNDSP49049.2020.9249602. <https://ieeexplore.ieee.org/document/9249602>

Tölli A, Thiele L, Suyama S, et al. Massive multiple-input multiple-output (MIMO) systems. In: Osseiran A, Monserrat JF, Marsch P, eds. 5G Mobile and Wireless Communications Technology. Cambridge: Cambridge University Press; 2016:208-247. doi:10.1017/CBO9781316417744.009

<https://www.cambridge.org/core/books/abs/5g-mobile-and-wireless-communications-technology/massive-multipleinput-multipleoutput-mimo-systems/B4D2E8808334C6E433D5E5A29649BD22>

²¹ Suma Kapilavai. June 5, 2019 “Tips and Trends: Small Cell 5G Systems.” Qorvo. <https://www.qorvo.com/design-hub/blog/tips-and-trends-small-cell-5g-systems>

“Traditionally small cells have been deployed in a 2-transmit/2-receive (2T/2R) MIMO configuration but with 5G, that architecture will be expanded to 4T/4R for increased throughput. These small cells are networked with 5G macro cells that use massive MIMO leveraging AAS (active antenna systems) in configurations of 32T/32R and 64T/64R. This maximizes spectral efficiency (more bits per Hz) for operators by providing the optimal balance between user coverage and capacity.” (Kapilavai 2019)

²² Zahid Ghadialy. 27 November 2016. “Antennas for Small Cells and C-RAN”

<https://www.telecomsinfrastructure.com/2016/11/antennas-for-small-cells-and-c-ran.html>

Group 2024)²³. These so-called “stealth” towers include 2 subtypes: (a) new structures that are built to look like a flag pole, commercial sign, tree/cactus, or water towers but have antennas and tower equipment camouflaged *inside* of them, and (b) placing antennas on the top of *already-existing* structures like buildings, water towers, smoke stacks, and so on (Bushan 2020, Foresite Group 2024). Highlighting the hazy distinction between antennas and towers, tower companies such as Tower Advantage and Foresite Group both include these stealth options and the traditional types of macro cell towers (e.g., monopole, lattice, and guyed) alongside “small cell pole” or “light pole” towers. Similarly, Mpirical—a company offering wireless and mobile technology training—explicitly notes that it is “important to note that the categorization of small cells is not always rigid, and there can be variations and overlap in their capabilities and deployment scenarios” (Nugent 2023)^{24,25}

As these wireless technologies have developed, so, too, has their complexity, forging a dizzying, jargon-filled landscape where it is remarkably difficult for anyone outside the industry to distinguish between antennas, transmitters, base stations, small cells, towers, and the like. This complexity obfuscates the regulatory processes, as public officials who might question the installation of large monopole macro cell towers are less likely to hesitate about so-called “small cell” deployment. Public officials seem to be expressing the increasingly popular sentiment that “small cells” are so insignificant they don’t need to be regulated. This idea helps support policies like the FCC’s 2018 Declaratory Ruling, “Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment,” which moved to preempt all state and municipal action that would impede or delay the roll-out of 5G technology, particularly as it pertained to state and municipal rights of way (ROW). This ruling explicitly frames many state and local regulations as “barriers” that must be “removed” (FCC 2018²⁶). In response, the National Association of Telecommunications Officers and Advisors (NATOA), with assistance from Communication Workers of America (CWA), released a 2021 report highlighting the “widespread harms of small cell preemption to cities, local governments and millions of low-income Americans nationwide.” The report, “Stretched Thin and Feeling the Squeeze: The Harmful Effects of Small Cell Preemption on Local Governments,” draws on a survey of 48 local governments and reports that small cell preemption is threatening local control and is having a negative impact on cities’ finances.²⁷

²³ “Types of Cell Towers” Foresite Group. (n.d.). <https://www.foresitegroup.net/post/types-of-cell-towers>

Shival S Bushan Feb 3, 2020. “What are the different types of cell towers?”
<https://toweradvantage.com/different-types-of-cell-towers/>

²⁴ Philip Nugent. What is small cell technology?“. Published: 9th June 2023 <https://www.mpirical.com/blog/what-is-small-cell-technology>

²⁵ For a peer-reviewed publication (2017) detailing “small cell” versus cell-free MIMO technology, see https://pureadmin.qub.ac.uk/ws/files/133935829/FINAL_VERSION.pdf A consumer-facing explanation can be found here: <https://vaunix.com/updates/insights-on-evolving5g-mimo-networks-and-test-methods---part-1/>

²⁶ <https://www.fcc.gov/document/fcc-reforms-pole-attachment-rules-boost-broadband-deployment>

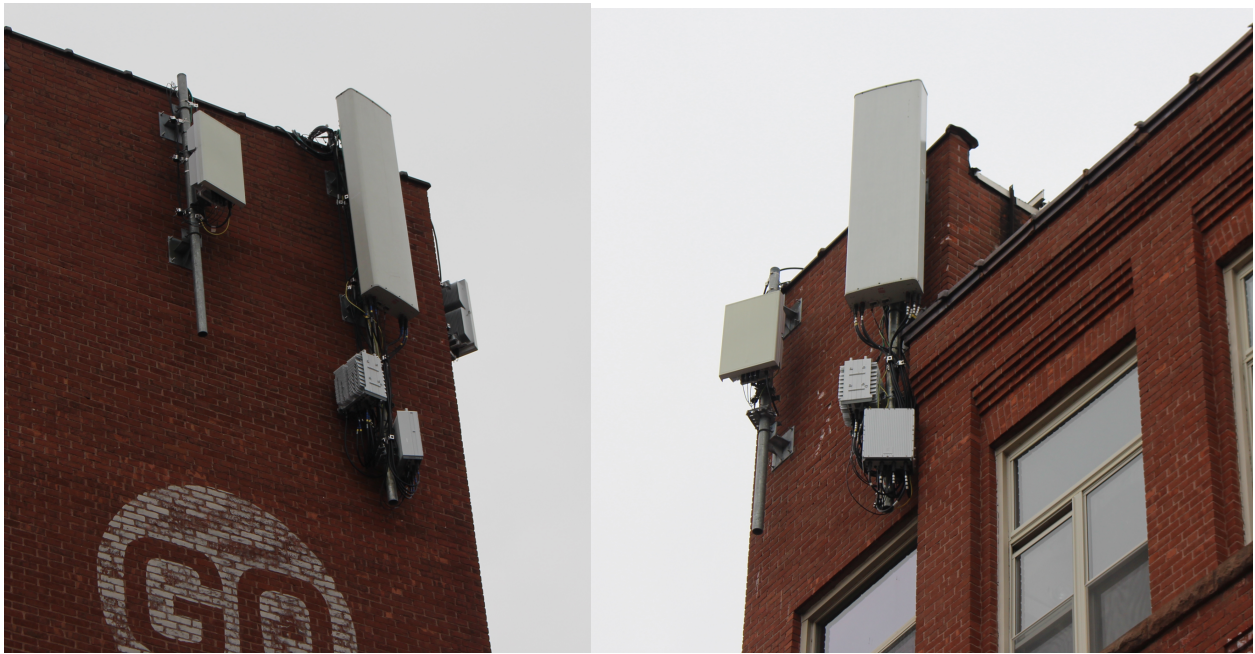
²⁷ (https://assets.noviams.com/novi-file-uploads/natoa/20210317_NATOA_CWARReport.pdf)



*Left: Smokestack, corner of Park St and Prospect, 2074 Park St, Hartford, CT.
Right: Water tower in Manchester, CT. Wireless equipment is often painted to camouflage its appearance.
Photos by R. Stephens.*



Above photographs purchased via Canva. Left: monopole macro cell tower. Top right: sector/panel antennas on building. Bottom right: multiple antennas affixed to smokestack, acting as a “stealth” macro cell tower).



2074 Park St, Hartford, CT (commercial building). Photos by R Stephens.



873 West Boulevard, Hartford, CT (apartment building). Photos by R Stephens.



The Packard (apartment building), West Hartford, CT. Photos by R Stephens.

Below photographs taken by R Stephens to highlight similar antennas on buildings in East Hartford, CT.



2.7 “SAFE TECHNOLOGY” DOES *NOT* MEAN NO TECHNOLOGY

GHC4ST is not advocating for a return to the dark ages. Until wireless technologies are better understood, however, we are advocating for a return to *wired* technologies. While the wires and cables can be momentarily annoying, we consider that small inconvenience far preferable to the risks of condemning the next generation (and ourselves) to cancers and other health problems.

It is possible to have cell phone service without exposing oneself (and others) to such risky levels. Indeed, the BioInitiative Working Group recommends setbacks of 1,640 feet from sensitive areas specifically because that distance provides sufficient protection for most people while still maintaining adequate cell reception.²⁸

²⁸ “NH Commission Setback Justification” by Dr. Kent Chamberlin, PhD. Dec 28, 2021.
<https://youtu.be/DWK74ie7krc?si=33Kk4J-mG1EKYwix>

3. METHODOLOGY

3.1 BACKGROUND RF MEASUREMENTS

Our wireless radiation measurements were taken with the Safe and Sound Pro II Meter *outside* the public spaces' main entrances (unless noted). They represent a *rough* approximation of the *environmental radiation* in that area (*before* accounting for the radiation inside). They were completed by Rachael Stephens from April 2023-2024. These measurements are simply meant to offer an informal, preliminary overview of the radiation levels across Greater Hartford. Still, we took various steps to protect their reliability, including:



- Standardizing the location of the meter
 - To conduct the measurements, we stood on the sidewalk outside the main entrance (or an approximate distance) and pointed the meter towards the main door. We held the meter at head-, waist-, and foot-levels for a total duration of at least one minute and typically more than 4 minutes.
- Removing personal wireless devices
 - When conducting measurements, we left all wireless-enabled (including WIFI, Bluetooth, cell data, and satellite) devices in the “turned-off” or “airplane” position and in our parked vehicle (which was also turned off). To verify that our personal devices were off and not distorting the measurement, we compared measurements while standing immediately next to the car and then a few yards away from it.
- Routinely verifying that the meter was responding properly
 - We did this by introducing and removing known sources of wireless radiation (e.g., turning cell phones on and off).
- Repeating measurements on different days of the week and at different times
 - To ensure reliability, we took a second set of measurements for more than half of the spaces. The measurements for all but two of these spaces were commensurate with our first set of measurements.
 - Whenever the measurement showed any kind of variability (e.g., not consistently within one category, a significant difference depending on where the meter was pointed or placed, etc.), we conducted measurements of that space on multiple occasions and then took the average of those measurements.
- Filming measurements with a DSLR camera that did not have wireless capability
 - While conducting measurements, we used a Canon T-9 DSLR camera to record the screen of the meter as well as the surroundings.
- Not compiling or analyzing results until after all the data was completed.
 - This protected against further biasing the selection process (which was relatively random but likely biased in favor of more densely populated areas as measurements were frequently conducted while traveling throughout the region for other purposes).

- The downside of this approach is that it wasn't until *after* analyzing the data that we realized it would have been helpful to measure levels at grounds that are farther from macro cell towers, particularly within suburban municipalities where the few grounds we did measure were “extreme” (e.g. Farmington, Manchester, Windsor). Controlling for distance to cell towers, however, was not feasible as there is no centralized, public database locating macro cell towers.

We did *not* control for the following variables and suggest addressing these matters in future endeavors:

- Standardizing the amount of time measurements are collected at each location.
 - This is especially important when accounting for the average power density.
- Standardizing multiple time periods when measurements are collected for each location.
 - While we diversified the days and times we collected measurements, we did not hold this variable constant across the different locations. Ideally, we would collect at least two measurements for each location (e.g., noon and 8:00PM).
- Standardizing the precise locations of the measurements.
 - In the cases of buildings (rather than parks), the distance from the building to the meter could be important.
- Diversifying for distance to macro cell towers.
 - This was deemed unfeasible as there is no centralized, public database locating macro cell towers. We initially tried to use public databases like antennasearch.com but quickly learned that many macro cell towers are not included and that there is a lack of consistency between what is classified as an “antenna” and what is classified as a “tower.” We then tried to access municipal and state records but found that every government branch we reached out to said they did not have any database of tower/antenna locations and that we would have to try to request permits individually. The act of requesting that which one does not yet know exists is, of course, a challenge. Ultimately, we were able to confirm the presence of macro cell towers that we could see, but we do not have any way to confirm the absence of macro towers, particularly due to the increasing use of “stealth” towers. This limitation reveals yet another complication created by the lack of federal regulation.

While this methodology is not fully controlled, we believe that it is sufficient for drawing public attention to: (i) the need for legislation that better protects our communities, and (ii) the socio-spatial distribution of wireless radiation.

Importantly, the levels of wireless radiation outside and inside the areas tested are likely *higher than our measurements even indicate*. First, our measurements do not account for the radiation *inside* buildings, including that which is produced by WiFi routers, personal cellular/wireless/Bluetooth devices (cell phones, laptops, etc), and more. Second, while most EMR (electromagnetic radiation) experts consider the Safe and Sound Pro II Meter as the “gold standard” for RF radiation measurements, it is not certified for the frequencies of 5G radiation (above 1800 Hz). The meter that is certified for measuring the frequencies involved in 5G is prohibitively expensive and was not available when we initially started this project. Finally, and

most significantly, when we conducted measurements, unlike most people today, we did not have any personal wireless devices (cell phones, smart watches, etc.) on or around our body. This undoubtedly decreased the power density levels significantly. In fact, for some of the school grounds with “extreme” levels, when a cell phone was simply turned on (and held by the measurer), the “max” power density jumped above 100,000 $\mu\text{W}/\text{m}^2$, which would be prohibited for schools in countries like Italy and Bulgaria.²⁹

3.2 ETHNOGRAPHIC METHODS OF PARTICIPANT OBSERVATION

Ethnography is both the process and product of anthropological research. The cornerstone of this approach is “participant observation,” or learning by participating in everyday activities rather than manufacturing inorganic, experimental conditions to observe a phenomenon inside a laboratory. In the tradition of engaged and applied anthropology, many anthropologists conduct research with community groups in which they are already involved. This was the case in this project. Rachael Stephens—a PhD Candidate in Anthropology and Education at UPenn—joined GHC4ST in September of 2022. Rachael’s interest in the group was both personal and professional. Diagnosed with electro-hypersensitivity in 2020, Rachael was immensely interested in limiting wireless radiation in all communities, including Greater Hartford, where she was conducting her doctoral research on issues of public-school finance inequality. While Rachael initially joined the group with intentions of simply participating, she quickly noticed the overlaps between the phenomena she was documenting for her dissertation and those she was witnessing as a part of GHC4ST, and grew to believe that ethnographic analysis could offer important insights into the socio-spatial dynamics at hand. After asking for and receiving the group’s permission, Rachael began to approach her work with GHC4ST more ethnographically. This primarily included taking fieldnotes after weekly meetings and during related activities (e.g. at city council meetings, while conducting measurements, etc.) and drafting research memos during an ongoing, iterative process of participation and analysis.

²⁹ We did not test the impact of a personal cell phone (in the “on” position and with cell data turned “on”) on every space that reached “extreme” levels. We did, however, test it in the following 5 school grounds, all of which (in the presence of a transmitting/receiving cell phone) exceeded 100,000 $\mu\text{W}/\text{m}^2$, which would be prohibited for schools in countries like Italy and Bulgaria: Manchester High School, Breakthrough Academy North (Hartford), Windsor High School, GH Academy of the Arts (Hartford), Sports and Medical Sciences Academy (Hartford).

4. RESULTS

4.1 WIRELESS RADIATION LEVELS

Table 4.1 RF level categories (for Safe and Sound Pro II Meter) for all locations and municipalities

Municipality	Location	Avg. RF Category
Berlin	Mary Griswold	Moderate
Berlin	Richard Hubbard	Moderate
Bloomfield	Bloomfield High	High
Bloomfield	Metacomet Elem.	Slight
Bolton	Town Hall	Moderate
Bolton	Bentley Memorial Library	Slight
Bolton	Bolton Center	Slight
Bolton	Bolton High	Slight
Bolton	Bolton Senior Center	Slight
Bolton	Herrick Park	Slight
East Hartford	Raymond Library	Extreme
East Hartford	Great River Park	Extreme
East Hartford	Sunset Ridge Middle	High
East Hartford	Police Station + Wickham Library	High
East Hartford	CREC Acad. of Comp. Sci. & Eng. Middle School	High
East Hartford	Shea Park	Mod/High
East Hartford	Silver Lane Elem.	Moderate
Farmington	Farmington High	Extreme
Glastonbury	Senior Center (Southern Entrance)	Extreme
Glastonbury	Skate Park	Extreme
Glastonbury	Police Station	Extreme
Glastonbury	Town Hall	Extreme
Glastonbury	Glastonbury High, Playing Fields	High/Ext.
Glastonbury	Glastonbury High, Front Entrance	Mod/High

Glastonbury	Riverfront Park	Moderate
Glastonbury	Senior Center (Eastern Entrance)	Moderate
Hartford	Jumoke (JAH-HC)	Extreme
Hartford	Hartford City Hall	Extreme
Hartford	West Middle	Extreme
Hartford	Rocky Ridge Park	Extreme
Hartford	Kenney Park, Main Parking Lot	Extreme
Hartford	South End Senior Center	Extreme
Hartford	Public Library, Asylum Ave	Extreme
Hartford	GH Acad. of the Arts	Extreme+
Hartford	Sports & Med. Sci.	Extreme+
Hartford	Annie Fisher Mont. & STEM Magnet	High
Hartford	Burns Latino	High
Hartford	Classical Magnet	High
Hartford	Hartford Public High	High
Hartford	Kinsella Magnet	High
Hartford	Prince Tech High	High
Hartford	Weaver High	High
Hartford	North End Senior Center	High
Hartford	Keeney Park, Disc Golf	High
Hartford	Elizabeth Park (Sunrise Overlook)	High
Hartford	Colt Park	High/Ext.
Hartford	Thomas J. Hyland Park	High/Ext.
Hartford	Breakthrough (North)	High/Ext.+
Hartford	Betances	Mod/High
Hartford	Bulkeley North & South	Mod/High

Hartford	Public Library, Albany Branch	Mod/High
Manchester	Arthur Illing Middle	Extreme
Manchester	Manchester High	Extreme+
Manchester	Highland Middle	Mod/High
Manchester	Case Mountain Park	Moderate
Manchester	Senior Center	Moderate
New Britain	Chamberlin Elem.	High
New Britain	New Britain High	High/Ext.
New Britain	Roosevelt Campus	High/Ext.
New Britain	Northend Elem.	Moderate
Newington	Newington High	Extreme
Newington	Elizabeth Green Elem.	Moderate
Newington	Martin Kellogg Mid.	Moderate
Simsbury	Simsbury High	Moderate
South Windsor	SW High	High
South Windsor	Major M. Donnelly Land Preserve	Moderate
Tolland	Tolland High	Extreme
Tolland	Tolland Middle	Slight/Mod.

Vernon	Vernon Senior Center	Extreme
West Hartford	Noah Webster Library	Extreme
West Hartford	Senior Center	Extreme
West Hartford	Charter Oak Int'l	High
West Hartford	Conard High	High
West Hartford	Whiting Lane Elem.	High
West Hartford	Sedgwick Middle	High/Ext.
West Hartford	Bristow Middle	Moderate
West Hartford	Elizabeth Park, Rose Garden	Slight/Mod
West Hartford	Samuel W. Elem.	Moderate
West Hartford	Westmoor Park	Moderate
West Hartford	Wolcott Elem.	Moderate
West Hartford	Webster Hill	Moderate
West Hartford	Duffy Middle	Moderate
West Hartford	Morley	Slight/Mod
Willington	Hall School	Slight/Mod
Windsor	John Fitch Park	Extreme
Windsor	JFK Middle	High
Windsor	Sage Park Mid.	High/Ext.
Windsor	Windsor High	High/Ext.+

Table 4.2 Examples of “Maximum” and “Average” power densities for a selection of the public spaces where we conducted measurements.

Municipality	Location	Macro Tower Visible?	RF Level Category	Max Power Density $\mu W/m^2$	Avg Power Density $\mu W/m^2$
Bolton	Herrick Park	N	Slight (Blinking)	18.70	0.88
Bolton	Town Hall	N	Moderate	356.00	1.42
Bolton	Bentley Memorial Library	N	Slight (Blinking)	2.89	0.22
Bolton	Bolton Senior Center	N	Slight (Blinking)	18.1	0.77
Glastonbury	Riverfront Park	Y	Extreme	14,900.00	236.00
Glastonbury	Community Center (eastern entrance)	N	Moderate	61,200.00	17.00

Glastonbury	Senior Center (south entrance)	Y	Extreme	14,900.00	2,100.00
Glastonbury	Police Station	Y	Extreme	1,249.00	162.00
Glastonbury	Glast. High, Baseball Fields	N	High/Extreme	2730	142.00
Glastonbury	Glast. High, Front Entrance	N	Mod/High	879.00	8.64
Glastonbury	Skate Park	Y	Extreme	9,230.00	146.00
Glastonbury	Town Hall	Y	Extreme	6320.00	406.00
East Hartford	Shea Park (near sign)	N	Moderate/High	448.00	20.00
East Hartford	Silver Lane Elementary	N	Moderate	97.00	6.22
East Hartford	CREC Academy of Comp. Science and Eng. Middle	N	High	986.00	48.60
East Hartford	Riverfront Park	Y	Extreme	15,600.00	1280.00
East Hartford	Raymond Library	Y	Extreme	7,580.00	380.00
Windsor	John Fitch Park	Y	Extreme	10,000.00	412.00
Manchester	Case Mountain	N	Moderate	197.00	2.76
Manchester	Highland Middle School	N	Mod/High	858.00	4.56
Manchester	Manchester Senior Center	N	Moderate	273.00	5.43

Table 4.3 Distances to nearest macro tower for public spaces where the levels of wireless radiation consistently (“extreme”) or occasionally (“high/extreme”) exceeded a power density of 1,000 $\mu W/m^2$ (100-10,000 times higher than precautionary limits).

Location	Avg. RF category	Approx. distance from closest known tower (miles) ^[i]	Municipalities where this proximity is prohibited ³⁰
EAST HARTFORD			
Great River Park	Extreme	0.4 mi Eversource Energy Service Company	Shelburne, MA
Raymond Library	Extreme	0.1 mi from “Verizon Tower” owned by Cellco Partnership	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
FARMINGTON			
Farmington High	Extreme	0.3 mile from tower at Farmington Police Station, (constructed in 2002	Shelburne, MA Copake, NY
GLASTONBURY			
Glastonbury High, Playing Fields	High/Ext.	BOE antennas on school building	-
Police Station	Extreme	0.0 mi from tower owned by and located at Glastonbury Police Dept.	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
Senior Center (Southern Entrance)	Extreme	0.2 mi to tower owned by “ SBA 2012 Tc Assets ” (while the address is listed on Main St, the GPS coordinates are for 193 Welles Street, where the tower is visible)	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
Skate Park	Extreme	0.2 Tower at Glastonbury Police Station , owned by Glastonbury Police Dept.	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
Town Hall	Extreme	0.1 mi from tower owned by and located at Glastonbury Police Dept.	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
HARTFORD			
Breakthrough (North)	High/Ext.	0.4 mile from Metro Mobile tower, 0.4 mile from 5 Eversource Energy towers, 0.6 mile from 6 more towers from Eversource, AT&T and T-Mobile	Shelburne, MA

³⁰See setback restrictions in section 6.2

Colt Park	High/Ext.	0.5 mi from Eversource tower and Verizon tower (likely even closer to eastern side where measurement was collected)	Shelburne, MA
GH Acad. of the Arts	Extreme	0.3 mile from tower on Probation Department Building	Shelburne, MA Copake, NY
Hartford City Hall	Extreme	0.1 mile from “ Sprint Nextel ” and other non-registered towers and 0.4 mile from registered towers like “ Eversource Energy Service Company ”	Shelburne, MA
Jumoke(JAH-HC)	Extreme	0.4 mile from tower at CT Public Radio	Shelburne, MA
Kenney Park, Ridgefield St Lot	Extreme	0.6 mi from Metro Mobile Cts Of Hartford, Inc. and Eversource Energy Aj towers	-
Public Library, Asylum Ave	Extreme	0.2 mi from CT Public Broadcasting	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
Rocky Ridge Park	Extreme	0.2 CT Public Broadcasting	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
Sports & Med. Sci.	Extreme	0.1 mile from “Verizon Tower” on Probation Department Building	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
South End Senior Center	Extreme	0.1 mile from “Channel 13” tower at corner of Maple Ave and Brown St 0.3 mile from numerous “towers” on the Maples Condos (owned by T-Mobile, Verizon, and Maples Condo Assoc.)	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
Thomas J. Hyland Park	High/Ext.	0.4 mi from CT Pub. Broadcasting	Shelburne, MA
West Middle	Extreme	0.3 mile from tower at CT Public Radio	Shelburne, MA Copake, NY
MANCHESTER			
Arthur Illing Middle	Extreme	0.1 mile from tower at Police Dept	Shelburne, MA Copake, NY Stockbridge, MA

			San Diego County, CA
Manchester High ³¹	Extreme	0.4 mile from tower at Police Dept	Shelburne, MA
NEW BRITAIN			
New Britain High	High/Ext.	0.6 mile to Sprint Nextel tower	-
Roosevelt Campus	High/Ext.	0.8 mile from Sprint Nextel	
NEWINGTON			
Newington High	Extreme	0.2 mi from device registered at the school's address (owned by Sprint; 119 ft above ground; while antennasearch.com classifies it as an "antenna" the property record repeatedly refers to it as a "tower")	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
TOLLAND			
Tolland High	Extreme	0.1 mile from tower (constructed in 2022; owned by AT&T)	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
VERNON			
Vernon Senior Center	Extreme	0.3 mi from Sprint Nextel	Shelburne, MA Copake, NY
WEST HARTFORD			
Noah Webster Library	Extreme	0.0 mi from Sprint tower owned by Nextel	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
Senior Center	Extreme	0.2 mi from Sprint Nextel	Shelburne, MA Copake, NY Stockbridge, MA San Diego County, CA
Sedgewick Middle	High/Ext. ³²	0.6 mile from macro tower at Frontier (corner of Sedgwick and North Main)	-
WINDSOR			

³¹ Use "Manchester special education" address as it is closest to the lot where measurements were conducted.

³² At Sedgewick, we originally took measurements outside of the south-facing door, not the formal main entrance (which faces west). There is a macro tower about 0.5 miles due east of the school (at the corner of Sedgewick and N Main), so the radiation levels are *far* higher when standing on the south or the east side of the school. At the main entrance, the peak was 2,290, max was 3,290, and average was 329 $\mu\text{W}/\text{m}^2$. This is likely because the school itself is blocking much of the radiation from this macro tower. We decided to use the measurements for the East entrance because they are more representative of the radiation to which those inside the school are exposed.

John Fitch Park	Extreme	0.5 mi from AT&T And Town Of Windsor Ct	Shelburne, MA
Sage Park Mid.	High/Ext.	0.4 mile from Crown Castle USA and .5 mile from AT&T	Shelburne, MA
Windsor High	High/Ext.	0.6 mile from Crown Castle USA	-

Table 4.4 Comparison of two school grounds in the suburban Town of Bloomfield, CT. Bloomfield High and Metacomet are 0.78 mile apart (<https://www.gps-coordinates.net/distance>).

Location	Approximate Distance from Closest Tower ⁱⁱ	Power Density ($\mu\text{W}/\text{m}^2$)	
		Max	Avg
Bloomfield High ("High")	0.4 miles from tower for Integrated Wireless Services	7,700	32.2
Metacomet Elem. School ("Slight")	0.8 mi from several towers owned by SBA Towers LLC, Town of Bloomfield, Sprint Nextel, etc.	8,790	0.843

Table 4.5 Comparison of two school grounds in the suburban Town of Newington, CT. These two schools are 1.06 mile apart (<https://www.gps-coordinates.net/distance>).

School Name (Location)	Approximate Distance from Closest Tower ⁱⁱ	Power Density ($\mu\text{W}/\text{m}^2$)	
		Max	Avg.
Newington High ("Extreme")	0.2 mile from device registered at the school's address (owned by Sprint) ³³	34,900	1,040
Elizabeth Green Elementary ("Moderate")	0.7 mile from tower owned by "The Marcus Group LLC" and 0.8 mile from tower for Town of Wethersfield	60	8.79

³³ 119 ft above ground, but www.antennasearch.com classifies it as an "antenna" and the property record repeatedly refers to the "cell tower"
<https://www.propertyrecordcards.com/PrintPage.aspx?towncode=094&uniqueid=N0046500>)

Photographs of public spaces included in measurements. Photographs by R. Stephens.



Newington High in Newington, CT (top) and Tolland High in Tolland, CT (bottom).

5. CONCLUSIONS

5.1 THE INEQUITABLE DISTRIBUTION OF WIRELESS RADIATION ACROSS GREATER HARTFORD

We conducted informal, preliminary measurements in the areas outside 85+ public spaces across 18 municipalities in and around the metro-region of Greater Hartford, Connecticut. Following the biologically based precautionary limits suggested by The Bioinitiative Working Group (2020), The European Academy for Environmental Medicine (2016), and The Institute of Building Biology (2008), we consider areas to be unsafe for long-term exposure if their wireless radiation levels exceed: $.1\text{-}10\ \mu\text{W}/\text{m}^2$ (or “slight” on the Safe and Sound Pro II Meter).

In total, 90% of the public spaces where we conducted measurements had background radiation levels higher than precautionary guidelines. An analysis of our RF (radiofrequency) radiation measurements shows that:

Almost all municipalities in Greater Hartford have at least some neighborhoods where the background radiation levels are *at least* 10x higher than the biologically based precautionary guidelines.

- Of the 18 municipalities where we conducted measurements, all but two—Bolton and Willington (both of which are often considered rural areas “outside” the bounds of the Greater Hartford metro-region)—had background radiation levels present at least one location that exceeded $100\ \mu\text{W}/\text{m}^2$, which is more than 10-1,000 times higher than the biologically based precautionary limits for long-term exposure.
- These levels of background wireless radiation ($100\ \mu\text{W}/\text{m}^2$) also constitute a more than 3-fold increase from the average radiofrequency radiation levels in US cities and suburbs in the 1990s ($30\ \mu\text{W}/\text{m}^2$) (Mantiply et al., 1997).

Wireless radiation levels appear to be correlated with proximity to cell towers.

- Of the 24 public spaces that consistently exceeded $1,000\ \mu\text{W}/\text{m}^2$ (“Extreme”), at least 22 are within 0.4 mile (~2,000 ft.) of a cell tower.
- Of the 33 public spaces that either consistently (“Extreme”) *or* occasionally (“High/Extreme”) exceeded $1,000\ \mu\text{W}/\text{m}^2$, at least 31 are located within 0.6 mile (~3,000 ft.) of a cell tower.

“Extreme” and “High” radiation levels were most densely concentrated in urban areas, followed by suburban and then rural areas. This is likely due to population density and zoning.³⁴

- “Extreme,” “High,” and “High/Ext.” levels of radiation (greater than $100\ \mu\text{W}/\text{m}^2$) were almost ubiquitous for spaces in urban areas (Hartford and New Britain).

³⁴ Of particular importance appears to be the percentage of commercially zoned areas as well as the ratio of multi-family to single-family housing.

- The only spaces in areas that had background levels less than 50 $\mu\text{W}/\text{m}^2$ were in Bolton, Tolland, Willington, and Bloomfield—all of which are generally considered suburban or rural.
- While suburban spaces within approximately 0.8 miles of a macro cell tower had High/Extreme radiation levels, these suburban municipalities were more likely to *also* have some areas with far lower radiation levels (e.g. “Moderate” or “Slight”).³⁵ In Tolland, for instance, the radiation levels at the high school (where there is a macro cell tower) averaged at 620 $\mu\text{W}/\text{m}^2$ but those at the middle school (less than 1 mile away) averaged below 100 $\mu\text{W}/\text{m}^2$. This suggests that compared to urban areas, suburban areas might be *less saturated* with high levels of wireless radiation, meaning that residents are less likely to be exposed to such high levels of radiation at all times.³⁶

5.2 TELECOMMUNICATIONS COMPANIES ARE USING QUESTIONABLE FCC POLICIES TO BULLDOZE STATE AND MUNICIPAL RIGHTS

Across the country, telecommunications companies are filing lawsuits against municipalities who have not immediately started rolling out the “small cell” technologies necessary for 5G deployment. The FCC is suggesting that any resistance from the state or municipal level is a violation of the FCC’s 2018 Declaratory Ruling (described in prior section).

Thankfully, much has happened since 2018 that makes the FCC’s 2018 Declaratory Ruling far less ominous than it might initially seem; yet, many public officials are not aware of this development and are understandably hesitant to risk a lawsuit from the FCC. This lack of clarity—undoubtedly exacerbated by the lack of scientific clarity regarding the health risks as well as the stigma against expressing concerns with 5G—has created a dangerous environment where the National Association of Telecommunications Officers and Advisors (NATOA) itself has expressed concerns that the FCC is threatening state and municipalities rights to local control.³⁷

These dynamics were made abundantly clear in 2023 in Connecticut’s capitol city, Hartford. In September 2023, Hartford’s City Council announced its plans to vote on a Resolution³⁸ (proposed by then-Mayor Bronin) to enter into a contractual agreement with AT&T that would allow the installation of small cell devices on public rights of way. In his cover letter, Mayor Bronin framed the proposed Resolution in light of the FCC’s September 2018 Declaratory

³⁵ For Farmington, and Windsor, we only tested school grounds that were within 0.6 mile of a tower. For these municipalities, it would be helpful to test other school grounds without a known macro tower in such close proximity. This reveals the importance of better controlling for distance to macro cell towers. While we initially tried to do so, the lack of centralized, public database locating macro cell towers made this unfeasible. While we could confirm the presence of macro cell towers visually, we do not have any way to confirm the absence, particularly due to the increasing use of “stealth” towers.

³⁶ Since we only have data from one space within several of the municipalities (e.g., Farmington, Simsbury, Vernon, Wethersfield, Willington), it is less helpful to generalize about these areas.

³⁷ https://assets.noviams.com/novi-file-uploads/natoa/20210317_NATOA_CWAReport.pdf

³⁸ Notably, the text of the proposed Resolution itself makes no mention of these more recent rulings, it only references the “Telecommunications Act of 1966” (page 3 in Resolution Packet; Presumably, this is a typo and is intended to be a reference to the Telecommunications Act of 1996), the 2018 Federal Communication Commission’s Declaratory Ruling, and the April 2022 FCC Equity Action Plan.

Ruling, wherein the FCC moved to preempt all state and municipal action that would impede or delay the roll-out of 5G technology, particularly as it pertained to state and municipal rights of way (ROW).³⁹ Mayor Bronin also noted how “in December 2021, AT&T filed a lawsuit in federal district court against the City [of Hartford] for its failure to act in a timely way (and in accordance with the FCC Declaratory Ruling).”

In isolation, these decisions created a *perception* that the City of Hartford needed to quickly “fall in line” with the mounting pressure from telecommunications companies. Importantly, however, this is not the full story, and several recent court decisions and declarations suggest that the telecommunications companies do NOT have as much power as they often suggest.

Most notably, in August 13, 2021, the U.S. Court of Appeals determined that the FCC was in violation of the Administrative Procedure Act for failing to respond to “evidence that exposure to RF radiation at levels below the Commission’s current limits may cause negative health effects.”⁴⁰ This ruling came out of the *Environmental Health Trust et al. v. the Federal Communications Commission (FCC)* case and was a response to the FCC’s 2019 decision not to update its 1996 exposure limits.

Before the September 2023 vote, GHC4ST made numerous attempts to reach out to and educate Hartford City Council members about the risks of wireless radiation as well as the deceiving tactics in which many telecommunications companies engage. GHC4ST also presented the council with signatures and testimonies from over 170 residents calling to postpone the vote until after we could provide them with more information. **While a handful of councilmembers informally agreed to try to support us, the Hartford City Council passed the Resolution without so much as a verbal statement documenting the concerns and requests expressed by GHC4ST or the 170+ residents who signed our petitions.**

5.3 DISCOURSES OF “DIGITAL EQUITY” ARE OBSCURING HEALTH RISKS THAT CAN EXACERBATE SOCIOECONOMIC INEQUITIES

Discourses of “digital equity” frame the deployment of small cell and other wireless technologies as imperative for closing the “digital divide.” While securing equitable access to communicational technology is vital, this narrative can obscure the health risks of wireless technologies and thus, further entrench existing socioeconomic inequities.

Building on community members’ interests in socioeconomic equality and equity, the FCC and telecommunications companies have crafted a convenient narrative wherein 5G technologies and small cell devices are an alleged solution to the “digital divide,” or the socioeconomically

³⁹ Mayor Bronin also noted that this ruling “was challenged by a number of states and municipalities, but several federal district courts and ultimately the 9th Circuit Court of Appeals upheld the FCC Rule making it authority in this area.”

⁴⁰ *Environmental Health Trust v. Federal Communications Commission*, no. 20-1025 (D.C. Cir. 2021). Justia Law. (n.d.). <https://law.justia.com/cases/federal/appellate-courts/cadc/20-1025/20-1025-2021-08-13.html>

inequitable distribution of access to contemporary technology, including high-speed internet. This enticing narrative has convinced many officials and activists that “doing right” by their constituents and by community members means greenlighting the roll-out of new, untested technologies that pose significant health risks.

This rhetoric was especially apparent when GHC4ST was working to engage Hartford’s City Council. In an informal conversation about an upcoming vote on small cell deployment, for instance, one of the council members expressed concern that Hartford’s youth get the same technologies that other towns get. Expressing his interest in “doing right” by the students in “his city,” this councilperson asked Rachael: “Why shouldn’t Hartford kids get the best technologies?”

GHC4ST’s answer to this question is simple: we want all students to have access to safe technology, not experimental technology that is dressed up with promises of closing the digital divide. We believe in building equitable communities where access to life’s necessities – including healthy food, clean air and water, stable shelter, adequate healthcare, engaging education, and communicational technology—is available for *all* residents. In fact, it is precisely because of our interest in socioeconomic equity that we are challenging telecommunications efforts to deploy small cell technology in all communities, especially those that already bear the brunt of various other environmental injustices (e.g., air pollution, toxic waste disposal, flooding, etc.). We worry that telecommunication companies’ promises to close the digital divide are enticing community members and public officials to advocate for policies that could easily *exacerbate* existing socioeconomic inequities. These intoxicating narratives obscure numerous risks.

First, small cell deployment could *hamper* existing efforts to mitigate the digital divide. In a 2021 report, the National Association of Telecommunications Officers and Advisors (NATOA) documented that over 56% of the 48 municipalities surveyed said that small cell deployment hindered their digital divide initiatives.

Second, this framing falsely implies that *wireless* internet technologies are the only way to bring high-speed internet connectivity. Fiber optic broadband connections are often faster and more secure and do not come with the risks of wireless radiation.⁴¹ In the case of Hartford, officials have suggested that they would prefer to use fiber optic but that most of the buildings in Hartford are too old to “affordably” support fiber optic technologies.⁴² We recognize that this is a logistical challenge, and do not envy the innumerable complications and challenges that municipal officials often face (most of which are not even visible to constituents). Still, we do *not* believe these challenges are a reason to resort to experimental 5G technologies.

Third, by proposing more small cell installation in urban areas like Hartford, the FCC’s efforts to promote “equity” could easily exacerbate the significant inequities in the existing distribution of wireless radiation. Due to population concentrations and zoning policies

⁴¹ There is concern that fiber optic cables (or other technologies that increase internet speeds) could increase *other* forms of electromagnetic radiation for homes and buildings where occupants use ethernet rather than Wi-Fi. This concern deserves further attention and is yet another reason for more open, transparent discussion and exploration.

⁴² DEEP’s Community Roundtable on High-Speed Internet. Public meeting via zoom 8/16/23.

(especially the percentages of commercially zoned areas as well as the ratio of multi-family to single-family housing), many urban areas – most of which have been racially minoritized and economically impoverished—already have comparatively high levels of wireless radiation. Small cell deployment in cities like Hartford, therefore, will only further increase residents’ exposure levels. This is particularly concerning given that many urban communities have been systematically impoverished, creating disproportionate rates of poverty and stress that both threaten residents’ health (increasing vulnerability to the health risks of radiation) *and* make it more difficult for them to seek treatment. Residents of urban areas are, therefore, facing the two-fold risk of being more likely to be living in areas with high levels of radiation *and* more likely to be under material, physical, and psychological stresses that make them especially vulnerable to additional health risks. To make matters worse, when they install towers/antennas, telecommunications companies only notify nearby *homeowners* of their rights to challenge the installation.

Discourses of “digital equity” are pushing small cell deployment in low-income, racially marginalized neighborhoods. We fear that this could easily be yet another installment in the enduring saga of environmental injustice wherein economically and racially marginalized residents bear the burden of countless environmental health risks (many of which were not initially recognized as harmful), including air pollution, lead-poisoning, toxic waste and pesticide exposure, flooding, and now, wireless radiation, too.

While they place a disproportionate burden on urban communities, the environmental health risks of wireless radiation are a threat to everyone. **As wireless radiation levels are increasing in almost *all* communities, including comparatively wealthy suburban towns, the issue of wireless radiation offers a somewhat unique opportunity to organize *across* socio-economic divides to protect *all* communities from the risks of wireless radiation.**

6. MOVING FORWARD

6.1 WE NEED MUNICIPAL AND STATE POLICIES THAT PROTECT PUBLIC HEALTH BEFORE TELECOMMUNICATIONS’ PROFITS

Addressing an issue as complex as that of wireless radiation will take coordination on all levels of government. Too often, as we have advocated for policy changes to protect the public health from wireless radiation, we have been told by each level of government that “it’s not their jurisdiction.” Municipal governments often don’t know that they have the rights to restrict these technologies. State governments tell us that it’s up to the municipalities. Public officials and lay people alike seem to assume that the federal government is taking care of this issue, but the FCC doesn’t even maintain a centralized database for the location of all macro cell towers, let alone restrict the levels of wireless radiation below those which would essentially cook human flesh like a microwaveable dinner. While those of advocating for change get shuffled across the different levels and departments of government, telecommunications companies have been left with a free pass to do as they please.

Some communities (listed below) and countries (listed in Section 1.4) have enacted policies that protect against the risks of wireless radiation, especially for children at schools. One of the most common policy responses is a “setback restriction” that prohibits the installation of towers/antennas from “sensitive areas.” Across the U.S. and abroad, communities have adopted restrictions limiting these technologies from within 500-3,000 ft from schools. Researchers recommend at least a 1640 feet distance (approximately 0.3 miles) from a cell tower to a school (Balmori 2022; Pearce 2020). Our data suggests that even this recommendation might be too lenient, as many of the spaces where we measured “Extreme” or “High/Extreme” levels of radiation have macro cell towers within up to 0.8 miles. At this moment, our primary goal is to raise awareness of these dangers so that we can have community conversations about the best ways forward.

As an initial step, we are advocating for *both* state and municipal policies that prohibit the installation of any new wireless antennas or towers from within 1,500-3,000 feet (~0.25-0.5 miles) of any “sensitive area” such as schools, senior centers, or residences.

6.2 EXAMPLES OF POLICIES THAT PROTECT PUBLIC HEALTH

To protect public health, some municipalities have established setback restrictions for the installation of wireless towers/antennas. Examples of Installation Setback Restrictions:⁴³

- *Shelburne, MA* – no new wireless antennas in residential zones and no wireless antennas within **3,000 feet** of schools and within **1,500 feet** of homes
- *Stockbridge, MA* – no towers built less than **1000 feet** from a school, park or athletic field and **600 feet** from any residence
- *Randolph, MA* – no wireless antennas within **500 feet** of homes and businesses
- *Copake, NY* – no wireless facility may be within **1,500 feet** from homes, schools, churches, or other buildings containing dwelling units
- *Scarsdale, NY* – No wireless facilities within **500 feet** from homes, schools, parks, and houses of worship
- *Sallisaw, OK* – no commercial wireless telecommunications towers within **1,500 feet** of homes
- *Calabasas, CA* – no “Tier 2” wireless telecommunications facilities within **1,000 feet** of homes or schools

⁴³ Shelburne MA: 11. All new CRS facilities shall be at least a distance of 3000 feet from the property line of any school. (see p.33, “Town of Shelburne Zoning Bylaw” (last updated 2/2022)
https://www.townofshelburne.com/files/Zoning_Bylaws_2022.pdf

Copake, NY: “No telecommunications 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.” Ch 230-7. (Town of Copake, NY / Part II: General Legislation Chapter 230 Telecommunications Facilities and Towers)
<https://ecode360.com/10553368>

Additional setback restrictions linked via EHT database: <https://ehtrust.org/policy/international-policy-actions-on-wireless/>

- **Bedford, NH** – No wireless antennas within **750 feet** from nearest residentially-zoned property
- **Los Altos, CA** – no Prohibits installation of small cells on public utility easements in residential neighborhoods *and* establishes **500 foot** setbacks from schools and from multi-family residences
- **Davis, CA** – no freestanding wireless facilities within **500 feet** of residential zone and schools

Other municipalities have established Moratoriums/Bans on 5G Rollout

- **Easton, CT** — May 5, 2022, Moratorium on 5G installation/rollout until Dec. 31 2023
- **NYC, NY Community Board 8 Manhattan** — December 2022, Moratorium on construction and planning of Link5G poles and devices
- **Farragut City, TN** — May 14, 2020, City Council approved Resolution R-2020-05, which called on state and federal governments to halt 5G until health risks are evaluated by “sound science”
- **County of Hawaii, HI** — July 22, 2020, County Council Passed Resolution 678-20 Calling for a cease to the buildout of “5G wireless infrastructure until such technologies have been proven through independent research...”

Examples of Municipal Requests for State intervention

- **Carmel City, IN**
- **Hallandale Beach, FL**

CT officials on the federal, state, and local levels have started to speak out against the premature deployment of wireless technologies

- US (CT) **Senator R. Blumenthal** <https://youtu.be/ekNC0J3xx1w>
- CT **House Representative David Michel** and **Representative Anne Hughes**
- Easton, CT **Board of Selectman Dave Bindelglass, M.D.**

6.3 COUNTERING THE STIGMA

Throughout history, stigmatizing novel perspectives as “craziness” has operated as an extraordinarily effective mode of social control. To neutralize ideas that would likely threaten the status quo (and profits), this stigmatization works by having people police themselves and others. For instance, today, when many of us first hear about the dangers of wireless radiation, we immediately feel a pull to dismiss the ideas as “craziness.” What’s more, discussing the dangers of wireless radiation – particularly 5G—has become associated with “conspiracy theories” and “tin foil hats,” leading many to feel nervous to express any concerns. This prevents more open dialogue and helps silence vital information.

Countering that stigma is, therefore, a key part of furthering efforts to protect the public from the risks of wireless radiation. To help people “check” their learned habits of rejecting the

risks of wireless radiation as “craziness,” we have found it very helpful to emphasize the following facts.

If the concern over wireless radiation were mere “hysteria,” then:

(1) Why do cell companies (and companies selling other wireless devices) put warnings in their info packets?

- a. Samsung Galaxy Z Fold3 5G Cell Phone
 - i. “Body-worn SAR testing has been carried out at a separation distance of 1.5 cm. To meet RF exposure guidelines during body-worn operation, the device should be positioned at least this distance away from the body.”⁴⁴
- b. iMac OS Monterey 12 (2021), macOS Sonoma 14 (2023)
 - ii. “This device should be operated **with a minimum separation distance of 20 cm (8 inches) between the equipment and a person’s body.**”⁴⁵
- c. The Amazon Echo Dot (4th Generation) Kids Edition
 - iii. “It is advised to use the Products in such a manner that minimizes the potential for human contact during normal operation... this device should be installed and operated with **at least 20 cm between the radiator and your body.**”⁴⁶
- d. Nanit Wireless Baby Monitor
 - iv. “This device must be installed to provide a separation distance of **at least 20 cm from all persons** and must not be co-located or operating in conjunction with any other antenna or transmitter.”⁴⁷

(2) Why do insurance companies refuse to sell product-liability policies that cover cell-phone radiation?

- a. *The Nation’s* special investigation team (Hertsgaard and Dowie 2018) couldn’t find a single insurance company that would sell a product-liability policy that covered cell-phone radiation.⁴⁸
- b. Insurance companies and liability consultants advise that clients buying property near EMF sources buy liability insurance from a carrier that has “EMF coverage built directly into their form via their definition of ‘Pollutants.’”⁴⁹
- c. Dr. Joshua Pearce, an academic with a PhD in engineering who also owns stock in the American Tower Corporation, recently published a scientific paper (2020) that warns cell phone tower firms from “the failed paths of other industries that have caused unintended human harm (e.g. tobacco).” Pearce declares that “there is

⁴⁴ https://www.samsung.com/sar/sarMain?site_cd=my&prd_md_name=SM-F711U&selNatCd=US&languageCode=EN

⁴⁵ <https://support.apple.com/guide/imac/fcc-compliance-statement-apd0a6c2b3db/mac>

⁴⁶ <https://www.amazon.com/gp/help/customer/display.html?nodeId=GZQ28LTRQBDS96WY>

⁴⁷ <https://fccid.io/2AIWVN101/User-Manual/User-Manual-3173723.pdf>

⁴⁸ Mark Hertsgaard, and Mark Dowie. (2018, April 5). How big wireless made us think that cell phones are safe: the disinformation campaign—and massive radiation increase—behind the 5G rollout: A special Investigation. *The Nation*. <https://www.thenation.com/article/archive/how-big-wireless-made-us-think-that-cell-phones-are-safe-a-special-investigation/>

⁴⁹ Willis - Global Risk Advisor, insurance and reinsurance broker. (n.d.).

https://www.willis.com/documents/Industries/Property_Investors/Publications/Team_CVs_June2007.pdf

already enough medical and scientific evidence to warrant long-term liability concerns for companies deploying cellular phone towers.”

(3) Why do other countries ban Wi-Fi in schools and take other precautionary measures?

- a. As of 2017, the following countries either have RF (radiofrequency) exposure limits (for 1800 MHz) that are *at least* 45% lower than the U.S. (whether for “sensitive areas” like schools, hospitals, and residential areas or for all areas)⁵⁰: *Bulgaria, India, Lithuania, Slovenia, Croatia, Greece, Italy.*
- b. Wi-Fi or cell phones are banned or limited in (some) “sensitive areas” (typically nurseries, kindergartens, or elementary schools)⁵¹ in: *Israel, France, Belgium, French Polynesia, Cyprus, Spain.*
- c. The following countries have “setback restrictions” that prohibit the installation of wireless infrastructure on or near “sensitive areas” like schools, hospitals, and residential areas⁵²: *Chile, Lithuania, Bangladesh, Israel, Greece.*

(4) Why did the WHO—via the International Agency for Research on Cancer (IARC)—declare wireless radiation as “possibly carcinogenic”?

- a. May 31, 2011, The “WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency electromagnetic fields as possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer, associated with wireless phone use.”⁵³

(5) Why did the US Federal Court system (2021) rule that the FCC failed to respond to “evidence that exposure to RF radiation at levels below the Commission’s current limits may cause negative health effects”⁵⁴?

- a. This means that the court found the evidence of negative health effects sufficiently compelling.

(6) Why did a two-year study by the National Institutes of Health find clear evidence that wireless radiation can cause cancer?

⁵⁰ Stam, R. (2018, January). *Comparison of international policies on electromagnetic fields*. National Institute for Public Health and the Environment. <https://www.rivm.nl/sites/default/files/2018-11/Comparison%20of%20international%20policies%20on%20electromagnetic%20fields%202018.pdf>

⁵¹ “What’s happening internationally.” Environmental Health Trust. <https://ehtrust.org/policy/international-policy-actions-on-wireless/>

⁵² “5G, Cell Towers, and Small Cells.” Environmental Health Trust. <https://ehtrust.org/wp-content/uploads/5G-Cell-Towers-Near-Schools-Children-Scientific-Research-Liability-Briefing-1-1.pdf> and Silva, A. “New Communications antenna law in Chile.” Newsletter of the International Car Association Legal Practice Division Vol 20, Issue 2 1. April 2013. [https://www.carey.cl/wp-content/uploads/filebase/newsalert/Communications%20Law%20\(April%202013\).pdf](https://www.carey.cl/wp-content/uploads/filebase/newsalert/Communications%20Law%20(April%202013).pdf)

⁵³ “IARC CLASSIFIES RADIOFREQUENCY ELECTROMAGNETIC FIELDS AS POSSIBLY CARCINOGENIC TO HUMANS.” The WHO- IARC. 31 May 2011 https://www.iarc.who.int/wp-content/uploads/2018/07/pr208_E.pdf

⁵⁴ *Environmental Health Trust v. Federal Communications Commission, no. 20-1025 (D.C. Cir. 2021)*. Justia Law. (n.d.). <https://law.justia.com/cases/federal/appellate-courts/cadc/20-1025/20-1025-2021-08-13.html>

- a. A two-year study conducted by the National Toxicology Program (an interagency program supported by the NIH, CDC, and FDA)—and later verified by the Ramazzini Institute, a highly respected research institution based in Italy (Falcioni et al. 2018; rats, in vivo, experimental study)—found an association between high exposure to wireless radiation and:
 - i. tumors in the heart and brain (NTP 2018; rats, in vivo, experimental study)
 - ii. DNA damage in the brain and blood cells (Smith-Roe et al. 2020; rats/mice, in vivo, experimental study).

(7) Why did the International Association of Fire Fighters (IAFF, 2004⁵⁵) declare its opposition to installing cell towers at fire stations?

- a. This issue was raised after firefighters in a CA station where a tower was installed started developing concerning symptoms (e.g., particularly cognitive impairment like getting lost on calls in one’s own hometown, forgetting how to do CPR, etc.).⁵⁶
- b. “The International Association of Fire Fighters’ position on locating cell towers commercial wireless infrastructure on fire department facilities, as adopted by its membership in August 2004, is that the IAFF oppose the use of fire stations as base stations for towers and/or antennas for the conduction of cell phone transmissions until a study with the highest scientific merit and integrity on health effects of exposure to low-intensity RF/MW radiation is conducted and it is proven that such sitings are not hazardous to the health of our members...IAFF members are concerned about the effects of living directly under these antenna base stations for a considerable stationary period of time and on a daily basis.”⁵⁷

(8) Why have educational organizations like the National Education Association and dozens of state and local school boards, teachers’ unions, and Parent Teacher Organizations (PTOs) called for policies that keep schools safe from wireless radiation?

- a. [Section C-19 of the NEA 2013-2014 Resolution on Electromagnetic Radiation:](#) “The National Education Association believes that all educational facilities must have healthy indoor air quality, be smoke-free, be safe from environmental and chemical hazards, and be safe from hazardous electromagnetic fields...Students

⁵⁵ “Revised and Amended IAFF Resolution No. 15; August 2004: Position on the Health Effects from Radio Frequency/Microwave (RF/MW) Radiation in Fire Department Facilities from Base Stations for Antennas and Towers for the Conduction of Cell Phone Transmissions” International Association of Fire Fighters. Accessed March 1, 2024. <https://www.iaff.org/cell-tower-radiation/>

⁵⁶ Susan Foster, the woman who organized the pilot study (conducted by conducted by Gunnar Heuser, M.D., PhD) with firefighters at this CA station, reports on the pilot study here (see page 20): <https://www.fcc.gov/ecfs/document/1062696679001/1> (FCC Filing 106269667900, Proceedings [GN 20-32](#), Jun 26, 2020)

⁵⁷ “Cell Tower Radiation Health Effects.” International Association of Fire Fighters. Accessed March 1, 2024. <https://www.iaff.org/cell-tower-radiation/> Available in pdf form: <https://mdsafetech.files.wordpress.com/2019/09/iaff-cell-tower-resolution-health-and-safety-fact-sheets-copy.pdf>

and/or their parents/guardians, education employees, and the public should be notified of actual and potential hazards.”⁵⁸

The bottom line: Even if we simply conclude that there is evidence to suggest today’s levels of wireless radiation *could* be harmful, especially for vulnerable populations (like children) – why risk it? Is downloading the next viral video on a smartphone at hyper speed more important than preventing cancer?

⁵⁸ “2013-2014 NEA Resolutions.” National Educational Association. Accessed April 21, 2024.
<https://web.archive.org/web/20150707103747/https://www.nea.org/assets/docs/nea-resolutions-2013-14.pdf>

IF THE CONCERNS OVER WIRELESS RADIATION WERE MERE “HYSTERIA,” THEN...

- Why do **other countries** ban Wi-Fi in schools?
- Why do **companies that sell wireless devices** put health warnings in their own info packets?
- Why do **insurance companies** refuse to sell product-liability policies that cover wireless radiation?
- Why did the **World Health Organization** (WHO) declare wireless radiation as “possibly carcinogenic”?
- Why did the **US Federal Court system** (2021) rule that the FCC failed to respond to “evidence that exposure to RF radiation at levels below the Commission’s current limits may cause negative health effects”?
- Why did the **National Institutes of Health (NIH)** find “clear evidence” that wireless radiation can cause cancer?
- Why have **hundreds of medical practitioners and scientists** and dozens of **medical organizations** (e.g., *American Acad. of Pediatrics, American & European Academies for Environmental Medicine, Santa Clara County Med. Association*, and more) called for stricter limits to wireless radiation?
- Why did the **International Association of Fire Fighters** (2004) declare its opposition to installing cell towers at fire stations?
- Why have educational organizations --including the **National Education Association** and dozens of state and local school boards, teachers’ unions, and Parent Teacher Organizations (PTOs) called for policies that keep schools safe from wireless radiation?



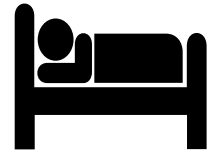
When we dismiss concerns about wireless radiation as if they are just “craziness,” who benefits?

For references, please see our website or our 2024 report.



WHAT CAN YOU DO RIGHT NOW?

- **Make a safe sleep environment for your body to "reset"**



- **unplug wifi routers** while you sleep!
- **keep cell phone away** from you (get a battery-operated alarm)
- **turn off wifi/bluetooth-enabled devices** or put them in "airplane mode" (turn off the wifi, bluetooth, and cell data)
 - Hardwire these devices if you need to stay connected (directions available on our website)
 - On Apple devices, toggling wifi/bluetooth to "standby" does not turn it "off"

- **Protect children, pregnant women, & small pets**



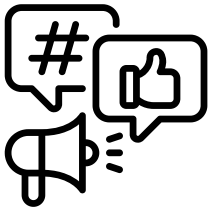
- **Minimize time near cell towers/antennas**, wifi routers, and wifi/bluetooth-enabled devices
 - this includes cell/smart phones (unless you put them on airplane mode) and computers (unless you hard-wire them via ethernet cables – yes, it IS possible and relatively easy!)

- **Support policy changes**

- Join in our efforts to make policies that prioritize public health (e.g., prohibit cell towers near schools, give municipalities local control over where towers/antennas are placed)
- Start by **signing our petition** calling on our local, state and federal officials to implement policies that protect the public from wireless radiation
<https://ghc4safetech.com/>



- **Spread awareness**



- **Connect us with your local organizations** (e.g., PTO, School Board, Municipal Government, Senior Center) and tell them that you'd like us to give a presentation
- **Counter the stigma** against challenging wireless technologies
- **Share this information as widely as you can!**



BUT WHY ARE THERE SO MANY STUDIES THAT SEEM TO SHOW “NO EFFECT” OF WIRELESS RADIATION?

- **Money matters (a lot)**

- Compared to studies funded by governments or institutions, studies funded by telecommunications companies are **1.5 – 2.5x less likely to report an “effect”** of wireless radiation at everyday exposure levels (McCredden 2023; Huss et al 2007).

- **A “lack of evidence of harm” (on some studies) does not prove a lack of potential harm, especially when looking for a proverbial “needle in a haystack”**

- Many studies show “no effect” of a specific frequency/power density on a specific part of biological health. But this does NOT mean wireless radiation is “safe,” it just means the scientists didn’t find evidence of harm for those specifics.



- **Many studies focus on thermal damage, short term exposure, and immediate impacts**

- But studies show that the health risks of everyday RF exposure are non-thermal (Pakhomov et al 1997abc; Marconi et al. 2015) and chronic (long-term exposure and cumulative impacts)

- **Biophysics is complicated: scientists are still trying to figure out exactly how wireless radiation affects biology**

- Studies suggest many of the biological responses to RF are:
 - dependent on the specific frequency of the wireless signal (Pakhomov et al 1997, Markovà 2005, Sarimov et al. 2004)
 - dependent on genetic, physiological, and physical variables (Belyaev et al 2000)

- **Wireless radiation is complicated, too**

- There are countless variables: frequency, power density, duration/location of the application, modulation, wave form, etc. ...it’s enough to make anyone’s head spin, and at the very least, leaves a lot of room for error and potentially, deception.
- Many of the “uncertainties” in methods for measuring radiation (e.g., dosimetry) are “likely to be related to the inherent variability in real-world exposures,” and there is a need for “developing improved exposure/dosimetric techniques for the higher microwave frequencies to be used by forthcoming communications technologies” (Foster, Ziskin & Balzano 2022).

Radiofrequency radiation is **the new tobacco**. Anyone sincerely reading the science should be **deeply, deeply concerned**.

Dr. Damien Downing,
President of The British Society for
Ecological Medicine

For complete references (and links to these studies) please see “current science” section of our website.



**GREATER HARTFORD COALITION
FOR SAFE TECHNOLOGY**

www.GHC4SafeTech.com. info@ghc4safetech.com

Works Referenced

Aldad, T. S., Gan, G., Gao, X.-B., & Taylor, H. S. (2012). Fetal Radiofrequency Radiation Exposure From 800-1900 Mhz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice. *Scientific Reports*, 2(1), 312.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3306017/>

Alster, N. (2015). Captured Agency: How the Federal Communications Commission is Dominated by the Industries It Presumably Regulates. Edmond J. Safra Center for Ethics, Harvard University. https://ethics.harvard.edu/files/center-for-ethics/files/capturedagency_alster.pdf

Balmori A. Evidence for a health risk by RF on humans living around mobile phone base stations: From radiofrequency sickness to cancer. *Environ Res.* 2022 Nov; 214 (Pt 2):113851. doi: 10.1016/j.envres.2022.113851. Epub 2022 Jul 14. PMID: 35843283.
<https://pubmed.ncbi.nlm.nih.gov/35843283/>

Baste V, Moen BE, Oftedal G, Strand LA, Bjørge L, Mild KH. (April 2012) Pregnancy outcomes after paternal radiofrequency field exposure aboard fast patrol boats. *Journal of Occupational and Environmental Medicine* . 2012;54:431–8
DOI: 10.1097/JOM.0b013e3182445003 <https://pubmed.ncbi.nlm.nih.gov/22354128/>

Belyaev IY, Alipov YD, Shcheglov VS, Polunin VA, Aizenberg OA. Cooperative response of Escherichia coli cells to the resonance effect of millimeter waves at super low intensity. *Electro Magnetobiol.* 1994;13:53–66.

Belyaev IY, Shcheglov VS, Alipov ED, Ushakov VD. Nonthermal effects of extremely high-frequency microwaves on chromatin conformation in cells in vitro—dependence on physical, physiological, and genetic factors. *IEEE Trans Micro Theory Tech.* 2000; 48:2172–9.

Belyaev IY, Shcheglov VS, Alipov YD, Polunin VA. Resonance effect of millimeter waves in the power range from 10-19 to 3×10^{-3} W/cm² on Escherichia coli cells at different concentrations. *Bioelectromagnetics.* 1996;17:312–21.

Falcioni L, Bua L, Tibaldi E, Lauriola M, De Angelis L, Gnudi F, Mandrioli D, Manservigi M, Manservigi F, Manzoli I, Menghetti I, Montella R, Panzacchi S, Sgargi D, Strollo V, Vornoli A, Belpoggi F. Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz GSM base station environmental emission. *Environ Res.* 2018 Aug;165:496-503. doi: 10.1016/j.envres.2018.01.037. Epub 2018 Mar 7. PMID: 29530389.
<https://pubmed.ncbi.nlm.nih.gov/29530389/>

Fernández C, de Salles AA, Sears ME, Morris RD, Davis DL. Absorption of wireless radiation in the child versus adult brain and eye from cell phone conversation or virtual reality. *Environ Res.* 2018 Nov;167:694-699. doi: 10.1016/j.envres.2018.05.013. Epub 2018 Jun 5. PMID: 29884550.

Foster KR, Ziskin MC, Balzano Q. Three Quarters of a Century of Research on RF Exposure Assessment and Dosimetry-What Have We Learned? *Int J Environ Res Public Health*. 2022 Feb 12;19(4):2067. doi: 10.3390/ijerph19042067. PMID: 35206253; PMCID: PMC8871822. <https://pubmed.ncbi.nlm.nih.gov/35206253/>

Gandhi, O. P. "Yes the Children Are More Exposed to Radiofrequency Energy From Mobile Telephones Than Adults," in *IEEE Access*, vol. 3, pp. 985-988, 2015, doi: 10.1109/ACCESS.2015.2438782.

Havas M (PhD). (2013). Radiation from wireless technology affects the blood, the heart, and the autonomic nervous system. *Review of Environmental Health*. 2013; 28(2-3):75-84. doi: 10.1515/reveh-2013-0004. PMID: 24192494. https://www.researchgate.net/publication/258313941_Radiation_from_wireless_technology_affects_the_blood_the_heart_and_the_autonomic_nervous_system1

Huss A, Egger M, Hug K, Huwiler-Müntener K, Röösl M. Source of funding and results of studies of health effects of mobile phone use: systematic review of experimental studies. *Environ Health Perspect*. 2007 Jan;115(1):1-4. doi: 10.1289/ehp.9149. PMID: 17366811; PMCID: PMC1797826. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1797826/>

Jiang et al. *Cell & Bioscience* (2024). Acute exposure of microwave impairs attention process by activating microglial inflammation. *Cell & Bioscience* (2024) 14:2 <https://doi.org/10.1186/s13578-023-01162-9>

Karipidis, K., Mate, R., Urban, D. et al. 5G mobile networks and health—a state-of-the-science review of the research into low-level RF fields above 6 GHz. *J Expo Sci Environ Epidemiol* 31, 585–605 (2021). <https://doi-org.proxy.library.upenn.edu/10.1038/s41370-021-00297-6>

Kesari KK, Behari J. 2010. Microwave exposure affecting reproductive system in male rats. *Appl Biochem Biotechnol*. 2010 ;162:416–28. <https://pubmed.ncbi.nlm.nih.gov/19768389/>

Korenstein-Ilan, Avital, Alexander Barbul, Pini Hasin, Alon Eliran, Avraham Gover, and Rafi Korenstein. 2008. "Terahertz Radiation Increases Genomic Instability in Human Lymphocytes," *Radiation Research* 170(2), 224-234, (1 August 2008). <https://doi.org/10.1667/RR0944.1>. <https://pubmed.ncbi.nlm.nih.gov/18666810/>

Mageroy N, Mollerlokken OJ, Riise T, Koefoed V, Moen BE. A higher risk of congenital anomalies in the offspring of personnel who served aboard a Norwegian missile torpedo boat. *Occup Environ Med*. 2006;63:92–7. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2078078/>

Mantiply ED, Pohl KR, Poppell SW, Murphy JA. Summary of measured radiofrequency electric and magnetic fields (10 kHz to 30 GHz) in the general and work environment. *Bioelectromagnetics*. 1997;18(8):563-77. PMID: 9383245.

Marconi A, Tasteyre A, de Seze R, Fogel P, Simoneau G, Conti M, Sarbach C, Young SS, Gilbert J-E, Thomas Y. 2015. Multivariate Entropy Analysis of Oxidative Stress Biomarkers

Following Mobile Phone Exposure of Human Volunteers: A Pilot Study *Journal Scientific Exploration*. 29 (3): 449-465, 2015.

Markovà E, Hillert L, Malmgren L, Persson BR, Belyaev IY. Microwaves from GSM mobile telephones affect 53BP1 and gamma-H2AX foci in human lymphocytes from hypersensitive and healthy persons. *Environ Health Perspect*. 2005 Sep;113(9):1172-7. doi: 10.1289/ehp.7561. PMID: 16140623; PMCID: PMC1280397. <https://pubmed.ncbi.nlm.nih.gov/16140623/>

McCredden JE, Weller S, Leach V. The assumption of safety is being used to justify the rollout of 5G technologies. *Front Public Health*. 2023 Jan 26;11:1058454. doi: 10.3389/fpubh.2023.1058454. PMID: 36815158; PMCID: PMC9940636. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9940636/>

Møllerlækken OJ, Moen BE. Is fertility reduced among men exposed to radiofrequency fields in the Norwegian Navy? *Bioelectromagnetics*. 2008;29:345–52.

Moon JH (MD, PhD). Health effects of electromagnetic fields on children. *Clinical Experiments in Pediatrics*. 2020 Nov; 63(11): 422–428. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7642138/>

Morgan L, Kesari S, Davis D. (2014). Why children absorb more microwave radiation than adults: The consequences. *Journal of Microscopy and Ultrastructure*. 2(2).

National Association of Telecommunications Officers and Advisors. (2021b, March). Stretched Thin and Feeling the Squeeze: The Harmful Effects of Small Cell Preemption on Local Governments. https://assets.noviams.com/novi-file-uploads/natoa/20210317_NATOA_CWAReport.pdf

NTP (National Toxicology Program). *Technical Report on the Toxicology and Carcinogenesis Studies in Hsd:Sprague Dawley SD Rats Exposed to Whole-Body Radio Frequency Radiation at a Frequency (900 MHz) and Modulations (GSM and CDMA) Used by Cell Phones*. National Toxicology Program; Bethesda, MA, USA: 2018. https://ntp.niehs.nih.gov/sites/default/files/ntp/htdocs/lt_rpts/tr595_508.pdf

NTP. *Technical Report on the Toxicology and Carcinogenesis Studies in P6C3F1/N Mice Exposed to Full Body Radiofrequency Radiation at a Frequency (1900 MHz)* National Toxicology Program; Bethesda, MA, USA: 2018. https://www.ncbi.nlm.nih.gov/books/NBK564537/pdf/Bookshelf_NBK564537.pdf

Ntzouni MP, Stamatakis A, Stylianopoulou F, Margaritis LH. Short-term memory in mice is affected by mobile phone radiation. *Pathophysiology*. 2011 Jun;18(3):193-9. doi: 10.1016/j.pathophys.2010.11.001. Epub 2010 Nov 26. PMID: 21112192.

Pakhomov AG, Prol HK, Mathur SP, Akyel Y, Campbell CB. Role of field intensity in the biological effectiveness of millimeter waves at a resonance frequency. *Bioelectrochem Bioenerg*. 1997;43:27–33.

Pakhomov AG, Prol HK, Mathur SP, Akyel Y, Campbell CB. Search for frequency-specific effects of millimeter-wave radiation on isolated nerve function. *Bioelectromagnetics*. 1997;18:324–34.

Pall ML. Wi-Fi is an important threat to human health. *Environ Res*. 2018 Jul;164:405-416. doi: 10.1016/j.envres.2018.01.035. Epub 2018 Mar 21. PMID: 29573716.

Pearce JM. Limiting liability with positioning to minimize negative health effects of cellular phone towers. *Environ Res*. 2020 Feb;181:108845. doi: 10.1016/j.envres.2019.108845. Epub 2019 Nov 29. PMID: 31791710. <https://pubmed.ncbi.nlm.nih.gov/31791710/>

Pikov, V., et al. (July 19, 2010). Modulation of neuronal activity and plasma membrane properties with low-power millimeter waves in organotypic cortical slices. *Journal of Neural Engineering*. Vol 7, 4. 7 045003DOI 10.1088/1741-2560/7/4/045003
<https://pubmed.ncbi.nlm.nih.gov/20644247/>

Pinto, R., Ardoino, L., Villani, P., & Marino, C. (2023). In Vivo Studies on Radiofrequency (100 kHz-300 GHz) Electromagnetic Field Exposure and Cancer: A Systematic Review. *International journal of environmental research and public health*, 20(3), 2071.
<https://doi.org/10.3390/ijerph20032071>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9915925/> <https://www.mdpi.com/1660-4601/20/3/2071>

Rago, R., Salacone, P., Caponecchia, L. *et al*. The semen quality of the mobile phone users. *J Endocrinol Invest* 36, 970–974 (2013). <https://doi.org/10.3275/8996>

Saili L, Hanini A, Smirani C, Azzouz I, Azzouz A, Sakly M, Abdelmelek H, Bouslama Z. (2015) Effects of acute exposure to WIFI signals (2.45GHz) on heart variability and blood pressure in Albinos rabbit. *Environ Toxicol Pharmacol*. 2015 Sep;40(2):600-5. doi: 10.1016/j.etap.2015.08.015. Epub 2015 Aug 17. PMID: 26356390.
<https://pubmed.ncbi.nlm.nih.gov/26356390/>

Sarimov, R, L. O. G. Malmgren, E. Markova, B. R. R. Persson and I. Y. Belyaev, "Nonthermal GSM microwaves affect chromatin conformation in human lymphocytes similar to heat shock," in *IEEE Transactions on Plasma Science*, vol. 32, no. 4, pp. 1600-1608, Aug. 2004, doi: 10.1109/TPS.2004.832613.

Schmiedchen, K., Driessen, S. & Oftedal, G. Methodological limitations in experimental studies on symptom development in individuals with idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF) – a systematic review. *Environ Health* 18, 88 (2019).
<https://doi.org/10.1186/s12940-019-0519-x>

Smith-Roe, S.L., Wyde, M.E., Stout, M.D., Winters, J.W., Hobbs, C.A., Shepard, K.G., Green, A.S., Kissling, G.E., Shockley, K.R., Tice, R.R., Bucher, J.R. and Witt, K.L. (2020), Evaluation of the genotoxicity of cell phone radiofrequency radiation in male and female rats and mice

following subchronic exposure. *Environ Mol Mutagen*, 61: 276-290. <https://doi-org.proxy.library.upenn.edu/10.1002/em.22343>

Stam, R. January 2018. "Comparison of international policies on electromagnetic fields." The Netherlands National Institute for Public Health and the Environment, RIVM. <https://www.rivm.nl/sites/default/files/2018-11/Comparison%20of%20international%20policies%20on%20electromagnetic%20fields%202018.pdf>

Türedi, Sibel, and Hatice Hancı, Zehra Topal, Deniz Ünal, Tolga Mercantepe, İlyas Bozkurt, Haydar Kaya & Ersan Odacı (2015) The effects of prenatal exposure to a 900-MHz electromagnetic field on the 21-day-old male rat heart, *Electromagnetic Biology and Medicine*, 34:4, 390-397, DOI: 10.3109/15368378.2014.952742

Wang, H., Liu, Y., Sun, Y. *et al.* Changes in cognitive function, synaptic structure and protein expression after long-term exposure to 2.856 and 9.375 GHz microwaves. *Cell Commun Signal* 21, 34 (2023). <https://doi.org/10.1186/s12964-022-01011-1>

Wang, H., Liu, Y., Sun, Y. *et al.* Changes in cognitive function, synaptic structure and protein expression after long-term exposure to 2.856 and 9.375 GHz microwaves. *Cell Commun Signal* 21, 34 (2023). <https://doi.org/10.1186/s12964-022-01011-1>

Weller S, May M, McCredden J, Leach V, Phung D, Belyaev I. Comment on "5G mobile networks and health-a state-of-the-science review of the research into low-level RF fields above 6 GHz" by Karipidis et al. *J Expo Sci Environ Epidemiol*. 2023 Jan;33(1):17-20. doi: 10.1038/s41370-022-00497-8 Epub 2022 Nov 24. PMID: 36434135; PMCID: PMC9849131. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9849131/>

Zwamborn APM, Vossen SHJ, van Leersum BJA, Ouwens MA, Makel WN. (2003) Effects of Global Communication system radio-frequency fields on Well Being and Cognitive Functions of human subjects with and without subjective complaints. Netherlands Organisation for Applied Scientific Research (TNO), TNO report, FEL-03-C148: 1-89