PUBLIC REQUEST TO ADDRESS
THE BOARD OF SUPERVISORS
COUNTY OF LOS ANGELES, CALIFORNIA

Correspondence Received

			The following individuals submitted comments on agenda item:		
Agenda #	**Relate To**	**Position**	**Name**	**Comments**	**Attachment**
7.		**Favor**	Esthela Pacheco		Yes
			Jaspreet Puri	I live in Stevenson Ranch where AT&T is proposing a 75-95 foot cell tower in the middle of the residential community (zoned at 35 feet) and next to the elementary school. During the hearing approving the cell tower (which has been appealed) Regional Planning testified that they do not have sufficient resources to review AT&T's technical materials. To ensure Regional Planning has the necessary resources, an amendment to the Wireless Facility Ordinance requiring applicants pay for the County to hire an independent consultant to review technical materials is necessary. The Ordinance also should be amended to prohibit cell towers within 1500 feet of schools, which is what the Newhall School District supports.	No
			Saam Dowlatshahi	I live in Stevenson Ranch where AT&T is proposing a 75-95 foot cell tower in the middle of the residential community (zoned at 35 feet) and next to the elementary school. During the hearing approving the cell tower (which has been appealed) Regional Planning testified that they do not have sufficient resources to review AT&T's technical materials. To ensure Regional Planning has the necessary resources, an amendment to the Wireless Facility Ordinance requiring applicants pay for the County to hire an independent consultant to review technical materials is necessary. the Ordinance also should be amended to prohibit cell towers within 1500 feet of schools, which is what the Newhall School District supports.	No
			Victor E Reyes		Yes

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			The following individuals submitted comments on agenda item:		
Agenda #	**Relate To**	**Position**	**Name**	**Comments**	**Attachment**
7.		**Oppose**	Al Lew	I urge the Board to vote NO on the proposed changes to Titles 16 and 22 of the L.A. County Code. If these changes are passed by you it will eliminate public notice, oversight, safety and environmental review, as well as strip from LA residents any opportunities for appeal. You will remove due process rights for residents and fast track the installation of harmful cell towers, small cells and other wireless infrastructure that have numerous studies proving their harm. Wireless technology is also slow, outdated, expensive and a fire hazard. A much safer, faster and secure option is fiber optic technology. We've already paid for it through our landline phone bills, but big telecom companies never completed the job. • Residents deserve to know in advance if a wireless antenna will be installed near their homes. • Residents deserve the opportunity to be included in and appeal decisions made by officials. • Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. • No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. • Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife. • High speed fiber optic is a much superior and less expensive technology and should be adopted instead of wireless.	No

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			The following individuals submitted comments on agenda item:		
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7.		**Oppose**	Alan Ackerman	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA.	No
			Alice Pero	I do not want a cell tower put up right outside my home or close by. This directly affects my health as radiation from cell towers causes cancer. I already have a condition that would be aggravated by such radiation. There have been no notices or hearings or opportunities to appeal and this violates my Constitutional rights. I urge that further Fiber Optic Broadband Infrastructures be made that would satisfy the need we have for faster internet. We should not give telecom companies free reign to build these towers without oversight.	No

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			The following individuals submitted comments on agenda item:		
Agenda #	**Relate To**	**Position**	**Name**	**Comments**	**Attachment**
7.		**Oppose**	Alison Childs	This is unacceptable. Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for animals, humans, nor the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife. There are THOUSANDS of research papers produced by the United States Navy that demonstrate HARMFUL levels of EMF/RF by wireless devices, routers, nodes, and all related equipment. LA County residents like myself and my family must be told the status of existing and any proposed Wireless infrastructure in the county. We have a 4G/5G node outside of our apartment and have had non-stop health issues ever since living here. City Council members who approve such projects that result in a detriment to our health and safety are liable for the health impact. Thank you.Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for animals, humans, nor the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife. There are THOUSANDS of research papers produced by the United States Navy that display HARMFUL levels of EMF/RF by wireless devices, routers, nodes, and all related equipment. LA County residents like myself and my family should be told the status of existing and any proposed Wireless infrastructure in the county. We have a 4G/5G node outside of our apartment and have had non-stop health issues ever since living here. City Council members who approve such projects that are detrimental to our health and safety are liable for any health impact. Thank you.	No

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			The following individuals submitted comments on agenda item:		
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7.		**Oppose**	Alva L Whetton	I urge the Board of Supervisors and request they be included in the public record. Demand protections on the following bases: Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	No
			Amy Allen	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.I do not want powerful wireless antennas outside my bedroom window, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies.	No
			Andrea Pullen	Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	No

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			The following individuals submitted comments on agenda item:		
Agenda #	**Relate To**	**Position**	**Name**	**Comments**	**Attachment**
7.		**Oppose**	Andrea Stern	Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA.	No
			Angela Ford	As a California resident, I implore you to vote NO on Nov. 15 to the proposed changes to Titles 16 and 22 of the L.A. County Code and adopt the "redlined" versions of Titles 16 and 22 that Fiber First LA submitted. The placement of wireless infrastructure must always have public knowledge and input. I demand the following protections are implemented in regard to the installation of wireless communications infrastructure: • Notify residents in advance if a wireless antenna will be installed near their homes. • Provide everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed, fiber optic internet access, including residents in underserved communities. • Do not force residents to rely on slow, expensive and unreliable wireless broadband that poses a fire risk and has not been proven to be safe. • Conduct prior Environmental Impact Assessments (EIA). Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife. Your priority should be the health and safety of California residents and the protection of the environment. The public must be notified and included in the decision-making process before the placement of any wireless infrastructure. show less	No
			Anne Dubow	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA	No
			Baldo Capiz		Yes
			Baldomero Capiz	Las comunidades más necesitadas están relegadas de los servicios públicos, como es la conexión de fibra óptica a internet. Debe de ser para todas las familias. Gracias	No
			Barbara Paris	Please see attached	Yes

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			Ben Levi	This is a must-read and watch for every Supervisor before you vote to pass the amended ordinances. Cell Phone Tower Radiation Pollution — Blake Levitt — 2009 This presentation was to a Congressional Staff Briefing in 2009. youtube.com/watch?v=00CBHFoL5Hw Hi everyone, it's a pleasure to be with you. There's very little time allotted to all the speakers. So I'm going to get right to the point. We likely have a looming health problem on our hands with radiofrequency radiation. It's called RF and it's emitted from all wireless technologies. This includes both consumer products and infrastructure issues, everything from cell and cordless phones, cell towers, WiFi internet, wireless computer systems in schools and homes, Wi-Max, radiofrequency ID tags, and a host of other high tech products. The continuing unfettered use of this kind of radiation needs much closer scrutiny. People assume that these technologies are safe. But at the federal level, there is almost no government research today. And most of the regulatory agencies have had their programs completely eviscerated. A whole area of important expertise is being lost just when we need it most. Almost all of the research on RF is now coming from Europe and it's coming from Asia; we're falling far behind. No one is protected in the US today from long term, low level exposures to RF, which is what we mostly experience. It's called electrosmog, and it's a form of energetic air pollution. One study in Europe a few years back found that the background RF in urban areas had increased by a factor of over 3,000% in just a ten-year period. Cell technology likely accounts for the rise that they've measured. US cities are thought to be comparable, if not higher. That, by anyone's reckoning, is an altered environment. We're essentially experimenting on people without their consent. There are exposure standards in place, but they're controversial and they're obsolete. The debate on this, by the way, is not new. It goes all the way back to World War Two. When the US Bureau of Ships first noticed that midshipmen developed cataracts and infertility problems near radar units. The heart of the debate is over what are called "thermal" versus "non-thermal" effects. The electromagnetic spectrum is traditionally divided into ionizing and non-ionizing radiation. Ionizing radiation, which we're all familiar with, include solar rays, X-rays, nuclear activities, things like that. It's known to have enough power to knock electrons off of cellular orbits, and thereby cause genetic mutations. Those exposures, by the way, are known to be cumulative over a lifetime. But non-ionizing radiation, which includes everything from the visible light frequencies all the way down to the Earth's natural electromagnetic fields, are thought not to have enough power to do that. The non-ionizing bands have been deemed safe if they are kept under certain thresholds for tissue heating and electric shock.	Yes	

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But that safety premise is false. Non-ionizing radiation can cause a host of biological effects below those thresholds. No one disputes thermal effects. Radiofrequency radiation can and does heat tissue, just like a microwave oven. The only debate is over whether there are adverse non-thermal effects, what are they, and can they be reversed? The human anatomy… think about it for a minute… is an electrical organism. The heartbeat is electrical, brainwaves are electrical, critical stages of cell division itself are electrically influenced. There's not much that happens in the human body that isn't electrical in one way or another.

But the distinctions between forms of radiation may be more for the precision of the physics community than for the accuracy of biology models. Researchers are finding more more and more multisystemic effects at lower intensities all the time, and these non-ionizing exposures appear to be cumulative as well. There may, in fact, be no safe threshold for low level non-ionizing radiation, just like the National Academy of Sciences has said that there is no safe threshold for ionizing radiation. They issued a study last year that found that the only difference may lie in in specific exposure parameters that are not yet understood.

The work of doctors Henry Lai and N.P. Singh at the University of Washington in Seattle definitely points in that direction. Those researchers found both double and single strand DNA breaks with low level microwave exposures below heating thresholds. According to traditional theory, that is not supposed to be happening. Their work has been replicated in about 12 different studies.

All wireless devices need base stations to bounce signals. That's how it works. Concerns over the infrastructure that's needed to support all of this technology started at the federal level with the Telecommunications Act of 1996. That bill unleashed not only the whole wireless juggernaut that we appear to love so much, but it also created a kind of rolling nightmare for homeowners and local zoning Commissions.

Section 704 was written by lobbyists for the telecom industry. Unfortunately, it was among, in fact, one of the most destructive pieces of legislation as a journalist that I've seen in my career. That clause literally eviscerated the reason we have zoning in the first place. All state statutes identify the purpose of zoning as the responsibility to protect the health, safety and welfare of a community. But the industry knew that without taking the health piece off the table, this build-out could never occur. They knew that once local officials look at the science, they do not approve towers near residences or schools… period. The placement of towers is a very contentious issue at the local level. I'm sure that every congressional office has heard from constituents about it. Property devaluation and health concerns are always at the top of the list. Few people realize the key questions about the safety of radiofrequency radiation have never been settled… despite what anyone says, no safe level of RF has ever really been determined.

Unfortunately, there is a growing segment of the population that has become

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				hypersensitive to these exposures. People report sleeplessness, hyper-vigilance, rashes, concentration problems, headaches, and a range of other symptoms. People do not even have an agency to report symptoms to. In fact, most doctors do not know that these exposures should be considered as environmental factors. Low level ambient RF is now associated with some of the fastest rising complaints in doctor's offices, including headaches and sleep disorders, asthma and allergies, autism, and a host of deadly neurotransmitter diseases like Alzheimer's, Parkinson's and ALS. There is a big disconnect with doctors when it comes to this, because most of the information is contained in biophysics journals, not a place where MDs typically read. What are we doing to ourselves? And more specifically, what are we doing to other species, too? RF, even at extremely low intensities, is a known active genotoxin, meaning that it can and does damage DNA and that of other species as well. We should not fool ourselves. This is not an environmental freebie. Within the last 10 years, we have completely altered the electromagnetic signature at the Earth's surface with power densities and signaling characteristics that simply do not exist in nature. And this is all done with a presumption of safety that should not be made. We may already be seeing the law of unintended consequences with other applications of this. Species extinctions have accelerated to a rate never seen before. There are studies that find that wildlife abandons areas when cell towers go in. There are plausible theories that say that ambient RF may play a role in the whole colony collapse of honeybees; that's a big one these days. Low level electromagnetic fields are known to throw bees off of their natural navigational course. One health	
			Beth Thorne	As a California resident, I implore you to vote NO on Nov. 15 to the proposed changes to Titles 16 and 22 of the L.A. County Code and adopt the "redlined" versions of Titles 16 and 22 that Fiber First LA submitted. The placement of wireless infrastructure must always have public knowledge and input. I demand the following protections are implemented in regard to the installation of wireless communications infrastructure: • Notify residents in advance if a wireless antenna will be installed near their homes. • Provide everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed, fiber optic internet access, including residents in underserved communities. • Do not force residents to rely on slow, expensive and unreliable wireless broadband that poses a fire risk and has not been proven to be safe. • Conduct prior Environmental Impact Assessments (EIA). Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance	No

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	and defense, vitality, longevity and survivorship of wildlife. Your priority should be the health and safety of California residents and the protection of the environment. The public must be notified and included in the decision-making process before the placement of any wireless infrastructure.	
Betty Winholtz	Please vote no and adopt the “redlined” versions that were submitted by Fiber First LA. You don't have to live in LA to be concerned about this. Those of us who travel through frequently are also exposed. f pass it, then important safeguards will be stripped from the public, including the elimination of public notice, setbacks, oversight, safety and environmental review, as well as any opportunities for appeal. Protections are necessary because: Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	No
Brant Benun	Adopt redlined versions submitted by fiber first la	No
Brenda Martinez	Our Boyle Heights Neighborhood Council voted unanimously to opposed this Ordinance, for the record see our attached Resolution. Resolution that was shared with our Council District office and according to Chief of Staff of CD 14 Jenifer Barraza, they shared with the full board of supervisors. Thank you for the consideration, please give the community reassurance that they voice matters!	Yes
Brenda Martinez	Wireless technology is not safe for our natural world. We need our birds, bees, plants and trees to be healthy. I urge you to adopt the "redlined" versions of Title 16 and 22 that were submitted by Fiber First LA. The placement of wireless infrastructure must have public knowledge and input.	Yes
Brendan Miller	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA.	No
Capuchin Will	"I do not want a cell tower put up right outside my home, or in my community,	No

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	or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA."	
Carla Cohen	The electro-magnetic fields and radiation are very harmful to ones health. I do not want it in my district.	No
Cathy Catsoulas		No
Cecelia Venucci	All neighbors to a wireless facility must be given full notice. A due process right to appeal must be given, I have found proposals that were riddled with inaccurate information that put us at risk for exposures above the safety limit for public exposure. Wireless facilities should be phasedout and replaced with the much more secure and faster fiber-optic cabling.	No
Charlene Hopey	Opposed as written. I support the Model Legislation for Title 16 & 22 submitted by Fiber First LA. I am asking the supervisors not to take away our rights of Notice, Hearings and Appeals. Please keep us informed and safe and do not take away any of our long standing rights and protections as the Proposed Amendments to Titles 16 & 22 will do. I ask that you vote no on these. People are still living in trailers or away from their property for 4 years now because they cannot rebuild after the destruction of the Woolsey fire. Because of equipment or structural failures, these cell sites have started or been involved in starting major wildfires in the last 15 years, including the Woolsey. But you are still pushing these wireless sites throughout the Mountains and open space in LA County without oversight or monitoring. These wireless sites have an average life span of 5 years and you think the telecommunications industry cares enough into the future to be responsible in their oversight. You are wrong. They are telling you they will do this but they won't. You are putting wildlife, vegetation, air quality, heating, greenhouse gases and destruction of people's homes lives and businesses in the hands of an industry who have already shown they cannot act responsibly. I assume you believe the money push they are giving you, that they can be trusted. I do not trust them and I do not know how you can trust them. I do not understand how you can do this. I do not want you to Amend Titles 16 and 22 as written. I want CEQUA protections to stay in place. I support the Redlined Versions for Titles 16 and 22 submitted by Fiber First LA. I am hoping the BOS will listen to your constituents instead of just the telecommunications industry. I was surprised at the Planning Commission Meeting back in February when a representative from the wireless companies joined the meeting. The President of the Planning Commission greeted him warmly saying his name and how happy she was he could join. They obviously had a good relationship. Nobody who has voiced the problems with this technology have been engaged with or embraced like this. Many have submitted these problems in many formats for years. Yes some have gotten	No

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				upset when not listened to, but they have been those who are physically suffering from exposure to this technology and are terrified for what the future holds for them. With the County's strong relationship to the telecommunications industry and much softer ties with constituents who are voicing strong and supported negative issues of wireless cell sites, your relationship seems out of balance in terms of the input you are willing to accept as you move to Amend 16 and 22 removing long standing rights and protections for the citizens of LA County. Your constituents have given you strong and supported evidence that these cell sites are not safe in many ways. The most obvious safety issues that you cannot dismiss, because of strong evidence, ease of seeing as they burn, and the after affects, is they cause fires when not properly installed, monitored and maintained. And you are giving away your power to protect us from this. I am your constituent and I do not want you to do this. Plus, the LA County Planning Department strongly opposes, in their own documents on 16 and 22, the use of Strand Mounted Wireless with it's significant issues, including failure and possible fire issues, and still you are allowing these to be installed right now throughout the Santa Monica Mountains. Stand up now and protect us from the dangers of these wireless cell sites, do not dismiss CEQUA and it's long standing protections just because it is inconvenient for the LA County Planning Department and the Board of Supervisors when dealing with the installation and monitoring of these wireless cell sites. Again, I ask the Supervisors - do not take away our rights of Notice, Hearings and Appeals. Please keep us informed and safe and do not take away any of our long standing rights and protections. I support the redlined version for Titles 16 & 22 as submitted by Fiber First LA.	
			Charlene Hopey	• I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the Model Legislation to Title 16 & 22 submitted by Fiber First L.A. and to prioritize future-proof fiber to the home for the reasons outlined by our federal government agency, the NTIA. • I do not want powerful wireless antennas outside my bedroom window, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies. • In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can they justify giving the telecom companies free reign to build out these wireless cell sites without any county (government) oversight? • I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a	No

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	short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics	
Cheri L Scripter	The scientific evidence is clear: We should exercise caution and place cell towers far away from residences and businesses. Task companies will upgrading technology (both safety and viability) for the betterment of all of us.	No
Chris Gaff	“I live in Stevenson Ranch where AT&T is proposing a 75-95 foot cell tower in the middle of the residential community (zoned at 35 feet) and next to the elementary school. During the hearing approving the cell tower (which has been appealed) Regional Planning testified that they do not have sufficient resources to review AT&T’s technical materials. To ensure Regional Planning has the necessary resources, an amendment to the Wireless Facility Ordinance requiring applicants pay for the County to hire an independent consultant to review technical materials is necessary.” The Ordinance also should be amended to prohibit cell towers within 1500 feet of schools, which is what the Newhall School District supports.	No
Cindy Koch	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. 5G Kills	No
Cliff Bowen	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA	No
Daniella Kiraz Villanueva	"I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA."	No
David Boito	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA.	No
David E Shirazi	"I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without	No

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	any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA."	
David G Goldberg	Come on Board Members. There is absolutely no reason to make the placement of Wireless Facilities EASIER for the telecoms. Of course better technology and connectivity is important, but NOTHING is more important than the safety of your citizenry. Los Angeles must keep strong mechanisms in place to at least be able to deny the placement of cell towers where they are dangerous to people and especially our children. If permit applications are nothing more than a rubber stamp, wireless facilities will run rampant throughout Los Angeles. I'm here in Colorado but we look up to Los Angeles as a progressive city that sets an example for the rest of the country in doing what is safe and right for it's people, no matter the political cost. Please continue to do the right thing Los Angeles and keep stringent conditions in place for placement of wireless facilities! Thank you!	No
David L Antion	Please adopt the redefined version that was submitted by Fiber First LA. As a citizen I value my and others' health and rights.	No
DESIREE UNDERWOOD	I am writing to urge the Board to vote NO and adopt the “redlined” versions that were submitted by Fiber First LA. I am requesting that my comments be included in the public record. We all MUST HAVE protections on the following bases: Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	No
Diane Boito		No
Dick Hogue		Yes
Dweezil Zappa		No
Ed H Montes	"Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA." You can also attach a document with additional information	No

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Emily Van Horn	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA.	Yes
Emma F Sharp	"I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA." • I do not want powerful wireless antennas outside my bedroom window, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies. • In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can they justify giving the telecom companies free reign to build out these wireless cell sites without any county (government) oversight? • I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.	No
Erik Brauer		No
Erik Brauer		No
Eugenia Dillard		No
Fiber First LA Community Groups	We oppose Title 16 and Title 22 Proposed Ordinances.We urge LA County Board of Supervisors to delay passing these ordinances and allow time to incorporate needed amendments and permit full consideration of fiber optic options. A promise of "wireless now, fiberoptic later" is not sufficient.	Yes
Gail Mortensen	Do not want 5G cell towers in the vicinity. Electromagnetic fields and radiation are hazardous to your health.	No
Gayle Mah	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our	No

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	federal government agency the NTIA.	
Gina Flores		No
Gina Lauria	Please do not allow the big wireless industry to harm us with their equipment installed so close to our homes and schools. They are pushing through their technology without proper testing and disclosure. Many are sensitive to this equipment and once installed, they will no longer be able to live in their homes without severe harm. Who will pay to equip their homes with supplies to protect them? Will you be offering a blank check for this? Please make Verizon and others provide the truth about 5g to you before you decide this to be a good idea.	No
Greg Aurassian	Oppss this telecomm misuse of power	No
Gregory S Pajer		No
Harold Deen	I don't want these towers set up. It is an artifical interference to my health safety.	No
Heela Cohen	As it is I have health issues due to dirty electricity around me, I don't need to accelerate it. In addition, there is no lack of safe technologies. I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.	No
JANICE GARCIA		No
Janiece Skillen	Safe guard our community. Keep safeguards in place. And make them stronger. Our health is at risk.	No
Jay B Abrams	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. I do not want powerful wireless antennas outside my bedroom window, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies. In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can they justify giving the telecom companies free reign to build out these wireless cell sites without any county (government)	No

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		oversight? I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless.	
	Jeffrey Krantz	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA.	No
	Jen Bruni	Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	No
	Jesse McDade		No
	Jessica Hancock	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.	No
	Jill Powers	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our	No

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	federal government agency the NTIA. I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.	
Jodi Nelson	Opposed as written. Please see redlined version of Title 16 submitted by FFLA. Please see my attachment sent through the portal and place in public record.	Yes
Jodi Nelson	Submitting FFLA CEQA Document to be a part of the public record.	Yes
John Doe	Tear down ALL cell towers IMMEDIATELY. propublica.org/article/fcc-5g-wireless-safety-cellphones-risk	No
John F Hayes	There are possible safer approaches to doing this such as using fiber optics in many locations and there are many questions and concerns regarding the safety of having cell towers close to buildings or homes occupied. There are many studies that have been done showing biological hazards resulting from close proximity to cell towers and putting this on a fast track without any public notice or recourse maybe very detrimental to the community health and environment.	No
Jorge Padilla		Yes
Josephine Hancock	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. Thera are many people including myself who are EMF sensitive and our lives are being devastated by the increase in radiation from these towers. We will be holding the county and you personally liable for any harm caused by your decision to allow the continued increase in number of towers which adversely impact our health and lives.	No
Josh Casillas	ATT has already installed a tower in front of the last 3 homes on Sout Barrington 90064. They installed it without consenting or asking or posting about it prior. This transpired in 2019 or so. They ran the wires across 5 lanes of South Barrington from East to West and planted it in on the West Side of the street. Not one notice, not one hearing. It currently stands in front of 2571 South Barrington Ave. My family has lived at that residence since 1974. We are the last homes standing on the block, this is a disgrace and a crass attempt to get us last home owners out. I am completely disgusted. Blessings, josh	No
Joyce L Gaines	Please see my letter. I would like this declined and research into fiber optics	Yes

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	considered as a safer alternative to our environment and the health of our people. Thank you very much.	
Judy M Frankel	NO on Title 16 and Title 22	Yes
Julie Figueiredo	Terrible. 5G is not safety tested, do not risk your fellow humans health plz	No
Julie Levine	CEQA, fire and other safety concerns are not addressed and our memos on this have failed to show up under public comment. If this is a public hearing, why is it buried in a huge agenda with virtually no time for us to speak out? I have been forced to move away from my home and community due to failure to obtain consent or even provide notice of the small cell roll out in front of my home. You have failed to provide the Fiber First LA redlined ordinances in your public record and you are already defacto providing worst case practices and now looking to institutionalize these bad practices with an ordinance that protects telecom but NOT LA County residents. Shame on you.	Yes
Kalli Sorensen	"Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA."	No
Karen Blechman	"I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA."	No
Karen Diehl	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA	No
Karen Iglesias	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA	No
Karen O Wadler	I oppose having wireless antennas outside on my block or anywhere near my home. The harm to people who are susceptible as well as small children is paramount to place them away from people.	No
Karoline Muniz	Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA.	No
Kathleen Gildred	I support Fiber First LA's Model Legislation for Title 16 & 22 as submitted to the Board of Supervisors. Please see attached written comments.	Yes
Kathleen F Rosenblatt	Fiber optics work better, cost less, and have no health hazard issues.	No

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			Kathryn Ray	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA."	No
			Katie Smith	Please see attachment	Yes
			Kay Love	Opposed as written. Please See Model Legislation of Title 16 and 22 submitted by Fiber First LA. Dear members of the Board of Supervisors, I am writing to ask you to please Vote NO on the proposed changes to Titles 16 and 22 of the Los Angeles County Code. These changes, which are supposed to close the digital divide, will only make things worse by making certain that minority communities get inferior wireless connections while more affluent communities get fiber optic. This will cause another digital divide that will persist for many years. Wireless connections to the internet are slow, unreliable, expensive (if you want any kind of decent connection), unregulated (so wireless companies can charge whatever they want), and come with a host of other problems including fire and health hazards and negative environmental impacts. Wireless will never be able to provide the speeds that will be required of internet connections in the near future. In short, wireless broadband is a losing technology being foisted on minority communities in a well-meaning but futile attempt to make up for what the telecoms have failed to do for twenty years - connect the customers in their service area to fiber optic broadband, as they promised, and as they were paid to do. Everyone deserves a fiber optic connection to the internet, and that includes every single family living in minority communities in Los Angeles. We do not want poor wireless service. We need the same quality broadband connections as everyone else. Please vote NO on the changes to Titles 16 and 22 and demand that Los Angeles County use its power and influence to connect everyone with fiber optic. Sincerely, Kay Love	No
			Kelli M Finn		No
			Kelly Kress	Residents deserve to have a say whether antennas are installed near their	No

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	homes and work places.	
Kelly Tajiri	Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA." do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the Model Legislation to Title 16 & 22 submitted by Fiber First L.A. and to prioritize future-proof fiber to the home for the reasons outlined by our federal government agency, the NTIA. • I do not want powerful wireless antennas outside my bedroom window, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies.	No
Kristina Staros		No
Kristina Stone	Please see attachment	Yes
Kylea-Rose Pearse		No
Kymberly Ponegalek	Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA.	No
La Hou	Opposing installations of wireless towers. It is destructive to humans and natural environments. I rather have no wireless service.	No
Larry Nelson	Please see attachment	Yes
Laura I Nobiensky	Do NOT remove due process rights of LA residents.	Yes
Leslie Drake	Adopt the version submitted by Fiber First LA Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	No
Li Bacca	"Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA." You can also attach a document with additional information	No
Linda Zielski	They are everywhere, they are detrimental to our health, we don't need them, they are not good for the environment, especially if blown over by wind in fire hazardous conditions. These companies should not be able to do what ever	No

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		they want where ever they want. • In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can they justify giving the telecom companies free reign to build out these wireless cell sites without any county (government) oversight?	
		Lisa Kassner	I am concerned about my privacy, and my health. I do not want powerful wireless antennas outside my bedroom window, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies. Therefore I am yet another person who does not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA.	No
		Lorna Paisley	These electromagnetic waves can actually be harmful to some people. The job of the city is to keep everyone safe. Different amounts of energy have different effects on different people. There are people who cannot be near a microwave because of those electromagnetic waves. People who work around electromagnetic waves on a daily basis can get head aches. We now know that the electromagnetic waves that make cell phones work can cause cancer with too much radiation hitting your head, or testicles, or places where people keep their phones. I had a friend who died of cancer and the doctor thought the cancer was caused by his cell phone . Enough	No
		Lucy Cole	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.	No
		Mariam Eckenfels-Garcia	Please see attached written Comments	Yes
		Marilynn Schoonmaker	Im aaking that you think first of the people and invironment. Fiber internet is safer and less detrimental to our environment. Fiber shoukd be used as a human and property safegard. Broadband is not only slow and expensive in comparison it is also a high fire danger and safety issue. Espevially in rural high fire areas where broadband is the only option. Something needs to be	No

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	done about these companys that have the means and the vision but not in all areas.	
Marin A Lutz	"I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA."	No
Mark Dutton	"I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA."	No
Mark Kushinsky	Please vote no and prioritize more public safety and wildlife safety that can be effected by this. Please reduce potential harm by voting no . Please adopt the redlined versions submitted by fiber first la.	No
Mary Fraser	We all need due process for the siting and installation of wireless antennas. As a person who is very sensitive to EMF and other frequencies I absolutely oppose your approval of this agenda item. Fiber optic cables are better, stay intact in the event of many emergencies and should be prioritized.	No
Mary Kendall	Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife. People should have the right to do process when technology adversely affects them.	No
Mary Zakrasek	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies.	No

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		Maureen R Manley	Although many may people may not be sensitive to radiation, some people are severely sensitive, and their health needs and concerns must be considered and protected. Citizens should have Notice or Hearings or opportunities to Appeal cell towers around their homes. They must have the right to have safety provisions, regulation, oversight, and/or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.	No
		Megan Zappa		No
		Megan Zappa		No
		Melissa Oak	"Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA." You can also attach a document with additional information	No
		Mia Marsicano		No
		Mia Marsicano		No
		Mia Mazer	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. Additionally, there are members of my family who experience severe reactions when close to cellular towers - we need to keep the wifi off in our house. A 5G tower near our home would render it inhabitable.	No
		Michael Kazakov	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA.	No
		Michael Lincourt	As a California resident, I implore you to vote NO on Nov. 15 to the proposed changes to Titles 16 and 22 of the L.A. County Code and adopt the "redlined" versions of Titles 16 and 22 that Fiber First LA submitted. The placement of wireless infrastructure must always have public knowledge and input. I demand the following protections are implemented in regard to the	No

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				installation of wireless communications infrastructure: • Notify residents in advance if a wireless antenna will be installed near their homes. • Provide everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed, fiber optic internet access, including residents in underserved communities. • Do not force residents to rely on slow, expensive and unreliable wireless broadband that poses a fire risk and has not been proven to be safe. • Conduct prior Environmental Impact Assessments (EIA). Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife. Your priority should be the health and safety of California residents and the protection of the environment. The public must be notified and included in the decision-making process before the placement of any wireless infrastructure	
			Michelle Mohawk	Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA	No
			Monique M Lukens	• I am EMF sensitive. I do not and cannot have powerful wireless antennas outside my home, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as is shown in hundreds of peer reviewed studies. • In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. "California Public Utilities Commission (CPUC)" has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can you justify giving the telecom companies free reign to build out these wireless cell sites without any county (government) oversight?	No
			nancy HARRINGTON	I request you include my comment in the public record. We need protections on the following bases: Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den	No

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	building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	
Nancy McCoy-Blotzke	I want the Supervisors to invest time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.	No
nancy c princetta		No
Nicholas Alva	No Industry shall be allowed to have unlimited access nor rights. Defend public health and property. There must always be legal recourse and allowances for arguments opposing proposed development, construction or implementation. Especially when it comes to toxic industries. Technocracy must be contained, limited, and in some instances done away with.	No
Nicole Pajer	Please adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. As an expecting mother, I am praying that our board of supervisors will make the right decision and not bring 5G into our neighborhoods. Please take note on what Malibu, Encinitas, Elk Grove and so many cities across the nation that care about their citizens are doing. As people in power, we, the residents of LA county are counting on you to do the right thing here. There is no need to rush passing this through. Let's do some research and really think this through here. I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. Put 5G in shopping centers, put it in sports arenas, do NOT put it outside of our bedroom windows where our children sleep, where we gather with family for dinner and where we live. 5G small cell towers have proven to be a fire hazard, not to mention having them near your home is tanking property values across the country. Nobody wants to willingly buy a home near a cell phone tower. We pay enough to live here. Let’s help our properties retain their value. Not to mention the health issues. Cities across the nation are delaying this technology due to cancer concerns. Well guess what, these concerns are WELL justified. There are studies to back them up and before you pass a law that could potentially harm many, you should read them all. If anyone is questioning the health effects of having this technology so close to our homes, here is proof that it needs to be reevaluated. And P.S. All of these things affect YOU, YOUR FAMILIES, YOUR FRIENDS AND YOUR	No

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NEIGHBORS AS WELL. You are not exempt from this. You are making a decision that will also affect those that you love.

The science (these are all links to studies and you can find them in one concentrated place at 5gcrisis.com/science). I also urge you to look at the science tab on the Americans for Responsible Technology website. A lot of people have been highlighting this science and this is not a hoax. The evidence is there. It's a matter of whether you want to pay attention to it or ignore it. I'm really hoping that you do the right thing for your constituents and educate yourself on the damage these small cells can cause and find a way to work together with local experts to figure out how to roll this out more safely.

Independent Science on the Effect of Wireless Radiation on Human Health

There are more than 1,000 scientific studies conducted by independent researchers from around the world concerning the biological effects of RF radiation. Here we present some of the most recent.

- I. Effects on Fetal and Newborn Development
- II. Effects on Young Children
- III. Brain Tumors
- IV. Parotid Gland Tumors
- V. Other Malignancies
- VI. Effects on DNA
- VII. Neurological/Cognitive Effects
- VIII. Effects on Male Fertility
- IX. Electromagnetic Sensitivity
- X. Effects on Implanted Medical Devices
- XI. 5G Effects
- XII Miscellaneous Articles

I. Effects On Fetal And Newborn Development?

1. Mother's Exposure to Electromagnetic Fields Before and During Pregnancy is Associated with Risk of Speech Problems in Offspring. Zarei, S., et al. Journal of Biomedical Physics and Engineering 9(1):61-68 (2019).?
2. Prenatal Exposure to Extremely Low Frequency Magnetic Field and Its Impact on Fetal Growth. Ren, Y., et al. Environmental Health (2019).?
3. The Effects of Radio Frequency Radiation on Mice Fetus Weight, Length and Tissues. Alimohammadi, I., et al. Data in Brief 19:2189-2194 (2018).?
4. Effects of Prenatal Exposure to WiFi Signal (2.45 GHz) on Postnatal Development and Behavior in Rat: Influence of Maternal Restraint. Othman, H., et al. Behavioral Brain Research 326: 291-301 (2017).?
5. Exposure to Magnetic Field Non-Ionizing Radiation and the Risk of Miscarriage: A prospective Cohort Study. Li, De-Kun, et al. Scientific Reports (2017). ?
6. Postnatal Development and Behavior Effects of In-Utero Exposure of Rats to Radiofrequency Waves Emitted From Conventional WiFi Devices. Othman, H., et al. Environmental Toxicology and Pharmacology 52:239-247 (2017).?
7. Lasting Hepatotoxic Effects of Prenatal Mobile Phone Exposure. Yilmaz, A., et al. The Journal of Maternal-Fetal & Neonatal Medicine 30(11): 1355-

1359 (2017).?
8. Multiple Assessment Methods of Prenatal Exposure to Radio Frequency Radiation from Telecommunication in the Mothers and Children's Environmental Health (MOCEH) Study. Choi, Ha, et al. International Journal of Occupational Medicine and Environmental Health 29(6):959-972 (2016).?
9. The Use of Signal-Transduction and Metabolic Pathways to Predict Human Disease Targets from Electric and Magnetic Fields Using in vitro Data in Human Cell Lines. Parham, Portier, et al. Frontiers in Public Health (2016). ?
10. A Review on Electromagnetic Fields (EMFs) and the Reproductive System. Asghari, Khaki, et al. Electronic Physician 8(7):2655-2662 (2016).?
11. Genotoxicity Induced by Foetal and Infant Exposure to Magnetic Fields and Modulation of Ionising Radiation Effects. Udroiu, Antoccia, et al. PLoS One (2015).?
12. Oxidative Stress of Brain and Liver is Increased by Wi-Fi (2.45 GHz) Exposure of Rats During Pregnancy and the Development of Newborns. Çelik, Ömer, et al. Journal of Chemical Neuroanatomy 75(B):134-139 (2015).?
13. Neurodegenerative Changes and Apoptosis Induced by Intrauterine and Extrauterine Exposure of Radiofrequency Radiation. Güler, Göknur, et al. Journal of Chemical Neuroanatomy 75(B):128-133 (2015).?
14. Maternal Exposure to a Continuous 900-MHz Electromagnetic Field Provokes Neuronal Loss and Pathological Changes in Cerebellum of 32-Day-Old Female Rat Offspring. Odaci, Ersan, et al. Journal of Chemical Neuroanatomy 75(B):105-110 (2015).?
15. Different Periods of Intrauterine Exposure to Electromagnetic Field: Influence on Female Rats' Fertility, Prenatal and Postnatal Development. Alchalabi, Aklilu, et al. Asian Pacific Journal of Reproduction 5(1):14-23 (2015).?
16. Use of Mobile Phone During Pregnancy and the Risk of Spontaneous Abortion. Mahmoudabadi, Ziaei, et al. Journal of Environmental Health Science and Engineering 13:34 (2015).?
17. Oxidative Mechanisms of Biological Activity of Low-Intensity Radiofrequency Radiation. Yakymenko, et al. Electromagnetic Biology and Medicine 34(3):1-16 (2015).?
18. Effects of Prenatal 900 MHz Electromagnetic Field Exposures on the Histology of Rat Kidney. Ulubay, et al. International Journal of Radiation Biology 91(1):35-41 (2015).?
19. The Effect of Exposure of Rats During Prenatal Period to Radiation Spreading from Mobile Phones on Renal Development. Bedir, et al. Renal Failure 37(2):305-9 (2014).?
20. Dosimetric Study of Fetal Exposure to Uniform Magnetic Fields at 50 Hz. Liorni, et al. Bioelectromagnetics 35(8):580-97 (2014).?
21. Influence of Pregnancy Stage and Fetus Position on the Whole-Body and Local Exposure of the Fetus to RF-EMF. Varsier, et al. Physics in Medicine and Biology 59(17):4913-26 (2014).?
22. Autism-Relevant Social Abnormalities in Mice Exposed Perinatally to Extremely Low Frequency Electromagnetic Fields. Alsaeed, et al. International Journal of Developmental Neuroscience 37:58-6 (2014).?
23. Pyramidal Cell Loss in the Cornu Ammonis of 32-day-old Female Rats

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	Following Exposure to a 900 Megahertz Electromagnetic Field During Prenatal Days 13–21. Bas, et al. NeuroQuantology Volume 11, Issue 4: 591-599 (2013).? 24. The Effects of 900 Megahertz Electromagnetic Field Applied in the Prenatal Period on Spinal Cord Morphology and Motor Be	
Olga Hernandez	Vote no adopt the “redlined “version that were submitted by fiber first LA. Vote No on the proposed changes to title 16 and 22 of the LA County code	No
Pamela Bowen	This is detrimental to health and we need to be responsible about this. I don’t want cell towers put up in my community, by my house or elsewhere. There are many peer reviewed studies about this.	No
Patricia Krieger	I live in Stevenson Ranch where AT&T is proposing a 75-95 foot cell tower in the middle of the residential community (zoned at 35 feet) and next to the elementary school. During the hearing approving the cell tower (which has been appealed) Regional Planning testified that they do not have sufficient resources to review AT&T’s technical materials. To resources, an amendment to the Wireless Facility Ordinance requiring applicants pay for the County to hire an independent consultant to review technical materials is necessary. ensure Regional Planning has the necessary. Our local school board has submitted a letter in opposition to the local tower based on it lack of solution to the supposed problem and lack of supporting data that it could impact childrens health. Please require a health assestment for any tower near schools or residents.	No
Paul Landry	"I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA." I do not want powerful wireless antennas outside my bedroom window, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies.	No
Paul Andre Schabracq	The proposed amendments would allow for the acceleration of wireless infrastructure and remove due process rights for residents. I urge the Board to vote NO and adopt the “redlined” versions that were submitted by Fiber First LA. If passed, important safeguards will be stripped from L.A. County residents, including the elimination of public notice, setbacks, oversight, safety and environmental review, as well as any opportunities for appeal.	No
Peggy Fisher	Residents deserve to know in advance/object if a wireless antenna will be installed near their homes.	No

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	Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	
Penelope Fleming	I do not want a cell tower put up near my home or in our community without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. We have already paid the telecom companies for the installation of fiber optics.	No
rachael place	I do not agree with this proposed Wireless Facilities Ordinance. It's a violation of public rights.	No
Rebecca Heisler	Extensive research documents health hazards. I have been harmed by this technology :cardiac symptoms, flat-lining, headaches, insomnia, etc. My treating physicians and my patients have also been medically injured. The FCC has ignored its responsibility to update research on hazards. The FCC, FDA, HHS, all have the responsablity, as do you, to protect the public.	No
Rebecca Hull	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize future proof fiber to the home for the reasons outlined by our federal government agency the NTIA. I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Thank you.	No
Rebecca M Coolidge	Residents have a right to know if an unreliable, expensive, and dangerous wireless antenna will be installed near their homes. Everyone also has the right to reliable, affordable high speed fiber optic internet access. Wireless antennae pose a fire hazard, and the ambient levels of EMF they cause are dangerous for the environment because they have been shown to disrupt the migratory habits, food-finding, reproduction, and survival of animals and wildlife. A large number of international studies have found them to be	No

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		harmful to human health as well.	
	Renee Greenblatt	For "Comments" you can say: "Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA." You can also attach a document with additional information you want to submit.*	No
	Robert A Thompson	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA.	No
	Rola Masri	We are not asking for something that cannot be done. We are asking for our supervisors to ensure that there are measures in the ordinance to protect your constituency. These requests have fallen on deaf ears at the Department of Regional Planning and any and all outreach to the Supervisor's offices have been directed back to the complacent department of regional planning who is being advised by attorneys who also have wireless industry clients. Our Requests are simple: 1. Please streamline fiberoptics to the premise which is now considered a Federal best practice for optimum speed, efficiency, cybersecurity, privacy, safety, resiliency, energy efficiency and long-term cost-savings. The Biden Administration $65 billion Infrastructure funding encourages the deployment of fiber optics to the premise over small cell technology. Why is LA County promoting inferior technology and streamlining it? 2. Please require and ensure that all wireless carriers follow fire code that every other infrastructure is required to follow. Fire code exemptions for wireless facilities are not acceptable considering that at least 3 major wildfires in California were fully or partially caused by equipment from wireless facilities. And this ordinance would streamline their installation closer to our homes without proper fire inspections? 3. Please require all wireless carriers to show proof of liability insurance. There are so many ways for wireless infrastructure to cause harm including but not limited to falling debris, fires, harm to humans and the environment from untested radio frequency radiation and much more. Carriers need to be held liable for the harm their infrastructure can potentially cause. 4. LA County must hire an independent consultant to measure the cumulative levels of radio frequency radiation after each wireless facility is installed. This is within FCC rules. These tests must be required at least biannually and they must be done without the knowledge of the wireless carrier. Far too many facilities are now exceeding even the loose guidelines of the FCC that only protects people from heating and burning and does not consider other long-term biological effects. 5. The ordinance must include ADA accommodations for those who are already injured from wireless radiation such as what is emitted from cell towers, cell phones, WiFi and other wireless devices. It would be catastrophic for those who are already sickened by radiation to have to live with a wireless facility outside their window. Incidents like these across the country have	No

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	uprooted entire families and, in some cases, have made them totally homeless. Supervisors must agree that adding to our homeless crisis would be a disaster. While we agree that we need to close the digital divide and every home needs access to Information and Communication technology, we also know that the industry has to do better than substandard wireless infrastructure that has already been outdated. We need symmetrical upload and download speeds that are easily upgradable, that are cost efficient, energy efficient, cybersecure, private, safer and all around better. We need the county to prioritize fiber to the premise and only allow wireless facilities as a last resort. This ordinance is absolutely unacceptable as it stands. As the second largest county in the US, we need to do better. Thank you.	
Rosser Cole	At my advanced age, I am concerned about subjecting myself to 5G, as, after my reading up on the subject, I believe it may be injurious to my health - particularly because of ramifications having to do with Covid. I don't want installations near my house, or that of my neighbors - or anywhere else for that matter.	No
sally maslon	"Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA.	No
sammy pyon	I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.	No
Scott Kassner	I do not want a cell tower put up right outside my home, or in my community, or on my street, emitting radiation all day and all night without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. I urge the Supervisors to take the "long view" and focus their on support Fiber Optic Broadband Infrastructure that will last 15 to 20 years, instead of the inferior Wireless Broadband that has a short 5 year life span.	No
Serena McCullough	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA.	No
Shaun Ryan		No

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Shawna Chriss	In the last 15 years, there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can they justify giving the telecom companies free rein to build out these wireless cell sites without any county (government) oversight?	No
Sheba Lo		No
Sidnee Cox	Please do not make any changes to the L.A. County Code on Titles 16 and 22 that will remove the public's right to prior notice regarding the siting of telecommunication facilities, or the public's right to appeal any decisions regarding these sitings. Please prioritize fiber optic and wired connections as a viable alternative to wireless deployment. Please incorporate the proposed Redline drafts of Titles 16 and 22 submitted by FiberFirstLa Thank you.	Yes
Stacy Sebasty	I do not want a cell tower put up right outside my apartment, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA. In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can they justify giving the telecom companies free reign to build out these wireless cell sites without any county (government) oversight? I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.	No
Stella Rowe	As a California resident, I implore you to vote NO on Nov. 15 to the proposed changes to Titles 16 and 22 of the L.A. County Code and adopt the "redlined" versions of Titles 16 and 22 that Fiber First LA submitted. The placement of wireless infrastructure must always have public knowledge and input.Wi-fi not tested harmful effects on health of humans and animals in the area. I have headaches and do not feel well near cell towers Stella Rowe	No
Stephanie L Speights	In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can they justify giving the telecom companies free reign to build out these wireless cell sites without any county (government) oversight?	No

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Steve Chatham	The L.A. Board's priority should be the health and safety of California residents and the protection of the environment. The public must be notified and included in the decision-making process before the placement of any wireless infrastructure. Do not take the rights away from people to be informed and agree.	No
Steve Nichols	In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can they justify giving the telecom companies free reign to build out these wireless cell sites without any county (government) oversight?	No
Steve Novak	Please adopt the "redlined" versions that were submitted by Fiber First LA. Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife. Thank you. Sincerely, Steve Novak	No
Susan Dolhi	Residents deserve to know in advance if a wireless antenna will be installed near their homes. Your priority should be the health and safety of California residents and the protection of the environment. The public must be notified and included in the decision-making process before the placement of any wireless infrastructure. show less	No
Susan Foster	Opposed as written.	Yes
Susan K Pantle	Please adopt the redlined version submitted by Fiber First LA & they be included in the public record. I want protections on the following bases: Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe.	No

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	Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife. It is crucial that your voice is heard by the L.A. County Board of Supervisors on this critical matter. Forwarning, public input, the opportunity to appeal decisions and proper oversight, safety and environmental review are critical to public health and safety and must be maintained at all costs. The L.A. Board's priority should be the health and safety of California residents and the protection of the environment. The public must be notified and included in the decision-making process before the placement of any wireless infrastructure.	
Tara B Shakeshaft	Please adopt the redlined versions that were submitted by Fiber First LA. Thank you.	No
Theodora Scarato	Wireless radiation is not safe for humans or the environment.	Yes
Theodora Scarato	Safety is not assured with wireless radiation. Scientific research indicates serious health risks and liability issues.	Yes
Tiffany Johnson	I urge you to vote No on the proposed changes to Title 16 & 22 and adopt the redlined versions that were submitted by Fiber First LA. LA residents deserve to know ahead of time if wireless antennas will be installed near their homes. As a mother, I am also concerned about the placement of wireless antennas near schools. This is a factor that would impact my decision in where my child attends school in the future.	No
Tina Deraco	"I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA." • I do not want powerful wireless antennas outside my bedroom window, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies.	No
Tom M Teeple	"Opposed as written. Please see Model Legislation of Title 16 & 22 submitted by Fiber First LA." You can also attach a document with additional information	No
Tracy Leventhal	Did you know that humans are electrical beings? We actually have our own frequency and it mimics the Earth's frequency. Wireless radiation does not match human frequency and in fact, is extremely dangerous to our health. Low voltage cells become cancer. Please oppose this bill to put in more wireless facilities close to our homes and be accountable for protecting the	No

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			citizens of Los Angeles. This includes you and your loved ones. This not worth any dollar amount or supposed improved computer outcomes to jeopardize the health of so many.	
		Tracy A Off	Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	No
		Victoria Naylor	I urge you to vote NO on the proposed changes to Titles 16 and 22, which would allow for the acceleration of wireless infrastructure and remove due process rights for residents. Residents deserve to know in advance if a wireless antenna will be installed near their homes. Numerous studies have shown the harmful health effects of wireless technology, especially to children. Please adopt the “redlined” versions that were submitted by Fiber First LA.	No
		Virginia Fair	I do not want a cell tower put up right outside my home, or in my community, or on my street without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize futureproof fiber to the home for the reasons outlined by our federal government agency the NTIA."	No
		Vivian M Escalante		Yes
		yelena sonkin		No
	Other	Baker Melanie	My family live in Stevenson Ranch where AT&T is proposing a 75-95 foot cell tower in the middle of the residential community (zoned at 35 feet) and next to our elementary school. During the hearing approving the cell tower (which has been appealed) Regional Planning testified that they do not have sufficient resources to review AT&T’s technical materials. To ensure Regional Planning has the necessary resources, an amendment to the Wireless Facility Ordinance requiring applicants pay for the County to hire an independent consultant to review technical materials is necessary. The Ordinance also should be amended to prohibit cell towers within 1500 feet of schools, which is what the Newhall School District supports. They do	No

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	not feel there is enough research done about safety of our children and staff. We were also told that the cell tower would not befit the school or the home behind because of the hills.	
Edmundo Sanchez	Dear LA County Board of Supervisors, I live in Stevenson Ranch where AT&T is proposing a 75-95 foot cell tower in the middle of the residential community (zoned at 35 feet) and next to the elementary school. During the hearing approving the cell tower (which has been appealed) Regional Planning testified that they do not have sufficient resources to review AT&T's technical materials. ***To ensure Regional Planning has the necessary resources, an amendment to the Wireless Facility Ordinance requiring applicants pay for the County to hire an independent consultant to review technical materials is necessary.*** Also, please amend the ordinance to prohibit cell towers within 1500 feet of schools, which is what the Newhall School District supports. Thank you so much for your consideration, Edmundo Sanchez	No
J Tanner	Our Los Angeles community is in critical need of a wireless facilities ordinance that protects it's citizens from the overreaching greed and power of wireless communications companies. I have become familiar with the need for legislative guidelines thru first hand experience. I am a resident of Stevenson Ranch where AT&T has applied for a 75' cellular tower which they have admitted they will likely convert to a 95' tower. It is a literal towering industrial takeover right in-between homes and an elementary school. This is an R1 zoned residential neighborhood that has been occupied by hundreds of residents for decades without this tower, (and with cell phone and internet services). Though there may be some gap in coverage in a small number of residences, many homeowners have rectified this by the simple use of modern cellular equipment or new micro site cellular equipment. AT&T has misrepresented and contradicted numerous facts in an attempt to push this tower through. An independent unbiased consultant is vital to review all technical facts and protect communities from this type of detrimental situation to their own residential neighborhoods. This cell tower permit is up for appeal. We hope we can count on you to limit the size of any cellular equipment in these situations with the use of micro site installations and to require cellular companies to pay the county for the necessary technical studies that are required to prove an absolute need with no other options available before they are permitted to destroy the neighborhood ethics, property values and pose possible health risks to residents. We ask that you simply imagine this occurrence next to your own homes and construct a viable resolution. Thank You for your analysis.	No
Keyvan Shakieri	a proposed amendment to the Ordinance that will protect families and children	Yes
Melissa Prado	An Amendment to proposed ordinance to provide protection for children and families	Yes
Shannon Mast	Dear LA County Board of Supervisors, I live in Stevenson Ranch where AT&T is proposing a 75-95 foot cell tower in	No

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COUNTY OF LOS ANGELES, CALIFORNIA

Correspondence Received

				the middle of the residential community (zoned at 35 feet) and next to the elementary school. During the hearing approving the cell tower (which has been appealed) Regional Planning testified that they do not have sufficient resources to review AT&T's technical materials. ***To ensure Regional Planning has the necessary resources, an amendment to the Wireless Facility Ordinance requiring applicants pay for the County to hire an independent consultant to review technical materials is necessary.*** Also, please amend the ordinance to prohibit cell towers within 1500 feet of schools, which is what the Newhall School District supports. Thank you so much for your consideration, Shannon Mast 26050 Salinger Lane 661-644-5018	
			Theresa Myers	Vote NO and instead adopt the "redlined" versions that were submitted by Fiber First LA. If passed, important safeguards will be stripped from L.A. County residents, including the elimination of public notice, setbacks, oversight, safety and environmental review, as well as any opportunities for appeal. This sets dangerous precedent for the rest of the country. The amendments would benefit telecom giants by allowing them to profit from fast-tracking the installation of harmful cell towers, small cells and other wireless infrastructure across the county while removing our due process rights. We demand protections on the following bases: Residents deserve to know in advance if a wireless antenna will be installed near their homes. Everyone in L.A. County is entitled to reliable, affordable, safe, future-proof, high-speed fiber optic internet access, including residents in underserved communities. No one should have to rely on slow, expensive and unreliable wireless broadband that is a fire risk and has not been proven to be safe. Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.	No
			Tiffany Hedgpeth		Yes
		Item Total	**180**		

As of: 11/14/2022 1:11:20 PM

Grand Total			**180**		

As of: 11/14/2022 1:11:20 PM

Kathleen Gildred

November 13, 2022

Dear Supervisors -

You have an important job to do, protecting the safety of the nearly 10 million residents in LA County. So far, those of you who represent us are all women, and I would hope you would want to make the best choices for your families, our families, and our communities.

I urge you to adopt the 'redlined' changes to Title 16 & 22 that were submitted by Fiber First L.A. and to prioritize future-proof fiber to the home for the reasons outlined by our federal government agency, the NTIA.

Are you aware that no studies prove 5G microwave radiation is safe? The landmark US national toxicology program study of 2018 found clear evidence of cancer and DNA damage. That study was for 2G/3G technology, and 5G is over 100 times stronger. Thousands more scientific studies prove electromagnetic field radiation causes biological harm including increased cancer risk, neurological disorders, learning and memory deficits, increased blood pressure and blood glucose, increase in harmful free radicals, cellular stress, structural/functional changes to the reproductive system, and DNA damage.

Did you know that firefighters in California have been granted an exemption to cell towers erected on their fire stations because the Firefighter's Unions entered substantial evidence into the public record that cell towers on or near fire stations caused **(in every firefighter examined)** brain abnormalities, neurological damage, cancer and other illnesses caused by wireless radiation?

It is unconstitutional that the Telecommunications Act of 1996 prevents cities and individuals to challenge the impact of 5G [wireless radiation] on the environment / people's health, which many are already experiencing. The telecommunication industry’s unbounded profit motive should never outweigh public and environmental safety.

We do have a better option. Communications are faster, more reliable, and safer using wired and corded connections. We have already paid the telecom companies for the installation of fiber optics, which uses a tenth the energy, and lasts fifteen to twenty years, as opposed to the five years of the inferior wireless broadband.

I hope you take all this into consideration when you vote on Titles 16 and 22 of the wireless ordinance.

Thank you for voting your conscience.
Sincerely,
Kathleen Gildred

November 13, 2022

Dear Supervisors,

I do not want a cell tower put in my community without Notice or Hearings or opportunities to Appeal, without any safety provisions, and without regulation, oversight, or monitoring by local, state, or federal agencies. I urge the Board of Supervisors to take a conservative approach to protecting the health and beauty of our community citizens.

In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, I hope you will not approve this Agenda Item and allow telecom companies free reign to build out these wireless cell sites without any county (government) oversight?

My recommendations to the Supervisors is to invest our time and resources in Fiber Optic Broadband Infrastructure that is safer and will last 15 to 20 years.

I hope you take this to heart and I appreciate your time.

Sincerely,

Joyce Gaines

Comments Re: Wireless Facility Ordinance (November 15, 2022; Agenda Item No. 7)

Dear Supervisors:

On November 15, 2022, the Board of Supervisors will be voting on a wireless facilities ordinance for the County of Los Angeles. The below proposed amendment is critical to ensure that Regional Planning staff is able to retain consultants having the expertise required to appropriately evaluate the technical materials submitted for those projects that are subject to non-ministerial review**.**

Requested amendment: Requirement of an independent, unbiased consultant at Applicant's expense.

Reason for request: Specialized area of science requiring technical expertise that Regional Planning lacks.

The amendment is necessary because Regional Planning staff have stated under oath before the Planning Commission that they do not have the expertise to perform a substantive review of application materials submitted by wireless providers. As a result, the County of Los Angeles is not performing its required obligation to perform a substantive review of applicants' materials, putting communities at risk of improper and detrimental projects and subjecting the County to potential litigation.

Background: I am one of hundreds opposing a 75-95 foot macrosite in the center of the Stevenson Ranch community, which is zoned as residential. While the 75-95-foot height of the cell tower clearly violates the current Wireless Facilities Policy and the draft Ordinance, which limit wireless facilities to 35 feet in residential communities, and 10 realtors have represented to the County that property values will decline by up to 10 percent or more (therefore not meeting the CUP requirements of not negatively impacting nearby property values), AT&T represented to Regional Planning that there is a significant gap in coverage and the proposed location and 75-95-foot tower is the only way to address the gap (no alternatives analysis was submitted).

Residents submitted evidence into the record refuting AT&T claims, establishing that the propagation maps submitted by AT&T were inaccurate. Evidence included information establishing AT&T used an incorrect standard for assessing coverage strength, video establishing areas that were purported to have no vehicle coverage had vehicle coverage, other AT&T coverage maps that show AT&T was misrepresenting the coverage area in what was submitted to the County, and resident statements.

In a shocking admission, at the Planning Commission hearing, Commissioner Louie and staff confirmed that as a Department, Regional Planning takes "the gap coverage at face value" and "no independent review" is performed. August 17, 2022 Transcript, pp. 34-35. Thus, Regional Planning accepted the coverage gap simply because AT&T said so. Regional Planning's failure to perform anything more than a ministerial review of the purported coverage

gap is inconsistent with the County's current municipal code and the proposed wireless facilities ordinance.

Other municipalities have likewise determined that they lack the expertise necessary to perform a proper review of materials submitted by wireless providers. To address this, they have included provisions in their wireless facilities ordinances that allow the municipalities to hire a consultant to review the applicant's materials at the expense of the applicants. Municipal entities that have done this include, but are not limited to, Cerritos, Gardena, Palo Alto, Encinitas, Coachella, San Bruno, Sebastopol, Ripon, San Mateo, El Monte, Los Altos, Monterey and West Sacramento.

Proposed amendment: Below is a proposed amendment to the draft ordinance, which is modeled after Monterey's code:

Section 22.140.700(D)(5)

> " 5. The Director or designee may request independent consultant review on any issue that involves specialized or expert knowledge in connection with the permit application. Such issues may include, but are not limited to:
>
> a. Permit application completeness or accuracy;
>
> b. Planned compliance with applicable radio frequency exposure standards;
>
> c. Whether and where a significant gap exists or may exist, and whether such a gap relates to service coverage or service capacity;
>
> d. Whether technically feasible and potentially available alternative locations and designs exist;
>
> e. The applicability, reliability and/or sufficiency of analyses or methodologies used by the applicant to reach conclusions about any issue within this scope; and
>
> f. Any other issue that requires expert or specialized knowledge identified by the Director or designee.
>
> The applicant shall pay for the cost of such review and for the technical consultant's testimony in any hearing as requested by the Director or designee and shall provide a reasonable advance deposit of the estimated cost of such review with the County prior to the commencement of any work by the technical consultant. The applicant shall provide an additional advance deposit to cover the consultant's testimony and expenses at any meeting where that testimony is requested by the Director or designee. Where the advance deposit(s) are insufficient to pay for the cost of such review and/or testimony, the Director or designee shall invoice the applicant who shall pay the invoice in full within 10 calendar days after receipt of the invoice. No permit shall issue to an applicant where that applicant has not timely paid a required fee, provided any required deposit or paid any invoice as required in the code."

Thank you for considering this important addition to the Wireless Facility Ordinance.

Tiffany Hedgpeth
Stevenson Ranch, CA

Message to the Los Angeles County Board of Supervisors:

I strongly urge you to vote "No" on the two Wireless Facilities ordinances (i.e. Agenda item #7).

I am the Founder and Director of the Healthy Adolescent Brain Awareness Foundation. I know from my research of all the scientific warnings of the possible adverse health effects of wireless technology. These ordinances have the potential to be a disaster for our children. Please see the following page of the Haba Foundation website:

https://habafoundation.org/research/electromagnetic-radiation/

If the rapid installation of wireless facilities progresses as it will if the two ordinances to be voted on in Agenda item #7 pass, there will almost certainly come a time when the adverse health effects of wireless technology will be well known by the general population.

This would not be the first time a government has disregarded the health of some segment of the population. The following is a short list of other examples:

1. Ignoring the health effects of tobacco for the interest of industry profits for decades until thousands of people were sickened and killed.

2. Ignoring the health effects of lead for industry profits despite decades of studies that showed children exhibiting lifetime mental disabilities. The health effects of lead and cleanup projects are still evident today.

3. Disregarding the health effects of asbestos for the sake of industry profits and now dealing with a large population of people who have died or are sickened with lung cancer and the cleanup costs.

4. Government spraying people with DDT in public settings with complete disregard of the science that showed harm in the interest of industry profits.

There are too many other examples to mention here of industry lying about the science and government believing them. It is no secret that government policy takes too long to catch up with the science. The majority of scientists doing work in this field are warning that proliferation of wireless infrastructure without proper testing and regulation can be a disaster for the human health and the environment. It is no longer a debate; the weight of the scientific evidence is showing clear biological effects caused by wireless radiation.

I can see that if these two wireless ordinances pass, the LA County Board of Supervisors could quite likely be considered as aiding and abetting an industry that has done everything in its power to lobby for unfair laws while misrepresenting the science to Federal, State and Local officials.

LA County can instead streamline fiberoptics to the premises and circumvent the effects of wireless radiation health and environmental implications while bridging the digital divide with superior technology.

I encourage you to consider the effect on your legacy when you cast your vote on these two ordinances.

Respectfully submitted,
Dick Hogue
Granada Hills

Cell Phone Tower Radiation Pollution — Blake Levitt — 2009

This presentation was made to a Congressional Staff Briefing in 2009. (youtube video)

Hi everyone, it's a pleasure to be with you. There's very little time allotted to all the speakers. So I'm going to get right to the point. We likely have a looming health problem on our hands with radiofrequency radiation. It's called RF and it's emitted from all wireless technologies. This includes both consumer products and infrastructure issues, everything from cell and cordless phones, cell towers, WiFi internet, wireless computer systems in schools and homes, Wi-Max, radiofrequency ID tags, and a host of other high tech products.

The continuing unfettered use of this kind of radiation needs much closer scrutiny. People assume that these technologies are safe. But at the federal level, there is almost no government research today. And most of the regulatory agencies have had their programs completely eviscerated. A whole area of important expertise is being lost just when we need it most. Almost all of the research on RF is now coming from Europe and it's coming from Asia; we're falling far behind. No one is protected in the US today from long term, low level exposures to RF, which is what we mostly experience.

It's called electrosmog, and it's a form of energetic air pollution. One study in Europe a few years back found that the background RF in urban areas had increased by a factor of over 3,000% in just a ten-year period. Cell technology likely accounts for the rise that they've measured. US cities are thought to be comparable, if not higher. That, by anyone's reckoning, is an altered environment. We're essentially experimenting on people without their consent. There are exposure standards in place, but they're controversial and they're obsolete.

The debate on this, by the way, is not new. It goes all the way back to World War Two. When the US Bureau of Ships first noticed that midshipmen developed cataracts and infertility problems near radar units. The heart of the debate is over what are called "thermal" versus "non-thermal" effects. The electromagnetic spectrum is traditionally divided into ionizing and non-ionizing radiation. Ionizing radiation, which we're all familiar with, include solar rays, X-rays, nuclear activities, things like that. It's known to have enough power to knock electrons off of cellular orbits, and thereby cause genetic mutations. Those exposures, by the way, are known to be cumulative over a lifetime. But non-ionizing radiation, which includes everything from the visible light frequencies all the way down to the Earth's natural electromagnetic fields, are thought not to have enough power to do that. The non-ionizing bands have been deemed safe if they are kept under certain thresholds for tissue heating and electric shock.

But that safety premise is false. Non-ionizing radiation can cause a host of biological effects below those thresholds. No one disputes thermal effects. Radiofrequency radiation can and does heat tissue, just like a microwave oven. The only debate is over whether there are adverse non-thermal effects, what are they, and can they be reversed? The human anatomy… think about it for a minute… is an electrical organism. The heartbeat is electrical, brainwaves are electrical, critical stages of cell division itself are electrically influenced. There's not much that happens in the human body that isn't electrical in one way or another.

But the distinctions between forms of radiation may be more for the precision of the physics community than for the accuracy of biology models. Researchers are finding more more and more multisystemic effects at lower intensities all the time, and these non-ionizing exposures appear to be cumulative as well. There may, in fact, be no safe threshold for low level non-ionizing radiation, just like the National Academy of Sciences has said that there is no safe threshold for ionizing radiation. They issued a study last year that found that the only difference may lie in in specific exposure parameters that are not yet understood.

The work of doctors Henry Lai and N.P. Singh at the University of Washington in Seattle definitely points in that direction. Those researchers found both double and single strand DNA breaks with low level microwave exposures below heating thresholds. According to traditional theory, that is not supposed to be happening. Their work has been replicated in about 12 different studies.

All wireless devices need base stations to bounce signals. That's how it works. Concerns over the infrastructure that's needed to support all of this technology started at the federal level with the Telecommunications Act of 1996. That bill unleashed not only the whole wireless juggernaut that we appear to love so much, but it also created a kind of rolling nightmare for homeowners and local zoning Commissions.

Section 704 was written by lobbyists for the telecom industry. Unfortunately, it was among, in fact, one of the most destructive pieces of legislation as a journalist that I've seen in my career. That clause literally eviscerated the reason we have zoning in the first place. All state statutes identify the purpose of zoning as the responsibility to protect the health, safety and welfare of a community. But the industry knew that without taking the health piece off the table, this build-out could never occur. They knew that once local officials look at the science, they do not approve towers near residences or schools… period. The placement of towers is a very contentious issue at the local level. I'm sure that every congressional office has heard from constituents about it. Property devaluation and health concerns are always at the top of the list. Few people realize the key questions about the safety of radiofrequency radiation have never been settled… despite what anyone says, no safe level of RF has ever really been determined.

Unfortunately, there is a growing segment of the population that has become hypersensitive to these exposures. People report sleeplessness, hyper-vigilance, rashes, concentration problems, headaches, and a range of other symptoms. People do not even have an agency to report symptoms to. In fact, most doctors do not know that these exposures should be considered as environmental factors. Low level ambient RF is now associated with some of the fastest rising complaints in doctor's offices, including headaches and sleep disorders, asthma and allergies, autism, and a host of deadly neurotransmitter diseases like Alzheimer's, Parkinson's and ALS. There is a big disconnect with doctors when it comes to this, because most of the information is contained in biophysics journals, not a place where MDs typically read.

What are we doing to ourselves? And more specifically, what are we doing to other species, too? RF, even at extremely low intensities, is a known active genotoxin, meaning that it can and does damage DNA and that of other species as well. We should not fool ourselves. This is not an environmental freebie. Within the last 10 years, we have completely altered the electromagnetic signature at the Earth's surface with power

densities and signaling characteristics that simply do not exist in nature. And this is all done with a presumption of safety that should not be made. We may already be seeing the law of unintended consequences with other applications of this. Species extinctions have accelerated to a rate never seen before. There are studies that find that wildlife abandons areas when cell towers go in. There are plausible theories that say that ambient RF may play a role in the whole colony collapse of honeybees; that's a big one these days. Low level electromagnetic fields are known to throw bees off of their natural navigational course.

One health policy analyst that I worked with recently recognized immediately that with the big ticket illnesses like Alzheimer's, Parkinson's, ALS and brain tumors associated with low level RF, that wireless technology may have the ability to actually sink the healthcare system. Back in 1975, long before computers and cell phones and WiFi, Dr. William Bice found severe alterations in human electroencephalograms at RF power levels that are now common in most urban areas. It was a small study using 10 human test subjects, but over a year's period of time at extremely low power levels, Bice documented the entrainment of test subjects' brainwaves with the microwave bands. Reactions entailed radical changes in mood and behavior, including rage reactions. Think of that the next time that somebody flips out on an airplane, or shoots up a school. Think of that entrainment.

Most of the newer technologies are functioning specifically in those wave bands. There are indications that some frequencies may be unsafe at any intensity. Exposures to electromagnetic fields have been found to interact with every system of the body. This is an important point when someone argues that turning down the power is all that's required. At power densities comparable to living within 1,000 feet of a cell tower, studies now show impaired fertility, numerous cancers links with Alzheimer's, Parkinson's and ALS, immune system suppression, increased permeability of the blood brain barrier, serotonin and melatonin suppression, and increases in free radical production. None of this is something that you want. And none of this research that I just mentioned is currently included in the FCC standards, which officially take no work after 1986 into consideration. And no regulatory agency is collecting information on what these technologies may be doing to people. There's no post-surveillance activity by any of the agencies. Collecting hazards data should not be left up to private entrepreneurs with an eye toward class action litigation, as is now the case. There needs to be immediate government oversight.

Senator Leahy also had a very good bill a few years back that called for the removal of Section 704. Hopefully that bill will be resurrected, as it goes right to the heart of the matter regarding states' rights and citizen protection. In the meantime, there was an RF interagency workgroup with representatives from FCC, EPA, FDA, OSHA, NTIA, NIOSH and US Fish and Wildlife. They've said that the FCC standards are dosimetry-based, not biologically-based. That's an important point. That means that the standards are written more for how to make the systems work, than for the biology of systems and its path. That's you and me and every other living thing. But as the professionals who helped write the legislation, you have an ethical obligation to get this one right. Constituents back home are really relying on you, as are the regulatory agencies. Thank you.

Julie Levine
PO Box 1705
Topanga, Ca 90290
310-463-3016

Following are my comments on the Wireless Facilities Ordinances that will be voted on by the Supervisors next week during the November 15th meeting.

We are asking the supervisors to please vote NO on these ordinances because they will streamline infrastructure that is outdated and substandard. We want the Supervisors to streamline fiber to the premises instead which the Department of Treasury has explicitly encouraged states to prioritize over wireless infrastructure.
https://home.treasury.gov/system/files/136/Capital-Projects-Fund-Guidance-States-Territories-and-Freely-Associated-States.pdf

The intent of the Supervisors when they asked for these ordinances to be drafted was for community to have input. None of our community input for these ordinances have been considered in drafting these ordinances and this sham hearing does not provide time for real input and documents submitted by Fiber First LA (which I support) have not been included in your public record. The DRP is quick to say that their hands are tied by FCC guidelines and the Telecommunications Act of 1996 yet numerous other local governments have been able to implement more protective ordinances that still abide by FCC guidelines and the TCA of 1996. Specifically, we are asking for:

1. Streamlined fiber optics to the premise which is now considered a Federal best practice for optimum speed, efficiency, cybersecurity, privacy, safety, resiliency, energy efficiency and long-term cost-savings. The Biden Administration $65 billion Infrastructure funding encourages the deployment of fiber optics to the premise over small cell technology. Why is LA County promoting inferior technology and streamlining it?

2. Require and ensure that all wireless carriers follow fire code that every other infrastructure is required to follow. Fire code exemptions for wireless facilities are not acceptable considering that at least 3 major wildfires in California were fully or partially caused by equipment from wireless facilities. And this ordinance would streamline their installation closer to our homes without proper fire inspections?

3. Require all wireless carriers to show proof of liability and pollution insurance. There are so many ways for wireless infrastructure to cause harm including but not limited to falling debris, fires, harm to humans and the environment from untested radio frequency radiation and much more. Carriers need to be held liable for the harm their infrastructure can potentially cause. (Please note that insurances consider electromagnetic fields, such as what is emitted from wireless infrastructure, a pollutant that requires a separate "Pollution Liability" coverage)

4. LA County must hire an independent consultant to measure the cumulative levels of radio frequency radiation after each wireless facility is installed. This is within FCC rules. These tests must be required at least biannually, and they must be done without the knowledge of the wireless carrier. Far too many facilities are now exceeding even the minimal guidelines of the

FCC that only protects people from heating and burning and does not consider other long-term biological effects.

5. The ordinance must include ADA accommodations for those who are already injured from wireless radiation such as what is emitted from cell towers, cell phones, Wi-Fi and other wireless devices. It would be catastrophic for those who are already sickened by wireless radiation to have to live with a wireless facility outside their window. Incidents like these across the country have uprooted entire families and, in some cases, have made them totally homeless. Supervisors must agree that adding to our homeless crisis would be a disaster.

6. The ordinance must address CEQA issues especially as they relate to fire hazards, and stop the virtual 100% use of the most dangerous and discouraged use strand mounted antenna being placed throughout the Santa Monica Mountains.

7. The Supervisors must address the issues in the red-lined ordinances provided by Fiber First LA which I support.

While we agree that we need to close the digital divide and every home needs access to Information and Communication technology, we also know that the industry must and can do better than substandard wireless infrastructure that has already been outdated. We need symmetrical upload and download speeds that are easily upgradable, that are cost efficient, energy efficient, cybersecure, private, safer and all around better. We need the county to prioritize fiber to the premise and only allow wireless facilities as a last resort. These ordinances are unacceptable as they stand. As the second largest county in the US, we need to do better.

Finally, on a personal note, I have been forced to move away from my home and community because of existing worst case practices by LA County and the placement of small cell towers around my home despite my letters, those of Andrew Campanelli PC and my physician Dr. Jessica Liao of UCLA medical center documenting my Microwave Sickness and inability to tolerate wireless radiation.

Sincerely,

Julie Levine

Topanga CA Resident until 9/30/22 & Executive Director,
5G Free California

101 South Topanga Canyon Blvd. #1705, Topanga, CA 90290
www.FiberFirstLA.org • info@FiberFirstLA.org

MEMORANDUM

To: Los Angeles County Board of Supervisors/Department of Regional Planning
From: Fiber First Los Angeles County
Re: **Legal Issues Under CEQA, NEPA, and NHPA Presented by Proposed Amendments to Title 16 and 22 Ordinances**
Date: September 23, 2022

The following is an analysis of various legal issues under the California Environmental Quality Act (CEQA), the National Historic Preservation Act (NHPA) and related California state laws, and the National Environmental Policy Act (NEPA) arising from proposed wireless facilities ordinances (amending County Code Titles 16 and 22) now before the Los Angeles Board of Supervisors (BOS) as a result of recommendations by the Department of Regional Planning (LACDRP).

Fiber First Los Angeles (FFLA) contests the Proposed Environmental Determination, which states:

> *PROPOSED ENVIRONMENTAL DETERMINATION*
> *DETERMINATION DATE:* *March 23, 2022*
> *PROJECT NUMBER:* *2021-002931*
> *PERMIT NUMBER(S):* *RPPL2021007939 Permit Number*
> *SUPERVISORIAL DISTRICT:* *1-5*
> *PROJECT LOCATION:* *Countywide*
> *OWNER:* *N/A*
> *APPLICANT:* *Los Angeles County*
> *CASE PLANNER:* *Alyson Stewart, Senior Regional Planner, ordinance@planning.lacounty.gov*
>
> *Los Angeles County ("County") completed an initial review for the above-mentioned project. Based on examination of the project proposal and the supporting information included for the project, the County proposes that an Exemption is the appropriate environmental documentation under the California Environmental Quality Act (CEQA). This project (Ordinance) qualifies for a Categorical Exemption, (Class 1 – Existing Facilities, and Class 3 – New Construction or Conversion of Small Structures) under the California Environmental Quality Act (CEQA) and County environmental guidelines. The project includes authorization for modifications to existing facilities as well as for*

minor alterations to land with the construction or conversion of small structures. Both actions will not have a significant effect on the environment.

I. Executive Summary

The county staff recommends that the Board find that the action on wireless-related provisions through Amendments to County Codes Titles 16 and 22 is exempt from any environmental or historical evaluation based on a purported Categorical Exemption, (Class 1 – Existing Facilities, and Class 3 – New Construction or Conversion of Small Structures) under the California Environmental Quality Act (CEQA) and County environmental guidelines. We disagree.

1. There will be massive and irreversible adverse environmental consequences if the staff-recommended amendments are adopted.
2. The claimed Categorical Exemptions do not apply for any purpose.
3. Even if the Categorical Exemptions do apply generally, the BOS action will fall within specific Exceptions to the Exemptions, specifically, CEQA Guidelines Section 15300.2[1]:
    (a) Location. Classes 3, 4, 5, 6, and 11 involving significant impacts on particularly sensitive environments
    (b) Cumulative Impacts.
    (c) Significant Effects. Arising from unusual circumstances
    (f) Historical Resources. Substantial adverse change to a historic resource.
4. The extensive federal involvement in Los Angeles Country triggers NEPA's "small handle doctrine," which will necessitate a separate NEPA compliant Environmental Impact Statement (EIS). The BOS is the "co-lead agency," as this term is interpreted under NEPA, in close consultation and collaboration with several federal agencies that are most engaged in providing funding to Los Angeles County.
5. There are a substantial number of registered and otherwise recognized historical sites and places located in Los Angeles County that are specially protected, and subject to Section 15300.2 Exceptions as well as provisions of NHPA and court decisions.
6. To the extent staff claims CEQA is preempted in whole or in part by the Communications Act (47 U.S.C.) Title III they are incorrect. Nothing in that statute or any FCC rule promulgated thereunder preempts the Board's duty to perform a compliant programmatic Environmental Impact Report (EIR) for both proposed ordinances and the individual projects they countenance.
7. The FCC's shot clock rules have no relevance to the ordinance drafting process for Titles 16 and 22. They apply only to decisions involving individual applications. The shot clock rules do not pre-empt state or local due process notice and hearing requirements, although they do compress the available time for final disposition.

[1] https://casetext.com/regulation/california-code-of-regulations/title-14-natural-resources/division-6-resources-agency/chapter-3-guidelines-for-implementation-of-the-california-environmental-quality-act/article-19-categorical-exemptions/section-153002-exceptions.

8. The BOS cannot avoid its heavy environmental responsibilities under CEQA, NEPA, and NHPA by pushing the process into Ministerial Site Review. All permits must remain subject to traditional Conditional Use Permit review.

II. Legal Analysis

The LACDRP's proposed Environmental Determination recommendation is fatally defective as a matter of CEQA law in two fundamental respects. First, the staff asserts that the proposed Code Amendments to Titles 16 and 22 are Categorically Exempt, which in CEQA language means that their environmental impacts are so negligible as not to justify even preparing an Initial Environmental Review, much less a Negative Declaration. The staff ignores, however, that categorical exemptions are construed narrowly. Aptos Residents Ass'n v. Cty. of Santa Cruz, (2018) 20 Cal. App. 5th 1039, 1046, 229 Cal. Rptr. 3d 605, 612. The county must determine the cumulative impact of all reasonably expected wireless facilities that will be authorized pursuant to the ordinances. Id. The extensive evidence of serious environmental impacts presented below belies any notion the operation of the contemplated ordinances could not possibly have a significant effect on the environment.

Union of Med. Marijuana Patients, Inc. v. City of San Diego, (2019) 7 Cal. 5th 1171, 1184-87, 250 Cal. Rptr. 3d 818, 825-27, 446 P.3d 317, 323-25 (quotation marks, citations and footnotes omitted) provides a good overview of the statutory regime:

2. CEQA generally

> CEQA was enacted to advance four related purposes: to (1) inform the government and public about a proposed activity's potential environmental impacts; (2) identify ways to reduce, or avoid, environmental damage; (3) prevent environmental damage by requiring project changes via alternatives or mitigation measures when feasible; and (4) disclose to the public the rationale for governmental approval of a project that may significantly impact the environment. CEQA embodies a central state policy to require state and local governmental entities to perform their duties so that major consideration is given to preventing environmental damage. CEQA prescribes how governmental decisions will be made when public entities, including the state itself, are charged with approving, funding – or themselves undertaking – a project with significant effects on the environment.
>
> CEQA review is undertaken by a lead agency, defined as the public agency which has the principal responsibility for carrying out or approving a project which may have a significant effect upon the environment. A putative lead agency's implementation of CEQA proceeds by way of a multistep decision tree, which has been characterized as having three tiers. First, the agency must determine whether the proposed activity is subject to CEQA at all. Second, assuming CEQA is found to apply, the agency must decide whether the activity qualifies for one of the many exemptions that excuse otherwise covered activities from CEQA's environmental review. Finally, assuming no applicable exemption, the agency must undertake environmental review of the activity, the third tier. We examine the three-tier process in more detail below.

CEQA's applicability: When a public agency is asked to grant regulatory approval of a private activity or proposes to fund or undertake an activity on its own, the agency must first decide whether the proposed activity is subject to CEQA. In practice, this requires the agency to conduct a preliminary review to determine whether the proposed activity constitutes a "project" for purposes of CEQA. If the proposed activity is found not to be a project, the agency may proceed without further regard to CEQA.

Exemption from environmental review: If the lead agency concludes it is faced with a project, it must then decide whether the project is exempt from the CEQA review process under either a statutory exemption or a categorical exemption set forth in the CEQA Guidelines. The statutory exemptions, created by the Legislature, are found in section 21080, subdivision (b). Among the most important exemptions is the first, for "[m]inisterial" projects, which are defined generally as projects whose approval does not require an agency to exercise discretion. The categorical exemptions in Guidelines sections 15300 through 15333 were promulgated by the Secretary for the Natural Resources Agency in response to the Legislature's directive to develop "a list of classes of projects that have been determined not to have a significant effect on the environment." If the lead agency concludes a project is exempt from review, it must issue a notice of exemption citing the evidence on which it relied in reaching that conclusion. The agency may thereafter proceed without further consideration of CEQA.

Environmental review: Environmental review is required under CEQA only if a public agency concludes that a proposed activity is a project and does not qualify for an exemption. In that case, the agency must first undertake an initial study to determine whether the project may have a significant effect on the environment." If the initial study finds no substantial evidence that the project may have a significant environmental effect, the lead agency must prepare a negative declaration, and environmental review ends. If the initial study identifies potentially significant environmental effects but (1) those effects can be fully mitigated by changes in the project and (2) the project applicant agrees to incorporate those changes, the agency must prepare a *mitigated* negative declaration. This too ends CEQA review. Finally, if the initial study finds substantial evidence that the project may have a significant environmental impact and a mitigated negative declaration is inappropriate, the lead agency must prepare and certify a full and complete EIR before approving or proceeding with the project.

In Farmland Protection Alliance v. County of Yolo, 71 Cal. App 5th 300 (2021) the Appellate Court held that if **any** aspect of a project entails a significant environmental impact, a Negative Declaration, or Mitigated Negative Declaration cannot cure this fundamental deficiency and a full EIR is thereby required. As explained below, in addition to qualifying for a Cumulative Impacts Exception, proposed Titles 16 and 22 also effectively meet the requirements of the Historic Resource Exception, which like Cumulative Impacts does not require the analysis of the "unusual circumstances" test of the Supreme Court in Berkeley. Historic Resources are considered so important that if a single historic resource is seriously threatened the entire asserted Exemption collapses.

A. Ministerial Exemption

Proposed Titles 16 and 22 contemplate a comprehensive Ministerial Site Review that is inappropriate as a general matter. This Ministerial Site Review does not comply with CEQA. It allows unfettered discretion by the LACRPD and fails to apply strict criteria for each permit application. Further, it presumes there will always be an insignificant environmental impact, when it is highly likely many individual wireless facilities subject to the process will, in fact, have a significant impact.

CEQA Guidelines 14 CCR § 15369 defines “Ministerial”:

> "Ministerial" describes a governmental decision involving little or no personal judgment by the public official as to the wisdom or manner of carrying out the project. The public official merely applies the law to the facts as presented but uses no special discretion or judgment in reaching a decision. A ministerial decision involves only the use of fixed standards or objective measurements, and the public official cannot use personal, subjective judgment in deciding whether or how the project should be carried out. Common examples of ministerial permits include automobile registrations, dog licenses, and marriage licenses. A building permit is ministerial if the ordinance requiring the permit limits the public official to determining whether the zoning allows the structure to be built in the requested location, the structure would meet the strength requirements in the Uniform Building Code, and the applicant has paid his fee.

CEQA Guidelines 14 CCR §15002(i) states:

> (i) Discretionary Action. CEQA applies in situations where a governmental agency can use its judgment in deciding whether and how to carry out or approve a project. A project subject to such judgmental controls is called a "discretionary project." See Section 15357.
>
> (1) Where the law requires a governmental agency to act on a project in a set way without allowing the agency to use its own judgment, the project is called "ministerial," and CEQA does not apply. See Section15369.
>
> (2) Whether an agency has discretionary or ministerial controls over a project depends on the authority granted by the law providing the controls over the activity. Similar projects may be subject to discretionary controls in one city or county and only ministerial controls in another. See Section 15268.

CEQA Guidelines 14 CCR § 15300.1 provides:

> § 15300.1. Relation to Ministerial Projects.
>
> Section 21080 of the Public Resources Code exempts from the application of CEQA those projects over which public agencies exercise only ministerial authority. Since ministerial projects are already exempt, Categorical Exemptions should be applied only where a project is not ministerial under a public agency's statutes and ordinances. The inclusion of activities which may be ministerial within the classes and examples contained in this article shall not be construed as a finding by the Secretary for resources that such an activity is discretionary.

The draft ordinances' contemplated "Ministerial" review process does not meet the applicable definitions and treatment that are required before a project is exempt from CEQA review.

B. The claimed Categorical Exemptions do not apply

The LACDRP proposed Environmental Determination implicitly accepts that the ordinance drafting process here is a "project" for purposes of CEQA (step 1) because it undertakes step 2. We expressly agree that this ordinance exercise is a CEQA project. Staff, however, manifestly errs at step 2.

We first note that the draft Environmental Determination is defective because it does not "cit[e] the evidence on which [the lead agency, here presumably the County] relie[s] in reaching that Conclusion." Union of Med. Marijuana Patients, supra, 7 Cal. 5th at 1186, *citing* Muzzy Ranch Co. v. Solano County Airport Land Use Com. (2007) 41 Cal.4th 372, 380, 386-387, 60 Cal. Rptr. 3d 247, 160 P.3d 116. "The exemption can be relied on only if a factual evaluation of the agency's proposed activity reveals that it applies… whether a particular activity qualifies for the commonsense exemption presents an issue of fact, and [] the agency invoking the exemption has the burden of demonstrating it applies." Muzzy, 41 Cal. 4th at 386. An agency's duty to provide such factual support "is all the more important where the record shows, as it does here, that opponents of the project have raised arguments regarding possible significant environmental impacts." Id. This alone is fatal to the proposed Environmental Determination. But there are additional issues.

Exemption Class 1 pertains to "existing facilities" when the project involves negligible or no expansion of an existing use. Every type of wireless facility (other than exempt facilities covered by Section 6409 of the federal Spectrum Act, 47 U.S.C. Section 1455 and its implementing regulations at 47 C.F.R. Section 1.6100) that will be authorized under the proposed ordinance will either involve a new facility or a new use on an existing facility.

The Title 22 changes address, for example, new towers on public property other than highways or on private property. *See, e.g.*, proposed 22.140.E.b.i,[2] d. The Title 16 amendments contemplate the leasing of public infrastructure and allow for new or replacement poles to which new facilities will be attached. *E.g.*, proposed 16.25.030.E.3.d., 16.25.050.E. New poles or structures are not existing facilities.[3] Even when existing county infrastructure is used the wireless facility will be a non-negligible "new use."

Exemption Class 3 consists of construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure. This exemption does not apply because the ordinances will allow for construction and location of thousands of facilities. It is foreseeable that there may be many more applications than the 700 "small cabinets" involved in S.F.

[2] This provision addresses potential towers on the grounds of historical properties, a matter clearly not within any categorical exemption.

[3] The staff does not rely on Class 2 for an exemption, but this also does not apply because the replacement structure will not have the same purpose or capacity.

Beautiful v. City & Cty. of S.F., (2014) 226 Cal. App. 4th 1012, 172 Cal. Rptr. 3d 134[4] or the "transformer boxes" in McCann v. City of San Diego, (2021) 70 Cal. App. 5th 51, 89, 285 Cal. Rptr. 3d 175.[5] More than minor modifications will be required. The draft ordinances provide for ministerial approval of thousands of wireless projects, so the scope is much greater than the 13 microcell sites addressed in Aptos. The ordinances expressly contemplate that facilities will be placed in scenic rural areas – not just neighborhoods or the urban core. They also expressly allow facilities on, in or near to historical resources. Los Angeles County General Plan Goal C/NR 14[6] requires mitigation of impacts to historic resources, inter-jurisdictional collaboration, preservation of historic resources and it mandates that "proper notification and recovery processes are carried out for development on or near historic … resources." Exemption Class 3 does not apply.

C. Applicable California Judicial Standards

Even if the exemptions apply this is an unusual circumstance, and there is a reasonable possibility of a significant effect due to this circumstance. The significant effect is so substantial that the effect itself is an unusual circumstance. There are therefore applicable exceptions to the exemptions.

CEQA Guidelines Section 15300.2[7] provides explicit exceptions to the exemptions section upon which the staff relies. The most relevant sections are:

> (a) Location. Classes 3, 4, 5, 6, and 11 are qualified by consideration of where the project is to be located -a project that is ordinarily insignificant in its impact on the environment may in a particularly sensitive environment be significant.
>
> (b) Cumulative Impact. All exemptions for these classes are inapplicable when the cumulative impact of successive projects of the same type in the same place, over time is significant.
>
> (c) Significant Effect. A categorical exemption shall not be used for an activity where there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances…

[4] These projects will involve more obtrusive antennas, wiring and associated equipment on various structures more than 10 feet above the ground and sometimes equipment on the ground.

[5] McCann involved a "mitigated negative declaration" not a claimed categorical exemption. Notably, the McCann court found that San Diego did not adequately address whether the project would have a significant impact due to greenhouse gas emissions. 70 Cal. App. 5th 51, 91. The staff recommendation here suffers the same defect. As explained below, the projects contemplated by the ordinances will lead to more electric utility consumption that will, in turn, generate additional greenhouse gas emissions.

[6] https://planning.lacounty.gov/assets/upl/project/gp_final-general-plan.pdf#page=163.

[7] https://casetext.com/regulation/california-code-of-regulations/title-14-natural-resources/division-6-resources-agency/chapter-3-guidelines-for-implementation-of-the-california-environmental-quality-act/article-19-categorical-exemptions/section-153002-exceptions.

> (f) Historical Resources. A categorical exemption shall not be used for a project which may cause a substantial adverse change in the significance of a historical resource.[8]

As explained above and in more detail below, the proposed action falls well within exceptions (a), (b) and (f) and easily meets the "unusual circumstances" test in (c), as established by the California Supreme Court. Historical resources are involved so (f) applies as well.

In Berkeley Hillside Pres. v. City of Berkeley, (2015) 60 Cal. 4th 1086, 184 Cal. Rptr. 3d 643, 343 P.3d 834 the California Supreme Court addressed the scope of exceptions under the "unusual circumstances test" under Exception (c):

> A party invoking the exception may establish an unusual circumstance without evidence of an environmental effect, by showing that the project has some feature that distinguishes it from others in the exempt class, such as its size or location. In such a case, to render the exception applicable, the party need **only** show a reasonable possibility of a significant effect due to that unusual circumstance. Alternatively, … a party may establish an unusual circumstance with evidence that the project will have a significant environmental impact. That evidence, if convincing, necessarily also establishes "a reasonable possibility that the activity will have a significant effect … due to unusual circumstances.

60 Cal. 4th at 1105.[9]

Berkeley applies only to Exception (c). The other listed Exceptions are more liberally interpreted and applied. As explained below, the cumulative impacts even in a single location, which could be a neighborhood where permitted towers under Title 22 are densified will be significant. This distinguishes the present situation from prior situations where the environmental risks were clearly limited. The proposed Titles 16 and 22 propose to use Ministerial Site Review for a huge number of specific sites under comprehensive plans written by the telecom providers.[10] As explained below, FFLA will be able to present overwhelming evidence that there is more than a reasonable probability, indeed an almost certain likelihood, that there will be a massive environmental impact.

D. Proper Application CEQA Exemptions and Exceptions

Statutory interpretation requires harmonization of different statutes and multiple parts of the same statute to reconcile potential conflicts and give optimal effect to legislative intent. In the present instance, the staff is asking the Board to ignore the framework California courts have developed to constrain arbitrary overuse of claimed Categorical Exemptions and Negative

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[8] *See* Committee to Save the Hollywoodland Specific Plan v. City of Los Angeles (2008) 161 Cal.App.4th 1168, 1186 ["a categorical exemption is not applied to projects that may cause a substantial adverse change in the significance of a historic resource."]

[9] The majority deemed the above analysis consistent with the concurring opinion's "central proposition" that the exception applies where there is evidence that a project *will* have a significant effect." 60 Cal. 4th at 1106.

[10] There are already thousands of sites in the incorporated and unincorporated parts of Los Angeles County, and one provider alone wants to install more than 1,300 new facilities. *See* https://pw.lacounty.gov/tnl/streetlights/?action=small-cell; https://data.lacity.org/City-Infrastructure-Service-Requests/Small-Cell-Locations/3nrm-mq6k; https://www.crowncastle.com/communities/los-angeles-ca.

Declarations. Here, staff does not even get to the point of a Negative Declaration analysis – which makes the error even more egregious.

The Third District Court of Appeal (in a unanimous opinion authored by Justice Robie) recently reaffirmed that Cal. Pub. Res. Code § 21151 requires a "full EIR" whenever a project may have any significant environmental effect; it thus reversed the trial court's judgment that had allowed a deficient revised Mitigated Negative Declaration (MND) and its mitigation measures to remain intact while ordering Yolo County to also prepare an EIR limited to addressing only the project's impacts on three species of concern (tricolored blackbird, valley elderberry longhorn beetle, and golden eagle). The court reversed and remanded with instructions to issue a peremptory writ directing the County to set aside its MND approval and to prepare a full EIR. Farmland Protection Alliance v. County of Yolo, (2021) 71 Cal. App. 5th 300, 286 Cal. Rptr. 3d 227.

Boiled down to the essentials, the Court of Appeal held that neither CEQA nor its interpretive case law authorize a "limited EIR" at the "third tier" of the CEQA review process, nor do they provide any authority for "an order splitting the analysis of a project's environmental impacts across two types of environmental review documents," such as the deficient MND and the "limited EIR" ordered by the trial court in that case. Rather, once substantial evidence is presented that a project might have a significant environmental impact in any area, a negative declaration is inappropriate and a "full EIR" is required. While the CEQA remedies statute (Public Resources Code, §21168.9[11]) is intended to provide flexibility in facilitating compliance with CEQA, judicial remedies cannot avoid "the heart of the Act – the preparation of an environmental impact report for the project." Yolo involved an MDR but the principles articulated in that case still directly and forcefully guide the unusual circumstances test to the proposed "Project" – here the two ordinances at hand.

The Court held that "if *any* aspect of the project triggers preparation of an environmental impact report, a full environmental impact report must be prepared in accordance with the definition of [an EIR in Public Resources Code] section 21061." (*Citing* San Bernardino Valley Audubon Society v. Metropolitan Water Dist. *(*1999) 71 Cal.App.4th 382, 402 & fn. 11; Muzzy, supra at 381.

E. Unassessed Environmental Impacts

The proposed amendments to Code Titles 16 and 22 (henceforth, "Project") and the associated Facility Design Guidelines raise a wide range of unaddressed but substantiated grave environmental risks that meet the unusual circumstances test. Further, since there are historical resources in issue there can be no exemption. These risks are:

- Human Health;
- Wildlife—fauna and plants;
- Historic sites;
- Wildfires, earthquakes, floods leading to lack of resilience;
- Plastic faux trees (including monopines) and other plastic faux products;
- Energy use and wasteful consumption;
- Especially sensitive environmental areas.

[11] https://codes.findlaw.com/ca/public-resources-code/prc-sect-21168-9/.

The Project, if approved, represents a massive, unprecedented assault on human populations and the environment which distinguishes it from individual applications or locations covered by the CEQA Exceptions.

1. **Human Health Effects**

There is already an extensive and mounting body of peer reviewed studies from many countries on the health effects of exposing densified human populations from continuous cumulative RF/EMF radiation exposure from small cell and macro towers in addition to other RF radiation emitting devices. The present regulatory environment, especially as it relates to "microwave illness" or Electromagnetic Hypersensitivity (EHS), is uncertain. The bottom line is that harm to humans from radiofrequency radiation exposure is clearly foreseeable and the BOS has a high duty to proceed with precaution and heightened vigilance—the very opposite of the position taken by relying on a Category 3 Exemption and the attempt to blanket the unincorporated portions of the county using a Ministerial Exemption. A compendium of abstracts of the published scientific papers on radiofrequency and other non-ionizing magnetic fields is available at https://bit.ly/EMF08102022. The great majority of those published by independent (non-telecom funded) researchers shows significant risk.

2. **Wildlife—Fauna and Plants**

The effects of RF/EMF radiation exposure of fauna and plants is at present a regulatory no-man's land. The FCC's maximum radiation exposure rules do not address wildlife or plants. Bats and bees and other airborne species occupy air space in close proximity to transmitting cell tower antennas. Wireless network densification increases RFR levels (El-Hajj & Naous, 2020[12]) and with over 800,000 new cell sites[13] projected for the 5G buildout nationwide, environmental effects need to be properly examined, because ambient RFR is increasing in wildlife habitat.

A landmark three-part research review on effects to wildlife was published in R*eviews on Environmental Health in 2021* by U.S. experts, including former U.S. Fish and Wildlife senior biologist Albert Manville. The authors reviewed and cited more than 1,200 scientific references. These experts concluded that the evidence was adequate to trigger urgent regulatory action. The review found adverse biological effects to wildlife from even very low intensity non-ionizing radiation emissions at multiple orders of magnitude below current FCC-allowed levels (Levitt et al., 2021a[14], Levitt et al., 2021b[15], Levitt et al., 2021c[16]).

Comprehensive documentation of the biological effects of non-ionizing electromagnetic radiation to flora and fauna has never before been undertaken to this degree in any previous publication. These three experts divide their science and findings with urgent warnings into three parts: Part 1 identifies ambient EMF adverse effects on wildlife and notes a particular urgency regarding millimeter wave emissions and the pulsation/modulation used in 5G technologies. Part 2 explores natural and man-made fields, animal magnetoreception mechanisms, and pertinent studies to all wildlife kingdoms. Part 3 examines current exposure standards, applicable laws, and future directions. Their conclusions after this expansive review of the science are neither

[12] https://ieeexplore.ieee.org/document/9221314.

[13] https://docs.fcc.gov/public/attachments/DOC-354323A1.pdf.

[14] https://pubmed.ncbi.nlm.nih.gov/34047144/.

[15] https://pubmed.ncbi.nlm.nih.gov/34243228/.

[16] https://doi.org/10.1515/reveh-2021-0083.

equivocal nor speculative. This environmental research review is a clarion call to develop regulations that ensure wildlife and its habitat are protected. The abstract summarizes the findings:

- Numerous studies across all frequencies and taxa indicate that low-level EMF exposures have numerous adverse effects, including on orientation, migration, food finding, reproduction, mating, nest and den building, territorial maintenance, defense, vitality, longevity, and survivorship. Cyto-toxic and geno-toxic effects have long been observed. It is time to recognize ambient EMF as a novel form of pollution and develop rules at regulatory agencies that designate air as 'habitat' so EMF can be regulated like other pollutants. Wildlife loss is often unseen and undocumented until tipping points are reached. A robust dialog regarding technology's high-impact role in the nascent field of electroecology needs to commence. Long-term chronic low-level EMF exposure standards should be set accordingly for wildlife, including, but not limited to, the redesign of wireless devices, as well as infrastructure, in order to reduce the rising ambient levels.
- Numerous individual studies on impacts to flora and fauna have been published over the last two years, notably several on pollinators and insects.
- Two studies used scientific simulations to quantify the amount of power absorbed into the bodies of various insects for different RFR frequencies. In January 2020 researchers published "Radio-frequency electromagnetic field exposure of Western Honey Bees" in Scientific Reports on the absorption of RFR into honey bees at different developmental stages with phantoms simulating worker bees, a drone, a larva, and a queen (Thielens et al., 2020). The simulations were combined with measurements of environmental RF-EMF exposure near beehives in Belgium in order to estimate realistic exposures. They found absorbed RF-EMF power increases by factors of up to 16 to 121 when the frequency is increased from 0.6 GHz to 6 GHz for a fixed incident electric field strength. The implications of the impacts to bees – an ecologically and economically important insect species – are widespread and consequential.
- In October 2021 a second simulation study with far-reaching implications "Radio-frequency exposure of the yellow fever mosquito (A. aegypti) from 2 to 240 GHz" published in PLOS Computational Biology simulated the far field exposure of a mosquito between 2 and 240 GHz and found the power absorption into the mosquito is 16 times higher at 60 GHz than at 6 GHz at the same incident field strength. This increase is even larger (by a factor of 21.8) for 120 GHz when compared to 6 GHz. The authors conclude "higher absorption of EMF by yellow fever mosquitoes, which can cause dielectric heating and have an impact on behaviour, development and possibly spread of the insect."
- In 2020, a report by Alain Hill of the biological effects of non-ionizing radiation on insects found that mobile communications was a critical factor in weakening the insect world along with pesticides and habitat loss. (Khan et al., 2021) found the Apis Cerana bee becomes very passive at a certain level of frequencies and power.

- In May 2021, Spanish biologist Alfonso Balmori published "Electromagnetic radiation as an emerging driver factor for the decline of insects" in Science of The Total Environment. Balmori found that electromagnetic radiation threatens insect biodiversity worldwide. He documents the sufficient evidence of effects of non-thermal, non-ionizing radiation on insects, at well below the limits allowed by FCC guidelines, and warns that action must be taken now before significant new deployment of new technologies (like with 5G) is undertaken. He cautions that the loss of insect diversity and abundance will likely provoke cascading effects on food webs and ecosystem services.
- A November 2021 review of the effects of millimeter waves, ultraviolet, and gamma rays on plants found many non-thermal effects specifically from millimeter waves (Zhong et al. 2021). (The paper examined the millimeter range 30 to 300 GHz which overlaps with FCC's limits 300 kHz to 100 GHz.) Millimeter-wave irradiation stimulated cell division, enzyme synthesis, growth rate, and biomass. The review highlights how different doses and durations provoked dynamic morphophysiological effects in plants. Seed pretreatment with weak microwaves or millimeter wave irradiation altered root physiology. Different effects were observed in different plants and the authors state that, "the discordance of proteomic changes in different plants is reasonable, since different plants have a distinct tolerance to stress. Moreover, the cell tissues from soybeans and chickpeas used for proteomic analysis were different, which implies that tissue-specific or organ-specific responses of plants under millimeter-wave irradiation might exist and require further investigation." This review adds to the published analysis confirming non thermal effects from RFR. While these frequencies may have beneficial uses in agriculture, the adverse impact to trees and plants in close vicinity to transmitting antennas must be addressed.

There are massive risks to the environment from the heedless deployment of wireless radiation. The proposed ordinances will facilitate even more, without acknowledgement of the science on the subject. These environmental effects within Los Angeles County must be acknowledged and addressed in any Environmental Determination. They cannot be ignored or brushed off in any potential Categorical Exemptions, Negative or Modified Negative Declaration. As a matter of law an Environmental Impact Report is required.

3. **Wildfires, earthquakes, floods lead to lack of resilience**

a. **Wildfire**

Four major wildfires have been initiated, in whole or in part, by telecommunications equipment in Southern California in the last 15 years. Cumulatively, these fires have caused over $6 billion in damages, destroyed over 2000 homes, cost 5 lives, severely burned firefighters and civilians and triggered the largest mass evacuation in California history. These fires are:

1) Guejito Fire (2007)[17] in San Diego which became part of the Witch Creek Fire, the worst fire in San Diego history,[18] causing the largest mass evacuation in California's history of nearly 1,000,000 people.[19]
2) The Malibu Canyon Fire (2007)[20]: Three utility poles overloaded with equipment from Sprint (now T-Mobile), AT&T, Verizon and NextG (now owned by Crown Castle) snapped in the wind and ignited the grass below. All four carriers as well as Southern California Edison,[21] the utility that services Los Angeles County, were accused by the CPUC of attempting to mislead fire investigators.
3) Woolsey Fire (2018)[22]: A telecommunications lashing wire came loose igniting at least one of the two ignition points for the $6 billion fire.[23] Southern California Edison (SCE) was cited for 28 violations by the CPUC. One critical violation involved the failure by SCE to mark as a priority the repair of a broken communication line and broken telecommunications lashing wire. The broken equipment was found during a May 2018 telecommunications inspection. Without priority designation for repair, this known electrical hazard remained in disrepair. In November 2018, the broken Edison telecommunications equipment was involved as part of the ignition of the month-long fire.
4) Silverado Fire in Irvine (2020)[24] involved SCE and a T-Mobile lashing wire.[25] Silverado merged with a second fire causing the evacuation of 130,000 people.

RF stimulates combustible terpene production in conifers. In currently ongoing litigation in the Federal Court (Eastern District) Eisenstecken et al. v Tahoe Regional Planning Agency[26], plaintiffs cite several studies confirming that RF radiation stimulates terpene production in conifers. Terpenes are a combustible and flammable compound. They represent a significant fire hazard.

FFLA has already provided evidence of the high but unassessed wildfire risks that would be allowed by the adoption of Titles 16 and 22 amended ordinances. Others have produced evidence

[17] https://www.supremecourt.gov/DocketPDF/18/18-1368/98044/20190430151930791_18-___petitionforawritofcertiorari.pdf.

[18] https://www.sandiego.gov/fire/about/majorfires/2007witchcreek.

[19] https://www.kpbs.org/news/midday-edition/2017/10/16/2007-firestorms-ravaged-san-diego-county.

[20] https://www.dwt.com/-/media/files/blogs/broadband-advisor/2022/01/jan-20/cpuc-decision-21-10-019.pdfhttps://www.dwt.com/-/media/files/blogs/broadband-advisor/2022/01/jan-20/cpuc-decision-21-10-019.pdf.

[21] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M077/K126/77126214.PDF.

[22] https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/safety-and-enforcement-division/investigations-wildfires/sed-investigation-report---woolsey-fire---redacted.pdf.

[23] https://timesofsandiego.com/business/2018/11/28/6-billion-is-estimated-damage-from-woolsey-fire-in-la-and-ventura-counties/.

[24] https://www.theepochtimes.com/law-firm-seeks-clients-to-sue-socal-edison-over-silverado-fire_3639317.html.

[25] https://www.wxii12.com/article/power-company-equipment-woolsey-fire-california/34540269#.

[26] https://casetext.com/case/eisenstecken-v-tahoe-regl-planning-agency/.

that the proposed wireless "Resilience Hubs" are the very worst, least resilient technology to be relying upon during power outages or earthquakes.[27]

By relying on the proposed exemption, the staff is basically asserting these concerns are not even worthy of consideration, but there is no evidence that the LACDRP even examined them.[28]

F. Energy use and wasteful consumption

Mobile service is energy intensive. The transition to 5G, whether 5G NR (non-standalone) or 5G Standalone NR, will exacerbate this situation until newer and far more efficient equipment can be designed and deployed, and 5G networks can fully implement use of their emerging "sleep mode" capability.[29] But even with "sleep mode" the energy consumption profile will still be high.

Environmental Heath Trust provides an extensive summary of this and much more evidence on the topic, with citation to recent sources on its website.[30] All this energy consumption will translate into far more greenhouse gas output, thereby contributing to existing climate issues. An EIR is required to assess the additional greenhouse load that will flow from the operation of thousands of wireless facilities these ordinances will permit.

G. Plastic faux trees (including monopines) and other plastic faux products

Monopines and other toxic faux products designed to camouflage macro cell towers produce microplastic waste that is being scattered, and will increasingly be scattered, all over Los Angeles County. The mechanism is straightforward. The faux plastic falls off the towers via weather, wind, etc. onto the ground, then gets washed away into the storm drain system and other discharge channels. It is standard industry practice to replace faux plastic on macro towers every

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[27] In April 2022, the BOS voted in favor of a "Safety Upgrade" to the General Plan and included Wireless Resilience Hubs (WRH) as an important component of this Safety Upgrade. The stated purpose of a WRH is to help LA County address more effectively power outages, wildfires, floods, and other public emergencies. However, there is evidence that WRH will actually make Los Angeles County less safe during these emergencies, because intensive use of cell phones and other wireless devices during emergencies will actually further compromise the power grid. The proposed proliferation of cell towers authorized and encouraged by the amendments to Titles 16 and 22 under Ministerial Site Review will "hard wire" the problem, because local ordinances by California law must be "consistent" with the General Plan. An immediately available alternative proposed by Fiber Free Los Angeles and other concerned organizations is to accelerate the deployment of Resilience Hubs based on Optical Fiber to the home and workplace, supported by funding under the BEAD and other federal and state programs. *See* Tim Schoechle, "Reinventing Wires: https://gettingsmarteraboutthesmartgrid.org/pdf/Wires.pdf; https://www.nytimes.com/2019/10/28/business/energy-environment/california-cellular-blackout.html.

[28] The proposed Environmental Determination does not mention any matters of concern. It just baldly states there are two applicable Categorical Exemptions without providing any evidence in support. *But see* Union of Med. Marijuana Patients at 1186; Muzzy, 41 Cal.4th at 380. In addition, faux plastic trees may present an additional fire risk in this respect. https://www.firehouse.com/rescue/article/10544313/plastics-polymerization-what-firefighters-need-to-know.

[29] The 5G Dilemma: More Base Stations, More Antennas—Less Energy? 5G networks will likely consume more energy than 4G, but one expert says the problem may not be as bad as it seems, Dexter Johnson, IEEE Spectrum (Oct. 3, 2018), available at https://spectrum.ieee.org/will-increased-energy-consumption-be-the-achilles-heel-of-5g-networks. For "sleep mode" background see Ericsson, A technical look at 5G energy consumption and performance, Frenger and Tano (Sept. 19, 2019), available at https://www.ericsson.com/en/blog/2019/9/energy-consumption-5g-nr.

[30] https://ehtrust.org/science/reports-on-power-consumption-and-increasing-energy-use-of-wireless-systems-and-digital-ecosystem/.

five years, up to 10,000 pounds per tower. Microplastics on these faux macro towers contain lead and other carcinogenic materials proscribed under Proposition 65. Scientific studies[31] confirm evidence of microplastics in human and animal lungs and blood. There is no evidence that the LACDRP is even familiar with the problem, much less seriously addressed it. The issue is currently being litigated in *Eisenstecken et al. v Tahoe Regional Planning Agency*.[32]

H. Cumulative Impacts

Section 15300.2 of the CEQA Guidelines clearly provides for an Exception to the Exemption for cumulative impacts. It states:

> All exemptions for these classes are inapplicable when the cumulative impact of successive projects of the same type in the same place, over time is significant. Moreover, a strong line of judicial decisions in California[33] recognizes that a valid EIR must include a careful analysis of cumulative impacts. Massive cumulative impacts is another unusually dangerous condition of the proposed Project.

For purposes of 15300.2 in this matter "projects of the same type" means any of the many "wireless facilities" that will be covered by Title 16 or 22. "The same place" means all of Los Angeles County. *See* Aptos, supra (the "same type" was DAS and "same place" was "Day Valley). The Board must assess the cumulative impact of all the individual wireless facility projects the proposed ordinances will authorize. As noted above, these wireless facilities are not being proposed willy-nilly. They are part and parcel of a wireless plan developed by the telecom providers and their installers with a single purpose to blanket all of Los Angeles County without *any* consideration of the cumulative impact of each component segment of this larger plan. This is precisely the kind of "project" that CEQA and its Cumulative Effects Exception intend an agency to carefully scrutinize with heightened environmental awareness and sensitivity of an EIR process.

I. Piecemealing and Segmentation

CEQA Guidelines explicitly prohibit piecemealing[34] as a strategy to circumvent CEQA's EIR requirements. Section 21159.27. PROHIBITION AGAINST PIECEMEALING TO QUALIFY FOR EXEMPTIONS states: "A project may not be divided into smaller projects to qualify for one or more exemptions pursuant to this article." The specific intention of the Project is to encourage piecemealing under an accelerated Ministerial Site Review. The staff's asserted Exemption cannot stand.

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[31] https://drive.google.com/file/d/127Ud8b5nTZuT3meINAFj0ngbj2NQyPa0/view?usp=sharing.

[32] On September 7, 2022 the Lahontan Regional Water Quality Control Board (LRWQCB) officially opened an investigation of hazardous waste discharges of microplastic and other toxics emitted from monopine cell towers. The LRWQCB issued Requests for Information on six faux plastic macro cell tower sites operated by Verizon and other telecom companies. Currently, there is a Zero Discharge Standard under the Clean Water Act and California Porter-Cologne Act. Discharges of hazardous waste from monopines into Lake Tahoe have been ignored for many years, and at last the LRWQCB is seriously investigating the past practice and proposals for new developments referenced in *Eisenstecken et al. v. TRPA.* Although Lake Tahoe represents a unique national treasure, there are many historic sites and environmentally sensitive areas in Los Angeles County that must be protected from microplastic hazardous waste discharges into the air, land, and water from faux plastic macro cell towers. *See e.g.* https://drive.google.com/file/d/1GycVZ8Uhv8reweII64dnQ4VHIKNiMlcS/view?usp=sharing.

[33] https://www.co.shasta.ca.us/docs/libraries/resource-management-docs/eir/hatchet-ridge/ch_4_otheranalyses.pdf.

[34] https://resources.ca.gov/CNRALegacyFiles/ceqa/docs/2014_CEQA_Statutes_and_Guidelines.pdf.

J. Especially sensitive environmental areas

Los Angeles County is replete with environmentally sensitive areas, including parts of the Coastal Zone and the Santa Monica Mountains, all of which are identified in the General Plan. Several are expressly mentioned in, for example, proposed 22.26.E.1.b. The Significant Ecological Area (SEA) Program is a component of the Los Angeles County Conservation/Open Space Element.[35] The imposition of Ministerial Site Review will create an unnecessary conflict with these other important State and County policies and programs, which would otherwise be harmonized and balanced under the established Conditional Use Permit framework. One major purpose of the move to "ministerial" is to avoid dealing with such things. But this you cannot do, unless and until the Board addresses the environmental impact as part of the ordinance drafting process. Even then environmental analysis of certain projects will still be required.

K. Unexamined Alternatives

CEQA: CEQA Guidelines § 15126.6 explicitly states: "An EIR need not consider every conceivable alternative to a project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision making and public participation." (*See* https://planning.lacity.org/eir/SwanHall/DEIR/Chapters/7_Alternatives.pdf).

Environmentally safe, energy efficient, resilient, climate change friendly optical fiber to the home and workplace is an alternative solution to the Digital Divide. The Board should express the same policy decision as the current federal administration: wireless solutions are a less preferred alternative. Wireless should be deployed only where it is necessary, not everywhere in heedless fashion. CEQA requires that each potentially feasible alternative be examined, but the proposed Environmental Determination completely avoids any such effort.

L. Federal and State Policy

Local government agencies like the Board are constrained by and must respect directly applicable federal statutes.[36]

1. NEPA "Small Handle Doctrine"

There is quite likely more federal funding and engagement in Los Angeles County than any other California county or quite possibly in the U.S. Specifically, the American Rescue Plan Act provides $1.9 billion in federal funding to assist economic recovery. Substantial funding is also forthcoming under the NTIA policy announced in May 2022. Federal funding under the 2021 Infrastructure Investment and Jobs Act is also being directed to support efforts such as a Community Wireless Network in Los Angeles County. Other federal statutes are possibly applicable as well. This extensive federal involvement triggers NEPA's "small handle" application which necessitates a NEPA review in addition to a CEQA review on the revisions of Titles 16 and 22 which will alter forever the health and well-being of Los Angeles County residents and its environment. Moreover, the Council on Environmental Quality strongly encourages close coordination between NEPA and CEQA environmental reviews[37]. This is

[35] https://planning.lacounty.gov/sea/faqs.

[36] The telecoms repeatedly claim the federal laws they like must be obeyed. But other federal laws preclude the permit review process and substance that they and staff champion.

[37] https://opr.ca.gov/docs/NEPA_CEQA_Handbook_Feb2014.pdf.

another unique circumstance of the present Project which precludes BOS' reliance on the Exemption.

References:

- https://ceo.lacounty.gov/recovery/arp/
- https://www.jstor.org/stable/24115016
- https://sprlaw.com/wp-content/uploads/2020/10/CEQ-New-NEPA-Regulations.pdf
- https://opr.ca.gov/docs/NEPA_CEQA_Handbook_Feb2014.pdf

M. Climate Change Impact Assessment

CEQA Guidelines explicitly require climate change impact analyses.[38] As the presumable lead agency, the county must analyze the greenhouse gas emissions of this project. This "project" relates to two ordinances that will govern how wireless facilities are permitted so any environmental inquiry must assess not only the quantity of emissions and how that quantity of emissions compares to statewide or global emissions but also the project's effect on climate change.

The precedent that the staff is recommending encourages the Board to allow massive deployment of wireless macro towers and other RF radiation emitting devices under Ministerial Site Review. This reckless policy will have massive negative environmental repercussions in Los Angeles County. Moreover, other counties in California and possibly in other states will cite this precedent to justify similar actions. The collective adverse impacts of hundreds of such projects throughout the U.S. could very well contribute to an adverse climate change impact. CEQA Guidelines 15064.4, subd (a)-(c) require a full inquiry and conclusion that uses appropriate modeling and reflects evolving scientific knowledge and the state's regulatory regime. A flat assertion of a Categorical Exemption, without any evidentiary support, simply does not suffice.

N. Cost/Benefit Analysis

California courts sometimes look to NEPA and federal decisions for guidance. Friends of Mammoth v. Board of Supervisors (1972) 8 Cal.3d 247, 260–261; Bowman v. City of Berkeley (2004) 122 Cal.App.4th 572, 591 (CEQA is patterned on NEPA; NEPA cases can be persuasive authority for interpreting CEQA). It is therefore noteworthy that NEPA regulations require cost/benefit analyses in assessment of alternatives. 40 C.F.R. § 1502.22 Cost-benefit analysis[39] states:

> If the agency is considering a cost-benefit analysis for the proposed action relevant to the choice among alternatives with different environmental effects, the agency shall incorporate the cost-benefit analysis by reference or append it to the statement.

The present situation of the proposed amendments to Titles 16 and 22 presents an excellent opportunity to coordinate CEQA and NEPA practices. NEPA cases can be persuasive in interpreting CEQA when CEQA is unclear (Wildlife Alive v. Chickering (1976) 18 Cal.3d 190, 202-203). CEQA amplifies NEPA practice but does not rely on it. There are provisions for coordinating CEQA review with NEPA and other types of review (CEQA Guidelines section 15004 (c)) Although CEQA does not explicitly require cost-benefit analysis as does NEPA, the

[38] https://opr.ca.gov/ceqa/ceqa-climate-change.html.

[39] https://www.law.cornell.edu/cfr/text/40/1502.22.

County of Los Angeles can benefit from and rely upon a NEPA cost benefit analysis in reaching an informed decision as part of fulfilling its CEQA obligations.

Moreover, the staff's claimed Exemption blindly relies on a plethora of unchallenged false claims advanced by the telecom providers. These false claims include:

- The environmental impacts are trivial;
- Radiation exposure levels of children in schools, disabled persons, elderly, and pregnant women are safe;
- Blanketing Los Angeles County, especially underserved communities with macro towers and other radiative emitting devices will close the Digital Divide;
- Wireless devices are energy saving;
- Wireless hubs will promote community network resilience during power outages.

Each such claim is incorrect. At least one federal court has rejected a NEPA EIS on the grounds that the EIS included false statements.[40]

O. Other Applicable Federal Laws

The staff's abuse of claimed Exemptions will place the BOS in direct violation of other important federal statutes. Here are two examples.

1. **National Historic Preservation Act (NHPA).**

The proposed Wireless Facility Design Guidelines address the incursion of small cell and macro towers on historic sites and related properties. For example:

Historic resources and landmarks.

- No new facilities shall be permitted on or within historic resources or structures listed or eligible for listing on the national, state, or county historic registers.
- Existing facilities located on or within historic resources or structures listed or eligible for listing in any historic registers shall be located and designed to eliminate impacts on the historic resource.
- A Historic Resource Assessment, prepared to the satisfaction of the Director, may be required for a facility to be located on a site containing an eligible resource to identify impacts to historic resources, and identify mitigation to minimize impacts.[41]

The Title 22 Wireless Ordinance Summary states:

Development Standards for All Facilities (except small cell facilities).

[40] *See Natural Res. Def. Council v. U.S. Forest Serv.*, 421 F.3d 797, 811–13 (9th Cir. 2005) (finding that the agency's use of inflated, inaccurate, and misleading data violated NEPA).

[41] Proposed Section 22.140.700.E.1.b.v allows the Director to use individual judgment on whether to require more information and/or impose mitigation measures as a condition of the permit. Despite the staff's desire to move to a "ministerial" review, this is a discretionary act for CEQA purposes. *See* Protecting Our Water & Envtl. Res. v. Cty. of Stanislaus, (2020) 10 Cal. 5th 479, 489, 268 Cal. Rptr. 3d 148, 153, 472 P.3d 459, 464.

> Facilities may not be placed on historically significant buildings or structures. They may be placed elsewhere on the property containing historic buildings or structures, provided a Historic Resource Assessment is prepared and submitted.

The Project, however, sets up an accelerated process under Ministerial Site Review that still does not fully implement federal and state law regarding historical resources.

2. **Identification of Historic Sites in Los Angeles County**

The recognized historic sites in Los Angeles County can be found at:

https://ohp.parks.ca.gov/?page_id=21427 and https://hlrc.lacounty.gov/.

Existing County Code Ch. 22.124 recognizes and protects some "historic districts." The proposed Tit. 22 revisions do provide mitigating measures for those districts, but there are several state and nationally recognized historic districts that have not gone through the county 22.124 process. The View Park site in Angela Sherick-Bright v. Los Angeles County[42] is one of these. To be consistent with how the current and proposed amended Titles 16 and 22 apply, we must recognize that some nationally or state recognized places (landmarks or districts) are not accepted for full protection under Chapter 22.124 (Historic Preservation), but are still protected (by way of an exception to any exemption) under state and federal law. There are "historic resources (as defined in current 22.14) that are not, for example, an "historic district" as defined in 22.14 because they have not been recognized by the Board under 22.124, and thus covered by Ch. 22.82.

It appears the drafters of the proposed wireless ordinances are aware of this. *See* proposed Section 22.140.E.1.b.v. which uses "historic resources," the broader term. But what the draft ordinance fails to deal with is existing Section 22.82.030.B:

> Notwithstanding Section 22.300.020 (Application of Community Standards Districts to Property), where an ordinance establishing or amending a historic district imposes development standards, limitations, conditions or regulations which are inconsistent with those otherwise imposed by this Title 22, the development standards, limitations, conditions, and regulations set forth in the ordinance establishing or amending the historic district shall supersede any inconsistent provisions in this Title 22.

A specific provision on development for a particular county 22.124/22.82 district ordinance and preservation plan should prevail over the proposed new provisions. That may or may not be the drafter's intent, however. The proposed language is ambiguous. If the intent is to preserve the specific provisions for existing 22.124/22.82 districts, then it is true there will no impact as to these districts. However, there are many other historic resources not yet recognized in 22.124/22.82, and there will certainly be a significant environmental impact on them. CEQA Guidelines §15300.2(f) provides that any claimed Categorical Exemption does not apply because of the historical resources exception.

More important, the drafters clearly recognize there will be an impact on historical resources, whether part of the 22.124/22.82 regime or not. There are specific draft terms addressing historical resources. It appears the drafters attempted to provide some mitigating provisions, but

[42] https://drive.google.com/file/d/1pfnYIhHB2IbhmYh59nJUTR8y9PbhRlnZ/view?usp=sharing.

staff has not provided any facts in support of the proposition there will still be no significant impact on any historical resource. This could, in theory, form the basis of a Modified Negative Declaration, if the mitigating steps are sufficient. But staff did not go that far; it just incorrectly asserts the Categorical Exemption, implying thereby no historic analysis is required.

3. **Federal Clean Water Act/California Porter Cologne Acts.**

As noted, the Project will permit unregulated wide diffusion of toxic faux plastic and micro plastic and related plastic waste, lead, and other toxic and carcinogenic materials listed under Proposition 65. The toxic wastes are being carried by strong winds and deposited on land, in or near lakes, streams, and coastal waters. They will penetrate ground water aquifers used for drinking water. They will expose animals and plants in environmentally sensitive areas. They will enter food chains. The widespread discharge of such toxic materials is subject to a Zero Discharge Standard as implemented in California through State, Regional, and Local Water Quality Boards, which are governed by California's Porter Cologne Act. The BOS Project completely ignores this unique and imminent environmental hazard.

P. Federal and State Shot Clock Regulations.

An unstated but obvious reason for the staff's effort to "streamline" the process through ministerial treatment instead of the currently-required Conditional Use process is that the FCC and state legislatively imposed "shot clock" rules require strict deadlines for a final decision. If the deadline is not met, the status for many wireless facility categories will be "deemed approved." FFLA acknowledges this practical problem.

It is important to understand that **the "shot clock" rules *do not apply* to the ordinance drafting process.** They pertain only to individual (or bundled) permit applications seeking land use approval.

The environmental rules FCC establishes when it is complying with NEPA are qualitatively different than the rules FCC promulgates under its Title III authority. The "preemption" in 47 U.S.C. 332(c)(7)(B)(iv) is in Title III. It provides that a state or local government may not "regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions." This provision speaks only to "radio frequency emissions" and does not in any way inhibit inquiry into the other environmental effects of the facilities – visual effects, greenhouse gas emissions, camouflage shedding of microplastics, lead and other carcinogenic materials. The FCC's NEPA rules are in 47 C.F.R. Part 1, Subpart I and do not derive from Title III. Instead these rules are mandated by NEPA, which is an entirely different statute. That is why the FCC has directly held that its NEPA related rules do not preempt state law equivalents like CEQA. *See In re Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Inv.*, 33 FCC Rcd 3102, 3132 ¶77 (March 30, 2018), *rev'd other grnds United Keetoowah Band of Cherokee Indians in Oklahoma*, 933 F.3d 728, 744 (D.C. Cir. 2019):

> …Finally, nothing we do in this order precludes any review conducted by other authorities—such as state and local authorities—insofar as they have review processes encompassing small wireless facility deployments.[152] The existence of state and local review procedures, adopted and implemented by regulators with more intimate knowledge of local geography and history, reduces the

likelihood that small wireless facilities will be deployed in ways that will have adverse environmental and historic preservation effects.[153]

[n.152] The record refers to a range of such requirements that exist under state or local law. See, e.g., City of Boston et al. Ex Parte Letter at 8 (stating appreciation that this order "does not intend to preempt state and local environmental and historical review, and thus leaves open the possibility that states and localities may be able to provide protections that had been provided through the Section 106 and NEPA processes" and noting that "many states have their own versions of NEPA and Section 106"); Letter from Scott K. Bergmann, CTIA, to Marlene H. Dortch, FCC, WT Docket No. 17-79, at 3 (filed Mar. 16, 2018) (the actions taken here do not "mean that small wireless facilities can be deployed by private parties without environmental and historic protections; state and local zoning, environmental, and historic preservation requirements will continue to apply"); Letter from Kenneth S. Fellman, counsel for Colorado Communications and Utility Alliance et al., to Marlene H. Dortch, FCC, WT Docket No. 17-79, Attach. At 5 (filed Oct. 19, 2017) (discussing Colorado state rights-of-way and Denver zoning requirements for wireless facilities); National League of Cities Comments, Attach. At 4 (discussing examples of factors that local authorities consider in connection with right-of-way access, including environmental and aesthetic considerations); National League of Cities et al. Request for Extension of Time at 3 (filed July 7, 2017) (observing that several states have enacted small wireless facility siting laws); see also, e.g., 2017 Pole Replacement Order, 32 FCC Rcd 9760, 9769-70, para. 23 (noting state law requirements for the handling of human or burial remains). Although this order does not preclude otherwise-existing review by other authorities, it also does not eliminate otherwise-existing limitations on that review, see, e.g., City of Boston et al. Ex Parte Letter at 8 (discussing limits under 47 U.S.C. § 1455), but instead leaves the preexisting status quo in place at this time.

[n.153] We recognize that state and local procedures do not mirror the review required under Section 1.1312 of the Commission's rules in all respects. But these procedures nevertheless act as an independent check and show that our action today will not have the effect of authorizing indiscriminate deployment. To the extent that review provided for under state and local law differs, those differences presumably reflect the judgment of state and local lawmakers as to the type of review required for a particular geographic area. We thus find no basis to ignore the role of state and local procedures based on differences in their scope or application cited by commenters. See, e.g., Missouri SHPO Comments at 4; Texas Historical Commission Comments at 3; City of Boston et al. Mar. 14, 2018 Ex Parte Letter at 8-9.

There is no evidence NEPA or 47 U.S.C. Title III was intended to preempt CEQA. In fact, Congress intended NEPA and CEQA to be closely coordinated and integrated within a larger federal/state environmental framework. So any analysis required by CEQA for this project, or any of the hundreds of wireless facility application projects the draft ordinances contemplate, must still be obtained.

It is true a local jurisdiction cannot "regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions." That is the result of a federal statute (47 USC §332(c)(7), which, again is in Title III), not an agency rule. Even so, that does not mean the local jurisdiction is federally preempted from informing itself of the environmental impact from emissions that will flow from the permits it issues. Information gathering to produce required knowledge is not "regulation." Even if the county cannot "regulate" RF emissions, nothing in any federal or state law prevents the Board from informing itself, and thus also the public, about the emissions that will occur because of the permits the County will grant pursuant to the contemplated ordinances.

CEQA compliance is not "regulation on the basis of environmental effects." While CEQA has a substantive mandate (Public Resources Code section 21081), it is mainly procedural in nature, not substantive like the specifics of a zoning ordinance or design guidelines. A fully compliant CEQA analysis of the substantive ordinance and guideline outcomes is still fully required, and the Board must take a meaningful look at the true environmental impact of the proposed action. This means that any Initial Study must look at the impact of additional RF emissions on humans and the rest of the environment. It must also consider the extent to which the operation of thousands of additional wireless facilities will further increase greenhouse gas emissions and result in other toxins like lead or microplastics going into the environment.

4. California Shot Clock Rules as Applied to CEQA Exception Analysis

There are cases that stand for the premise that there must be a CEQA decision prior to commencing the Permit Streamlining Act's (PSA) time limits for acting on a "complete application." Eller Media Co. v. City of Los Angeles (2001) 87 Cal.App.4th 1217, 1221 [noting the Permit Streamlining Act measures all time limits for final approval or disapproval of an application in terms of the environmental review process established by CEQA]; *see also* § 65950, subd. (a); Riverwatch v. County of San Diego (1999) 76 Cal.App.4th 1428, 1440–1441 [discussing exceptions to PSA time limits, stating "CEQA itself contains no automatic approval provisions and its time limits are directory rather than mandatory."] However, unfortunately, AB 57 enacted shot clocks that do not have the same provisions that allow CEQA review to be completed as the Permit Streamlining Act does.[43] Therefore, the new rules might- and likely do- override the directory nature of CEQA-based time limits. Even so, as the article at this link indicates it is unclear what happens when a permit is deemed approved in this context. Nonetheless any CEQA-required process must be completed, even if under a compressed schedule.

In sum, the federal and state shock clock rules raise complex legal questions, but they will only arise in individual permit applications. The FCC rules defer to the state; some California cases recognize that a CEQA analysis must precede the initiation of the shot clock, but the PSA appears to supersede these cases. At the same time, NEPA is the superior federal statute and CEQA was enacted to extend Congress' intention to foster "little NEPAs." The Board cannot frustrate or undermine the federal and state policies that check against the abuse of Exemptions.

[43] *See* https://www.westerncity.com/article/brave-new-world-cell-antennas-california-what-you-need-know-about-ab-57.

To be sure, the ordinance provisions must be constructed to allow, indeed assure, any applicable shot clock is met because there are negative consequences when they are not. But nothing in federal law or any state law allows or requires that fundamental procedural due process or property rights and the environment be sacrificed at the shot clock altar. Notice and an opportunity for hearing must be provided, so ministerial treatment is not allowed.

III. Conclusion

The proposed amendments to Titles 16 and 22 will inevitably result in the blanketing of Los Angeles County with small cell and macro towers installed in high densified residential communities, rural areas and many environmentally sensitive and vulnerable historic sites. This ill-conceived, wireless industry promoted project will have massive human health and environmental consequences and threaten over 1,000 historic sites and resources in Los Angeles County. The staff failed even to consider, much less evaluate, any of these risks and wrongly contends that it has no legal obligation to do so. There is not a shred of evidence the Planning Division has consulted with the California state authorities that are responsible for the protection and stewardship of historical resources. Rather, by a flick of the administrative finger, the entire wireless enterprise – or at least that which is most urgent for humans and the environment – is careless and wrongly gifted over to "ministerial" treatment and thus exempted from meaningful evaluation.

The staff also asserts a Category 3 Exemption under the CEQA Guidelines. This memo explains why that Exemption does not contemplate or allow the wholescale environmental destruction that will result from the amended Titles 16 and 22. The staff's reliance on this section is refuted by the extremely unusual circumstances that attend the project, which will disqualify any reliance on this Exemption.

Any potentially applicable Exemption is overridden as this memorandum documents by two Exceptions to the Exemption: the Exception for Historic Resources, and Cumulative Effects. Because the documented environmental and health risks are so grave, a Negative Declaration or Mitigated Negative Declaration will not suffice. The BOS must prepare a Comprehensive Programmatic Environmental Impact Report as required by CEQA. This EIR should also require ongoing monitoring and mitigation of identified impacts.

The BOS must also recognize that the proposed Project is not a small and insignificant County initiative. Because of the extensive federal involvement, including significant funding and services in Los Angeles County like airports, roads, crime prevention, weather forecasting and other basic functions, various federal laws are immediately applicable. The most directly relevant of these is NEPA. The BOS is legally required as the co-lead agency to consult and collaborate closely with a lead federal agency (or agencies), most prominently in this instance the Department of Transportation, FAA, and/or other concerned federal agencies in preparing a Comprehensive Environmental Impact Assessment.

The rigorous environmental review required for the Project is not preempted by federal law, in particular the 1996 Telecommunications Act ("Communications Act") for several reasons. First, nothing in that statute indicates that states are preempted from informing themselves of the environmental and health effects, even if they are preempted from regulating the facilities causing these harms. Second, the Communications Act does not preempt or supersede other federal statutes, including most relevant here NEPA, NHPA, Americans with Disabilities Act and the Clean Water Act, all of which are triggered by the extensive federal presence. Third, it is

a core principle of American jurisprudence that whenever possible, any statutes in apparent conflict must be "harmonized." If CEQA, NEPA and Communications Act mandates are effectively harmonized, the result will be a fair and effective solution for balancing broadband infrastructural development, addressing the needs of internet-underserved communities, and protecting Los Angeles County's living environment.

- In Matthew 7:12, Jesus says, “Do unto others as you would have them do to you.” Residents deserve to know in advance if a wireless antenna will be installed near their homes.
- Everyone in L.A. County is entitled to reliable, **affordable, safe, future-proof**, high-speed fiber optic internet access, including residents in underserved communities.
- No one should have to rely on slow, expensive and unreliable **wireless broadband that is a fire risk and has not been proven to be safe.**
- Birds, bees, plants and trees are vital to planetary health. Wireless technology is not safe for the environment. Ambient levels of electromagnetic fields (EMF) have shown to produce adverse and synergistic effects on orientation and migration, food-finding, reproduction, mating, nest and den building, territorial maintenance and defense, vitality, longevity and survivorship of wildlife.

LOS ANGELES AREA
CHAMBER OF COMMERCE

November 11, 2022

The Honorable Board of Supervisors
County of Los Angeles
500 West Temple Street
Los Angeles, CA 90012

RE: Item 7 - Wireless Facilities Ordinance Project No. R2021-002931-(1-5) - SUPPORT

Dear Supervisors,

On behalf of the 503,000 businesses in Los Angeles and the 1400 that are member companies of the Los Angeles Area Chamber of Commerce, I write to urge the Board of Supervisors to support Item 7 The Wireless Facilities Ordinance.

The Ordinance is compatible with, and supportive of, the goals, policies, and principles of the Los Angeles County General Plan. It establishes land use regulations, including development standards, for the placement of small cell facilities and macro facilities that are consistent with federal, state, and case law. The FCC establishes parameters for how local jurisdictions are to regulate wireless facilities and the Ordinance is consistent with these parameters.

The Chamber supports smart broadband access and adoption policies like increase digital literacy among students, employees and business. Readily available broadband access for County consumers, students, and workers will enhance access to online information, educational opportunities, and web-enabled information systems, which in turn will drive economic vitality for the County's communities. The Ordinance will help drive economic and workforce development in the County.

For the aforementioned reasons, the L.A. Area Chamber urges your support on item 7 the L.A. County Wireless Facility Ordinance. Thank you for your consideration. If you have any questions please contact Senior Public Policy Manager, Esthela Pacheco at epacheco@lachamber.com.

Sincerely,

Maria S. Salinas

Maria S. Salinas
President & CEO
Los Angeles Area Chamber of Commerce

350 S. Bixel St. | Los Angeles, CA 90017 | P: 213.580.7500 | F: 213.580.7511 | lachamber.com

November 11, 2022

Los Angeles County Board of Supervisors
500 West Temple Street, Room 383
Los Angeles, CA, 90012

Subject: LA County Wireless Facility Ordinance- SUPPORT

Dear Chair Mitchell and Board Supervisors,

The Valley Industry and Commerce Association (VICA), representing businesses in the San Fernando Valley, fully supports the LA County Wireless Facility Ordinance as recommended by the Board of Supervisors.

The proposed revisions to the WFO establishes application requirements and land use regulations, including zoning and development standards for Small Cell Facilities. Small Cells will assist in expanding 5G wireless network service across the county.

As noted in a CTIA report, 5G is transforming the wireless industry into a full-fledged mobile and fixed broadband solution for homes, enterprises, and communities large and small. New 5G wireless technology offers a future proof and cost-effective option for delivering high-speed broadband, including in rural areas of America. 5G for home broadband services already can offer 100+ Mbps and faster speeds. These speeds are more than enough to simultaneously support the online services used by American families, from video conferencing and streaming and to remote learning and gaming.

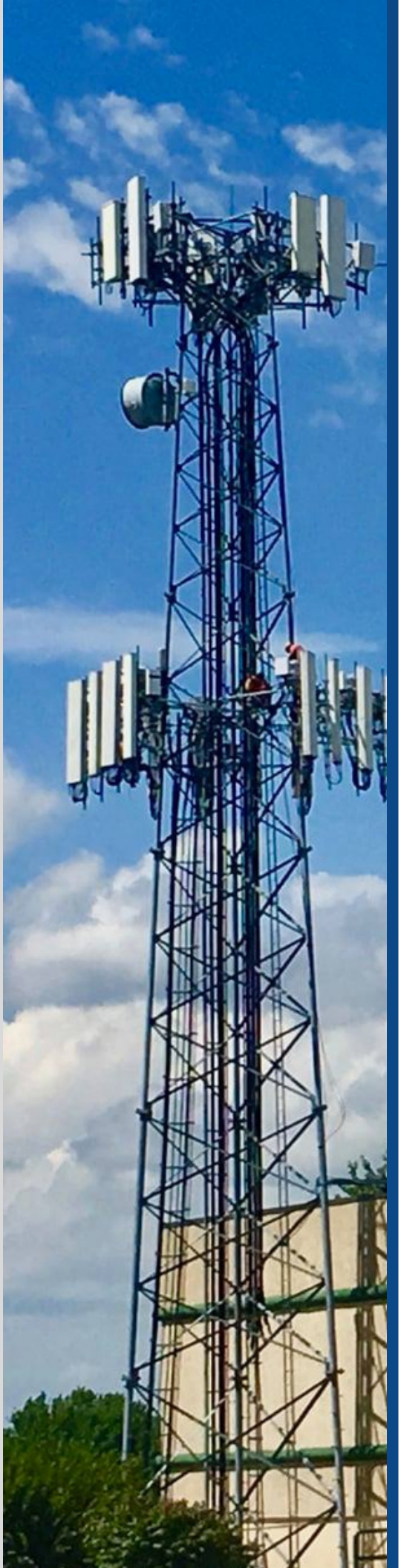
The recommended revisions to standards and regulations will serve to update the County's current ordinance and will greatly assist in advancing the Board's regional digital divide strategy for improving access to broadband services.

For these reasons, VICA respectfully urges you to support the LA County Wireless Facility Ordinance.

Sincerely,

Victor Berrellez
VICA Chair

Stuart Waldman
VICA President



ENVIRONMENTAL HEALTH TRUST

2022

5G, 4G CELL TOWER RADIATION

A REGULATORY GAP

WWW.EHTRUST.ORG

CITIES AND TOWNS WITH STRONG ORDINANCES

SETBACKS FOR CELL ANTENNAS

Many communities have setbacks for cell towers and small cells.

Shelburne, MA: 3,000 feet for schools and 1,500 feet of homes; no new wireless antennas in residential zones
Copake, NY: 1,500 feet from homes, schools, churches, or other buildings containing dwelling units
Sallisaw, OK: No commercial wireless telecommunications towers within 1,500 of homes.
Calabasas, CA: No "Tier 2" wireless telecommunications facilities within 1,000 feet of homes and schools
Bedford, NH: 750 feet from residentially-zoned property
Scarsdale, NY: No wireless facilities within 500 feet from homes, schools, parks, and houses of worship
Walnut City, California: 1,500 feet
Stockbridge, Massachusetts: 1,000 feet
San Diego County California: 1,000 feet (small cells)
Bar Harbor Maine: 1500 setback for schools

School Boards
Palo Alto, California: School Board supports the City of Palo Alto immediately establishing local municipal zoning setback rules of 1500 feet or more from an operating wireless transmitter and a school site.
West Linn-Wilsonville Oregon School Board prohibits cell towers on school property.
Los Angeles California School District: Resolutions opposing cell towers on school property and a cautionary level" for radiofrequency radiation 10,000 times lower than FCC limits.

Bold blue on this PDF are hyperlinked. For more setbacks go to ehtrust.org

ENVIRONMENTAL HEALTH TRUST

A REGULATORY GAP
No Federal Agency Ensuring Cell Tower Wireless Safety

There is no U.S. government agency with oversight for cell tower radiation health effects: no research reviews, no reports, no environmental monitoring, no risk mitigation and no post market health surveillance for the daily, full body radio-frequency (RF) radiation exposure from cell towers.

"The FDA does not regulate cell towers or cell tower radiation. Therefore, the FDA has no studies or information on cell towers to provide in response to your questions."
-Ellen Flannery, Director, FDA Policy Center for Devices and Radiological Health to a California mother with a cell tower on her street who asked the FDA about safety, July 11, 2022

"As a Federal research agency, the NCI is not involved in the regulation of radio frequency telecommunications infrastructure and devices, nor do we make recommendations for policies related to this technology"
-National Cancer Institute letter to Denise Ricciardi, member of the New Hampshire State Commission on 5G, July 30, 2020

The ACS does "not have any official position or statement on whether or not radiofrequency radiation from cell phones, cell phones towers, or other sources is a cause of cancer."
-American Cancer Society Website

"EPA's last review was in the 1984 document Biological Effects of Radiofrequency Radiation. The EPA does not currently have a funded mandate for radiofrequency matters."
-Lee Ann B. Veal Director, EPA Radiation Protection Division Office of Radiation and Indoor Air, July 8, 2020 Letter to Theodora Scarato

Fact: There are no scientific reports by the CDC on cell tower radiation safety, nor does the agency have staff with expertise monitoring the science and evaluating risk. Public information requests found that **several CDC website pages on radio frequency were found to be drafted with a wireless industry consultant.**

"The electromagnetic radiation standards used by the Federal Communications Commission (FCC) continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today." **- U.S. Department of Interior Letter to FCC, 2014**

Fact: The World Health Organization (WHO) EMF Project has not reviewed the science since 1993. The WHO webpages on cell phones and cell towers are not based on a published scientific review. The WHO EMF Project webpages were written by a scientist who **used wireless industry money** to start the WHO EMF Project and who is now a consultant to industry. **In contrast, the WHO International Agency for Research on Cancer (a separate WHO entity vetted for conflicts of interest) determined RF radiation to be a Class 2 B "possible" carcinogen in 2011.** Many scientists now state **the evidence showing cancer has increased.**

Blue text *is hyperlinked to source.*

EXPERT VOICES

"The National Toxicology Program studies clearly showed that non-ionizing cell phone radiofrequency radiation radiation can cause cancers and other adverse health effects. An important lesson that should be learned is that we cannot assume any current or future wireless technology such as 5G is safe without adequate testing."
-Ronald Melnick PhD 28 year scientist at National Institutes of Health

"I recommend public health organizations raise awareness and educate the public on why and how to reduce our daily exposure to wireless radio frequency radiation. Protective public health policy is needed now. It is time for regulatory bodies to fully evaluate the research and develop science based exposure limits that truly protect the public and the environment."
-Linda S. Birnbaum, PhD, Former Director, National Institute of Environmental Health Sciences and National Toxicology Program of the National Institutes of Health.

"Now we have 5G rolling out in massive quantities, without due diligence to determine are these sources of radiation safe not only for humans but for wildlife. And the answer is, no, they are not."
-Albert M. Manville II, Ph.D. Adjunct Professor, Johns Hopkins University, Wildlife Biologist (17 years), retired from Division of Migratory Bird Management, U.S. Fish & Wildlife Service

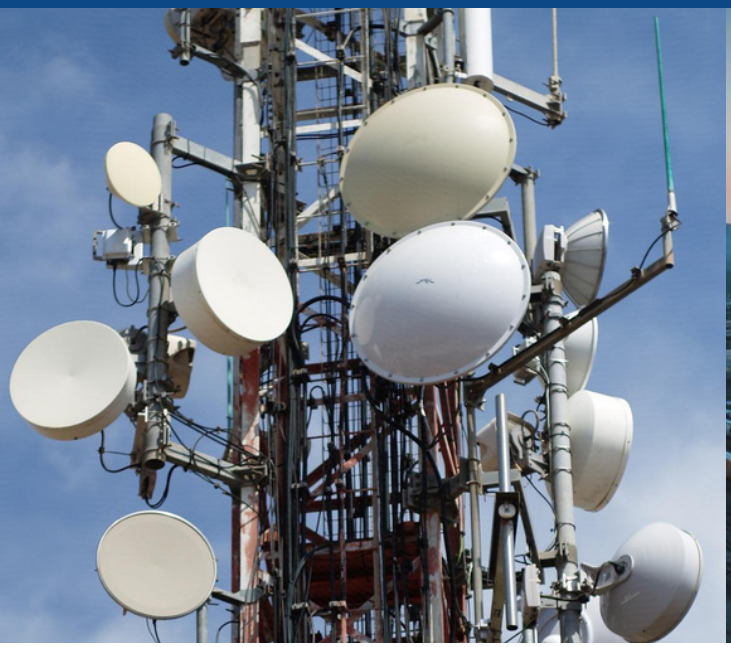
"Given the human, animal and experimental evidence, I assert that, to a reasonable degree of scientific certainty, the probability that RF exposure causes gliomas and neuromas is high."
-Christopher Portier PhD former Director of the United States National Center for Environmental Health at the CDC, former Director of the U.S. Agency for Toxic Substances and Disease Registry.

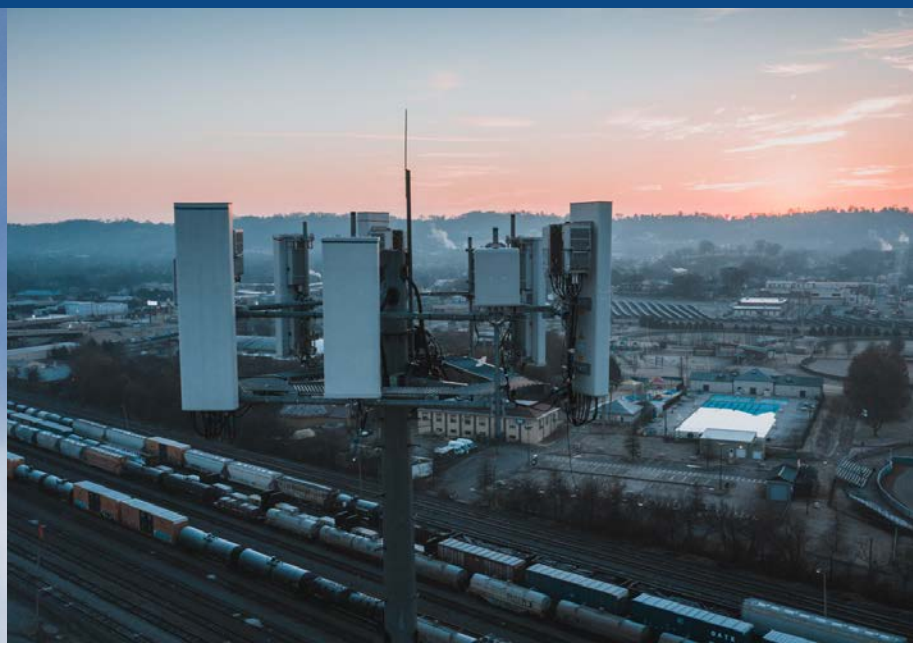
"We should not wait to protect children's brains. The science is now clear and compelling indicating that wireless technology is harmful to health, especially to for children. Wireless radiation is repeating the history of lead, tobacco and DDT."
-Devra Davis PhD, MPH, President of Environmental Health Trust, founding director of the Board on Environmental Studies and Toxicology of the U.S. National Research Council, National Academy of Sciences, and a member of the team of the Intergovernmental Panel on Climate Change scientists who were awarded the Nobel Peace Prize in 2007

ENVIRONMENTAL HEALTH TRUST

5G, CELL TOWERS AND WIRELESS

LEGAL & LIABILITY ISSUES





When a new cell tower or wireless network is proposed the first question to ask is "Do you have insurance for damages from long-term exposure to the radiofrequency radiation (RFR)?" Usually the answer is "No."

An Uninsurable Risk?

- Insurers rank wireless, cell tower, and 5G RFR non-ionizing electromagnetic radiation as a "high" risk, comparing the issue to lead and asbestos.
- Most insurance plans have "electromagnetic field exclusions" and do not insure for long-term RFR damages.
- Wireless RFR and non-ionizing electromagnetic radiation are defined as a type of "pollution" by wireless companies themselves.
- US mobile operators have been unable to get insurance to cover liabilities related to damages from long-term RFR exposure.
- Wireless companies warn their shareholders of RFR risk but do not warn users of their products, nor do the companies warn the people exposed to emissions from their infrastructure.

This PDF is hyperlinked. For more on legal liability issues go to ehtrust.org

ENVIRONMENTAL HEALTH TRUST

Cell Tower Companies Warn Shareholders of Risk From Cell Tower Radiation

Why Don't They Warn Families Living Near Cell Towers?

Verizon 10-K Report

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

Crown Castle 10-K Report

"We cannot guarantee that claims relating to radio frequency emissions will not arise in the future or that the results of such studies will not be adverse to us...If a connection between radio frequency emissions and possible negative health effects were established, our operations, costs, or revenues may be materially and adversely affected. We currently do not maintain any significant insurance with respect to these matters."

AT&T 10-K Report

"In the wireless area, we also face current and potential litigation relating to alleged adverse health effects on customers or employees who use such technologies including, for example, wireless devices. We may incur significant expenses defending such suits or government charges and may be required to pay amounts or otherwise change our operations in ways that could materially adversely affect our operations or financial results."

T- MOBILE 10-K Report

"Our business could be adversely affected by findings of product liability for health or safety risks from wireless devices and transmission equipment, as well as by changes to regulations or radio frequency emission standards."

This PDF is hyperlinked. For more on legal liability issues go to ehtrust.org

Cell Tower Companies Warn Shareholders of Risk From Cell Tower Radiation

Why Don't They Warn Families Living Near Cell Towers?

American Tower 10-K

"If a scientific study or court decision resulted in a finding that radio frequency emissions pose health risks to consumers, it could negatively impact our tenants and the market for wireless services, which could materially and adversely affect our business, results of operations or financial condition. We do not maintain any significant insurance with respect to these matters."

Nokia 10-K

"Although our products are designed to meet all relevant safety standards and other recommendations and regulatory requirements globally, we cannot guarantee we will not become subject to product liability claims or be held liable for such claims, which could have a material adverse effect on us."

Qualcomm 10-K

"If wireless handsets pose health and safety risks, we may be subject to new regulations, and demand for our products and those of our licensees and customers may decrease."

Ericsson Annual Report

"Any perceived risk or new scientific findings of adverse health effects from mobile communication devices and equipment could adversely affect us through a reduction in sales or through liability claims."

This PDF is hyperlinked. For more on legal liability issues go to ehtrust.org

ENVIRONMENTAL HEALTH TRUST

LEGAL & LIABILITY ISSUES

"Electromagnetic field exclusions" are clear and common in most insurance companies. It is applied as a market standard. This exclusion serves to exclude cover for illnesses caused by long-term EMF (non-ionizing radiation) exposure."
-**Complete Markets "Electromagnetic Fields Liability Insurance**"

"Electro-magnetic signals emitted by mobile devices and base stations may be found to pose health risks, with potential impacts including: changes to national legislation, a reduction in mobile phone usage or litigation."
-Vodaphone 2017 Report ranks EMF as a "Principal Risk with "High" impact.

Swiss Re Institute (2019)
5G is High Risk

5G mobile networks are classified as a "high," "off-the-leash" risk. "Existing concerns regarding potential negative health effects from electromagnetic fields (EMF) are only likely to increase. An uptick in liability claims could be a potential long-term consequence" and "[a]s the biological effects of EMF in general and 5G in particular are still being debated, potential claims for health impairments may come with a long latency."

Portland Oregon Public School Insurance
EMF Exclusion

"Exclusions: This insurance does not apply to: Bodily injury, personal injury, advertising injury, or property damage arising directly or indirectly out of, resulting from, caused or contributed to by electromagnetic radiation, provided that such loss, cost or expense results from or is contributed to by the hazardous properties of electromagnetic radiation."

Verizon Total Mobile Protection Plan (pg 10)
Non-ionizing Radiation Defined as Pollution

"Pollution" is defined as "any solid, liquid, gaseous, or thermal irritant or contaminant including smoke, vapor, soot, fumes, acid, alkalis, chemicals, artificially produced electric fields, magnetic field, electromagnetic field, sound waves, microwaves, and all artificially produced ionizing or non-ionizing radiation and/or waste."

This PDF is hyperlinked. For more on legal liability issues go to ehtrust.org

ENVIRONMENTAL HEALTH TRUST

5G, Small Cells & Cell Towers Can Drop Property Values

Would you buy a home with cell antennas outside the bedroom window?

Legal filings by cities and municipalities to the FCC highlight how small cell deployment could impact aesthetics and property values.

""“many deployments of small cells could affect property values, with significant potential effect…”

- Reply Comments of Smart Communities Siting Coalition (local governments and associations representing 1,854 communities) 4/7/2017,Docket No. 16-421, April 7, 2017

“**Considering that the Smart Communities’ prior filings show that the addition of facilities of this size diminish property values, it is strange for the Commission to assume that approval can be granted in the regulatory blink of an eye…."**

"**…allowing poles to go up in areas where poles have been taken down has significant impacts on aesthetics (not to mention property values).”**

--Ex Parte Submission of Smart Communities CLetter to Ms. Marlene H. Dortch, Secretary Federal Communications Commission September 19, 2018

DECREASED PROPERTY VALUE

"An overwhelming 94 percent of home buyers and renters surveyed by the National Institute for Science, Law & Public Policy (NISLAPP) say they are less interested and would pay less for a property located near a cell tower or antenna."

"of the 1,000 survey respondents, 79 % said that under no circumstances would they ever purchase or rent a property within a few blocks of a cell tower or antennas, and almost 90% said they were concerned about the increasing number of cell towers and antennas in their residential neighborhood."

"**Cell Towers, Antennas Problematic for Buyers" Realtor Magazine**

"...cell towers are concerning to many people and drop property values."

"While most states do not require disclosure of neighborhood nuisances, such as cell towers or noisy neighbors, a few states do, and more are likely to in the future."
-Real Estate Attorney, South Florida Sun Sentinel, 2021

The California Association of Realtors' Property Sellers Questionnaire specifically lists "cell towers" on the disclosure form for sellers of real estate.
-Click to go to the California Association of Realtors' Property Sellers Questionnaire
(p. 3-4 under K. Neighborhood)

"While the magnitude of the impact varies, the studies uniformly indicate that there is a significant impact on residential property values from installation of cell phone towers..."
-David E. Burgoyne, ASA, SR/WA Certified General Real Estate Appraiser

"In some areas with new towers, property values have decreased by up to 20%."

-"Your new neighbor, a cell tower, may impact the value of your home" National Business Post 2022

PDF is hyperlinked. More on property values at ehtrust.org

ENVIRONMENTAL HEALTH TRUST

EXPERT VOICES

"I am calling on my industry to bring safer technology to market. The current implementation of technology is not safe. Take a good look at the science. This is about our children's future. Do not be lulled into believing that 25-year-old standards can protect the youngest and most vulnerable. They simply cannot."
- Frank Clegg, Former President of Microsoft Canada, CEO of Canadians for Safe Technology

"A moratorium is urgently needed on the implementation of 5G for wireless communication."
-Lennart Hardell, MD, PhD , advisory to World Health Organization international Agency for Research on Cancer, Department of Oncology, University Hospital, Örebro, Sweden (retired) , leads the Environment and Cancer Research Foundation

"The evidence indicating wireless is carcinogenic has increased and can no longer be ignored. If the World Health Organization International Agency for Research on Cancer were to meet to review all of the evidence, we believe the weight of evidence supports a new determination- that wireless radiofrequency radiation is a human carcinogen."
-Anthony B. Miller MD, Professor Emeritus, Dalla Lana School of Public Health of the University of Toronto. Former Senior Epidemiologist for the International Agency for Research on Cancer and former Director of the Epidemiology Unit of the National Cancer Institute of Canada

"Most parents believe that cellphones were safety-tested before they came on the market. We assume that our federal health and environmental agencies regularly review the latest research and ensure that these incredible devices are safe. They do not. Children are not little adults. As we sadly learned with early childhood lead exposures leaving long-lasting impairments, the developing brain is particularly susceptible."
-Jerome Paulson, MD , Professor Emeritus, George Washington University, Milliken School of Public Health, former Chair of American Academy of Pediatrics Committee on Environmental Health

"The exposure levels of the Federal Communications Commission are totally outdated and do not protect the health of the public, especially of children. I urge you to take strong and active steps to reduce exposure of children and staff to excessive levels of radiofrequency EMFS within your schools."
-David O. Carpenter, M.D. Director, Institute for Health and the Environment University at Albany

ENVIRONMENTAL HEALTH TRUST

FCC EXPOSURE LIMITS DO NOT PROTECT

OUTDATED FCC REGULATIONS FOR RF RADIATION

FCC human exposure limits were adopted in 1996 after the EPA was defunded from creating safety limits. They have not been properly reviewed these limits since 1996.

FCC's human exposure limits for the RF microwaves emitted by 5G, 4G, cell towers, cell phones, Wi-Fi, Bluetooth, smart devices and wireless networks are based on outdated science and faulty assumptions.

The limits are irrelevant to modern day technologies and do not reflect the way people are exposed to RF and actually use technology in the 21st century.

Reasons Why FCC's 1996 Limit Do Not Protect

Heating Based Only

FCC limits are heat based "thermal" limits. This means they primarily protect against the over heating of tissue from RF. FCC's limits are not based on protecting against non-heating biological effects such as cancer, oxidative stress, headaches, behavioral problems, memory damage, disrupting bee behavior or tree damage etc.

Short Term Impacts Only

FCC limits are based on protecting against acute effects. No federal report or research review exists regarding safety from chronic, long term, RF exposures from cell towers, Wi-Fi and wireless networks in the home, school and workplace. The FDA nominated the National Toxicology Program (NTP) to perform animal studies designed to mimic a lifetime of human cell phone exposure. Cancer and DNA damage was found. Another large scale animal study used cell tower level exposures and found the same tumors as the NTP. However, the FDA rejected these findings.

Children Are Not Protected

FCC limits are misleadingly presented as being "designed to protect children. When safety thresholds were developed decades ago, the science investigating RF impacts to children's developing brains simply did not exist. Current research concludes the limits should be hundreds of times more protective for children because they are more vulnerable.

FCC EXPOSURE LIMITS DO NOT PROTECT

OUTDATED FCC REGULATIONS FOR RF RADIATION

No Risk Analysis or Review of Totality of Science
No agency has reviewed all of the latest science. Usually the EPA and FDA use risk assessment to characterize the nature and magnitude of risks to human health for various populations such as children and pregnant women. The EPA also estimates ecological risks, including plants, birds, other wildlife, and aquatic life. When groundbreaking studies are published, a quantitative risk analysis of the data is performed. This has never been done for RF.

"The FCC and FDA have failed in their obligation to prescribe safe RFR guidelines produced from wireless communication devices to protect the public health and safety. Devices are becoming more sophisticated, and their usage is as common to daily life as brushing your teeth."
- Pittsburgh Law Review "The FCC Keeps Letting Me Be: Why Radiofrequency Radiation Standards Have Failed to Keep Up With Technology" by Hala Mouzaffar

"**The wireless industry reaction features stonewalling public relations and hyper aggressive legal action. It can also involve undermining the credibility and cutting off the funding for researchers who do not endorse cellular safety. It is these hardball tactics that look a lot like 20th century Big Tobacco tactics. It is these hardball tactics—along with consistently supportive FCC policies—that heighten suspicion the wireless industry does indeed have something to hide."**

-Norm Alster in the Harvard Press Book "Captured Agency: How the Federal Communications Commission is Dominated by the Industries it Presumably Regulates"

ENVIRONMENTAL HEALTH TRUST

The 2022 study "**Measurements of radiofrequency electromagnetic fields, including 5G, in the city of Columbia, South Carolina, USA**" published in World Academy of Sciences Journal authored by Tarmo Koppel and Lennart Hardell MD of the Environment and Cancer Research Foundation found the highest RF exposure readings were registered close to cell phone base station antennas mounted on top of utility poles, street lamps or traffic lights.

WORLD ACADEMY OF SCIENCES JOURNAL 4: 23, 2022

Measurements of radiofrequency electromagnetic fields, including 5G, in the city of Columbia, SC, USA

TARMO KOPPEL[1,3] and LENNART HARDELL[2]

Figure 7. Gervais Street: Cell phone base station antenna placed close to street level and causing high exposure to pedestrians and nearby café visitors (exposure scenario illustration). The antenna appears camouflaged and seemingly part of a utility pole. The measurer only discovered the antenna due to the high radiofrequency levels in the vicinity.

WORLD ACADEMY OF SCIENCES JOURNAL 4: 23, 2022

Measurements of radiofrequency electromagnetic fields, including 5G, in the city of Columbia, SC, USA

TARMO KOPPEL[1,3] and LENNART HARDELL[2]

Figure 8. Gervais Street: Another cell phone base station antenna close to street level and causing high exposure to pedestrians (exposure scenario illustration). Note the antenna appears undistinguishable from the utility pole an unnoticeable between the trees.

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American Academy of Pediatrics Webpage Excerpts

Electromagnetic Fields: A Hazard to Your Health?

In recent years, concern has increased about exposure to radio frequency electromagnetic radiation emitted from cell phones and phone station antennae. An Egyptian study confirmed concerns that living nearby mobile phone base stations increased the risk for developing:

- Headaches
- Memory problems
- Dizziness
- Depression
- Sleep problems

Short-term exposure to these fields in experimental studies have not always shown negative effects, but this does not rule out cumulative damage from these fields, so larger studies over longer periods are needed to help understand who is at risk. In large studies, an association has been observed between symptoms and exposure to these fields in the everyday environment.

Last Updated 12/28/2012
Source American Academy of Pediatrics (Copyright © 2012)

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Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol

Thermal and non-thermal health effects of low intensity non-ionizing radiation: An international perspective☆

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ARTICLE INFO

Article history:
Received 6 April 2018
Received in revised form
31 May 2018
Accepted 4 July 2018
Available online 6 July 2018

ABSTRACT

Exposure to low frequency and radiofrequency electromagnetic fields at low intensities poses a significant health hazard that has not been adequately addressed by national and international organizations such as the World Health Organization. There is strong evidence that excessive exposure to mobile phone-frequencies over long periods of time increases the risk of brain cancer both in humans and animals. The mechanism(s) responsible include induction of reactive oxygen species, gene expression alteration and DNA damage through both epigenetic and genetic processes. *In vivo* and *in vitro* studies demonstrate adverse effects on male and female reproduction, almost certainly due to generation of reactive oxygen species. There is increasing evidence the exposures can result in neurobehavioral decrements and that some individuals develop a syndrome of "electro-hypersensitivity" or "microwave illness", which is one of several syndromes commonly categorized as "idiopathic environmental intolerance". While the symptoms are non-specific, new biochemical indicators and imaging techniques allow diagnosis that excludes the symptoms as being only psychosomatic. Unfortunately standards set by most national and international bodies are not protective of human health. This is a particular concern in children, given the rapid expansion of use of wireless technologies, the greater susceptibility of the developing nervous system, the hyperconductivity of their brain tissue, the greater penetration of radiofrequency radiation relative to head size and their potential for a longer lifetime exposure.

European Parliament

Health impact of 5G

STUDY

Panel for the Future of Science and Technology

EPRS | European Parliamentary Research Service

Scientific Foresight Unit (STOA)

PE 690.012 – July 2021

Health impact of 5G

Current state of knowledge of 5G-related carcinogenic and reproductive/developmental hazards as they emerge from epidemiological studies and in vivo experimental studies

The upcoming deployment of 5G mobile networks will allow for significantly faster mobile broadband speeds and increasingly extensive mobile data usage. Technical innovations include a different transmission system (MIMO: use of multiple-input and multiple-output antennas), directional signal transmission or reception (beamforming), and the use of other frequency ranges. At the same time, a change is expected in the exposure to electromagnetic fields (EMF) of humans and the environment. In addition to those used to date, the 5G pioneer bands identified at EU level have frequencies of 700 MHz, 3.6 GHz (3.4 to 3.8 GHz) and 26 GHz (24.25 to 27.5 GHz). The first two frequencies (FR1) are similar to those used for 2G to 4G technologies and have been investigated in both epidemiological and experimental studies for different end points (including carcinogenicity and reproductive/developmental effects), while 26 GHz (FR2) and higher frequencies have not been adequately studied for the same end points.

The International Agency for Research on Cancer (IARC) classified radiofrequency (RF) EMF as 'possibly carcinogenic to humans' (Group 2B) and recently recommended RF exposure for re-evaluation 'with high priority' (IARC, 2019). Since 2011 a great number of studies have been performed, both epidemiological and experimental. The present review addresses the current knowledge regarding both carcinogenic and reproductive/developmental hazards of RF as exploited by 5G. There are various *in vivo* experimental and epidemiological studies on RF at a lower frequency range (450 to 6000 MHz), which also includes the frequencies used in previous generations' broadband cellular networks, but very few (and inadequate) on the higher frequency range (24 to 100 GHz, centimetre/MMW).

The review shows: 1) 5G lower frequencies (700 and 3 600 MHz): a) limited evidence of carcinogenicity in epidemiological studies; b) sufficient evidence of carcinogenicity in experimental bioassays; c) sufficient evidence of reproductive/developmental adverse effects in humans; d) sufficient evidence of reproductive/developmental adverse effects in experimental animals; 2) 5G higher frequencies (24.25-27.5 GHz): the systematic review found no adequate studies either in humans or in experimental animals.

Conclusions: 1) cancer: FR1 (450 to 6 000 MHz): EMF are probably carcinogenic for humans, in particular related to gliomas and acoustic neuromas; FR2 (24 to 100 GHz): no adequate studies were performed on the higher frequencies; 2) reproductive developmental effects: FR1 (450 to 6 000 MHz): these frequencies clearly affect male fertility and possibly female fertility too. They may have possible adverse effects on the development of embryos, foetuses and newborns; FR2 (24 to 100 GHz): no adequate studies were performed on non-thermal effects of the higher frequencies.

Environmental Research 208 (2022) 112627

Contents lists available at ScienceDirect

Environmental Research

journal homepage: www.elsevier.com/locate/envres

Very high radiofrequency radiation at Skeppsbron in Stockholm, Sweden from mobile phone base station antennas positioned close to pedestrians' heads

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Fig. 3. Street view on the Skeppsbron street with some of the mobile phone base station antennas pointed out with a circle; note the low placement of the antennas, where microwaves irradiate the pedestrian at close range.

A B S T R A C T

In urban environment there is a constant increase of public exposure to radiofrequency electromagnetic fields from mobile phone base stations. With the placement of mobile phone base station antennas radiofrequency hotspots emerge. This study investigates an area at Skeppsbron street in Stockholm, Sweden with an aggregation of base station antennas placed at low level close to pedestrians' heads. Detailed spatial distribution measurements were performed with 1) a radiofrequency broadband analyzer and 2) a portable exposimeter. The results display a greatly uneven distribution of the radiofrequency field with hotspots. The highest spatial average across all quadrat cells was 12.1 V m^{-1} (388 mW m^{-2}), whereas the maximum recorded reading from the entire area was 31.6 V m^{-1} (2648 mW m^{-2}). Exposimeter measurements show that the majority of exposure is due to mobile phone downlink bands. Most dominant are 2600 and 2100 MHz bands used by 4G and 3G mobile phone services, respectively. The average radiofrequency radiation values from the earlier studies show that the level of ambient RF radiation exposure in Stockholm is increasing. This study concluded that mobile phone base station antennas at Skeppsbron, Stockholm are examples of poor radiofrequency infrastructure design which brings upon highly elevated exposure levels to popular seaside promenade and a busy traffic street.

Studies from recent decades have shown elevated health risk under long term exposure to such highly elevated radiofrequency fields.

A review by Khurana et al. (2010) found in 80% of the available studies neurobehavioral symptoms or cancer in populations living at distances <500 m from base stations (Khurana et al., 2010). In another review exposure from base stations and other antenna arrays showed changes in immunological and reproductive systems as well as DNA double strand breaks, influence on calcium movement in the heart and increased proliferation rates in human astrocytoma cancer cells (Levitt and Lai, 2010).

When a GSM 900 MHz base station was installed in the village Rimbach in Germany it had an influence on the neurotransmitters adrenaline, noradrenaline, dopamine and phenyletylamine (Buchner and Eger, 2011). Influence on cortisol and thyroid hormones in people living near base stations was shown in other studies (Augner et al., 2010; Eskander et al., 2012).

Dode et al. (2011 compared base station (BS) clusters and cases of deaths by neoplasia in the Belo Horizonte municipality, Minas Gerais state, Brazil, from 1996 to 2006. In their study largest electric field was 12.4 V m^{-1} and the smallest was 0.4 V m^{-1}. They found cancer-related death rates be higher close to base stations. This finding confirmed earlier findings by Eger (Eger et al., 2004).

In a study from India, genetic damage using the single cell gel electrophoresis (comet) assay was assessed in peripheral blood leukocytes of individuals residing in the vicinity of a mobile phone base station and comparing it to that in healthy controls. Genetic damage parameters of DNA migration length, damage frequency, and damage index were significantly ($p < 0.001$) elevated in the sample group compared to respective values in healthy controls (Gandhi et al., 2014).

The effect of RF radiation among 20 subjects living close to mobile phone base station compared with 20 subjects living with a distance of about 1 km was studied (Singh et al., 2016). The authors concluded that: "*It was unveiled that a majority of the subjects who were residing near the mobile base station complained of sleep disturbances, headache, dizziness, irritability, concentration difficulties, and hypertension. A majority of the study subjects had significantly lesser stimulated salivary secretion ($p < 0.01$) as compared to the control subjects.*"

Zothansiama et al. (2017) in India inspected DNA damage a antioxidant status in cultured human peripheral blood lymphocy (HPBLs) of individuals residing in the vicinity of mobile phone b stations and compared it with healthy controls living further away. analyses of data from the exposed group (n = 40), residing withi perimeter of 80 m of mobile base stations, showed statistically sign cantly ($p < 0.0001$) higher frequency of micronuclei when compare the control group, residing 300 m away from the mobile base statio

The Ramazzini Institute findings (Falcioni et al., 2018) are suppor by the results in the USNTP study on rats and mice exposed to RF diation (National Toxicology Program, 2018a, 2018b). A clear evide of increased incidence of heart Schwannoma and some evidence glioma and tumours in the adreanal medulla in male rats was fo according to the expert panel, for further discussion see Hardell Carlberg (2019).

The study concluded that Skeppsbron street mobile phone base station antennas are examples of a poor radiofrequency infrastructure design with mobile phone base station antennas positioned into close range to the general public which brings upon high exposure levels. Given the low placement of the antennas (height from the street floor), the highest exposure was often registered at pedestrian head level. Given that head is one of most vulnerable parts of the body, these placements by mobile telephony service providers put pedestrians into unnecessary risk. Position of these antennas, can pose a health risk to people at close range. This is especially critical for people at particular risk, including persons with medical implants, pregnant women or chronically ill persons.

Based on the latest scientific literature regarding RF exposure and adverse health effects, this study recommends repositioning such base station antennas to areas away from the nearby inhabitants, workers and the general public. Alternatively, very low power antennas may also be considered to reduce the exposure. Occupational exposure of people

Environ. Rev. **18**: 369–395 (2010) doi:10.1139/A10-018 Published by NRC Research Press

Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays

B. Blake Levitt and Henry Lai

Abstract: The siting of cellular phone base stations and other cellular infrastructure such as roof-mounted antenna arrays, especially in residential neighborhoods, is a contentious subject in land-use regulation. Local resistance from nearby residents and landowners is often based on fears of adverse health effects despite reassurances from telecommunications service providers that international exposure standards will be followed. Both anecdotal reports and some epidemiology studies have found headaches, skin rashes, sleep disturbances, depression, decreased libido, increased rates of suicide, concentration problems, dizziness, memory changes, increased risk of cancer, tremors, and other neurophysiological effects in populations near base stations. The objective of this paper is to review the existing studies of people living or working near cellular infrastructure and other pertinent studies that could apply to long-term, low-level radiofrequency radiation (RFR) exposures. While specific epidemiological research in this area is sparse and contradictory, and such exposures are difficult to quantify given the increasing background levels of RFR from myriad personal consumer products, some research does exist to warrant caution in infrastructure siting. Further epidemiology research that takes total ambient RFR exposures into consideration is warranted. Symptoms reported today may be classic microwave sickness, first described in 1978. Nonionizing electromagnetic fields are among the fastest growing forms of environmental pollution. Some extrapolations can be made from research other than epidemiology regarding biological effects from exposures at levels far below current exposure guidelines.

Clinical Biochemistry
Volume 45, Issues 1–2, January 2012, Pages 157-161

Case Report

How does long term exposure to base stations and mobile phones affect human hormone profiles?

Emad F. Eskander, Selim F. Estefan, Ahmed A. Abd-Rabou

Objectives

This study is concerned with assessing the role of exposure to radio frequency radiation (RFR) emitted either from mobiles or base stations and its relations v human's hormone profiles.

Results

This study showed significant decrease in volunteers' ACTH, cortisol, thyroid hormones, prolactin for young females, and testosterone levels.

Current Alzheimer Research, 2022, *19*, 119-132

MINI-REVIEW ARTICLE

Low Intensity Electromagnetic Fields Act *via* Voltage-Gated Calcium Channel (VGCC) Activation to Cause Very Early Onset Alzheimer's Disease: 18 Distinct Types of Evidence

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ARTICLE HISTORY

Received: October 04, 2021
Revised: December 22, 2021
Accepted: December 31, 2021

DOI:
10.2174/1567205019666220202114510

Abstract: Electronically generated electromagnetic fields (EMFs), including those used in wireless communication such as cell phones, Wi-Fi and smart meters, are coherent, producing very high electric and magnetic forces, which act on the voltage sensor of voltage-gated calcium channels to produce increases in intracellular calcium $[Ca^{2+}]i$. The calcium hypothesis of Alzheimer's disease (AD) has shown that each of the important AD-specific and nonspecific causal elements is produced by excessive $[Ca^{2+}]i$. $[Ca^{2+}]i$ acts in AD *via* excessive calcium signaling and the peroxynitrite/oxidative stress/inflammation pathway, which are each elevated by EMFs.An apparent vicious cycle in AD involves amyloid-beta protein (Aβ) and $[Ca^{2+}]i$. Three types of epidemiology suggest EMF causation of AD, including early onset AD. Extensive animal model studies show that low intensity EMFs cause neurodegeneration, including AD, with AD animals having elevated levels of Aβ, amyloid precursor protein and BACE1. Rats exposed to pulsed EMFs every day are reported to develop universal or near universal very early onset neurodegeneration, including AD; these findings are superficially similar to humans with digital dementia. EMFs producing modest increases in $[Ca^{2+}]i$ can also produce protective, therapeutic effects. The therapeutic pathway and peroxynitrite pathway inhibit each other. A summary of 18 different findings is provided, which collectively provide powerful evidence for EMF causation of AD. The author is concerned that smarter, more highly pulsed "smart" wireless communication may cause widespread very, very early onset AD in human populations.

ELECTROMAGNETIC BIOLOGY AND MEDICINE
2022, VOL. 41, NO. 2, 230–255
https://doi.org/10.1080/15368378.2022.2065683

The roles of intensity, exposure duration, and modulation on the biological effects of radiofrequency radiation and exposure guidelines

Henry Lai[a] and B. Blake Levitt[b]

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ABSTRACT

In this paper, we review the literature on three important exposure metrics that are inadequately represented in most major radiofrequency radiation (RFR) exposure guidelines today: intensity, exposure duration, and signal modulation. Exposure intensity produces unpredictable effects as demonstrated by nonlinear effects. This is most likely caused by the biological system's ability to adjust and compensate but could lead to eventual biomic breakdown after prolonged exposure. A review of 112 low-intensity studies reveals that biological effects of RFR could occur at a median specific absorption rate of 0.0165 W/kg. Intensity and exposure duration interact since the dose of energy absorbed is the product of intensity and time. The result is that RFR behaves like a biological "stressor" capable of affecting numerous living systems. In addition to intensity and duration, man-made RFR is generally modulated to allow information to be encrypted. The effects of modulation on biological functions are not well understood. Four types of modulation outcomes are discussed. In addition, it is invalid to make direct comparisons between thermal energy and radiofrequency electromagnetic energy. Research data indicate that electromagnetic energy is more biologically potent in causing effects than thermal changes. The two likely functionthrough different mechanisms. As such, any current RFR exposure guidelines based on acute continuous-wave exposure are inadequate for health protection.

ARTICLE HISTORY
Received 15 February 2022
Accepted 1 April 2022

KEYWORDS
Radiofrequency radiation (RFR); intensity; duration of exposure; modulation; specific absorption rate (SAR); biological effects

Current Alzheimer Research, 2022, *19*, 119-132

MINI-REVIEW ARTICLE

Low Intensity Electromagnetic Fields Act *via* Voltage-Gated Calcium Channel (VGCC) Activation to Cause Very Early Onset Alzheimer's Disease: 18 Distinct Types of Evidence

Martin L. Pall[1,*]

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ELECTROMAGNETIC BIOLOGY AND MEDICINE
https://doi.org/10.1080/15368378.2021.1881866

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REVIEW

Genetic effects of non-ionizing electromagnetic fields

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ABSTRACT

This is a review of the research on the genetic effects of non-ionizing electromagnetic field (EMF), mainly on radiofrequency radiation (RFR) and static and extremely low frequency EMF (ELF-EMF). The majority of the studies are on genotoxicity (e.g., DNA damage, chromatin conformation changes, etc.) and gene expression. Genetic effects of EMF depend on various factors, including field parameters and characteristics (frequency, intensity, wave-shape), cell type, and exposure duration. The types of gene expression affected (e.g., genes involved in cell cycle arrest, apoptosis and stress responses, heat-shock proteins) are consistent with the findings that EMF causes genetic damages. Many studies reported effects in cells and animals after exposure to EMF at intensities similar to those in the public and occupational environments. The mechanisms by which effects are induced by EMF are basically unknown. Involvement of free radicals is a likely possibility. EMF also interacts synergistically with different entities on genetic functions. Interactions, particularly with chemotherapeutic compounds, raise the possibility of using EMF as an adjuvant for cancer treatment to increase the efficacy and decrease side effects of traditional chemotherapeutic drugs. Other data, such as adaptive effects and mitotic spindle aberrations after EMF exposure, further support the notion that EMF causes genetic effects in living organisms.

ARTICLE HISTORY
Received 22 September 2020
Accepted 13 December 2020

KEYWORDS
Radiofrequency radiation; static/extremely low frequency EMF; genetic effects; genotoxicity; gene expression

International Journal of
Environmental Research and Public Health

MDPI

Article

The Effect of Continuous Low-Intensity Exposure to Electromagnetic Fields from Radio Base Stations to Cancer Mortality in Brazil

Nádia Cristina Pinheiro Rodrigues [1,2,*], Adilza Condessa Dode [3], Mônica Kramer de Noronha Andrade [1], Gisele O'Dwyer [1], Denise Leite Maia Monteiro [4], Inês Nascimento Carvalho Reis [1], Roberto Pinheiro Rodrigues [5,6], Vera Cecília Frossard [1] and Valéria Teresa Saraiva Lino [1]

Abstract: Background: this study aims to estimate the rate of death by cancer as a result of Radio Base Station (RBS) radiofrequency exposure, especially for breast, cervix, lung, and esophagus cancers. Methods: we collected information on the number of deaths by cancer, gender, age group, gross domestic product per capita, death year, and the amount of exposure over a lifetime. We investigated all cancer types and some specific types (breast, cervix, lung, and esophagus cancers). Results: in capitals where RBS radiofrequency exposure was higher than 2000/antennas-year, the average mortality rate was 112/100,000 for all cancers. The adjusted analysis showed that, the higher the exposure to RBS radiofrequency, the higher cancer mortality was. The highest adjusted risk was observed for cervix cancer (rate ratio = 2.18). The spatial analysis showed that the highest RBS radiofrequency exposure was observed in a city in southern Brazil that also showed the highest mortality rate for all types of cancer and specifically for lung and breast cancer. Conclusion: the balance of our results indicates that exposure to radiofrequency electromagnetic fields from RBS increases the rate of death for all types of cancer.

Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/envres

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

A B S T R A C T

Background: In 2011, IARC classified radiofrequency radiation (RFR) as possible human carcinogen (Group 2B). According to IARC, animals studies, as well as epidemiological ones, showed limited evidence of carcinogenicity. In 2016, the NTP published the first results of its long-term bioassays on near field RFR, reporting increased incidence of malignant glial tumors of the brain and heart Schwannoma in rats exposed to GSM – and CDMA – modulated cell phone RFR. The tumors observed in the NTP study are of the type similar to the ones observed in some epidemiological studies of cell phone users.

Objectives: The Ramazzini Institute (RI) performed a life-span carcinogenic study on Sprague-Dawley rats to evaluate the carcinogenic effects of RFR in the situation of far field, reproducing the environmental exposure to RFR generated by 1.8 GHz GSM antenna of the radio base stations of mobile phone. This is the largest long-term study ever performed in rats on the health effects of RFR, including 2448 animals. In this article, we reported the final results regarding brain and heart tumors.

Methods: Male and female Sprague-Dawley rats were exposed from prenatal life until natural death to a 1.8 GHz GSM far field of 0, 5, 25, 50 V/m with a whole-body exposure for 19 h/day.

Results: A statistically significant increase in the incidence of heart Schwannomas was observed in treated male rats at the highest dose (50 V/m). Furthermore, an increase in the incidence of heart Schwann cells hyperplasia was observed in treated male and female rats at the highest dose (50 V/m), although this was not statistically significant. An increase in the incidence of malignant glial tumors was observed in treated female rats at the highest dose (50 V/m), although not statistically significant.

Conclusions: The RI findings on far field exposure to RFR are consistent with and reinforce the results of the NTP study on near field exposure, as both reported an increase in the incidence of tumors of the brain and heart in RFR-exposed Sprague-Dawley rats. These tumors are of the same histotype of those observed in some epidemiological studies on cell phone users. These experimental studies provide sufficient evidence to call for the re-evaluation of IARC conclusions regarding the carcinogenic potential of RFR in humans.

A Study of the Environmental Impact of Wired and Wireless Local Area Network Access

Article *in* IEEE Transactions on Consumer Electronics · February 2013

DOI: 10.1109/TCE.2013.6490245

1 author:

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National University of Singapore
321 PUBLICATIONS **7,261** CITATIONS

A Study of the Environmental Impact of Wired and Wireless Local Area Network Access

Biplab Sikdar, *Senior Member*, IEEE

Abstract — *This paper presents a life cycle assessment of the energy and emission intensity of wired and wireless local area network access. Following a cradle-to-grave approach, the energy consumed and greenhouse gas emissions in the manufacture of Ethernet switches and WiFi access points (including the extraction of raw materials, component manufacturing, assembly, and transportation) as well as during their actual usage are evaluated. The results show that while the manufacturing stage is responsible for a significant fraction of the overall energy consumption, the usage phase accounts for most of the emissions*[1].

Index Terms — Local area networks, environmental impact, green networks, sustainability.

I. Introduction

Network access through local area networks (LANs) is ubiquitous in residential, commercial, educational and public places. Among the various available technologies, Ethernet (or IEEE 802.3) and WiFi (or IEEE 802.11) are two of the most popular means for network access. Given the widespread use and popularity of these two local area network access protocols, it is of interest and importance to evaluate the environmental impact of these technologies. This paper investigates two aspects of the sustainability of local area networks by evaluating the energy and emission intensity of WiFi access points and Ethernet switches.

The most common way to use Ethernet is for a user to connect to an Ethernet switch using a cable. On the other hand, WiFi users usually connect (wirelessly) to an access point that serves as a gateway to the network. Ethernet and WiFi network interface cards are also required at the clients to connect to the switches and access points, respectively, and most computing devices either have them built-in or can use them as an add-on device. This paper focuses its attention on the access points for WiFi based networks and the switches for Ethernet based networks, and evaluates the energy it takes to manufacture and operate them, along with the greenhouse gas emissions they are responsible for. In addition, this paper also aims to analyze and identify the stages in the life cycle that have the greatest impact on the environment. The methodology used in paper is also applicable to the client side Ethernet and wireless access cards.

[1] This work was supported in part by the Research Council of Norway under Grant No. 209280/F11.

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The energy, sustainability and environmental aspects of various Information and Communication Technologies (ICT) have received increasing attention in the recent past [1],[2],[3]. However, to the best of the author's knowledge, the sustainability and environmental impact of WiFi or Ethernet based local area networks has not been adequately addressed. Past research has evaluated the energy intensity of computer manufacturing in terms of the total energy and fossil fuel consumption of desktop computers and cathode ray tube monitors [4]. The life cycle inventory data of various electronic components has been calculated in terms of the energy consumption and atmospheric emissions [5]. Existing literature has evaluated the material and energy consumption of mobile phones [6],[7], as well as the energy consumption of universal mobile telecommunication system (UMTS) and global system for mobile communications (GSM) mobile communication systems [8]. The energy consumption of a WiFi access point has also been evaluated [9]. This paper fills the void in existing literature regarding the energy and emission intensity of local area network access.

This paper uses a Life Cycle Assessment (LCA) method to evaluate the environmental impact of WiFi access points and Ethernet switches. Two popular, commercial-off-the-shelf devices (one access point and one switch) were used as case studies for the LCA. Following a cradle-to-grave approach and detailed inventory analysis, the energy consumption and emissions associated with the manufacturing and operation of the access point and the switch are evaluated.

The rest of the paper is organized as follows. Section II presents an overview of LCA, the datasets used in this paper, and the architecture of WiFi access points and an Ethernet switches. Section III presents the energy and emission intensity analysis of the access point and the switch. Section IV presents a discussion of the results and Section V concludes the paper.

II. Background and Relevant Concepts

This section provides an overview of the methodology, concepts and the data sources used in this paper. We also describe the architecture of WiFi access points and Ethernet switches. The complexity of the architecture directly affects the material and component costs as well as the cost of running the device.

A. Ethernet Swtich

The IEEE 802.3 Standard [10] specifies the physical (PHY) layer and the medium access control (MAC) at the data link

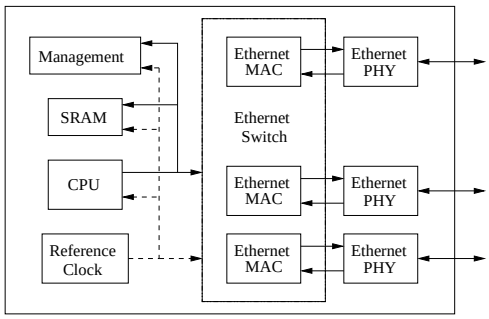

Fig. 1. Simplified block diagram of an Ethernet switch.

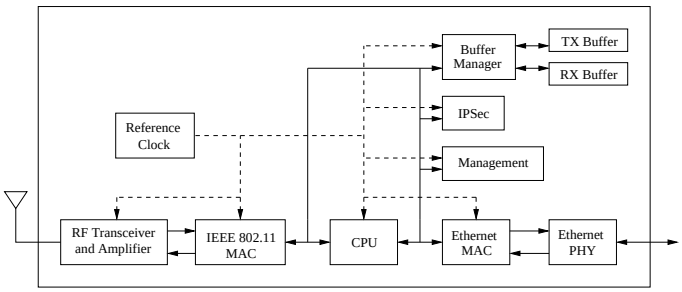

Fig. 2. Simplified block disgram of a WiFi access point.

layer for wired Ethernet. The data rates supported by Ethernet has evolved from 10 Mbits/s in 1985 (IEEE 802.3a) to 40 Gbits/s in 2010. The basic mode of connections in Ethernet is to use copper or fiber cables to connect computing devices, either directly, or through the use of intermediate hubs, switches and routers. The basic utility of the Ethernet switch is to create a separate collision domain for each switch port, resulting in a considerable improvement over the throughput achievable by using hubs.

A simplified block diagram of an Ethernet switch is shown in Figure 1 [11]. The switch has functional blocks for the MAC and PHY layers of the IEEE 802.3 protocol, a switch fabric and an associated scheduler, and a control unit. The Ethernet MAC and PHY functional blocks are responsible for transmitting and receiving Ethernet frames, address checking, cyclic redundancy checking (CRC) and carrier sense multiple access with collision detection (CSMA/CD). The switch maintains a table with known MAC addresses and the ports they are on. Depending on the manufacturer, the memory for storing this table might be the on same chip as the switch fabric, or on a separate chip. Vendors also add different levels of manageability into switches. While a low-end switch may not have any manageability, managed switches have functional blocks for collecting traffic related statistics, and managing and troubleshooting connections. Finally, some switches may also have layer 3 functionalities.

For the case study reported in this paper, an Ethernet switch with 5 ports, capable of data rates up to 100 Mbits/s was used. The switch under consideration has a single integrated circuit (IC) that does the switching and management functions and there is no separate memory chip for storing the routing table. The switch also has an IC for DC-to-DC conversion. There is single clock for the entire device. The switch also has indicator light emitting diodes (LEDs) to indicate the status of each port as well as the switch.

B. WiFi Access Point

The IEEE 802.11 standard [12] covers both the physical and the medium access control layers of wireless networks. The standard specifies that a network can be configured in two different ways: infrastructure and ad-hoc. In the infrastructure mode, an access point is typically connected using an Ethernet (IEEE 802.3) link to a wired network and all wireless nodes communicate with this network through the access point. On the other hand, in an ad-hoc network the computers are brought together to form a network dynamically. The focus of this paper is on infrastructure networks that are based on the use of access points.

A simplified block diagram of a WiFi access point is shown in Figure 2 [13]. The access points have functional blocks for the MAC and PHY layers of both IEEE 802.11 and 802.3 protocols, transmit and receive buffers that are controlled by a buffer manager, units for management and Internet Protocol Security (IPSec), and a control unit. The access point communicates with the wired network using the Ethernet MAC and PHY functional blocks. These two blocks are responsible for transmitting and receiving Ethernet frames, address checking, CRC, and CSMA/CD based medium access. The received frames and the frames to be transmitted are stored in pre-allocated transmit and receive buffers. Depending on the exact architecture of the access point, the Ethernet MAC functional block and the central processing unit (CPU) are also responsible for checksum calculation, and insertion and deletion of Transport Control Protocol/Internet Protocol (TCP/IP) headers. The radio frequency (RF) transceiver and amplifier carry out the IEEE 802.11 PHY operations and its functionality is analogous to that of the Ethernet PHY functional block. Similarly, the functionality of the IEEE 802.11 and Ethernet MAC functional blocks are similar, except that the IEEE 802.11 MAC is based on CSMA with collision avoidance (CSMA/CA). The management functional block is responsible for allowing administrators to setup, repair and maintain the access point while the IPSec functional block authenticates and encrypts the IP packets.

For this paper's case study, the WiFi access point used has two antennas and also includes a 5-port Ethernet hub (a typical configuration for many popular access points). The access point under consideration uses two memory chips: a 256MB double data rate synchronous dynamic random access memory (DDR SDRAM) and a 8MB flash memory. The access point also uses two separate ICs for the Ethernet switch and the IEEE 802.11 router. In addition, three different clocks are used: one by the Ethernet functional blocks, one by the IEEE 802.11 MAC and one by the IEEE 802.11 PHY.

C. Life Cycle Assessment

Life cycle assessment is a well-established tool for the study and quantification of the environmental impact of process, products, and activities. As the name suggests, the

TABLE I
PARTS INVENTORY OF THE WIFI ACCESS POINT (SM: SURFACE MOUNTED, HM: HOLE MOUNTED, BNC: BAYONET NEILL-CONCELMAN)

Component	Quantity	Weight (g)	Area (mm^2)	Material (Wh/g)	Component cost (Wh/g)	Component cost (Wh/mm^2)	Emission ($g\text{-}CO_2/g$)	Source(s)	Energy Intensity (Wh)	Emission ($g\text{-}CO_2$)
Access Point										
SM resistors	121	0.54	-	3.53	95.99	-	2.71	[15],[16]	53.74	1.46
SM capacitors	188	2.72	-	6.28	109.86	-	1.29	[15],[16]	315.90	3.51
SM inductors	15	0.42	-	5.80	48.00	-	2.70	[15],[16]	22.60	1.13
HM capacitors	5	4.14	-	31.50	11.88	-	13.22	[15],[16]	179.59	54.73
HM inductors	7	10.12	-	18.50	6.51	-	6.64	[15],[16]	253.10	67.20
ICs	18	4.63	520.20	98.32	24.11	40.27	28.57	[15],[16]	21515.31	132.28
Diodes	17	1.53	-	386.59		-	56.86	[15]	591.48	87.00
LED housing	8	1.64	-	22.5	0.86	-	1.86	[15],[16]	38.31	3.05
PWB	1	82.36	21957.75	0.03	-	0.34	0.02	[15],[16]	8124.37	439.16
Connectors	4	25.80	-	22.70	6.51	-	3.50	[15]	753.62	90.30
Screws	3	2.00	-	14.85	7.78	-	1.78	[15]	45.26	3.56
Aluminum cover	1	1.76	-	16.10	0.75	-	17.06	[15],[16]	29.66	30.03
BNC connectors	2	55.32	-	19.79	5.08	-	10.18	[15]	1375.81	563.16
Cables	2	59.68	-	12.02	0.83	-	5.59	[15]	766.89	333.61
Clock crystals	3	1.11	-	18.50	6.51	-	6.64	[6],[15]	27.76	7.37
Plastic casing	1	207.50	-	22.50	0.86	-	1.86	[15],[16]	4847.20	385.95
Antennas										
Cables	2	59.68	-	12.02	0.83	-	5.59	[15]	40.47	17.61
BNC connectors	2	28.51	-	19.79	5.08	-	10.18	[15]	709.04	290.23
Plastic casing	2	28.34	-	22.50	0.86	-	1.86	[15],[16]	622.02	52.71
Packaging										
Paper	5	22.00	-	1.67	0.83	-	0.85	[15]	55.00	18.70
Cardboard	2	237.00	-	15.92	1.33	-	0.33	[15]	4088.25	78.21
Plastic	4	31.00	-	22.50	0.86	-	1.86	[15],[16]	724.16	57.66
Pins	2	0.07	-	14.85	7.78	-	1.78	[15],[16]	1.58	0.13
				Total					45304.66	2718.75

analysis covers the entire life cycle of a product, starting from the extraction of raw materials, manufacturing, transport, use (including re-use and maintenance), and final disposal (including recycling). The methodology followed by LCA of a product involves four stages: Goal and Scope Definition, Inventory Analysis, Impact Assessment, and Interpretation [14]. The first stage in LCA defines the system under study. This stage establishes the system boundaries, and defines the inputs and outputs of the system. The second stage quantifies the material and energy use of the product, and uses it to quantify the overall burden on the environmental. The environmental burden may be defined in terms of resource and energy consumption, air and water emissions, and solid waste. The third stage aggregates the metrics related to the environmental burden into a number of impact categories and evaluates their potential environmental impact. This stage considers specific environmental effects (for example, global warming) and aggregates the environmental burdens as per their contribution to these effects. The final stage in the LCA methodology isolates the stages in the life cycle that have the most impact, does sensitivity analysis, and identifies and recommends possibilities for performance improvement. The methodology for LCA is still under evolution and the exact details of the steps of the LCA are usually adapted for the specific product or process under consideration.

D. Data Sources

This paper primarily uses the LCA database developed by the Center for Environmental Assessment of Product and Material Systems at the Chalmers University of Technology in Göteborg, Sweden [15]. The database was initiated by a joint research forum comprising of thirteen industrial corporations and Chalmers University of Technology. The database was first released in 1998 and currently contains more than 500 data sets that have been documented and quality reviewed. The database lists the energy and material inputs and outputs associated with the production of various materials, components, assembly, and transportation systems. Three impact assessment models are provided in the database: EPS (Environmental Priority Services), EDIP (Environmental Design of Industrial Products), and Eco-Indicator. The database also provides a simple impact assessment calculator where the environmental impact of each dataset can be calculated based on the three assessment methods mentioned above.

The majority of the per unit energy cost values used in this paper were obtained from the LCA database developed by Chalmers University of Technology [15]. The energy and emissions associated with the production of various raw materials was obtained from data originally generated by the Dutch environmental consultant Pré (using the Eco-Indicator impact assessment model), that was further developed [16].

TABLE II
PARTS INVENTORY OF THE POWER SUPPLY (SM: SURFACE MOUNTED, HM: HOLE MOUNTED)

Power Supply										
Component	**Quantity**	**Weight (g)**	**Area (mm^2)**	**Material (Wh/g)**	**Component cost**		**Emission ($g\text{-}CO_2/g$)**	**Source(s)**	**Energy Intensity (Wh)**	**Emission ($g\text{-}CO_2$)**
					(Wh/g)	**(Wh/mm^2)**				
SM resistors	16	0.14	-	3.53	95.99	-	2.71	[15],[16]	13.93	0.38
SM capacitors	5	0.05	-	6.28	109.86	-	1.29	[15],[16]	5.81	0.06
HM resistors	1	0.54	-	6.15	5.16	-	4.43	[15],[16]	6.10	2.39
HM capacitors	4	10.29	-	31.50	11.88	-	13.22	[15],[16]	446.38	136.03
HM inductors	3	21.41	-	18.50	6.51	-	6.64	[15],[16]	535.48	142.16
ICs	2	0.57	39.10	98.32	24.11	40.27	28.57	[15],[16]	1644.43	16.29
Transistors	3	3.72	22.64	178.52	24.11	23.13	48.41	[6],[15]	1277.45	180.09
Diodes	3	0.25	-	386.59		-	56.86	[15]	96.65	14.72
PWB	1	-	2479.00	0.03	-	0.34	0.02	[15],[16]	917.23	49.58
Fuses	1	0.27	-	18.50	6.51	-	6.64	[15]	6.75	1.79
Screws	2	0.85	-	14.85	7.78	-	1.78	[15]	19.42	1.51
Heat sink	2	6.59	-	16.10	0.75	-	17.06	[15],[16]	111.04	112.43
Foam	3	1.60	-	0.32	28.16	-	1.18	[15]	45.57	1.89
Cable	2	30.13	-	12.02	0.83	-	5.59	[15]	387.17	168.43
Plastic casing	1	37.00	-	22.50	0.86	-	1.86	[15],[16]	864.32	68.82
Plug pins	2	2.00	-	15.92	5.08	-	10.18	[15],[16]	42.00	20.36
				Total					6419.55	916.93

For any component for which data was not explicitly available (e.g. surface mounted inductors), data corresponding to "other electronic components" from the LCA database was used [15]. Finally, the material and component costs for diodes are combined in a single entry, as given in the LCA database [15].

III. ENERGY AND EMISSION INTENSITY OF LOCAL AREA NETWORK ACCESS

This section presents a LCA based study to evaluate the energy consumption and greenhouse gas emissions of WiFi access points and Ethernet switches. We first present the overall methodology and then present the details of the study.

A. Methodology

The objective of this paper is to quantify the energy and emission intensity of local area network access. An additional objective is to isolate the major sources of environmental burden and identify areas for possible improvement. To accomplish these objectives, a LCA of an Ethernet base station and a WiFi access point is performed.

The system boundary of the LCA presented in this paper includes the entire life cycle of the switch and the base station. This includes the pre-manufacturing steps (raw material extraction and production), manufacturing of parts and components, product assembly, transportation, use, and disposal. The inputs to the system consist of the materials and energy required for manufacturing, transporting, and operating the devices. The outputs of the system consist of the product (the switch and the access point), emissions, waste, and energy released into the environment. A detailed list of the parts and components that are used to manufacture the switch and the access point is created for the inventory analysis. In order to create the parts inventory, both the devices under study were disassembled and their individual components were counted, measured (for dimensions), and weighed. LCA data (primarily from the database at Chalmers University of Technology) is then used on the parts inventory for the impact assessment.

For the WiFi access point and Ethernet switch chosen for the case study, the life-cycle of the two devices is divided into two phases: manufacture and use. It is assumed that at the end of the use phase, the access point and the switch are discarded and not recycled. While this assumption is pessimistic, it is not unrealistic since recent statistics show that only 13.6% of electronic waste is recycled in the USA and the rest ends up in landfills or incinerators [17].

The rest of this section elaborates on the inventory analysis and impact assessment of the LCA. The energy and emissions in the various steps of the manufacturing process and the actual use are enumerated and listed to calculate the overall energy and emission intensity of local area network access.

B. Energy and Emissions During Manufacture

The manufacturing process for a WiFi access point or an Ethernet switch consists of the following steps, each of which contributes to the energy and emission intensity:

- *Raw material extraction and processing:* The first step in the manufacturing process is the extraction, processing and refining of raw materials that are required for the manufacturing of the various components that constitute the two devices. For electronic and computing devices, while precious metals constitute only a small percentage of the overall device weight, the energy needed to extract and refine them is typically far larger than that required for other materials.
- *Component manufacturing:* In this step the raw materials are used to manufacture the individual components inside an access point or switch. The electronic components needed by an access point or switch can be classified as either passive (such as resistors and capacitors) or active (such as semiconductor chips),

TABLE III
PARTS INVENTORY OF THE ETHERNET SWITCH (SM: SURFACE MOUNTED, HM: HOLE MOUNTED)

Component	Quantity	Weight (g)	Area (mm^2)	Material (Wh/g)	Component cost (Wh/g)	Component cost (Wh/mm^2)	Emission ($g\text{-}CO_2/g$)	Source(s)	Energy Intensity (Wh)	Emission ($g\text{-}CO_2$)
Switch										
SM resistors	54	0.49	-	3.53	95.99	-	2.71	[15],[16]	48.77	1.33
SM capacitors	52	0.41	-	6.28	109.86	-	1.29	[15],[16]	47.62	0.53
SM inductors	4	0.31	-	5.80	48.00	-	2.70	[15],[16]	16.68	0.84
HM capacitors	6	3.68	-	31.50	11.88	-	13.22	[15],[16]	159.64	48.65
HM inductors	4	8.45	-	18.50	6.51	-	6.64	[15],[16]	211.33	56.11
ICs	2	1.66	121.30	98.32	24.11	40.27	28.57	[15],[16]	5087.99	47.43
Diodes	8	0.33	-	386.59		-	56.86	[15]	127.58	18.76
PWB	1	26.47	7055.00	0.03	-	0.34	0.02	[15],[16]	2610.35	141.10
Connectors	3	24.07	-	22.70	6.51	-	3.50	[15]	703.09	84.25
Screws	3	2.00	-	14.85	7.78	-	1.78	[15]	45.26	3.56
Heat sink	1	2.24	-	16.10	0.75	-	17.06	[15],[16]	37.74	38.21
Grips	4	0.21	-	0.32	28.16	-	1.18	[15]	5.98	0.25
Cable	2	170.08	-	12.02	0.83	-	5.59	[15]	2185.53	950.75
Clock crystals	1	0.42	-	18.50	6.51	-	6.64	[6],[15]	10.50	2.79
Plastic casing	1	27.00	-	22.50	0.86	-	1.86	[15],[16]	630.72	50.22
Metal casing	1	115.50	-	15.92	5.08	-	10.18	[15],[16]	2425.50	1175.79
Packaging										
Paper	3	42.00	-	1.67	0.83	-	0.85	[15]	105.00	35.70
Cardboard	2	199.00	-	15.92	1.33	-	0.33	[15]	3432.75	65.67
Plastic	3	9.50	-	22.50	0.86	-	1.86	[15],[16]	221.92	17.67
Pins	2	0.06	-	14.85	7.78	-	1.78	[15],[16]	1.36	0.11
				Total					18115.31	2739.72

each having different energy intensities. In addition, there are a number of other components such as connectors, cables, switches etc..

- *Assembly:* The assembly phase starts with the soldering of the electronic components on a printed wiring board (PWB). All other components such as antennas and casing are then assembled and the product is tested. The major sources of energy consumption in this phase are the electricity required for lighting, air conditioning and machinery, usually in that order [6].
- *Packaging and transportation:* The energy consumed for packaging and transportation is primarily dependent on the weight and dimensions of the product, the distance traveled, and the means of transportation. The transportation stage includes cargo vessels (from Asia to North America in the context of the case study) as well as trucks (from cargo terminals to distribution points). Details of the assumptions and calculations related to the packaging and transportation are listed in the Appendix.

To evaluate the energy intensity of each stage of the manufacturing process, first a detailed inventory analysis to evaluate the weight (or surface area in case of semiconductor devices and printed wiring boards) of the various components that constitute the access point and the switch was conducted. Then, existing databases were used to evaluate the energy and emission intensity of each component in each stage of the manufacturing process.

The WiFi access point in the case study (as well as typical commercial access points) can be considered to be made of three parts: the access point itself, the antennas, and the power supply. On the other hand, the Ethernet switch in the case study (and other commercial Ethernet switches) consists of just the switch hardware and the power supply. Both devices use a similar power supply with minor variations. To keep the comparison as even as possible, it is assumed that the same power supply is used for both devices and a generic commercial off the shelf power supply is used in this case study. The list of all components and their weights for the WiFi access point are given in Table I and those for the power supply are given in Table II. Similarly, the list of all components and their weights for the Ethernet switch are given in Table III. Note that the figures for packaging in these tables do not include the corrugated cardboard boxes used for the bulk shipping from the factory to the retail shops. Tables IV and V show the overall figures for the energy and emission intensity for the access point and switch, respectively, and include the material and energy costs during the transportation stages. For the ICs and transistors, the surface area of the silicon wafers (i.e. die size) used inside the chips are also listed (since the LCA database provides the energy intensity in terms of the area). However, since only the external area of an IC is measurable and most data sheets do not provide die size dimensions, this paper assumes that the die area is 40% of the IC area. Typical IC packaging technologies such as chip scale packaging (CSP), ball grid array (BGA), shrink small-outline package (SSOP) and thin-SSOP (TSSOP) have a die size that is between 30-80% of the IC area [18], and this paper uses a conservative estimate in this range. Also, the die size of a power transistor is assumed to be 11.07 mm^2 [19] and that of other discrete transistors is assumed to be 0.5 mm^2 [20].

TABLE IV
OVERALL ENERGY AND EMISSION INTENSITY OF THE WIFI ACCESS POINT. THE VALUES FOR RAW MATERIAL EXTRACTION AND COMPONENT MANUFACTURING STAGES ARE OBTAINED FROM TABLES I AND III

Stage		Weight (g)	Distance (km)	Energy Intensity			Emission Intensity		
				Unit Cost	Source	Energy (Wh)	Unit Cost ($g\text{-}CO_2/g$)	Source	Emission ($g\text{-}CO_2$)
Materials and components		759.29	-	-	-	24534.86	-	-	3656.65
Assembly		759.29	-	15.90 Wh/g	[6]	12072.71	6.50 $g\text{-}CO_2/g$	[6]	4935.39
Transportation: truck	Cardboard	64.51	-	17.25 Wh/g	[15]	1112.80	0.33 $g\text{-}CO_2/g$	[15]	21.29
	Transport	823.80	400	0.00061 Wh/g-km	[15]	201.01	0.000161 $g\text{-}C0_2/g\text{-}km$	[15]	53.05
Transportation: ship		1466.80	20100	0.000056 Wh/g-km	[15]	1651.03	0.0000151 $g\text{-}CO_2/g\text{-}km$	[15]	445.19
		Total				39572.41			9111.57

C. Energy and Emissions During Usage

Measurements were conducted on the WiFi access point under different traffic loads to evaluate the power consumption of an access point in the use phase. The measurements show that the current drawn from the power supply was constant at 150.25 mA at all loads and the supply voltage was 14.78 V. Considering a power supply efficiency of 80% [21], the per day energy consumption of the access point is 66.62 Wh, assuming a typical usage scenario where the access point always stays powered on (e.g. in academic institutions and many residences). Thus the total power intensity of the access point is 24316.30, 48632.60 and 72948.90 Wh for usage lifetimes of one, two and three years, respectively. As of 1999, the CO_2 emission intensity of power generation in the USA was 0.61 grams of CO_2 per Wh (based on generation from all energy sources) [22]. This implies that the energy usage of the access point resulted in 40.64 g, 14.83 kg, 29.67 kg and 44.50 kg of CO_2 emissions over a period of a day, a year, two years and three years, respectively.

Similar measurements conducted on the Ethernet switch show that the current drawn from the power supply was constant at 107.3 mA at all loads and the power supply voltage was 15.07 V. Again, considering a power supply efficiency of 80%, the per day energy consumption of the Ethernet switch is 48.51 Wh, assuming a typical usage scenario where the Ethernet switch always stays powered on. Thus the total power intensity of the Ethernet switch is 17706.15, 35412.30 and 53118.45 Wh for usage lifetimes of one, two and three years, respectively. In terms of the emissions, this energy usage of the Ethernet switch corresponds to 29.59 g, 10.80 kg, 21.60 kg and 32.40 kg of CO_2 emission of a period of a day, a year, two years and three years, respectively.

IV. DISCUSSION

The results of the previous two subsections show that the manufacturing stage accounts for a significant portion of the overall energy intensity of both the WiFi access point and the Ethernet switch. Table VI lists the overall energy consumption and emission intensity of the switch and the access point for various device lifetimes. The table also lists the relative contribution of the manufacturing phase to these two metrics. For the WiFi access point in the case study, the energy consumed during manufacturing accounts for 61.9%, 44.9% and 35.2% of the overall energy consumption for product lifetimes of one, two and three years, respectively. On the other hand, the CO_2 emissions during manufacturing account for 38.1%, 23.5% and 17.0% of the overall CO_2 emissions for product lifetimes of one, two and three years, respectively. The corresponding numbers for the Ethernet switch are 80.1%, 66.8% and 57.2% for the energy consumption and 49.2%, 32.6% and 24.4% for the CO_2 emissions.

For both the access point and the switch, the manufacturing phase accounts for a large fraction of the overall energy consumption. On the other hand, the usage phase accounts for a higher fraction of the CO_2 emissions for both the devices. While recycling is an option to mitigate the environmental impact of manufacturing, they only recover a fraction of the used raw materials in the components, while assembly and transportation energies are never recovered. Thus, extending the usable lifetime of the access points, for example by upgrades, is an attractive option to reduce the environmental impact of local area networks. Also, since the usage phase contributes most of the CO_2 emissions, using cleaner sources of electricity for domestic and office users would lower the emission intensity of local area networks.

During the manufacture stage, the energy consumption for the WiFi access point is about 80% higher than that of the Ethernet switch. However, the CO_2 emissions for the WiFi access point during the manufacture stage is only 15% higher than that for the Ethernet switch. This is primarily due to two factors: (i) the access point has a large number of ICs which drive up the energy consumption; (ii) the Ethernet switch used in the case study had a metal casing which increased its CO_2 emissions. During the usage stage, the energy consumption as well as CO_2 emissions of the WiFi access point is about 37% more than that of the Ethernet switch. This number is specific to the particular choice of the access point and Ethernet switch chosen for the case study. However, in general an Ethernet switch tends to consume lower energy than a corresponding WiFi access point. This is primarily because an Ethernet switch has a smaller number of functionalities compared to a WiFi access point. The larger number of functions supported by WiFi access points also implies that they require more components when they are manufactured. Consequently, the

TABLE V
OVERALL ENERGY AND EMISSION INTENSITY OF THE ETHERNET SWITCH. THE VALUES FOR RAW MATERIAL EXTRACTION AND COMPONENT MANUFACTURING STAGES ARE OBTAINED FROM TABLES II AND III

Stage		Weight (g)	Distance (km)	Energy Intensity			Emission Intensity		
				Unit Cost	Source	Energy (Wh)	Unit Cost ($g\text{-}CO_2/g$)	Source	Emission ($g\text{-}CO_2$)
Materials and components		932.75	-	-	-	51724.21	-	-	3635.68
Assembly		932.75	-	15.90 Wh/g	[6]	14830.73	6.50 $g\text{-}CO_2/g$	[6]	6062.88
Transportation: truck	Cardboard	108.86	-	17.25 Wh/g	[15]	1877.84	0.33 $g\text{-}CO_2/g$	[15]	35.92
	Transport	1041.61	400	0.00061 Wh/g-km	[15]	254.15	0.000161 $g\text{-}C0_2/g\text{-}km$	[15]	67.08
Transportation: ship		2126.68	20100	0.000056 Wh/g-km	[15]	2393.79	0.0000151 $g\text{-}CO_2/g\text{-}km$	[15]	645.47
		Total				71080.72			10447.03

overall energy and emission intensity of WiFi access points are generally higher than Ethernet switches.

This paper assumed that the devices are discarded at the end of their use phase. A fraction of the devices may be repaired and reused, and some devices may be shipped to countries in Asia and Africa where they may be reused or recycled. While the reuse of devices adds some extra environmental burdens (e.g. due to transportation), overall it serves to reduce the impact associated with the manufacturing of a device. The recycling of electronic devices to reclaim materials is primarily done for metals such as copper and gold [23]. The negative environmental and social impact of such processes (e.g. due to release of toxic pollutants) tends to be high, particularly for unregulated operations that are prevalent in certain countries [23]. The overall benefit of such recycling is an open issue.

As a caveat, it is pointed out there are a number of assumptions made in this paper (e.g. no recycling, power supply efficiency values etc.), which may not be valid in all cases. However, it is fairly straightforward to accommodate alterations. Also, the absence of data in some cases (e.g. manufacturing costs for SM inductors) forced the use of approximations. While such approximations cannot be avoided in the absence of data, since only a small fraction of the components were affected, the errors introduced are not expected to be significant.

V. CONCLUSIONS

This paper presented an LCA based study to evaluate the energy and emission intensity of a WiFi access point and an Ethernet switch over their lifetime. The energy and emissions expended in the manufacturing phase were computed using a detailed inventory analysis and those in the use phase were evaluated experimentally in an operational network. For the devices considered in this paper's study, the results show that manufacturing accounts for 62-80% of the total energy consumption and the remaining 20-38% comes from the use phase, assuming a one year operational lifetime. Similarly, the manufacturing and usage phases account for 38-49% and 51-62% of the total emissions, respectively. For a three year operational lifetime, the energy consumed during the manufacturing phase changes to 35-57% while the emissions during the manufacturing phase changes to 17-24%. The results show that the energy consumed in the manufacturing phase is a significant fraction of the overall energy intensity of both the access point and Ethernet switch. However, the emissions during the use phase dominate the emissions during the manufacturing phase. Mechanisms to increase the overall lifetime of the devices while using cleaner sources of electricity are thus an attractive way to decrease their environmental impact and energy footprint.

APPENDIX

The details of the assumptions related to the packaging and transportation of the devices from the place of manufacture to the place of use are listed in this appendix.

The WiFi access point and the Ethernet switch considered in the case study were both made in China. It is assumed that the two products were manufactured in the Guangzhou province (with a large concentration of electronics industry) and transported using a truck to Hong Kong (150 km), from where it was put in a cargo ship to New York City (20100 km). Finally, the two devices were transported in trucks from New York City to Troy, New York (250 km) where it was purchased and used.

Each device was individually packed (along with instruction manuals, compact disks etc.) at the factory in a cardboard box that is also shrink wrapped in clear plastic. It was assumed that the individual switch and access point packages were put in type EH corrugated cardboard boxes with internal dimensions of 0.91 m x 0.56 m x 0.56 m (36 in x 22 in x 22 in) and external dimensions of 0.93 m x 0.58 m x 0.59 m (36.5 in x 22.75 in x 23.13 in) for bulk transport before being shipped from the factory. The tare weight of the cardboard box was assumed to be 3.48 kg [24]. The dimension of each Ethernet switch and access point after its individual packaging was 24.61 cm x 15.40 cm x 5.87 cm and 27.78 cm x 22.86 cm x 6.99 cm, respectively. Thus each cardboard box for shipping contained 54 switches and 32 access points. The additional shipping weight (due to the cardboard box) per switch and access point was thus 64.51 g and 108.86 g, respectively. Also, it was assumed that a 12.19 m (40 ft) container, with a tare weight of 3750 kg and internal dimensions of 12.12 m x 2.39 m x 2.39 m (39 ft 3 in x 7 ft 10 in x 7 ft 10 in) was used for the overseas shipping [25]. A container can thus hold 108

TABLE VI
ENERGY AND EMISSION INTENSITY FOR VARIOUS LIFETIMES AND THE RELATIVE CONTRIBUTION OF THE MANUFACTURING STAGE (IN PARENTHESIS)

Device	Energy Intensity (KWh)					Emission Intensity (kg-CO_2)				
	1 year	2 years	3 years	5 years	10 years	1 year	2 years	3 years	5 years	10 years
Switch	88.79 (80.06%)	106.49 (66.75%)	124.20 (57.23%)	159.61 (44.53%)	248.14 (28.65%)	21.25 (49.17%)	32.05 (32.60%)	42.85 (24.38%)	64.45 (16.21%)	118.45 (8.82%)
Access Point	63.89 (61.94%)	88.21 (44.86%)	112.52 (35.17%)	161.15 (24.56%)	282.74 (14.00%)	23.94 (38.06%)	38.77 (23.50%)	53.60 (17.00%)	83.26 (10.94%)	157.41 (5.79%)

cardboard shipping boxes, thereby carrying 5832 Ethernet switches and 3456 access points per trip. Since a container is reused a large number of times over a period of many years (10 to 15 voyages per year, with a typical lifetime of 10 to 15 years) and recycled at the end [25], the share of the container's manufacturing cost for the transport of a single switch or access point is quite small, and was thus neglected in this study. The additional shipping weight (due to the shipping container) per switch and access point was 643.00 g and 1085.07 g, respectively.

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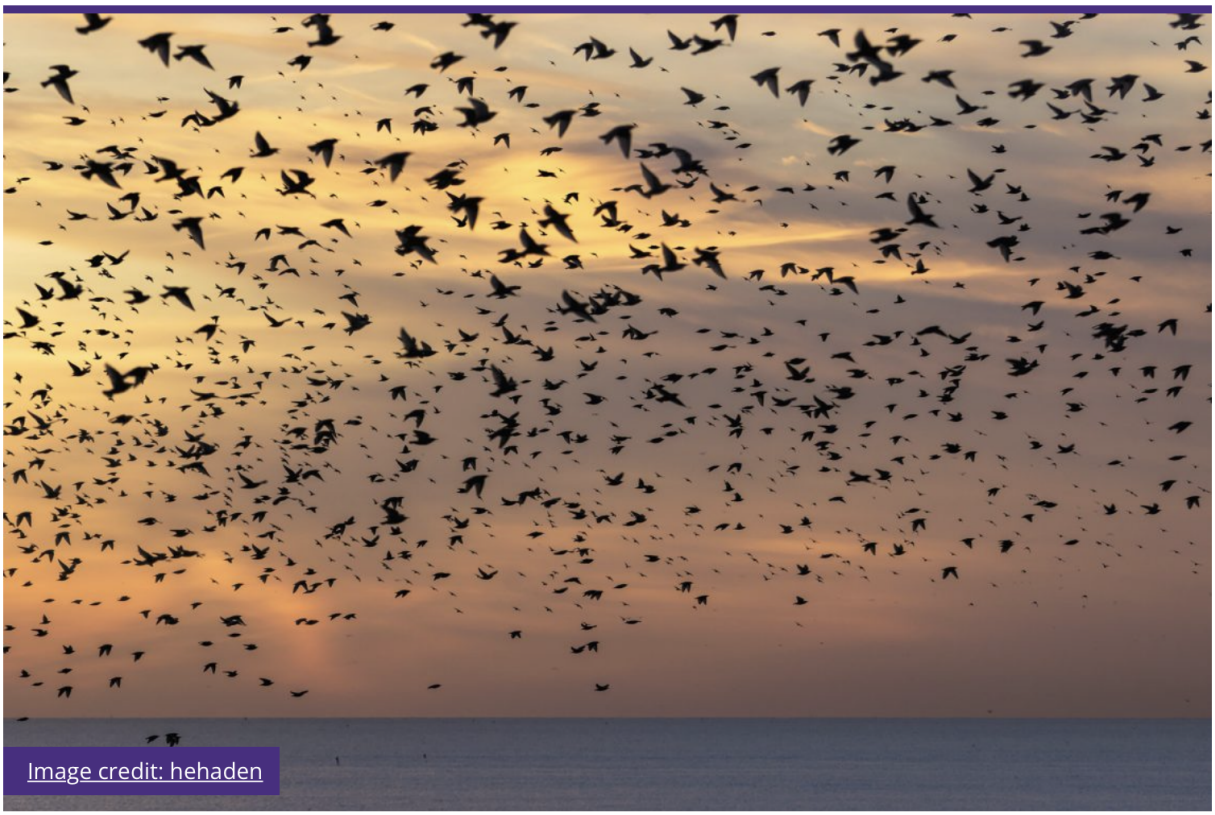
What Will 5G Mean for the Environment?

JANUARY 30, 2020 // AUTHOR: CLAIRE CURRAN



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Beginning 2020, the fifth generation of wireless technology is expected to be widely implemented throughout the world. The new network, called 5G, promises to give faster speeds and a higher capacity for the use of more devices.

"What Will 5G Mean for the Environment?" by Clair Curran of the Henry M. Jackson School of International Studies, University of Washington

However, while companies from countries such as the United States and China are competing to be the first to deliver 5G to the consumer, the environmental impacts of the new network are being overlooked. In a time when the environment is at its most delicate, overlooking these impacts is extremely risky for future generations.

The main environmental issues associated with the implementation of the 5G network come with the manufacturing of the many component parts of the 5G infrastructure. In addition, the proliferation of new devices that will use the 5G network that is tied to the acceleration of demand from consumers for new 5G-dependent devices will have serious environmental consequences.

The 5G network will inevitably cause a large increase in energy usage among consumers, which is already one of the main contributors to climate change. Additionally, the manufacturing and maintenance of the new technologies associated with 5G creates waste and uses important resources that have detrimental consequences for the environment. 5G networks use technology that has harmful effects on birds, which in turn has cascading effects through entire ecosystems. And, while 5G developers are seeking to create a network that has fewer environmental impacts than past networks, there is still room for improvement and the consequences of 5G should be considered before it is widely rolled out.

What is 5G?

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5G stands for the fifth generation of wireless technology. It is the wave of wireless technology surpassing the 4G network that is used now. Previous generations brought the first cell phones (1G), text messaging (2G), online capabilities (3G), and faster speed (4G).[1] The fifth generation aims to increase the speed of data movement, be more responsive, and allow for greater connectivity of devices simultaneously.[2] This means that 5G will allow for nearly instantaneous downloading of data that, with the current network, would take hours. For example, downloading a movie using 5G would take mere seconds. These new improvements will allow for self-driving cars, massive expansion of Internet of Things (IoT) device use, and acceleration of new technological advancements used in everyday activities by a much wider range of people.

While 5G is not fully developed, it is expected to consist of at least five new technologies that allow it to perform much more complicated tasks at faster speeds. The new technologies 5G will use are hardware that works with much higher frequencies (millimeter wavelengths), small cells, massive MIMO (multiple input multiple output), beamforming, and full duplex.[3]Working together, these new technologies will expand the potential of many of the devices used today and devices being developed for the future.

Millimeter waves are a higher frequency wavelength than the radio wavelength generally used in wireless transmission today.[4] The use of this portion of the spectrum corresponds to higher frequency and shorter wavelengths, in this case in the millimeter range (vs the lower radio frequencies where the wavelengths can be in the meters to hundreds of kilometers). Higher frequency waves allow

for more devices to be connected to the same network at the same time, because there is more space available compared to the radio waves that are used today. The use of this portion of the spectrum has much longer wavelengths than of that anticipated for a portion of the 5G implementation. The waves in use now can measure up to tens of centimeters, while the new 5G waves would be no greater than ten millimeters.[5] The millimeter waves will create more transmission space for the ever-expanding number of people and devices crowding the current networks. The millimeter waves will create more space for devices to be used by consumers, which will increase energy usage, subsequently leading to increased global warming.

Millimeter waves are very weak in their ability to connect two devices, which is why 5G needs something called “small cells” to give full, uninterrupted coverage. Small cells are essentially miniature cell towers that would be placed 250 meters apart throughout cities and other areas needing coverage.[6] The small cells are necessary as emissions [or signals] at this higher frequency/shorter wavelength have more difficulty passing through solid objects and are even easily intercepted by rain.[7] The small cells could be placed on anything from trees to street lights to the sides of businesses and homes to maximize connection and limit “dead zones” (areas where connections are lost).[8]

The next new piece of technology necessary for 5G is massive MIMO, which stands for multiple input multiple output. The MIMO describes the capacity of 5G’s base stations, because those base stations would be able to handle a much higher amount of data at any one moment of time. Currently, 4G base stations

have around eight transmitters and four receivers which direct the flow of data between devices.[9] 5G will exceed this capacity with the use of massive MIMO that can handle 22 times more ports.[10] Figure 1 shows how a massive MIMO tower would be able to direct a higher number of connections at once. However, massive MIMO causes signals to be crossed more easily. Crossed signals cause an interruption in the transmission of data from one device to the next due to a clashing of the wavelengths as they travel to their respective destinations. To overcome the cross signals problem, beamforming is needed.

Figure 1. 5G Network of Base Towers, Small Cells, and Stylized Disruptions[11]

To maximize the efficiency of sending data another new technology called beamforming will be used in 5G. For data to be sent to the correct user, a way of directing the wavelengths without interference is necessary. This is done through a technique called beamforming. Beamforming directs where exactly data are being sent by using a variety of antennas to organize signals based on certain characteristics, such as the magnitude of the signal.[12] By directly sending signals to where they need to go, beamforming decreases the chances that a signal is dropped due to the interference of a physical object.

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One way that 5G will follow through on its promise of faster data transmission is through sending and receiving data simultaneously.[13] The method that allows for simultaneous input and output of data is called full duplexing. While full duplex capabilities allow for faster transmission of data, there is an issue of signal interference, because of echoes.[14] Full duplexing will cut transmission times in half, because it allows for a response to occur as soon as an input is delivered, eliminating the turnaround time that is seen in transmission today.

Because these technologies are new and untested, it is hard to say how they will impact our environment. This raises another issue: there are impacts that can be anticipated and predicted, but there are also unanticipated impacts because much of the new technologies are untested. Nevertheless, it is possible to anticipate some of detrimental environmental consequences of the new technologies and the 5G network, because we know these technologies will increase exposure to harmful radiation, increase mining of rare minerals, increase waste, and increase energy usage. The main 5G environmental concerns have to do with two of the five new components: the millimeter waves and the small cells.

Increased Energy Usage of the 5G Network

The whole aim of the new 5G network is to allow for more devices to be used by the consumer at faster rates than ever before, because of this goal there will certainly be an increase in energy usage globally. Energy usage is one of the

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main contributors to climate change today and an increase in energy usage would cause climate change to increase drastically as well. 5G will operate on a higher frequency portion of the spectrum to open new space for more devices. The smaller size of the millimeter waves compared to radio frequency waves allows for more data to be shared more quickly and creates a wide bandwidth that can support much larger tasks.[15] While the idea of more space for devices to be used is great for consumers, this will lead to a spike in energy usage for two reasons – the technology itself is energy demanding and will increase demand for more electronic devices. The ability for more devices to be used on the same network creates more incentive for consumers to buy electronics and use them more often. This will have a harmful impact on the environment through increased energy use.

Climate change has several underlying contributors; however, energy usage is gaining attention in its severity with regards to perpetuating climate change. Before 5G has even been released, about 2% of the world's greenhouse gas emissions can be attributed to the ICT industry.[16] While 2% may not seem like a very large portion, it translates to around 860 million tons of greenhouse gas emissions.[17] Greenhouse gas emissions are the main contributors to natural disasters, such as flooding and drought, which are increasing severity and occurrence every year. Currently, roughly 85% of the energy used in the United States can be attributed to fossil fuel consumption.[18] The dwindling availability of fossil fuels and the environmental burden of releasing these fossil fuels into our atmosphere signal an immediate need to shift to other energy sources. Without a shift to other forms of energy production and the addition of technology

allowed by the implementation of 5G, the strain on our environment will rise and the damage may never be repaired. With an increase in energy usage through technology and the implementation of 5G, it can be expected that the climate change issues faced today will only increase.

The overall contribution of carbon dioxide emissions from the ICT industry has a huge impact on climate change and will continue to have even larger impacts without proper actions. In a European Union report, researchers estimated that in order to keep the increase in global temperature below 2° Celsius a decrease in carbon emissions of around 15-30% is necessary by 2020.[19]

Engineers claim that the small cells used to provide the 5G connection will be energy efficient and powered in a sustainable way; however the maintenance and production of these cells is more of an issue. Supporters of the 5G network advocate that the small cells will use solar or wind energy to stay sustainable and green.[20] These devices, labeled “fuel-cell energy servers” will work as clean energy-based generators for the small cells.[21] While implementing base stations that use sustainable energy to function would be a step in the right direction in environmental conservation, it is not the solution to the main issue caused by 5G, which is the impact that the massive amount of new devices in the hands of consumers will have on the amount of energy required to power these devices.

Consumption Increases and 5G Technologies

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The wasteful nature of manufacturing and maintenance of both individual devices and the devices used to deliver 5G connection could become a major contributor of climate change. The promise of 5G technology is to expand the number of devices functioning might be the most troubling aspect of the new technology. Cell phones, computers, and other everyday devices are manufactured in a way that puts stress on the environment. A report by the EPA estimated that in 2010, 25% of the world's greenhouse gas emissions comes from electricity and heat production making it the largest single source of emissions.[22] The main gas emitted by this sector is carbon dioxide, due to the burning of natural gas, such as coal, to fuel electricity sources.[23] Carbon dioxide is one of the most common greenhouse gases seen in our atmosphere, it traps heat in earth's atmosphere trying to escape into space, which causes the atmosphere to warm generating climate change.[24]

Increased consumption of devices is taking a toll on the environment.[25] As consumers gain access to more technologies the cycle of consumption only expands. As new devices are developed, the older devices are thrown out even if they are still functional. Often, big companies will purposefully change their products in ways that make certain partner devices (such as chargers or earphones) unusable–creating demand for new products. Economic incentives mean that companies will continue these practices in spite of the environmental impacts.

One of the main issues with the 5G network and the resulting increase in consumption of technological devices is that the production required for these

devices is not sustainable. In the case of making new devices, whether they be new smart-phones or the small cells needed for 5G, the use of nonrenewable metals is required. It is extremely difficult to use metals for manufacturing sustainably, because metals are not a renewable resource.[26] Metals used in the manufacturing of the smart devices frequently used today often cannot be recycled in the same way many household items can be recycled. Because these technologies cannot be recycled, they create tons of waste when they are created and tons of waste when they are thrown away.

There are around six billion mobile devices in use today, with this number expected to increase drastically as the global population increases and new devices enter the market.[27]One estimate of the life-time carbon emissions of a single device–not including related accessories and network connection–is that a device produces a total of 45kg of carbon dioxide at a medium level of usage over three years. This amount of emission is comparable to that of driving the average European car for 300km.[28]

But, the most environmentally taxing stage of a mobile device life cycle is during the production stage, where around 68% of total carbon emissions is produced, equating to 30kg of carbon dioxide.[29] To put this into perspective, an iPhone X weighs approximately 0.174kg, so in order to produce the actual device, 172 iPhone X's worth of carbon dioxide is also created. These emissions vary from person to person and between different devices, but it's possible to estimate the impact one device has on the environment. 5G grants the capacity for more

devices to be used, significantly increase the existing carbon footprint of smart devices today.

Energy usage for the ever-growing number of devices on the market and in homes is another environmental threat that would be greatly increased by the new capabilities brought by the 5G network. Often, energy forecasts overlook the amount of energy that will be consumed by new technologies, which leads to a skewed understanding of the actual amount of energy expected to be used.[30] One example of this is with IoT devices.[31] IoT is one of the main aspects of 5G people in the technology field are most excited about. 5G will allow for a larger expansion of IoT into the everyday household.[32] While some IoT devices promise lower energy usage abilities, the 50 billion new IoT devices expected to be produced and used by consumers will surpass the energy used by today's electronics.

The small cells required for the 5G network to properly function causes another issue of waste with the new network. Because of the weak nature of the millimeter waves used in the 5G technology, small cells will need to be placed around 250 meters apart to insure continuous connection.[33] The main issue with these small cells is that the manufacturing and maintenance of these cells will create a lot of waste. The manufacturing of technology takes a large toll on the environment, due to the consumption of non-renewable resources to produce devices, and technology ending up in landfills. Implementing these small cells into large cities where they must be placed at such a high density will have a drastic impact on technology waste.

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Technology is constantly changing and improving, which is one of the huge reasons it has such high economic value. But, when a technological advancement in small cells happens, the current small cells would have to be replaced. The short lifespan of devices created today makes waste predictable and inevitable. In New York City, where there would have to be at least 3,135,200 small cells, the waste created in just one city when a new advancement in small cells is implemented would have overwhelming consequences on the environment. 5G is just one of many examples of how important it is to look at the consequences of new advancements before their implementation. While it is exciting to see new technology that promises to improve everyday life, the consequences of additional waste and energy usage must be considered to preserve a sustainable environment in the future.

The Impact of 5G on Ecosystems

There is some evidence that the new devices and technologies associated with 5G will be harmful to delicate ecosystems. The main component of the 5G network that will affect the earth's ecosystems is the millimeter waves. The millimeter waves that are being used in developing the 5G network have never been used at such scale before. This makes it especially difficult to know how they will impact the environment and certain ecosystems. However, studies have found that there are some harms caused by these new technologies.

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The millimeter waves, specifically, have been linked to many disturbances in the ecosystems of birds. In a study by the Centre for Environment and Vocational Studies of Punjab University, researchers observed that after exposure to radiation from a cell tower for just 5-30 minutes, the eggs of sparrows were disfigured.[34] The disfiguration of birds exposed for such a short amount of time to these frequencies is significant considering that the new 5G network will have a much higher density of base stations (small cells) throughout areas needing connection. The potential dangers of having so many small cells all over areas where birds live could cause whole populations of birds to have mutations that threaten their population's survival. Additionally, a study done in Spain showed breeding, nesting, and roosting was negatively affected by microwave radiation emitted by a cell tower.[35] Again, the issue of the increase in the amount of connection conductors in the form of small cells to provide connection with the 5G network is seen to be harmful to species that live around humans.

Additionally, Warnke found that cellular devices had a detrimental impact on bees.[36] In this study, beehives exposed for just ten minutes to 900MHz waves fell victim to colony collapse disorder.[37] Colony collapse disorder is when many of the bees living in the hive abandon the hive leaving the queen, the eggs, and a few worker bees. The worker bees exposed to this radiation also had worsened navigational skills, causing them to stop returning to their original hive after about ten days.[38] Bees are an incredibly important part of the earth's ecosystem. Around one-third of the food produced today is dependent on bees for pollination, making bees are a vital part of the agricultural system.[39] Bees not only provide pollination for the plant-based food we eat, but they are also important to

maintaining the food livestock eats. Without bees, a vast majority of the food eaten today would be lost or at the very least highly limited. Climate change has already caused a large decline in the world's bee population.

The impact that the cell towers have on birds and bees is important to understand, because all ecosystems of the earth are interconnected. If one component of an ecosystem is disrupted the whole system will be affected. The disturbances of birds with the cell towers of today would only increase, because with 5G a larger number of small cell radio-tower-like devices would be necessary to ensure high quality connection for users. Having a larger number of high concentrations of these millimeter waves in the form of small cells would cause a wider exposure to bees and birds, and possibly other species that are equally important to our environment.

The Importance of a Proactive Approach

As innovation continues, it is important that big mobile companies around the world consider the impact 5G will have on the environment before pushing to have it widely implemented. The companies pushing for the expansion of 5G may stand to make short term economic gains. While the new network will undoubtedly benefit consumers greatly, looking at 5G's long-term environmental impacts is also very important so that the risks are clearly understood and articulated.

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The technology needed to power the new 5G network will inevitably change how mobile devices are used as well as their capabilities. This technological advancement will also change the way technology and the environment interact. The change from using radio waves to using millimeter waves and the new use of small cells in 5G will allow more devices to be used and manufactured, more energy to be used, and have detrimental consequences for important ecosystems.

While it is unrealistic to call for 5G to not become the new network norm, companies, governments, and consumers should be proactive and understand the impact that this new technology will have on the environment. 5G developers should carry out Environmental Impact Assessments that fully estimate the impact that the new technology will have on the environment before rushing to widely implement it. Environmental Impact Assessments are intended to assess the impact new technologies have on the environment, while also maximizing potential benefits to the environment.[40] This process mitigates, prevents, and identifies environmental harm, which is imperative to ensuring that the environment is sustainable and sound in the future.

Additionally, the method of Life Cycle Assessments (LCA) of devices would also be extremely beneficial for understanding the impact that 5G will inevitably have on the environment. An LCA can be used to assess the impact that devices have on carbon emissions throughout their life span, from the manufacturing of the device to the energy required to power the device and ultimately the waste created when the device is discarded into a landfill or other disposal system.[41]

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By having full awareness of the impact new technology will have on the environment ways to combat the negative impacts can be developed and implemented effectively.

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This publication was made possible in part by a grant from Carnegie Corporation of New York. The statements made and views expressed are solely the responsibility of the author.

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frontiers in Public Health

REVIEW
published: 13 August 2019
doi: 10.3389/fpubh.2019.00223

Risks to Health and Well-Being From Radio-Frequency Radiation Emitted by Cell Phones and Other Wireless Devices

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OPEN ACCESS

Edited by:
Dariusz Leszczynski, University of Helsinki, Finland

Reviewed by:
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Sareesh Naduvil Narayanan, Ras al-Khaimah Medical and Health Sciences University, United Arab Emirates

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Specialty section:
This article was submitted to Radiation and Health, a section of the journal Frontiers in Public Health

Received: *10 April 2019*
Accepted: *25 July 2019*
Published: *13 August 2019*

Citation:
Miller AB, Sears ME, Morgan LL, Davis DL, Hardell L, Oremus M and Soskolne CL (2019) Risks to Health and Well-Being From Radio-Frequency Radiation Emitted by Cell Phones and Other Wireless Devices. Front. Public Health 7:223. doi: 10.3389/fpubh.2019.00223

Radiation exposure has long been a concern for the public, policy makers, and health researchers. Beginning with radar during World War II, human exposure to radio-frequency radiation[1] (RFR) technologies has grown substantially over time. In 2011, the *International Agency for Research on Cancer* (IARC) reviewed the published literature and categorized RFR as a "possible" (Group 2B) human carcinogen. A broad range of adverse human health effects associated with RFR have been reported since the IARC review. In addition, three large-scale carcinogenicity studies in rodents exposed to levels of RFR that mimic lifetime human exposures have shown significantly increased rates of Schwannomas and malignant gliomas, as well as chromosomal DNA damage. Of particular concern are the effects of RFR exposure on the developing brain in children. Compared with an adult male, a cell phone held against the head of a child exposes deeper brain structures to greater radiation doses per unit volume, and the young, thin skull's bone marrow absorbs a roughly 10-fold higher local dose. Experimental and observational studies also suggest that men who keep cell phones in their trouser pockets have significantly lower sperm counts and significantly impaired sperm motility and morphology, including mitochondrial DNA damage. Based on the accumulated evidence, we recommend that IARC re-evaluate its 2011 classification of the human carcinogenicity of RFR, and that WHO complete a systematic review of multiple other health effects such as sperm damage. In the interim, current knowledge provides justification for governments, public health authorities, and physicians/allied health professionals to warn the population that having a cell phone next to the body is harmful, and to support measures to reduce all exposures to RFR.

Keywords: brain cancer, electromagnetic hypersensitivity, glioma, non-cancer outcomes, policy recommendations, radiofrequency fields, child development, acoustic neuroma

[1] Per IEEE C95.1-1991, the radio-frequency radiation frequency range is from 3 kHz to 300 GHz and is non-ionizing.

INTRODUCTION

We live in a generation that relies heavily on technology. Whether for personal use or work, wireless devices, such as cell phones, are commonly used around the world, and exposure to radiofrequency radiation (RFR) is widespread, including in public spaces (1, 2).

In this review, we address the current scientific evidence on health risks from exposure to RFR, which is in the non-ionizing frequency range. We focus here on human health effects, but also note evidence that RFR can cause physiological and/or morphological effects on bees, plants and trees (3–5).

We recognize a diversity of opinions on the potential adverse effects of RFR exposure from cell or mobile phones and other wireless transmitting devices (WTDs) including cordless phones and Wi-Fi. The paradigmatic approach in cancer epidemiology, which considers the body of epidemiological, toxicological, and mechanistic/cellular evidence when assessing causality, is applied.

CARCINOGENICITY

Since 1998, the *International Commission on Non-Ionizing Radiation Protection* (ICNIRP) has maintained that no evidence of adverse biological effects of RFR exist, other than tissue heating at exposures above prescribed thresholds (6).

In contrast, in 2011, an expert working group of the *International Agency for Research on Cancer* (IARC) categorized RFR emitted by cell phones and other WTDs as a Group 2B ("possible") human carcinogen (7).

Since the IARC categorization, analyses of the large international Interphone study, a series of studies by the Hardell group in Sweden, and the French CERENAT case-control studies, signal increased risks of brain tumors, particularly with ipsilateral use (8). The largest case-control studies on cell phone exposure and glioma and acoustic neuroma demonstrated significantly elevated risks that tended to increase with increasing latency, increasing cumulative duration of use, ipsilateral phone use, and earlier age at first exposure (8).

Pooled analyses by the Hardell group that examined risk of glioma and acoustic neuroma stratified by age at first exposure to cell phones found the highest odds ratios among those first exposed before age 20 years (9–11). For glioma, first use of cell phones before age 20 years resulted in an odds ratio (OR) of 1.8 (95% confidence interval [CI] 1.2–2.8). For ipsilateral use, the OR was 2.3 (CI 1.3-4.2); contralateral use was 1.9 (CI 0.9-3.7). Use of cordless phone before age 20 yielded OR 2.3 (CI 1.4–3.9), ipsilateral OR 3.1 (CI 1.6–6.3) and contralateral use OR 1.5 (CI 0.6–3.8) (9).

Although Karipidis et al. (12) and Nilsson et al. (13) found no evidence of an increased incidence of gliomas in recent years in Australia and Sweden, respectively, Karipidis et al. (12) only reported on brain tumor data for ages 20–59 and Nilsson et al. (13) failed to include data for high grade glioma. In contrast, others have reported evidence that increases in specific types of brain tumors seen in laboratory studies are occurring in Britain and the US:

- The incidence of neuro-epithelial brain cancers has significantly increased in all children, adolescent, and young adult age groupings from birth to 24 years in the United States (14, 15).
- A sustained and statistically significant rise in glioblastoma multiforme across all ages has been described in the UK (16).

The incidence of several brain tumors are increasing at statistically significant rates, according to the 2010–2017 *Central Brain Tumor Registry of the U.S.* (CBTRUS) dataset (17).

- There was a significant increase in incidence of radiographically diagnosed tumors of the pituitary from 2006 to 2012 (APC = 7.3% [95% CI: 4.1%, 10.5%]), with no significant change in incidence from 2012 to 2015 (18).
- Meningioma rates have increased in all age groups from 15 through 85+ years.
- Nerve sheath tumor (Schwannoma) rates have increased in all age groups from age 20 through 84 years.
- Vestibular Schwannoma rates, as a percentage of nerve sheath tumors, have also increased from 58% in 2004 to 95% in 2010-2014.

Epidemiological evidence was subsequently reviewed and incorporated in a meta-analysis by Röösli et al. (19). They concluded that overall, epidemiological evidence does not suggest increased brain or salivary gland tumor risk with mobile phone (MP) use, although the authors admitted that some uncertainty remains regarding long latency periods (>15 years), rare brain tumor subtypes, and MP usage during childhood. Of concern is that these analyses included cohort studies with poor exposure classification (20).

In epidemiological studies, recall bias can play a substantial role in the attenuation of odds ratios toward the null hypothesis. An analysis of data from one large multicenter case-control study of RFR exposure, did not find that recall bias was an issue (21). In another multi-country study it was found that young people can recall phone use moderately well, with recall depending on the amount of phone use and participants' characteristics (22). With less rigorous querying of exposure, prospective cohort studies are unfortunately vulnerable to exposure misclassification and imprecision in identifying risk from rare events, to the point that negative results from such studies are misleading (8, 23).

Another example of disparate results from studies of different design focuses on prognosis for patients with gliomas, depending upon cell phone use. A Swedish study on glioma found lower survival in patients with glioblastoma associated with long term use of wireless phones (24). Ollson et al. (25), however, reported no indication of reduced survival among glioblastoma patients in Denmark, Finland and Sweden with a history of mobile phone use (ever regular use, time since start of regular use, cumulative call time overall or in the last 12 months) relative to no or non-regular use. Notably, Olsson et al. (25) differed from Carlberg and Hardell (24) in that the study did not include use of cordless phones, used shorter latency time and excluded patients older than 69 years. Furthermore, a major shortcoming was that patients with the worst prognosis were excluded, as in Finland

inoperable cases were excluded, all of which would bias the risk estimate toward unity.

In the interim, three large-scale toxicological (animal carcinogenicity) studies support the human evidence, as do modeling, cellular and DNA studies identifying vulnerable subgroups of the population.

The *U.S. National Toxicology Program* (NTP) (National Toxicology Program (26, 27) has reported significantly increased incidence of glioma and malignant Schwannoma (mostly on the nerves on the heart, but also additional organs) in large animal carcinogenicity studies with exposure to levels of RFR that did not significantly heat tissue. Multiple organs (e.g., brain, heart) also had evidence of DNA damage. Although these findings have been dismissed by the ICNIRP (28), one of the key originators of the NTP study has refuted the criticisms (29).

A study by Italy's Ramazzini Institute has evaluated lifespan environmental exposure of rodents to RFR, as generated by 1.8 GHz GSM antennae of cell phone radio base stations. Although the exposures were 60 to 6,000 times lower than those in the NTP study, statistically significant increases in Schwannomas of the heart in male rodents exposed to the highest dose, and Schwann-cell hyperplasia in the heart in male and female rodents were observed (30). A non-statistically significant increase in malignant glial tumors in female rodents also was detected. These findings with far field exposure to RFR are consistent with and reinforce the results of the NTP study on near field exposure. Both reported an increase in the incidence of tumors of the brain and heart in RFR-exposed Sprague-Dawley rats, which are tumors of the same histological type as those observed in some epidemiological studies on cell phone users.

Further, in a 2015 animal carcinogenicity study, tumor promotion by exposure of mice to RFR at levels below exposure limits for humans was demonstrated (31). Co-carcinogenicity of RFR was also demonstrated by Soffritti and Giuliani (32) who examined both power-line frequency magnetic fields as well as 1.8 GHz modulated RFR. They found that exposure to Sinusoidal-50 Hz Magnetic Field (S-50 Hz MF) combined with acute exposure to gamma radiation or to chronic administration of formaldehyde in drinking water induced a significantly increased incidence of malignant tumors in male and female Sprague Dawley rats. In the same report, preliminary results indicate higher incidence of malignant Schwannoma of the heart after exposure to RFR in male rats. Given the ubiquity of many of these co-carcinogens, this provides further evidence to support the recommendation to reduce the public's exposure to RFR to as low as is reasonably achievable.

Finally, a case series highlights potential cancer risk from cell phones carried close to the body. West et al. (33) reported four "extraordinary" multifocal breast cancers that arose directly under the antennae of the cell phones habitually carried within the bra, on the sternal side of the breast (the opposite of the norm). We note that case reports can point to major unrecognized hazards and avenues for further investigation, although they do not usually provide direct causal evidence.

In a study of four groups of men, of which one group did not use mobile phones, it was found that DNA damage indicators in hair follicle cells in the ear canal were higher in the RFR exposure groups than in the control subjects. In addition, DNA damage increased with the daily duration of exposure (34).

Many profess that RFR cannot be carcinogenic as it has insufficient energy to cause direct DNA damage. In a review, Vijayalaxmi and Prihoda (35) found some studies suggested significantly increased damage in cells exposed to RF energy compared to unexposed and/or sham-exposed control cells, others did not. Unfortunately, however, in grading the evidence, these authors failed to consider baseline DNA status or the fact that genotoxicity has been poorly predicted using tissue culture studies (36). As well funding, a strong source of bias in this field of enquiry, was not considered (37).

CHILDREN AND REPRODUCTION

As a result of rapid growth rates and the greater vulnerability of developing nervous systems, the long-term risks to children from RFR exposure from cell phones and other WTDs are expected to be greater than those to adults (38). By analogy with other carcinogens, longer opportunities for exposure due to earlier use of cell phones and other WTDs could be associated with greater cancer risks in later life.

Modeling of energy absorption can be an indicator of potential exposure to RFR. A study modeling the exposure of children 3–14 years of age to RFR has indicated that a cell phone held against the head of a child exposes deeper brain structures to roughly double the radiation doses (including fluctuating electrical and magnetic fields) per unit volume than in adults, and also that the marrow in the young, thin skull absorbs a roughly 10-fold higher local dose than in the skull of an adult male (39). Thus, pediatric populations are among the most vulnerable to RFR exposure.

The increasing use of cell phones in children, which can be regarded as a form of addictive behavior (40), has been shown to be associated with emotional and behavioral disorders. Divan et al. (41) studied 13,000 mothers and children and found that prenatal exposure to cell phones was associated with behavioral problems and hyperactivity in children. A subsequent Danish study of 24,499 children found a 23% increased odds of emotional and behavioral difficulties at age 11 years among children whose mothers reported any cell phone use at age 7 years, compared to children whose mothers reported no use at age 7 years (42). A cross-sectional study of 4,524 US children aged 8–11 years from 20 study sites indicated that shorter screen time and longer sleep periods independently improved child cognition, with maximum benefits achieved with low screen time and age-appropriate sleep times (43). Similarly, a cohort study of Swiss adolescents suggested a potential adverse effect of RFR on cognitive functions that involve brain regions mostly exposed during mobile phone use (44). Sage and Burgio et al. (45) posit that epigenetic drivers and DNA damage underlie adverse effects of wireless devices on childhood development.

RFR exposure occurs in the context of other exposures, both beneficial (e.g., nutrition) and adverse (e.g., toxicants or stress). Two studies identified that RFR potentiated adverse effects of lead on neurodevelopment, with higher maternal use of mobile phones during pregnancy [1,198 mother-child pairs, (46)] and

Attention Deficit Hyper-activity Disorder (ADHD) with higher cell phone use and higher blood lead levels, in 2,422 elementary school children (47).

A study of Mobile Phone Base Station Tower settings adjacent to school buildings has found that high exposure of male students to RFR from these towers was associated with delayed fine and gross motor skills, spatial working memory, and attention in adolescent students, compared with students who were exposed to low RFR (48). A recent prospective cohort study showed a potential adverse effect of RFR brain dose on adolescents' cognitive functions including spatial memory that involve brain regions exposed during cell phone use (44).

In a review, Pall (49) concluded that various non-thermal microwave EMF exposures produce diverse neuropsychiatric effects. Both animal research (50–52) and human studies of brain imaging research (53–56) indicate potential roles of RFR in these outcomes.

Male fertility has been addressed in cross-sectional studies in men. Associations between keeping cell phones in trouser pockets and lower sperm quantity and quality have been reported (57). Both *in vivo* and *in vitro* studies with human sperm confirm adverse effects of RFR on the testicular proteome and other indicators of male reproductive health (57, 58), including infertility (59). Rago et al. (60) found significantly altered sperm DNA fragmentation in subjects who use mobile phones for more than 4 h/day and in particular those who place the device in the trousers pocket. In a cohort study, Zhang et al. (61) found that cell phone use may negatively affect sperm quality in men by decreasing the semen volume, sperm concentration, or sperm count, thus impairing male fertility. Gautam et al. (62) studied the effect of 3G (1.8–2.5 GHz) mobile phone radiation on the reproductive system of male Wistar rats. They found that exposure to mobile phone radiation induces oxidative stress in the rats which may lead to alteration in sperm parameters affecting their fertility.

RELATED OBSERVATIONS, IMPLICATIONS AND STRENGTHS OF CURRENT EVIDENCE

An extensive review of numerous published studies confirms non-thermally induced biological effects or damage (e.g., oxidative stress, damaged DNA, gene and protein expression, breakdown of the blood-brain barrier) from exposure to RFR (63), as well as adverse (chronic) health effects from long-term exposure (64). Biological effects of typical population exposures to RFR are largely attributed to fluctuating electrical and magnetic fields (65–67).

Indeed, an increasing number of people have developed constellations of symptoms attributed to exposure to RFR (e.g., headaches, fatigue, appetite loss, insomnia), a syndrome termed *Microwave Sickness* or *Electro-Hyper-Sensitivity* (EHS) (68–70).

Causal inference is supported by consistency between epidemiological studies of the effects of RFR on induction of human cancer, especially glioma and vestibular Schwannomas, and evidence from animal studies (8). The combined weight of the evidence linking RFR to public health risks includes a broad array of findings: experimental biological evidence of non-thermal effects of RFR; concordance of evidence regarding carcinogenicity of RFR; human evidence of male reproductive damage; human and animal evidence of developmental harms; and limited human and animal evidence of potentiation of effects from chemical toxicants. Thus, diverse, independent evidence of a potentially troubling and escalating problem warrants policy intervention.

CHALLENGES TO RESEARCH, FROM RAPID TECHNOLOGICAL ADVANCES

Advances in RFR-related technologies have been and continue to be rapid. Changes in carrier frequencies and the growing complexity of modulation technologies can quickly render "yesterdays" technologies obsolete. This rapid obsolescence restricts the amount of data on human RFR exposure to particular frequencies, modulations and related health outcomes that can be collected during the lifespan of the technology in question.

Epidemiological studies with adequate statistical power must be based upon large numbers of participants with sufficient latency and intensity of exposure to specific technologies. Therefore, a lack of epidemiological evidence does not necessarily indicate an absence of effect, but rather an inability to study an exposure for the length of time necessary, with an adequate sample size and unexposed comparators, to draw clear conclusions. For example, no case-control study has been published on fourth generation (4G; 2–8 GHz) Long-term Evolution (LTE) modulation, even though the modulation was introduced in 2010 and achieved a 39% market share worldwide by 2018 (71).

With this absence of human evidence, governments must require large-scale animal studies (or other appropriate studies of indicators of carcinogenicity and other adverse health effects) to determine whether the newest modulation technologies incur risks, prior to release into the marketplace. Governments should also investigate short-term impacts such as insomnia, memory, reaction time, hearing and vision, especially those that can occur in children and adolescents, whose use of wireless devices has grown exponentially within the past few years.

The Telecom industry's fifth generation (5G) wireless service will require the placement of many times more small antennae/cell towers close to all recipients of the service, because solid structures, rain and foliage block the associated millimeter wave RFR (72). Frequency bands for 5G are separated into two different frequency ranges. Frequency Range 1 (FR1) includes sub-6 GHz frequency bands, some of which are bands traditionally used by previous standards, but has been extended to cover potential new spectrum offerings from 410 to 7,125 MHz. Frequency Range 2 (FR2) includes higher frequency bands from 24.25 to 52.6 GHz. Bands in FR2 are largely of millimeter wave length, these have a shorter range but a higher available bandwidth than bands in the FR1. 5G technology is being developed as it is also being deployed, with large arrays

of directional, steerable, beam-forming antennae, operating at higher power than previous technologies. 5G is not stand-alone—it will operate and interface with other (including 3G and 4G) frequencies and modulations to enable diverse devices under continual development for the "internet of things," driverless vehicles and more (72).

Novel 5G technology is being rolled out in several densely populated cities, although potential chronic health or environmental impacts have not been evaluated and are not being followed. Higher frequency (shorter wavelength) radiation associated with 5G does not penetrate the body as deeply as frequencies from older technologies although its effects may be systemic (73, 74). The range and magnitude of potential impacts of 5G technologies are under-researched, although important biological outcomes have been reported with millimeter wavelength exposure. These include oxidative stress and altered gene expression, effects on skin and systemic effects such as on immune function (74). *In vivo* studies reporting resonance with human sweat ducts (73), acceleration of bacterial and viral replication, and other endpoints indicate the potential for novel as well as more commonly recognized biological impacts from this range of frequencies, and highlight the need for research before population-wide continuous exposures.

GAPS IN APPLYING CURRENT EVIDENCE

Current exposure limits are based on an assumption that the only adverse health effect from RFR is heating from short-term (acute), time-averaged exposures (75). Unfortunately, in some countries, notably the US, scientific evidence of the potential hazards of RFR has been largely dismissed (76). Findings of carcinogenicity, infertility and cell damage occurring at daily exposure levels—within current limits—indicate that existing exposure standards are not sufficiently protective of public health. Evidence of carcinogenicity alone, such as that from the NTP study, should be sufficient to recognize that current exposure limits are inadequate.

Public health authorities in many jurisdictions have not yet incorporated the latest science from the U.S. NTP or other groups. Many cite 28-year old guidelines by the *Institute of Electrical and Electronic Engineers* which claimed that "Research on the effects of chronic exposure and speculations on the biological significance of non-thermal interactions have not yet resulted in any meaningful basis for alteration of the standard" (77)[2].

Conversely, some authorities have taken specific actions to reduce exposure to their citizens (78), including testing and recalling phones that exceed current exposure limits.

While we do not know how risks to individuals from using cell phones may be offset by the benefits to public health of being able to summon timely health, fire and police emergency services, the findings reported above underscore the importance of evaluating potential adverse health effects from RFR exposure, and taking pragmatic, practical actions to minimize exposure.

We propose the following considerations to address gaps in the current body of evidence:

- As many claim that we should by now be seeing an increase in the incidence of brain tumors if RFR causes them, ignoring the increases in brain tumors summarized above, a detailed evaluation of age-specific, location-specific trends in the incidence of gliomas in many countries is warranted.
- Studies should be designed to yield the strongest evidence, most efficiently:
  - ➢ Population-based case-control designs can be more statistically powerful to determine relationships with rare outcomes such as glioma, than cohort studies. Such studies should explore the relationship between energy absorption (SAR[3]), duration of exposure, and adverse outcomes, especially brain cancer, cardiomyopathies and abnormal cardiac rythms, hematologic malignancies, thyroid cancer.
  - ➢ Cohort studies are inefficient in the study of rare outcomes with long latencies, such as glioma, because of cost-considerations relating to the follow-up required of very large cohorts needed for the study of rare outcomes. In addition, without continual resource-consuming follow-up at frequent intervals, it is not possible to ascertain ongoing information about changing technologies, uses (e.g., phoning vs. texting or accessing the Internet) and/or exposures.
  - ➢ Cross-sectional studies comparing high-, medium-, and low-exposure persons may yield hypothesis-generating information about a range of outcomes relating to memory, vision, hearing, reaction-time, pain, fertility, and sleep patterns.
- Exposure assessment is poor in this field, with very little fine-grained detail as to frequencies and modulations, doses and dose rates, and peak exposures, particularly over the long-term. Solutions such as wearable meters and phone apps have not yet been incorporated in large-scale research.
- Systematic reviews on the topic could use existing databases of research reports, such as the one created by *Oceania Radiofrequency Science Advisory Association* (79) or EMF Portal (80), to facilitate literature searches.
- Studies should be conducted to determine appropriate locations for installation of antennae and other broadcasting systems; these studies should include examination of biomarkers of inflammation, genotoxicity, and other health indicators in persons who live at different radiuses around these installations. This is difficult to study in the general population because many people's greatest exposure arises from their personal devices.
- Further work should be undertaken to determine the distance that wireless technology antennae should be kept away from humans to ensure acceptable levels of safety, distinguishing among a broad range of sources (e.g., from commercial transmitters to Bluetooth devices), recognizing that exposures fall with the inverse of the square of the distance

[2]The FCC adopted the IEEE C95.1 1991 standard in 1996.

[3]When necessary, SAR values should be adjusted for age of child in W/kg.

(The inverse-square law specifies that intensity is inversely proportional to the square of the distance from the source of radiation). The effective radiated power from cell towers needs to be regularly measured and monitored.

POLICY RECOMMENDATIONS BASED ON THE EVIDENCE TO DATE

At the time of writing, a total of 32 countries or governmental bodies within these countries[4] have issued policies and health recommendations concerning exposure to RFR (78). Three U.S. states have issued advisories to limit exposure to RFR (81–83) and the *Worcester Massachusetts Public Schools* (84) voted to post precautionary guidelines on Wi-Fi radiation on its website. In France, Wi-Fi has been removed from pre-schools and ordered to be shut off in elementary schools when not in use, and children aged 16 years or under are banned from bringing cell phones to school (85). Because the national test agency found 9 out of 10 phones exceeded permissible radiation limits, France is also recalling several million phones.

We therefore recommend the following:

1. Governmental and institutional support of data collection and analysis to monitor potential links between RFR associated with wireless technology and cancers, sperm, the heart, the nervous system, sleep, vision and hearing, and effects on children.
2. Further dissemination of information regarding potential health risk information that is in wireless devices and manuals is necessary to respect users' *Right To Know*. Cautionary statements and protective measures should be posted on packaging and at points of sale. Governments should follow the practice of France, Israel and Belgium and mandate labeling, as for tobacco and alcohol.
3. Regulations should require that any WTD that could be used or carried directly against the skin (e.g., a cell phone) or in close proximity (e.g., a device being used on the lap of a small child) be tested appropriately as used, and that this information be prominently displayed at point of sale, on packaging, and both on the exterior and within the device.
4. IARC should convene a new working group to update the categorization of RFR, including current scientific findings that highlight, in particular, risks to youngsters of subsequent cancers. We note that an IARC Advisory Group has recently recommended that RFR should be re-evaluated by the IARC Monographs program with high priority.
5. The World Health Organization (WHO) should complete its long-standing RFR systematic review project, using strong modern scientific methods. National and regional public health authorities similarly need to update their understanding and to provide adequate precautionary guidance for the public to minimize potential health risks.
6. Emerging human evidence is confirming animal evidence of developmental problems with RFR exposure during pregnancy. RFR sources should be avoided and distanced from expectant mothers, as recommended by physicians and scientists (babysafeproject.org).
7. Other countries should follow France, limiting RFR exposure in children under 16 years of age.
8. Cell towers should be distanced from homes, daycare centers, schools, and places frequented by pregnant women, men who wish to father healthy children, and the young.

Specific examples of how the health policy recommendations above, invoking the Precautionary Principle, might be practically applied to protect public health, are provided in the **Annex**.

[4]Argentina, Australia, Austria, Belgium, Canada, Chile, Cyprus, Denmark, European Environmental Agency, European Parliament, Finland, France, French Polynesia, Germany, Greece, Italy, India, Ireland, Israel, Namibia, New Zealand, Poland, Romania, Russia, Singapore, Spain, Switzerland, Taiwan, Tanzania, Turkey, United Kingdom, United States.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

ACKNOWLEDGMENTS

The authors acknowledge the contributions of Mr. Ali Siddiqui in drafting the Policy Recommendations, and those from members of the Board of the *International Network for Epidemiology in Policy* (INEP) into previous iterations of this manuscript. We are grateful to external reviewers for their thoughtful critiques that have served to improve both accuracy and presentation.This manuscript was initially developed by the authors as a draft of a Position Statement of INEP. The opportunity was then provided to INEP's 23 member organizations to endorse what the INEP Board had recommended, but 12 of those member organizations elected not to vote. Of the 11 that did vote, three endorsed the statement, two voted against it, and six abstained. Ultimately, the Board voted to abandon its involvement with what it determined to be a divisive topic. The authors then decided that, in the public interest, the document should be published independent of INEP.

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Conflict of Interest Statement: The authors declare that this manuscript was drafted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest, although subsequent to its preparation, DD became a consultant to legal counsel representing persons with glioma attributed to radiation from cell phones.

ANNEX: EXAMPLES OF ACTIONS FOR REDUCING RFR EXPOSURE

1. Focus actions for reducing exposure to RFR on pregnant women, infants, children and adolescents, as well as males who might wish to become fathers.
2. Reduce, as much as possible, the extent to which infants and young children are exposed to RFR from Wi-Fi-enabled devices such as baby monitors, wearable devices, cell phones, tablets, etc.
3. Avoid placing cell towers and small cell antennae close to schools and homes pending further research and revision of the existing exposure limits. In schools, homes and the workplace, cable or optical fiber connections to the Internet are preferred. Wi-Fi routers in schools and daycares/kindergartens should be strongly discouraged and programs instituted to provide Internet access via cable or fiber.
4. Ensure that WTDs minimize radiation by transmitting only when necessary, and as infrequently as is feasible. Examples include transmitting only in response to a signal (e.g., accessing a router or querying a device, a cordless phone handset being turned on, or voice or motion activation). Prominent, visible power switches are needed to ensure that WTDs can be easily turned on only when needed, and off when not required (e.g., Wi-Fi when sleeping).
5. Lower permitted power densities in close proximity to fixed-site antennae, from "occupational" limits to exposure limits for the general public.
6. Update current exposure limits to be protective against the non-thermal effects of RFR. Such action should be taken by all heath ministries and public health agencies, as well as industry regulatory bodies. Exposure limits should be based on measurements of RFR levels related to biological effects (2).
7. Ensure that advisories relating to cell phone use are placed in such a way that purchasers can find them easily, similar to the Berkeley Cell Phone "Right to Know" Ordinance (86).
8. Advise the public that texting and speaker mode are preferable to holding cell phones to the ear. Alternatively, use hands-free accessories for cell phones, including air tube headsets that interrupt the transmission of RFR.
9. When possible, keep cell phones away from the body (e.g., on a nearby desk, in a purse or bag, or on a mounted hands-free accessory in motor vehicles).
10. Delay the widespread implementation of 5G (and any other new technology) until studies can be conducted to assess safety. This includes a wide range of household and community-wide infrastructure WTDs and self-driving vehicles, as well as the building of 5G minicells.
11. Fiber-optic connections for the Internet should be made available to every home, office, school, warehouse and factory, when and where possible.

GLOSSARY

ALARA	As Low a level As Reasonably Achievable
CBTRUS	Central Brain Tumor Registry of the United States
CI	Confidence Interval
EMR	Electro Magnetic Radiation
IARC	International Agency for Research on Cancer
ICNIRP	International Commission on Non-Ionizing Radiation Protection
INEP	International Network for Epidemiology in Policy
LTE	Long-Term Evolution modulation
NTP	U.S. National Toxicology Program
OR	Odds Ratio
RFR	Radio-Frequency Radiation
SAR	Specific Absorption Rate
WTD	Wireless Transmitting Device

November 24, 2021

The Honorable Jessica Rosenworcel, Commissioner
Acting Chairwoman
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Dear Chairwoman Rosenworcel,

We write to you as scientists and public health experts deeply committed to protecting public health and the environment. As authors of numerous publications and reports in the field we urge that the FCC ensure a robust review of the latest science and expert recommendations in the FCC's upcoming reexamination of its Inquiry on human exposure limits for wireless radiation. The major scientific developments of the last two years must be included in the FCC review- especially in the new 5G environment where wireless is ubiquitous.

We request the FCC reopen Docket #13-84 "Reassessment of FCC Radiofrequency Exposure Limits and Policies" and Docket #03-137 'Proposed Changes to the Commission Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields" in order to refresh the record before issuing a final response to the recent August 13, 2021 judgment by the U.S. Court of Appeals for the District of Columbia Circuit, in Environmental Health Trust et al. v. the FCC.

Furthermore, as the FCC does not have expertise in interpreting scientific studies, it relies on input from federal health agencies and knowledgeable expert organizations to evaluate the scientific evidence and the adequacy of FCC limits. However the relevant US health and safety agencies have not reviewed the research on impacts to flora and fauna; long-term exposures from cell towers; children's unique vulnerability; and health effects such as damage to the brain and reproduction. The court noted that the "silence" of federal agencies such as the National Cancer Institute, the Environmental Protection Agency, the Centers for Disease Control and Prevention, and the National Institute for Occupational Safety and Health does not mean these agencies agree with the FCC's 1996 limits. In fact, none of these agencies has systematically reviewed the totality of science in their respective area of expertise both to develop safety standards and to offer an analysis of the adequacy of FCC's 1996 wireless exposure limits.

Accordingly, we recommend that the FCC record be reopened with ample time to allow for new substantive comments. U.S. safety limits for cell phones and cell towers must rest on sound science to ensure the public and wildlife are protected.

Importantly, we also recommend a full environmental impact review to evaluate 5G and the rapid proliferation of 4G wireless antennas in the USA. A three part review published in Reviews in Environmental Health found the scientific evidence showing adverse effects is sufficient to trigger new regulatory action to protect wildlife, yet the US does not have regulations that were ever designed to protect flora and fauna (1). Instead, the FCC is fast tracking small cell deployment and opening new

spectrum disregarding recent research which finds, for example, that the higher frequencies of 5G can result in higher absorption rates into the bodies of pollinators.

In addition, experts are warning that 5G will contribute to climate change and have documented the exponentially increasing energy demands of 5G networks, "smart" wireless devices, and other new communication technologies. As the FCC has projected hundreds of thousands of new wireless facilities, we recommend a full environmental assessment for the 5G rollout and 4G wireless network densification.

The scientific evidence has substantially increased over the last two years (2). In 2020 scientists of the National Institute of Environmental Health Sciences National Toxicology Program published their animal-study findings of "significant increases in DNA damage" in groups of mice and rats after just 14 to 19 weeks of exposure to cell phone radiation (3). A 2021 analysis published by the Environmental Working Group concluded FCC limits should be 200 to 400 times more protective than the whole-body exposure limit set by the FCC in 1996 (4). Unaware of the scientists calling for caution, school districts nationwide are deploying high-capacity Wi-Fi networks in school buildings, testing out 5G networks with students, and signing leases with companies to install cell towers on school property, relying on these outdated FCC limits. As the American Academy of Pediatrics and numerous other specialists have noted, children are uniquely vulnerable to wireless radiation (5).

Health risks should be assessed by experts with no conflicts of interest. The FCC should not rely on the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a small 14 member privately constituted invite only Commission lacking in transparency whose self-appointed membership has conflicts of interest and industry ties (6). ICNIRP has rejected the NTP and Ramazzini Institute animal studies with unfounded criticisms (7). Further, ICNIRP has not shown any systematic review of the totality of the research such as impacts to the developing brain and damage to reproduction. It has never conducted a comprehensive evaluation of human health and environmental risks associated with RF radiation. Their exposure guidelines are based solely on protecting against heating effects, with no change of concept since 1998, two years after the FCC adopted human exposure guidelines in 1996.

Broadband internet provides the connectivity that enables Americans to do their jobs, to participate equally in school learning and health care, and to create a fairer playing field by eliminating the digital divide. The United States must bridge the digital divide with a "future-proof" broadband infrastructure with wired *rather than wireless* connections to and through homes, schools and businesses that is affordable, reliable, high-speed, and sustainable.

Wherever possible, we urge that the broadband system rely on wired connections, rather than wireless connections. Wired connections are safer, faster, more secure, more energy efficient, and more reliable. Wired connections are especially important for schools and other institutions where they will save money and reduce exposure to wireless radiation.

Our experts stand ready to provide more detailed information to you on this important issue, including elaborating on materials and assistance with evaluating the science and impacts on humans, climate, animals, and wilderness.

Sincerely,

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3. Smith-Roe, SL., et al. (2020) "Evaluation of the genotoxicity of cell phone radiofrequency radiation in male and female rats and mice following subchronic exposure." Environmental and molecular mutagenesis, Feb;61(2):276-290
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November 19, 2021

The Honorable Jessica Rosenworcel
Chairwoman
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Dear Chairwoman Rosenworcel,

The Environmental Working Group, a nonprofit public health research and advocacy organization with offices in Washington, D.C, Minneapolis, and Sacramento, Calif., requests that the Federal Communications Commission reopen Docket #13-84, "Reassessment of FCC Radiofrequency Exposure Limits and Policies," and Docket #03-137, "Proposed Changes to the Commission Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields," to allow robust review and consideration of scientific evidence published in the past two years and in response to the court ruling in *Environmental Health Trust et al. v. the FCC*.

Since 2009, the Environmental Working Group has extensively researched the topic of the human and environmental health impacts of radiofrequency radiation emitted from wireless communication devices. EWG also closely follows regulatory approaches and recommendations on radiofrequency radiation made by authoritative health agencies around the world. The World Health Organization states on its website:

> *… during the 20th century, environmental exposure to man-made sources of EMF steadily increased due to electricity demand, ever-advancing wireless technologies and changes in work practices and social behaviour. Everyone is exposed to a complex mix of electric and magnetic fields at many different frequencies, at home and at work, and concern continues to grow over possible health effects from overexposure*.[1]

Extensive research literature points to the potential health risks of radiofrequency radiation, particularly for the developing child. Peer-reviewed studies show that the

[1] World Health Organization, web page not dated, "Supporting the development of national policies on electromagnetic fields". https://www.who.int/activities/supporting-the-development-of-national-policies-on-electromagnetic-fields Accessed Nov. 16, 2021.

bodies of children absorb more radiofrequency radiation, compared to adults, putting children at greater health risk as a result to such exposure.[2]

Scientists and public health advocates have raised concerns for decades about the adverse health effects of exposure to electromagnetic radiation. Recent research publications highlight the severity of these impacts, especially among vulnerable populations, and the need for more stringent health-based exposure standards. In 2011, the International Agency for Research on Cancer (IARC), an agency of the World Health Organization, classified radiofrequency electromagnetic fields as "possibly carcinogenic to humans."[3]

For today's generation of children, exposure to radiofrequency radiation from wireless communication devices starts from the fetal development period as a result of wireless devices in the pregnant person's everyday environment. Following birth, today's children will be exposed to radiofrequency radiation throughout their lives – an exposure scenario that is drastically different from the very limited consumer use and exposure to wireless radiation of the 1980s and 1990s, when the basis for current FCC standards was established.

This comment letter highlights two key considerations that point to the need for the FCC to reassess existing radiofrequency exposure limits and policies:

1. A 2021 peer-reviewed publication we authored that uses Environmental Protection Agency methodology to determine protective health-based exposure limits for radiofrequency radiation, based on the U.S. government's landmark 2018 laboratory study; and
2. Recent literature that documents a range of effects of non-ionizing electromagnetic radiation on different body systems that current FCC standards do not take into account.

1. Health-based limits developed with consideration for children's health

[2] 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; 167:694-699. https://doi.org/10.1016/j.envres.2018.05.013; Gandhi OP, Morgan LL, de Salles AA, Han YY, Herberman RB, Davis DL. Exposure limits: the underestimation of absorbed cell phone radiation, especially in children. Electromagn Biol Med. 2012; 31(1):34-51. https://doi.org/10.3109/15368378.2011.622827

[3] International Agency for Research on Cancer. IARC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans. Press Release N: 208. 2011. https://www.iarc.who.int/wp-content/uploads/2018/07/pr208_E.pdf Accessed Nov. 16, 2021.

A peer-reviewed article published by our organization in 2021 (Uche & Naidenko, 2021)[4] documented how the current FCC exposure limit for radiofrequency radiation is not sufficient to protect the general population, especially children, against the adverse impacts associated with radiofrequency radiation exposure. The current limit, last revised a quarter-century ago – well before wireless devices became ubiquitous – needs to be updated with the latest science to be fully health protective for all users of wireless communication technologies.

Our study, published in the journal *Environmental Health*, recommends strict, lower health-based exposure standards for both children and adults for radiofrequency radiation emitted from wireless devices. This recommendation draws on data from a landmark 2018 study from the National Toxicology Program, one of the largest long-term laboratory studies on the health effects of radiofrequency radiation exposure.[5]

EWG's study used an approach similar to the methodology that the U.S. EPA developed to assess human health risks arising from toxic chemical exposures. EWG study recommends a whole-body specific absorption rate (SAR) limit of 0.2 to 0.4 mW/kg for children, which is 200 to 400 times lower than the current federal whole-body exposure limit. For adults, EWG recommends a whole-body specific absorption rate limit of 2 to 4 mW/kg, which is 20 to 40 times lower than the federal limit (Uche & Naidenko, 2021).[4]

EWG's analysis and recommendation for a much stricter limit for radiofrequency radiation exposure is a step toward advancing a re-evaluation of the existing federal limit for radiofrequency radiation exposure while reviewing the latest research on radiofrequency radiation exposure.

2. Wide range of potential impacts of non-ionizing electromagnetic radiation on human health not accounted for in the current FCC standard

[4] Uche UI, Naidenko OV. Development of health-based exposure limits for radiofrequency radiation from wireless devices using a benchmark dose approach. Environ Health. 2021; 20(1):84. https://doi.org/10.1186/s12940-021-00768-1

[5] National Toxicology Program. 595: NTP 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, US Department of Health and Human Services. 2018. https://ntp.niehs.nih.gov/ntp/htdocs/lt_rpts/tr595_508.pdf?utm_source=direct&utm_medium=prod&utm_campaign=ntpgolinks&utm_term=tr595

The current FCC standard was based on the 1986 recommendations of the National Council on Radiation Protection and Measurements[6] and 1991 recommendations of the Institute of Electrical and Electronics Engineers,[7] which chose an exposure level based on behavioral changes observed in laboratory animals exposed to radiofrequency radiation for a duration of minutes to hours in studies conducted in the 1970s and 1980s. With extensive current research linking radiofrequency exposure to adverse impacts, even at exposure levels below the current federal limit, the FCC needs to review the latest science and update the allowable exposure limits.

Among the reported biological effects of electric and magnetic fields are harm to fetal growth and development (Ozgur et al., 2013);[8] changes in brain activity (Wallace and Selmaoui, 2019);[9] changes in heart rate variability (Wallace et al., 2020);[10] DNA damage (Smith-Roe et al., 2020);[11] cognitive effects (Azimzadeh and Jelodar);[12] and increased risk of cancer, including gliomas,[3] parotid gland tumors (Sadetzki et al., 2008),[13] thyroid cancers (Luo et al., 2019).[14] These adverse health effects may be associated with different mechanistic pathways, such as changes in the activity of voltage-gated calcium

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[6] National Council on Radiation Protection and Measurements. Biological effects and exposure criteria for radiofrequency electromagnetic fields: NCRP Report No. 86; 1986. Available from: https://ncrponline.org/shop/reports/report-no-086-biological-effects-and-exposure-criteria-for-radiofrequency-electromagnetic-fields-1986/

[7] Institute of Electrical and Electronics Engineers. (Revision of ANSI C95.1–1982). IEEE standard for safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz. IEEE Std C95. 1991. https://doi.org/10.1109/IEEESTD.1992.101091

[8] Ozgur E, Kismali G, Guler G, Akcay A, Ozkurt G, Sel T, et al. Effects of prenatal and postnatal exposure to GSM-like radiofrequency on blood chemistry and oxidative stress in infant rabbits, an experimental study.
Cell Biochem Biophys. 2013;67(2):743–51. https://doi.org/10.1007/s12013- 013- 9564-1

[9] Wallace J, Selmaoui B. Effect of mobile phone radiofrequency signal on the alpha rhythm of human waking EEG: a review. Environ Res. 2019; 175:274–86. https://doi.org/10.1016/j.envres.2019.05.016

[10] Wallace J, Andrianome S, Ghosn R, Blanchard ES, Telliez F, Selmaoui B.Heart rate variability in healthy young adults exposed to global system for mobile communication (GSM) 900-MHz radiofrequency signal from mobile phones. Environ Res. 2020; 191:110097. https://doi.org/10.1016/j.envres.2020.110097

[11] Smith-Roe SL, Wyde ME, Stout MD, Winters JW, Hobbs CA, Shepard KG, et al. Evaluation of the genotoxicity of cell phone radiofrequency radiation in male and female rats and mice following subchronic exposure. Environ Mol Mutagen. 2020; 61(2):276–90. https://doi.org/10.1002/em.22343

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[13] Sadetzki S, Chetrit A, Jarus-Hakak A, Cardis E, Deutch Y, Duvdevani S, et al. Cellular phone use and risk of benign and malignant parotid gland tumors – a nationwide case-control study. Am J Epidemiol. 2008;167(4):457–67. https://doi.org/10.1093/aje/kwm325

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channels (Blackman et al., 1991);[15] changes in the concentrations of reactive oxygen species and redox homeostasis (Ertilav et al., 2018);[16] changes in intracellular enzymes and gene expression (Fragopoulou et al.,2018);[17] and changes in membrane permeability (Perera et al., 2018).[18]

Table 1. Extensive research points to effects of non-ionizing electromagnetic radiation on individual body systems that are not considered by the current FCC standards for cell phone radiation.

Reported health effects	**Key studies**
Elevated risk of brain cancer, breast cancer, parotid gland tumors, and thyroid cancer	Choi YJ, Moskowitz JM, Myung SK, Lee YR, Hong YC. Cellular Phone Use and Risk of Tumors: Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2020; 17(21):8079. West JG, Kapoor NS, Liao SY, Chen JW, Bailey L, Nagourney RA. Multifocal Breast Cancer in Young Women with Prolonged Contact between Their Breasts and Their Cellular Phones. Case Rep Med. 2013; 2013:354682 Sadetzki S, Chetrit A, Jarus-Hakak A, Cardis E, Deutch Y, Duvdevani S, et al. Cellular phone use and risk of benign and malignant parotid gland tumors – a nationwide case-control study. American journal of epidemiology 2008; 167(4):457-67. Luo J, Li H, Deziel NC, Huang H, Zhao N, Ma S, et al. Genetic susceptibility may modify the association between cell phone

[15] Blackman C, Benane S, House D. The influence of temperature during electric-and magnetic-field-induced alteration of calcium-ion release from in vitro brain tissue. Bioelectromagnetics. 1991;12(3):173–82. https://doi.org/10.1002/bem.2250120305

[16] Ertilav K, Uslusoy F, Ataizi S, Nazıroğlu M. Long term exposure to cellphone frequencies (900 and 1800 MHz) induces apoptosis, mitochondrial oxidative stress and TRPV1 channel activation in the hippocampus and dorsal root ganglion of rats. Metab Brain Dis. 2018;33(3):753–63. https://doi.org/10.1007/s11011-017-0180-4

[17] Fragopoulou AF, Polyzos A, Papadopoulou MD, Sansone A, Manta AK, Balafas E, et al. Hippocampal lipidome and transcriptome profile alterations triggered by acute exposure of mice to GSM 1800 MHz mobile phone radiation: an exploratory study. Brain Behavior. 2018; 8(6):e01001. https://doi.org/10.1002/brb3.1001

[18] Perera PGT, Nguyen THP, Dekiwadia C, Wandiyanto JV, Sbarski I, Bazaka O, et al. Exposure to high-frequency electromagnetic field triggers rapid uptake of large nanosphere clusters by pheochromocytoma cells. Int J Nanomed. 2018;13:8429. https://doi.org/10.2147/IJN.S183767

	use and thyroid cancer: A population-based case-control study in Connecticut. Environmental Research. 2020; 182:109013.
Eye strain, damage to eye tissues cataracts	Bormusov E, P Andley U, Sharon N, Schächter L, Lahav A, Dovrat A. Non-thermal electromagnetic radiation damage to lens epithelium. Open Ophthalmol J. 2008; 2:102-6
Cardiomyopathy, heart rate variability	National Toxicology Program. 2018. 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. Wallace J, Andrianome S, Ghosn R, Blanchard ES, Telliez F, Selmaoui B. Heart rate variability in healthy young adults exposed to global system for mobile communication (GSM) 900-MHz radiofrequency signal from mobile phones. Environmental Research 2020; 191:110097
Damage to sperm, decreased male fertility	Kesari KK, Agarwal A, Henkel R. Radiations and male fertility. Reprod Biol Endocrinol. 2018; 16(1):118
Changes in brain activity Changes in blood-brain barrier	Volkow ND, Tomasi D, Wang G-J, Vaska P, Fowler JS, Telang F, et al. Effects of cell phone radiofrequency signal exposure on brain glucose metabolism. JAMA 2011; 305(8):808-13 Wallace J, Selmaoui B. Effect of mobile phone radiofrequency signal on the alpha rhythm of human waking EEG: A review. Environmental research. 2019; 175:274-86
Changes in the immune system function	Piszczek P, Wójcik-Piotrowicz K, Gil K, Kaszuba-Zwoińska J. Immunity and electromagnetic fields. Environ Res. 2021; 200:111505.

As documented in Table 1, exposure to non-ionizing electromagnetic fields can harm a variety of organs and body systems, highlighting the urgency of a public-health-focused reassessment of existing exposure limits for radiofrequency radiation. Further, exposure to non-ionizing electromagnetic fields during pregnancy has been associated with an

increased risk of miscarriage (Li et al., 2017)[19] and an increased frequency of hyperactivity and inattention during early childhood (Birks et al., 2017).[20]

In conclusion, the Environmental Working Group urges the FCC to open its record for a more comprehensive evaluation of radiofrequency radiation and update its standard to ensure the safety of wireless radiation devices for everyone, especially young children.

Submitted on behalf of the Environmental Working Group,

Uloma Igara Uche, Ph.D.
Environmental Health Science Fellow
Environmental Working Group

Olga V. Naidenko, Ph.D.
Vice President, Science Investigations
Environmental Working Group

[19] Li DK, Chen H, Ferber JR, Odouli R, Quesenberry C. Exposure to Magnetic Field Non-Ionizing Radiation and the Risk of Miscarriage: A Prospective Cohort Study. Sci Rep. 2017; 7(1):17541. https://doi.org/10.1038/s41598-017-16623-8

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November 9, 2021

The Honorable Jessica Rosenworcel, Commissioner
Acting Chairwoman
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Dear Chairwoman Rosenworcel,

I am writing to request that the FCC re-open Docket #13-84 "Reassessment of FCC Radiofrequency Exposure Limits and Policies" and Docket #03-137" Proposed Changes to the Commission Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields- in order to refresh the record before responding to the mandate of the August 13, 2021 judgment by the U.S. Court of Appeals for the District of Columbia Circuit, in Environmental Health Trust et al. v. the FCC.

I am Professor and Chair Emeritus at the University of New Hampshire Department of Electrical & Computer Engineering and served on the New Hampshire State Commission on 5G Technology. After a year of investigation we issued our final report on November 1, 2020.

I want to ensure the fifteen recommendations of the expert New Hampshire State Commission are considered by the FCC. If the FCC does not re-open the record, the Report will not be available to the Commission as it was finalized in 2020.

Sincerely

Digitally signed by Kent Chamberlin
Date: 2021.11.09 21:21:17 -05'00'

Kent Chamberlin, PhD
Professor & Chair Emeritus

New Hampshire State Commission on 5G Technology Final Report Recommendations

RECOMMENDATION 1

Propose a resolution of the House to the US Congress and Executive Branch to require the Federal Communication Commission (FCC) to commission an independent review of the current radiofrequency (RF) standards of the electromagnetic radiation in the 300MHz to 300GHz microwave spectrum as well as a health study to assess and recommend mitigation for the health risks associated with the use of cellular communications and data transmittal.

RECOMMENDATION 2

Require that the most appropriate agency (agencies) of the State of New Hampshire include links on its (their) website(s) that contain information and warnings about RF-radiation from all sources, but specifically from 5G small cells deployed on public rights-of-way as well as showing the proper use of cell phones to minimize exposure to RF-radiation, with adequate funding granted by the Legislature. In addition, public service announcements on radio, television, print media, and internet should periodically appear, warning of the health risks associated with radiation exposure. Of significant importance are warnings concerning the newborn and young as well as pregnant women.

RECOMMENDATION 3

Require every pole or other structure in the public rights of- way that holds a 5G antenna be labeled indicating RF-radiation being emitted above. This label should be at eye level and legible from nine feet away.

RECOMMENDATION 4

Schools and public libraries should migrate from RF wireless connections for computers, laptops, pads, and other devices, to hardwired or optical connections within a five-year period starting when funding becomes available.

RECOMMENDATION 5

Signal strength measurements must be collected at all wireless facilities as part of the commissioning process and as mandated by state or municipal ordinances. Measurements are also to be collected when changes are made to the system that might affect its radiation, such as changes in the software controlling it. Signal strength is to be assessed under worst-case conditions in regions surrounding the tower that either are occupied or are accessible to the public, and the results of the data collection effort is to be made available to

the public via a website. In the event that the measured power for a wireless facility exceeds radiation thresholds, the municipality is empowered to immediately have the facility taken offline. The measurements are to be carried out by an independent contractor and the cost of the measurements will be borne by the site installer.

RECOMMENDATION 6

Establish new protocols for performing signal strength measurements in areas around wireless facilities to better evaluate signal characteristics known to be deleterious to human health as has been documented through peer-reviewed research efforts. Those new protocols are to take into account the impulsive nature of high-data-rate radiation that a growing –body of evidence shows as having a significantly greater negative impact on human health than does continuous radiation. The protocols will also enable the summative effects of multiple radiation sources to be measured.

RECOMMENDATION 7

Require that any new wireless antennas located on a state or municipal right-of-way or on private property be set back from residences, businesses, and schools. This should be enforceable by the municipality during the permitting process unless the owners of residences, businesses, or school districts waive this restriction.

RECOMMENDATION 8

Upgrade the educational offerings by the NH Office of Professional Licensure and Certification (OPLC) for home inspectors to include RF intensity measurements.

RECOMMENDATION 9

The State of New Hampshire should begin an effort to measure RF intensities within frequency ranges throughout the state, with the aim of developing and refining a continually updated map of RF exposure levels across the state using data submitted by state-trained home inspectors.

RECOMMENDATION 10

Strongly recommend all new cell phones and all other wireless devices sold come equipped with updated software that can stop the phone from radiating when positioned against the body.

RECOMMENDATION 11

Promote and adopt a statewide position that would strongly encourage moving forward with the deployment of fiber optic cable connectivity, internal wired connections, and optical wireless to serve all commercial and public properties statewide.

RECOMMENDATION 12

Further basic science studies are needed in conjunction with the medical community outlining the characteristics of expressed clinical symptoms related to radio frequency radiation exposure.The majority of the Commission feels the medical community is in the ideal position to clarify the clinical presentation of symptoms precipitated by the exposure to radio frequency radiation consistent with the Americans with Disabilities Act (ADA) which identifies such a disability. The medical community can also help delineate appropriate protections and protocols for affected individuals. All of these endeavors (basic science, clinical assessment, epidemiological studies) must be completely independent and outside of commercial influence.

RECOMMENDATION 13

Recommend the use of exposure warning signs to be posted in commercial and public buildings. In addition, encourage commercial and public buildings, especially healthcare facilities, to establish RF-radiation free zones where employees and visitors can seek refuge from the effects of wireless RF emissions.

RECOMMENDATION 14

The State of New Hampshire should engage agencies with appropriate scientific expertise, including ecological knowledge, to develop RF-radiation safety limits that will protect the trees, plants, birds, insects, and pollinators.

RECOMMENDATION 15

The State of New Hampshire should engage our Federal Delegation to legislate that under the National Environmental Policy Act (NEPA) the FCC do an environmental impact statement as to the effect on New Hampshire and the country as a whole from the expansion of RF wireless technologies.

November 24, 2021

The Honorable Jessica Rosenworcel
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Dear Chairwoman Rosenworcel,

I am a physician in France and for the past fifteen years I have been working on the documented health issues related to cell phone radiation as well as the cell phone SAR test procedures.

In regards to the recent U.S. DC Circuit Court of Appeals' ruling in EHT v FCC, we are writing to request that the FCC re-open Dockets #13-84 and #03-137 to allow new, significant policy developments and research be included for consideration because of it's relevance to the FCC examining its cell phone SAR testing procedures.

I am President of the Phonegate Alerte Association, formed in 2018 and our efforts to ensure transparency have led to the French government's actions to withdraw or update at least 23 models of cell phones from different manufacturers (Xiaomi, Nokia, Huawei, Wiko, Alcatel, etc.) because they were found to exceed European Union regulatory SAR limits for human exposure to radiofrequency radiation.

Similar to the FCC's regulations on cell phone test procedures, European Union regulations allow manufacturers to test cell phones at 5 mm separation distance from the body. They do not force companies to test cell phones or wireless devices at positions that are directly against the body (0 mm separation distance) *despite the reality that billions of people are using cell phones close to the body.*

The French Government is Requesting 0 mm Cell Phone Radiation Testing

In late 2019, the French government health agency ANSES issued a report[1] on the possible health effects associated with high radiation from mobile telephones carried close to the body and recommended that cell phones be tested at 0 millimeters, instead of 5 mm as the European Commission regulations require. Subsequently, France submitted a formal objection[2] to the European Commission in regards to the

[1] https://www.anses.fr/en/content/exposure-mobile-telephones-carried-close-body
[2] https://ec.europa.eu/docsroom/documents/43448

current compliance test separation distance requirements of only 5 mm. The authorities have requested that compliance test distances be revised to 0 mm

> "*Developments in the use of mobile telephones have led to a wide variety of situations in which telephones are no longer exclusively held close to a person's ear in order to hold a conversation, since they are now also used to send and receive data through various applications for listening to music, playing video games or making video calls, which means that the equipment is used in ways which were not previously foreseen. There is also a growing trend for telephones to be networked with numerous connected objects, such as headsets or watches, which tend to result in lengthy connections between a telephone and the mobile network without the telephone being held in the hand, since it is often carried in clothing and is therefore closer to – or in contact with – the trunk.*
>
> *For this reason, the French authorities believe that it is necessary to revise the harmonised standard EN 50566: 2017 concerning measurements of the SAR of devices that are hand-held or body-mounted in close proximity to the human body so that a maximum distance of 0 mm from the body is taken into consideration."*

The FCC should ensure that cell phones are tested in body contact positions at 0 mm.

For background, in 2016, the French National Frequency Agency (ANFR) officially tested various models of cell phones and found that the majority exceeded regulatory limits when tested in body contact positions - with 0 mm between the phone and simulated body testing device (aka "phantom").

Cell Phones Violate Radiation Limits

Since December 4, 2019 ANFR has posted *143 new cell phone SAR test reports*. Despite the fact that the European Union strengthened their requirements to ensure cell phones were tested at 5 mm from the body, many cell phone models are still violating the limit of 2.0 W/kg for trunk SAR when tested by ANFR (10 g of tissue). All of the test results are posted online[3].

Examples of smartphones that **violated the EU limits of 2.0 W/kg as well as the FCC limit of 1.6 W/kg when SAR radiation tested by the ANFR at 5mm include:**

- February 26, 2020: Sony Xperia 5 violated the limit at 2.64 W/kg.
- November 12, 2020: Essential Heyou 40 violated the limit at 2.54 W/kg[4]
- September 9, 2020: Essential Heyou 60 violated the limit at 2.86 W/kg[5]
- February 26, 2020: Xiaomi Mi Note 10 violated the limit at 2.45 W/kg[6]

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[3] https://data.anfr.fr/explore/dataset/das-telephonie-mobile/table/?disjunctive.marque&disjunctive.modele&dataChart=eyJxdWVyaWVzIjpbeyJjb25maWciOnsiZGF0YXNldCI6ImRhcy10ZWxlcGhvbmllLW1vYmlsZSIsIm9wdGlvbnMiOnsiZGlzanVuY3RpdmUubWFycXVlIjp0cnVlLCJkaXNqdW5jdGl2ZS5tb2RlbGUiOnRydWV9fSwiY2hhcnRzIjpbeyJ0eXBlIjoibGluZSIsImZ1bmMiOiJBVkciLCJ5QXhpcyI6ImRhc190ZXRlX25vcm1lX25mX2VuXzUwMzYwIiwic2NpZW50aWZpY0Rpc3BsYXkiOnRydWUsImNvbG9yIjoiIzY2YzJhNSJ9XSwieEF4aXMiOiJkYXRlX2R1X2NvbnRyb2xlX3Bhcl9sX2FuZnIiLCJtYXhwb2ludHMiOiIiLCJ0aW1lc2NhbGUiOiJ5ZWFyIiwic29ydCI6IiJ9XX0%3D&sort=das_tronc_au_contact

[4] https://www.anfr.fr/das/COM054200035

[5] https://www.anfr.fr/das/COM054200035

[6] https://www.anfr.fr/das/COM006200006/

Examples of smartphones **that would be compliant with the EU limit but would violate the FCC limits of 1.6 W/kg when SAR radiation tested by the ANFR at 5mm include:**

- September 16, 2020 Logicom Le Fleep 178 violated FCC's limit at 1.94 W/kg[7]
- September 16, 2020: Sky 55 Konrow violated FCC's limit at 1.91 W/kg[8]
- September 30, 2020: Wiki Lubi 5 Plus violated FCC's limit at 1.9 W/kg [9]
- September 29, 2020: Nokia 5.1 violated FCC's limit at 1.82 W/kg[10]
- April 8, 2021: Wiko F 300 violated FCC's limit at 1.8 W/kg[11]

As European Union and FCC test procedures utilize different averaging volumes, one cannot directly compare the measurements. However, FCC test procedures could result in even higher SAR violations (Gandhi 2019)[12].

Unfortunately ANFR no longer tests cell phones in body contact positions with 0 mm distance from the phone to the body phantom. If they did, far more of the 143 cell phones tested in the last two years would violate FCC and EU limits because every millimeter can significantly increase exposure. Further, due to the averaging volume differences between the FCC and EU limits, several of the phones that ANFR finds are compliant with the 1.6 W/kg limit would violate the FCC's test procedures.

The FCC presently allows manufacturers to SAR test cell phones with a separation distance between the phone and body (which can be up to approximately one inch from the body in some models of phones still in use in the USA) inaccurately measuring SAR levels into the body. Actual SAR exposure in direct body contact positions would be much higher than FCC test measurements.

New Research on Metal and Radiation Levels

Studies on SAR in human tissue published since 2019 related to cell phone test procedures need to be included in the FCC re-examination. Metal can reflect and refocus cellular radiation, resulting in much higher absorption rates. The FCC, states, "Electrically conductive objects in or on the body may interact with sources of RF energy in ways that are not easily predicted. Examples of conductive objects in the body include implanted metallic objects. Examples of conductive objects on the body include eyeglasses, jewelry, or metallic accessories."

- In January 2021 the study "Experimental Validation for Temperature Rise in Human Tissue Due to Implanted Metal Plates with Screw Holes Using Translucent Solid Phantom" was published in 2020 International Symposium on Antennas and Propagation (ISAP), Osaka, Japan IEEE, 2021 and found increases in SAR enhancement due to the implanted metallic plates observed at specific frequencies. [13]
- On December 2020, the study The effect of metal objects on the SAR and temperature increase in the human head exposed to dipole antenna (numerical analysis) published in Case Studies in Thermal Engineering found "the presence of metal objects in proximity to the head alters SAR and temperature increase within the tissues. In most cases, metal objects redistribute the EM

[7] https://www.anfr.fr/das/COM044200035
[8] https://www.anfr.fr/das/COM044200036
[9] https://www.anfr.fr/das/COM046200002
[10] https://www.anfr.fr/das/COM085200003
[11] https://www.anfr.fr/das/COM057210009
[12] https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8688629
[13] https://ieeexplore.ieee.org/document/9391129

> field incident upon them to a smaller region increasing power absorption, thereby increasing SAR and temperature in that region. The power absorption in head layers is found to be sensitive to metal object's size and shape, and distance of the antenna from the objects".[14]

These are just *a few* of the published studies on radiation levels will not be included in the FCC's examination of cell phone test procedures *unless the FCC refreshes the record.*

Investigative Reports on Telecom Influence

In September 2020, the editor-in-chief of the Program 66 minutes interviewed Chicago Tribune journalist and Pulitzer Prize winner Sam Roe and myself discussing how FCC's cell phone test procedures allow violations of FCC limits because they do not requite cell phones to be tested at 0 mm.[15]

On November 12, 2020, France Télévisions Complément d'Investigation "5G A Wave of Doubt" directed by investigative journalist Nicolas Vescovacci was broadcast on France 2[16]. The investigation described how cell phones exceed radiation thresholds when tested against the body and how cell phones are being taken off the market in response. Importantly, the industry ties of members of International Commission on Non-Ionizing Radiation Protection (ICNIRP) were revealed. In June 2020, a report released by European Members of Parliment Michèle Rivasi (Europe Écologie) and Dr. Klaus Buchner (Ökologisch-Demokratische Partei) found that ICNIRP has long ignored the science on non thermal effects[17].

This 2020 investigative research must be included in the FCC's record review so that the FCC does not inadvertently allow the wireless industry to influence its review of the record and decision.

There is Not a 50-Fold Safety Factor for Cell Phone Local SAR

Furthermore, we would like to importantly note that after we questioned ICNIRP President Rodney Croft and Vice President Eric Van Rongen, we received confirmation that there is not a 50 fold safety factor when it comes to ICNIRP's cell phone local SAR limit.

Here is what Mr. Van Rongen wrote about this:

> "Anyone who states that a reduction factor of 50 applies to local exposures obviously misinterprets the guidelines, although the 1998 guidelines might not have been very clear in that respect the 2020 ones provide more clear information."

On December 17, 2019 Environmental Health Trust and Phonegate Association write members of Congress a letter[18] and Background and Facts document[19] on the urgent need for a hearing regarding cell phone radiation test procedures, due to the excessive radiation the phone can expose the user to in body contact positions.

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[14] https://www.sciencedirect.com/science/article/pii/S2214157X20305311?via%3Dihub
[15] Phonegate : entretien avec le journaliste américain et prix Pulitzer Sam Roe
[16] https://www.francetvinfo.fr/replay-magazine/france-2/complement-d-enquete/complement-d-enquete-5g-londe-dun-doute_4152949.html
[17] https://ehtrust.org/wp-content/uploads/ICNIRP-report-FINAL-JUNE-2020.pdf
[18] https://ehtrust.org/wp-content/uploads/Signed-Letter-to-US-Congress-phonegate-.pdf
[19] Background and Facts Documenting PhoneGate and Our Call for Congressional Action https://ehtrust.org/wp-content/uploads/Background-and-Facts-on-PhoneGate-1-1.pd

We have a significant amount of new data on SAR test methods from 2020 and 2021 to share with the FCC in order to ensure the protection of cell phone users, especially children. SAR tests are thermally based and they are an inadequate measurement to ensure safety. Stronger regulations which protect users from thermal and non-thermal effects are needed.

New Law To Require Radiation Testing of Wi-Fi Laptops, Router and Electronics

In addition, there has been new legislation regarding transparency on wireless radiation in France. Starting in July 2020, the wireless industry must label tablets, laptops, Wi-Fi routers, DECT phones and other wireless connected electronics with the radiofrequency radiation SAR exposure levels for consumers **at point of sale and for all advertising**. This includes the SAR for the head, trunk and extremities. All equipment used close to the head, hand-held or carried close to the body is potentially covered. From the SAR Regulation Guide provided by ANFR, you can find a non-exhaustive list of equipment qualified as radio equipment that required SAR testing.

Note: For years France law[20] has ensured cell phones were SAR radiation labeled, banned the sale of cell phones designed for young children, prohibited advertising to children under 14 years of age[21] and warned[22] users to keep devices away from the body.

It is imperative that the two above-mentioned dockets are re-opened to allow recent developments to be submitted for a proper assessment of FCC's testing protocol.

Sincerely,

Marc Arazi, M.D.

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A book on Phonegate was published by Massot Editions on this international health scandal. An English version is planned and we will be sure to send it to you when it is released in the United States.

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[20] Article 183 - LOI n° 2010-788 du 12 juillet 2010 portant engagement national pour l'environnement (1)
[21] **Law on sobriety, transparency, information and consultation for exposure to electromagnetic waves**
[22] **Order of November 15, 2019 relating to the display of the specific absorption rate of radioelectric equipment and to consumer information NOR: SSAP1834792A**

November 18, 2021

The Honorable Jessica Rosenworcel, Commissioner
Acting Chairwoman
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Dear Chairwoman Rosenworcel,

We are writing to request that the FCC re-open the relevant Dockets to ensure the latest science be included in the FCC's reexamination of the adequacy of its human exposure limits and regulations for radiofrequency radiation exposures.

We urge the Commission to look at new scientific evidence published since December 4, 2019. Of 39 new genetic effect studies, 79 % (31 studies) showed effects and 21 % (8 studies) did not show significant effects. Of 33 new neurological effect studies, 85 % (28 studies) showed effects and 15 % (5 studies) did not show significant effects. Of 30 new oxidative effect studies, 93% (28 studies) showed effects and 7 % (2 studies) did not show significant effects. The preponderance of scientific research on RFR continues on an upward trend.

There is a broad consensus among those in the scientific research community who are knowledgeable on the published literature, that new, biologically-based public safety limits for chronic exposure to radiofrequency radiation (RFR) are warranted now. The available evidence for health risks due to low intensity radiofrequency radiation exposures from wireless technology applications is sufficient and compelling. Research published over the last two years has added significant additional weight to the body of evidence which indicates that FCC public safety exposure limits are grossly inadequate to protect public health given the proliferation of RFR-emitting devices now in common usage.

The evidence for health risks comes directly from hundreds of published scientific and public health studies reporting that low-intensity RFR is capable of producing health harm across very large populations of exposed people.

The BioInitiative Working Group has been gathering and evaluating hundreds of such studies since 2006, and has published two large reports detailing this evidence. The group concluded that the scientific evidence was more than sufficient in 2007, and certainly in 2012 (www.bioinitiative.org) to establish new biologically-based exposure safety standards. Further, we have submitted numerous comments to the FCC since 2013 advising that the Commission has not struck the right balance between the wireless technologies rollout and managing resulting health impacts for Americans, particularly for children. The increased risk for cancers, neurological diseases, fertility and reproduction, immune disfunction, memory and learning impairment, and other serious medical problems associated with exposure to low-intensity RF are documented and analyzed for the Commission to review at: https://bioinitiative.org/research summaries/

When the cumulative body of evidence is assessed over the last decades of research, the overall picture for studies on radiofrequency radiation effects shows clear and consistent patterns of effects on living tissues. Chronic RFR exposures at environmental levels common today can reasonably be presumed to produce health harm at and below current FCC safety limits for humans and should be substantially lowered.

Genetic effects: Effect= 67% (259 studies); No Effect= 33% (129 studies) (literature up to November 12, 2021)

Neurological effects: Effect= 74% (271 studies); No Effect= 26% (97 studies) (literature up to November 12, 2021)

Oxidative effects: Effect= 9***2***% (258 studies); No Effect= 8% (23) studies) (literature up to November 12, 2021)

Respectfully submitted on behalf of the BioInitiative Working Group by:

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Consumers for Safe Cell Phones

November 24, 2021

The Honorable Jessica Rosenworcel
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Dear Chairwoman Rosenworcel,

As one of the petitioners who recently sought the DC Circuit Court of Appeal's review of the FCC's December 4th, 2019 decision to maintain their outdated 25 year old wireless exposure guidelines, we write to urge the Commission to follow the Court's directive to properly review the evidence that had been submitted into Dockets #13-84 and #03-137. A proper review requires that the two dockets be re-opened to allow newly published research and documents (made public over the past 2 years) to be included in the analysis. This will provide the FCC with up-to-date information to use in undertaking the Court's required thorough analysis.

The Court's ruling stated that the Commission "*must, in particular, (i) provide a reasoned explanation for its decision to retain its testing procedures for determining whether cell phones and other portable electronic devices comply with its guidelines*…"

Of particular concern to the Court is the failure of the FCC to review the evidence in the record related to assessing their inadequate cell phone testing guidelines. Since the GAO released their 2012 report[1] stating, "*The Federal Communications Commission's (FCC) RF energy exposure limit may not reflect the latest research, and testing requirements may not identify maximum exposure in all possible usage conditions… Some consumers may use mobile phones against the body, which FCC does not currently test, and could result in RF energy exposure higher than the FCC limit."* - we have been calling on the FCC to test phones directly against the body with zero separation to simulate the manner in which they are typically used by consumers.

[1] "Telecommunications: Exposure and Testing Requirements for Mobile Phones Should Be Reassessed" - GAO-12-77: Published: Jul 24, 2012

FCC's current testing protocol allows a separation distance between the phone and the torso simulating use in a holster or belt clip, enabling a phone to pass the FCC compliance test when in fact, the exposure from phones used in real life usage positions will likely exceed the federal "safety" limit. This is because it is commonplace for today's consumer to carry a transmitting phone in a pants or breast pocket or tucked into a bra with no separation between the antennas and the body.

Here are some examples of the RF warnings for wireless devices currently on the market in 2021:

- The Apple iPhone 13 Pro Max RF Exposure statement[2] reads, *"iPhone is evaluated in positions that simulate uses against the head, with no separation, and when worn or carried against the torso of the body, with 5mm separation."* [Users will likely carry and use transmitting phones in pockets and bras against their body unaware because the RF "safety" warning is located in the small print of the legal section deep within menus on the phone where it is not likely to be found.]
- The Miku Pro Smart Baby Monitor manual states[3], "*RF EXPOSURE WARNING: ….This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.*" [Yet many parents will locate these RF transmitting monitors close to the crib or in a child's playroom unaware that these RF warnings are in the manual.]
- The AT&T DECT 6.0 Home Cordless Phone manual[4] states, "*The telephone base shall be installed and used such that parts of the user's body other than the hands are maintained at a distance of approximately 20 cm (8 inches) or more*." [Yet many people install the base unit on the desk just inches from their head or on their bedside table unaware of these instructions.]

Key evidence has been published in the past two years that indicates cell phones directly in body contact (as when worn and used in a pants or shirt pocket or sports bra) are associated with an increased risk for breast tumors and sperm damage.

As examples, these 2020 and 2021 published studies referenced below must be included in a thorough FCC assessment of their cell phone testing protocol in order to perform a more "reasonable analysis" of the testing protocol:

I. "The Association Between Smartphone Use and Breast Cancer Risk Among Taiwanese Women: A Case-Control Study" - Cancer Manag Res 2020 Oct 29;12:10799-10807 doi: 10.2147/CMAR.S267415.

> Results: "*Participants who carried their smartphone near their chest or waist-abdomen area had significantly increased 5.03-fold and 4.06-fold risks of breast cancer*"

II. "Effects of mobile phone usage on sperm quality - No time-dependent relationship on usage: A systematic review and updated meta-analysis" - 2021 Nov; 202:111784. doi: 10.1016/j.envres.2021.111784. Epub 2021 Jul 30

> Results: "*Exposure to mobile phones is associated with reduced sperm motility, viability, and concentration*." 18 studies were evaluated including 4280 samples.

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[2] https://www.apple.com/legal/rfexposure/iphone14,3/en/
[3] https://cdn.shopify.com/s/files/1/2621/9254/files/mikucare.com_quick_setup-guide.pdf?v=1589825520
[4] https://att.vtp-media.com/products/CL/CL82X07/CL82X07_WEBCIB_i5.0_20201217.pdf

If the past two years of important research and evidence are not allowed to be included in the re-assessment of the FCC's cell phone testing protocol, it is certain that the public's distrust of the safety of phones and other wireless consumer devices will become even more widespread. The public's trust is dependent upon the FCC's thorough evaluation of the current, up to date body of research, especially with the advent of the novel and more powerful exposures expected with 5G.

Respectfully submitted,

Cynthia Franklin, Director
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Science of the Total Environment 572 (2016) 554–569

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Radiofrequency radiation injures trees around mobile phone base stations

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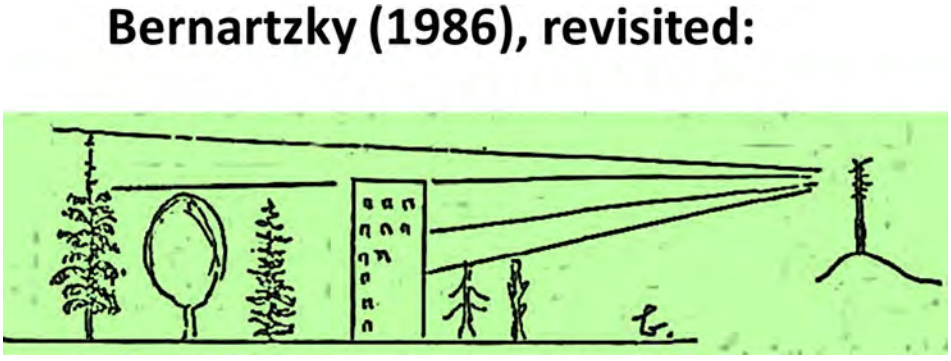
HIGHLIGHTS

- High frequency nonionizing radiation is becoming increasingly common.
- This study found a high level of damage to trees in the vicinity of phone masts.
- Deployment has been continued without consideration of environmental impact.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:
Received 6 June 2016
Received in revised form 19 July 2016
Accepted 6 August 2016
Available online xxxx

Editor: D. Barcelo

Keywords:
Electromagnetic radiation
Effects on trees
Phone masts
Radiofrequencies

ABSTRACT

In the last two decades, the deployment of phone masts around the world has taken place and, for many years, there has been a discussion in the scientific community about the possible environmental impact from mobile phone base stations. Trees have several advantages over animals as experimental subjects and the aim of this study was to verify whether there is a connection between unusual (generally unilateral) tree damage and radiofrequency exposure. To achieve this, a detailed long-term (2006–2015) field monitoring study was performed in the cities of Bamberg and Hallstadt (Germany). During monitoring, observations and photographic recordings of unusual or unexplainable tree damage were taken, alongside the measurement of electromagnetic radiation. In 2015 measurements of RF-EMF (Radiofrequency Electromagnetic Fields) were carried out. A polygon spanning both cities was chosen as the study site, where 144 measurements of the radiofrequency of electromagnetic fields were taken at a height of 1.5 m in streets and parks at different locations. By interpolation of the 144 measurement points, we were able to compile an electromagnetic map of the power flux density in Bamberg and Hallstadt. We selected 60 damaged trees, in addition to 30 randomly selected trees and 30 trees in low radiation areas (n = 120) in this polygon. The measurements of all trees revealed significant differences between the damaged side facing a phone mast and the opposite side, as well as differences between the exposed side of damaged trees and all other groups of trees in both sides. Thus, we found that side differences in measured values of power flux density corresponded to side differences in damage. The 30 selected trees in low radiation areas (no visual

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http://dx.doi.org/10.1016/j.scitotenv.2016.08.045

contact to any phone mast and power flux density under 50 μW/m^2) showed no damage. Statistical analysis demonstrated that electromagnetic radiation from mobile phone masts is harmful for trees. These results are consistent with the fact that damage afflicted on trees by mobile phone towers usually start on one side, extending to the whole tree over time.

1. Introduction

For many years, there has been a discussion in the scientific community about whether artificial radiofrequency radiation has harmful effects on living organisms and, more specifically, on the environmental impact from mobile phone base stations (Panagopoulos et al., 2016). Trees have several advantages over animals as experimental subjects: they are continuously exposed to radiation in a constant orientation in the electromagnetic field due to their inability to move (Vian et al., 2016). Additionally, it is possible to easily document changes over time, such as disturbed growth, dying branches, and premature colour change of leaves. Moreover, the damage to trees is objective and cannot be attributed to psychological or psychosomatic factors.

Plants are specialized in the interception of electromagnetic radiation (light) but radiofrequency radiation impact on plants, which is becoming common in the environment because of the exponential use of mobile phone technology, has received little attention and his physiological effect has long been considered negligible.

Since the mid-twentieth century, several researchers have investigated the effects of electromagnetic radiation on plants, both in the laboratory (Kiepenheuer et al., 1949; Brauer, 1950; Harte, 1950, 1972; Jerman et al., 1998; Lerchl et al., 2000; Sandu et al., 2005; Roux et al., 2006, 2008; Sharma et al., 2009; Tkalec et al., 2005, 2009; Beaubois et al., 2007; Kundu and IEEE, 2013; Pesnya and Romanovsky, 2013; Cammaerts and Johansson, 2015; Grémiaux et al., 2016; Vian et al., 2016), and in nature (field observations) (Bernatzky, 1986; Volkrodt, 1987, 1991; Selga and Selga, 1996; Balodis et al., 1996; Haggerty, 2010). Both kinds of study have frequently found pernicious effects.

Around the world, phone masts have been deployed in the last two decades everywhere. Preliminary published studies have indicated deleterious effects of radiofrequency radiation on trees (Balmori, 2004; Van't Wout, 2006; Schorpp, 2011; Waldmann-Selsam, 2007; Waldmann-Selsam and Eger, 2013), cautioning that research on this topic is extremely urgent (Balmori, 2015). However, these early warnings have had no success and deployment has been continued without consideration of environmental impact.

In a review of the effects of environmental microwaves on plants (Jayasanka and Asaeda, 2013), it was indicated that effects depend on the plant family and the growth stage, as well as the exposure duration, frequency, and power density. This review concluded that most studies that address the effects of microwaves on animals and plants have documented effects and responses at exposures below limits specified in the electromagnetic radiation exposure guidelines and it is therefore necessary to rethink these guidelines (Jayasanka and Asaeda, 2013).

Since 2005, on the occasion of medical examinations of sick residents living near mobile phone base stations, changes in nearby trees (crown, leaves, trunk, branches, growth…) were observed at the same time as clinical symptoms in humans occurred. Since 2006 tree damages in the radiation field of mobile phone base stations were documented (http://kompetenzinitiative.net/KIT/KIT/baeume-in-bamberg/). In the radio shadow of buildings or that one of other trees, the trees stayed healthy.

Additionally, unilateral crown damage, beginning on the side facing an antenna, pointed to a possible link between RF-EMF (Radiofrequency Electromagnetic Fields) and tree damage. We carried out measurements on both sides of unilaterally damaged trees. Most of the trees had been exposed to RF-EMF for at least five years. Each time we found considerable differences between the measured values on the damaged and on the healthy side.

The aim of the present study was to verify whether there is a connection between unusual (generally unilateral) tree damage and radiofrequency exposure.

2. Materials and methods

The official information of 65 mobile phone sites in the neighbouring cities Bamberg and Hallstadt was extracted from the EMF database (EMF-Datenbank) of the German Federal Network Agency (Bundesnetzagentur, in March 2011 and October 2015). Each site certificate ("Standortbescheinigung") provides information on the mounting height of antennas, the number and main beam direction of the sector antennas, the number of omnidirectional antennas (ND), the number of other transmitters, as well as the horizontal and vertical safety distances. The current specifications of the transmission facilities are available at: http://emf3.bundesnetzagentur.de/karte/Default.aspx

On most of the 65 mobile phone sites several sector antennas emitting RF-EMF with differences in frequency, modulation and other physical characteristics are installed (GSM 900, GSM 1800, UMTS, LTE (4th generation), TETRA). In 2011 there was a total of 483 sector antennas, in 2015 a total of 779 sector antennas.

Numerical code, address and UTM 32N coordinates for the 65 Mobile phone (base stations) sites in Bamberg and Hallstadt are shown in Table 1.

Between 2006 and 2015 there was observation and documentation of tree damages. There were some preliminary measurements on both sides of unilaterally damaged trees and approximately 700 trees in Bamberg and Hallstadt were visited. The condition of numerous trees has been documented in photographs. The photographs record the state of trees showing damage patterns not attributable to diseases, pests, drought or other environmental factors in order to monitor damage and growth over several years (in 2006, Olympus FE-100 was used; since 2007, Panasonic DMC-FZ50 was used).

In 2015 we selected a polygonal study site, with an approximate area of 30 km^2, which includes partial municipalities of Bamberg and Hallstadt (70 km^2). The study area with the location of the phone masts in the layer of natural areas and municipalities is shown in Fig. 1. In this area, different measurements (see below) were done both for having a radiation map and for knowing which are the incident power densities beside different trees. In spite of the fact that measurements are changing continuously, they do not show significant differences between times (own data, see below).

In this polygon, we performed 144 measurements of the radiofrequency electromagnetic fields at a height of 1.5 m at different points in the city. These measurements were taken in streets and parks and allowed the preparation of an electromagnetic map of Bamberg and Hallstadt with their interpolation. The measurements were carried out with an EMF-broadband analyzer HF 59B (27–3300 MHz) and the horizontal-isotrope broadband antenna UBB27_G3, (Gigahertz Solutions). Measurements of the sum peak values of power flux density were in μW/m^2, which can be converted in V/m.

In general, a sector antenna covers an angle of 120° and the radiation of the sector antennas is distributed in main and secondary beams, bundled vertically and horizontally. The high-frequency emissions are reflected/diffracted and/or absorbed by buildings and trees. Therefore,

Table 1
Official information of the 65 mobile phone base stations in Bamberg and Hallstadt.

Code number	Adress in Bamberg and Hallstadt	X	Y	Code number	Adress in Bamberg and Hallstadt	X	Y
1	Altenburg	634268	5527019	34	Ludwigstr. 25 (Post)	636318	5529177
2	Am Borstig 2	636070	5531636	35	Luitpoldstr. 51	636241	5529232
3	Am Hirschknock	637511	5532267	36	Mainstraße, Ladekai 2	633924	5530319
4	An der Breitenau 2	637253	5530650	37	Mainstraße, Ladekai 3	633816	5530130
5	(An der Breitenau, P&R) ca.	637259	5526912	38	Margaretendamm 28	635341	5529331
6	(Artur-Landgraf-Straße)	635183	5526912	39	Memmelsdorfer Straße (Post) ca.	637769	5531392
7	Breitäckerstr. 9	632965	5529621	40	Memmelsdorfer Str. 208a	637568	5531191
8	Coburger Str. 6a	635877	5529951	41	Memmelsdorfer Str. 208a	634861	5528541
9	Coburger Str. 35	635252	5530468	42	Mußstr. 1	634949	5528827
10	Erlichstr. 47/51	637291	5527903	43	Pödeldorfer Str. 144	637828	5529305
11	Franz-Ludwig-Str. 7	635843	5528490	44	Rheinstr. 16 ca.	632910	5530367
12	Geisfelder Str. 30	637689	5528020	45	Robert-Bosch-Str. 40	637767	5528292
13	Grüner Markt 1	635624	5528370	46	Schildstr. 81	637049	5529049
14	Grüner Markt 23	635640	5528565	47	Schranne 3	635511	5528166
15	Gutenbergstr. 20	638448	5527180	48	Schützenstr. 23	636197	5527961
16	Hainstr. 4	635945	5528229	49	Schwarzenbergstr. 50	636762	5528732
17	Hainstr. 39	636341	5527550	50	Siemensstr. 37-43	638091	5528505
18	Hauptsmoorstr. 26a	638223	5530558	51	Theresienstr. 32	637487	5527866
19	Hauptsmoorwald, Pödeldorfer Straße	639683	5529635	52	Unterer Kaulberg 4	635350	5528084
20	Hauptsmoorwald, Geisfelder Straße	639890	5528022	53	Von-Ketteler-Str. 2	637905	5527553
21	Heiliggrabstr. 15	636054	5529240	54	Wilhelmsplatz 3	636316	5528259
22	Heinrichsdamm 1	635849	5528723	55	Zollnerstr. 181	637772	5530133
23	Heinrichsdamm 33a, P&R	636748	5527529	56	Heganger 18	634327	5530982
24	Hohenlohestr. 7	634794	5526480	57	Biegenhofstr. 13	633963	5531045
25	Kantstr. 33	637161	5530333	58	Seebachstr. 1	634399	5531764
26	Katzenberg	635374	5528266	59	Landsknechtstr.	634800	5531918
27	Kirschäckerstr. 37	636649	5530756	60	Lichtenfelser Str.	634864	5532621
28	(Kloster-Langheim-Str. 8)	637190	5529182	61	Michelinstr. 130 ca.	635629	5532106
29	Kronacher Str. 50	636722	5531496	62	Margaretendamm	634991	5529497
30	Lagerhausstr. 4-6	634850	5529871	63	Mainstr. 36a/Kiliansplatz	634326	5532386
31	Lagerhausstr. 19	634304	5530136	64	Bamberger Straße	635964	5526050
32	(Laurenziplatz 20)	635207	5527404	65	Würzburger Str. 76	635359	5526709
33	Ludwigstr. 2	635207	5529103				

due to existing obstacles there is an inhomogeneous radiofrequency field distribution. Buildings and vegetation (trees and foliage) can shield and reduce radiation and thus affect the quality of signal propagation (e.g. Meng and Lee, 2010). Living material is not a perfect dielectric object and interferes with high frequency electromagnetic fields in a way that depends upon several parameters, including the general shape, conductivity, and density of the tissue, and the frequency and amplitude of the electromagnetic radiation (Vian et al., 2016).

In the polygon mentioned before we selected 60 trees showing unilateral damage. The selection was limited by the fact that we were able to measure with the telescopic rod only up to a height of 6 m. Many trees (*Tilia, Betula, Quercus, Populus, Picea*) showing damage above the

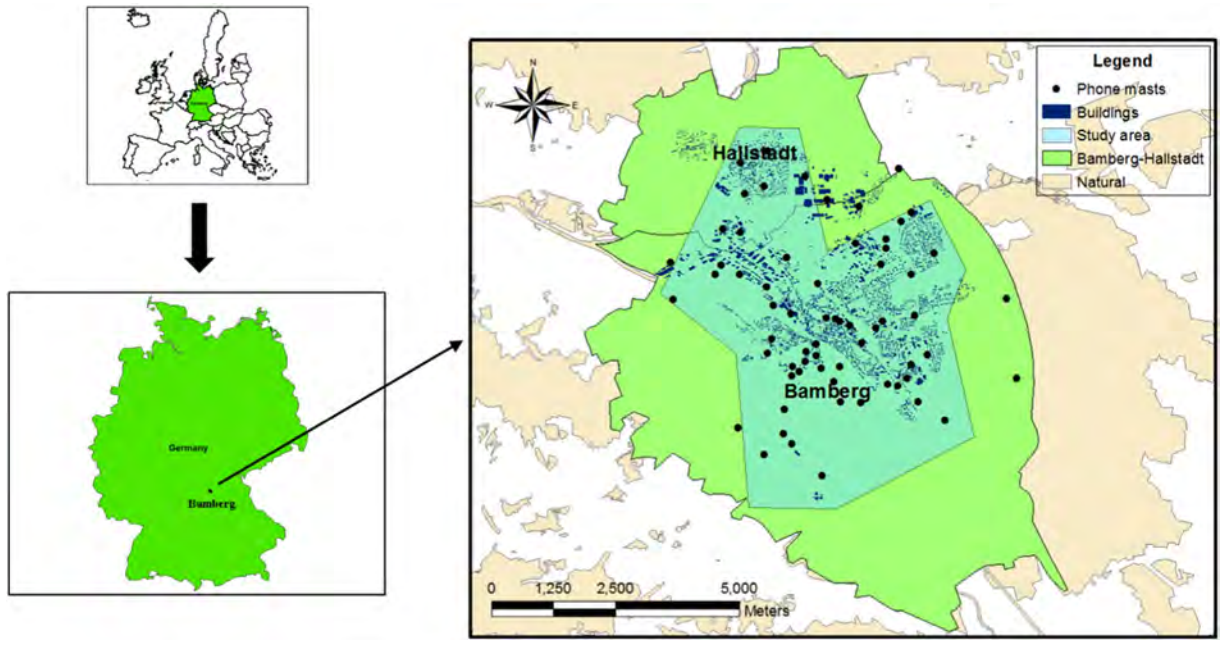

Fig. 1. The study area with the location of the phone masts in the layer of natural areas, buildings, and municipalities.

height of 6 m could not be included. The measurements at the trees were done between April and October 2015. *Acer platanoides*, *Carpinus betulus*, *Tilia* sp., *Taxus baccata* and *Thuja occidentalis* are widely spread in Bamberg and Hallstadt and can be reached for measurements. Therefore they are the most represented species.

The selected 60 trees from the study polygon show damage patterns that are not usually attributable to harmful organisms, such as diseases (fungi, bacteria, viruses) and pests (insects, nematodes) or other environmental factors (water stress, heat, drought, frost, sun, compaction of the soil, air and soil pollutants).

The main features of damage from this source are:

- Trees are mainly affected on one side (showing side differences and unilateral damage) and can appear in any orientation. The damage only originates on one side.
- Damage appears without external indications that the tree is infested with insects, nematodes, fungi, bacteria or viruses.
- Damage appears on trees, which have previously grown well. Damage appears on once healthy trees within one or two years after Antennas were put into operation.
- Damage increases from the outside to the inner part of the crown over time.
- Trees of different species in the same location also show damage.
- Damage appears in favourable (gardens, parks) as well as in unfavourable locations.
- Trees in the same location, but that are shielded by buildings or other trees, are healthy.

For these damaged trees, we used 13 damage codes that may be recognised with the naked eye (for explanations, see Table 2). In order to explain each type of damage visually, a photograph was added for each damage code.

Table 2
Tree damage codes.

01 Damage only on one side: The tree shows damage only on one side. The damage can be recognized with the naked eye.	
02 Crown transparency (sparse leaves or needles): The number of leaves or needles is reduced. The crown transparency increases from year to year.	
03 Brown leaves (start at leaf margins): The leaves begin to turn brown in june. The browning starts at the leaf margins. It looks similar to effects by salt.	
04 Colour change of leaves prematurely: Leaves become yellow, red or brown (in the whole) early in the year.	
05 Tree leaves fall prematurely: The leaves begin to fall already from june on.	
06 Dead branches: Over a period of some years it can be observed how little and big branches die.	
07 Tip of the main guide dried.	
08 Irregular growth. The growth of deciduous and coniferous trees can be disturbed in different manners. One observation is that trees bend to a side.	
09 Not grow in height: Trees often stop to grow in height. The height was not measured. Only the visual impression was valuated.	
10 Colour change of needles. Needles can change their colour to yellow, red or brown.	
11 Dead parts were trimmed down: When bigger branches die, it becomes necessary to remove these parts for the sake of security of people passing.	
12 Damage on different sides: The trees show damages on different sides.	
13 No damage: The tree shows the typical habitus of its species. With the naked eye no damage can be seen.	

Table 3
144 selected points in Bamberg and Hallstadt with their measurements and UTM coordinates.

Number	Streets and parks in Bamberg and Hallstadt	Measurement μW/m²	X	Y	Number	Streets and parks in Bamberg and Hallstadt	Measurement μW/m²	X	Y
1	Wassermannpark	2300	637395	5530345	73	Ludwigstraße/Zollnerstraße	50	636228	5529444
2	Memmelsdorfer Str. 209	1830	637581	5531113	74	Landratsamt, Ludwigstraße, Einfahrt	670	636422	5529044
3	Holunderweg	10	638125	5530967	75	Wilhelmsplatz, Mitte	460	636250	5528263
4	Hauptsmoorstraße/Seehofstraße	3600	638039	5530857	76	Amalienstr. 16	16570	636303	5528086
5	Greifffenbergstr. 79	4210	638349	5530855	77	Otttostr. 7a	120	636133	5527878
6	Heimfriedweg 16	870	638393	5530621	78	Schönbornstr. 3	3640	636251	5527696
7	AWO, Innenhof, Parkplatz	3920	638223	5530584	79	Hainspielplatz	1530	636229	5527403
8	Ferdinand-Tietz-Str. 40	2600	637883	5530616	80	P&R Heinrichsdamm, Parkplatz bei Kirschen	3400	636706	5527667
9	Ferdinand-Tietz-Str. 38	80	637889	5530601	81	P&R Heinrichsdamm, südöstlich des Senders, Eichen	1690	636755	5527504
10	Petrinistr. 20	1340	637797	5530514	82	Luisenhain, Höhe Wasserwerk	260	636895	5526482
11	Petrinistr. 32	4700	637891	5530449	83	Kapellenstraße	2120	637050	5528148
12	Zollnerstraße 181	9300	637773	5530102	84	Geisfelder Str. 9, Gärtnerei	740	637410	5528164
13	Wassermannstr. 14	540	637424	5530125	85	Gereuthstr. 8	30	637621	5527424
14	Feldkirchenstraße/Kantstraße	2620	636803	5530069	86	Distelweg, Innenhof	15	637881	5527160
15	Breslaustr. 20	3890	637392	5530431	87	Am Sendelbach BSC 1920	30	637331	5526877
16	Berliner Ring	16920	637188	5530786	88	Am Sendelbach, Kleingartenanlage	10	637542	5526222
17	Rodezstr. 3	3780	637044	5530765	89	Robert-Bosch-Straße	2060	637504	5528200
18	Am Spinnseyer 3	880	637545	5530764	90	Ludwigstraße/Memmelsdorfer Straße	1000	635974	5529708
19	Kirschäckerstr. 24	4290	636655	5530857	91	Coburger Straße, Neubau Studentenwohnheim	3460	635867	5529878
20	Kammermeisterweg	810	636283	5530282	92	Coburger Straße, junge Platane	3400	635835	5529941
21	Eichendorff-Gymnasium, Hof	6340	637194	5529084	93	Gundelsheimer Str. 2	9000	635783	5529680
22	Starkenfeldstraße/Pfarrfeldstraße	3660	637092	5529138	94	Hallstadter Straße	12	635232	5530212
23	Parkplatz auf der Westseite der Polizei	9020	636921	5528970	95	Gerberstraße/Benzstraße	1280	635108	5530546
24	Starkenfeldstraße, Höhe Polizei	1120	636975	5529061	96	Coburger Straße, Einfahrt Fitnesszentrum	2000	635326	5530508
25	Starkenfeldstr. 2	860	637527	5529216	97	Kleintierzuchtanlage	890	635380	5530622
26	Pödeldorfer Str., Haltestelle	2180	636965	5529217	98	Margaretendamm, Eingang ehemaliges Hallenbad	1300	635455	5529178
27	Kindergarten St. Heinrich, Eingang	6450	637712	5529364	99	Margaretendamm/Europabrücke	1890	635200	5529365
28	Pödeldorfer Straße, Haltestelle Wörthstraße	1620	637654	5529433	100	Margartendamm 38, nahe Sendeanlage	5560	635003	5529497
29	Pödeldorfer Str. 142, Nordseite	30	637840	5529437	101	Hafenstraße/Regnitzstraße	7610	634719	5529740
30	Pödeldorfer Str. 142, Südseite	17060	637824	5529410	102	Lagerhausstraße	210	634556	5530102
31	Berliner Ring, Höhe Pödeldorfer Str. 144	4480	637900	5529380	103	Hafenstr. 28, Bayerischer Hafen	3200	634192	5530370
32	Schwimmbad Bambados, Vorgarten mit Bambus	1620	638074	5529315	104	Laubanger 29	160	634202	5530561
33	Schwimmbad Bambados, Parkplatz, Feldahorn	2540	638202	5529346	105	Heganger	1400	634341	5530812
34	Carl-Meinelt-Str.	5360	638043	5529094	106	Emil-Kemmer-Str. 2	5000	633822	5530863
35	Volkspark, FC Eintracht, Ostseite	120	638343	5529065	107	Emil-Kemmer-Str. 14	2500	634342	5531099
36	Michelsberger Garten, Teil Streuobst	5450	634831	5528673	108	Dr. Robert-Pfleger-Straße 60	90	634448	5530978
37	Michelsberger Garten, Terrassengarten, bei Eibe	2500	634988	5528508	109	Friedhof Gaustadt, Haupteingang	13100	632981	5529677
38	Michelsberger Garten, Südostecke, bei Holunder	910	635036	5528455	110	Friedhof Gaustadt, Ahornpaar	1400	632929	5529728
39	Michelsberg, Aussichtsterrasse, oberhalb Weinberg	1260	634924	5528463	111	Herzog-Max-Str. 21	1600	636245	5528071
40	Michelsberg, Aussichtsterrasse, Aussichtspunkt	780	634911	5528537	112	Gaustadter Hauptstr. 116	10	634042	5529457
41	Michelsberg, Nordostecke, bei jungen Linden	390	634874	5528565	113	Landesgartenschaugelände, Hafenerlebnispfad	2000	633789	5529894
42	Storchsgasse/Michelsberg	200	634725	5528415	114	Landesgartenschau, junge Baumgruppe	1270	633949	5529718
43	St. Getreu-Kirche, Südseite	55	634518	5528405	115	Würzburger Str.	340	635283	5527151
44	Villa Remeis, Garten	390	634295	5528203	116	Würzburger Straße/Arthur-Landgraf-Straße	1380	635355	5526862
45	Villa Remeis, Treppe	300	634400	5528237	117	Hohe-Kreuz-Straße/Würzburger Straße, Haltestelle	590	635383	5526733
46	Maienbrunnen 2	3920	634744	5528838	118	Hohe-Kreuz-Straße	10950	635469	5526729
47	Am Leinritt	2140	635071	5528617	119	Am Hahnenweg 6	3420	635332	5526729
48	Abtsberg 27	130	634526	5528935	120	Am Hahnenweg/Viktor-von-Scheffel-Straße	640	635307	5526710
49	Welcome Hotel, Garten	3200	634788	5529012	121	Am Hahnenweg 28 a	145	635028	5526654
50	Mußstraße, eingang Kindergarten	1670	634864	5529011	122	Schlüsselberger Straße	200	634712	5526534
51	Mußstraße/Schlüsselstraße	710	634846	5529034	123	Schlüsselberger Str./Haltestelle Hezilostr., Parkdeck	460	634749	5526549
52	Nebingerhof	2040	635069	5528901	124	Hezilostr. 13	70	634604	5526563
53	Graf-Stauffenberg-Platz	100	635120	5529009	125	Sückleinsweg, junge Hainbuchenhecke	75	634512	5526654
54	Don-Bosdo-Straße, Innenhof	10	635176	5529056	126	Rößleinsweg, oberes Ende	300	634708	5526789
55	Pfeuferstraße/Weide	1100	635222	5528820	127	Große Wiese	1500	634874	5526810

Table 3 (*continued*)

Number	Streets and parks in Bamberg and Hallstadt	Measurement μW/m²	X	Y	Number	Streets and parks in Bamberg and Hallstadt	Measurement μW/m²	X	Y
56	Weidendamm/Don-Bosco-Straße	1860	635166	5529195	128	Suidgerstraße	195	634508	5526409
57	Katzenberg/Karolinenstraße	1720	635316	5528239	129	Waizendorfer Straße	280	635317	5525864
58	Vorderer Bach	450	635305	5528141	130	Waizendorfer Straße, Einfahrt Gärtnerei	210	635326	5525582
59	Obere Brücke	8000	635565	5528289	131	Klinikum, Nähe Spielplatz	175	635732	5525672
60	Judenstraße	6	635479	5528040	132	Klinikum Weiher	100	635759	5525520
61	Tourist Information	4920	635674	5528172	133	Buger Straße/Bamberger Straße	2730	635829	5526082
62	Universität, Am Kranen 14, Innenhof	10	635501	5528535	134	Dunantstraße	470	635848	5526176
63	Fleischstraße	10	635703	5528683	135	Buger Straße/Paradiesweg	90	635743	5526286
64	ZOB	600	635882	5528541	136	Buger Straße/Abzweigung Münchner Ring	470	635528	5526499
65	Schönleinsplatz, Ostseite	900	636004	5528300	137	Hallstadt, Markplatz, bei Linde	2000	634582	5532426
66	Friedrichstraße, Parkplatz	165	635984	5528360	138	Hallstadt, Markplatz 21, Innenhof	8	634632	5532488
67	Franz-Ludwig-Straße/Luisenstraße	1720	636158	5528410	139	Hallstadt, Lichtenfelser Str. 12	4000	634659	5532474
68	Franz-Ludwig-Str, Strassenbauamt	90	636246	5528408	140	Hallstadt, Lichtenfelser Str. 8	9000	634720	5532516
69	Heiliggrabstraße, Nähe Sender	4740	636072	5529245	141	Hallstadt, Am Gründleinsbach/Kemmerner Weg	200	634743	5532784
70	Heiliggrabstr. 29, Landesjustizkasse	20	636063	5529399	142	Hallstadt, Valentinstraße/Seebachstraße	2200	634232	5532237
71	Heiliggrabstr. 57, Aussichtspunkt Schiefer Turm	4500	635797	5529410	143	Hallstadt, Johannisstr. 6	5000	634805	5532078
72	Bahnhof, ParkplatzWestseite	1600	636300	5529374	144	Hallstadt, Bamberger Straße/Michael-Bienlein-Straße	1860	634805	5531969

For each selected tree, the types of damage and the Universal Transversal Mercator (UTM) coordinates were recorded. In addition, two measurements were recorded: on the side showing damage and on the side without damage, generally corresponding to opposite sides of each tree. On both sides, the measurements were carried out at a variable height of 1–6 m (depending on the height of the tree), using a telescopic rod, a ladder, and the broadband radiofrequency meter.

Most measurements were done in the afternoon or in the evening on different days between April and October 2015. But the measurements on the two sides of each single tree were done one after another immediately on the same day and at the same time. The measurements took about 5 min on each side. When we stood on the ground or on a ladder we measured the peak values. When we used the telescopic rod we measured the peak hold values. Using the telescopic rod and measuring peak hold values it took longer, because the measurements had to be repeated often in cases where RF-EMF emitting cars or passengers disturbed the results. At each single tree the two measurements were done in the height where the damage had appeared. Because the height of the 120 trees differed, it was necessary to do the measurements at different heights.

In theory, although measurements are changing continuously there is no evidence about significant changes in power densities of electromagnetic radiation produced by phone masts over time. One study carried over one year in the city of Madrid showed no changes in terms of radiation intensity between the three rounds of measurements

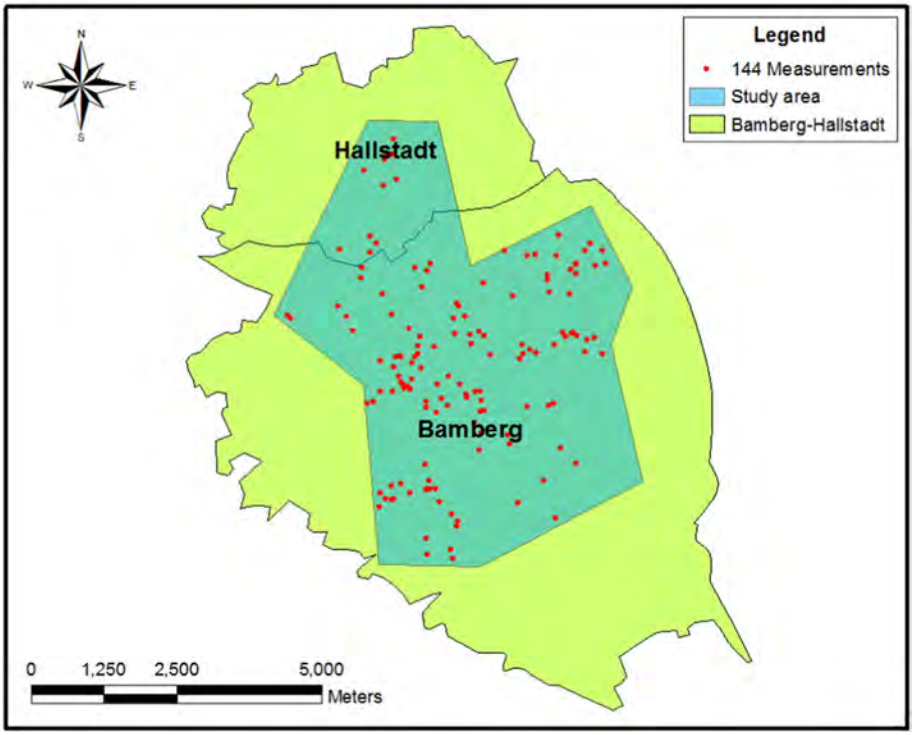

Fig. 2. Location of the 144 measurements points in Bamberg and Hallstadt in the study area.

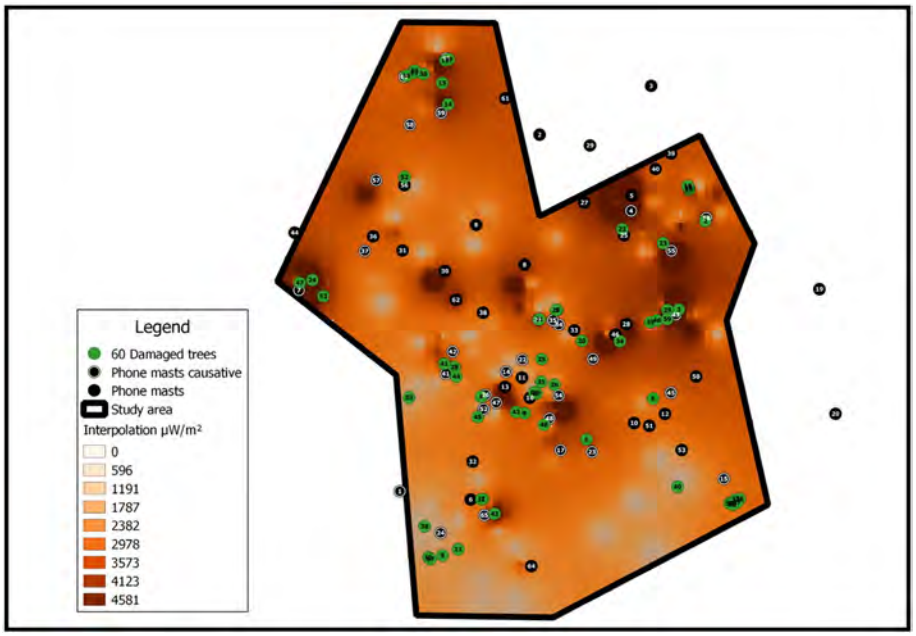

Fig. 3. Map showing the 60 damaged trees and phone masts (both with code numbers) over the interpolation electromagnetic map of the 144 measurement points.

performed in about 200 sampling points (own data). Repeatability analysis checked this. Despite the fact that the increase in sector antennas (observed between 2011 and 2015) would have probably increased the radiation in the environment of the study area, measurements used in this study were mostly done in 2015.

In an attempt to link the electromagnetic radiation measured at every tree to specific phone masts, the distances to the three nearest antennas that could be mainly responsible for the radiation measurements at each tree were calculated in meters with Geographical Information System (GIS) programs, following the general approach criteria of proximity. However, it must be taken into account that buildings and vegetation diminish radiation intensity and, in many cases, the nearest phone mast or masts may be obscured by obstacles. In other cases, the phone mast is in direct line of sight from the tree and the radiation can reach the tree directly.

Additionally, 30 random points were generated inside the polygonal study area and outside a layer of buildings, downloaded from: http://www.mapcruzin.com/free-germany-arcgis-maps-shapefiles.htm using a Random Points tool of QGIS 2.6.0-Brighton (QGIS Development Team, 2014) allowing create random points inside a specific layer. Therefore the points were randomly situated in specific places in the study area outside buildings but not frequently concur with the location of trees. That is why measurements were taken from the nearest tree for each random point, generating a random tree group. Measurements and damage characteristics were scored in the same way as with 60 damaged trees explained above, measuring the maximum value of radiation corresponding to opposite sides of each tree.

In areas of the city with low measurements of electromagnetic radiation (no visual contact to any phone mast and power flux density <50 µW/m^2), we scored another 30 trees in the same way as with 60 damaged trees and 30 random points. The UTM coordinates and the three nearest phone masts of each tree in these last two groups (random and low radiation trees) were also recorded.

To generate electromagnetic maps, we used ArcGis 9.3 (ESRI, 2008) and QGIS 2.6.0-Brighton (QGIS Development Team, 2014). To check possible differences between groups of data and taking into account that there were two measures made in each tree, repeated measures analysis of variance were applied, considering a repeated measures factor (within-subjects) and another between-subjects. The post hoc Bonferroni test was used in all cases to elucidate significant differences. Statistics were performed using STATISTICA 7 program (StatSoft, Inc, 2004).

3. Results

The results of radiation measurements obtained at 144 points in Bamberg and Hallstadt at a height of 1.5 m were between 6 µW/m^2 (0.047 V/m) and 17,060 µW/m^2 (2.53 V/m) (for measurements and UTM coordinates, see Table 3). The measured values are far below the current limit values (41 V/m for GSM system and 61 V/m for UMTS; ICNIRP, 1998).

The locations of these points in the study area are shown in Fig. 2. By interpolation of the 144 measurements points (Table 3), we prepared a map of the power flux density in Bamberg and Hallstadt (Fig. 3). This map is theoretical and approximate, since many factors affect the true electromagnetic values. However, the map is useful to provide approximate differences in exposure (electromagnetic pollution) throughout the city.

The 60 selected trees showing damage patterns not attributable to diseases, pests or other environmental factors are presented in Table 4. In this Table, we added the tree code number, the scientific name, the UTM coordinates, the measurements (power flux density) on both sides of each tree, and the distances (meters) and code numbers to the three nearest antennas for each tree, which may be mainly responsible for the electromagnetic radiation measured. We also included the orientation of the tree damage and the number of main (nearest) phone mast(s) in direct line of sight, whose lobe of radiation most directly affected each tree. Finally, we included the codes of damage observed in the 60 trees.

From all 60 selected trees, one or more phone mast(s) could be seen, with no obstacles between the phone mast and damaged tree. In many cases, one of the three closest antennas caused the main radiation on the tree surface. In ten trees (codes: 4, 7, 9, 10, 15, 26, 27, 31, 35, and 50), another antenna in direct line of sight caused the measured radiofrequency exposure. This was determined using topography and existing buildings (Table 4 and Fig. 3).

The 60 damaged trees (with their code number) and the phone masts are overlaid on the electromagnetic map prepared by interpolation of the 144 measurements points (Fig. 3). The likely antenna or

antennas causing radiation damage to each tree are also shown (Fig. 3). The measurements at all selected trees revealed significant differences between the damaged side facing a phone mast and the intact (or less damaged) opposite side. On the side facing a phone mast, the measured values were 80–13,000 μW/m^2 (0.173–2.213 V/m). On the opposite side the values were 8–720 μW/m^2 (0.054–0.52 V/m).

Table 4
60 selected trees showing damage patterns not attributable to diseases, drought or other environmental factors.

														Effect codes												
														1	2	3	4	5	6	7	8	9	10	11	12	13
N°	Scientific name	X	Y	Side antenna measurement μW/m²	Opposite side measurement μW/m²	Number of Phone Mast 1	Distance a 1	Number of Phone Mast 2	Distance a 2	Number of Phone Mast 3	Distance a 3	Direction of damage	Number of main phone mast(s) causing the radiation	Damage only on one side	Sparse leaves or needles (crown transparency)	Brown leaves (start at leaf margins)	Colour change of leaves prematurely	leaves fall prematurely	Dead branches (Peak branches dried).	Tip of the main guide dried	Irregular growth	Not grow in eight	Color change of needles	Dead parts were trimmed down	damage on different sides	no damage
1	*Acer platanoides*	636298	5529366	970	130	35	145,6	34	190,1	21	274,6	S, SW	35,34,21	+	+	+		+	+	+		+				
2	*Acer platanoides*	638211	5530518	680	80	18	41,76	55	583,9	40	930,8	N	18	+	+	+		+	+			+		+		
3	*Acer platanoides*	637868	5529371	2100	290	43	77,18	28	703,9	55	768	S	43	+	+	+		+	+	+		+				
4	*Acer platanoides*	635316	5528245	2300	130	26	61,68	52	164,6	47	210,4	E, S	26,52,47, 14	+	+	+		+	+	+		+		+		
5	*Acer platanoides*	636677	5527688	3600	290	23	174,1	17	363,2	48	552,2	S	23	+	+	+		+	+	+		+		+		
6	*Acer platanoides*	637536	5528219	700	140	45	242,3	12	251	51	356,4	E	45	+	+	+		+	+	+						
7	*Acer platanoides*	635339	5526919	270	30	6	156,2	65	211	32	502,6	W	1	+		+		+	+	+		+		+		
8	*Acer platanoides*	635876	5528029	80	10	16	211,6	48	328,1	47	389,9	W	47	+	+	+		+								
9	*Acer platanoides*	634819	5526187	160	20	24	294,1	65	751,1	6	811,2	N	24, 1		+	+		+	+					+		
10	*Acer platanoides*	634638	5526163	180	55	24	353,3	65	904,4	6	926,3	N	24, 1		+	+		+	+							
11	*Acer platanoides*	635022	5526270	95	20	24	310	65	553,4	6	661,9	NW	24	+	+			+								
12	*Acer platanoides*	634854	5532596	11800	400	60	26,93	63	568,2	59	680,1	N	60	+	+	+		+	+	+		+				
13	*Acer platanoides*	634455	5532438	9900	620	63	139,1	60	448,1	59	624	W	63	+			+							+		
14	*Acer platanoides*	634890	5532028	3380	500	59	142,1	58	557,5	60	593,6	SW	59	+	+	+		+	+	+		+		+		
15	*Acer platanoides*	634815	5532307	1050	50	60	317,8	59	389,3	63	495,3	SW	58	+	+	+		+	+	+		+		+		
16	*Carpinus betulus*	638001	5530928	1210	120	18	431,5	40	506,6	39	518,8	S	18	+	+	+		+	+							
17	*Carpinus betulus*	637996	5530945	2520	150	18	448,7	40	493,7	39	501,3	S	18	+	+	+		+	+							
18	*Carpinus betulus*	637987	5530959	890	90	18	465,3	40	478,9	39	484,8	S	18	+	+	+		+								
19	*Carpinus betulus*	637984	5530970	670	10	40	471,1	39	473,6	18	476,3	S	18	+	+	+		+								
20	*Carpinus betulus*	636619	5528966	1000	200	33	169,6	49	274,2	34	367,6	SE	49		+	+		+	+			+		+		
21	*Carpinus betulus*	636068	5529245	430	20	21	14,87	35	173,5	34	259,1	W	21	+	+	+		+				+		+		
22	*Carpinus betulus*	637138	5530413	4340	110	25	83,24	4	263,4	5	450,6	NE	4	+	+	+		+	+	+		+				
23	*Carpinus betulus*	637664	5530231	990	60	55	145,8	25	513,2	4	586,9	E	55	+	+	+		+	+							
24	*Carpinus betulus*	633137	5529754	2700	50	7	217,4	44	653,7	37	776,2	E	37	+	+	+		+	+							
25	*Tilia sp.*	636098	5528729	870	150	22	249,1	11	349,5	14	486,5	W	22	+	+	+		+	+							
26	*Tilia sp.*	636261	5528398	410	20	54	149,5	16	358,4	11	428	W	14	+		+		+								
27	*Tilia sp.*	636030	5528283	680	160	16	100,7	11	279	54	287	S	48	+	+		+	+	+					+		
28	*Tilia sp.*	634972	5528626	660	170	41	139,8	42	202,3	26	539,6	SW	41	+	+	+		+	+	+		+		+		
29	*Tilia sp.*	636283	5529365	2450	160	35	139,5	34	191,2	21	260,9	SW	35, 34, 21	+		+		+				+		+		
30	*Tilia sp.*	634573	5532422	3800	420	63	249,6	60	352,5	59	552,8	NE	60	+	+	+		+	+					+		
31	*Tilia sp.*	635319	5526914	380	120	6	136	65	208,9	32	502,6	W	1	+	+		+	+	+	+						
32	*Quercus robur*	638598	5526911	860	130	15	308	53	944,7	12	1434	NW	15		+			+	+							
33	*Quercus rubra*	637501	5529207	1340	120	28	312	43	341,4	46	478,8	E	43	+	+			+	+							
34	*Quercus rubra*	637107	5528961	1650	250	46	105,4	28	236,1	49	414,1	SW	49	+	+				+							
35	*Aesculus hippocastanum*	636092	5528434	400	20	16	252,3	11	255,2	54	284,3	W	14	+	+	+		+	+	+		+				
36	*Robinia pseudoacacia*	638653	5526920	1300	40	15	331,1	53	979,9	12	1463	NW	15	+			+		+	+		+				

Table 4 *(continued)*

37	*Robinia pseudoacacia*	638619	5526874	660	240	15	350,5	53	985,3	12	1476	NW	15	+			+		+					+		
38	*Sorbus occuparia*	634587	5526564	84	8	24	223,4	1	555,7	6	690,2	N	1	+	+	+		+	+	+		+				
39	*Acer negundo*	637722	5529366	3060	310	43	122,3	28	562,9	46	743,9	SE	43	+	+			+	+			+		+		
40	*Acer saccharinum*	637852	5527078	840	180	53	477,9	15	604,7	51	868,4	E	15	+	+			+								
41	*Juglans regia*	634841	5528669	4500	590	41	129,6	42	191,4	26	668,2	N, E	42	+	+			+	+	+	+	+				
42	*Taxus baccata*	635767	5528046	300	70	16	255,3	47	282,7	13	354,2	NW	47	+	+				+					+	+	
43	*Taxus baccata*	635491	5526727	8970	190	65	133,2	6	359,3	32	734,2	W	65	+	+				+					+	+	
44	*Taxus baccata*	634997	5528506	2500	240	41	140,4	42	324,6	26	446,9	N,E,W	41,42		+				+					+	+	
45	*Taxus baccata*	635272	5527980	2700	70	52	130	47	302,8	26	303,6	NE	52	+	+				+					+	+	
46	*Taxus baccata*	637586	5529231	1520	190	43	253,1	28	399	46	567	E	43	+	+									+	+	
47	*Thuja occidentalis*	632975	5529719	910	30	7	98,51	44	651,3	37	936,1	S	7	+	+				+					+		
48	*Thuja occidentalis*	636128	5527881	120	10	48	105,6	16	393,2	17	393,6	S	17	+	+				+					+		
49	*Thuja occidentalis*	634900	5532611	13000	520	60	37,36	63	616,5	59	700,2	NW	60	+	+				+					+		
50	*Thuja occidentalis*	634387	5528232	290	50	41	565,8	42	818,5	52	974,3	S	1	+	+				+	+				+		
51	*Picea pungens*	638525	5526863	770	90	15	326,2	53	927,6	12	1427	NE	15	+	+				+					+		
52	*Picea pungens*	634328	5531086	3080	310	56	104	57	367,3	58	681,7	W	57		+				+				+	+		
53	*Picea pungens*	633280	5529546	1350	200	7	323,8	37	792,7	44	900,5	W	7	+	+				+		+			+		
54	*Pinus sylvestris*	638542	5526861	790	50	15	332,6	53	940,5	12	1439	NE	15		+				+		+	+		+		
55	*Pinus sylvestris*	634461	5532462	5300	130	63	154,9	60	433,2	59	641	SW	63	+	+									+		
56	*Pseudotsuga menziesii*	638560	5526844	1720	60	15	354,2	53	965,2	12	1463	NE	15	+	+				+	+		+		+		
57	*Juniperus communis*	634664	5526141	160	20	24	363,1	65	897,6	6	929,4	N	24	+	+				+					+		
58	*Corylus avellana 'Contorta'*	634355	5532399	420	80	63	31,78	60	555,3	58	636,5	W	63	+	+	+		+	+							
59	*Corylus avellana*	637720	5529249	3880	720	43	121,7	28	534,2	46	700,2	N	43	+	+	+		+							+	
60	*Symphoricarpos albus*	636002	5528299	1200	320	16	90,27	11	248,5	54	316,5	E	54	+	+			+	+						+	

In the five most represented species ($n \geq 4$) among the 60 affected trees, most trees showed damage only on one side: unilateral damage (Damage code 1, Tables 2 and 4). By species and percentages: *Acer platanoides* (86%), *Carpinus betulus* (88%), *Tilia* sp. (100%), *Taxus baccata* (80%) and *Thuja occidentalis* (100%). On the seven trees not given code 1, the damage spread over the whole tree, but trees still showed side differences. Most of these trees were characterized with sparse leaves or needles (crown transparency) (Damage code 2, Tables 2 and 4). By species and percentages: *Acer platanoides* (86%), *Carpinus betulus* (100%), *Taxus baccata* (100%) and *Thuja occidentalis* (100%). In many of the trees with the one-sided damage, the leaves turned prematurely yellow or brown in June – this always began at the leaf margins (Damage code 3, Tables 2 and 4). The species with higher percentages were: *Acer platanoides* (86%) and *Carpinus betulus* (100%). In many trees leaves fall prematurely: *Acer platanoides* (93%), *Carpinus betulus* (100%) and *Tilia sp.* (100%) (Damage code 5, Tables 2 and 4). Many trees of the species *Acer platanoides* (80%), *Taxus baccata* (80%) and *Thuja occidentalis* (100%) had dead branches (Peak branches dried) (Damage code 6, Tables 2 and 4). All the trees of the species *Taxus baccata* (100%) and *Thuja occidentalis (100%)* exhibited color change of the needles (Damage code 10, Tables 2 and 4). Finally, in all trees of the species *Taxus baccata*, dead parts were trimmed (Damage code 11, Tables 2 and 4). Some trees stopped growing in height while, in others, the main guide died (see Tables 2 and 4).

The 30 randomly selected trees are presented in Table 5 with the tree code number, the scientific name, the UTM coordinates, the measurements (power flux density) on both sides of each tree, the distance (meters) to the three nearest antennas, their code number and the damage codes. Trees in these locations may be in areas with either high or low radiation. Seventeen trees in this group were situated in places with low radiation and showed no signs of damage. The measurements were 8–50 $\mu W/m^2$ (0.054–0.137 V/m) and showed no difference between the two opposite sides. Thirteen trees stood in the radiation field of one or more phone mast. Six of these had damage only on the side facing a phone mast, and five had damages on other sides. The measurements on the exposed sides were 40–4600 $\mu W/m^2$ (0.122–1.316 V/m).

The 30 trees selected in areas with low radiation (radio shadow of hills, buildings or trees) are presented in Table 6 with the tree code number, scientific name, UTM coordinates, measurements (power flux density) on both sides of each tree, distance (meters) to the three nearest antennas, their code number and the damage codes. All trees selected in low radiation areas showed no damage (code 13). The power flux density values measured were 3–40 $\mu W/m^2$ (0.033–0.122 V/m) and no significant differences were found between the two opposite sides.

The trees in random points and the trees in areas of low radiation are represented In Fig. 4 over the electromagnetic map prepared by interpolation of the 144 measurements points.

We performed a Repeated Measures ANOVA analysis in order to include the measurements of the exposed and shielded side of each tree (R1 = within subjects factor) in the three groups of trees (damaged, random, and low radiation), and to avoid pseudoreplication. The comparisons of all factor levels revealed significant differences, including the interaction between factors. A post hoc Bonferroni comparisons test, recommended for different sized groups of samples, revealed significant differences between measurements from the exposed side of damaged trees and all other groups (Table 7). Fig. 5 shows the measurements (mean and standard error) in all groups.

In the "Random points" group of trees, we performed another Repeated Measures ANOVA (R1 = within subjects factor) for trees damaged and undamaged within this group (Table 8). The results showed significant differences in both factors, including the interaction, which means that depending on the group of tree (damaged or undamaged),

Table 5
Results of the tree measurements at the 30 random points.

												Effect codes												
												1	2	3	4	5	6	7	8	9	10	11	12	13
N°	Scientific name	X	Y	Side antenna measurement µW/m²	Opposite side measurement µW/m²	Number of Phone Mast 1	Distance a 1	Number of Phone Mast 2	Distance a 2	Number of Phone Mast 3	Distance a 3	Damage only on one side	Sparse leaves or needles (crown transparency)	Brown leaves (start at leaf margins)	Colour change of leaves prematurely	leaves fall prematurely	Dead branches (Peak branches dried).	Tip of the main guide dried	Irregular growth	Not grow in eight	Color change of needles	Dead parts were trimmed down	damage on different sides	no damage
1	*Salix viminalis*	634095	5532455	10	10	63	241,1	58	754,9	60	786,7													+
2	*Thuja occidentalis*	634760	5532680	500	120	60	119,6	63	524,2	59	763		+				+	+			+		+	
3	*Abies alba*	634030	5530490	2200	900	36	201,2	37	418,8	31	447,7		+				+			+	+		+	
4	*Acer campestre*	634545	5530739	890	320	56	326,5	31	649,4	57	657,5	+	+				+							
5	*Acer platanoides*	634557	5530005	4600	1100	31	284,9	30	322,2	62	668,1	+	+	+		+						+		
6	*Picea abies*	635311	5530644	1900	210	9	185,6	8	894,8	30	900									+	+			
7	*Thuja occidentalis*	635635	5529879	10	10	8	252,5	38	621,9	9	702,6													+
8	*Acer platanoides*	635693	5529848	2600	310	8	210,9	38	625,5	21	707,1	+	+			+	+					+		
9	*Cornus sanguinea*	636415	5530248	40	30	27	559,3	8	614,5	25	750,8													+
10	*Acer pseudoplatanus*	637525	5530896	50	50	5	270,5	40	298,1	4	366,7													+
11	*Syringa*	638111	5531436	10	10	39	344,8	40	595,7	18	885,1													+
12	*Acer platanoides 'Globorum'*	637928	5530541	30	30	18	295,5	55	436,8	4	683,7													+
13	*Acer platanoides*	637159	5529361	20	15	28	181,7	46	330,8	43	671,3													+
14	*Quercus rubra*	638342	5528994	1480	570	50	549,7	43	600,8	45	907,4		+			+	+					+	+	
15	*Thuja occidentalis*	638359	5528569	25	20	50	275,5	45	653,6	12	866,2													+
16	*Tilia sp*	637412	5527922	460	320	51	93,6	10	122,5	12	293,8											+		
17	*Quercus robur*	637363	5527807	45	33	10	120	51	137,3	12	389,4													+
18	*Larix decidua*	637804	5527628	4400	3170	53	125,8	51	396,4	12	408,5		+				+		+				+	
19	*Acer pseudoplatanus*	637919	5527135	760	120	53	418,2	15	530,9	51	849,1	+	+			+	+	+				+		
20	*Acer negundo*	637329	5526888	190	30	23	865,1	53	879,8	51	990,7	+										+		
21	*Quercus robur*	637115	5527423	46	26	23	382	10	511,2	51	578,5													+
22	*Thuja occidentalis*	637315	5526260	40	13	64	1367	23	1390	53	1421	+									+			
23	*Salix matsudana 'Tortuosa'*	635403	5525413	15	12	64	848,8	24	1229	65	1297													+
24	*Populus tremula*	635410	5525828	15	9	64	596,8	65	882,5	24	897													+
25	*Salix matsudana 'Tortuosa'*	634981	5526161	41	23	24	369,8	65	665,7	6	777,7													+
26	*Prunus sp.*	634829	5526050	28	21	24	431,4	65	845,7	6	931,9													+
27	*Picea pungens*	634791	5526809	470	340	24	329	6	405,3	1	563,6		+				+		+				+	
28	*Cornus sanguinea*	635164	5527863	15	15	52	288,9	26	454,4	47	460,7													+
29	*Cornus sanguinea*	634905	5528779	20	20	42	65,12	41	242	26	695,1													+
30	*Acer negundo*	634202	5529092	8	8	42	792,6	41	859	62	886,9													+

significant or non-significant respectively differences between the measurements of the two sides are seen (Fig. 6). A post hoc Bonferroni comparisons test showed significant differences between the measurements from the exposed side of damaged trees and all other groups in the random points group (Table 8).

Of the 120 trees, those with lower mean distance to the three closest antennas have usually higher values of radiation (Fig. 7). However, screening is common in cities due to a large amount of buildings, thus some trees that are close to antennas show lower radiation values than expected. This means that radiation measurements at points close to antennas are variable (high and low) while trees farther from antennas always have low values.

A dossier with documentation gathered over the years and the examples of tree damages is presented in: http://kompetenzinitiative.net/KIT/KIT/baeume-in-bamberg/

4. Discussion

In the present study it was useful, that tree damages in the vicinity of phone masts in Bamberg and Hallstadt had been documented starting 2006. We found a high level of damage to trees in the vicinity of phone masts. The damage encountered in these trees is not attributable to harmful organisms, such as diseases, pests or other environmental factors. These would impact upon the entire tree, whereas damage to trees in the present study was only found on parts of the tree and only on one side (unilateral). Therefore, these factors cannot explain the damage documented here. Generally in all trees of this study, damage is higher in areas of high radiation and occurs on the side where the nearest phone mast is located (Table 4 and Fig. 3). Moreover, areas with more antennas have more levels of radiation and damaged trees are found most often in these high electromagnetic polluted areas. These results showed that side differences in damage corresponded to side differences in measured values of power flux density. This paper look at the effects on trees, but also provides information on how electromagnetic radiation is distributed in a city (interpolation map and Fig. 7).

In this study deciduous and coniferous trees were examined under the real radiofrequency field conditions around phone masts in Bamberg and Hallstadt. From most phone masts a broad band of frequencies with different modulations and pulse frequencies and fluctuating power densities is emitted (GSM 900, GSM 1800, UMTS, LTE, TETRA). Different signals may have different effects due to their physical parameters (Belyaev, 2010; IARC, 2013). We do not discriminate between these different signals and cannot answer the question which part of the

Table 6
Results of the tree measurements in the 30 points with low radiation.

												Effect codes												
												1	2	3	4	5	6	7	8	9	10	11	12	13
Nº	Scientific name	X	Y	Side antenna measurement µW/m²	Opposite side measurement µW/m²	Number of Phone Mast 1	Distance a 1	Number of Phone Mast 2	Distance a 2	Number of Phone Mast 3	Distance a 3	Damage only on one side	Sparse leaves or needles (crown transparency)	Brown leaves (start at leaf margins)	Colour change of leaves prematurely	leaves fall prematurely	Dead branches (Peak branches dried).	Tip of the main guide dried	Irregular growth	Not grow in eight	Color change of needles	Dead parts were trimmed down	damage on different sides	no damage
1	*Acer platanoides*	636741	5529855	26	20	25	636,3	33	784,1	35	798,8													+
2	*Carpinus betulus*	634853	5529041	10	8	42	234,5	62	476,4	41	500,1													+
3	*Carpinus betulus*	638311	5528439	12	10	50	229,7	45	563,5	12	750													+
4	*Carpinus betulus*	636753	5529880	8	8	25	609,6	33	811,5	28	823,5													+
5	*Carpinus betulus*	637817	5527130	15	12	53	432,1	15	633	51	806,6													+
6	*Carpinus betulus*	634931	5526731	15	15	24	286	6	310,3	65	428,6													+
7	*Tilia sp.*	636500	5529673	8	8	35	511,4	34	528,3	33	570,3													+
8	*Tilia sp.*	636824	5529794	17	9	25	635,7	28	713,1	33	755,3													+
9	*Quercus robur*	636455	5526130	9	8	64	497,5	65	1240	17	1425													+
10	*Quercus robur 'Fastigiata'*	636178	5528932	10	10	34	282,2	35	306,5	21	332													+
11	*Aesculus hippocastanum*	636828	5529780	10	10	25	645,5	28	699	33	744,2													+
12	*Aesculus carnea*	636463	5529709	12	12	35	526,1	34	551,4	33	608,6													+
13	*Robinia pseudoacacia*	635507	5528534	15	15	14	136,6	13	201,5	26	299,2													+
14	*Robinia pseudoacacia*	634720	5532783	8	8	60	216,7	63	559,3	59	868,7													+
15	*Acer campestre*	635697	5528689	40	30	14	136,5	22	155,8	11	246,8													+
16	*Acer campestre*	636486	5526116	6	6	64	526,2	65	1273	23	1437													+
17	*Juglans regia*	635744	5528667	20	15	22	119	14	145,7	11	202,8													+
18	*Platanus hispanica*	635496	5528529	17	15	14	148,4	13	204,1	26	289,9													+
19	*Prunus avium*	637958	5530874	10	8	18	412,4	40	502,6	39	551,4													+
20	*Prunus sp.*	636079	5528463	10	10	11	237,5	16	269,7	54	312,7													+
21	*Taxus baccata*	638407	5528502	5	5	50	316	45	673,6	12	864,8													+
22	*Taxus baccata*	638222	5531032	10	10	18	474	39	578,6	40	673,1													+
23	*Thuja occidentalis*	636518	5529853	9	9	8	648,4	35	680	34	705													+
24	*Thuja occidentalis*	635318	5528784	20	15	42	371,5	14	389,4	13	514,8													+
25	*Picea pungens*	636512	5529735	17	17	35	571,4	34	590,8	33	632													+
26	*Juniperus communis*	636549	5529756	8	8	35	607,8	34	623,4	33	653,7													+
27	*Cornus sanguinea*	638167	5529098	8	6	43	397,2	50	597,9	45	899,8													+
28	*Sambucus nigra*	635529	5525601	5	5	64	625,2	65	1121	24	1146													+
29	*Corylus avellana*	636422	5526181	5	3	64	476,4	65	1187	17	1371													+
30	*Corylus avellana*	636625	5529834	6	6	35	714	34	725,2	25	732,3													+

radiation has caused the damage. Nevertheless broad bands of frequencies, modulation, pulse frequencies, interferences and other physical characteristics may play an important role, since in some cases, damage already appears at low intensities. This can be a shortcoming of the study.

The aim of the present study was to find out whether there is a causal relationship between the unilateral tree damages, which had been observed since 2006, and the RF-EMF emitted from phone masts and a preliminary observation to find out whether various species react differently to RF exposure.

The selection of the 60 unilaterally damaged trees was limited by the fact that we could do measurements only up to a height of 6 m. Trees with damages above the height of 6 m could not be included.

Many factors can affect the health of trees: Air and soil pollutants, heat, frost, drought, as well as composition, compaction and sealing of the soil, road salts, root injury due to construction work, diseases and pests. Most of these factors do not affect a tree only on one side over a period of >5 years. Industrial air pollutants could eventually cause unilateral damage in direction to an industrial emitter. But the observed unilateral damages appeared in all directions and were not oriented to the incineration plant or other industrial plants. Root injury due to construction work can produce damage on one side of a tree, but 24 of the 60 selected trees were situated in gardens, parks or on the cemetery where they could not be affected by construction damages.

From the damaged side there was always visual contact to one or more phone mast (s). In each case measurements of the power flux density on the damaged side which was facing a phone mast and on the opposite side without (or with less) damage were carried out and the difference between the measured values on both sides was significant (Fig. 5), as well as between the exposed side of damaged trees and all other groups. In all 60 trees the gradient of damage corresponded to a gradient of measured values. The attenuation of the RF-EMF within the treetop offers an explanation: a part of the RF-EMF is absorbed by leaves or needles and another part is reflected, scattered and diffracted.

In the randomely selected group of 30 trees, 17 trees were situated on places with low radiation. These 17 trees showed no damages, the measured values were below 50 µW/m^2 (0.137 V/m) and there was no difference between opposite sides as in the low radiation group. On the other hand, 13 trees grew in the radiation field of one or more phone mast (s). These trees showed unilateral damage or damage on different sides. The measured values at damaged trees showed differences between both sides as in the previous group above.

In the group of 30 trees in areas with low radiation (radio shadow of hills, buildings or trees and without visual contact to phone masts)

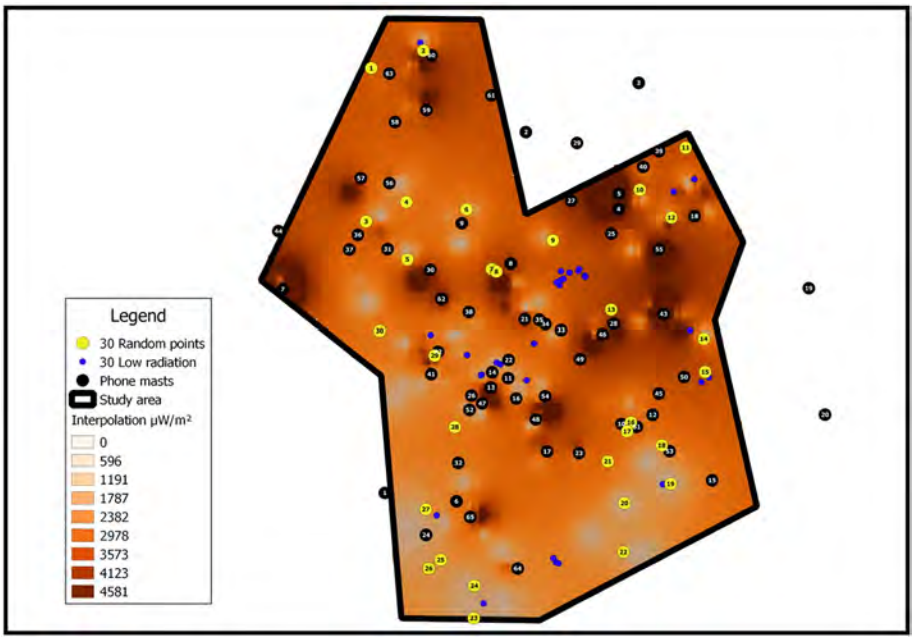

Fig. 4. Map showing the 30 trees at random points and the 30 trees in areas of low radiation (both with code numbers) over the interpolation electromagnetic map of the 144 measurement points. Phone masts (with code numbers) are also represented.

there were no unilateral damages. The measured values were below 50 µW/m^2 (0.137 V/m) and there was no difference between opposite sides. These results in the three groups point to a connection between unilateral tree damage and RF exposure.

In the electromagnetic field of all mobile phone base stations visited numerous tree damages were observed. The damage occurred in temporal relation with the putting into operation of new mobile phone base stations. Woody plants of all species are affected (deciduous and coniferous trees as well as shrubs).

In the five most represented species ($n \geq 4$) among the 60 damaged trees (*Acer platanoides*, *Carpinus betulus*, *Tilia* sp., *Taxus baccata* and *Thuja occidentalis*), most trees showed damage only on one side (Damage code 1, Tables 2 and 4). Most of these trees were characterized with sparse leaves or needles (crown transparency) (Damage code 2, Tables 2 and 4). In many of the trees with the one-sided damage, the leaves turned prematurely yellow or brown in June – this always began at the leaf margins (Damage code 3, Tables 2 and 4). In many trees leaves fall prematurely (Damage code 5, Tables 2 and 4) or had dead branches (Peak branches dried) (Damage code 6, Tables 2 and 4). Some trees stopped growing in height while, in others, the main guide died (see Tables 2 and 4).

The differences in susceptibility of different species could be related to radiofrequency energy absorption properties of the trees (e.g., dielectric property). Perhaps this study cannot answer questions about these differences, however it is quite possible that differences are related to the electrical conductivity, related also with the density of the wood (species of fast or slow growth) and particularly with the percentage of water in the tissues. Poplars and aspen that grow near rivers and water bodies in Spain seem to be particularly sensitive to the effects of radiation. But the waves reflection in the water could also influence.

The results presented here lead us to conclude that damage found in the selected trees is caused by electromagnetic radiation from phone

Table 7
Repeated measures ANOVA analysis and Bonferroni post hoc comparisons ($p < 0.01$ values with *) in the three types of trees (damaged, random, and low radiation). Measurement Side 1/2 correspond to the maximum/minumum value of radiation respectively for the opposite sides of each tree.

	SS	Degr. of	MS	F	p
Intercept	62663309	1	62663309	25.81460	0.000001*
Type of tree	52931692	2	26465846	10.90280	0.000046*
Error	284010086	117	2427437		
R1	33197069	1	33197069	18.28694	0.000039*
R1*Type of tree	44608664	2	22304332	12.28656	0.000014*
Error	212395158	117	1815343		

	Type of tree	R1	{1}	{2}	{3}	{4}	{5}	{6}
1	Damaged	Measurement Side1		0.000000*	0.001829*	0.000001*	0.000000*	0.000000*
2	Damaged	Measurement Side2	0.000000*		1.000000	1.000000	1.000000	1.000000
3	Random	Measurement Side1	0.001829*	1.000000		1.000000	1.000000	1.000000
4	Random	Measurement Side2	0.000001*	1.000000	1.000000		1.000000	1.000000
5	Low radiation	Measurement Side1	0.000000*	1.000000	1.000000	1.000000		1.000000
6	Low radiation	Measurement Side2	0.000000*	1.000000	1.000000	1.000000	1.000000	

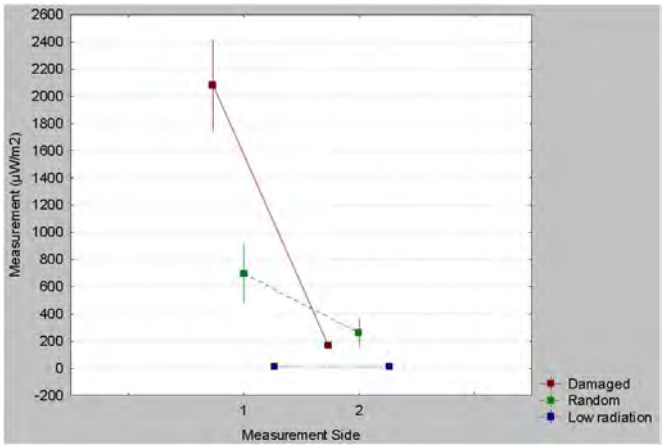

Fig. 5. Differences between measurements in both sides for the three different tree groups: damaged, random, and low radiation. Measurement Side 1/2 correspond to the maximum/minumum value of radiation respectively for the opposite sides of each tree. The bars represent means ± standard errors. The central point represents the mean and the straight line ± 0.95*SE.

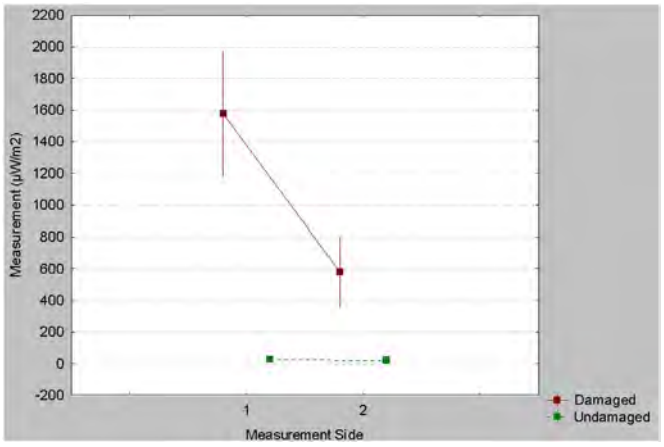

Fig. 6. Differences between measurements in both sides for the damaged and undamaged trees within the random trees group. Measurement side 1/2 correspond to the maximum/minumum value of radiation respectively for the opposite sides of each tree. The bars represent means ± standard errors. The central point represents the mean and the straight line ± 0.95*SE.

masts, as we proposed in previous studies (Balmori, 2004; Waldmann-Selsam, 2007; Waldmann-Selsam and Eger, 2013; Balmori, 2014). Interested parties are able to locate the damaged trees found in this work in Bamberg and Hallstadt with their UTM coordinates. However, trees with code numbers 20, 38 and 48 (Table 4) have been cut down and removed.

Research on the effects of radiation from phone masts is advancing rapidly. In February 2011 the first symposium on the effects of electromagnetic radiation on trees took place in Baarn, Netherlands (Schorpp, 2011 - http://www.boomaantastingen.nl/), where similar effects and results to those found in the current paper were presented.

Although there are some related experiments that show no effect of long-term exposure (3,5 years), 2450-MHz (continous wave) and power flux densities from 0.007 to 300 W/m^2 on crown transparency, height growth and photosynthesis of young spruce and beech trees (Schmutz et al., 1996), this result may not be transferred to modulated 2450-MHz or to other pulsed and modulated frequencies. In addiction, an increasing number of studies have highlighted biological responses and modifications at the molecular and whole plant level after exposure to high frequency electromagnetic fields (Vian et al., 2016). Plants can perceive and respond to various kinds of electromagnetic radiation over a wide range of frequencies. Moreover, a low electric field intensity (5 V/m) was sufficient to evoke morphological responses (Grémiaux et al., 2016). Electromagnetic radiation impacts at physiological and ecological levels (Cammaerts and Johansson, 2015), and evokes a multitude of responses in plants. The effects of high frequency electromagnetic fields can also take place at the subcellular level: it can alter the activity of several enzymes, including those of reactive oxygen species (ROS) metabolism, a well-known marker of plant responses to various kinds of environmental factors; it evokes the expression of specific genes previously implicated in plant responses to wounding (gene expression modifications), and modifies the growth of the whole plants (Vian et al., 2016). It could be hypothesized that membrane potential variations in response to electromagnetic radiation exposure may initiate electrical waves of depolarization (AP and/or VP) that could initiate immediate or delayed growth responses (Grémiaux et al., 2016). It has been proposed that electromagnetic fields act similarly in plants and in animals, with the probable activation of calcium channels via their voltage sensor (Pall, 2016).

Electromagnetic radiation (1800 MHz) interferes with carbohydrate metabolism and inhibits the growth of *Zea mays* (Kumar et al., 2015). Furthermore, cell phone electromagnetic radiation inhibits root growth of the mung bean (*Vigna radiata*) by inducing ROS-generated oxidative stress despite increased activities of antioxidant enzymes (Sharma et al., 2009). Germination rate and embryonic stem length of *Triticum aestivum* was also affected by cell phone radiation (Hussein and El-Maghraby, 2014). After soybeans were exposed to weak microwave radiation from the GSM 900 mobile phone and base station, growth of

Table 8
Repeated measures ANOVA analysis and Bonferroni post hoc comparisons ($p < 0.01$ values with *) in the random trees group. Measurement Side 1/2 correspond to the maximum/minumum value of radiation respectively for the opposite sides of each tree.

	SS	Degr. of	MS	F	p
Intercept	17829607	1	17829607	16.60985	0.000343*
13 code	16391606	1	16391606	15.27023	0.000538*
Error	30056202	28	1073436		
R1	3701923	1	3701923	16.73250	0.000329*
R1*13 code	3627579	1	3627579	16.39647	0.000368*
Error	6194761	28	221241		

	13 code	R1	{1}	{2}	{3}	{4}
1	Undamaged	Measurement Side 1		1.000000	0.002129*	0.416303
2	Undamaged	Measurement Side 2	1.000000		0.000034*	0.927155
3	Damaged	Measurement Side 1	0.002129*	0.000034*		0.000055*
4	Damaged	Measurement Side 2	0.416303	0.927155	0.000055*	

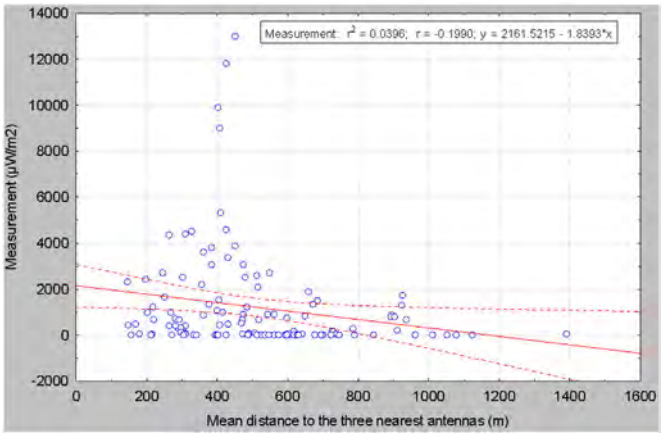

Fig. 7. Scatterplot showing the correlation between measurements from each of the 120 trees and the mean distance to the three nearest antennas. Dashed lines represent the 0.95 confidence interval.

epicotyl and hypocotyl was reduced, whereas the outgrowth of roots was stimulated. These findings indicate that the observed effects were significantly dependent on field strength as well as amplitude modulation of the applied field (Halgamuge et al., 2015). Phone mast radiation also affects common cress (*Lepidium sativum*) seed germination (Cammaerts and Johansson, 2015). In *Arabidopsis thaliana*, the long term exposure to non ionizing radiation causes a reduction in the number of chloroplasts as well as the decrease of stroma thylakoids and the photosynthetic pigments (Stefi et al., 2016). Finally, low-intensity exposure to radiofrequency fields can induce mitotic aberrations in root meristematic cells of *Allium cepa*; the observed effects were markedly dependent on the frequencies applied as well as on field strength and modulation (Tkalec et al., 2009).

In general, polarization from man-made electromagnetic radiation appears to have a greater bioactive effect than natural radiation, and significantly increases the probability for initiation of biological or health effects (Panagopoulos et al., 2015).

Tree damages as in Bamberg and Hallstadt were documented by the authors in several countries: Spain (Valladolid, Salamanca, Madrid, Palencia, León), Germany (Munich, Nürnberg, Erlangen, Bayreuth, Neuburg/Donau, Garmisch-Partenkirchen, Murnau, Stuttgart, Kassel, Fulda, Göttingen, biosphere reserve Rhön, Tegernsee Valley and in several small towns), Austria (Graz), Belgium (Brussels) and Luxemburg.

Each phone mast can harm many trees and each tree can be affected by several phone masts belonging to the same or different base stations. Damaged trees seem to exist around each antenna and the several million phone masts in the world could potentially be damaging the growth and health of millions of trees. This can occur not only in cities, but also in well-preserved forests, and in natural and national parks, where base stations are being installed without the necessary prior environmental impact studies, due to a lack of knowledge of the problem. For this reason, it is essential for an assessment on the environmental impact of any new base station prior to implementation.

Additionally, phone masts can cause a drop in timber productivity in plantations of pine, poplar, etc., as well as fruits, nuts, etc. Thus, the industry must be required to pay damages to plantation owners. Similarly, as trees are a common social good, the industry should compensate for damaged and dead trees around the world due to radiation. Further, the money spent by municipalities to repair or replace damaged trees should enter into the computation of costs/benefits of this technology. For installation of any new technology, the burden of proof should be to the industry that requires demonstration of safety prior to deployment.

Electromagnetic radiation from telecommunication antennas affected the abundance and composition of wild pollinators in natural habitats and these changes in the composition of pollinator communities associated with electromagnetic smog may have important ecological and economic impacts on the pollination service that could significantly affect the maintenance of wild plant diversity, crop production and human welfare (Lázaro et al., 2016).

Evidence for plant damage due to high frequency electromagnetic radiation was not taken into account in determining the current statutory regulations (the limit values). Once the problem becomes evident, the guidelines of radiation emitted by the antennas should be reviewed. Proper risk assessment of electromagnetic radiation should be undertaken to develop management strategies for reducing this pollution in the natural environment (Kumar et al., 2015).

Moreover, due to the lack of recognition, certain modern projects with interesting ideas for decreasing environmental pollution could have opposite effects than expected. For example, in the Netherlands, the TreeWiFi project (http://treewifi.org/), which aims to motivate people to use bikes and public transport in order to reduce the [NO2] pollution providing free WiFi when air quality improves, could be favoring electromagnetic pollution with even more harmful effects as it has been demonstrated in this manuscript (see also: http://www.greenpeace.org/canada/fr/Blog/le-wi-fi-tuerait-les-ar-bres/blog/33569/).

In addition, the number of sector antennas has increased in Bamberg and this increase appears to be accelerating: 483 sector antennas in 2011 and 779 sector antennas in 2015. Both radiation and damaged trees represent a loss of quality of life for citizens. This study began after finding that patients who claimed to be affected by phone masts, referred to as radiation, live in areas where affected trees and plants are located. Evidence of radiation damage was even found in potted plants inside patient homes (Waldmann-Selsam and Eger, 2013). Thus, this study is certainly complementary to the study by Eger and Jahn (2010) and other research that has shown effects on the health of people by phone masts located in their vicinity (Santini et al., 2002; Eger et al., 2004; Wolf and Wolf, 2004; Abdel-Rassoul et al., 2007; Khurana et al., 2010; Dode et al., 2011; Gómez-Perretta et al., 2013; Shahbazi-Gahrouei et al., 2014; Belyaev et al., 2015).

In the introduction to the International Seminar on "Effects of Electromagnetic Fields on the Living Environment" in 1999 in Ismaning, Germany, organized by WHO, ICNIRP and German Federal Office for Radiation Protection (BfS), M. Repacholi, head of the International EMF Project of the WHO, said: "By comparison, influences of these fields on plants, animals, birds and other living organisms have not been properly examined. Given that any adverse impacts on the environment will ultimately affect human life, it is difficult to understand why more work has not been done. There are many questions that need to be raised: …" and "…it seems that research should focus on the long-term, low-level EMF exposure for which almost no information is available. Specific topics that need to be addressed include: … EMF influences on agricultural plants and trees" (Matthes et al., 2000).

5. Conclusions

In this study we found a high-level damage in trees within the vicinity of phone masts. Preliminary laboratory studies have indicated some deleterious effects of radiofrequency radiation. However, these early warnings have had no success and deployment has been continued without consideration of environmental impact.

We observed trees with unilateral damage in the radiation field of phone masts. We excluded the possibility that root injury due to construction work or air pollutants could have caused the unilateral damage. We found out that from the damaged side there was always visual contact to one or more phone mast (s).

Statistical analyses demonstrated that the electromagnetic radiation from cellphone towers is harmful to trees. Results show that the measurements in the most affected sides of damaged trees (i.e. those that withstand higher radiation levels) are different to all other groups. These results are consistent with the fact that damage inflicted on

trees by cellphone towers usually start on one side, extending to the whole tree over time.

The occurrence of unilateral damage is the most important fact in our study and an important argument for a causal relationship with RF-EMF, as it supplies evidence for non-thermal RF-EMF effects. This constitutes a danger for trees worldwide. The further deployment of phone masts has to be stopped. Scientific research on trees under the real radiofrequency field conditions must continue.

Acknowledgements

The work presented here was carried out without any funding. Francisco Cabrero and José Ignacio Aguirre from the Department of Zoology, University Complutense of Madrid suggested the interpolation points on the map of radiation. This paper is dedicated in memoriam to the great Swedish researcher and courageous man, Örjan Hallberg. Authors have not a conflict of interest to declare.

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The WASHINGTON
SPECTATOR

JANUARY / FEBRUARY 2022

VOL. 48, NO. 1 ISSN 0887-428X

washingtonspectator.org

Federal Court Instructs FCC to Review Electromagnetic Radiation Standards

By Barbara Koeppel

FOR 25 YEARS—THROUGH FIVE DEMOCRATIC AND Republican administrations—the Federal Communications Commission has refused to revise the regulations it set in 1996 that address what level of radiation from cell phones should be considered safe. Labeled radio-frequency radiation (RFR), these emissions are discharged from all wireless devices, Wi-Fi networks, and the thousands of towers stretched across the United States that transmit and receive the signals.

The FCC's power is promethean. It is the sole U.S. agency that determines the acceptable RFR exposure from wireless devices for people of all ages, wildlife, and the environment. And it insists its original 1996 limits are fine.

However, scientists who've reviewed hundreds of studies published over the last two decades claim the FCC ignores critical findings that show a "statistically significant" link between heavy cell phone use (10 or more years) and brain and thyroid tumors, especially on the side of the head where people hold their phones. Professional groups such as the American Academy of Pediatrics and the California Medical Association have asked the FCC to update its numbers.

Photo by BearFotos

The scientists and physicians worry that the FCC simply repeats the industry's line that all is well—which is particularly troubling since millions more people around the world are exposed each year. In the United States, for example, only 44 million people had cell phones in 1996; today, the number has soared to about 300 million, and that doesn't include the tablets, watches, and other wireless products that increase RFR exposure exponentially.

Thus, in 2019, the Environmental Health Trust (EHT), Consumers for Safe Cell Phones, Children's Health Defense, and 11 other petitioners sued the FCC. They argued that although the U.S. Government Accountability Office told the FCC in 2013 to review its 1996 limits in light of new research, six years later, the FCC was still repeating its all-is-safe mantra. In a 2019 press release, the FCC said that "after a thorough review of the record, we find it appropriate to maintain the existing radiofrequency limits, which are among the most stringent in the world for cell phones."

At the least, this assurance is doubtful. The lawsuit against the FCC argues precisely the opposite: that the Commission has *not* reviewed "the record." Also, researchers point out that countries such as Italy, Switzerland, France, Israel, China, India, and Russia have more stringent limits than the United States regarding the use of Wi-Fi in schools and day care centers, and on acceptable levels of radiation emissions from cell towers. In addition, some have banned all cell phone ads pitched to children.

The lawsuit notes that the FCC even ignored the landmark 10-year, $30 million National Toxicology Program study carried out under the National Institutes of Health—which produced unequivocal results in 2019. Having exposed rats and mice to cell phone radiation for two years, the NTP researchers reported "clear evidence of cancer in the male rats' heart cells, some evidence of increased brain gliomas (brain cancer), and adrenal gland tumors, DNA damage in the brains of male and female rats and mice, and lower birth weights of female rats' offspring."

Two years after the suit was filed, the U.S. Court of Appeals of the D.C. Circuit ruled in August 2021 that the FCC had to reexamine the research to determine if its regulations should be updated. Further, the court called the commission's behavior "arbitrary and capricious," since it had ignored evidence of the harm to children's brains (which are not fully developed) and to

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The Washington Spectator (ISSN 0887-428X) is published bi-monthly by the Public Concern Foundation Inc, 105 Hudson Street, Suite 407, New York, NY 10013.

male and female reproductive systems. It also ruled that because the FCC never produced regulations about radiofrequency radiation's effects on wildlife, it had "completely failed" to address the evidence of potential environmental harm.

However, the court did not set a date for the FCC to comply—which meant the commission could retain its old regulations indefinitely. Also, the court did not address the issue of whether RFR exposures cause cancer; instead it said the FCC had passed the "minimum legal requirement" to assure it had evaluated the research on cancer and radiation exposure. Thus, scientists are concerned that the FCC will again find ways to defer serious examination of the voluminous literature on the subject.

How could this be, given the NTP findings and other research? To bolster its no-cancer claims, the FCC points to a letter the U.S. Food and Drug Administration wrote the commission, which claimed the NTP results weren't relevant to humans since the study was done on rats and mice (although 10 years earlier, the FDA itself had approved the animal study). Dr. Joel Moskowitz, director of the Center for Family and Community Health at the University of California, Berkeley and a leading authority on radiofrequency radiation, says, "The FDA wrote a biased review of the research regarding cancer risk from cell phone radiation."

[Dr. Joel Moskowitz:] "The FDA wrote a biased review of the research regarding cancer risk from cell phone radiation."

Also, the FCC cited reports from organizations that have undeclared conflicts of interest (ties to the wireless industry), which contest the cancer links. Dr. Ronald Melnick, the lead designer of the NTP study, has published two articles stating that the results from these groups' reports were "unfounded."

In fact, the FCC failed on several fronts. Besides ignoring the NTP study, the commission dismissed the American Academy of Pediatrics' request for regulations that reflect the special effects RFR have on children and pregnant women. It never explained why it ignored research that showed children's brains absorb higher levels of the radiation. Instead, it has insisted for 20-plus years that RFR is only harmful if it overheats the human body by at least one degree centigrade. This is a red herring, since wireless devices don't emit the kind of radiation that produces higher temperatures. Also, the FCC didn't consider the effects of long-term exposures.

Many researchers insist these links have been proven. As noted in an earlier article in this journal ("Wireless Hazards," *Washington Spectator*, December 2020), studies over the past 20 years have found strong evidence of brain tumors and leaks in the blood-brain barrier, acoustic neuromas (tumors on the nerves leading from the inner ear to the brain), thyroid tumors, and cognitive impairment. They also showed a link to male infertility: when men carried phones in their pants' pockets, their sperm were weakened and reduced. Also, physicians and scientists found that some individuals are particularly sensitive to RFR radiation, which can cause tinnitus, vertigo, headaches, fatigue, and loss of memory. Early this month, some experts studying the U.S. diplomats' and CIA agents' "Havana Syndrome" symptoms suggested they could be related to radiofrequency radiation.

The latest evidence

Theodora Scarato, the executive director of the Environmental Health Trust, says that since the FCC had not yet responded to the court's August ruling by last November, the EHT asked the commission to consider additional studies that were completed after 2019, when the suit was filed.

For example, in late 2019, the European Parliamentary Research Service said that electromagnetic fields (EMFs) emitted by 2G, 3G, and 4G cell phones (which operate at 450 to 6,000 megahertz) are "probably carcinogenic for humans," particularly in causing gliomas, acoustic neuromas, and meningiomas (slow-growing, mostly nonmalignant brain tumors).

In 2020, Yoon-Jung Choi and Joel Moskowitz (the lead authors) and three other scientists reviewed 46 "case-controlled studies" and published their findings in "Cellular Phone Use and Risk of Tumors: Systematic Review and Meta-Analysis," in the November *International Journal of Environmental Research and Public Health*. Moskowitz says, "This study updated our earlier analysis published in 2009." Evidence from the new study, he says, links cell phone use to increased tumor risk. The researchers' numbers are compelling: 1,000 or more hours of cell phone use, or about 17 minutes a day over 10 years, was associated with a statistically significant 60 percent increase in brain tumor risk.

Also in 2020, Devra Davis (an epidemiologist and co-founder of the Environmental Health Trust), Aaron Pilarcik (a biophysicist at the Worcester Polytechnic Institute), and Anthony Miller (an epidemiologist specializing in cancer etiology and

an adviser to the World Health Organization) reviewed data on colon and rectal cancer from the U.S. Centers for Disease Control, the U.S. SEER Program at the National Cancer Institute, and the Iranian National Cancer Registry. They found that the colon cancer risk for adults born in the 1990s had doubled and the rectal cancer risk had increased fourfold by the time they were 24 years old—when compared to those born 60 years ago. They hypothesized that cell phone radiation could play a role in the increased risk and recommended the FCC set limits to reduce the exposure. Their study, "Increased Generational Risk of Colon and Rectal Cancer in Recent Birth Cohorts Under Age 40—the Hypothetical Role of Radiofrequency Radiation from Cell Phones," was published in the *Annals of Gastroenterology and Digestive Disorders.*

In 2020, Henry Lai (a retired University of Washington scientist) reviewed the research on genetic effects and found that exposure to RFR can break DNA strands and affect the central nervous system. The review, "Genetic Effects of Non-Ionizing Electromagnetic Fields" was published in the December 2020 issue of *Electromagnetic Biology and Medicine.*

In 2021, Henry Lai, with Albert Manville (a biologist formerly at the U.S. Fish and Wildlife Service) and Blake Levitt (an environmental journalist), studied the effects of cell phone towers in various countries, comparing data from the 1980s to the present. They found that the toxic effects of EMFs on cells and genes had altered "the wildlife's orientation and migration patterns, their ability to find food, mate, reproduce, build nests and dens, and maintain and defend their territory." Yet the FCC has still set no standards for long-term, low-level EMF exposure on wildlife. The scientists' three-part research was published in *Reviews on Environmental Health,* "Effects of Non-Ionizing Electromagnetic Fields (EMF) on Flora and Fauna."

Also in 2021, the journal *Andrologia* published a study by Iranian scientists who found DNA fragmentation in sperm and recommended that men keep cell phones "away from the pelvis as much as possible."

Further, from 2015 to the present, the French government has tested the radiation from cell phones when people hold them next to their bodies. Their findings are dramatic: They reported exposures to RFR up to 11 times higher than those approved in FCC guidelines. Thus, the government passed a ministerial order in 2019 urging the public to limit children's cell phone use and "keep the phones away from the belly of pregnant women and the lower abdomen of adolescents."

Moreover, the National Institutes of Health and the American Cancer Society funded a study in 2019 and 2020 at Yale University that found increased thyroid cancer among heavy cell phone users.

The accompanying table enumerates many of the ways that doctors and vigilant public jurisdictions have identified to help people reduce the health risks that could be associated with exposure to RFR and cell phone radiation emissions.

The EHT's Scarato reminds readers concerned about RFR emissions exposure to "contact their senators and representatives to raise the issues with the committees." In the Senate, the Committee on Commerce, Science, and Transportation, along with its Subcommittee on Communications, Media, and Broadband oversees the FCC. In the House, the FCC reports to the Energy and Commerce Committee and its Communications and Technology Subcommittee. Public pressure on the members of these committees will help to prod the FCC to review the research and respond to the ruling of the Court of Appeals. ■

Barbara Koeppel is a Washington, D.C.-based investigative reporter who covers social, economic, political, and foreign policy issues.

PROTECT YOURSELF FROM WIRELESS RADIATION

The California Department of Public Health recommends these precautions:

- **Use headsets—not ear buds—but remove them when not talking, since even headsets release small amounts of radiation when not in use.**
- **Text instead of talk.**
- **Carry phones away from your body in backpacks, tote bags, handbags, and briefcases.**
- **Keep phones away from your head when streaming.**
- **Download movies instead of streaming them.**
- **Don't use cell phones when reception is poor and they show just one or two bars—in subways, cars, basements, or rural areas. Under such circumstances cell phones often need vastly more energy to communicate with cell towers and other phones, and radiation levels intensify.**
- **Men should not carry phones in pants' pockets. Cleveland Clinic Center for Male Fertility researchers found this weakened and reduced sperm, which can cause infertility.**

Go to page 8 for more information

(Continued from page 3)

PROTECT YOURSELF FROM WIRELESS RADIATION

Countries must adopt tough laws

- Belgium and France banned companies from designing phones to appeal to children.
- Israel and Cyprus banned Wi-Fi in day care centers and kindergartens, requiring connections be wired. Israel limited Wi-Fi use in first and second grades to three hours a week.
- France ordered cities to map the locations of antennae, measure their radiation levels, and tell the public. Also, it banned ads showing people holding phones next to their heads and ordered companies to list phones' exposure levels. If they don't, they can be fined up to 75,000 euros.
- India ordered companies to remove towers located near hospitals and schools.
- Israel ordered companies to list phones' radiation levels.
- Geneva (Switzerland) placed a moratorium on the rollout of 5G.

Scientists also recommend these steps:

- Use corded landlines at home, but put satellite or cordless handsets on speakerphone, since they emit even more radiation than cell phones.
- Push for laws to protect children.
- Get states to create expert commissions to study radiation emissions' effects. New Hampshire's commission recommended that towers and antennae be placed farther from schools and homes.

To Whom It May Concern:

Dear Sirs/Madams:

I am Scientist Emeritus and Former Director of the National Institute of Environmental Health Sciences and National Toxicology Program of the National Institutes of Health. I am currently a Scholar in Residence at the Nicholas School of the Environment at Duke University.

Wireless networks, cell towers and cell phones create radiofrequency radiation emissions. U.S. FCC limits for human exposure to radiofrequency were last reviewed in 1996 and based on the assumption that heating is the only harmful effect. Aware that the FCC's 1996 limits lacked the underpinning of solid scientific data regarding long term health effects, the FDA requested large-scale studies by the National Toxicology Program (NTP) and in 2018 the NTP studies found clear evidence of an association with cancer in male rats. Additionally, the NTP found heart damage and DNA damage, despite the fact that the animals were carefully exposed to non-heating RFR levels long assumed to be safe. The Ramazzini Institute animal studies used even lower RFR lower exposures to approximate cell tower emissions and also found increases of the same tumor type. The NTP studies were carefully controlled to ensure exposures did not significantly heat the animals. The animal study findings in combination with human studies indicate adverse effects from non heating levels of radiofrequency.

I document the importance of the NTP findings of effects from non thermal exposures in my declaration in an Amicus Brief for the case Environmental Health Trust et al v. the FCC. The August 13, 2021 judgment ordered the FCC to address several issues including the health implications of long term exposures.

A mounting body of published studies associates radiofrequency radiation with adverse negative health effects. FCC limits need to be strengthened to protect the public, especially children and vulnerable populations, from long term exposures.

Linda S. Birnbaum, PhD
Scientist Emeritus and Former Director
National Institute of Environmental Health Sciences and National Toxicology Program
Scholar in Residence, Duke University, Former President, Society of Toxicology
Adjunct Professor, Yale University and UNC, Chapel Hill, Visiting Professor, Queensland University (Australia)

National Toxicology Program Radiofrequency Radiation
https://ntp.niehs.nih.gov/whatwestudy/topics/cellphones/index.html

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Smith-Roe SL., et al., Evaluation of the genotoxicity of cell phone radiofrequency radiation in male and female rats and mice following subchronic exposure, Environ Mol Mutagen 2020; 61 (2): 276-290

Massachusetts Joint Committee on Consumer Protection
Massachusetts Joint Committee on Advanced Information Technology, the Internet and Cybersecurity Committee
24 Beacon St. Room 506
Boston, MA 02133

Subject: In Support of Technology Safety Bills S. 186, S. 187, H. 115, H. 105-114

Dear Esteemed Legislators,

I am writing in support of legislation that which reduces RFR exposure, especially for children who are more vulnerable.

I am Professor Emeritus of Pediatrics and of Environmental & Occupational Health George Washington University School of Medicine and Health Sciences and George Washington University Milken Institute School of Public Health. I am also past chair of the Council on Environmental Health of the American Academy of Pediatrics, and also served on the Children's Health Protection Advisory Committee for the US EPA.

We assume that our federal health and environmental agencies regularly review the latest research and ensure that cell phones and wireless devices are safe. However, U.S. agencies which regulate cell phone radiation have not shown they have evaluated the research on children's unique vulnerability to ensure long term safety.

The reality is that US safety regulations for cell phone radiation were last set twenty-five years ago based on science that is now outdated. The Federal Communications Commission (FCC) is the primary agency responsible for regulating wireless radiation. The FCC has no expertise related to human health topics. Moreover, federal agencies like the Environmental Protection Agency or the National Cancer Institute or the Food and Drug Administration have not carried out up-to-date full scientific review of this growing technology. Just like the thousands of chemicals in our environment today, wireless radiation has not had appropriate oversight. It has slipped through the cracks.

The one agency which has carried out studies on the impact of long term exposure to electromagnetic fields and human health is the National Toxicology Program (NTP), a component of the National Institute of Environmental Health Sciences. The NTP found:

- **Clear evidence of an association with tumors in the hearts of male rats.** The tumors were malignant schwannomas.
- **Some evidence of an association with tumors in the brains of male rats.** The tumors were malignant gliomas.
- **Some evidence of an association with tumors in the adrenal glands of male rats.** The tumors were benign, malignant, or complex combined pheochromocytoma.

Pediatricians have long called for an update to this outdated cell phone radiation test method because research finds children can absorb up to 10 or more times higher wireless radiation than adults into their brain, eyes and bone marrow. Children are not little adults. As we sadly learned with early childhood lead exposures leaving long-lasting impairments, the developing brain is particularly susceptible. Unlike my generation, today's youth will be exposed for years and years.

Please support legislation that reduces children's radiofrequency radiation exposure and call on the federal government to strengthen human exposure limits to protect children. I am glad to answer any questions that you have.

Sincerely,

Jerome Paulson MD FAAP

January 28, 2021

Chairman Don Serotta
Town of Chester
1786 Kings Highway
Chester, NY 10918

Dear Chairman Don Serotta,

Cell antennas and cell towers should not be placed near schools and homes.

On August 13, 2021, the United States Court of Appeals for the District of Columbia Circuit ruled in our case against the FCC that the decision by the Federal Communications Commission (FCC) to retain its 1996 safety limits for human exposure to wireless radiation (which includes cell tower emissions) was "arbitrary and capricious." Once of the important aspects of the court decision was that the ruling found the FCC did not adequately explain why it ignored the impacts of long term wireless exposure, especially for children, who are more vulnerable to wireless radiation. This ruling highlights how no federal health agency has reviewed the full body of research to develop proper safety standards.

Extensive published scientific evidence indicates that radiofrequency radiation *at levels far below FCC limits* can cause cancer, increased oxidative stress, genetic damage, structural and functional changes of the reproductive system, memory deficits, behavioral problems, and neurological impacts. We consider radiofrequency radiation (RFR) to be a human carcinogen based on the current body of evidence.

At this time we have not identified a safe level of exposure. Although radiation levels decrease as you increase your distance from a particular antenna/tower, the reality is that adding a tower or base station to a community will definitely *increase* the radiation exposure in that area and at any distance within the surrounding coverage area.

We recommend policies to reduce human exposure to RFR, especially for children. Schools are where children spend the majority of their daytime hours. Therefore we strongly recommend against installing cell towers near schools, daycares, parks, homes, or hospitals.

Recent research on people living near cell antennas has found increases in molecular markers in the blood that predict cancer. This study evaluated effects in the human blood of individuals living near mobile phone base stations (for study purposes, they chose a distance of 80 meters) compared with healthy controls living more than 300 meters from a base station. The study measured higher RFR levels in the homes of people living in homes within 80 meters from the cell antennas (documenting the impact of increased RFR radiation from the antenna installations) and found statistically significant differences in their blood. The group living closer to the antennas had statistically significant higher frequency of micronuclei and a rise in lipid peroxidation in their blood; these changes are considered biomarkers predictive of cancer (Zothansiama et al, 2017).

Please note the following facts about cell towers and cell phone radiation:

- In 2011, radiofrequency radiation was classified as a Class 2B possible carcinogen by the World Health Organization's International Agency for Research on Cancer. Between then and now, the published peer-reviewed scientific evidence has significantly increased. Now, many scientists are of the opinion that the weight of current peer-reviewed evidence supports the conclusion that radiofrequency radiation should be regarded as a human carcinogen (Hardell and Carlberg 2017, Peleg et al, 2018, Miller et al 2018).
- The US National Toxicology Program $25 million animal study on long-term exposure to radiofrequency radiation found DNA Damage, heart damage, increased brain tumors, and increased heart tumors deemed "clear evidence of cancer." Importantly, this study was launched almost two decades ago by the FDA because the US government had not performed research on the long-term effects of RFR exposure and the FDA wanted data on long-term safety. In 1996, the EPA was defunded from developing proper safety standards, and since then there has been no systematic review of the science by any US agency.
- Researchers with the renowned Ramazzini Institute in Italy published findings that lab animals exposed to levels of RFR below FCC limits developed the same types of cancerous cancers as the US National Toxicology Program found in their large-scale animal study.
- An Australian study looked at RFR levels to which kindergarten children were exposed, depending on how close their school was to base stations/cell towers. Researchers equipped the children with RFR measuring devices. Researchers found that kindergartens located nearby base stations/cell towers (closer than 300 meters or approximately 330 yards) had total exposure to radiofrequency radiation (RFR or RF-EMF) more than 3 times higher than children at schools where base stations were further away than 300 meters.
- A 2018 study measured radiofrequency radiation exposures in the environment including emissions from cell phone towers, TV and FM radio broadcast antennas, cell phone

handsets, and Wi-Fi—in several countries including the United States. The researchers concluded that cell phone tower (base station) radiation emissions are the dominant contributor to RFR exposure in most outdoor areas.

- A 2015 review found that in 93 out of 100 studies, RFR exposure caused oxidative stress (Yakymenko 2015). A 2021 review again confirmed non ionizing radiation has oxidative effects (Schuermann 2021). Many well-known causes of cancer in humans (such as asbestos and arsenic) are understood to induce oxidative stress.
- Studies also show that when combined with lead or a known carcinogen, RFR has magnified the carcinogen's effects. For example, RFR at levels far below FCC limits more than doubled the numbers of liver and lung tumors in carcinogen-exposed mice (Lerchl 2015).
- The International Association of Firefighters has officially opposed cell towers on their stations since 2004 after a study found neurological damage in firefighters with antennas on their fire station. In 2017, when 5G "small cells" were coming to California via a 5G streamlining bill (SB 649), firefighter organizations came out in strong opposition to the bill and requested that towers not be installed on firehouses. They were successful and SB649 was amended to exempt their stations from the deployment due to their health concerns.
- Published research finds the frequencies impact wildlife. For example, studies have found that the radiation alters bird navigation and disturbs honeybee colonies. Research also shows adverse impacts on trees and plants. (Research on EMF and Bees, Research on Wildlife Research on Trees)
- A 2019 study of students in schools near cell towers found their higher RF exposure was associated with impacts on motor skills, memory, and attention (Meo 2019). Examples of other effects linked to cell towers in research studies include neuropsychiatric problems, elevated diabetes, headaches, sleep problems, and genetic damage. Such research continues to accumulate after the 2010 landmark review study on 56 studies that reported biological effects found at very low intensities of wireless radiation, including impacts on reproduction, permeability of the blood-brain barrier, behavior, cellular changes, and metabolic changes, and increases in cancer risk (Lai and Levitt 2010).

- The International EMF Scientist Appeal was submitted to the United Nations urging immediate protective policy action in light of the scientific evidence that has found adverse biological effects from electromagnetic radiation, including radiofrequency radiation, and, as of January 2019, this Appeal is signed by 247 scientists from 42 nations; these are scientists who have published peer-reviewed articles about electromagnetic fields. They state, "numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being."

The exposure limits of the US Federal Communications Commission are totally outdated and do not protect the health of the public, especially not the health of children. The Los Angeles School District has banned cell towers on their District's school grounds.

Please note that in several countries, governments have set policies to protect children, pregnant women, and medically fragile persons by classifying areas with homes, hospitals, and schools as "sensitive areas." Some examples include:

- In India the government has set RFR limits to 1/10th of ICNIRP and the Brihanmumbai Municipal Corporation, Zilla Parishad, Rajasthan, and Mumbai have banned cell antenna/tower installations on schools.
- Greece has banned the installation of mobile phone base stations at the premises of schools, kindergartens, hospitals, or eldercare facilities.
- Chile's "Antenna Law" prohibits cell antennas/towers in "sensitive areas" (educational institutions, nurseries, kindergartens, hospitals, clinics, nursing homes).
- Several countries have lower allowable RFR limits in "sensitive" areas.

EHT's position is that children require special protections from radiofrequency radiation and their exposures should be reduced to as low as possible. We strongly recommend against cell tower/antenna placements at schools or near homes as this would increase daily RFR exposure.

Please feel free to contact us with more questions.

Sincerely,

Devra Davis, PhD, MPH
President and Founder, Environmental Health Trust
Visiting Professor, Hebrew University Hadassah Medical Center
https://ehtrust.org

Anthony B. Miller, MD
Professor Emeritus at the Dalla Lana School of Public Health, University of Toronto
Senior Advisor to Environmental Health Trust

Dr. Hugh Scully Testimony to the City of Toronto

(Past-President of Ontario Medical Association, Past-President of Canadian

Medical Association, Past-President of Canadian Cardiovascular Society.)

As a physician leader in Canada with a great commitment to the health of Canadians, I am very concerned about the increasing evidence internationally that EMR is creating increasing health problems in our population as its use increases exponentially. This is particularly true among children and young Canadians, and teachers and nurses who are continuously exposed to WiFi routers in schools [and hospitals].

As a cardiac specialist, I am concerned that approximately 20% of people have detrimental cardiac rhythm sensitivity to EMR.

This issue is under active consideration by the Health and Public Policy Committee of the Royal College of Physicians and Surgeons of Canada, the Health Policy and Public Health Committees of the Canadian Medical Association and the Council of Family Physicians of Canada, the Canadian Pediatric Society and the Canadian Cardiovascular Society.

There is an abundance of evidence from around the world that EMR can be harmful to health. Many countries...not Canada or the United States...have initiated policies to mitigate the risks. We, in Canada, need to do the same or more.

It is imperative that City of Toronto does not install WiFi's in public parks and spaces. I ask you to vote against Councillor Matlow's proposal.

Sincerely,

Dr. Hugh Scully, BA,MD,MSc,FRSC[C],FACS

Professor of Surgery and Health Policy, University of Toronto, Past-President, OMA, CMA, CCS, Former Member of Council [Board], RCPSC and WMA, Member, Health Policy Advisory Council, American College of Surgeons.

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December 12, 2015

Montgomery County Schools
Carver Educational Services Center
850 Hungerford Drive
Rockville, MD 20850

cc Montgomery County City Council

Dear Montgomery County School District,

I am a pediatric neurologist and neuroscientist on the faculty of Harvard Medical School and on staff at the Massachusetts General Hospital. I am Board Certified in Neurology with Special Competency in Child Neurology, and Subspecialty Certification in Neurodevelopmental Disorders.

I have an extensive history of research and clinical practice in neurodevelopmental disorders, particularly autism spectrum disorders. I have published papers in brain imaging research, in physiological abnormalities in autism spectrum disorders, and in environmental influences on neurodevelopmental disorders such as autism and on brain development and function.

A few years ago I accepted an invitation to review literature pertinent to a potential link between Autism Spectrum Disorders and Electromagnetic Frequencies (EMF) and Radiofrequency Radiation(RFR). I set out to write a paper of modest length, but found much more literature than I had anticipated to review. I ended up producing a 60 page single spaced paper with over 550 citations. It is available at http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec20_2012_Findings_in_Autism.pdf and it was published in a revised and somewhat shortened form in two parts in the peer reviewed indexed journal *Pathophysiology (2013)*with the title: Áutism and EMF? Plausibility of a pathophysiological link." Please also see the appendix to this letter which contains a summary of this material and includes substantial scientific citations.

More recently I published an article entitled "Connections in Our Environment: Sizing up Electromagnetic Fields," in *Autism Notebook Spring 2015* edition in which I summarized and personalized the information in the . In this article I describe how here is a whole series of problems at the cellular, sub-cellular and metabolic levels and immune levels that have been identified in autism. And interestingly, for every single one of those problems, there's literature about how EMFs can create those kinds of problems.

The argument I made in these articles is not that EMF is proven to cause autism, but rather, that EMF can certainly contribute to degrading the physiological integrity of the system at the cellular and molecular level" – and this in turn appears to contribute to the pathogenesis/causation not only of autism but of many highly common chronic illnesses, including cancer, obesity, diabetes and heart disease.. Please see this article on page 24-25 at the link http://virtualpublications.soloprinting.com/publication/?i=252361

In fact, there are thousands of papers that have accumulated over decades –and are now accumulating at an accelerating pace, as our ability to measure impacts become more sensitive – that document adverse health and neurological impacts of EMF/RFR. Children are more vulnerable than adults, and children with chronic illnesses and/or neurodevelopmental disabilities are even more vulnerable. Elderly or chronically ill adults are more vulnerable than healthy adults.

Current technologies were designed and promulgated without taking account of biological impacts other than thermal impacts. We now know that there are a large array of impacts that have nothing to do with the heating of tissue. The claim from wifi proponents that the only concern is thermal impacts is now definitively outdated scientifically.

Radiofrequency electromagnetic radiation from wifi and cell towers can exert a disorganizing effect on the ability to learn and remember, and can also be destabilizing to immune and metabolic function. This will make it harder for some children to learn, particularly those who are already having learning or medical problems in the first place. And since half of the children in this country have some kind of chronic illness, this means that a lot of people are more vulnerable than you might expect to these issues.

Powerful industrial entities have a vested interest in leading the public to believe that EMF/RFR, which we cannot see, taste or touch, is harmless, but this is not true. Please do the right and precautionary thing for our children.

I urge you to opt for wired technologies in Montgomery County classrooms, particularly for those subpopulations that are most sensitive. It will be easier for you to make a healthier decision now than to undo misguided decisions later.

Thank you.

Martha Herbert, PhD, MD

Selected pertinent publications

Connections in our Environment: Sizing up Electromagnetic Fields by M.R. Herbert (published in Autism Notebook Spring 2015, pp.. 24-25) reviews in two pages key points of the more technical Herbert & Sage Autism-EMF paper

Herbert, M.R. and Sage, C. "Autism and EMF? Plausibility of a Pathophysiological Link". Part 1: *Pathophysiology* , 2013, Jun;20(3):191-209, epub Oct 4, PMID 24095003. Pubmed abstract for Part 1. Part II: *Pathophysiology,* 2013 Jun;20(3):211-34. Epub 2013 Oct 8, PMID 24113318. Pubmed abstract for Part II.

APPENDIX: MORE DETAILED SUMMARY OF THE PATHOPHYSIOLOGY

I became interested in the health and brain effects of electromagnetic frequency (EMF) and radiofrequency radiation (RFR) exposures in relation to my brain research because I was interested in how such exposures might alter brain function. In order to familiarize myself in more detail existing literature on the pathophysiological impacts of EMF/RFR, I coauthored a 40,000 word chapter in the 2012 update of the Bioinitiative, [1] and published an updated 30,000 word version of that paper ("Autism and EMF? Plausibility of a Pathophysiological Link") in 2013 in two parts in the peer reviewed journal *Pathophysiology.* [2, 3] My intention was to assess the plausibility of an association between increasing incidence of autism spectrum disorder and increasing EMF/RFR exposures. Rather than directly address the epidemiological issues, I looked at the parallels between the pathophysiological features documented in autism and the pathophysiological impacts of EMF/RFR documented in the peer-reviewed published scientific literature.

I will include here a brief summary of the paper (prepared for a lay audience) of the features of EMF/RFR that I reviewed (with citations at the end of this letter):

- EMF/RFR stresses cells. It lead to cellular stress, such as production of heat shock proteins, even when The EMF/RFR isn't intense enough to cause measurable heat increase. [4-6]
- EMF/RFR damages cell membranes, and make them leaky, which makes it hard for them to maintain important chemical and electrical differences between what is inside and outside the membrane. This degrades metabolism in many ways – makes it inefficient. [7-15]
- EMF/RFR damages mitochondria. Mitochondria are the energy factories of our cells. Mitochondria conduct their chemical reactions on their membranes. When those membranes get damaged, the mitochondria struggle to do their work and don't do it so well. Mitochondria can also be damaged through direct hits to steps in their chemical assembly line. When mitochondria get inefficient, so do we. This can hit our brains especially hard, since electrical communication and synapses in the brain demands huge amounts of energy.
- EMF/RFR creates "oxidative stress." Oxidative stress is something that occurs when the system can't keep up with the stress caused by utilizing oxygen, because the price we pay for using oxygen is that it generates free radicals. These are generated in the normal course of events, and they are "quenched" by antioxidants like we get

in fresh fruits and vegetables; but when the antioxidants can't keep up or the damage is too great, the free radicals start damaging things.

- EMF/RFR is genotoxic and damages proteins, with a major mechanism being EMF/RFR-created free radicals which damage cell membranes, DNA, proteins, anything they touch. When free radicals damage DNA they can cause mutations. This is one of the main ways that EMF/RFR is genotoxic – toxic to the genes. When they damage proteins they can cause them to fold up in peculiar ways. We are learning that diseases like Alzheimer's are related to the accumulation of mis-folded proteins, and the failure of the brain to clear out this biological trash from its tissues and fluids.
- EMF/RFR depletes glutathione, which is the body's premier antioxidant and detoxification substance. So on the one hand EMF/RFR creates damage that increases the need for antioxidants, and on the other hand they deplete those very antioxidants.[1, 16]
- EMF/RFR damages vital barriers in the body, particularly the blood-brain barrier, which protects the brain from things in the blood that might hurt the brain. When the blood-brain barrier gets leaky, cells inside the brain suffer, be damaged, and get killed. [1, 16, 17]
- EMF/RFR can alter the function of calcium channels, which are openings in the cell membranes that play a huge number of vital roles in brain and body. [18-27]
- EMF/RFR degrades the rich, complex integration of brainwaves, and increase the "entropy" or disorganization of signals in the brain – this means that they can become less synchronized or coordinated; such reduced brain coordination has been measured in autism. [28-40]
- EMF/RFR can interfere with sleep and the brain's production of melatonin. [41-43]
- EMF/RFR can contribute to immune problems. [44-50]
- EMF/RFR contribute to increasing stress at the chemical, immune and electrical levels, which we experience psychologically. [51-57] [17, 58-62] [63-68]

Please note that:

1. There are a lot of other things that can create similar damaging effects, such as thousands of "xenobiotic" substances that we call toxicants. Significantly, toxic chemicals (including those that contain naturally occurring toxic elements such as lead and mercury) cause damage through many of the same mechanisms outlined above.
2. In many of the experimental studies with EMF/RFR, damage could be diminished by improving nutrient status, particularly by adding antioxidants and melatonin. [69-72]

I understand that the concept of electromagnetic hypersensitivity is not always well understood in the medical and scientific communities. Indeed, the inter-individual variability is perplexing to those who would expect a more consistent set of features.

But given the range of challenges I have listed that EMF/RFR poses to core processes in biological systems, and given the inter-individually variable vulnerability across these symptoms, it is really not surprising that there would be subgroups with different combinations of symptom clusters.

It also appears to be the case that the onset and duration of symptoms or even brain response to EMR/RFR can be variable. This again is to be expected given the mediation of these symptoms through a variety of the above-listed pathophysiological processes, many of which differ in scale (ranging from molecular to cellular to tissue and organ) and time course of impact. The different parts of the body also absorb this energy differently, both

because of their biophysical properties and as a function of their state of health or compromise thereof.

Here is a list of subgroups of symptom clusters identified by a group of German physicians, t exemplifies these variability issues:

Group 1 no symptoms
Group 2 sleep disturbance, tiredness, depressive mood
Group 3 headaches, restlessness, dazed state, irritability, disturbance of concentration, forgetfulness, learning difficulties, difficulty finding words
Group 4 frequent infections, sinusitis, lymph node swellings, joint and limb pains, nerve and soft tissue pains, numbness or tingling, allergies
Group 5 tinnitus, hearing loss, sudden hearing loss, giddiness, impaired balance, visual disturbances, eye inflammation, dry eyes
Group 6 tachycardia, episodic hypertension, collapse
Group 7 other symptoms: hormonal disturbances, thyroid disease, night sweats, frequent urge to urinate, weight increase, nausea, loss of appetite, nose bleeds, skin complaints, tumors, diabetes

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UNIVERSITY AT ALBANY
State University of New York

Institute for Health and the Environment
WHO Collaborating Center in Environmental Health

3 August 2016

Petaluma City Schools
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200 Douglas Street
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Dear Sirs/Madams:

I am a public health physician who served as the Co-Editor of the Bioinitiative Report, published in 2007 as a comprehensive review of the adverse health effects of radiofrequency electromagnetic fields.

There is strong and consistent evidence that excessive exposure to radiofrequency electromagnetic fields has adverse human health effects. Of particular concern is the clear evidence that children are more vulnerable than adults. The best-documented adverse effects are an increase in risk of cancer, but cancers do not appear immediately upon exposure but rather come years later. The National Toxicology Program has within the past couple of months reported that even rats exposed to radiofrequency radiation develop brain cancer! Within a school setting there is increasing evidence that excessive exposures reduce learning ability, which is the last thing one wants in a school. Some children will also develop a syndrome of electrohypersensitivity, where they get headaches and reduced ability to pay attention and learn. While these effects are not nearly as well documented as those relating to cancer, they are particularly important within a school. This is especially the case in a wireless computer classroom, where exposure can be very high. However there will be essentially no exposure in a wired computer classroom.

The exposure levels of the Federal Communications Commission are totally outdated and do not protect the health of the public, especially of children. I urge you to abandon any plans for wireless communication within schools. It is of course critical that all children have access to the Internet, but when this is done through wired connections they will not be exposed to excessive electromagnetic fields.

Yours sincerely,

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4 August, 2016

Dear Petaluma City Schools;
Superintendent Gary Callahan and Board of Trustees

Regarding: Wireless technology should not be used in schools or pre-schools due to health risks for children and employees

We have been asked to declare our opinion about wireless technology in schools by parents that are concerned about their children.

Based on current published scientific studies, we urge your administration to educate themselves on the potential risks from wireless technologies in schools, and to choose wired teaching technologies. The well-being and educational potential of children depends on it.

High-speed connectivity to schools is important but it can be a wired connection instead of Wi-Fi. Wireless classroom infrastructure and wireless devices for schoolchildren should be avoided for these reasons:

- Wireless radiofrequency (RF) radiation emissions were classified as a Possible Human Carcinogen (group 2B) by the World Health Organization International Agency for Research on Cancer (IARC) in May 2011. One of the signers, Dr Hardell, was part of the evaluation group.
- The IARC classification holds for *all forms of radio frequency radiation* including RF-EMF emissions from wireless transmitters (access points), tablets and laptops.
- Epidemiological studies show links between RF radiation exposure and cancer, neurological disorders, hormonal changes, symptoms of electrical hypersensitivity (EHS) and more. Laboratory studies show that RF radiation exposure increases risk of cancer, abnormal sperm, learning and memory deficits, and heart irregularities. Foetal exposures in both animal and human studies may result in altered brain development in the young offspring, with disruption in learning, memory and behaviour.
- Recently a report was released from The National Toxicology Program (NTP) under the National Institutes of Health (NIH) in USA on the largest ever animal study on cell phone RF radiation and cancer (http://biorxiv.org/content/biorxiv/early/2016/05/26/055699.full.pdf). An increased incidence of glioma and malignant schwannoma in the heart was found. Interestingly our research group and others have in epidemiological studies shown that persons using wireless phones (both mobile phones and cordless phones; DECT) have an increased risk for glioma and acoustic neuroma. Acoustic neuroma or vestibular schwannoma is the same type of tumour as the one found in the heart, although benign.
- The research showing increased brain cancer risk in humans *has strengthened* since the IARC 2011 classification as new research has been published which repeatedly shows a significant association after RF radiation exposure. In addition, tumour

promotion studies have now been replicated showing cancer promotion after exposures at low levels.

- It is our opinion and that of many colleagues that the current IARC cancer risk classification should move to an *even higher* risk group. The carcinogenic effect has been shown in human and animal studies. Several laboratory studies have shown mechanistic effects in carcinogenesis such as oxidative stress, down regulation of mRNA, DNA damage with single strand breaks.
- In summary RF radiation should be classified as Carcinogenic to Humans, Group 1 according to the IARC classification. This classification should have a major impact on prevention.

The evidence for these statements is based on hundreds of published, peer-reviewed scientific studies that report adverse health effects at levels much lower than current ICNIRP and FCC public safety limits. Compliance with government regulations does not mean that the school wireless environment is safe for children and staff (especially pregnant staff).

As researchers in cancer epidemiology and RF radiation exposures, we have published extensively in this area and it is our opinion that schools should choose wired Internet connections. Multiple epidemiological research studies show that exposures equivalent to 30 minutes a day of cell phone use over ten years results in a significantly increased brain cancer risk.

What will be the health effect for a child exposed all day long in school for 12 years? Wireless networks in schools result in full body low level RF radiation exposures that can have a cumulative effect on the developing body of a child. No safe level of this radiation has been determined by any health agency and therefore we have no safety assurances. Cancers can have long latency periods (time from first exposure until diagnosis) and it will take decades before we know the full extent of health impacts from this radiation. The statistics and effects will be borne by the children you serve.

Wi-Fi in schools, in contrast to wired Internet connections, will increase risk of neurologic impairment and long-term risk of cancer in students. Promoting wireless technology in schools disregards the current health warnings from international science and public health experts in this field.

We recommend that your school district install wired Internet connections and develop curriculum that teaches students at all ages safer ways to use their technology devices. If cell phones and other wireless devices are used in the school curriculum (as many schools are now doing with Bring your Own Device Policy) then there should be educational curriculum in place and well posted instructions in classrooms so that the students and staff use these devices in ways that reduce exposure to the radiation as much as possible.

Supporting wired educational technologies is the safe solution in contrast to potentially hazardous exposures from wireless radiation.

Respectfully submitted

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August 4, 2016

Petaluma City Schools
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200 Douglas Street
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Re: Adverse Effects of Radiofrequency fields

I am writing to express my concern over the increasing exposure of children in schools to Radiofrequency Fields (e.g. from wi-fi, as required for cell phones and iPads, and emitted by cell towers) and the lack of concern expressed by many councils, governments and School Boards on this issue. In particular, justification for the "safety" of radiofrequency fields is placed upon the use of outdated safety standards, based upon tissue heating, whereas it has now been well demonstrated that adverse biological effects occur at far lower levels of radiofrequency fields that do not induce tissue heating, including a recent animal study performed by the National Toxicology Program in the United States which found an increased incidence of brain cancers and other cancers in rats exposed to prolonged Radiofrequency fields.

I am a physician and epidemiologist specializing in cancer etiology, prevention, and screening, expert in epidemiology, and particularly causes of human cancer. I have performed research on ionizing radiation and cancer, electromagnetic fields and cancer, and have served on many committees assessing the carcinogenicity of various exposures, including working groups of the International Agency for Research on Cancer (IARC), widely regarded as providing unbiased assessment on the carcinogenicity of chemicals and other exposure to humans.

In 2011, an IARC working group designated radiofrequency fields as a class 2B carcinogen, a <u>possible</u> human carcinogen. Since that review a number of additional studies have been reported. One of the most important was a large case-control study in France, which found a doubling of risk of glioma, the most malignant form of brain cancer, after two years of exposure to cell phones. After five years exposure the risk was five-fold. They also found that in those who lived in urban environments the risk was even higher. In my view, and that of many colleagues who have written papers on this issue, these studies provide evidence that radiofrequency fields are not just a <u>possible</u> human carcinogen but a <u>probable</u> human carcinogen, i.e. IARC category 2A. It would be impossible to ignore such an assessment in regulatory approaches.

It is important to recognize that there are no safe levels of exposure to human carcinogens. Risk increases with increasing intensity of exposure, and for many carcinogens, even more with increasing duration of exposure. The only way to avoid the carcinogenic risk is to avoid exposure altogether. This is why we ban known carcinogens from the environment and why much effort is taken to get people, particularly young people, not to smoke. We now recognize that exposure to carcinogens in childhood can increase the risk of cancer in adulthood many years later. Further, people vary in their genetic makeup, and certain genes can make some people more susceptible than others to the effect of carcinogens. It is the young and those who are susceptible we should protect.

As an epidemiologist who has done a great deal of work on breast cancer, I have been concerned by a series of case reports from California and elsewhere of women who developed unusual breast cancers in the exact position where they kept cell phones in their bras. These are unusual cancers. They are multifocal, mirroring where the cell phone was kept. Thus in these relatively young women the radiofrequency radiation from very close contact with a cell phone has caused breast cancer.

Not only brain and breast cancers but parotid gland tumors, tumors of the salivary gland, have been associated with prolonged exposure to cell phones.

Given the long natural history of cancer and the fact that human populations have not been exposed for a sufficient length of time to reveal the full adverse effects of radiofrequency fields, it is extremely important to adopt a precautionary approach to the exposure of humans to such fields. An individual, if appropriately informed, can reduce her or his exposure to radiofrequency fields from devices that use wi-fi, but in the case of cell towers, smart meters and wi-fi in schools, the exposure they receive is outside their control. Then, with the people who manufacture these devices and those who promote wi-fi failing to issue adequate health warnings, we are reaching a situation where schools, work places and homes are being saturated with radiofrequency fields.

Thus to avoid a potential epidemic of cancer caused by radiofrequency fields from wi-fi and other devices, we should introduce means to reduce exposure as much as reasonably achievable, use hard wire connections to the internet and strengthen the codes that are meant to protect the public.

Yours sincerely

Anthony B. Miller, MD, FRCP(C), FRCP, FACE
Professor Emeritus
Dalla Lana School of Public Health, University of Toronto, Ontario, Canada

Karolinska Institutet
Department of Neuroscience
Experimental Dermatology Unit

Stockholm, December 8, 2015

To:
MCPS CEO Dr. Andrew Zuckerman [Andrew_Zuckerman@mcpsmd.org]
MCPS Superintendent Mr. Larry Bowers [Larry_Bowers@mcpsmd.org]
MCPS Chief Technology Officer Mr. Sherwin Collette [Sherwin_Collette@mcpsmd.org]
MCPS Board of Education [boe@mcpsmd.org]
840 Hungerford Drive
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cc:
Montgomery County Council [county.council@montgomerycountymd.gov]

Dear Madame or Sir,

My name is Olle Johansson, and I am an associate professor, heading the Experimental Dermatology Unit at Sweden's Karolinska Institute in the Department of Neuroscience. I understand you have recently made public pronouncements regarding the safety of Wi-Fi. As a neuroscientist who has been studying the biophysical and epidemiological effects of electromagnetic fields (EMFs) for over 30 years, I believe this designation is short-sighted.

Wireless communication is now being implemented in our daily life in a very fast way. At the same time, it is becoming more and more obvious that the exposure to electromagnetic fields not only may induce acute thermal effects to living organisms, but also non-thermal effects, the latter often after longer exposures. This has been demonstrated in a very large number of **non-ionizing radiation** studies and includes cellular DNA-damage, disruptions and alterations of cellular functions like increases in intracellular stimulatory pathways and calcium handling, disruption of tissue structures like the blood-brain barrier, impact on vessel and immune functions, and loss of fertility. Whereas scientists can observe and reproduce these effects in controlled laboratory experiments, epidemiological and ecological data derived from long-term exposures in well-designed case-control studies reflect this link all the way from molecular and cellular effects to the living organism up to the induction and proliferation of diseases observed in humans. It should be noted that we are not the only species at jeopardy; practically all animals, plants and bacteria may be at stake. Although epidemiological and ecological investigations as such never demonstrate causative effects, due to the vast number of confounders, they confirm the relevance of the controlled observations in the laboratories.

Many times since the early 1980s I have pointed out that the public's usage of cell phones has become the largest full-scale biological and medical experiment ever with mankind, and I was also the first person to firmly point out that this involuntary exposure violates the Nuremberg Code's principles for human experimentation, which clearly states that voluntary

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consent of human subjects is absolutely essential. Among many effects seen, the very serious one is the deterioration of the genome. Such an effect - if seen in a food item under development or in a potential pharmaceutical drug - immediately would completely ban it from further marketing and sale; genotoxic effects are not to be allowed or spread. For these reasons above, we, scientists, can not accept that children undergo an enormous health risk for their present and future, by being exposed to WI-FI in kindergardens or schools (even if the WI-FI masts/routers are not in the children's classroom). The precautionary principle has to be respected. Furthermore, when men place cell phones in their front pocket, or laptops on their laps, it should be noted that experimental studies have demonstrated that after similar exposures there is a decrease in sperm count as well as in the quality of sperm, which is a phenomenon that could affect society's overall ability to procreate in the future. Experiments in mice point to that it may be true already in 5 generations time.

Many other states including France, Russia, Israel and Germany, have employed various precautionary steps and their responses (including labelling cell phones and other transmitting devices with SAR ratings, discouraging the use of cell phones and other wireless gadgets by children, warning parents of the risks, and removing or restricting WiFi in schools and replacing it with hard-wired ethernet) as a result of the *WHO/IARC classification of radiofrequency electromagnetic radiation in 2011 as a Class 2B carcinogen as well as the earlier classification of power-frequent magnetic fields in 2001 also as a Class 2B carcinogen*, the information summarized in the Bioinitiative Reports of 2007 and 2012, and the other considerable international and independent research and reviews, that show adverse biological effects from electromagnetic fields, including heart palpitations, headaches, skin rashes, damage to DNA, mental health effects, impaired concentration, decreased problem-solving capacity, electrohypersensitivity, etc., are about to set a new standard for educational quality with due respect to children's and staff's health.

In the case of "protection from exposure to electromagnetic fields", it is thus of paramount importance to act from a prudence avoidance/precautionary principle point of view. Anything else would be highly hazardous. Total transparency of information is the key sentence here, as I believe the public does not appreciate having the complete truth revealed years after a certain catastrophe already has taken place. For instance, it shall be noted, that today's recommended values for wireless systems, such as the SAR-values, are just recommendations, and not safety levels. Since scientists observe biological effects at as low as 20 microWatts/kg, can it truly be stated that it is safe to allow irradiation of humans at SAR 2 W/kg, or at 100,000 times stronger levels of radiation?

IMBALANCED REPORTING

Another misunderstanding is the use of scientific publications (as the tobacco industry did for many years) as 'weights' to balance each other. But one can NEVER balance a report showing a negative health effect with one showing no effect. This is a misunderstanding which, unfortunately, is very often used both by the industrial representatives as well as official authorities to the detriment of the general public. True balance would be reports showing negative health effects against *exact replications* showing no or positive effects. However, this is not what the public has been led to believe.

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NEED FOR INDEPENDENT RESEARCH

In many commentaries, debate articles and public lectures - for the last 20-30 years – I have urged that completely independent research projects must be inaugurated immediately to ensure our public health. These projects must be entirely independent of all types of commercial interests; public health can not have a price-tag! It is also of paramount importance that scientists involved in such projects must be free of any carrier considerations and that the funding needed is covered to 100%, not 99% or less. This is the clear responsibility of the democratically elected body of every country.

WHO/INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC), 2011

Very recently (in Lyon, France, 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. This should be added to the previous (2001) 2B classification of power-frequent (ELF) electromagnetic fields – emitted at high levels from handheld gadgets, such as eReaders and mobile phones – as a risk factor for childhood leukemia. Given the 2001 very close votes (9 to 11) for moving it to 2A and all the new knowledge that has accumulated since 2001, today the association between childhood leukemia and power-frequent (ELF) electromagnetic fields would definitely be signed into the much more serious 2A ("probably carcinogenic") category. So, the 'red flag' is – unfortunately – flying very high.

INVOLUNTARY EXPOSURE

According to Article 24 of the UNICEF's Child Convention "children have the right to … a clean and safe environment, and information to help them stay healthy". We must all ensure that this article never is violated. This is about our social responsibility, and is very much a public health issue.

In summary, electromagnetic fields may be among the most serious and overlooked health issues today, and having these fields checked and reduced/removed from schools and kindergardens may be essential for health protection and restoration, and is a must for persons with the functional impairment electrohypersensitivity as for children who are more fragile (cf. Belyaev I, Dean A, Eger H, Hubmann G, Jandrisovits R, Johansson O, Kern M, Kundi M, Lercher P, Mosgöller W, Moshammer H, Müller K, Oberfeld G, Ohnsorge P, Pelzmann P, Scheingraber C, Thill R, "EUROPAEM EMF Guideline 2015 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses", Rev Environ Health 2015; 30: 337–371). In addition, as recently discussed in a think-tank group here in Stockholm, it is very important to constantly educate oneself and participate in the general debate and public discussions to keep the information build-up active. Thus, it is of paramount importance to keep the "kettle boiling", never blindly trusting or accepting given 'facts', but only read and think for yourself and for your loved ones. Only so you can arrive at a genuinely working precautionary principle.

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CONCLUSION

In conclusion, wireless systems, such as Wi-Fi routers or cell towers, and their electromagnetic fields, can not be regarded as safe in schools, but must be deemed highly hazardous and unsafe for the children as well as for the staff.

I encourage governments and local health and educational bodies to adopt a framework of guidelines for public and occupational EMF exposure that reflect the Precautionary Principle. As noted, the Precautionary Principle states when there are indications of possible adverse effects, though they remain uncertain, the risks from doing nothing may be far greater than the risks of taking action to control these exposures. The Precautionary Principle shifts the burden of proof from those suspecting a risk to those who discount it — as some nations have already done. Precautionary strategies should be based on design and performance standards and may not necessarily define numerical thresholds because such thresholds may erroneously be interpreted as levels below which no adverse effect can occur.

Some 100 years back, we learned the hard lessons of ionizing radiation and the need for strict health protections – now we must openly face the possibility that we must take a seat in life's school and learn again. This time it is about non-ionizing radiation.

Based on all of the above, I strongly urge you to reconsider your public stance on the safety of Wi-Fi, cell towers, and similar systems in schools as their non-ionizing radiation emissions very likely are hazardous and unsafe for students, staff and teachers.

With my very best regards
Yours sincerely
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January 3, 2016

Dear Montgomery County COO Dr. Andrew Zuckerman, Interim Superintendent Larry Bowers, Board of Education and Office of Technology;

I have been asked to comment on the MCPS Statement Concerning Deployment of Wireless Computing Technologies. I am happy to do so.

The first paragraph in that statement is not relevant to the issue at hand because it is perfectly possible to use wired communication for such education. This document is being produced on a computer on which I only use wired communication, connecting to the internet, connecting to my printer and for other purposes, as well.

The 2nd and 3rd paragraphs of your statement may well be technically correct. However these give us no assurance whatsoever of safety of Wi-Fi fields. The FCC guidelines as are many other such guidelines, are based on the assumption that only heating effects of microwave/lower frequency EMFs can have biological effects. However that assumption has been falsified by thousands of studies published from the 1950s to the present, each showing that non-thermal levels of exposure often produce biological effects. For example, in 1971, the U.S. Office of Naval Medical Research produced a document reporting over 100 different non-thermal effects [1], listing 40 apparent neuropsychiatric changes produced by non-thermal microwave frequency exposures, including 5 central/peripheral nervous system (NS) changes, 9 central NS effects, 4 autonomic system effects, 17 psychological disorders, 4 behavioral changes and 2 misc. effects [1]. It also listed cardiac effects including ECG changes and cardiac necrosis as well as both hypotension and hypertension, and also 8 different endocrine effects.

Changes affecting fertility included tubular degeneration in the testis, decreased spermatogenesis, altered sex ratio, altered menstrual activity, altered fetal development, programmed cell death (what is now known as apoptosis) and decreased lactation. Many other non-thermal changes were also listed for a total of over 100 non-thermal effects. They also provided [1] approximately 2000 citations documenting these various health effects. That was almost 45 years ago and is only the beginning of the evidence for the existence of non-thermal effects. My own recent paper [2] shows that widespread neuropsychiatric effects are caused by non-thermal exposures to many different microwave frequency electromagnetic fields (EMFs).

Tolgskaya and Gordon [3] in 1973 published a long and detailed review of effects of microwave and lower frequency EMFs on experimental animals, mostly rodents. They report that non-thermal exposures impact many tissues, with the nervous system being the most sensitive organ in the body, based on histological studies, followed by the heart and the testis. They also report effects of non-thermal exposures on liver, kidney, endocrine and many other organs. The nervous system effects are very extensive and include changes many changes in cell structure, disfunction of synaptic connections between neurons and programmed cell death and are discussed in Refs. [2,3] and more modern studies reporting extensive effects of such non-thermal EMF exposures on the brain are also cited in [2]. There are also many modern studies showing effects of non-thermal exposures on fertility in animals.

The Raines 1981 National Aeronautics and Space Administration (NASA) report [4] reviewed an extensive literature based on occupational exposures to non-thermal microwave EMFs. Based on multiple studies, Raines [4] reports that 19 neuropsychiatric effects are associated with occupational microwave/ radiofrequency EMFs, as well as cardiac effects, endocrine including neuroendocrine effects and several other effects.

I reviewed many other scientific reviews on this topic, each of which clearly supports the view that there are various non-thermal health impacts of these EMFs [5]. In 2015, 206 international scientists signed a statement sent to the United Nations Secretary General and to member states, stating that international safety guidelines and standards are inadequate to protect human health [6]. Each of these 206 scientists from 40 countries had scientific publications on biological effects of such EMFs and therefore each is well qualified to judge this. ***It can be seen from this statement to the UN, that there is a strong scientific consensus that current safety guidelines and standards are inadequate because they do not take into consideration all of the non-thermal health effects produced by various EMF exposures.***

That scientific consensus also rejects, therefore, the FCC EMF guidelines, guidelines that cannot be defended despite your own attempt to do so in MCPS Statement Concerning Deployment of Wireless Computing Technologies.

It can be seen from the previous paragraphs, that the following non-thermal effects of EMF exposures are well documented:

Ø Widespread neuropsychiatric effects
Ø Several types of endocrine (that is hormonal) effects
Ø Cardiac effects impacting the electrocardiogram (Note: these are often associated with occurrence of sudden cardiac death)
Ø Male infertility

However, there are many additional types of biological changes produced by non-thermal EMF exposures (reviewed in 5,7] including:

Ø Oxidative stress
Ø Changes in calcium fluxes and calcium signaling
Ø Several types of DNA damage to the cells of the body, including single strand and double strand DNA breaks and 8-OH-guanine in DNA
Ø Cancer (which is undoubtedly caused, in part, by such DNA damage)
Ø Female infertility
Ø Lowered melatonin; sleep disruption
Ø Therapeutic effects of EMFs when they are highly controlled and focused on a specific part of the body

It can be seen from the above, that each of the things that we most value as individuals and as a species are being attacked by non-thermal microwave frequency EMFs [5.7]:

§ **Our Health**
§ **Our brain function**
§ **The integrity of our genomes**
§ **Our ability to produce healthy offspring**

I want to emphasize that the specific health effects listed above are **not** the only things that are likely to be impacted by non-thermal EMF exposures, they are however the best documented such effects.

While it has been clear for many years that there are many non-thermal health effects of microwave frequency EMFs, it has not been clear until about 2 ½ years ago, how these effects are produced by such exposures. I stumbled onto the mechanism in 2012 and published on it in mid-2013. This 2013 paper [8] was honored by being placed on the Global Medical Discovery web site as one of the most important medical papers of 2013. At this writing, it has been cited 61 times according to the Google Scholar database, with over 2/3rds of those citations during 2015. So clearly it is having a substantial and rapidly increasing impact on the scientific literature. I have given 26 professional talks, in part or in whole on EMF effects in 10 different countries over the last 2 1/4 years. So it is clear that there has been a tremendous amount of interest in this research.

What the 2013 study showed [8], was that in 24 different studies (and there are now 2 more that can now be added [2]), effects of low-intensity EMFs, both microwave frequency and lower frequency EMFs could be blocked by calcium channel blockers, drugs that block what are called voltage-gated calcium channels (VGCCs). There were a total of 5 different types of calcium

channel blocker drugs used in these studies, with each type acting on a different site on the VGCCs and each thought to be highly specific for blocking VGCCs. What these studies tell us is that these EMFs act to produce non-thermal effects by activating the VGCCs. Where several effects were studied, when one of them was blocked or greatly lowered, each other effect studied was also blocked or greatly lowered. This tells us that the role of VGCC activation is quite wide – many effects go through that mechanism, possibly even all non-thermal effects in mammals. There are a number of other types of evidence confirming this mechanism of action of microwave frequency EMFs [2,]. Each of the 11 health impacts caused by non-thermal EMF exposures can be explained as being produced by indirect effects of VGCC activation [5,7].

It is now apparent [7] that these EMFs act directly on the voltage sensor of the VGCCs, the part of the VGCC protein that detects electrical changes and can open the channel in response to electrical changes. The voltage sensor (and this is shown on pp. 102-104 in [7]) is predicted, because of its structure and its location in the plasma membrane of the cell, to be extraordinarily sensitive to activation by these EMFs, about 7.2 million times more sensitive than are single charged groups elsewhere in the cell. What this means is that arguments that EMFs produced by particular devices are too weak to produce biological effects, are immediately highly suspect because the actual target, the voltage sensor of the VGCCs is extremely sensitive to these EMFs. **Because heating is mostly produced by forces on these singly charged groups elsewhere in the cell, limiting safety guidelines to heating effects means that these guideline allow exposures that are something like 7.2 million times too high**.

Why then does the FCC stick with these totally unscientific safety guidelines? That is the 64 billion dollar question. The FCC has been shown, in a long detailed document published by Harvard University Center for Ethics, to be a “captured agency”, that is captured by the telecommunications industry that the FCC is supposed to be regulating [9; can be obtained full text from web site listed in 9]. So perhaps the failure of the FCC to follow the extensive science in this important area, can be understood. Of course, what that means is that the FCC is completely failing in its role of protecting the public and it is a major blunder, therefore for either you or any other organization to depend on the FCC guideline as a reliable predictor of impacts of EMFs in humans.

So what is known about health impacts of Wi-Fi EMFs?

Table 1. The following Table summarizes various health impacts of Wi-Fi EMF exposures:

Citation(s)	**Health Effects**
[10,11,12,13,14,15,16]	Sperm/testicular damage, male infertility
[10,15,17,18,19,20]	Oxidative stress
[20]	Calcium overload

[11,12,20]	Apoptosis (programmed cell death)
[17]	Melatonin lowering; sleep disruption
[10,13]	Cellular DNA damage
[21]	MicroRNA expression (brain)
[18]	Disrupts development of teeth
[22]	Cardiac changes, blood pressure disruption; erythrocyte damage; catecholamine elevation
[23,24]	Neuropsych changes including EEG
[25]	Growth stimulation of adipose stem cells (role in obesity?)

Each of the effects reported above in 2 to 7 studies have an extensive literature for their occurring in response to various other microwave frequency EMFs so it should be clear that these observations on Wi-Fi exposures are highly probable to be correct. These include (see Table 1) findings that Wi-Fi exposures produce impacts on the testes leading to lowered male fertility; oxidative stress; intracellular calcium overload; apoptosis (a process that has an important causal role in neurodegenerative diseases); cellular DNA damage; neuropsychiatric changes including EEG changes. Each of these are very serious and oxidative stress has causal roles in many different human diseases; intracellular calcium overload has many different consequences – for example, it has a central role in causing neurodegenerative diseases; cellular DNA damage can cause cancer and produce mutations that impact future generations (if there are any). Other Wi-Fi effects each only documented by a single study are also effects where a variety of other non-thermal microwave EMFs also cause these, as shown by extensive literature on each of them. These include: melatonin lowering and sleep disruption; and the effects reported by Saili et al [22] cardiac changes, blood pressure disruption; erythrocyte damage; catecholamine elevation. So these may well be correct observations as well despite having only a single Wi-Fi specific study for each.

Summary:

1. The EMF safety guidelines supported by the FCC and others assume that only heating effects need be of concern. These assumptions have been known to be false for at least 45 years and there is a scientific consensus on this, that has lead to the petition by 206 highly qualified international scientists to the UN stating that current safety guidelines are inadequate.
2. We now know that low intensity non-thermal exposures work via VGCC activation and that indirect effects of such VGCC activation can produce each of the health effects that have been widely reported to occur in response to such EMF exposures for something like 60 years. These attack:
    a. **Our health**

b. **Our brain function**
c. **The integrity of our genomes**
d. **Our ability to produce healthy offspring**

3. The voltage sensor of the VGCCs is stunningly sensitive to such low intensity EMFs, about 7.2 million times more sensitive than are singly charge groups elsewhere in our cells. The consequence of this is that safety guidelines allow exposures that are very roughly 7.2 million times too high.
4. The FCC has been shown, in a detailed Harvard University study, to be a Captured Agency, captured by the industry that it is supposed to be regulating. This provides an additional reason to be very highly skeptical about all FCC safety guidelines.
5. 15 studies have each shown health effects of Wi-Fi, most of which have also been shown to occur in response to low intensity exposures to other types of microwave frequency EMFs. These are likely to have massive health effects by producing male infertility (female infertility has not been studied in response to Wi-Fi), oxidative stress (involved in dozens of human diseases), cellular DNA damage (possibly leading to both cancer and mutations in future generations), life threatening cardiac effects, cellular apoptosis and also intracellular calcium overload (with both of these possibly leading to neurodegenerative diseases), various neuropsychiatric changes and many others.

It is my view that it is sheer insanity to fail to see the threat to our and to all human civilization by continuing to ignore the threats from such EMFs, starting with Wi-Fi.

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Columbia University, College of Physicians and Surgeons
Department of Physiology and Cellular Biophysics

Board Member
Los Angeles Unified School District,
Board of Education

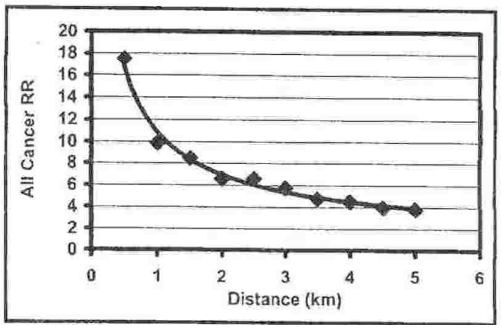
Re: Health effects of cell tower radiation

As an active researcher on biological effects of electromagnetic fields (EMF) for over twenty five years at Columbia University, as well as one of the organizers of the 2007 online Bioinitiative Report on the subject, I am writing in support of a limit on the construction of cell towers in the vicinity of schools.

There is now sufficient scientific data about the biological effects of EMF, and in particular about radiofrequency (RF) radiation, to argue for adoption of precautionary measures. We can state unequivocally that EMF can cause single and double strand DNA breakage at exposure levels that are considered safe under the FCC guidelines in the USA. As I shall illustrate below, there are also epidemiology studies that show an increased risk of cancers associated with exposure to RF. Since we know that an accumulation of changes or mutations in DNA is associated with cancer, there is good reason to believe that the elevated rates of cancers among persons living near RF towers are probably linked to DNA damage caused by EMF. Because of the nature of EMF exposure and the length of time it takes for most cancers to develop, one cannot expect 'conclusive proof' such as the link between helicobacter pylori and gastric ulcer. (That link was recently demonstrated by the Australian doctor who proved a link conclusively by swallowing the bacteria and getting the disease.) However, there is enough evidence of a plausible mechanism to link EMF exposure to increased risk of cancer, and therefore of a need to limit exposure, especially of children.

EMF have been shown to cause other potentially harmful biological effects, such as leakage of the blood brain barrier that can lead to damage of neurons in the brain, increased micronuclei (DNA fragments) in human blood lymphocytes, all at EMF exposures well below the limits in the current FCC guidelines. Probably the most convincing evidence of potential harm comes from living cells themselves when they start to manufacture stress proteins upon exposure to EMF. The stress response occurs with a number of potentially harmful environmental factors, such as elevated temperature, changes in pH, toxic metals, etc. This means that ***when stress protein synthesis is stimulated by radiofrequency or power frequency EMF, the body is telling us in its own language that RF exposure is potentially harmful.***

There have been several attempts to measure the health risks associated with exposure to RF, and I can best summarize the findings with a graph from the study by Dr. Neil Cherry of all childhood cancers around the Sutro Tower in San Francisco between the years 1937 and 1988. Similar studies with similar results were done around broadcasting antennas in Sydney, Australia and Rome, Italy, and there are now studies of effects of cellphones on brain cancer. The Sutro tower contains antennas for broadcasting FM (54.7 kW), TV (616 kW) and UHF (18.3 MW) signals over a fairly wide area, and while the fields are not uniform, and also vary during the day, the fields were measured and average values estimated, so that one could associate the cancer risk with the degree of EMF exposure.



The data in the figure are the risk ratios (RR) for a total of 123 cases of childhood cancer from a population of 50,686 children, and include a 51 cases of leukaemia, 35 cases of brain cancer and 37 cases of lymphatic cancer. It is clear from the results that the risk ratio for all childhood cancers is elevated in the area studied, and while the risk falls off with radial distance from the antennas, as expected, it is still above a risk ratio of 5 even at a distance of 3km where the field was 1μW/cm^2. This figure is what we can expect from prolonged RF exposure. In the Bioinitiative Report, we recommended 0.1μW/cm^2 as a desirable precautionary level based on this and related studies, including recent studies of brain cancer and cellphone exposure.

As I mentioned above, many potentially harmful effects, such as the stress response and DNA strand breaks, occur at nonthermal levels (field strengths that do not cause a temperature increase) and are therefore considered safe. It is obvious that the safety standards must be revised downward to take into account the nonthermal as well as thermal biological responses that occur at much lower intensities. Since we cannot rely on the current standards, it is best to act according to the precautionary principle, the approach advocated by the European Union and the scientists involved in the Bioinitiative report. In light of the current evidence, the precautionary approach appears to be the most reasonable for those who must protect the health and welfare of the public and especially its most vulnerable members, children of school-age.

Sincerely yours,

Martin Blank, Ph.D.
Associate Professor of Physiology and Cellular Biophysics

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MCPS COO Dr. Andrew Zuckerman
MCPS Interim Superintendent Larry Bowers
MCPS Board of Education
MCPS Office of Technology
Montgomery County Schools
Carver Educational Services Center
850 Hungerford Drive
Rockville, MD 20850

December 13, 2015

Dear Montgomery County COO Dr. Andrew Zuckerman, Interim Superintendent Larry Bowers, Board of Education and Office of Technology;

In my capacity as a pediatric occupational therapist, biologist, international speaker, and author on the subject of the impact of technology on child development and learning, I'm writing to you on behalf of students, teachers, and parents requesting you reconsider the use of devices which operate using wireless radiation.

Please find below guiding principles regarding managed balance between technology and healthy activity, as well as information on wireless radiation. More judicious use of educational based technologies is a safe manner, will serve to ensure sustainable futures for all children. Reversion to Ethernet or fiber optic cable devices, until such time as the World Health Organization deems wireless to not be harmful to young children, is recommended.

Guiding principles for the use of educational based technology in school environments.

Minimize Risk and Maximize Safety.

- Wireless radiation has not been proven safe (WHO 2011).
- Recent research indicates wireless radiation causes harmful effects to adult humans (Avendano 2012, Hardell 2013).
- Long term effects of wireless radiation on children are unknown at this time (AAP 2013).
- Children have thinner skulls, more aqueous bodies, and have rapidly developing cells, indicating they are exceedingly more vulnerable to harmful effects from wireless radiation than adults (AAP 2013, C4ST 2015).
- The American Academy of Pediatrics and the Canadian Pediatric Society recommends no more than 1-2 hours total technology use per day, including

educational technology. Many schools exceed these expert guidelines (AAP 2014).

Weigh Risk vs. Benefit.

- Education technology is not evidence based and is laden with conflict of interest e.g. manufacturers claims are financially motivated, and are not substantiated by university level research.
- Traditional and standardized teaching methods have substantive research support and evidence, yet are being rapidly replaced with education technology.

Ensure adequate foundational skills prior to use of technology.

Children need to balance the following 4 critical factors with technology, to optimize development and learning. Time spent with technology adversely affects these factors.

- *Movement:* stimulates vestibular, proprioceptive and cardiovascular systems.
- *Touch:* stimulates parasympathetic system for lowered cortisol and adrenalin.
- *Human Connection:* activates parasympathetic system; a life sustaining force.
- *Nature:* attention restorative, improves learning, erases effects of technology.
- *See video:* Message to Schools on EdTech

Risks associated with the use of technology by children are as follows:

- *Sedentary nature* of technology use is causally related to the recent rise in obesity/diabetes, developmental delay and learning difficulties (Tremblay 2011, HELP EDI Mapping 2009/13, Ratey 2008, PISA 2012).
- *Isolating factor* of technology use is associated with escalation in social impairments, mental illnesses (including adhd and autism), and self-regulation difficulties (Houtrow 2014).
- *Overstimulation* from technology use is a causal factor in rise in attention deficit, aggression, sleep disturbance, and chronic stress from hyper-arousal of the sympathetic nervous system (Christakis 2004, Gentile 2009, Markman 2010, Bristol University 2010).
- *Neglect* of students by teachers and support staff who are engaged in their own personal technology, is unfortunately common.
- Consequently, the risks associated with using education technology far outweigh the dubious benefits.

When In Doubt, Act With Caution.

- Existing research on harmful effects of wireless radiation on *adults*, indicates taking a cautionary approach when considering same radiation exposure to *children* (AAP 2014).

- Rapid cell turnover in children creates particular concern regarding potential DNA damage from wireless radiation, and consequent susceptibility to cancer. While rise in cancer incidence is becoming more apparent, rise in rates of cancer in children will not be observable until adulthood.
- Removal of wireless radiation and reversion to Ethernet cabled devices, will ensure immediate and long term safety to all students, teachers, and support staff.
- Defaulting to a remote authority regarding removing wireless radiation from schools, is not acting in the best interests of students and staff, and may not be defensible in a court of law.

Montgomery County's statement that the radiofrequency levels in schools "is compliant" with federal regulations *does not* assure safety to the students in your care. The current proposed technology plan to further increase the use of screens in classrooms on a daily basis, clearly does not support children's healthy development.

The implications of failure of schools to act with caution now regarding wireless radiation and technology, could potentially be horrific in both scope and magnitude, and may constitute neglect of children. Please act now to safeguard your children's future.

Respectfully,

CRowan

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ENVIRONMENTAL HEALTH TRUST

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Montgomery County Board of Education
Montgomery County Schools
Carver Educational Services Center
850 Hungerford Drive
Rockville, MD 20850

January 20, 2016

Dear Montgomery County Board of Education,

Concerned parents in your school district have asked me to write to you regarding the health risks of wireless radiofrequency radiation exposure in the classroom. Based on what I have been told, I want to urge you to halt programs that currently have students use their own phones in ways that expose their eyes and brains to levels of radiation that have never been tested for safety.

I was Founding Director of the Board on Environmental Studies and Toxicology of the U.S. National Research Council, and Founding Director of the Center for Environmental Oncology at the University of Pittsburgh Cancer Institute. President Clinton appointed me to the Chemical Safety and Hazard Investigation Board, and I am former Senior Advisor to the Assistant Secretary for Health in the Department of Health and Human Services. I founded the non-profit Environmental Health Trust in 2007 to provide basic research and education about environmental health hazards. Our scientific team is currently focusing on the health risks of radiofrequency radiation as an important public health issue.

Many people are unaware that cell phones and wireless laptops and tablets function as two-way microwave radios. A typical classroom might have the following scenario: every student has a laptop--which is typically tested for use 8 inches from an adult male body--a cell phone in the pocket--which is also tested at a minimum distance from an adult male body-- and a network transmitter on the ceiling and possibly a cell tower outside next to the sports field. All these devices emit microwave radiation which can be readily absorbed into children's bodies and brains.

Manufacturers specifically recommend that cell phones be used “as tested”—at this little-known minimum distance from the body. Recently, *Consumer Reports* in November advised that people should not keep phones in the pocket—advice that few children or adults appreciate. *These devices have never been tested for safety with children.* Accumulating research indicates that long-term exposure to low levels over long lifetimes could pose a serious risk to our health.

Regarding tested distances for using laptops, the Federal Communications Commission (FCC) states that laptops and computers are "mobile devices are transmitters designed to be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons." The body in this instance refers to a large male weighing more than 200 pounds and standing six feet tall.

As the county is preparing to increase student use of Chromebooks, please be aware that the Samsung Chromebook manual states:
"United States of America USA and Canada Safety Requirements and Notices

- Do not touch or move antenna while the unit is transmitting or receiving.
- Do not hold any component containing the radio such that the antenna is very close or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Regardless of the power levels, care should be taken to minimize human contact during normal operation.
- This device should be used more than 20 cm (8 inches) from the body when wireless devices are on and transmitting.
- FCC Statement for Wireless LAN use: *"While installing and operating this transmitter and antenna combination the radio frequency exposure limit of 1mW/cm2 may be exceeded at distances close to the antenna installed. Therefore, the user must maintain a minimum distance of 20cm from the antenna at all times."*

As one of the leaders in educational policy of this nation, your school district has an opportunity to set an example for school districts nationwide by installing safer technology in classrooms and educating students, teachers and staff about tested distances that devices should be used to reduce radiation. A number of public and private schools have already implemented such policies. Just as we provide children with seat belts and bike helmets, a precautionary approach to wireless is recommended by many scientists and governments worldwide.

For more information about all of these issues, please read cell phone instructions for various models at http://showthefineprint.org. Our newly posted Ebook also details fine print safety instructions in wireless device user manuals.

When children use these devices close to their bodies, they are exceeding these safety instructions, and exposing themselves to radiofrequency (RF) radiation levels which can exceed our government FCC RF radiation exposure limits. The FCC RF exposure limit was designed to protect the public from the thermal (heating) effects of acute exposure to RF energy. The FCC states, "Tissue damage in humans could occur during exposure to high RF levels because of the body's inability to cope with or dissipate the excessive heat that could be generated. Two areas of the body, the eyes and the testes, are particularly vulnerable to RF heating because of the relative lack of available blood flow to dissipate the excess heat load."

CHILDREN ABSORB MORE RADIATION THAN ADULTS

Our recently published research in the IEEE *Spectrum* with investigators at the Federal Universities of Brazil provides new state-of-the-art radiation exposure brain modeling which confirms that substantially higher radiofrequency radiation doses occur in younger children as compared to adults even where products comply with tested guidelines developed for adults.

FCC REGULATIONS ARE OUTDATED

FCC exposure limits were set more than 19 years ago and were based on decades-old research. The Government Accountability Office published a 2012 Report that calls on the FCC to formally reassess their current RF energy (microwave) exposure limits, stating that the "FCC RF energy exposure limit *may not* reflect the latest research." I encourage you to read scientific submissions to FCC Proceeding Number 13-84 at http://bit.ly/1aGxQiq. It is unknown when the FCC will make a ruling, however, *until that time* the current outdated FCC limits are *not reflective* of the current state of science.

FCC REGULATIONS DO NOT PROTECT THE PUBLIC FROM BIOLOGICAL EFFECTS

As the California Medical Association states in their 2014 Resolution calling for updated FCC Regulations, "peer reviewed research has demonstrated adverse biological effects of wireless EMF [electromagnetic fields] including single and double stranded DNA breaks, creation of reactive oxygen species, immune dysfunction, cognitive processing effects, stress protein synthesis in the brain, altered brain development, sleep and memory disturbances, ADHD, abnormal behavior, sperm dysfunction, and brain tumors."

In May 2015, over 200 scientists who have authored more than 2,000 articles on this topic appealed to the United Nations to address "the emerging public health crisis" related to cellphones and other wireless devices, urging that the United Nations Environmental Programme (UNEP) initiate an assessment of alternatives to current exposure standards and practices that could substantially lower human exposures to non-ionizing radiation. These scientists state that "the ICNIRP guidelines do not cover long-term exposure and low-intensity effects, " and are " insufficient to protect public health." They also state that "the various agencies setting safety standards have failed to impose sufficient guidelines to protect the general public, particularly children who are more vulnerable to the effects of EMF." Please see their website at https://emfscientist.org.

INCREASED CANCER RISK

Wireless radiofrequency radiation was classified as a Class 2B "Possible Human Carcinogen" by the World Health Organization's International Agency for Research on Cancer in 2011. According to many scientists, evidence *has increased* since 2011, indicating that cell phone and wireless radiation should be classified as a "probable carcinogen." Those exposed at younger ages show four to eight times increased cancer risk. Replicated research just published in Biochemical and Biophysical Research Communications indicates that radiofrequency acts as a *tumor promoter* at low to moderate levels.

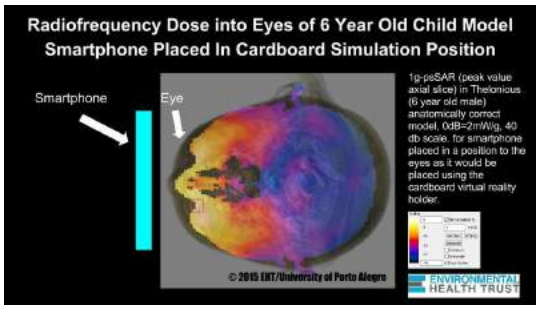
CONCERN FOR PREGNANT STUDENTS AND STAFF

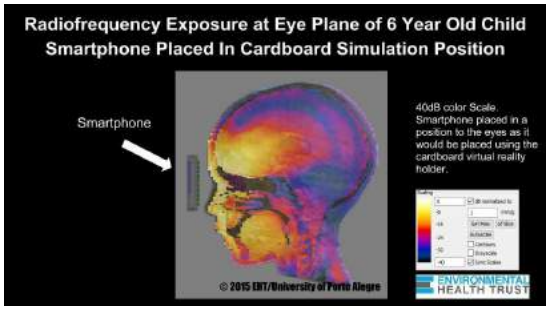
Pregnant students and staff are especially at risk from wireless because the fetus is the most vulnerable to toxic exposures. Several experimental studies are showing irreversible changes after prenatal exposure to cell phone and wireless radiation such as altered brain functioning, decreased brain cells and altered reproductive organ development. More than 100 physicians, scientists and public health professionals joined together to express their concern about the risk that wireless radiation poses to pregnancy and now *urge pregnant women to limit their exposures*. Please read these scientists BabySafe Joint Statement

VIRTUAL TECHNOLOGY RESULTS IN HIGHER EXPOSURES TO THE EYE AND BRAIN

Most recently, I was contacted by a parent in your district about the virtual reality devices now used in MCPS classrooms to go on a virtual "field trip." As indicated by online instructions, this experience involves using smartphones placed directly in front of the child's eyes so that they can directly watch a fascinating video of faraway lands. The smartphone is streaming radiation throughout the classroom from the teacher's iPad for the entire "field trip."

Please be aware that FCC regulations set decades ago did not utilize science that looks at the effects from cell phones on different body tissues such as the eyes. Upon hearing about this issue, I contacted EHT-associated scientists at federal universities of Brazil who do state-of-the-art computer modeling. I asked them to position the phone as it would be in the virtual reality cardboard for use in front of the child's eyes and assess the microwave radiation. The yellow and orange color show the highest exposures.





My colleagues and I are sharing this work with you today because we believe you should have more information about microwave radiation exposures that will take place through this system.

This research image above utilizes a sophisticated computer system that the U.S. Food and Drug Administration (FDA) currently applies to evaluate medical devices. It simulates the radiation absorption into *anatomically correct models*--something that currently used systems for testing phones and devices cannot do. In a study from Memorial Sloan-Kettering Cancer Center, radiation physicist David Gultekin, working with Bell Labs electrical engineer Lothar Moeller, reported that normal working cell phones can create tiny hotspots within brain tissue. Unlike other organs, eyes do not have circulation to effectively carry away heat.

In addition to the impact from the microwave radiation, there could also be impacts to a child's retina from the blue light emitted by the screen. Youths under the age of 20, and especially very young children,

have little or no yellowing of the lens (which helps protect the adult eye). Therefore, blue light (or UV) which enters the eye is unfiltered in children and strikes the retina at full-strength exposing not only the retina, but the lens to possible damage over the long time. Such injury may not be evident until later in time.

In 2010, Andreas Christ and team reported that children's hippocampus and hypothalamus absorbs 1.6–3.1 times higher and the cerebellum absorbs 2.5 times higher microwave radiation compared to adults; children's bone marrow of the skull absorbs 10 times higher microwave radiation than in adults, *and children's eyes absorb much higher microwave radiation than adults.* A recent Deans' Lecture I delivered to University of Melbourne provides an overview on this research.

SIMPLE STEPS WILL PROTECT CHILDREN

Compelling research raises the possibility of very serious harm to children from radiofrequency radiation exposures well below "FCC compliant" levels. Legal does not mean safe. Based on the preliminary work that I share with you here, I urge you to forgo the use of such devices such as virtual reality cardboard as there is no research that has considered their impact on children's eyes. At this time, the smart choice for school decision makers is to act now and reduce radiofrequency wireless exposures. In fact, many countries (over 20) and health authorities worldwide recommend reducing radiofrequency radiation to children.

More recently, the Cyprus Government's National Committee on Environment and Children's Health released a video about reducing wireless and I invite you to watch this excellent example of responsible action at this link https://www.youtube.com/watch?v=H43IKNjTvRM .

I understand that your county has a Bring Your Own Device policy whereby cell phones are not only allowed *in* the classroom but are actively used in the curriculum. As I have been told, students in film class might use their cell phones to take footage to create a movie, and in some math classes they use their cell phones as a calculator. Advice should be routinely provided to any student using a wireless device at school about *how to reduce exposures*. For example, if phones are used on airplane mode, and wireless is turned off on computers then these devices will neither send nor receive microwave radiation.

When powered on, phones undergo short bursts of microwave radiation up to 900 times per minute, *whether or not the phone is being used for talking.* Once teachers and students are educated on how they can simply turn their phone onto airplane mode, then they can use the phone in the classroom *without* being exposed to unnecessary radiofrequency radiation.

Likewise, laptops such as Chromebooks are also emitting constant radiation and at much higher levels when a student is streaming video or using cloud based applications. Laptops can easily be hardwired to ethernet so that students can safely use the internet without radiation emissions. Please review the Best Practices for Low EMF in Schools developed by the Northeast Collaborative For High Performing Schools which details how schools can reduce exposure to radiofrequency fields and still have full internet connectivity.

Along with the recommendation of over 200 scientists (see https://emfscientist.org) and health authorities worldwide, I recommend that the best course of action is to take simple precautions—as many nations already currently advise. *Children's exposures to wireless radiation should be reduced as much as possible.* We have a responsibility to act now to reduce children's exposure to radiofrequency radiation. Children's nervous, immune and reproductive systems are rapidly developing and, along with pregnant women, children deserve an abundance of caution.

As several colleagues and I wrote in a letter to the U.S. Secretary of Education just a few months ago, we recommend your school district do the following:

1. **Raise school community awareness through new educational curriculum:** Students, teachers and their families should be given information on wireless health risks and simple precautionary steps they can take to protect their health. It is important to teach children how to use technology both safely and more responsibly in order to protect their health and wellbeing.

2. **Install a safe communication and information technology infrastructure in schools to meet educational needs:** Solutions exist to reduce exposures to wireless emissions and mitigate the health risk. Low-EMF Best Practices have been developed, allowing educational needs to be met with safer, hard-wired Internet connections, which are also faster and more secure.

Low-EMF Best Practices are the solution that allows for full communication, information access and learning tools use in the classroom while minimizing unnecessary health risks. Your district can thoughtfully integrate safe technology into every classroom while responsibly safeguarding the health of every generation.

I fully understand that this information has not been widely understood. I would be happy to provide or develop an online technical briefing to your senior staff to assist you as you make decisions today that will affect the health of students for the rest of their lives.

Yours respectfully,

Devra Davis, PhD MPH
President and Founder
Environmental Health Trust
Visiting Professor of Medicine
The Hebrew University, Hadassah Medical Center
Associate Editor, Frontiers in Radiation and Health
ehtrust.org

UNIVERSITY AT ALBANY
State University of New York

Institute for Health and the Environment
WHO Collaborating Center in Environmental Health

July 28, 2014

Board of Trustees
Fay School
48 Main Street
Southborough, MA 01772

Re: Advisability of WiFi in schools

Dear Sirs/Madams:

This is concerning potential adverse health effects associated with exposure to radiofrequency/microwave (RF/MW) radiation, specifically that from wireless routers and wireless computers. I am writing to express concern that students at your school are experiencing electrosensitivity symptoms from these technologies.

I am a public health physician who has been involved in issues related to electromagnetic fields (EMFs) for several decades. I served as the Executive Secretary for the New York Powerline Project in the 1980s, a program of research that showed that children living in homes with elevated magnetic fields coming from powerlines suffered from an elevated risk of developing leukemia. I served as Director of the Wadsworth Laboratory of the New York State Department of Health, as well as Dean of the School of Public Health at the University at Albany/SUNY. I have edited two books on effects of EMFs, ranging from low frequency fields to radiofrequency/ microwave radiation, or the kind emitted by WiFi routers, cell phones, neighborhood antennas and wireless computer equipment. I served as the co-editor of the BioInitiative Report 2012 (Bioinitiatve.org), a comprehensive review of the literature showing biological effects at non-thermal levels of exposure, much of which has since been published in the peer-reviewed journal, *Pathophysiology* (attached). Also, I served on the President's Cancer Panel that examined radiation exposures as they relate to cancer risk, in 2009, and a report from that testimony is also attached. Thus, this is a subject which I know well, and one on which I take a public health approach rooted in the fundamental principle of the need to protect against risk of disease, even when one may not have all the information that would be desirable.

There is clear and strong evidence that intensive use of cell phones increases the risk of brain cancer, tumors of the auditory nerve and cancer of the parotid gland, the salivary gland in the cheek by the ear. The evidence for this conclusion is detailed in the attached publications. The WHO's International Agency for Research on Cancer has also classified the radiation from both cell phones and WiFi as a Class 2B "Possible Carcinogen" (2011). WiFi uses similar radio-frequency radiation as cell phones (in the 1.8 to 5.0 GHz range). The difference between a cell phone and a WiFi environment, however, is that while the cell phone is used only intermittently, and at higher power, a WiFi environment is continuous, and transmitting even when not being used. In addition, WiFi transmitters are indoors, where people (and in this case, children) may be very close by, or certainly close to devices using the WiFi, such as wireless computers, iPads and smart boards, the radiation from which can be intolerable to sensitive people.

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www.albany.edu/ihe

Furthermore, commercial routers, like those in schools, operate at much higher wattage than consumer routers. They are designed to penetrate through materials like cement, wood and brick, to handle dozens to hundreds of users, and to reach into outdoor areas, so industrial grade routers are of much greater concern.

An additional consideration to appreciate is that it is not only the power of wireless radiation that causes biological dysregulation, but the frequencies, pulsing, amplitude, and the quantity and kind of information being transmitted that can have effects as well. These 'non-thermal effects' have been shown in thousands of studies to be biologically active, and may be more important than the effects from the power. Thus, while a router may be in the ceiling, or not right next to a student, teacher or administrator, the known biological and health effects, particularly the non-thermal ones, are still very much occurring.

Finally, while acute electrosensitivity symptoms, like the ones I understand your students are experiencing, are of course of great concern (such as cognitive effects impairing attention, memory, energy levels, and concentration; cardiac irregularities, including in children; or, headaches or other symptoms in students wearing braces), the full effects for society from chronic and cumulative exposures are not known at this time. Given what we do know, however, including the DNA effects, I must, as a public health physician, advise minimizing these exposures as much as possible. Indications are that cell phones and wireless technologies may turn out to be a serious public health issue, comparable to tobacco, asbestos, DDT, PCBs, pesticides and lead paint, or possibly worse given the ubiquitous nature of the exposures. While unfortunately we must wait for federal regulation to catch up with the science, the prudent thing to do in the interim would be to exercise precaution at every opportunity.

Computers and the world-wide web have tremendous value in education, but the value also depends on how these are used in numerous respects. As wired internet connections do not pose radiation risk, are readily available, are faster and more secure than WiFi, and are now even available for certain tablets, I highly recommend you factor the risks I have described into your technology planning. At the same time, I would urge you to take the complaints of your students very seriously, and potentially involve the school nurse and teachers in helping to assess the extent of the electrosensitivity problem among students at the school.

An excellent reference on the EMF and electrosensitivity science is "Electrosensitivity and Electrohypersensitivity—A Summary" (2013) authored by M.J. Bevington and available through Electrosensitivy-U.K. (www.es-uk.info/)

If I can be of further help, please do not hesitate to call.

Yours sincerely,

David O. Carpenter, M.D.
Director, Institute for Health and the Environment
University at Albany

Enclosures

Martin Blank, PhD
Department of Physiology and Cellular Biophysics
Columbia University
New York, NY 10032

July 25, 2014

Mr. Thomas McKean, President, Board of Trustees
Mr. James Shay, President-Elect, Board of Trustees
Fay School
48 Main Street
Southborough, MA01772

To the Board of Trustees,

It has been brought to my attention that school children have become symptomatic at your school after installation of WiFi. I am writing to express my concern and to encourage you to review the independent science on this matter.

I can say with conviction, in light of the science, and in particular in light of the cellular and DNA science, which has been my focus at Columbia University for several decades, putting radiating antennas in schools (and in close proximity to developing children) is an uninformed choice. Assurances that the antennas are within 'FCC guidelines' is meaningless today, given that it is now widely understood that the methodology used to assess exposure levels only accounts for one type of risk from antennas, the thermal effect from the power, not the other known risks, such as non-thermal frequencies, pulsing, signal characteristics, etc. They fail also to consider multiple simultaneous exposures from a variety of sources in the environment, and cumulative exposures over a lifetime. Compliance with FCC guidelines, thus, unfortunately, is not in any way an assurance of safety today, as the guidelines are fundamentally flawed. Until the guidelines and advisories in the U.S. are updated, the intelligent thing for your Board of Trustees to do is to exercise the Precautionary Principle and hard wire all internet connections.

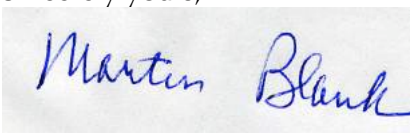
I know this might be disappointing to hear, as I understand you have invested in the WiFi. But there is no amount of money that could justify the added physiological stress from wireless antenna radiation and its many consequences, most in particular for children. Our research has shown that the cellular stress response, a protective reaction that is indicative of cellular damage, occurs at levels that are deemed 'safe'. Many other harmful reactions have been reported, such as the impairment of DNA processes that can account for the observed increased risk of cancer, as well as the potential cognitive decline, and sleep effects that may be due to impairment of the blood brain barrier. The DNA effects are of particular concern for future generations, an area of research that is just beginning to raise alarms. As with other environmental toxic exposures, children are far more vulnerable than adults, and they will have longer lifetimes of exposure.

The science showing reasons for concern about the microwave radiation emitted by antennas is abundant and there will be a day of reckoning. As I explain in my recent book,

Overpowered, The Precautionary Principle instructs us that in the face of serious threats, a lack of scientific 'certainty' never justifies inaction. The changes occurring at the molecular level, and known associations with many diseases, are sufficient at this time to give us pause and to recommend minimizing exposures to these fields, in our homes, schools, neighborhoods and workplaces. There is significant potential for risk, and to very large numbers of people, and the effects are occurring nonetheless whether or not we are noticing them.

I recommend you hardwire the internet connections at your school, and also encourage students to use hard wired connections at home for internet access, as well as for all computer equipment connections and voice communications.

Sincerely yours,



Martin Blank, PhD
mb32@columbia.edu,

Martin Blank, PhD, Special Lecturer and (ret.) Associate Professor, Columbia University, Department of Physiology and Cellular Biophysics. Dr. Blank is a leading expert in the effects of electromagnetic fields on DNA and biology, and Past President of the Bioelectromagnetics Society. He holds two PhDs, in physical chemistry and in colloid science, an interdisciplinary field involving chemistry, physics and nanoscience. Dr. Blank was author of the BioInitiative Report's section on the impact of electromagnetic fields on Stress Proteins; Editor of the journal *Pathophysiology*'s special issue on Electromagnetic Fields (2009); and co-author of "Electromagnetic fields and health: DNA based dosimetry" (2012), which recommends a new way of assessing the biological impact of electromagnetic fields across the spectrum, using DNA. Dr. Blank's book, *"Overpowered—What Science Tells Us About the Dangers of Cell Phones and Other WiFi-Age Devices",* was published in 2014.

Wi-Fi in Schools

Are We Playing It Safe With Our Kids?

"Current FCC standards do not account for the unique vulnerability and use patterns specific to pregnant women and children. It is essential that any new standard for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded throughout their lifetimes." American Academy of Pediatrics Letter to FCC August 29, 2013 (20)

By Cindy Russell, MD
VP of Community Health, SCCMA

Industry has been quite successful in creating magically useful wireless technologies such as cell phones, Ipads, Wi-Fi, and now wearable tech devices such as Google glasses, we all love. Many of these handy gadgets have now reached the typical classroom across the globe. It has become apparent, however, that there are substantial downsides to being too connected to technology and as safety concerns mount, governments such as France and Israel are backing away from the blind adoption of wireless technology in schools, especially for young children.

These devices are cool and convenient, however there remains nagging questions of overuse and safety as the application of these devices has increased to the point we are literally exposed 24 hours a day to this radiation. Wireless microwaves come from many sources both at work and at home.

An increasing number of physicians, scientists, and parents are concerned about long term health effects from Wi-Fi in schools. (42)(43)(44)(49) As any parent knows, computers now are as ubiquitous in schools as they are at work. From kindergarteners on up kids are required to learn computer skills in order to take core testing online. There is a push to enable students to be connected to the internet 24/7 to take photos, email documents, and research a topic. In schools, wired connections for computers have been rapidly being eliminated to install wireless systems that connect students both indoors and outdoors on campus.

Europe and some schools in the U.S. are taking a different more precautionary approach and going back to the future with wired plug in computers. Studies have also cast doubt on some of the benefits of classroom computers and warned of the new age of "Digital Dementia" which has now crept into Korean youth due to the heavy use of electronic gadgets. (17)(48)

Professors in college are banning computers during lectures and finding students learn more. (38) (39)

CHILDREN ARE MORE VULNERABLE THUS NEED MORE PROTECTION

Children have several organ systems that are immature at birth and are thus much more sensitive to toxic exposures. The human brain, one of the top vital organs, is far from being a finished product in youth. Long-term structural maturation of the nervous system is required for successful development of cognitive, motor, and sensory functions. Neuronal axons – long thin projections from the nerve cell – act as electronic transmission lines. Axons in major pathways of the brain continue to develop throughout childhood and adolescence. Myelin is the insulation surrounding individual nerves protecting it from outside electrical charges. The process of myelination is much faster the first two years but continues into adulthood. (16) Children have thinner skulls (29), their immune systems are undeveloped, their cells are dividing more rapidly, thus, they are more vulnerable to EMF radiation and other carcinogens. They also have a longer cumulative exposure to all toxins including EMF radiation.

CURRENT WIRELESS SAFETY STANDARDS AND MICROWAVING POTATOES

Wireless devices work on high frequency microwaves similar to the microwave you use to cook food with. It is with less power but substantial research (1)(2)(3)(4) demonstrates that even at low power within the current safety standards these microwaves can cause biologic harm to plants, animals, and cellular structures. Current Federal Communications Commission (FCC) standards are based only on heat generated by the device, not on adverse biological effects seen in hundreds of studies and at much lower levels.

Our own CMA supports reassessment of EMF standards. The California Medical Association, in 2014, passed a resolution as follows:

> "Resolved 1:That CMA supports efforts to re-evaluate microwave safety exposure levels associated with wireless communication devices, including consideration

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of adverse nonthermal biologic and health effects from non-ionizing electromagnetic radiation used in wireless communications and be it further

Resolved 2: That CMA support efforts to implement new safety limits for wireless devices to levels that do not cause human or environmental harm based on scientific research.

ADVERSE EFFECTS DEMONSTRATED IN PEER REVIEWED PUBLISHED RESEARCH (2)

- DNA with single and double stranded breaks
- Leakage of the blood brain barrier (two hours of cell phone exposure causes 7+ days of albumin leakage)
- Stress protein production in the body indicating injury
- Infertility/reproductive harm
- Neurologic harm with direct damage to brain cells
- Lowering of melatonin levels
- Immune dysfunction
- Inflammation/oxidation.

PLAUSIBLE MECHANISM FOUND FOR EMF MICROWAVE EFFECTS

Dr. Martin Pall, Professor Emeritus of Biochemistry, Washington State University has studied how electromagnetic fields impact the cells of our bodies. His 2013 paper on this subject highlights a major biological mechanism of action of EMF microwave radiation on cell structure. His work, along with two dozen prior studies, demonstrated that EMF microwave radiation effects cellular calcium channels and this can be inhibited with calcium channel blockers. "A whole series of biological changes reportedly produced by microwave exposures can now be explained in terms of this new paradigm of EMF actions via Voltage Gated Calcium Channels (VGCC) activation." (14)(15)

EMF AFFECTS ON WILDLIFE: BIRDS, BEES, AND TOMATO PLANTS

Bird researchers in Germany found that their migratory European Robins lost their sense of navigation when in the city. (5) This was found to be due to the EMF radiation interfering with the bird's special internal magnetic compass. They replicated the experiment over seven years before publishing the results in the prestigious journal *Nature*.

John Phillips and others have found that newts, sea turtles, and migratory birds use a magnetic compass to navigate long distances and this can be interrupted by low levels of EMF. (6)(7) A review of effects on cell towers and wireless devices showed that beehives can have rapid colony collapse with exposure to cell phone radiation. (8)

Plants have been shown to have stress response to EMF from wireless devices. (9)(10) (22) In tomatoes exposed for short duration, the stress response seen by exposure to EMF was prevented by administration of calcium counteracting drugs. (11) Even simple high school science experiments document abnormal seed growth near Wi-Fi routers. (19) There appear to be adverse biological effects of this seemingly harmless radiation.

HUMAN ELECTROSENSITIVITY: IS IT REAL?

There is varied opinion about those who state they are sensitive to EMF. Scientific research has not given a definitive answer, nevertheless, many seem to suffer from vague and often disabling symptoms they feel in the presence of EMF. Exposure to EMF radiation in some people reportedly causes headaches, memory problems, fatigue, sleep disorders, depression. This is so significant for some people that they have to live in a very low EMF environment to feel normal. (25)

Sweden recognizes electro-sensitivity as a functional impairment and estimates that about 3% of the population suffers from this. (23)(24) Dr. Magda Havas found in replicated studies that some EMF sensitive individuals heart rates increased with wireless devices turned on in double blind study. (12)(26) Researchers at Louisiana State University, in 2011, studied a self reported EMF sensitive physician and found "In a double-blinded EMF provocation procedure specifically designed to minimize unintentional sensory cues, the subject developed temporal pain, headache, muscle twitching, and skipped heartbeats within 100 s after initiation of EMF exposure ($p < .05$)." They concluded that "EMF hypersensitivity can occur as a bona fide environmentally inducible neurological syndrome." (27)

In May 2011, the International Agency for Research on Cancer (IARC) classified radiofrequency electromagnetic fields as possibly carcinogenic to humans (Group 2B).(30)

Genius and Lipp reviewed the current literature on EHS, in 2011, and point to several explanations for this multisystem phenomenon, including toxicant induced loss of tolerance as many with EHS symptoms had high levels of PCB's possibly causing immune dysfunction. Scientific research also identifies an inflammatory response with cytokine production. Another aspect of research points to catecholamine and adrenal gland dysfunction. In addition, heavy metal toxicity has also been proposed as contributing to EHS. (28)

The Austrian Medical Association feels Electrohypersensitivity is a real phenomenon and in 2012 published Guidelines for EMF and Electro-hypersensitivity. They state the primary method of treatment should consist in the prevention or reduction of EMF exposure, taking care to reduce or eliminate all sources of EMF if possible. (32)

GOVERNMENT ACTIONS ON WI-FI IN SCHOOLS

While much of the U.S. is marching forward with Wi-Fi in schools, Europe is changing direction, as indicated by the policies listed below. (45) Internationally there is wide disagreement in standards. The U.S. and Canadian limits are 1000 microwatts/cm2. China and Russia are 10 microwatts/cm2. Belgium is 2.4 microwatts/cm2, and Austria is 0.001 microwatts/cm2. The Bioinitiative Report 2012 recommendation for "No Observable Effect" is 0.0003 microwatts/cm2. Cosmic background EMF we evolved with is <0.00000000001 microwatts/cm2. (2)

COUNCIL OF EUROPE PARLIAMENT ASSEMBLY 2011 EMF MICROWAVE POLICY : "THE POTENTIAL DANGERS OF ELECTROMAGNETIC FIELDS AND THEIR EFFECT ON THE ENVIRONMENT"

The report notes "other non-ionizing frequencies, whether from ex-

tremely low frequencies, power lines or certain high frequency waves used in the fields of radar, telecommunications, and mobile telephony, appear to have more or less potentially harmful, non-thermal, biological effects on plants, insects, and animals, as well as the human body, even when exposed to levels that are below the official threshold values."

The Council calls for a number of measures to protect humans and the environment, especially from high-frequency electromagnetic fields. One of the recommendations is to "take all reasonable measures to reduce exposure to electromagnetic fields, especially to radio frequencies from mobile phones, and particularly the exposure to children and young people who seem to be most at risk from head tumors". (37)

IN FRANCE: A NEW NATIONAL LAW BANS WI-FI IN NURSERY SCHOOLS

In January 2015, France passed a landmark law that calls for precaution with wireless devices for children and the general public. (34)(35) It calls for:

1. Wi-Fi banned in nursery schools.
2. Wi-Fi routers should be turned off in school when not in use.
3. Schools are informed when new tech equipment is installed.
4. Citizens will have access to environmental cell tower radiation measurements near homes.
5. There will be continued research conducted into health effects of wireless communications.
6. Information on reducing exposure to EMF radiation is mandatory in the contents of the cell phone package.
7. Wi-Fi hotspots are labeled.

ISRAELI MINISTRY OF EDUCATION ISSUE GUIDELINES TO LIMIT WI-FI IN SCHOOLS

On August 27, 2013, the Israeli Ministry of Education issued new guidelines regarding Wi-Fi use in schools. (33) The guidelines will:

1. Stop the installation of wireless networks in classrooms in kindergarten.
2. Limit the use of Wi-Fi between first and third grades. In the first grade, students will be limited to use Wi-Fi to study for one hour per day and no more than three days per week. Between the first and third grades, students will be limited to use Wi-Fi up to two hours per day for no more than four days per week.
3. To limit unnecessary exposure teachers will be required to turn off mobile phones and Wi-Fi routers when they are not in use for educational purposes.
4. All Wi-Fi equipment be tested for compliance with safety limits before and after installation in an Israeli school.
5. Desktop computers and power supplies be kept at least 20 cm from students.

2012 THE RUSSIAN COMMITTEE ON NON-IONIZING RADIATION PROTECTION

OFFICIALLY RECOMMENDED THAT WI-FI NOT BE USED IN SCHOOLS.

2011 THE RUSSIAN COMMITTEE ON NON-IONIZING RADIATION PROTECTION (RNCNIRP) RELEASED THEIR RESOLUTION ENTITLED "ELECTROMAGNETIC FIELDS FROM MOBILE PHONES: HEALTH EFFECTS ON CHILDREN AND TEENAGERS."

According to the opinion of the Russian National Committee on Non-Ionizing Radiation Protection, the following health hazards are likely to be faced by the children mobile phone users in the nearest future: disruption of memory, decline of attention, diminishing learning and cognitive abilities, increased irritability, sleep problems, increase in sensitivity to the stress, increased epileptic readiness. (36)

Expected (possible) remote health risks: brain tumors, tumors of acoustical and vestibular nerves (in the age of 25-30 years), Alzheimer's

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disease, "got dementia", depressive syndrome, and the other types of degeneration of the nervous structures of the brain (in the age of 50 to 60).

PLAYING IT SAFE FOR OUR KIDS

A healthy and safe learning environment is a cornerstone of education. Current FCC standards are obsolete and inappropriate as they are based only on heat effects, not biological effects. They give us a false sense of security. There may be higher EMF levels at school than at home as routers are more powerful. Cumulative Effects on DNA or cell structures are not taken into consideration in any safety standard. Because of the long-term exposure to EMF microwave radiation this generation is experiencing, they will be at higher risk for potential health problems. We will not know what happens to our progeny's DNA until our grandchildren are born.

Considering there has been a more precautionary approach internationally to microwave radiation exposure and the trend is toward less exposure in schools, especially to vulnerable populations such as children, it makes sense to re-evaluate our wireless schools. We buckle our seat belts and wear a helmet when we ride bikes even though we don't know if we will get in an accident. Although not all the issues of wireless microwaves are understood, there is enough science to understand it acts as a toxicant at even low levels that fall within current safety standards. We also know that decades of research precedes meaningful regulation in the area of toxins, thus the only reasonable approach is precautionary.

In addition, we need to be thoughtful about how much our kids should use computers and what this is doing not only to them, but to our society as a whole. We get starry eyed with every new wireless gadget, however, in "Alone Together" Sherry Turkle expertly addresses the rise in isolation, loneliness, lack of privacy, and increasing pressure on students in this age of invasive technology. Her thorough and non-judgmental scientific investigation of the psychological effects of computers makes us aware that we need to take care that we do not replace real human connection with a "virtual reality" that will redirect us in an unhealthy direction.

As physicians and parents, we understand that decisions we make today may have far reaching consequences in the future for our kids. Let's play it safe for them right now.

RECOMMENDATIONS FOR SCHOOLS

1. **Wired internet connections** like we used to have are the safest and possibly cheapest option – all the benefits of the internet without the risk.
2. **Wireless devices**, but with an on/off switch in each room so teachers can use only when needed for educational purposes.
3. **Limit Wi-Fi** use, especially in younger grades.
4. **Cell phones stay off and in the backpacks during class** and on the campus during school hours.
5. **Have EMF and electrical measurements done by one or more qualified, experienced consultants before and after any installation**. Understand you may need to increase your knowledge of low and high frequency electromagnetic fields and limits to accurately interpret the reports. The Bioinitiative Report is a very useful compendium that has recommendations for safer levels.
6. **Support efforts by governments to provide independent standardized transparent research to define safe limits in all the different wireless frequencies used commercially**. This could lead to less EMF emissions and safer wireless devices.

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STEPHEN T. SINATRA M.D., F.A.C.C.
F.A.C.N., C.N.S., C.B.T.,
Integrative Metabolic Cardiology

July 16, 2014

Chairman and Trustees
Fay School
48 Main Street
Southborough, MA 01772

RE: Wi-Fi in Schools

Dear Chairman and Trustees:

I am writing this letter on behalf of concerned parents of children who are attending schools with Wi-Fi technology. I'm a cardiologist and co-founder of Doctors for Safer Schools, an organization dedicated to informing teachers, parents and superintendents about the uncertainty and possible environmental health hazards of Wi-Fi technologies.

The heart is a delicate and complex electromagnetic organ that can be adversely affected by exogenous signals from wireless technology and microwave radiation. For this reason it is unwise to expose students and teachers to Wi-Fi radiation for internet access, especially when safer alternative wired options are available. Children are particularly vulnerable to this radiation and the incidents of cardiovascular events including sudden cardiac arrest, seems to be increasing, especially among young athletes (up to the age of 19). In some cases this is due to undetected heart defects, blunt trauma to the heart in contact sports, and heat stress during strenuous exercise, but in instances these irregularities may be exacerbated by or due to microwave signals interfering with the autonomic nervous system that regulates the heart.

I know this because I am a board certified cardiologist and have been a Fellow of the American College of Cardiology since 1977. At the Manchester Memorial Hospital in Connecticut, I served in several roles, including Chief of Cardiology, Director of Cardiac Rehabilitation, and Director of Medical Education.

In both Canada and the United States a large number of students are complaining that they feel unwell in classrooms that have Wi-Fi technology. These complaints have been investigated and what emerges is the following:

1. Symptoms common among these students include headaches, dizziness, nausea, feeling faint, pulsing sensations or pressure in the head, chest pain or pressure, difficulty

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concentrating, weakness, fatigue, and a racing or irregular heart accompanied by feelings of anxiety. These symptoms may seem diverse but they indicate autonomic dystonia or dysfunction of the autonomic nervous system.

2. Symptoms do not appear in parts of the school that do not have this technology (Wi-Fi-free portables) and they do not appear in homes that do not have wireless technology.

3. We know that the heart is sensitive to and can be adversely affected by the same frequency used for Wi-Fi (2.4 GHz) at levels a fraction of federal guidelines (less than 1%) and at levels that have been recorded in two Ontario schools with Wi-Fi technology.

4. The incidence of sudden cardiac arrests (SCA) among young athletes is increasing and doctors don't know why. In one small Ontario community, the number of students experiencing SCA is disturbingly high. Whether WiFi and nearby cell phone antennas exacerbate SCA needs to be investigated further before students are subjected to these fields.

In conclusion it is unwise to install wireless technology (WiFi) in schools. We do not know what the long-term effects of low-level microwave radiation are on students and teachers. The safety of this technology on children has not been tested and I would advise that you follow the precautionary principle that states the following:
"*In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*"
(Rio Conference 1992).

The principle implies that we have a social responsibility to protect the public from exposure to harm, when scientific investigations have found a plausible risk. That "plausible risk" exists for microwave radiation at very low levels. These protections can be relaxed only if further scientific findings emerge that provide sound evidence that no harm will result. In some legal systems the application of the precautionary principle has been made a statutory requirement.

Sincerely,

Stephen T. Sinatra, M.D., F.A.C.C., F.A.C.N., C.N.S

Karolinska Institutet
Department of Neuroscience
Experimental Dermatology Unit

Stockholm, July 24, 2014

Mr. Thomas McKean, President, Board of Trustees
Mr. James Shay, President-Elect, Board of Trustees
Fay School
48 Main Street
Southborough, MA 01772

Ladies and Gentlemen,

It has been brought to my attention that children in your school are physically being impacted by radiation from WiFi antennas, and that some of the student's reactions have been severe. I was concerned to learn this. It is unwise to chronically expose children to this type of radiation, as their bodies are more sensitive than adults and the radiation has been shown to impair not just physiological functioning but cognitive function and learning.

Radiation of the kind emitted by WiFi transmitters impacts attention, memory, perception, learning capacity, energy, emotions and social skills. There is also diminished reaction time, decreased motor function, increased distraction, hyperactivity, and inability to focus on complex and long-term tasks. In some situations, children experience cardiac difficulties. In one Canadian school district, incidence of cardiac arrest in children was 40x the expected rate, and defibrillators have had to be placed at each school. Online time, particularly multi-tasking in young children, has been linked with a chronically distracted view of the world preventing learning critical social, emotional and relational skills. There is a physiological as well as psychological addiction taking place. I am sure, that as stewards of the lives of the children in your charge, you would not wish any of these outcomes.

Given the large and growing body of science indicating biological and health effects from the radiation emitted by antennas, it would be most imprudent at this time to permit wireless antennas on—or inside—your property. Understand the FCC exposure guidelines only protect against the acute power density, or acute thermal, effects, and they do nothing to protect against the other aspects of the radiation's risk, such the frequencies, amplitude, pulsing, intensity, polarity and biologically disruptive information content. Thus, until the FCC establishes guidelines for the non-thermal effects, any reliance by your school on current FCC guidelines, based solely on *thermal effects* would necessarily be incomplete. I urge a school of your caliber to be a leader on this issue, and appreciate that two wrongs do not make a right.

I enclose for your review the transcript of the Seletun Scientific Statement laying out the key concerns on this topic. If I can be of further help, please, do not hesitate to be in touch.

Yours truly,

Olle Johansson, Associate Professor
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CC: cheemf@lists.healthandenvironment.org
Sent: 2/8/2013 2:21:54 P.M. Pacific Standard Time
Subj: [cheemf] Adoption of Wi-Fi in Los Angeles USD classrooms

TO: Los Angeles Unified School District (LAUSD)

FROM: Joel M. Moskowitz, Ph.D.
Director, Center for Family and Community Health
School of Public Health
University of California, Berkeley

RE: Adoption of Wi-Fi in Classrooms

DATE: February 8, 2013

Based upon my review of the research of the health effects associated with exposure to radiofrequency (RF) electromagnetic radiation (EMR), especially microwave radiation, I feel compelled to register my concern that adoption of Wi-Fi in LAUSD classrooms is likely to put at risk the health of many students and employees in the District.

In December, Dr. Gayle Nicoll of URS Corporation asked me to serve as an expert reviewer for a report that URS prepared for the LAUSD regarding the adoption of Wi-Fi in classrooms. Since Ms. Nicoll could not assure me that URS has no conflicts of interest, I turned down her request and sent her references to recent studies about Wi-Fi radiation. I cc:ed Board members and key staff as I was concerned about the health risks of unnecessarily subjecting 660,000 children to 13,000 hours of Wi-Fi microwave radiation during their K-12 school years.

Although I have not seen the URS report, I imagine it is based on the FCC's outmoded 1996 safety standards which only protect the public from the **thermal risk of RF EMR exposure** (i.e., from heating of tissue). For the past three years, in numerous media interviews I have been calling on the FCC to strengthen its standards and testing procedures to protect the public and workers from the low-intensity, **non-thermal risks of RF EMR exposure** that have been reported in hundreds, if not thousands, of research studies. These include increased risk of neurological and cardiovascular problems, sperm damage and male infertility, reproductive health risks, and cancer.

The **precautionary principle** should be applied to this critical policy decision. This principle, developed at a U.N. environmental conference in 1992 states that in the absence of scientific consensus if an action has a suspected risk of causing harm, the burden of proof it is not harmful falls on those taking the action, and all reasonable measures to reduce the risk must be taken.

Internet access can be provided to students through wires or optical fiber without installing Wi-Fi in the classrooms.

For further information, please see my **Electromagnetic Radiation Safety web site** at http://saferemr.blogspot.com where I have archived news releases and links to recent reports by major scientific groups and political agencies.

Sincerely,

Joel M. Moskowitz, Ph.D.

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December 1, 2015

Montgomery County Schools
Carver Educational Services Center
850 Hungerford Drive
Rockville, MD 20850

Attention: Dr. Andrew Zuckerman, Chief Operating Officer
MCPS Board of Education Members

This letter of comment has been prepared after reviewing the *Montgomery County Public Schools Radiofrequency (RF) Summary Monitoring Report* dated July 2015 produced by AECOM Environment.

1) The instrument cited as being used for the peak measurements in section 7, a Narda SRM-3006, is not suitable to measure the very short (1 millisecond) spikes typically found in WiFi 802.11n communication. As stated on page 7-1, each data sweep takes 550 milliseconds, making the instrument unsuitable for reliably logging the short bursts typical in 802.11n WiFi communications. Palit et al conclude that 50% of the uplink traffic will be in bursts shorter than 2 milliseconds. The peak levels of those packets will not be reliably logged by a device with a 550 millisecond sweep time.

Palit et al, 2012. Anatomy of WiFi Access Traffic of Smartphones and Implications for Energy Saving Techniques. International Journal of Energy, Information and Communications, Vol. 3, Issue 1.

2) Even the average-level tests seem inconsistent with engineering reality. Figure 7.1 shows a background noise level mostly flat between 2.4GHz and 5.8Ghz. That noise (typically -70dBm) is generally consistent with the internal thermal noise in a quality wide-band measuring instrument. Two tiny peaks out of that noise are represented to be the "*average electric field generated at one foot away from an AP in use at Beverly Farms Elementary School*." Even with just the 802.11n beacon-frame idling, the peak field a foot away from an access point should be a million times higher than the levels of figure 7.1. Why do we just see a blip on the chart? Clearly some unusual 'averaging' has occurred, yet the parameters of that averaging, and the potential clinical implications of that averaging, are not noted in the annotation to the Figures. Further, Figure 7.2 shows a background noise level some 10dB higher than figure 7.1, something that would be very unusual in measurements at these Gigahertz frequencies.

3) The RF exposure estimates are additionally inadequate because, in reality, there is no way to meet the distancing that AECOM's report bases it's measurements on for an individual student. In normal use, kids hover over devices. They hug them to the body. They put them in their laps at lunchtime, on the couch and in bed doing homework. It is entirely unrealistic to expect teachers and parents to guarantee that students always keep their Chromebooks at some arbitrary distance during use.

4) The report concludes with classroom RF measurement comparisons to an outdated 2007 BioInitiative Report recommendation of 0.1 uW/cm2. (Section 7). Graphics need to be re-drawn with comparisons to the 2012 recommended BioInitiative level, and do so not only for a 12" spacing, but also for the one-inch distance measured from the Chromebook (Figure 7-3 and 7-4). Using an arbitrary 12" distance to report and compare to either the 2007 or 2012 BioInitiative recommendations will seriously underestimate RF exposures since students don't always (or even typically) maintain a foot of distance. Their 'leaning in' and having to place their faces close to the device is common usage, and is unavoidable.

5) The methodology is not specific as to the number of operating devices and clustering of students at work – which is necessary to characterize exposures from a room full of operational wireless devices. Figure 2.1 shows multiple wireless devices connected to one wireless router. Measuring one or several Chromebooks rather than one Chromebook for each of the 25-35 students plus router isn't how a normal classroom operates. It **does not** produce RF measurements of a typical class using many wireless devices at once, so this is a fundamental flaw. It will underestimate RF exposures.

6) There is also a comment to be made here about the setup – how does this methodology reasonably reflect how smaller or younger children with short arms and torsos actually use tablets? What RF exposures they can expect to receive? The likely consequence to the measurements is greater exposure. Unless the students are using chopsticks instead of their fingers, or are using wired keyboards that increase the distance to the wireless device, RF exposures will be worse for the younger or smaller-stature students.

7) This Report appears to legitimize MCSD's use of wireless in the classroom by asserting compliance with the 2007 BioInitiative Report recommendation, yet the report does not mention the significant revision of that threshold in the years between 2007 and 2012. Both BioInitiative Reports clearly state that their recommendations are interim and 'that they may have to go lower.' Recent studies of students reporting headache, irritability, concentration and behavior problems at levels as low as 0.003-0.006 uW/cm2, indicate that neither BioInitiative Report threshold may be low enough to assure safety. As the co-editor of the BioInitiative Reports, and a founding member of the BioInitiative Working Group, the way in which our work has been invoked is not consistent with the findings of the BioInitiative Reports overall. The conclusions of this report cannot be said to give a positive assertion of safety because of the degree of uncertainty over whether the testing equipment was adequate (we believe it was not); the lack of comparison data; and the failure to measure RF exposures at realistic distances from the student(s).

8) Correct BioInitiative citations are:

BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors. BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation at

www.bioinitiative.org, December 31, 2012.

BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors. BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF) at www.bioinitiative.org, August 31, 2007

CONCLUSION

The data in this report cannot therefore be used to infer safety, or lack of safety, of children in any of the tested locations.

Respectfully submitted,

Cindy Sage. MA
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Prof. Trevor Marshall, PhD
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Senior Member IEEE,
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trevor.m@trevormarshall.com

September 22, 2014

On behalf of the BioInitative Working Group, we are writing to express our concern about the views expressed by CEOs from Google, Dell, Apple, Adobe, eBay, Facebook, the George Lucas Educational Foundation and others to the FCC supporting wireless technologies in schools.

Your letter to the FCC dated July 7, 2014 titled Education Superhighway, states:

> *"Today, we are writing to you to urge swift bi-partisan action at your July 11, 2014 meeting to adopt the E-Rate modernization proposal set forth by Chairman Wheeler."*
> *"By responsibly investing $2 billion of unused funds and providing predictable ongoing support for Wi-Fi, the plan will make dramatic progress in bringing high-speed connectivity to our classrooms."*

No one denies that bringing high-speed connectivity to our classrooms is important. But it can be a wired connection and does not have to be WiFi. It does not reflect well on the ethics of your corporations to encourage the FCC to provide $2 billion dollars for new wireless classroom infrastructure and devices for school children, knowing that wireless emissions have been classified as a Possible Human Carcinogen by the World Health Organization's International Agency for Research on Cancer (2011). To promote wireless technologies in schools is to deliberately and knowingly disregard current health warnings from international science and public health experts.

Saturating schools with wireless technology will likely create unnecessary liability for municipalities and result in a loss of public trust and confidence in the corporations that push their wireless products with a blind eye toward health concerns.

Epidemiological studies show links between radiofrequency radiation (RFR) exposure and cancers, neurological disorders, hormonal changes, symptoms of electrical hypersensitivity (EHS) and more. Laboratory studies show that RFR exposure increases risk of cancer, abnormal sperm, learning and memory deficits, and heart irregularities. Fetal exposures in both animal and human studies result in altered brain development in the young offspring, with disruption in learning, memory and behavior. The brain development of a fetus can be impaired by in-utero exposure to a pregnant woman. The evidence for these statements is based on hundreds of published, peer-reviewed scientific studies that report adverse effects at levels much lower than current FCC public safety limits. WiFi is schools, in contrast to wired internet connections, will increase risk of neurologic impairment and long-term risk of cancer in students. Corporations cannot avoid responsibility simply by asserting compliance with existing legal, but outdated and inadequate FCC public safety limits.

Today, corporations that deal with educational technology should be looking forward and helping school administrators and municipal leaders to access safe, wired solutions. Your corporations can reasonably foresee and offer alternatives to potentially hazardous exposures to wireless radiation by choosing to support wired educational technologies.

Thank you for your attention to this letter.

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David O. Carpenter, MD, Tel: 518-525-2660 Email: dcarpenter@albany.edu
Co-Editors, BioInitiative 2012 Report
For the BioInitiative Working Group

Copies: CEOs signing Education Superhighway letter to the FCC
Federal Communications Commission
The White House, President Obama
US Secretary of Education Secretary Arne Duncan

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American Academy of Environmental Medicine

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May 13, 2013

Open Letter to the Superintendents
of the School Districts of the United States

The American Academy of Environmental Medicine (AAEM) strongly supports the use of wired Internet connections.

The AAEM comprises Medical Doctors, Osteopaths, and PhD researchers focusing on the effects of environmental agents on human health. For forty years the Academy has trained Physicians to treat the most difficult patients who are often overlooked by our medical system, because the cause of their illness, rather than being caused by an infection or traditionally understood cause, is related to more basic underlying causes such as chemical, toxic metal, food or radiation exposures.

In May 2011 the World Health Organization elevated exposure to wireless radiation, including WiFi, into the Class 2b list of Carcinogens.

There is consistent emerging science that shows people, especially children who are more vulnerable due to developing brains, and thinner skulls, are affected by the increasing exposure to wireless radiation. In September 2010, the Journal of the American Society for Reproductive Medicine-Fertility and Sterility, reported that only four hours of exposure to a standard laptop using WiFi caused DNA damage to human sperm.

In December 2012 the American Academy of Pediatrics- representing 60,000 pediatricians, wrote to Congress requesting it update the safety levels of microwave radiation exposure especially for children and pregnant women.

In a school setting, children are exposed to WiFi for an unprecedented period of time, for their entire childhood. Some of these signals will be much more powerful than is received at home, due to the need for the signals to go through walls, and serve multiple computers simultaneously. The school signals are dozens of times more powerful than the café and restaurant systems.

To install this system in your school district risks a widespread public health hazard that the medical system is not yet prepared to address. Statistics show that you can expect to see an immediate reaction in 3% and delayed effects in 30%, including teachers.

It is better to exercise caution and substitute with a safe alternate such as a wired connection, which is not classified as a possible Carcinogen. While more research is being conducted children must be protected. Wired technology is not only safer, it also stronger and more secure.

While the debate ensues about the dangers of WiFi, cell phone towers and cell phones, it is the doctors who must deal with the after affects. Until we can determine why some get sick and others do not, and some are debilitated for indeterminate amounts of time, we implore you to not take the risk, with the health of so many children who have entrusted you to keep them safe while at school.

Respectfully,

The Executive Committee of the American Academy of Environmental Medicine

Message to Schools and Colleges about Wireless Devices and Health

If wireless devices, such as Wi-Fi, are used in your schools and colleges, then the health of your students, your faculty, and your staff can be at risk. This is a difficult problem but an addressable one if you act.

Background: Wireless devices transmit information using radiofrequency/microwave radiation. The international biomedical research community has been studying the biological impact of such radiation for decades, but more intensely in recent years. Thousands of peer-reviewed studies published in biomedical research journals have contributed to our understanding of this impact. So many serious biological effects have been found that immediate responsive action is warranted. Further, these biological effects are occurring at levels of radiation far lower than earlier understood. Simply stated, a worldwide health crisis is emerging and is becoming a hallmark of the 21st Century. The international biomedical research community is trying to warn us; but we, in the USA, are not yet listening. I hope this message will help to change that.

As a scientist, I urge you to look into the **health impact of the radiofrequency/microwave radiation** produced by wireless devices. Examples of wireless devices of concern in our environment are Wi-Fi in all of its forms; cell phones and cell towers (especially those located on school grounds); cordless phones; wireless computers, whether desktop, laptop, or tablet versions; wireless baby monitors; wireless smart electricity meters; emerging wireless smart appliances; and microwave ovens (because they always leak radiation).

This crisis is the consequence of many factors. Here are some of them:

- All living things are bioelectrical in nature. That is why electrocardiograms and electroencephalograms work. They, of course, measure the tiny electrical signals that operate the heart and the brain. The critical tasks performed by these tiny electrical signals, and so many other electrical signals in all living things, can be disrupted by radiofrequency/microwave radiation.

- The levels of manmade radiofrequency/microwave radiation in our environment are increasing exponentially and already exceed, by many orders of magnitude, the levels at which all life on Earth evolved. Simply stated, we are drowning in a rising sea of manmade radiofrequency/microwave radiation.

- The invisible nature of radiofrequency/microwave radiation leaves the public and the decision-makers unaware of the rising levels of radiation around them.

- The genuine usefulness of wireless devices promotes denial of the risks.

- The intense advertising, the economic power, and the political power of profitable wireless industries enable them to dominate the public dialogue and to hold sway over government regulators and legislators.

- Current Federal standards for limiting the exposure of the public to radiofrequency/microwave radiation are outdated and overly permissive. Those standards are based on thermal heating alone. In effect, the Government claims that if you are not cooked too much by the radiation, then you are fine. Those Federal standards ignore the many biological effects that occur at much lower levels of radiation, leaving the public unprotected.

- Federal and state governments are advocating unlimited expansion of wireless technology, and are even co-funding such expansion and mandating the acceptance of wireless technology by the public. Such

actions reflect a widespread lack of understanding of, or willful blindness to, the underlying science and its consequences for public health.

- Some of the more serious consequences of exposure to radiofrequency/microwave radiation (such as DNA damage, cancer, and infertility) are especially nefarious because they give no early warning signs.

- Other consequences of exposure do give early warning signs (such as sleep disruption, headaches, fatigue, ringing in the ears, memory loss, dizziness, heart arrhythmia, and many others); but those signs are too often dismissed because they can have other causes as well, complicating identification of the true cause.

- The absence of routine training of physicians in the biological effects of radiofrequency/microwave radiation makes it difficult for physicians to identify the causes and to provide responsive guidance.

- Even aware individuals cannot control their exposure in any environment shared with others, because the radiation around them, much like second-hand smoke, is forced on them by unaware individuals. Only governments can fully solve this problem, but they are currently part of the problem. For now the public will have to protect itself, and that will require public education and action.

Fortunately, many of the services that wireless devices offer can be realized with much safer wired devices. The wired devices achieve connectivity with fiber-optic, coaxial, or Ethernet cables. The wired devices are faster, more reliable, and more cyber secure. They are, however, less mobile, often less convenient, and somewhat more expensive to install. But those drawbacks pale in comparison to the benefits of good health.

Simply stated, schools and colleges can protect their students, staff, and faculty from the health risks posed by wireless devices, including Wi-Fi, by converting to safe wired connectivity. If your institution lacks the resources to convert now, do consider shutting down your wireless devices anyway and converting as soon as you can. You can advance learning without leaving a trail of illness behind you, some of which can be lifelong.

As a suggested starting place for exploring the concerns about the radiation from wireless devices, I have appended an “Annotated List of References” and an “Annotated List of Videos”. Please view, especially, video (1) called “Wi-Fi in Schools, the Facts”, made in Australia, on page 6.

Regards,

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My background

I am a retired U.S. Government scientist (Ph.D., Applied Physics, Harvard University, 1975). During my Government career, I worked for the Executive Office of the President, the National Science Foundation, and the National Institute of Standards and Technology. For those organizations, respectively, I addressed Federal research and development program evaluation, energy policy research, and measurement development in support of the electronics and electrical-equipment industries and the biomedical research community. I currently interact with other scientists and with physicians around the world on the impact of the environment – including the radiofrequency/microwave environment – on human health.

ANNOTATED LIST OF REFERENCES

The international biomedical research community has conducted thousands of studies seeking to identify the biological effects of exposure to both low frequency and radiofrequency electromagnetic fields, extending into the microwave region. So many serious biological effects have been found from such fields, at levels earlier thought to be low enough to be safe, that immediate action is needed to alert and protect the public.

The most massive review of this biomedical literature is the 1479-page BioInitiative 2012 Report which considered about ***1800*** biomedical research publications, most issued in the previous five years. The BioInitiative 2012 Report was prepared by an international body of 29 experts, heavy in Ph.D.s and M.D.s, from 10 countries, including the USA which contributed the most experts (10). The review concludes that "The continued rollout of wireless technologies and devices puts global public health at risk from unrestricted wireless commerce unless new, and far lower*[,]* exposure limits and strong precautionary warnings for their use are implemented."

> BioInitiative Working Group, Cindy Sage, M.A. and David O. Carpenter, M.D., Editors, BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation, December 31, 2012
> http://www.bioinitiative.org

A group of six doctors in Oregon, led by Paul Dart, M.D., released, in June 2013, a 74-page review of ***279*** biomedical research publications. This review makes the health case against "cell phones, base stations, Wi-Fi, Smart Meters and other RF *[radiofrequency]* or ELF *[extremely low frequency]* -emitting devices". The review notes that "The current levels of exposure need to be reduced rather than increased further. The FCC *[Federal Communications Commission]* must especially protect vulnerable groups in the population including children and teenagers, pregnant women, men of reproductive age, individuals with compromised immune systems, seniors, and workers." This review is posted on the website of the FCC at the link entitled "Health Effects of RF - Research Review (87)".

> Biological and Health Effects of Microwave Radio Frequency Transmissions, A Review of the Research Literature, A Report to the Staff and Directors of the Eugene Water and Electric Board, June 4, 2013
> http://apps.fcc.gov/ecfs/comment/view?id=6017465430

Michael Bevington, in 2013, published a book that summarizes the findings of ***1828*** international biomedical research publications. The book describes the symptoms caused by exposure to electromagnetic radiation, the many diseases associated with such exposure, and the relative risk levels associated with specific sources of electromagnetic radiation. The citations of papers include the PMID index numbers for easy location on the PubMed.gov website of the National Institutes of Health. This website provides the largest index to the biomedical research literature in the world.

> Electromagnetic Sensitivity and Electromagnetic Hypersensitivity: A Summary by Michael Bevington
> NEW EDITION: March 2013
> http://www.es-uk.info

About 200 scientists from 39 countries around the world submitted an international appeal to the United Nations and to the World Health Organization in May 2015. These scientists seek improved protection of the public from harm from the radiation produced by many wireless sources, including "cellular and cordless phones and their base stations, Wi-Fi, broadcast antennas, smart meters, and baby monitors" among others.

Together, these scientists have published over 2000 peer-reviewed research papers on this subject.

https://www.emfscientist.org/index.php/emf-scientist-appeal

The International Agency for Research on Cancer, of the World Health Organization, has already classified radiofrequency electromagnetic fields as a Class 2B carcinogen ("possible carcinogen"), based primarily on the increased risk of brain cancer. That decision was made in 2011. Since then, the research supporting a higher classification of risk ("probable carcinogen", or even "known carcinogen") has continued to build.

http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf

The American Academy of Environmental Medicine (AAEM), which trains physicians in preparation for Board Certification in Environmental Medicine, states: "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'." AAEM further states that "The peer reviewed, scientific literature demonstrates the correlation between RF *[radiofrequency]* exposure and neurological, cardiac, and pulmonary disease as well as reproductive and developmental disorders, immune dysfunction, cancer and other health conditions. The evidence is irrefutable." The AAEM concludes: "To install WiFi in schools plus public spaces risks a widespread public health hazard that the medical system is not yet prepared to address."

AAEM, Wireless Radiofrequency Radiation in Schools, November 14, 2013
http://www.aaemonline.org/pdf/WiredSchools.pdf

The American Academy of Pediatrics (AAP), whose 60,000 doctors care for our children, supports the development of more restrictive standards for radiofrequency radiation exposure that would better protect the public, particularly the children. The AAP, in a letter to the Federal Communications Commission (FCC) and the Food and Drug Administration (FDA), dated August 29, 2013, states that "Children are not little adults and are disproportionately impacted by all environmental exposures, including cell phone radiation. Current FCC standards do not account for the unique vulnerability and use patterns specific to pregnant women and children. It is essential that any new standard for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded throughout their lifetimes."

http://apps.fcc.gov/ecfs/document/view?id=7520941318

The U.S. Government bears a major responsibility for the exponential growth in the levels of radiation from wireless devices in the environment. In 1996, the U.S. Congress passed, and the President signed, the Telecommunications Act of 1996. Under pressure from the cell phone industries, this law included this provision: "No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities *[cell towers]* on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the *[Federal Communications]* Commission's regulations concerning such emissions." Because the Federal Communications Commission's regulations on radiation exposure are so permissive, this provision prevents state and local governments from protecting their people from radiation from cell towers, based on health concerns.

Telecommunications Act of 1996
https://transition.fcc.gov/Reports/tcom1996.pdf

The Federal Communications Commission (FCC) has acted in partnership with the wireless industries by permitting wireless radiation levels far higher than the biomedical research literature indicates are necessary to protect human health. The success of the wireless industries in capturing the FCC, the committees in the U.S. Congress that oversee the FCC, and the Executive Branch is detailed in a new monograph from the Center for Ethics at Harvard University. As an example of that capture, the President recently appointed, as head of the FCC, the former head of the CTIA – The Wireless Association, which is the major lobbying organization for the wireless industry. This, of course, is the infamous "revolving door".

> Norm Alster, Captured Agency: How the Federal Communications Commission is Dominated by the Industries It Presumably Regulates (2015)
> http://ethics.harvard.edu/news/new-e-books-edmond-j-safra-research-lab

Further, the U.S. Government's "American Recovery and Investment Act of 2009" provided funding that was used to motivate the installation of wireless smart meters (also called the "Advanced Metering Infrastructure" or "AMI") by offering cost sharing, in the form of grants, to the utilities that would adopt such meters.

> https://www.smartgrid.gov/recovery_act/overview/smart_grid_investment_grant_program.html

Many states then extended the impact of the above Act by *mandating* the acceptance of wireless smart meters by the public. These meters contain microwave transmitters/receivers and are placed either on, or inside, every home and many businesses. A California court-ordered document indicates that each smart meter broadcasts bursts of radiation, on average about 10,000 times per day and up to a maximum of about 190,000 times per day. Such bursts flood neighborhoods with radiation, day and night, throughout the year.

> http://emfsafetynetwork.org/wp-content/uploads/2011/11/PGERFDataOpt-outalternatives_11-1-11-3pm.pdf

Increasingly, the public is becoming aware of the threat that wireless radiation poses to health. The initial opposition focuses primarily on *mandated* sources of exposure, especially when the individuals exposed include the unborn and young children as they are among the most vulnerable. Thus, the strongest initial opposition is surfacing for cell towers, especially on school grounds; for Wi-Fi in schools and colleges; and for wireless smart meters placed on, or inside, homes and businesses. Most states now have opposition groups, and some states have even 10 or 20 such groups. These groups are pursuing relief through state regulatory bodies, through state legislatures, and through the courts. Below is a sampling of the hundreds of U.S. websites that reflect the nature and scope of the opposition to the unbridled expansion of wireless technology. Such websites seek to educate the public and decision-makers, and thus to promote responsive action, based on the underlying science.

> The BabySafe Project
> http://www.babysafeproject.org/the-science/
>
> National Association for Children and Safe Technology
> http://www.nacst.org/
>
> Stop Smart Meter's listing of groups in the USA and other countries opposed to wireless smart meters
> http://stopsmartmeters.org/frequently-asked-questions/contacts-database/
>
> Smart Grid Awareness, a Website by SkyVision Solutions, Consumer Protection Advocate
> http://smartgridawareness.org

ANNOTATED LIST OF VIDEOS

There are hundreds of videos on the Internet that address the impact of wireless radiation on health. Here are just a few that provide an especially good introduction to this topic. An Internet search will surface many more.

(1) An introduction to the health risks posed by Wi-Fi in schools

Wi-Fi in Schools, the Facts (September 9, 2013) (18 minutes)
Produced by Wi-Fi in Schools Australia.
https://www.youtube.com/watch?v=QQryZbxlqXI&feature=youtu.be

(2) Wide ranging overview of the impact of electromagnetic radiation on human health, particularly at microwave frequencies, with a special emphasis on children and the school environment

Electromagnetic Radiation Health for Children 2014 (70 minutes)
Presented by Dr. Erica Mallery-Blythe, a UK physician.
https://www.youtube.com/watch?v=sNFdZVeXw7M

(3) Documentary on the wireless industry's efforts to suppress public awareness of the health effects of wireless radiation

Microwaves, Science & Lies (2014) (90 minutes)
Produced by Jean Heches and Nancy de Meritens of France.
https://vimeo.com/ondemand/17755/89417454

(4) Samples of video testimony by individuals harmed by the radiation from wireless devices

Cell Phones Cause Cancer (October 17, 2012) (9 minutes)
Presented by Jimmy Gonzalez, Esq.
https://www.youtube.com/watch?v=DIlOVJd0lA8

Woman suffers acute radiation exposure from a bank of smart meters (January 21, 2015) (3 minutes).
Produced by Maryland Smart Meter Awareness.
https://www.youtube.com/watch?v=F9QZuWPw6Y0&feature=youtu.be

Man experiences adverse health effects from exposure to a smart meter (March 7, 2013) (3 minutes).
Presented by Garic Schoen of Gaithersburg, MD.
Produced by Maryland Smart Meter Awareness.
http://marylandsmartmeterawareness.org/smart-meter-news/maryland-ms-resident-testimony-to-economic-matters-committee-re-hb1038-on-march-14-2013/

Individuals with high sensitivity to the radiation from wireless devices search for increasingly rare safe electromagnetic environments.
Searching for a Golden Cage (May 8, 2014) (13 minutes)
Produced by Nadav Neuhaus.
http://time.com/golden-cage/

IDEA

IRISH DOCTORS' ENVIRONMENTAL ASSOCIATION
CUMANN COMHSHAOIL DHOCTÚIRÍ NA HEIREANN

7th January, 2013

Dear Principal,

The Irish Doctors Environmental Association (IDEA) has very serious concerns in relation to the ubiquitous use of Wi-Fi in Irish schools, and alerts you to the warnings of many leading international scientists and medical doctors who believe Wi-Fi is harmful to health, especially children's health.
http://wifiinschools.org.uk/resources/safeschools2012.pdf
Wi-Fi is an unregulated technology and there is absolutely no evidence that it is safe.

Since May 31st, 2011, radiofrequency electromagnetic fields (as in Wi-Fi) have been classified by the World Health Organisation as 'possibly carcinogenic' to humans. The IDEA unequivocally supports the Council of Europe, The European Environmental Agency and The International Commission for Electromagnetic Safety (ICEMS) in urging the adoption of the Precautionary Principle to protect human health.
Warnings by Scientists and Doctors:
http://www.iemfa.org/index.php/appeals

The Precautionary Principal has already been adopted by a number of Governments and agencies internationally.
Governments & organisations banning and warning against Wi-Fi:
http://www.cellphonetaskforce.org/?page_id128

While we fully support the promotion of technology in education we urge you to use wired technologies for your own safety and that of your pupils and staff. The tragedy of avoidable illness is only superseded by the knowledge that it could have been avoided.

Yours sincerely

Elizabeth Cullen M.B. B.Ch. B.A.O. M.Sc. Ph. D 045-485215

p.p. Philip Michael
Philip Michael M.B. B.Ch. B.A.O. D.C.H. MICGP 023 8844697

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April 9, 2014

Via email: rec@harlanglaw.dk

Dear members of The Committee on Radiation Protection/Komitéen for Strålebeskyttelse:

My name is Frank Clegg and I am the CEO of Canadians for Safe Technology, C4ST, a volunteer based, national organization which promotes the safe use of wireless technology.

In my previous role as President of Microsoft Canada, I witnessed the incredible benefits that technology can provide. I also witnessed the potential harmful effects if technology is not implemented safely. Though wireless technologies afford schools various advantages, this solution cannot overshadow the evidence which demonstrates cause for concern. I request that you consider the following important facts.

The Canadian Teachers' Federation (CTF) is a national alliance of provincial and territorial teacher organizations that represent nearly 200,000 elementary and secondary school teachers across Canada. In their submission to the public consultation of the Royal Society of Canada, Oct. 28, 2013, they submitted the following recommendations. (Safety Code 6 is Health Canada's guideline regarding the limits of radiation from wireless devices).

Recommendations...

... That Safety Code 6 include a recommendation for prudent use of Wi-Fi whenever possible including the recommendation to limit consistent exposure in schools by turning off wireless access points when not in use. ...

That Safety Code 6 exposure thresholds be based upon both thermal and biological effects of exposure to Wi-Fi.

... That the Expert Panel recommend an education program regarding the relative safety of Wi-Fi exposure and that appropriate resources be developed to educate the public regarding ways to avoid potential exposure risks of Wi-Fi access points and devices.

As reported by CBC News on Aug. 17, 2013, http://www.cbc.ca/news/canada/toronto/story/2013/08/17/toronto-cell-phone-ban.html "The Elementary Teachers' Federation of Ontario has updated its policy position on the student use of personal electronic devices, preferring for them to be turned off and put away unless a teacher says otherwise. That policy, which was amended at the union's annual general meeting, informs ETFO in its discussions with the government and school boards on related issues. A portion of that policy now states that such devices, which include cellphones, should "be stored and turned off during the instructional day unless their use is directly authorized by staff." In a separate resolution, ETFO voted to study the effects of non-ionizing electromagnetic radiation, the potentially harmful radiation emitted by cellphones. A report is due on the matter in February."

In a letter to the Peel Region, April 22, 2013, The American Academy of Environmental Medicine stated "To install this widespread wireless internet access system in Peel District schools risks a widespread public health hazard that the medical system is not yet prepared to address. Statistics show that you can expect to see an immediate reaction in 3% and delayed effects in 30%, including teachers."

In 2012, the BC Confederation of Parent Advisory Councils passed resolution 18 which states: "BCCPAC call on Boards of Education to cease to install Wi-Fi and other wireless networks in schools where other networking technology is feasible." http://www.bccpac.bc.ca/resolutions/wi-fi-classrooms-committee-report

In May 2011, the World Health Organization (WHO) announced that the radiation emitted from wireless devices, including Wi-Fi, is a Class 2B carcinogen, which falls into the same category as lead and DDT.

You may already be aware that some schools and libraries in France and Switzerland have already removed Wi-Fi due to the suspected harmful health effects.

The Council of Europe, which includes 47 countries, adopted resolution 1815 which suggests in member countries "give preference to wired Internet connections, and strictly regulate(s) the use of mobile phones by schoolchildren on school premises."

The European Parliament (EU) resolutions 2008/2211(INI) & 2007/2252(INI,) state: "wireless technology (mobile phones, Wi-Fi / WiMAX, Bluetooth, DECT landline telephones) emits EMFs that may have adverse effects on human health... particularly to young people whose brains are still developing... **the limits on exposure to electromagnetic fields which have been set for the general public are obsolete."** (emphasis in original)

Other countries such as Israel, Russia, Switzerland, Frankfurt, Bavaria, and Salzburg have followed suit making the difficult decision to use hard wired connections as well. Recently, France passed a law recommending hard wired technology in schools.

The Austrian Medical Chamber shares that “WiFi may lead to concentration difficulties and memory problems in certain individuals.” The Austrian Medical Association recommends Wi-Fi free school environments.

The International Society of Doctors for the Environment (ISDE) and Irish Doctors Environmental Association (IDEA) advises to “Avoid Wi-Fi in home or work if possible, particularly in schools or hospitals. Use wired technology whenever possible” sharing that: “Because of the potentially increased risks for the fetus, infants and young children due to their thinner more permeable skulls and developing systems, particularly the immune and neurological systems, based on the precautionary principal and on the mounting evidence for harm at the sub-cellular level, we recommend that EMR exposure should be kept to a minimum.”

The American Academy of Pediatrics (AAP) - 60,000 Pediatricians and Pediatric Surgeons calls for caution as well stating that "The differences in bone density and the amount of fluid in a child’s brain compared to an adult’s brain could allow children to absorb greater quantities of RF energy deeper into their brains than adults... the current exposure limits may not reflect the latest research on RF energy" and lends support to removing Wi-Fi from schools as well.

As stewards of the public trust, I urge you to ensure the safest possible learning environment for the students in your care and to set an example for school districts by removing Wi-Fi and adopting “Best Practices” which limit the use of other wireless technologies.

Sincerely,

Frank Clegg
CEO,
Canadians for Safe Technology (C4ST)
frank@c4st.org

cc: Susanne Hansen, sh.klodskov@gmail.com

UNIVERSITY AT ALBANY
State University of New York

Institute for Health and the Environment
and
Department of Environmental Health Sciences
School of Public Health

28 February 2011

Chairman and Trustees
Kawartha Pine Ridge District School Board
Education Centre
1994 Fisher Drive
Peterborough, Ontario K9J7A1

Dear Sirs/Madams:

This is concerning potential adverse health effects associated with exposure to radiofrequency (RF) radiation, specifically that from wireless routers. I am a public health physician who has been involved in issues related to electromagnetic fields (EMFs) for a number of years. I served as the Executive Secretary for the New York Powerline Project in the 1980s, a program of research which showed that children living in homes with elevated magnetic fields coming from powerlines suffered from an elevated risk of developing leukemia. I have edited two books on effects of EMFs, including RF radiation. I served as the co-editor of the Bioinitiative Report (www.bioinitiative.org), a comprehensive review of the literature on this subject. The public health chapter from this report was subsequently published in a peer reviewed journal, and that is attached. Also I testified before the President's Cancer Panel on this subject in 2009, and a publication coming from that testimony is also attached. Thus this is a subject which I know well, and one on which I take a public health approach that has as a fundamental principle the need to protect against risk of disease even when one does not have all the information that would be desirable.

There is clear and strong evidence that intensive use of cell phones increases the risk of brain cancer, tumors of the auditory nerve and cancer of the parotid gland, the salivary gland in the cheek by the ear. The evidence for this conclusion is detailed in the attached publications. WiFi uses similar radiofrequency radiation (1.8 to 5.0 GHz), although the intensity of exposure in the immediate environment is much lower than what one gets from holding a cell phone close to your head. The difference between a cell phone and a WiFi environment, however, is that while the cell phone is used only intermittently a WiFi environment is continuous. In addition WiFi transmitters are indoors, where people (and in this case, children) may be very close to them. There is evidence from Scandinavian studies of cell phone usage that children who use cell phones are about five times more likely to develop brain cancer than if use starts as an adult. Thus it is especially important to protect children.

To my knowledge there has not been any health investigation of individuals living or working in WiFi environments as compared to others who are not. However, because the radiation is the same as those for cell phones, there is every reason to assume that the health effects would be the same, varying only in relation to the total dose of radiation. Wired facilities do not generate any RF radiation. While there is not specific proof that WiFi increases risk of cancer, there is certainly no evidence that it is safe. I urge you to not put WiFi in any school. Children should not be put at increased risk of developing cancer.

Yours sincerely,

David O. Carpenter, M.D.
Director, Institute for Health and the Environment
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13th December 2015

PhD Mikko Ahonen, Tampere, Finland
MD Lena Hedendal, Luleå, Sweden
MSc. Tarmo Koppel, Tallinn, Estonia

1. Regarding: Measurements related problems in the MCPS Wi-Fi Report

We have analysed the measurement report and would like to note the following:

- In the **Comparison-table 2.2.** the MCPS provides only average values, no peak values. In cell phone technologies (like GSM) the difference between average and peak value is 2-fold. **In Wireless local area technologies like Wi-Fi, the difference between average value and peak value is up to 100-fold** (Ferro & Potorti, 2005). Note that in the table 2.2. by the MCPS only average values are presented. Later you provide **in the chapter 7.2.2 Maximum, Instantaneous Power Density**, **which needs attention since these levels occasionally exceeded in your school measurements allowable EMC-levels (EN60601-1 → 3 V/m) for medical instruments** (Robinson *et al*., 2003).

- **Almost all MCPS measurements were done in the near field of the devices under 3 wavelengths.** The wavelength for 2,4 GHz is 12,5 cm and for 5 GHz is 6 cm. That means that the near field will be <37,5 cm for 2,4 GHz and <18 cm for 5 GHz. In order to assess power density exposure in near field one needs to measure both electric and magnetic field components.

- The MCPS has not provided **information about Wi-Fi technology, namely it's beacon signal**. This signal, officially **SSID (Service Set IDentifier), is created by the access point (AP) by sending constantly SSID 10 times in a second , at 10 Hz** (Ferro and Poporti, 2005). **Mobile industry has patented technology to avoid this constant SSID sending for health reasons** (Swisscom, 2004). This SSID sending at 10 Hz is an additional risk-factor and it should be mentioned. Our brain operates in alpha, beta and gamma bands. This Wi-Fi beacon overlaps the alpha band. Low-frequency EMFs (including low-frequency pulses) have an effect on evoked potentials of the brain (Carrubba *et al*., 2008).

- **Because of the risk of this 10 Hz Beacon signal of Wi-Fi, The European Academy for Environmental Medicine has assigned very strict precautionary RF-levels for Wi-Fi** (Belyaev et al., 2015). Please, pay attention to Wi-Fi RF power density peak-levels in the next picture.

RF source Max Peak/Peak Hold	Daytime exposure	Nighttime exposure	Sensitive populations[1)]
Radio broadcast (FM)	10,000 µW/m²	1000 µW/m²	100 µW/m²
TETRA	1000 µW/m²	100 µW/m²	10 µW/m²
DVBT	1000 µW/m²	100 µW/m²	10 µW/m²
GSM (2G) 900/1800 MHz	100 µW/m²	10 µW/m²	1 µW/m²
DECT (cordless phone)	100 µW/m²	10 µW/m²	1 µW/m²
UMTS (3G)	100 µW/m²	10 µW/m²	1 µW/m²
LTE (4G)	100 µW/m²	10 µW/m²	1 µW/m²
GPRS (2.5G) with PTCCH* (8.33 Hz pulsing)	10 µW/m²	1 µW/m²	0.1 µW/m²
DAB+ (10.4 Hz pulsing)	10 µW/m²	1 µW/m²	0.1 µW/m²
Wi-Fi 2.4/5.6 GHz (10 Hz pulsing)	10 µW/m²	1 µW/m²	0.1 µW/m²

Picture. Precautionary levels for RF-radiation. **For Wi-Fi less than 10 μW/m² (peak value), which is 0,001 μW/cm² (peak value).** By the **European Academy for Environmental Medicine** (Belyaev *et al*., 2015, p. 356)

- **We would like to draw attention to** long-term exposure related health risks.

Radiofrequency radiation from Wi-Fi devices causes fertility problems as shown by several in vivo and in vitro studies (see for example Atasoy *et al*., 2013, Avendaño *et al*,. 2012, Dasdag *et al*., 2015a, Shokri *et al*., 2015).

Additionally, **RF-radiation from Wi-Fi access points (AP) causes oxidative stress in cells which leads to several disorders** (see for example Nazıroğlu *et al*., 2012, Aynali *et al*., 2013, Salah *et al*., 2013). The overall detrimental impact of RF radiation induced oxidative stress is summarised in the review of Yakymenko *et al*. (2015).

2. Regarding: The IARC classification of RF-EMF as Group 2B, i.e., 'possibly' carcinogenic to humans and the MCPS Report's inaccurate interpretation

The classification of radiofrequency electromagnetic fields (RF-EMF) as Group 2B, i.e., 'possibly' carcinogenic to humans,was made by 30 scientists from 14 countries at a meeting 2011 for the International Agency for Research on Cancer (IARC), World Health Organization (IARC 2011, Baan et al. 2012). **The working group mainly based their classification on one cohort study** (Schüz et al., 2006) **and five case-control studies** (Muscat et al., 2000, Inskip et al., 2001, Auvinen et al.,2002, The Interphone study group, 2010, Hardell et al., 2011).

They also reviewed more than 40 studies that assessed the carcinogenicity of RF-EMF in rodents, including seven 2-year cancer bioassays and also many studies with endpoints relevant to mechanisms of carcinogenesis, including genotoxicity, effects on immune function, gene and protein expression, cell signaling, oxidative stress, and apoptosis (Baan et al., 2011).

The referred INTERPHONE study (The Interphone study group, 2010), in the MCPS radiation report, was one of the case-control studies. **The Interphone study was a multicentre study of mobile phone use and brain tumours, including malignant tumours in the brain as glioma and benign tumours as acoustic neuroma and meningioma**. The pooled analysis included 2708 glioma cases and 2972 controls (participation rates 64% and 53%, respectively). In the Interphone study a regular user of mobile phones had an average of at least one call per week for a period of ≥6 months. **This very low user group was compared to several other groups of low users compared to nowadays more extensive use of mobile phones.** The highest group of users, ≥1640 hours was divided in three sub groups depending on how many years they had used a mobile phone. For the shortest time span on 1-4 years only 23 of the glioma cases and 8 of the controls had used their mobile phones for more than 1640 hours. If any of these 23 persons with a brain cancer or any of the 8 controls had used their mobile phones for only one year they would have used it at least in average for four and a half hours a day during a year. If they instead had talked in their mobile phones during four years it would be for an average of a little more than an hour a day.
For the group of users between 5 and 9 years, 84 cases and 73 controls, the use per day would be at least between 54 minutes and 30 minutes. **For the long user group of 10 years or more, 93 cases and 73 controls, they talked in their mobile phones for 27 minutes a day or less for more than 10 years of use.**
For the main part of cases their use of mobile phones had been for a lot less than four hours a day. Today when most people use only their mobile phone and landline phones both at home and at work are becoming scarce, an amount of 4 hours or more wireless telephone use / day for salesman, telephone operators and so on is not uncommon.
In the Interphone study there was an statistical significant increased risk for a malignant brain tumour of 1.4 times (odds ratio, OR, 1.4, 95% CI 1.03-1.89) only for the highest user group of a total on more than 1640 hours.
Hardell et al. (2011) in Sweden found that **cases who had used a mobile phone for more than 1 year had an increased risk for glioma of 1.3** (OR 1.3, 95% Cl 1.1-1.6).

The **risk increased with increasing time since first use and with total call time, reaching 3.2 times** (OR 3,2, Cl 2.0-5.1) **for more than 2000 hours of use**. Use of the mobile phone on the same side of the head as the tumour was associated with higher risk.

Since 2011 several other studies have been published which are strengthening the possible association between RF-EMF and cancer. Using the **Bradford Hill viewpoints for evaluating strengths of evidence of the risk for brain tumours associated with use of mobile and cordless phones the classification should be upgraded to group 1 carcinogen, i.e., "the agent is carcinogenic to humans"** (Hardell & Carlberg, 2013).

New case-control studies have verified Hardell's studies (Coureau et al., 2014) and up to 20 years of mobile phone use have found even higher risk for brain tumours (Hardell & Carlberg, 2015).

A newly published study has found a tumor promotion effect on mice from exposure to radiofrequency electromagnetic fields below exposure limits for humans (Lerchl *et al*., 2015). RF-EMFs do not cause direct DNA damage. On the contrary **numerous studies have shown generation of reactive oxygen species (ROS) that can cause oxidative damage of DNA. This is a well-known mechanism in carcinogenesis for many agents.** The broad biological potential of ROS and other free radicals makes radiofrequency radiation a potentially hazardous factor for human health, not only cancer risk but also other health effects (Yakymenko *et al*., 2015).

The IARC classification of RF-EMF as Group 2B, possibly carcinogenic to humans, doesn't only include exposure from mobile phones near the ear. **The classification includes all sources of RF-EMFs.** The exposure from mobile phone base stations, Wi-Fi access points, smart phones, laptops and tablets can be long term, sometimes around the clock both at home and at school. **This constant exposure to lower levels of exposure may be as deleterious to health as higher exposure during short time** (Fragopoulou et al., 2012, Dasdag et al., 2015b). This **risk may be accentuated for children because their probable longer use of wireless devices** (Morgan et al., 2014). **Children are also growing and have more immature cells which can be more sensible to RF-EMF** (Markova et al., 2010)

In conclusion, long term health effects from RF EMFs are still under investigation and a significant amount of troublesome scientific evidence has surfaced. By using wireless technologies at close range, long term health risks cannot be excluded. Therefore, we recommend schools to use wired technologies.

Respectfully submitted

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24 March 2014

Open letter by British medical doctors: Health and safety of Wi-Fi and mobile phones

We wish to highlight our concern over the safety of exposure to microwave radiation from wireless technology, particularly for vulnerable groups like children, pregnant women, the elderly and those with compromised health.

There is growing concern that chronic (long-term) exposure to radiofrequency/microwave radiation from wireless technologies causes damage, particularly genetic damage, cognitive damage, cancer and decreased fertility. There is now substantial evidence of a link between mobile phone use and brain cancer. This was recognised by the International Agency for Research on Cancer (IARC)'s 30-strong panel of scientists, which in 2011 classed radiofrequency radiation as "possibly carcinogenic".

Additionally, doctors are encountering a significant and growing number of people presenting with **a range of acute (short-term) symptoms from wireless radiation, including headaches, palpitations, rashes, fatigue, sleep disturbance, allergies and memory and concentration problems.**

International medical agencies have recognised the evidence of harm (see appended list) but these rulings may take many years to be reflected in public health policy. This controversy is a common characteristic of scientific understanding when environmental exposures are new.

New technologies and substances often come with scientific conflict, which can continue for several decades before consensus is achieved. Commercial pressures often delay the acceptance of health risks, even when scientific evidence is compelling. In the case of tobacco, asbestos, x-rays and leaded petrol, for example, it took many decades before damage was established and accepted by health agencies and, during those decades, millions of people suffered ill health and death as a result of the delay. Now, despite evidence of harm, wireless technology is being rolled out widely.

We urge health agencies and the public to act immediately to reduce exposure to radiofrequency/ microwave radiation. This is especially important for children, who are physiologically more vulnerable to this exposure, and for whom adults have a safeguarding responsibility. **Children's health should be put ahead of convenience and commercial benefits. Children should not use mobile phones except in an emergency, and WiFi should be replaced with wired alternatives in schools and other settings where children spend considerable time.**

Yours faithfully,

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Appendix – International Rulings

1. In 2011 the **World Health Organization's scientific panel, the International Agency for Research on Cancer (IARC),** reviewed all the evidence on carcinogenesis (cancer-causing) and categorised electromagnetic radiation from mobile phones and Wi-Fi as **Possibly Carcinogenic (Class 2B).**

See http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf

2. **The Council of Europe has called for member states to take measures to reduce exposure to electromagnetic fields and give preference to wired internet connections for children, particularly in schools and classrooms.**

The Parliamentary Assembly stated that "the Assembly regrets that, despite calls for the respect of the precautionary principle and despite all the recommendations, declarations and a number of statutory and legislative advances, there is still a lack of reaction to known or emerging environmental and health risks and virtually systematic delays in adopting and implementing effective preventive measures. Waiting for high levels of scientific and clinical proof before taking action to prevent well-known risks can lead to very high health and economic costs, as was the case with asbestos, leaded petrol and tobacco."

See http://assembly.coe.int/mainf.asp?link=/documents/adoptedtext/ta11/eres1815.htm

3. **The BioInitiative Report**, updated in 2012 by 29 scientists, states that **biological effects are clearly established and occur at very low levels of exposure to electromagnetic fields and radiofrequency radiation** from just minutes of exposure to mobile phone masts (cell towers), WI-FI, and wireless utility 'smart' meters.

See http://www.bioinitiative.org/conclusions

4. **The American Academy of Environmental Medicine** stated in a 2012 Position Paper that "**Multiple studies correlate RF exposure with diseases such as cancer, neurological disease, reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity."**

See http://aaemonline.org/emf_rf_position.html

6. **International Society of Doctors for the environment (ISDE) and Irish Doctors' Environmental Association (IDEA)** state that "**there is sufficient scientific evidence to warrant more stringent controls** on the level and distribution of electromagnetic radiation [EMR]. The joint statement and recommendations are part of a call by medical and scientific experts for safe technologies in schools."

See http://www.env-health.org/news/members-news/article/isde-idea-statement-on

5. The Safe Schools Report 2012 lists statements by **other doctors and medical associations** raising concerns over children's exposure to electromagnetic fields from Wi-Fi and other wireless technology.

See http://wifiinschools.org.uk/resources/safeschools2012.pdf

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July 10, 2009.

Open Letter to Parents, Teachers, & School Boards Regarding Wi-Fi Networks in Schools and Cell Phone Antennas near School Property

I am a scientist who does research on the health effects of electromagnetic radiation and I am becoming increasingly concerned that a growing number of schools are installing WiFi networks and are making their school grounds available for cell phone antennas.

You will be told by both the federal government (Federal Communication Commission in the US; Health Canada and Industry Canada in Canada) as well as by the Wi-Fi provider that this technology is **safe** provided that exposures to radio frequency radiation remain below federal guidelines.

This information is **outdated** and **incorrect** based on the growing number of scientific publications that are reporting adverse health and biological effects below our "short-term, thermal-based" guidelines (see www.bioiniative.org) and the growing number of scientific and medical organizations that are asking for stricter guidelines to be enforced.

For these reasons it is irresponsible to introduce Wi-Fi microwave radiation into a school environment where young children and school employees spend hours each day.

FACT:

1. **GUIDELINES: Guidelines for microwave radiation (which is what is used in Wi-Fi) range 5 orders of magnitude in countries around the world.** The lowest guidelines are in Salzburg Austria and now in Liechtenstein. The guideline in these countries is 0.1 microW/cm^2. See short video (http://videos.next-up.org/SfTv/Liechtenstein/AdoptsTheStandardOf06VmBioInitiative/09112008.html). In Switzerland the guideline is 1 and in both Canada and the US it is 1000 microW/cm^2!

   Why do Canada and the US have guidelines that are so much higher than other countries? Our guidelines are based on a short-term (6-minute in Canada and 30-minute in US) heating effect. It is assumed that if this radiation does not heat your tissue it is "safe". This is NOT correct. Effects are documented at intensities well below those that are able to heat body tissue. See attached report: *Analysis of Health and Environmental Effects of Proposed San Francisco Earthlink Wi-Fi Network* (2007). These biological effects include increased permeability of the blood brain barrier, increased calcium flux, increase in cancer and DNA breaks, induced stress proteins, and nerve damage. Exposure to this energy is associated with altered white blood cells in school children; childhood leukemia; impaired motor function, reaction time, and memory; headaches, dizziness, fatigue, weakness, and insomnia.

2. **ELECTRO-HYPER-SENSITIVITY:** A growing population is adversely affected by these electromagnetic frequencies. The illness is referred to as "electro-hyper-sensitivity" (EHS) and is recognized as a disability in Sweden. The World Health Organization defines EHS as:

   ". . . a phenomenon where individuals experience adverse health effects while using or being in the vicinity of devices emanating electric, magnetic, or electromagnetic fields (EMFs). . . EHS is a real and sometimes a debilitating problem for the affected persons, while the level of EMF in their neighborhood is no greater than is encountered in normal living environments. Their exposures are generally several orders of magnitude under the limits in internationally accepted standards. "

   Health Canada acknowledges in their Safety Code 6 guideline that some people are more sensitive to this form of

energy but they have yet to address this by revising their guidelines.

Symptoms of EHS include sleep disturbance, fatigue, pain, nausea, skin disorders, problems with eyes and ears (tinnitus), dizziness, etc. It is estimated that 3% of the population are severely affected and another 35% have moderate symptoms. Prolonged exposure may be related to sensitivity and for this reason it is imperative that children's exposure to microwave radiation (Wi-Fi and mobile phones) be minimized as much as possible.

3. **CHILDREN'S SENSITIVITY:** Children are more sensitive to environmental contaminants and that includes microwave radiation. The Stewart Report (2000) recommended that children not use cell phones except for emergencies. The cell phone exposes your head to microwave radiation. A wireless computer (Wi-Fi) exposes your entire upper body and if you have the computer on your lap it exposes your reproductive organs as well. Certainly this is not desirable, especially for younger children and teenagers. For this reason we need to discourage the use of wireless technology by children, especially in elementary schools. That does not mean that students cannot go on the Internet. It simply means that access to the Internet needs to be through wires rather than through the air (wireless, Wi-Fi).

4. **REMOVAL OF WI-FI:** Most people do not want to live near either cell phone antennas or Wi-Fi antennas because of health concerns. Yet when Wi-Fi (wireless routers) are used inside buildings it is similar to the antenna being inside the building rather than outside and is potentially much worse with respect to exposure since you are closer to the source of emission.

   Libraries in France are removing Wi-Fi because of concern from both the scientific community and their employees and patrons.

   The Vancouver School Board (VSB) passed a resolution in January 2005 that prohibits construction of cellular antennas within 1000 feet (305 m) from school property.

   Palm Beach, Florida, Los Angeles, California, and New Zealand have all prohibited cell phone base stations and antennas near schools due to safety concerns. The decision not to place cell antennas near schools is based on the likelihood that children are more susceptible to this form of radiation. **Clearly if we do not want antennas "near" schools", we certainly do not want antennas "inside" schools!** The safest route is to have wired internet access rather than wireless. While this is the more costly alternative in the short-term it is the least costly alternative in the long run if we factor in the cost of ill health of both teachers and students.

5. **ADVISORIES:** Advisories to limit cell phone use have been issued by the various countries and organizations including the UK (2000), Germany (2007), France, Russia, India, Belgium (2008) as well as the Toronto Board of Health and the Pittsburgh Cancer Institute (July 2008). While these advisories relate to cell phone use, they apply to Wi-Fi exposure as well since both use microwave radiation. If anything, Wi-Fi computers expose more of the body to this radiation than do cell phones.

6. **PRECAUTIONARY PRINCIPLE**: Even those who do not "accept" the science showing adverse biological effects of microwave exposure should recognize the need to be careful with the health of children. For this reason we have the Precautionary Principle, which states:

   In order to protect the environment, the precautionary approach shall be widely applied by States according to their capability. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation.

   In this case "States" refers to the School Board and those who make decisions about the health of children.

The two most important environments in a child's life are the home (especially the bedroom) and the school. For this reason it is imperative that these environments remain as safe as possible. **If we are to err, please let us err on the side of caution.**

Respectfully submitted,
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July 10, 2009

Shallow Minds:
How the Internet and Wi–Fi in Schools Can Affect Learning

By Cindy Lee Russell, MD
VP-Community Health, Santa Clara County Medical Association

Most of us cannot live without our computers, text messaging, e-mail, and immediate access to the vast cloud of information, especially kids and teenagers who have grown up in the age of the Internet. In fact, more schools are integrating computers at younger ages, even in kindergarten. Forty-nine states are phasing out cursive handwriting altogether. What effects does it have, however, on learning, brain development, cognition, and brain health? Studies have shown some interesting ways that technology is rewiring and shaping our brain, which may not be "all good."

A growing body of scientific evidence suggests that the Internet, with its distractions and interruptions, is turning us into scattered, superficial thinkers. What does that portend for our kids?

Multitasking and Internet Addiction

Nicholas Carr explains, in his book "The Shallows," that we are changing the way we process information. "Dozens of studies by psychologists, neurobiologists, educators, and Web designers point to the same conclusion: When we go online, we enter an environment that promotes cursory reading, hurried and distracted thinking, and superficial learning….The Net delivers precisely the kind of sensory and cognitive stimuli-repetitive, intensive, interactive, addictive, that have been shown to result in strong and rapid alterations in brain circuits and functions."

Researchers from Stanford, in 2009, gave a battery of cognitive tests to a group of heavy and light media Internet multitaskers. They found that the heavy multitaskers were much more easily distracted by "irrelevant environmental stimuli" and had less control over their working memory. In addition, they were much less able to focus on a particular task. Professor Clifford Nass, who led the research, stated intensive multitaskers are "suckers for irrelevancy. Everything distracts them." (5)

"Teaching is a human experience. Technology is a distraction when we need literacy, numeracy, and critical thinking." Paul Thomas, author and associate professor of education at Furman University

Law School Professors Ban Laptops in Classrooms

Several years ago, professors who were irritated with students surfing the Web and hiding behind laptop screens began banning the use of the Internet or laptops in the classroom. Laptops have been banned in classes at Harvard Law School, Yale, George Washington University, University of Virginia, and South Texas College of Law, to mention a few. (4)(15) A 2006 study by Carrie Fried backed up the policies, demonstrating that students who used laptops in

class spent considerable time multitasking. They more importantly found that the level of laptop use was negatively related to several measures of student learning. (3)

A 2012 survey by Elon University, the Pew Internet, and American Life Project asked over 1,000 leaders in the U.S. their thoughts about cognition in our millennial generation. They were asked to consider how the Internet and its environment are changing, for better or worse. Overall, the survey found that multitasking is the new norm and that hyper-connectivity may be leading to a lack of patience and concentration. The "always on" ethos may be encouraging a culture of expectation and instant gratification.

Brain Maturation, Learning, Memory, and Intelligence

The maturation of intelligence requires quiet, deep thought, and time. Established research findings in cognitive science leads to the conclusion that laptop use, especially with Wi-Fi access, could interfere with learning.

The hippocampus, which lies under the cortex, is intimately involved in long-term memory storage. Initial experiences are stored and stabilized in the hippocampus and then later transferred to the cortex. Removal of the hippocampus does not affect long-term memories, but prevents new memories from forming.

Learning depends on the ability to transfer information from our working memory to long-term memory and weave this into other acquired knowledge. There is a bottleneck in the passage of working memory to long-term memory. We have a limited ability as humans to capture and process information. The Internet provides too many choices and too much information at once. Excess distracting information creates "overload," preventing long-term memorization and important information is lost. No one disagrees that we need to protect our memories. As author Nicholas Carr highlights, personal memory is not just for the individual to function, but it shapes and sustains our collective cultural memory.

Brain Drain:

Adverse Neurologic and Health Effects of Wireless Microwave Communications

A growing body of peer reviewed research is showing neurologic damage to fetal brain and other systems from Wi-Fi and other microwave wireless sources. In a prior article, "Why-Fi: Is Wireless Communication Hazardous to Your Health?" in the Sept/Oct 2010 SCCMA *Bulletin*, the full range of effects of EMF from our cell phones and wireless devices was discussed. New basic science research in the last three years is confirming these findings. Initially, the Bioinitiative report of 2007 reviewed the biological effects of low level EMF. It found that there was clear evidence of adverse effects to living systems at current environmental exposures and at doses well below the threshold of the International Commission of Non-Ionizing Radiation Protection (ICNIRP) safety guidelines. Current microwave safety limits are based solely on the heating of tissue and do not take into account research showing negative biological effects on DNA, cancer, protein synthesis, skin tissue changes, sperm motility and viability, cognitive functioning, and disruption of the blood brain barrier.

Current Research on Cognition and Wireless Communication

Fetal Radiofrequency Radiation Exposure From 800-1900 MHz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice. *Scientific Reports*. March 2012.

Aldad et al noted that neurobehavioral disorders are increasingly prevalent in children with 3%-7% of school-aged children diagnosed with attention deficit hyperactivity disorder (ADHD). The etiology is unclear, however, an association between prenatal cellular telephone use and hyperactivity in children has been postulated by others. To test this, he exposed pregnant mice to cell phone radiation throughout gestation (days 1-17), with a sham cell phone control group. He found that the exposed group had dose responsive impaired neurologic transmission in the prefrontal cortex and that the mice exposed in utero were hyperactive and had impaired memory. He concluded "that these behavioral changes were due to altered neuronal developmental programming."(3)

Microwave Radiation Induced Oxidative Stress, Cognitive Impairment, and Inflammation in Brain of Fischer Rats. Megha. 2012.

Megha evaluated the intensity of oxidative stress, cognitive impairment, and brain inflammation in rats exposed to typical cell phone microwave radiation. They were subjected to 900 and 1,800 MHz EMF for two hours a day, for 30 days. They state, "Significant impairment in cognitive function and induction of oxidative stress in brain tissues of microwave exposed rats were observed, in comparison with sham exposed groups… Results of the present study indicated that increased oxidative stress due to microwave exposure may contribute to cognitive impairment and inflammation in brain."

Effect of Low Level Microwave Radiation Exposure on Cognitive Function and Oxidative Stress in Rats. Deshmukh. 2013.

The author highlights the exponential increase in wireless communication devices we are exposed to. He evaluated the effects of cell phone radiation on oxidation in tissues, in addition to cognition in rats. They subjected rats to 900 MHz EMF for two hours per day, five days a week, for 30 days, with an unexposed control group. "Results showed significant impairment in cognitive function and increase in oxidative stress, as evidenced by the increase in levels of MDA (a marker of lipid peroxidation) and protein carbonyl (a marker of protein oxidation) and unaltered GSH content in blood. Thus, the study demonstrated that low level MW radiation had significant effect on cognitive function and was also capable of leading to oxidative stress."

The Internet Can Damage Teenage Brains

A large radiologic study from China, published July 2011, looked at structural brain changes in Internet-addicted teenagers. It is estimated that 24 million teenagers are addicted to the Internet in China. The researchers found a consistent atrophy of grey matter in parts of the brain and shrinkage of the surface of the brain in those addicted to the Internet. The effects were worse the longer the addiction. In addition, the study revealed changes in white matter of the brain, which

function to transmit messages in the brain to the grey matter. They concluded these structural abnormalities were most likely associated with functional impairments in cognitive control.

"It strikes me as a terrible shame that our society requires photos of brains shrinking in order to take seriously the common-sense assumption that long hours in front of screens is not good for our children's health. Dr Aric Sigman, Fellow of the Royal Society of Medicine

WHO Classifies EMF as a Carcinogen

In 2011, The WHO/International Agency for Research on Cancer (IARC) classified radiofrequency electromagnetic fields as "possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer1, associated with wireless phone use."

France Bans Wi-Fi in Schools, But Replaces With Ethernet

The French National Assembly, March 2013, passed an amendment to ban Wi-Fi in their schools until it's proven "safe for human consumption." They instead agreed to install far safer, wired Ethernet cable connections.

The Council of Europe has called for a ban on Wi-Fi use in schools and also recommends a wired alternative.

In Austria, the Austrian Medical Society has also issued a policy statement asking for a ban of Wi-Fi in schools.

The U.K. has a useful frequently-updated website on Wi-Fi in schools, which provides much scientific research. http://www.wifiinschools.org.uk/ Still the controversy persists.

The Cost of a Virtual World

There are a host of concerns with classroom technology, and the virtual world it creates, that have not been explored in the rush to "modernize" education and prevent our kids from becoming "computer illiterate," despite the fact that computers are designed for ease of use. These issues range from distraction in the classroom, impairment of cognitive development and long-term memory, deficiency in learning social skills, Internet addiction, cyber bullying, access to inappropriate content, eye fatigue, and security risks to online learning networks. In addition, the sheer cost of computers and continuous upgrades is likely to break many school budgets. We have not mentioned the issue of toxic e-waste, another growing public health problem.

Common Sense

We will not get rid of the Internet or computers. We should not ignore, however, the enlarging body of science that points to real threats to public health and, especially, our children's safety and well-being. The best approach is precautionary. Reduce the risk by reducing the microwave emissions. It is our obligation as physicians and parents to protect our children. They are the

future and our legacy.

1. Remove wireless devices (white boards and routers) in schools in favor of wired connections and fiberoptic.
2. If there is Wi-Fi, then give teachers the authority to turn it off when not in use or if they feel it is not necessary.
3. Ban cell towers near or on schools.
4. Limit screen time on computers.
5. Limit or ban cell phone use in the class.
6. Limit or ban cell phone use at home.
7. Do not allow laptops to be placed on laps.
8. Undertake independent scientific studies on Wi-Fi and computer use that look at acute and long-term health effects.
9. Train teachers how to recognize symptoms of EMF reactions.
10. Conduct meetings with parents and teachers to address this issue in each school.

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Minimize health risks from electronic devices

Published in the September 2016 NJEA Review
by Adrienne Markowitz and Eileen Senn

Desktops, laptops, tablets, eBook readers, printers, projectors, smart boards, smart TVs, cellphones, cordless phones and wireless networks (WiFi) have become ubiquitous in schools. At their best, they are powerful tools for education. At their worst, they threaten the physical and mental health of teachers, paraeducators, secretaries, librarians and other school staff members and students who spend numerous hours using the devices.

Physical health risks from electronic devices include pain and tingling from repetitive strain injuries to the hands and wrists; pain in the neck, shoulders and back; dry, burning, itchy eyes, blurred vision and headaches; altered sleep patterns and next-day fatigue from exposure to blue screen light; distracted driving; and various health problems from exposure to radiation.

Mental health risks arise from stress due to raised expectations for multitasking, productivity and proficiency with devices; dealing with malfunctioning devices; student and colleague distraction from and addiction to devices; and intrusion of devices into nonwork time.

WiFi devices emit radiation

Radio frequency (RF) electromagnetic frequency (EMF) radiation is sent and/or received by the antennae of phones, routers and other wireless devices. RF radiation is capable of causing cancer, reproductive, neurological and ocular effects. The amount of radiation exposure received depends on the amount of time exposed and distance from the source. Radiation levels fall off exponentially with distance from antennae. If you double the distance, the radiation is four times less. If you triple the distance, it is nine times less, and so on. Children and developing fetuses are particularly at risk because their bodies are still growing. People with implanted medical devices are at risk for device interference.

Hazards and solutions

The most straightforward ways to minimize health risks are to use electronic devices in moderation and to maximize your distance from them. There are also specific solutions to specific hazards listed below.

Local associations should work with their UniServ field representative to negotiate solutions that are in the control of district administrators such as providing training and ergonomic equipment and hard-wiring devices. Individuals should take steps within their control, such as:

For repetitive strain injuries

- Use voice control/speech recognition.
- Use ergonomic alternatives to traditional mice and keyboards.
- Use as many fingers as possible when typing and both thumbs when texting.

For neck, shoulder and back pain

- Ensure an ergonomic workstation.
- When using a hand-held device, support it and the forearms.
- Avoid bending the head down or jutting it forward.
- Take frequent, short breaks from the device.
- Ensure good posture and change positions frequently.
- Stand and do stretching exercises.

For eye pain, blurred vision and headaches

- Use sufficient, but not excessive, lighting.
- Use assistive technology built into Apple, Android and Windows devices.
- Enlarge and darken the cursor and pointer.
- Enlarge the font; magnify the text.
- Use text-to-speech instead of reading.
- Use special computer glasses.
- Relax the eyes on a minibreak.

For altered sleep patterns and next-day fatigue

- Stop using devices at least one hour before bedtime.

For distracted driving

- Use hands-free devices, preferably speakerphones.
- Pull over and park.
- Let someone else drive.

For radiation exposure

- Keep devices away from the body and bedroom.
- Carry phones in briefcases, etc., not on the body.
- Put devices on desks, not laps.
- Hard wire all devices that connect to the internet.
- Hard wire all fixed devices such as printers, projectors and boards.
- Use hard-wired phones instead of cell or cordless phones.
- Text rather than call.
- Keep conversations short or talk in person.
- Put devices in airplane mode, which suspends EMF transmission by the device, thereby disabling Bluetooth, GPS, phone calls, and WiFi.
- Use speaker phone or ear buds instead of holding the phone next your head.
- Take off Bluetooth devices when not using them.

For stress

- Training in device use, assistive technology.
- Easy access to user manuals.
- Easily available technical support.

Cell phones and cancer

The National Toxicology Program (NTP) is conducting the largest set of laboratory rodent studies to date on cellphone RF radiation. The studies cost $25 million and are designed to mimic human exposure. They are based on the cellphone

frequencies and modulations currently in use in the United States. The NTP studies are designed to look at effects in all parts of the body.

On May 27, 2016, NTP released a report with partial results of the studies. They found increased occurrence of rare brain tumors called gliomas and increases in nerve tumors called schwannoma of the heart in male rats. The released results are partial because more rat studies and all of the mouse studies will be forthcoming by 2017. The cells that became cancerous in the rats were the same types of cells as those that have been reported to develop into tumors in human cellphone users.

The EMF produced by cellphones was classified as possibly carcinogenic to humans by the World Health Organization in 2011. They found that long-term use of a cell phone might lead to two different types of tumors, gliomas and acoustic neuroma, a tumor of the auditory nerve.

For more information

- "**Job stress: Is it killing you?**" NJEA Review, May 2012.
- "**As schools lift bans on cell phones, educators weigh pros and cons,**" Kinjo Kiema, NEA Today, Feb. 23, 2015.
- **Be kind to your eyes**, NJEA Review, September 2012.
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- **"Stretching Exercises at Your Desk, 12 Simple Tips,"** WebMD.
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- **"Radiofrequency and microwave radiation,"** Occupational Safety and Health Administration (OSHA).
- **"Report of Partial Findings from the National Toxicology Program (NTP) Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley SD Rats (Whole Body Exposure)."**
- **"Low EMF Best Practices,"** Collaborative for High Performance Schools (CHPS), 2014.
- Microsoft Accessibility Center: **www.microsoft.com/enable**
- Apple Accessibility Center: **www.apple.com/accessibility**
- Google/Android Accessibility Center: **www.google.com/accessibility/products-features.html**

Adrienne Markowitz holds a Master of Science in Industrial Hygiene from Hunter College, City University of New York. Eileen Senn holds a Master of Science in Occupational Health from Temple University in Philadelphia. They are consultants with the New Jersey Work Environment Council, which is a frequent partner with NJEA on school health and safety concerns.

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Parliamentary Assembly
Assemblée parlementaire
http://assembly.coe.int

COUNCIL OF EUROPE
CONSEIL DE L'EUROPE

Resolution 1815 (2011)[1]
Final version

The potential dangers of electromagnetic fields and their effect on the environment

Parliamentary Assembly

1. The Parliamentary Assembly has repeatedly stressed the importance of states' commitment to preserving the environment and environmental health, as set out in many charters, conventions, declarations and protocols since the United Nations Conference on the Human Environment and the Stockholm Declaration (Stockholm, 1972). The Assembly refers to its past work in this field, namely Recommendation 1863 (2009) on environment and health: better prevention of environment-related health hazards, Recommendation 1947 (2010) on noise and light pollution, and more generally, Recommendation 1885 (2009) on drafting an additional protocol to the European Convention on Human Rights concerning the right to a healthy environment and Recommendation 1430 (1999) on access to information, public participation in environmental decision-making and access to justice – implementation of the Århus Convention.

2. The potential health effects of the very low frequency of electromagnetic fields surrounding power lines and electrical devices are the subject of ongoing research and a significant amount of public debate. According to the World Health Organization, electromagnetic fields of all frequencies represent one of the most common and fastest growing environmental influences, about which anxiety and speculation are spreading. All populations are now exposed in varying degrees to electromagnetic fields, the levels of which will continue to increase as technology advances.

3. Mobile telephony has become commonplace around the world. This wireless technology relies upon an extensive network of fixed antennae, or base stations, relaying information with radio-frequency signals. Over 1.4 million base stations exist worldwide and the number is increasing significantly with the introduction of third generation technology. Other wireless networks that allow high-speed Internet access and services, such as wireless local area networks, are also increasingly common in homes, offices and many public areas (airports, schools, residential and urban areas). As the number of base stations and local wireless networks increases, so does the radio-frequency exposure of the population.

4. While electrical and electromagnetic fields in certain frequency bands have wholly beneficial effects which are applied in medicine, other non-ionising frequencies, whether from extremely low frequencies, power lines or certain high frequency waves used in the fields of radar, telecommunications and mobile telephony, appear to have more or less potentially harmful, non-thermal, biological effects on plants, insects and animals as well as the human body, even when exposed to levels that are below the official threshold values.

5. As regards standards or threshold values for emissions of electromagnetic fields of all types and frequencies, the Assembly strongly recommends that the ALARA (as low as reasonably achievable) principle is applied, covering both the so-called thermal effects and the athermic or biological effects of electromagnetic emissions or radiation. Moreover, the precautionary principle should be applied when scientific evaluation does not allow the risk to be determined with sufficient certainty. Given the context of growing exposure of the population, in particular that of vulnerable groups such as young people and children, there could be extremely high human and economic costs if early warnings are neglected.

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1. Text adopted by the Standing Committee, acting on behalf of the Assembly, on 27 May 2011 (see Doc. 12608, report of the Committee on the Environment, Agriculture and Local and Regional Affairs, rapporteur: Mr Huss).

6. The Assembly regrets that, despite calls for the respect of the precautionary principle and despite all the recommendations, declarations and a number of statutory and legislative advances, there is still a lack of reaction to known or emerging environmental and health risks and virtually systematic delays in adopting and implementing effective preventive measures. Waiting for high levels of scientific and clinical proof before taking action to prevent well-known risks can lead to very high health and economic costs, as was the case with asbestos, leaded petrol and tobacco.

7. Moreover, the Assembly notes that the problem of electromagnetic fields or waves and their potential consequences for the environment and health has clear parallels with other current issues, such as the licensing of medication, chemicals, pesticides, heavy metals or genetically modified organisms. It therefore highlights that the issue of independence and credibility of scientific expertise is crucial to accomplish a transparent and balanced assessment of potential negative impacts on the environment and human health.

8. In light of the above considerations, the Assembly recommends that the member states of the Council of Europe:

8.1. in general terms:

8.1.1. take all reasonable measures to reduce exposure to electromagnetic fields, especially to radio frequencies from mobile phones, and particularly the exposure to children and young people who seem to be most at risk from head tumours;

8.1.2. reconsider the scientific basis for the present standards on exposure to electromagnetic fields set by the International Commission on Non-Ionising Radiation Protection, which have serious limitations, and apply ALARA principles, covering both thermal effects and the athermic or biological effects of electromagnetic emissions or radiation;

8.1.3. put in place information and awareness-raising campaigns on the risks of potentially harmful long-term biological effects on the environment and on human health, especially targeting children, teenagers and young people of reproductive age;

8.1.4. pay particular attention to “electrosensitive” people who suffer from a syndrome of intolerance to electromagnetic fields and introduce special measures to protect them, including the creation of wave-free areas not covered by the wireless network;

8.1.5. in order to reduce costs, save energy, and protect the environment and human health, step up research on new types of antenna, mobile phone and DECT-type device, and encourage research to develop telecommunication based on other technologies which are just as efficient but whose effects are less negative on the environment and health;

8.2. concerning the private use of mobile phones, DECT wireless phones, WiFi, WLAN and WIMAX for computers and other wireless devices such as baby monitors:

8.2.1. set preventive thresholds for levels of long-term exposure to microwaves in all indoor areas, in accordance with the precautionary principle, not exceeding 0.6 volts per metre, and in the medium term to reduce it to 0.2 volts per metre;

8.2.2. undertake appropriate risk-assessment procedures for all new types of device prior to licensing;

8.2.3. introduce clear labelling indicating the presence of microwaves or electromagnetic fields, the transmitting power or the specific absorption rate (SAR) of the device and any health risks connected with its use;

8.2.4. raise awareness on potential health risks of DECT wireless telephones, baby monitors and other domestic appliances which emit continuous pulse waves, if all electrical equipment is left permanently on standby, and recommend the use of wired, fixed telephones at home or, failing that, models which do not permanently emit pulse waves;

8.3. concerning the protection of children:

8.3.1. develop within different ministries (education, environment and health) targeted information campaigns aimed at teachers, parents and children to alert them to the specific risks of early, ill-considered and prolonged use of mobiles and other devices emitting microwaves;

8.3.2. for children in general, and particularly in schools and classrooms, give preference to wired Internet connections, and strictly regulate the use of mobile phones by schoolchildren on school premises;

8.4. concerning the planning of electric power lines and relay antenna base stations:

8.4.1. introduce town planning measures to keep high-voltage power lines and other electric installations at a safe distance from dwellings;

8.4.2. apply strict safety standards for the health impact of electrical systems in new dwellings;

8.4.3. reduce threshold values for relay antennae in accordance with the ALARA principle and install systems for comprehensive and continuous monitoring of all antennae;

8.4.4. determine the sites of any new GSM, UMTS, WiFi or WIMAX antennae not solely according to the operators' interests but in consultation with local and regional government authorities, local residents and associations of concerned citizens;

8.5. concerning risk assessment and precautions:

8.5.1. make risk assessment more prevention oriented;

8.5.2. improve risk-assessment standards and quality by creating a standard risk scale, making the indication of the risk level mandatory, commissioning several risk hypotheses to be studied and considering compatibility with real-life conditions;

8.5.3. pay heed to and protect "early warning" scientists;

8.5.4. formulate a human-rights-oriented definition of the precautionary and ALARA principles;

8.5.5. increase public funding of independent research, in particular through grants from industry and taxation of products that are the subject of public research studies to evaluate health risks;

8.5.6. create independent commissions for the allocation of public funds;

8.5.7. make the transparency of lobby groups mandatory;

8.5.8. promote pluralist and contradictory debates between all stakeholders, including civil society (Århus Convention).

The Health Argument against Cell Phones and Cell Towers

The biomedical evidence showing that the radiofrequency radiation emitted by cell phones and cell towers is harmful to health continues to grow. This document summarizes the health argument against cellular technology, whatever the benefits of that technology may be. You may wish to inform yourself about these arguments for any of several reasons:

- You use a cell phone.
- You encourage, or do not discourage, the use of cell phones by family members.
- You live in, or are contemplating moving into, a community close to a cell tower.
- Your school, college, fire station, or police station is considering permitting the installation of a cell tower on its property.
- Your community is considering permitting the installation of cellular repeaters, small-cell towers, or even full cell towers within its jurisdiction.

Below, I introduce myself, provide evidence of the harmfulness of cellular radiation, and show that U.S. Government is not protecting us from harm and is unlikely to do so in the near future. That means that we must protect ourselves and our families at the individual and the community levels while working toward protective action by governments at the local, state, and Federal levels.

Who am I?

I am a retired U.S. Government career scientist (Ph.D., Applied Physics, Harvard University, 1975). During my Government career, I worked for the Executive Office of the President of the United States, the National Science Foundation, and the National Institute of Standards and Technology. For those organizations, respectively, I addressed Federal research and development program evaluation, energy policy research, and measurement development in support of the electronics and electrical-equipment industries and the biomedical research community. I currently interact with other scientists and with physicians around the world on the impact of electromagnetic fields on human health.

Evidence of harm

I present below key evidence, and associated references, that the exposure of humans to radiofrequency radiation, and specifically cellular radiation, is harmful to health.

In 2016, the National Toxicology Program, at the National Institutes of Health, linked cellular radiation to brain and heart tumors.

The National Toxicology Program (NTP), at the National Institutes of Health (NIH), just published the "Partial Findings" of a $25 million multi-year study of the impact of cellular radiation on health. The U.S. Food and Drug Administration "nominated" this NTP study. The NTP indicated that this is the largest and most complex study ever conducted by the NTP.

[1] Ronald M. Powell, Ph.D., USA, email ronpowell@verizon.net, web site https://www.scribd.com/document/291507610/.

The NTP study exposed each of six separate groups of male rats to one of the six possible combinations of three different levels of cellular radiation and two different modulation formats. The modulation format is the method used to impress information on the cellular signal. A separate seventh group of male rats was used as a "control", that is, for comparison, and was protected from exposure to any cellular radiation.

The NTP study found a "likely" causal relationship between exposure to cellular radiation and the occurrence of malignant brain cancer (glioma) and malignant nerve tumors (schwannomas) of the heart in the male rats:

> The rates of occurrence of brain glioma in the male rats ranged from 0 to 3.3 percent for the six groups exposed to radiation. The mean rate of occurrence was 2.0 percent across all six groups.[2]
>
> The rates of occurrence of heart schwannoma in the male rats ranged from 1.1 to 6.6 percent for the six groups exposed to radiation. The mean rate of occurrence was 3.5 percent across all six groups.[3]
>
> The seventh group of male rats, which was used as a control and which was protected from exposure to any cellular radiation, experienced no instances of brain glioma or heart schwannoma.

The NTP considered its findings so important to public health that it issued the "Partial Findings" (May 2016) prior to completing the full study. The NTP then presented those findings at an international conference (BioEM2016, June 2016) attended by 300 scientists from 41 countries. The NTP characterized the motivation for the early release of the "Partial Findings" this way:

> "Given the widespread global usage of mobile communications among users of all ages, even a very small increase in the incidence of disease resulting from exposure to RFR [radiofrequency radiation] could have broad implications for public health. There is a high level of public and media interest regarding the safety of cell phone RFR and the specific results of these NTP studies."

The NTP promised further findings from its study for publication through 2017. Included in those further findings will be test results on mice. You can learn more about this study from the following references:

> **Reference:** NTP's brief description of its study. National Toxicology Program: Cell Phones. (http://ntp.niehs.nih.gov/results/areas/cellphones/index.html)
>
> **Reference:** NTP's published "Partial Findings" of the study. Michael Wyde, Mark Cesta, Chad Blystone, Susan Elmore, Paul Foster, Michelle Hooth, Grace Kissling, David Malarkey, Robert Sills, Matthew Stout, Nigel Walker, Kristine Witt, Mary Wolfe, and John Bucher, Report of Partial Findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats (Whole Body Exposure), posted June 23, 2016. (http://biorxiv.org/content/biorxiv/early/2016/06/23/055699.full.pdf)
>
> **Reference:** Informative discussion of the NTP study. Environmental Health Trust, Frequently Asked Questions about the U.S. National Toxicology Program Radiofrequency Rodent Carcinogenicity Research Study. (http://ehtrust.org/science/facts-national-toxicology-program-cellphone-rat-cancer-study)

[2] In the "Partial Findings" reference cited above, the mean (average) rate of occurrence for malignant glioma in male rats was determined from Table 1 on page 13 as follows: (3 + 3 + 2 + 0 + 0 + 3)/(90 + 90 + 90 + 90 + 90 + 90) = 2.0 percent.
[3] In the "Partial Findings" reference cited above, the mean (average) rate of occurrence for malignant heart schwannoma in male rats was determined from Table 3 on page 15 as follows: (2 + 1 + 5 + 2 + 3 + 6)/(90 + 90 + 90 + 90 + 90 + 90) = 3.5 percent.

Reference: Announcement of the BioEM2016 presentation. Results of NIEHS' National Toxicology Program GSM/CDMA phone radiation study to be presented at BioEM2016 Meeting in Ghent, 05 June 2016 — 10 June 2016 Ghent University, Belgium.
(http://www.alphagalileo.org/ViewItem.aspx?ItemId=164837&CultureCode=en)

Reference: Viewgraphs presented by Michael Wyde, Ph.D., NTP study scientist, at BioEM2016 Meeting, Ghent, Belgium, June 8, 2016. NTP Toxicology and Carcinogenicity Studies of Cell Phone Radiofrequency Radiation.
(http://ntp.niehs.nih.gov/ntp/research/areas/cellphone/slides_bioem_wyde.pdf)

The NTP study reinforces the classification of radiofrequency radiation, including cellular radiation, as a possible human carcinogen, made by the International Agency for Research on Cancer of the World Health Organization in 2011.

In its "Partial Findings" the NTP noted that its study reinforces a decision made by the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO) in 2011. That decision classified radiofrequency radiation, including specifically cellular radiation, as a Group 2B carcinogen (possible carcinogen for humans). This classification was based on the increased risk of malignant brain cancer (glioma) and acoustic neuroma (a benign tumor of the auditory nerve), which is a form of schwannoma (vestibular schwannoma). [4]

Reference: Announcement of the IARC classification. International Agency for Research on Cancer**,** IARC Classifies Radiofrequency Electromagnetic Fields as Possibly Carcinogenic To Humans, Press Release No. 208, 31 May 2011.
(http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf)

Reference: Full report on the IARC classification. IARC Monographs: Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, Volume 102, 2013.
(http://monographs.iarc.fr/ENG/Monographs/vol102/mono102.pdf)

The findings of the NTP study, in combination with the findings of other studies conducted since 2011, have greatly increased the likelihood that the IARC will raise its classification of radiofrequency radiation to Group 2A (probable carcinogen for humans) or even to Group 1 (known carcinogen for humans) in the near future.

In 2015, hundreds of international scientists appealed to the United Nations and the World Health Organization to warn the public about the health risks caused by electromagnetic fields (EMF), including radiofrequency radiation and, specifically, cellular radiation.

As of January 29, 2017, 224 scientists from 41 nations have signed an international appeal first submitted to the United Nations and to the World Health Organization in May 2015. These scientists seek improved protection of the public from harm caused by the radiation produced by many wireless sources, including "cellular and cordless phones and their base stations, Wi-Fi, broadcast antennas, smart meters, and baby monitors" among others. Together, these scientists "have published more than 2000 research papers and studies on EMF." They state the following:

[4] The Mayo Clinic describes acoustic neuroma here: http://www.mayoclinic.org/diseases-conditions/acoustic-neuroma/basics/definition/CON-20023851.

"Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life."

Reference: Welcome to EMFscientist.org.
(https://www.emfscientist.org)

Reference: International EMF Scientist Appeal: Scientists call for Protection from Non-ionizing Electromagnetic Field Exposure, May 15, 2015 (updated October 10, 2016).
(https://www.emfscientist.org/index.php/emf-scientist-appeal)

Reference: International Scientists Petition U.N. to Protect Humans and Wildlife from Electromagnetic Fields and Wireless Technology.
(https://www.emfscientist.org/images/docs/International_EMF_Scientist_Appeal_Description.pdf)

In 2012, the BioInitiative Working Group published the most comprehensive of the recent analyses of the international biomedical research, showing a multitude of biological effects from exposure to radiofrequency radiation, including cellular radiation, at levels below the current exposure guidelines set by the Federal Communications Commission (FCC).

The health risks posed by the expanding use of radiofrequency radiation in wireless devices are not limited to cancer, as devastating as that consequence is. The broad range of health effects was extensively reviewed in the BioInitiative Report 2012. This 1479-page review considered about 1800 peer-reviewed biomedical research publications, most issued in the previous five years. The BioInitiative Report 2012 was prepared by an international body of 29 experts, heavy in Ph.D.s and M.D.s, from 10 countries, including the USA which contributed the greatest number of experts (10). The report concluded the following:

"The continued rollout of wireless technologies and devices puts global public health at risk from unrestricted wireless commerce unless new, and far lower exposure limits and strong precautionary warnings for their use are implemented."

Reference: BioInitiative Working Group, Cindy Sage, M.A. and David O. Carpenter, M.D., Editors, BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation, December 31, 2012.
(http://www.bioinitiative.org)

The BioInitiative Report 2012 documented, in its "RF Color Charts", examples of eight categories of biological effects that occurred at levels below the current exposure guidelines set by the FCC:

- stress proteins, heat shock proteins, and disrupted immune function
- reproduction and fertility effects
- oxidative damage, reactive ion species (ROS), DNA damage, and DNA repair failure
- disrupted calcium metabolism
- brain tumors and blood-brain barrier
- cancer (other than brain) and cell proliferation

- sleep, neuron firing rate, electroencephalogram (EEG), memory, learning, and behavior
- cardiac, heart muscle, blood-pressure, and vascular effects.

These biological effects were attributed to “Radiofrequency Radiation at Low Intensity Exposure” from “cell towers, Wi-Fi, wireless laptops, and smart meters”.

> **Reference:** See the “RF Color Charts”, accessed from the left column of the web page below. (http://www.bioinitiative.org)

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.

The current radiation exposure guidelines of the FCC were adopted in 1996, 20 years ago. Those guidelines are based primarily on an analysis by the National Council on Radiation Protection and Measurements (NCRP) which was published in 1986, 30 years ago. That was many years before the emergence of nearly all of the digital wireless devices in use today.

> “The FCC-adopted limits for Maximum Permissible Exposure (MPE) are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP) in 'Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,' NCRP Report No. 86, Sections 17.4.1, 17.4.1.1, 17.4.2 and 17.4.3. Copyright NCRP, 1986, Bethesda, Maryland 20814...."
>
> **Reference:** Federal Communications Commission, Office of Engineering & Technology, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, OET Bulletin 65, Edition 97-01 (August 1997). See the last paragraph on page 64. (http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf)

Those exposure guidelines have not been substantially changed since that analysis in 1986. They are based on the *thermal assumption* that the only harm that radiofrequency radiation can cause is due to tissue heating. This thermal assumption has been thoroughly disproved since, as biological effects have been found to occur at levels of radiation below, and even far below, those that cause significant tissue heating. Such lower levels are commonly referred to as *nonthermal* levels. The result is that many authorities now consider the FCC’s current exposure guidelines as entirely outdated and much too high (that is, much too permissive) to protect the public.

The evidence disproving the thermal assumption is based on the broadened understanding of the biological effects of radiofrequency radiation made possible by thousands of peer-reviewed papers published by international biomedical scientists since 1986. The BioInitiative Report 2012 is the most recent comprehensive review of that research and provides many examples of bioeffects occurring at nonthermal radiation levels, as described above. Further, the new study by the National Toxicology Program, also described above, added to the evidence disproving the thermal assumption. That study exposed rats to levels of radiation below those that cause significant heating, and both above and below the FCC’s current exposure guidelines as well. Yet, even below the FCC’s current exposure guidelines, the male rats still developed malignant brain cancer (glioma) and malignant tumors (schwannomas) of the nerves of the heart.

The shortcomings of the FCC's exposure guidelines are described in detail in the following reference:

> **Reference:** Outdated FCC "Safety" Standards: The Five Fallacies of the Electromagnetic Radiation Exposure Limits.
> (http://ehtrust.org/policy/fcc-safety-standards/)

The FCC is not a credible source for exposure guidelines because it lacks health expertise and because it is too heavily influenced by the wireless industries that it is supposed to regulate.

The FCC lacks the health expertise required for developing health-related radiation exposure guidelines. Further, the FCC seems more interested in assuring compatibility among electronic systems than in assuring the compatibility of electronic systems with human, animal, and plant life. Since the exposure guidelines relate to health, it would make more sense for them to be developed by an agency with health expertise, such as the Environmental Protection Agency (EPA).

In addition, the FCC lacks the impartiality required to be a source of credible guidelines. The FCC is too heavily influenced by the wireless industries that the FCC is supposed to regulate. The FCC has acted in partnership with the wireless industries by permitting wireless radiation levels far higher than the biomedical research literature indicates are necessary to protect human health. The success of the wireless industries in capturing the FCC, the committees in the U.S. Congress that oversee the FCC, and the Executive Branch is detailed in a recent monograph from the Center for Ethics at Harvard University.

> **Reference:** Norm Alster, Captured Agency: How the Federal Communications Commission is Dominated by the Industries It Presumably Regulates (2015).
> http://ethics.harvard.edu/news/new-e-books-edmond-j-safra-research-lab

As an example of that capture, President Obama, in 2013, appointed Thomas Wheeler, as the Chairman of the FCC. At that time, Mr. Wheeler was the head of the CTIA – The Wireless Association, which is the major lobbying organization for the wireless industries. This is the infamous "revolving door".

The FCC's decision to fast-track Fifth Generation (5G) cellular technology without prior study of its health impact demonstrates the FCC's disinterest in the public health.

On July 14, 2016, the FCC adopted new rules that would promote fast-tracking the expansion of cellular service to new and higher frequencies as part of the Fifth Generation (5G) of cellular technology. This decision will open selected frequency bands above 24 gigahertz (GHz) and up to 71 GHz. At the same time, the FCC has requested comment on opening even higher frequencies, possibly above 95 GHz.

> **Reference:** FCC Takes Steps to Facilitate Mobile Broadband and Next Generation Wireless Technologies in Spectrum above 24 GHz: New rules will enable rapid development and deployment of next generation 5G technologies and services.
> (http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0714/DOC-340301A1.pdf)

> **Reference:** Fact Sheet: Spectrum Frontiers Rules Identify, Open Up Vast Amounts of New High-Band Spectrum for Next Generation (5G) Wireless Broadband.
> (http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0714/DOC-340310A1.pdf)

All five commissioners of the FCC, including Chairman Thomas Wheeler, approved this expedited move to 5G. No commissioner called for evaluating the health impact before proceeding with 5G, despite the recent findings of the National Toxicology Program at NIH that cellular radiation likely causes tumors. Nor did even one commissioner express any interest in, or concern about, the impact of this new technology on public health. Rather, the FCC's emphasis was on the billions of dollars to be made by proceeding to implement 5G as rapidly as possible, with a minimum of regulatory interference, to assure an international competitive position.

In contrast to the FCC's disinterest in the impact of 5G on the public health, extensive written comments from individual members of the public and from many interested organizations raised a host of health concerns that were totally ignored in the FCC's presentations.

> **Reference:** July 2016 Open Commission Meeting addressing "Spectrum Frontiers" and "Advancing Technology Transitions".
> (https://www.fcc.gov/news-events/events/2016/07/july-2016-open-commission-meeting)
>
> **Reference:** The FCC Approves 5G Millimeter Wave Spectrum Frontiers. Includes excerpts from selected comments provided to the FCC by individuals and organizations that expressed concern about the health impact of the FCC's plan for 5G.
> (http://ehtrust.org/policy/fcc-approves-5g-millimeter-wave-spectrum-frontiers/)
>
> **Reference:** Comments on FCC Docket 14-177, Spectrum Bands above 24 GHz. All of the comments submitted to the FCC about the key docket leading to the implementation of 5G.
> (https://www.fcc.gov/ecfs/search/filings?proceedings_name=14-177&sort=date_disseminated,DESC)

U.S. Government agencies, and U.S. medical organizations, have disputed the validity of the FCC's exposure guidelines.

U.S. Government agencies, as well as U.S. medical organizations, have disputed the validity of the FCC's thermal exposure guidelines, maintaining that they are outdated and need to be updated to provide adequate protection of human beings, including children and seniors as well as other vulnerable groups.

U.S. Environmental Protection Agency

The Environmental Protection Agency (EPA) would be a better agency than the FCC to entrust with setting radiofrequency radiation exposure guidelines because the EPA has both health expertise and environmental responsibilities. The EPA is often cited by the FCC, and by the wireless industries, as one of the agencies that the FCC has *consulted* about the FCC's exposure guidelines, as if to increase the credibility of those guidelines. However, the fact that the EPA has *explicitly disputed* the validity of those guidelines is consistently omitted from those FCC citations.

Specifically, in 2002, the EPA addressed the limitations of the thermal exposure guidelines of the FCC, and the similar guidelines of private organizations, including the Institute of Electrical and Electronics Engineers and the International Commission on Non-Ionizing Radiation Protection:

> "The FCC's current exposure guidelines, as well as those of the Institute of Electrical and Electronics Engineers (IEEE) and the International Commission on Non-ionizing Radiation Protection, are thermally based, and do not apply to chronic, nonthermal exposure situations…. The FCC's exposure guideline is

considered protective of effects arising from a thermal mechanism but not from all possible mechanisms. Therefore, the generalization by many that the guidelines protect human beings from harm by any or all mechanisms is not justified."

"Federal health and safety agencies have not yet developed policies concerning possible risk from long-term, nonthermal exposures. When developing exposure standards for other physical agents such as toxic substances, health risk uncertainties, with emphasis given to sensitive populations, are often considered. Incorporating information on exposure scenarios involving repeated short duration/nonthermal exposures that may continue over very long periods of time (years), with an exposed population that includes children, the elderly, and people with various debilitating physical and medical conditions, could be beneficial in delineating appropriate protective exposure guidelines."

Reference: Letters from Frank Marcinowski, Director, Radiation Protection Division, EPA, and Norbert Hankin, Center for Science and Risk Assessment, Radiation Protection Division, EPA, to Janet Newton, President, the EMR Network, with copies to the FCC and the IEEE, dated July 16, 2002. (http://www.emrpolicy.org/litigation/case_law/docs/noi_epa_response.pdf)

In summary, the EPA makes the following points: (1) the FCC 's thermal exposure guidelines do *not* protect against all harm, only the harm caused by too much heating; (2) the FCC's thermal exposure guidelines do *not* apply to "chronic, nonthermal exposure", which is the type of exposure generated by cell towers and many other wireless devices; and (3) when new FCC guidelines are developed for chronic nonthermal exposures, they must accommodate "children, the elderly, and people with various debilitating physical and medical conditions" because those groups are not accommodated now.

U.S. Food and Drug Administration

The Food and Drug Administration (FDA) is also often cited by the FCC, and by the wireless industries, as one of the agencies that the FCC has consulted about exposure guidelines. But the FDA is the agency that "nominated" the NTP study of the possible health effects of cellular radiation, in part because of the FDA's uncertainty about the validity of the FCC's exposure guidelines:

"Currently cellular phones and other wireless communication devices are required to meet the radio frequency radiation (RFR) exposure guidelines of the Federal Communications Commission (FCC), which were most recently revised in August 1996. The existing exposure guidelines are based on protection from acute injury from thermal effects of RFR exposure, and may not be protective against any non-thermal effects of chronic exposures."

Reference: Nominations from FDA's Center from [for] Device[s] and Radiological Health, Radio Frequency Radiation Emissions of Wireless Communication Devices (CDRH), Executive Summary, as attached to transmittal letter from William T. Allaben, Ph.D., FDA Liaison, to Dr. Errol Zeiger, Coordinator, Chemical Nomination and Selection, National Toxicology Program, May 19, 1999,[5] (http://ntp.niehs.nih.gov/ntp/htdocs/chem_background/exsumpdf/wireless051999_508.pdf)

The FDA's wisdom in nominating the NTP study was well justified by the NTP's publication of the "Partial Findings" described above. Those findings demonstrated both that the FCC's exposure guidelines are not protective and that the thermal assumption on which those guidelines are based is invalid.

[5] This date and the referenced URL were changed when this superior reference was posted, at my request, by the NTP/NIEHS/NIH.

U.S. Department of the Interior

In 2014 the Department of the Interior (Fish and Wildlife Service) also addressed the limitations of the FCC's thermal exposure guidelines. The Department of the Interior was motivated by the multiple adverse effects of electromagnetic radiation on the health, and the life, of birds, particularly in connection with cell towers. The Department of the Interior stated the following:

> "However, the electromagnetic radiation standards used by the Federal Communications Commission (FCC) continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today."
>
> **Reference:** Letter from Willie R. Taylor, Director, Office of Environmental Policy and Compliance, Office of the Secretary, United States Department of the Interior, to Mr. Eli Veenendaal, National Telecommunications and Information Administration, U.S. Department of Commerce, dated February 7, 2014.
> (https://www.ntia.doc.gov/files/ntia/us_doi_comments.pdf)

American Academy of Environmental Medicine

The American Academy of Environmental Medicine (AAEM), which trains physicians in preparation for Board Certification in Environmental Medicine, states the following:

> "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'."
>
> "The peer reviewed, scientific literature demonstrates the correlation between RF [radiofrequency] exposure and neurological, cardiac, and pulmonary disease as well as reproductive and developmental disorders, immune dysfunction, cancer and other health conditions. The evidence is irrefutable."
>
> "To install WiFi in schools plus public spaces risks a widespread public health hazard that the medical system is not yet prepared to address."
>
> **Reference:** American Academy of Environmental Medicine, Wireless Radiofrequency Radiation in Schools, November 14, 2013.
> (http://www.aaemonline.org/pdf/WiredSchools.pdf)

American Academy of Pediatrics

The American Academy of Pediatrics (AAP), whose 60,000 doctors care for our children, supports the development of more restrictive standards for radiofrequency radiation exposure in order to better protect the public, particularly the children. In a letter to the Federal Communications Commission (FCC) and the Food and Drug Administration (FDA), dated August 29, 2013, the AAP states the following:

> "Children are not little adults and are disproportionately impacted by all environmental exposures, including cell phone radiation. Current FCC standards do not account for the unique vulnerability and use patterns specific to pregnant women and children. It is essential that any new standard for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded throughout their lifetimes."

Reference: American Academy of Pediatrics, letter dated August 29, 2013 addressed to The Honorable Mignon L. Clyburn, Acting Commissioner, Federal Communications Commission, and The Honorable Dr. Margaret A. Hamburg, Commissioner, U.S. Food and Drug Administration. (http://apps.fcc.gov/ecfs/document/view?id=7520941318)

After reviewing the "Partial Findings" from the new study by the National Toxicology Program at the National Institutes of Health, described above, the American Academy of Pediatrics cautioned parents about the use of cell phones by their children:

> "In light of the findings, the Academy continues to reinforce its recommendation that parents should limit use of cell phones by children and teens."
>
> **Reference:** American Academy of Pediatrics, AAP responds to study showing link between cell phone radiation, tumors in rats, May 27, 2016. (http://www.aappublications.org/news/2016/05/27/Cancer052716)

The Telecommunications Act of 1996, in combination with the FCC's exposure guidelines, empowers the wireless industries to mandate the exposure of the public to levels of radiofrequency radiation already found harmful to health.

The Telecommunications Act of 1996 bars state and local governments from objecting to the placement of cell towers on environmental/health grounds unless the FCC's exposure guidelines would be exceeded. Specifically, the Act states the following:

> "No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's [FCC's] regulations concerning such emissions."
>
> **Reference:** Telecommunications Act of 1996, Section 704 Facilities Siting; Radio Frequency Emission Standards, page 117. (http://transition.fcc.gov/Reports/tcom1996.pdf)

This Act, in combination with the FCC's permissive exposure guidelines, strips state and local governments of the right to protect their own residents from levels of radiofrequency radiation already shown to be harmful to health. In effect, this Act transfers to the wireless industries the right to ***mandate*** the exposure of the public, including those most vulnerable to harm, to radiofrequency radiation without the need for further governmental action. State and local governments can still resist, but to do so they must confront this Act which is designed to frustrate their success. Even so, some governments do heroically resist and some do succeed.

Protecting ourselves and our families

We can act on our own to protect ourselves and our families, but only partially.

Instead of increasing our exposure to cellular radiation, and to the radiation from other digital wireless

devices, we can decrease our exposure and improve our chances for good health. Desirable steps in this direction include the following:

- Reduce or stop the use of cell phones. Reserve them for emergencies or other essential uses.
- Replace cordless telephones with corded telephones.
- Establish wired (Ethernet) interconnections between routers and the wireless devices that the routers support. Then turn off the wireless capabilities, such as Wi-Fi and Bluetooth, of them all.
- "Opt out" of the wireless smart meter on your residence, if your state or local electric power company permits. Many states, but not all, have an opt-out provision.
- Alert family members about the health risks posed by wireless devices, particularly for vulnerable groups such as pregnant mothers, unborn children, young and teenage children, adult males of reproductive age, seniors, the disabled, and anyone with a chronic health condition. Everyone is vulnerable, but these groups are more so.

  Reference: For more information on reducing radiation at home, please see Ronald M. Powell, Ph.D., How to Reduce the Electromagnetic Radiation in Your Home, which is document (10) on the following list.
  (https://www.scribd.com/document/291507610/)

We can obtain better protection if we work together.

We can contribute our efforts to the hundreds of new organizations that are emerging nationwide to raise awareness about the health risks posed by the radiation exposure from wireless devices in homes, in the workplace, in schools, and in public places, especially where children are present. Through the Internet, look for organizations that address the intersection of health with cell phones, cordless phones, Wi-Fi, smart meters, and wireless desktop computers, laptops, and tablets. These wireless devices are the principal sources of radiofrequency radiation in the home.

Take care for our children. Today's adults grew up in an environment with much less radiofrequency radiation than exists today. Today's children are not so lucky. To have the same chance at a healthy life, they need a lot of help. Unfortunately, the levels of radiofrequency radiation in our environment are rising exponentially as governments and wireless industries continue to promote, and even mandate, the exposure of the public to ever higher levels of radiofrequency radiation, with no limit in sight. That means that many of our children will become chronically ill, and many will die, while still young adults. This is a tragedy in the making. To stop it will require greatly increased awareness of the problem and serious political action at multiple levels of government. That is no small task, but we all can help. We can join with others to become a part of the solution for ourselves and our families, but especially for our children and our grandchildren.

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Maryland Children's Environmental Health and Protection Advisory Council (2016) 78 Studies Showing Health Effects from Cell Tower Radio Frequency

• I do not want powerful wireless antennas outside my bedroom window, emitting radiation all day and all night. Wireless technology is not safe for us or our natural world, as shown in hundreds of peer reviewed studies.

• In the last 15 years there have been 4 major wildfires initiated, in whole or in part, by telecommunications equipment. CPUC has faulted telecom companies for their role in these fires. With the Board of Supervisors having this information, how can they justify giving the telecom companies free reign to build out these wireless cell sites without any county (government) oversight?

• I want the Supervisors to invest our time and resources in superior Fiber Optic Broadband Infrastructure that will last 15 to 20 years. I do not want the Supervisors to pursue a build out of inferior Wireless Broadband that has a short 5 year life span. Plus, we have already paid the telecom companies for the installation of fiber optics.

FIBER FIRST
LOS ANGELES COUNTY
101 South Topanga Canyon Blvd. #1705, Topanga, CA 90290
www.FiberFirstLA.org • info@FiberFirstLA.org

September 9, 2022

Members of the Board of Supervisors
Los Angeles County
500 West Temple St.
Los Angeles, CA 90012

Dear Board of Supervisors:

The Board of Supervisors will be considering whether to amend County Code of Ordinances Titles 16 and 22 as requested by the Department of Regional Planning sometime this fall. We have reviewed the proposed amendments and believe certain changes are necessary to comport with California and Federal law and to reflect better policy outcomes. Attached for your consideration are red-lined recommended changes to the proposed amendments, designed to help preserve and implement rights and duties assigned to you by Congress and the Legislature.[1] These recommendations include:

- Create consistency in treatment of facilities in County-owned right-of-way (subject to Chapter 16.25, with the Road Commissioner as the initial permitting authority), and those not in right-of-way (subject to Title 22, with the Regional Planning Commission or the Director as initial permitting authority), unless there are technical or legal reasons for different substantive treatment.
- Maintenance of the Conditional Use permit process (rather than "ministerial" resolution) for several wireless facility request types. "Ministerial" treatment is only appropriate for "exempt facilities," colocation facilities and backup power.
- Improvements to the information an applicant must provide in the application for permit. Most critically it requires information about the applicant's efforts to minimize the risk of fire and structural failure.
- More specification on location preferences.
- Additional permit conditions.
- Protection of historical resources consistent with federal and state law that is lacking in the Department's proposal.

[1] Please note: Our edits did not undertake to update the land use tables in Chapters 22.18 – 22.26 to reflect our substantive revisions to other Chapters. Our edits show up as blue (or purple depending on each screen). The red is staff's most recent update to its earlier proposal, which is black text. Underlining means it is new or edited language from the existing LA County Code, whether originally proposed by staff or us.

The federal Communications Act recognizes local governments' historical land use authority over the siting, construction, and modification of wireless telecommunications facilities in the United States. Congress specifically preserved the authority of local governments to exercise control over these activities in their communities. 47 U.S.C. 332(c) clearly states

> "Except as provided in this paragraph, nothing in this Act shall limit or affect the authority of a State or local government or instrumentality thereof over decisions regarding the placement, construction, and modification of personal wireless service facilities."

The Act specifies five exceptions. Local governments may not:

1. Unreasonably discriminate among providers of functionally equivalent services;
2. Prohibit or have the effect of prohibiting the provision of personal wireless services;
3. Fail to act on any application to place, construct or modify a wireless facility within a reasonable period of time;
4. Deny an application to place, construct or modify a wireless facility without a written record supported by substantial evidence;
5. Regulate the placement, construction or modification of a wireless facility based on environmental effects of radiofrequency emissions.

The state Legislature has delegated broad land use authority to counties, although it has also imposed some specific limits and responsibilities for wireless facilities, including those in public right-of-way (the topic of the proposed amendments to Title 16). Other than these exceptions, local governments may adopt whatever provisions are appropriate for their communities. With the sudden proliferation of wireless antennas related to the deployment of the next generation of wireless telecommunications, many local governments like Los Angeles County are revising and updating their zoning codes to avail themselves of the powers preserved for them by Congress.

Importantly, safety belongs to the local municipality to regulate. Revisions of the County Code present an excellent opportunity for members of the Board to ensure that special safety concerns unique to their districts are properly addressed, particularly those related to electrical, structural and fire code safety in the unique LA County climate. As you may be aware, telecommunications equipment has been implicated in several recent and devastating California wildfires.

We are aware that the Board has been advised that small cells are needed in neighborhoods in order to call 911 in the event of an emergency. **This is not correct**. Macro towers, not small cells, are the predominant network routing source for 911 calls. Government Code Sec. 65850.75 provides that emergency standby generators for macro cell tower sites are a permitted use and our revisions implement that legislation. The CPUC has established a Resiliency Plan [Order Instituting Rulemaking Regarding Emergency Disaster Relief Program. Rulemaking 18-03-011] requiring 72-hour backup power. Small cells will be given a waiver because of the impracticality and danger of having portable generators in the public right-of-way. Residential areas do not have to be smothered in small cells to ensure reliable 911 availability because the nearest macro tower will service emergency calls.

Wireless companies and site developers will always choose antenna locations that are the least expensive and most convenient for them, regardless of the needs or desires of the community. The provisions we recommend in the accompanying "redline" are designed to help the County effectively manage the deployment of wireless technology by providing clarity and guidance to applicants, ensure the facility is necessary at the proposed site to supply needed coverage in the community, and minimize the impact of deployment on residential communities.

We will be happy to meet with you or your designated representatives to provide additional information, examples of other cities that have adopted similar provisions, or discuss other options which may be available to you.

Sincerely,

Douglas A. Wood
Campaign Co-Coordinator
Fiber First LA County

DW:nl
enclosure

CC: Bruce Durbin, Regional Planning Department

ATTACHMENT

TITLE 22 ORDINANCE – Fiber First

Revisions to Proposed Ordinance

ORDINANCE NO. _____

An ordinance amending the Los Angeles County Code Title 22 – Planning and Zoning to establish regulations for personal wireless service facilities ~~on private property~~not located within a county highway in the unincorporated areas of Los Angeles County and associated provisions.

The Board of Supervisors of the County of Los Angeles ordains as follows:

SECTION 1. Chapter 22.14 is hereby amended to read as follows:

22.14.230 – W.

…

Wireless facility. The following terms are defined for the purposes of Section 22.140.~~650~~700 (Wireless Facilities).

Associated equipment. As defined in 47 C.F.R. Section 1.6002(c), or any successor provisions, equipment, switches, wiring, cabling, power sources, shelters or cabinets associated with an antenna, located at the same fixed location as the antenna, and when collocated on a structure, is mounted or installed at the same time as such antenna.

Antenna facility. As defined in 47 C.F.R. Section 1.6002(d), or any successor provisions, an antenna and associated equipment.

Architectural tower. A stand-alone tower that incorporates architectural elements and is constructed for the purpose of supporting and concealing wireless facilities, such as a faux belfry, minaret, cupola, water tower or tank, silo or other agricultural-type structure, clock tower, windmill, or another similar structure.

Base station. As defined in 47 C.F.R. Section 1.6100(b)(1), or any successor provision, a structure or equipment at a fixed location that enables FCC-licensed or authorized wireless communications between user equipment and a communications network. A base station includes a structure where a wireless facility may co-locate on, but is not built for the sole or primary purpose of supporting a wireless facility. This term does not include a tower or any equipment associated with a tower.

Collocation. As defined in 47 C.F.R. Section 1.6002(g)(1) and (2), or any successor provision, (1) mounting or installing an antenna facility on a pre-existing structure, and/or (2) modifying a pre-existing structure for the purpose of mounting or installing an antenna facility on that structure.

Eligible Facilities Request. As defined in 47 C.F.R. Section 1.6100(b)(3), or any successor provision, a request for modification of an existing tower or base station that, within the meaning of the Spectrum Act, does not substantially change the physical dimensions of that tower or base station, and involves colocation, removal, or replacement of transmission equipment. For the purposes of eligible facilities requests, colocation is as defined in 47 C.F.R. Section 1.6100(b)(2), or any successor provisions. **Faux rock outcroppings.** Artificial rocks that are used to conceal a wireless facility and are designed to mimic actual rocks typically found in proximity to the proposed project site and appropriate for that location.

Faux tree. An artificial tree that is used to conceal a wireless facility and is designed to mimic an actual tree typically found in proximity to the proposed project site and appropriate for that location.

FCC. The Federal Communications Commission or its lawful successor.

Macro facility. A wireless facility that does not meet the requirements of a small cell facility or an eligible facilities request.

Personal wireless services. As defined in 47 U.S.C. Section 332(c)(7)(C)(i), or any successor provision, commercial mobile services, unlicensed wireless services, and common carrier wireless exchange access services.

Personal wireless services facility. As defined in 47 U.S.C. Section 332(c)(7)(C)(ii), or any successor provision, a wireless facility that is used for the provision of personal wireless services.

Public right-of-way. As defined in Section 12.08.300.

Review authority. The Director for Ministerial permits and the Commission or Hearing Authority for Conditional Use Permits, subject to any appeal to higher authorities within the County.

Small cell facility. As defined in 47 C.F.R. Section 1.6002(l), or any successor provision, a "small wireless facility" is a personal wireless services facility that meets the following conditions:

1. The facility Is mounted on a structure up to 50 feet in height, including antennas, as defined in 47 C.F.R. Section 1.1320(d), or is mounted on a structure and extends no more than 10 percent in height above other adjacent structures, whichever is greater;
2. Each antenna associated with the facility, excluding associated antenna equipment (as defined under "antenna" in 47 C.F.R. Section 1.1320(d)), is no more than three cubic feet in volume;
3. All other wireless equipment associated with the structure, including the wireless equipment associated with the antenna and any pre-existing associated equipment on the structure, is no more than 28 cubic feet in volume;
4. The facility does not require antenna structure registration under 47 C.F.R. Part 17;
5. The facility is not located on Tribal lands, as defined under 36 C.F.R. Section 800.16(x); and
6. The facility does not result in human exposure to radiofrequency radiation in excess of the applicable safety standards specified in 47 C.F.R. Section 1.1307(b).

Substantial change. As defined in 47 C.F.R. Section 1.6100(b)(7).

Support structure. As defined in 47 C.F.R. Section 1.6002(m) for "structure", a pole, tower, base station, or other building, whether or not it has an existing antenna facility, that is used or to be used for the provision of personal wireless service (whether on its own or comingled with other types of services).

Temporary facility. A wireless facility used to provide personal wireless services on a temporary or emergency basis, such as, but not limited to, ~~for~~ a large-scale special event, following a duly proclaimed local or state emergency as defined in Section 8558 of the California Government Code, or during repair, maintenance, or upgrading of existing facilities. Temporary facilities include without limitation, cells on wheels (COW), sites on wheels (SOW), cells on light trucks (COLTs), or other similar wireless facilities, and:

1. That will be in place for no more than six months (or such other longer time as the County may allow in light of the event or emergency);
2. For which required notice is provided to the FAA;
3. That do not require marking or lighting under FAA regulations;
4. That will be less than 200 feet in height; and
5. That will either involve no excavation or involve excavation only as required to safely anchor the facility, including footings and other anchoring mechanisms, by no deeper than 24 inches below ground if the ground is undisturbed, or no deeper than 12 inches above the depth of any previous disturbance if the ground is disturbed.

Tower. A structure that is built for the sole or primary purpose of supporting any FCC-licensed or authorized antennas, including on-site fencing, equipment, switches, wiring, cabling, power sources, shelters, or cabinets associated with that tower but not installed as part of an antennas. This definition does not include utility poles.

Wireless facility. The antenna facility used for the provision of personal wireless services at a fixed location, including, without limitation, any associated support structure(s).

…

SECTION 2. Section 22.16.030 is hereby amended to read as follows:

22.16.030 – Land Use Regulations for Zones A-1, A-2, O-S, R-R, and W.

…

C. Use Regulations.

1. Principal Uses. Table 22.16.030-B, below, identifies the permit or review required to establish each principal use.

TABLE 22.16.030-B: PRINCIPAL USE REGULATIONS FOR AGRICULTURAL, OPEN SPACE, RESORT AND RECREATION, AND WATERSHED ZONES						
	A-1	A-2	O-S	R-R	W	Additional Regulations
Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses						
…	…	…	…	…	…	…
Wireless facilities, in compliance with Section 22.140. ~~650.C.1~~700.D.1	SPR	SPR	SPR	SPR	SPR	Section 22.140.~~650700~~
Wireless facilities, in compliance with Section 22.140. ~~650.C.2~~700.D.2	CUP	CUP	CUP	CUP	CUP	Section 22.140. ~~650700~~

~~TABLE 22.16.030-B: PRINCIPAL USE REGULATIONS FOR AGRICULTURAL, OPEN SPACE, RESORT AND RECREATION, AND WATERSHED ZONES~~

	A-1	A-2	O-S	R-R	W	Additional Regulations
~~Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses~~						
…	…	…	…	…	…	…
~~Wireless facilities, in compliance with Section 22.140.650.C.1700.D.1~~	~~Section 22.140.650700~~	~~SPR~~	~~SPR~~	~~SPR~~	~~SPR~~	~~SPR~~

~~TABLE 22.16.030-B: PRINCIPAL USE REGULATIONS FOR AGRICULTURAL, OPEN SPACE, RESORT AND RECREATION, AND WATERSHED ZONES~~

	A-1	A-2	O-S	R-R	W	Additional Regulations
~~Wireless facilities, in compliance with Section 22.140.650.C.2700.D.2~~	~~Section 22.140.650700~~	~~CUP~~	~~CUP~~	~~CUP~~	~~CUP~~	~~CUP~~

SECTION 3. Section 22.18.030 is hereby amended to read as follows:

22.18.030 – Land Use Regulations for Zones R-A, R-1, R-2, R-3, R-4 and R-5.

…

C. Use Regulations.

1. Principal Uses. Table 22.18.030-B, below, identifies the permit or review required to establish each principal use.

TABLE 22.18.030-B: PRINCIPAL USE REGULATIONS FOR RESIDENTIAL ZONES							
	R-A	R-1	R-2	R-3	R-4	R-5	Additional Regulations
Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses							
…	…	…	…	…	…	…	…
Wireless facilities, in compliance with Section 22.140. ~~650.C.1~~700.D.1	SPR	SPR	SPR	SPR	SPR	SPR	Section 22.140. ~~650~~700
Wireless facilities, in compliance with Section 22.140. ~~650.C.2~~700.D.2	CUP	CUP	CUP	CUP	CUP	CUP	Section 22.140. ~~650~~700

~~TABLE 22.18.030-B: PRINCIPAL USE REGULATIONS FOR RESIDENTIAL ZONES~~

	R-A	R-1	R-2	R-3	R-4	R-5	Additional Regulations
~~Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses~~							
…	…	…	…	…	…	…	…
~~Wireless facilities, in compliance with Section 22.140. 650.C.1~~	SPR	SPR	SPR	SPR	SPR	SPR	22.140.650700
~~Wireless facilities, in compliance with Section 22.140. 650.C.2~~	CUP	CUP	CUP	CUP	CUP	CUP	22.140.650700

SECTION 4. Section 22.20.030 is hereby amended to read as follows.

22.20.030 – Land Use Regulations for Zones C-H, C-1, C-2, C-3, C-M, C-MJ, and C-R.

…

C. Use Regulations.

1. Principal Uses. Table 22.20.030-B, below, identifies the permit or review

required to establish each principal use.

TABLE 22.20.030-B: PRINCIPAL USE REGULATIONS FOR RESIDENTIAL ZONES								
	C-H	C-1	C-2	C-3	C-M	C-MJ	C-R	Additional Regulations
Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses								
…	…	…	…	…	…	…	…	…
Wireless facilities, in compliance with Section 22.140. ~~650.C.1~~700.D.1	SPR	SPR	SPR	SPR	SPR	SPR	SPR	Section 22.140. ~~650~~700
Wireless facilities, in compliance with Section 22.140. ~~650.C.2~~700.D.2	CUP	CUP	CUP	CUP	CUP	CUP	CUP	Section 22.140. ~~650~~700

~~TABLE 22.20.030-B: PRINCIPAL USE REGULATIONS FOR COMMERCIAL ZONES~~

	C-H	C-1	C-2	C-3	C-M	C-MJ	C-R	Additional Regulations
~~Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses~~								
…	…	…	…	…	…	…	…	…
~~Wireless facilities in compliance with Section 22.140.650700~~	~~SPR~~	~~SPR~~	~~SPR~~	~~SPR~~	~~SPR~~	~~SPR~~	SPR	
~~22.140. 650.C.1700.D.1~~								
~~Wireless facilities, in compliance with Section 22.140.650700~~	~~CUP~~	~~CUP~~	~~CUP~~	~~CUP~~	~~CUP~~	~~CUP~~	CUP	
~~22.140. 650.C.2700.D.2~~								

SECTION 5. Section 22.22.030 is hereby amended to read as follows:

22.22.030 – Land Use Regulations for Zones M-1, M-1.5, M-2, and M-2.5.

…

C. Use Regulations.

2. Principal Uses. Table 22.22.030-B, below, identifies the permit or review required to establish each principal use.

TABLE 22.22.030-B: PRINCIPAL USE REGULATIONS FOR INDUSTRIAL ZONES					
	M-1	M-1.5	M-2	M-2.5	Additional Regulations
Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses					
…	…	…	…	…	…
Wireless facilities, in compliance with Section 22.140. ~~650.C.1~~700.D.1	SPR	SPR	SPR	SPR	Section 22.140. ~~650~~700
Wireless facilities, in compliance with Section 22.140. ~~650.C.2~~700.D.2	CUP	CUP	CUP	CUP	Section 22.140. ~~650~~700

~~required to establish each principal use.~~

SECTION 6. Section 22.22.040 is hereby amended to read as follows:

22.22.040 - Land Use Regulations for Zone M-3.

A. Permitted Uses. Premises in Zone M-3 may be used for any use, except that a use listed in Subsections B and C, below, is permitted only as provided in such sections, below, and uses listed in Subsection D, below, are prohibited. In addition, the following uses are permitted in Zone M-3:

1. Grading projects, with off-site transport up to 100,000 cubic yards of material, subject to Section 22.140.240 (Grading Projects).

2. One mobilehome or recreational vehicle on the same lot may be permitted for up to six consecutive months in any 12-month period if it is legally being used as a caretaker's residence for a use that requires the continuous supervision of a caretaker.

3. Use of property to gain access to any lawfully maintained use.

4. Wireless facilities, in compliance with Section 22.140.~~650.B.1700.D.1.~~ 700 and Chapter 22.158.

B. Conditional Use Permit. If a Conditional Use Permit (Chapter 22.158) application has first been approved, premises in Zone M-3 may be used for:

1. Any use that is listed under Zone M-2 in Section 22.22.030 (Land Use Regulations for Zones M-1, M-1.5, M-2, and M-2.5) that requires a Conditional Use Permit application and is subject to the same limitations and conditions as in Zone M-2.

~~2.~~

2. The following additional uses:

a. Mobilehomes used as caretaker residences for a period of longer than six consecutive months in any 12-month period, in compliance with Section 22.140.140 (Caretaker Residences, including Mobilehomes).

C. Other Permits Required. If an application for a specified permit has first been approved, premises in Zone M-3 may be used for the following:

1. Adult Businesses, as provided by Chapter 22.150 (Adult Business Permits).

2. Cemeteries, as provided in Chapter 22.154 (Cemetery Permits).

3. Explosives storage, as provided in Chapter 22.164 (Explosives Permits).

4. Surface mining operations, as provided in Chapter 22.190 (Surface Mining Permits).

5. Wireless facilities, in compliance with Section 22.140.~~650.B.2700.D.2.~~ 700 and Chapter 22.158.

SECTION 7. Section 22.22.050 is hereby amended to read as follows:

Section 22.22.050 – Land Use Regulations for Zones B-1 and B-2.

Table 22.22.050-A, below, identifies the permit or review required to establish each use.

TABLE 22.22.050-A: LAND USE REGULATIONS FOR ZONES B-1 AND B-2			
	B-1	B-2	Additional Regulations
…	…	…	…
Wireless facilities	-	-	-

SECTION 8. Chapter 22.24 is hereby amended to read as follows:

22.24.030 – Land Use Regulations for Rural Zones.

…

C. Use Regulations.

1. Principal Uses. Table 22.24.030-B, below, identifies the permit or review required to establish each principal use.

TABLE 22.24.030-B: PRINCIPAL USE REGULATIONS FOR RURAL ZONES			
	C-RU	MXD-RU	Additional Regulations
Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses			
…	…	…	…
Wireless facilities, in compliance with Section 22.140.~~650.C.1~~700.D.1	SPR	SPR	Section 22.140.~~650~~700
Wireless facilities, in compliance with Section 22.140.~~650.C.2~~700.D.2	CUP	CUP	Section 22.140.~~650~~700

~~TABLE 22.24.030-B: PRINCIPAL USE REGULATIONS FOR RURAL ZONES~~

	C-RU	MXD-RU	Additional Regulations
Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses … … … …			
Wireless facilities, in compliance with Section 22.140.650.C.1700.D.1	SPR	SPR	Section 22.140.650700
Wireless facilities, in compliance with Section 22.140.650.C.2700.D.2	CUP	CUP	Section 22.140.650700

SECTION 9. Section 22.26.020 is hereby amended to read as follows:

22.26.020 – Institutional Zone.

…

B. Land Use Regulations.

…

3. Use Regulations.

a. Principal Uses. Table 22.26.020-B, below, identifies the permit or review required to establish each use.

TABLE 22.26.020-B: LAND USE REGULATIONS FOR ZONE IT		
		Additional Regulations
Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses		
…	…	…
Wireless facilities, in compliance with Section 22.140.~~650.C.1~~700.D.1	SPR	Section 22.140.~~650~~700
Wireless facilities, in compliance with Section 22.140.~~650.C.2~~700.D.2	CUP	Section 22.140.~~650~~700

~~review required to establish each use.~~

SECTION 10. Section 22.26.030 is hereby amended to read as follows:

22.26.030 – Mixed Use Development Zone.

…

B. Land Use Regulations.

…

3. Use Regulations.

a. Principal Uses. Table 22.26.030-B, below, identifies the permit or review required to establish each use.

TABLE 22.26.030-B: PRINCIPAL USE REGULATIONS FOR ZONE MXD		
		Additional Regulations
Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses		
…	…	…
Wireless facilities, in compliance with Section 22.140.~~650.C.1~~700.D.1	SPR	Section 22.140.~~650~~700
Wireless facilities, in compliance with Section 22.140.~~650.C.2~~700.D.2	CUP	Section 22.140.~~650~~700

SECTION 11. Section 22.26.040 is hereby amended to read as follows:

Section 22.26.040 – Specific Plan Zone.

…

B. Land Use Regulations.

…

a. 3. Wireless Facilities. If a zone or land use category within a Specific Plan is silent with regard to wireless facilities, the Director may accept an application for a wireless facility ~~if the Director determines that a wireless facility is similar to another use permitted within such zone or land use category, in accordance with the following:~~consistent with the requirements in Chapter 22.140.700 and Chapter 22.158. This provision shall not apply if the Specific Plan Zone is within a local coastal program.

~~a. If the wireless facility is in compliance with Section 22.140.650.B.1700.D.1, the Director may accept a Ministerial Site Plan Review application (Chapter 22.186); or~~

~~b. If the wireless facility is in compliance with Section 22.140.650.B.2700.D.2, the Director may accept a Conditional Use Permit application (Chapter 22.158).~~

~~c. This provision shall not apply if the Specific Plan Zone is within a local coastal program.~~

SECTION 12. Section 22.26.060 is hereby amended to read as follows:

22.26.060 – Parking Restricted Zone.

…

B. Land Use Regulations.

…

3. Use Regulations.

a. Principal Uses. Table 22.26.060-B, below, identifies the permit or review required to establish each principal use.

TABLE 22.26.030-B: PRINCIPAL USE REGULATIONS FOR ZONE P-R

		Additional Regulations
Transportation, Electrical, Gas, Communications, Utilities, and Public Service Uses		
…	…	…
Wireless facilities, in compliance with Section 22.140. ~~650.C.1~~700.D.1	SPR	Section 22.140.~~650~~700
Wireless facilities, in compliance with Section 22.140. ~~650.C.2~~700.D.2	CUP	Section 22.140.~~650~~700

~~review required to establish each principal use.~~

SECTION 13. Section 22.140.~~650~~700 is hereby added to read as follows:

22.140.~~650~~700 Wireless Facilities

A. Purpose. This purpose of this Section is to:

~~Facilitate wireless communications service providers~~ Establish permitting procedures for the installation, operation, and modification of wireless facilities not in areas within a local coastal program, and to provide equitable, high quality wireless communications service infrastructure to serve the ~~current and future~~ needs of the County's residents, visitors, businesses, and local governments ~~quickly, effectively, and efficiently.~~

~~1. Establish streamlined permitting procedures for the installation, operation,~~

1. ~~and modification of wireless facilities,~~within the covered area while protecting the environment and public health, safety and welfare of the County residents~~.~~ and maintaining the County's rights to manage the reasonable deployment of wireless infrastructure.

2. Comply with all applicable federal and state laws and regulations regarding wireless facilities. This section is not intended to, nor shall it be interpreted or applied to: (a) prohibit or effectively prohibit any wireless telecommunications service provider's ability to provide reasonable and necessary wireless communications services; (b) prohibit or effectively prohibit any entity's ability to provide reasonable and necessary interstate or intrastate telecommunications service; (c) unreasonably discriminate among providers of functionally equivalent services; (d) deny any request for authorization to place, construct or modify wireless telecommunications service facilities solely on the

basis of environmental effects of radio frequency emissions so long as such wireless facilities comply in every instance and regard with all FCC's regulations concerning such emissions; (e) prohibit any collocation or modification that the County may not deny under federal or state law; or (f) otherwise authorize the County to preempt any applicable federal or state law.

3. Establish standards and location preferences to regulate the placement, design, and aesthetics of wireless facilities to minimize visual ~~and~~, physical and other impacts to surrounding properties.

~~4.~~ Comply with all applicable federal and state laws and regulations regarding wireless facilities.

B. Applicability. This Chapter applies to all personal wireless service facilities located on private property and public property, except for small cell facilities to be located ~~in the public right of way~~within a Highway which are subject to Chapter 16.25 (Small Cell Facilities) in Title 16 (Highways) of the County Code. Wireless facilities shall be permitted in all zones except Zones B-1 and B-2, subject to the required application ~~as specified in Subsection~~for approval of a Ministerial or Conditional Use permit, as applicable.

~~C~~1. Where another regulation in Title 22 applies to a personal wireless service facility, that regulation shall take precedence over this Section.

2. This Section shall not apply to areas within a local coastal program.

C. Exemptions. The following shall be exempt from the provisions of this Section, provided they satisfy applicable Fire, Electrical and Safety Code requirements:

1. A single ground- or building-mounted antenna not exceeding the maximum height permitted by this Chapter, including any mast, subject to the following restrictions:

a. A satellite dish antenna 39.37 inches or less in diameter and (a) intended for the sole use of a person occupying the same parcel to receive direct broadcast satellite service, including direct-to-home satellite service, or to receive or transmit fixed wireless signals via satellite or (b) a hub or relay antenna used to receive or transmit fixed wireless services that are not classified as

telecommunications services, is permitted anywhere on a lot provided it is no higher than needed to receive or transmit an acceptable quality signal and in no event higher than 12 feet above the roofline.

b. A non-satellite dish antenna 39.37 inches or less in diameter or diagonal measurement and (a) intended for the sole use of a person occupying the same parcel to receive video programming services via multipoint distribution services, including multichannel multipoint distribution services, instructional television fixed services, and local multipoint distribution services, or to receive or transmit fixed wireless signals other than via satellite or (b) a hub or relay antenna used to receive or transmit fixed wireless services that are not classified as telecommunications services, is permitted anywhere on a lot.

Amateur radio antennas that are in compliance with Section 22.140.040 (Amateur Radio Antennas).

~~2. "Like kind" equipment replacements, exchanges, or upgrades to an~~

~~3.~~2. ~~existing cabinet, vault, or shroud, or generator that do not increase pre-existing visual or noise impacts, are substantially similar in appearance and the same or less in size, dimensions, and weight, andnd have the same or less radio frequency (RF) emissions to the ten-existing and approved equipment. This exemption does not apply to generators~~.

~~4.~~3. The following temporary facilities that will be placed for less than seven consecutive days, provided any necessary building permit or other approval is obtained and the property owner's written consent is provided to the County:

a. Facilities installed and operated for large-scale events;

b. Facilities needed for coverage during repairs, upgrades, or the temporary relocation of an existing and already-approved facility; and

c. Emergency generators to provide auxiliary power to wireless facilities for seven or fewer days, provided they are to be located on private property, and complies with the Noise Ordinance in Title 12 and Fire Code (Title 32) of the County Code.

D. Application Requirements.

1. Ministerial Site Plan Review. A Ministerial Site Plan Review (Chapter 22.186, Type I) application is required to authorize the following:

~~a. Installation and operation of a small cell facility located on private property and public property that is not a public right of way;~~

~~b.~~ An Eligible Facilities Request, as defined in Section 22.14.230(W), for an existing facility, which does not include a small cell facility located in the public right of way which instead is subject to Chapter 16.25 (Small Cell Facilities) of the County Code~~, that was previously approved with a Ministerial Site Plan Review (Chapter; 22.186);~~

~~c. A macro facility on an existing support structure that meet all standards in Subsection E, below, and does not require a waiver;~~

~~c.~~a. Installation and operation of a temporary facility other than those described in Subsection ~~D~~C.3, ~~below~~B.4, above; ~~and~~

~~d.~~c. Placement and operation of an emergency generator to provide auxiliary power to a wireless facility for more than seven days but no more than 90 days, provided the generator is not located in the public right of way, and complies with the Noise Ordinance in Title 12 and Fire Code (Title 32) of the County Code.

d. The process set out in Chapter 22.186 and Chapter 22.226 shall be used, except that the Director shall give notice (or require the applicant to give notice) to all property owners and residents within the Notification Radius in Section 22.222.160.B that they have the opportunity to comment on whether the application proves entitlement to the permit.

e. The Director shall provide a notice of decision to the applicant and all persons who provided comment. The Director's decision on entitlement may be appealed to the appropriate Appeal Body.

2. Conditional Use Permit. A Conditional Use Permit (Chapter 22.158) application is required to authorize the following:

a. Installation and operation of a new macro facility not installed on an existing structure.

b. A macro facility on an existing support structure~~.~~ that meets all standards in Subsection E, below, and does not require a waiver;

~~b.~~c. Installation and operation of a small cell facility located on private property and public property that is not within a Highway as defined in Section 16.04.100;

~~c.~~d. Installation and operation of any wireless facility, of any type, that requires a waiver from one or more of the requirements in this Chapter or the design standards and guidelines specified in Subsection E, below.

3. Revised Exhibit "A". A Revised Exhibit "A" (Chapter 22.184) application is required to collocate a macro facility on an existing structure with an approved and unexpired discretionary permit that currently hosts another macro facility, or to make modifications to an existing macro facility with an approved and unexpired discretionary permit, including an Eligible Facilities Request for the macro facility. Certain conditions prescribed as part of the approval of the discretionary permit shall not be binding for modifications to a facility as part of an Eligible Facilities Request only to the extent that the request seeks to rectify those conditions (i.e., size, dimensions, or height), and all other conditions shall continue to apply.

~~4. For every new application, the applicant shall prepare and submit to the Director a report on the radio frequency emissions levels of each wireless facility demonstrating that such emissions comply with adopted FCC guidelines.~~

4. The Director may create and publish application forms that each applicant for a Ministerial Permit or Conditional Use Permit must use. If no such form is available, then the applicant must submit all documents, information, and any other materials necessary to allow the review authority to make required findings and ensure that the proposed facility will comply with this Chapter and applicable laws and not endanger the public health, safety, or welfare. Unless prohibited by state or federal law each application for Conditional Use Permit or Ministerial Permit must include, at minimum:

a. A statement signed by a person with legal authority to bind the applicant attesting under penalty of perjury to the accuracy of the information

provided in the application. If the attester is not an authorized employee of the applicant, then the attester must demonstrate that it is an authorized agent of the applicant, with lawful Power of Attorney from the applicant;

b. Contact information for:

i. Applicant and their representatives;

ii. Owner of proposed wireless communications facility;

iii. If different from facility owner, the identity of the person or entity responsible for operating the proposed wireless facility;

iv. The property owner or owner of the structure on which the proposed wireless facility would be installed;

v. Names, addresses, telephone numbers, and email addresses of anyone acting on behalf of the applicant with regard to the application;

vi. The name, address and phone number of all persons that prepared or assisted in preparing the application and any required reports;

c. The postal address, parcel number, or utility pole identifier of the property;

d. GIS coordinates;

e. If the personal wireless facility will be located within a private easement, proof that the terms of the easement allow occupation by the applicant and the use being requested or that the real property owner consents to the occupation and use;

f. The location of any residences, residential care facility or public or private school within 1,000 feet of the project site;

g. Documentation that notice consistent with that required by Government Code Sections 65090-65094 and as provided by Section 22.222.110 has been or will be provided, using the Notification Radius provisions in Section 22.222.150.B.

h. A depiction of the conspicuous sign measuring at least 9 inches by 12 inches that has been placed at the proposed location of each proposed facility installation.

i. Local contact person for emergencies;

j. Assessor's Parcel Number;

k. Need or purpose the personal wireless facility is designed to fulfill;

l. A siting analysis which identifies other feasible locations within or outside the County which could serve the area intended to be served by the facility;

m. Color-coded carrier-generated RF Coverage (propagation) maps, at a scale no smaller than 1 inch (1") to a quarter (1/4) mile with all appropriate legends, showing the coverage for the highest and lowest frequencies to be used by the facility. Frequencies are to be stated numerically, not qualitatively. Provide a represented value in dB of each colors it specifically represents;

n. Description as to why the desired location is superior to other similar locations, from a community perspective, including, but not limited to:

i. Description as to why the desired location is superior to other similar locations, from a community perspective;

ii. Proximity to residential buildings and descriptions of efforts to prevent any blocking of views of impressive scenes;

o. Proximity to residential buildings and descriptions of efforts to prevent any blocking of views of impressive scenes;

p. Written documentation demonstrating a good faith effort to locate the proposed facility in the least intrusive location in accordance with the location requirements of this Chapter;

q. Visual impact analyses with photo simulations including both "before" and "after" appearances, including the antenna and all associated equipment;

r. If the application is for a new tower, clear and convincing technical evidence by a carrier or wireless service provider justifying the total height of the proposed facility and the need for such to the exclusion of all reasonable alternatives;

s. An affirmation, under penalty of perjury, that the proposed installation will be FCC compliant, in that it will not cause members of the general public to be exposed to RF levels that exceed the emissions levels deemed safe by the FCC. A copy of the fully completed FCC form "A Local Government Official's Guide to

Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance: Appendix A" titled "Optional Checklist for Determination of Whether a Facility is Categorically Excluded" for each frequency band of RF emissions to be transmitted from the proposed facility upon the approval of the application. All planned radio frequency emissions on all frequency bands must be shown on the Appendix A form(s) attached to the application. All planned radio frequency emissions are to be entered on each Appendix A form only in wattage units of "effective radiated power;"

t. A statement detailing the frequency, modulation and class of service of radio or other transmitting equipment;

u. A copy of the FCC license applicable for the intended use of the proposed facilities;

v. A written statement of the applicant's willingness to allow other carriers to co-locate on the proposed personal wireless service facility where technically and economically feasible and aesthetically desirable, subject to the qualification that colocation should not occur when public exposures from the resulting higher cumulative sources would exceed FCC limits;

w. A master plan showing the geographic service area for the proposed personal wireless facility installation(s), and all of applicant's existing, proposed and anticipated installations in the County, as well as a schedule of completion dates for each installation;

x. Explanation of all state and federal required environmental and historic evaluations or assessments and proof they have been satisfactorily performed, or proof that a categorical exemption applies and is supported by substantial evidence;

y. Detailed engineering plans, sealed by a California licensed professional engineer. The plans shall disclose, at minimum:

i. a list of all associated equipment necessary for its operation;

ii. load calculation;

iii. a one-line diagram of the electrical system;

iv. plot plan showing the location of the service disconnecting means;

v. short circuit and coordination study ("SCCS") calculated pursuant to the IEEE 551-2006: Recommended Practice for Calculating AC Short-Circuit Currents in Industrial and Commercial Power Systems or the latest version of that standard. The study must demonstrate the protection devices will ensure the equipment enclosure will not be breached. The SCCS must include analysis of Voltage Transient Surges due to contact of conductors of different voltages;

vi. sufficient information for the review authority to verify that the facility will comply with all applicable safety codes and provisions, including but not limited to the Fire Code, Electrical Code and Building Code;

~~i.~~vii. a demonstration that the personal wireless facility and its supporting structure will meet APCO ANS 2.106.1, Public Safety Grade Site Hardening Requirements.

E. Development Standards.

1. General Standards. All wireless facilities, except for facilities as part of Eligible Facilities Requests and Small Cell Facilities, shall comply with the following standards. If a waiver is required for one or more of these standards due to technical infeasibility, Subsection D.2.~~b~~d, above, shall apply.

a. Compliance with all regulations. The facility shall comply with state and federal requirements, standards and law.

b. Location.

i. Wireless facilities shall not encroach into any required setbacks for structures.

~~for structures.~~

ii. All new freestanding towers and monopoles shall be set back a minimum distance of at least one hundred and twenty (120) percent of the height of the tower or monopole from any property line abutting a residentially zoned property. This minimum setback is not subject to a waiver.

iii. In Residential Zones:

~~ii.~~ Wireless facilities, including but not limited to small cells, in ~~the~~ public right of way, ~~wireless~~

(a) ~~*facilities*~~ shall be placed no ~~*further*~~less than five feet from any common property line shared with adjoining lots, and shall be stealth or use concealment techniques.

(b) Wireless facilities, including but not limited to small cells not in public right of way, are subject to required setbacks for structures.

~~iii.~~iv. Wireless facilities shall be located in compliance with ~~the~~ ~~limitations~~regulations as specified in Chapter 22.102 (Significant Ecological Areas), Chapter 22.104 (Hillside Management Areas, Division 10 (Community Standards Districts) and Division 11 (Non-Coastal Specific Plans), ~~and Chapter 22.336 (Santa Monica Mountains North Area Community Standards District),~~where applicable. ~~All wireless facilities to be located within the Santa Monica Mountains Coastal Zone shall be in compliance with all requirements in Chapter 22.44 (Santa Monica Mountains Local Implementation Program), and if applicable, Chapter 22.56 (Coastal Development Permits).~~

~~iv.~~v. New wireless facilities shall not be installed on buildings or structures listed or eligible for listing on the National, California, or County historic registers. New towers and support structures installed on the grounds of properties listed or eligible for listing on the National, California, or County historic registers shall be located and designed to eliminate impacts to the historic resource. A Historic Resource Assessment, prepared to the satisfaction of the Director, may be required for a facility to be located on a site containing an eligible resource to identify impacts to historic resources, and identify mitigation to minimize impacts.

~~d.~~ c. Height.

i. In Industrial, Rural, Agricultural, Open Space, Resort-Recreation and Watershed Zones, the maximum height of a non-building-mounted wireless facility shall be 75 feet.

ii. In all other zones except Zones R-1, R-2, and R-3, the maximum height of a non-building-mounted wireless facility shall be 65 feet. In

Zones R-1, R-2, and R-3, the maximum height of a wireless facility shall be 35 feet, and for a small cell facility not in the public right of way, the maximum height shall be 50 feet.

iii. In all other zones except Zones R-1, R-2, and R-3, the maximum height of a non-building-mounted wireless facility shall be 65 feet.

iv. The height of a wireless facility, including those located within an Airport Influence Area, shall comply with the applicable FAA requirements.

~~Airport Influence Area, shall comply with the applicable FAA requirements.~~

~~e.~~ d. Design standards.

i. Cables. All cables that serve the wireless facility shall be located within the interior of the structure, sheathed, or hidden to the fullest extent technically feasible.

~~ii.~~ Color. All pole-mounted equipment not concealed shall be treated

~~iii.~~ii. with exterior coatings of a color and texture to match the predominant visual background or existing architectural elements to visually blend in with the surrounding development.

~~iv.~~iii. Associated Equipment. Associated equipment shall not be visible, and, if placed on the ground, shall be located in an enclosed structure, such as a building or underground vault (with the exception of required electrical panels), or screened and secured by solid fencing, walls, and gates, and shall conform to the height of the applicable zone. Radio units ~~need not~~shall be enclosed unless the applicant demonstrates technical infeasibility but in all instances shall be stealth.

~~v.~~iv. Fencing. Barbed wire shall be prohibited.

v. ~~2. Additional standards for monopoles.~~The facility shall comply with applicable utility facilities construction standards including but not limited to California Public Utilities Commission General Order 95 and APCO ANS 2.106.1, Public Safety Grade Site Hardening Requirements, or their successor provisions.

vi. The facility shall comply with applicable safety codes and provisions, including but not limited to the Fire Code, Electrical Code and Building Code.

2. Additional standards for monopoles.

a. To the extent technically feasible, antennas shall be mounted directly on the structure for a streamlined design. If mounting equipment shall be required to make the facility feasible, the maximum length of each mounting equipment, such as arm, bracket, or extension, shall be two feet from the structure.

b. Strand mounted antennas are prohibited.

~~b.~~c. Wireless facilities designed as flagpoles are prohibited.

3. Additional standards for facilities mounted on structures other than towers or buildings. A facility mounted on a structure other than a tower or building, such as an architectural tower, bridge, pole sign, lamppost, monumental sign, outdoor advertising sign, stadium light, utility pole, water tank or windmill, shall comply with the following standards:

a. Non-ground mounted equipment shall be shrouded ~~and, if technically~~ ~~feasible,~~ or contained within the structure to the extent technically feasible. The applicant bears the burden of proving technical infeasibility to the satisfaction of the reviewing authority.

~~feasible, or contained within the structure to the extent technically feasible.~~

b. Cables shall be flush-mounted or fully sheathed to the structure to prevent visible gaps between the cables and the structure, unless expressively prohibited by a state regulation. Cables shall not be visibly loose or spooled.

c. Shroud and cables shall be finished to match the structure exterior in color.

~~color.~~

d. Architectural Towers. Architectural towers shall:

i. ~~i.~~ Completely conceal equipment, including antennas; and

ii. Blend in with the architecture of buildings located near the tower location.

4. Additional standards for roof-mounted facilities.

a. Roof-mounted facilities shall be completely concealed and not visible from any public right of way at ground level. Acceptable concealment includes screening or architectural features appropriate to the building such as parapets, penthouses, cupolas, steeples, chimneys, or architectural towers finished to match the building exterior.

~~b.~~ Chimneys and chimney-like textures as concealment shall be avoided for the roofs of commercial buildings.

~~5.~~5.Additional standards for facade-mounted facilities.

a. Facade-mounted equipment shall be flush mounted, architecturally integrated, or completely screened.

b. Architecturally integrated and screening elements shall be finished to match the building exterior.

F. Development Standards for Small Cell Facilities.

1. Setbacks.

~~a.~~ Small cell facilities shall not encroach into any required setbacks for structures.

~~b.~~a. ~~In Residential Zones, excluding the public right of way,~~ Small cell facilities shall be placed no ~~further~~closer than ~~five feet from~~1,000 to any ~~common property line shared with adjoining lots.~~residential structure, residential care facility or public or private school.

2. Height and size. The height and size of the small cell facility shall not exceed the dimensions specified in Section 22.14.230 (W) for “small cell facility.”

3. Design standards.

The Director shall create, update, publish and maintain Design Guidelines for Wireless Facilities (“Guidelines”) to assist applicants and the public in interpreting and applying the standards and requirements in this Chapter. The Guidelines may provide additional or more granular requirements, but must, at minimum, reflect and implement the standards in this Chapter.

a. All antennas, cables, and equipment shall be concealed and ~~or~~ located within the antenna shrouds, pole, conduits, and other stealthing apparatus~~.~~ to the extent technically feasible.

b. The small cell facility shall be finished with matching colors to blend in with the structure.

G. Modifications to Existing Macro Facilities. Existing macro facilities may be eligible for either:

1. A Ministerial Site Plan Review (Chapter 22.186) application if such facilities are redesigned with shorter mounting equipment that extends no more than two feet from the structure, or with removal of any existing mounting equipment, and with additional screening techniques, such as shrouds or walls, that blend in with the structure, including color and texture, and conforms to all standards in Subsection E, above, and does not require a waiver; or

2. A Revised Exhibit "A" (Chapter 22.184) application for modifications to a facility where such modifications will not bring the facility into conformity with the standards in Subsection E, above, or which requires a waiver.

3. An Eligible Facilities Request may be processed with a Ministerial Site Plan Review (Chapter 22.186) application if minor modifications will bring the facility in conformance with all standards in Subsection E, above, and does not require a waiver~~.~~, or a Revised Exhibit "A" (Chapter 184) application if the minor modifications will not bring the facility in conformance with the standards in Subsection E, above, or which may require a waiver.Otherwise, the Eligible Facilities Request may be processed with a Revised Exihibit "A," in accordance with Subsection D.3, above.

H. Standards for Wireless Facilities Subject to Conditional Use Permit. All facilities that are subject to a Conditional Use Permit (Chapter 22.158) pursuant to Subsection ~~C~~D.2, above, shall comply with the following standards: ~~Subsection CD.2, above, shall comply with the following standards:~~

1. Location.

a. Preferred Locations. To better assist applicants, minimize unnecessary visual clutter, promote safety and limit other impacts to aesthetics

and community character, the preferred locations for personal wireless service facilities are as follows:

i. Most Preferred: Industrial zones.

ii. Less Preferred: Commercial zones

iii. Least Preferred: Residential & Rural Zones

Applications that seek a permit involving a Least Preferred location may be approved if the applicant proves with clear and convincing evidence that the denial of an application would prohibit or effectively prohibit the provision of personal wireless services pursuant to 47 U.S.C. § 332(c)(7)(B)(i)(II) or otherwise violate applicable laws or regulations.

~~a.~~b. Wireless facilities shall be located and designed to minimize visual impacts to vistas from adopted scenic highways and ridgelines.

~~b.~~c. Wireless facilities shall be located to minimize visual impacts on adjacent residences and historic resources.

2. Design standards. Wireless facilities shall incorporate the following concealment measures appropriate for the proposed location:

a. Monopoles. Monopoles shall be designed as follows:

i. Monopoles shall be located to utilize existing natural or man-made features including topography, vegetation, buildings, or other structures in the immediate surroundings to provide the greatest amount of visual screening.

ii. If mounting equipment shall be required for the monopole, the maximum length of each mounting equipment, such as arm, bracket, or extension, shall be eight feet.

b. Faux Trees. Any proposed faux tree shall be designed as follows:

i. Wherever possible, faux trees shall be located within 50 feet of an existing grove of at least two live trees, and shall be similar in appearance to the species of the live trees.

ii. The faux tree species shall be appropriate for the location.

iii. Faux trees shed toxic microplastics and contain carcinogenic materials listed under Proposition 65. Applicants must disclose the chemical content of faux tree materials, effectively monitor their discharge into the environment, and take all effective measures to mitigate their adverse impacts. Annual reports shall be submitted under penalty of perjury certifying minimal environmental impacts and compliance with zero-discharge standard under the Clean Water Act and Porter-Cologne Act.

~~iii.~~iv. Antennas shall be painted, coated, or covered to match their background (e.g., leaves, branches, or trunk) and shall not extend beyond the tree branches or fronds.

~~iv.~~v. Faux branches or fronds shall conceal the antennas ~~asto~~as to the extent technically feasible and shall be weather-resistant.

~~v.~~vi. Faux bark cladding shall be provided from the ground to five feet beyond where the faux branches begin; above the faux bark cladding, the pole shall be painted a flat non-reflective paint of the same color as the bark cladding.

c. Faux Rock Outcroppings. Faux rock outcroppings, shall contain all equipment, including antennas, and shall be similar in appearance to real rocks in the immediate vicinity with respect to color, texture, and scale.

d. Architectural Towers. Architectural towers shall:

i. ~~iii.~~ Completely conceal equipment, including antennas; and

ii. ~~iv.~~ Blend in with the architecture of buildings located near the tower location.

l. Findings. If a wireless facility is subject to Subsection ~~C~~D.2, above, the following additional findings shall be made:

1. The facility complies with all applicable standards in this Section, unless a waiver has been requested pursuant to Subsection L, below;

2. The design of the facility is the least visually intrusive that is technically feasible and appropriate for the location; and

3. For new wireless facilities, the location of the facility does not create a safety hazard.

J. Conditions of Approval. For wireless facilities subject to Subsection D.1 above the Director, and for wireless facilities subject to Subsection CD.2, above, the Commission or the Hearing Officer may impose conditions to ensure that the approval will be in accordance with the findings required by the application. Such conditions may involve any pertinent factors that could affect the establishment, operation, and maintenance of the facility., including, but not limited to. All permits (whether Ministerial or Conditional Use Permit) must, however, contain the following conditions absent a request for waiver:

1. Every five years, the permittee shall prepare and submit to the Director a report on the radio frequency emissions levels of each wireless facility demonstrating that such emissions comply with adopted FCC limitations for general population/uncontrolled exposure to such emissions when operating at full strength.

K. Wireless Facility AuthorizationPermit Duration. A Conditional Use Permit to authorize a wireless facility may be valid for a period of 15 years.

1. The permittee shall defend, indemnify, and hold harmless the county or any of its boards, commissions, agents, officers, and employees from any claim, action or proceeding against the county, its boards, commission, agents, officers, or employees to attack, set aside, void, or annul, the approval of the project, or to hold the county liable in whole or in part as a result of the engineering, design, construction or operation of the facility. The county shall promptly notify the provider(s) of any such claim, action or proceeding if the county bears its own attorney's fees and costs, and the county defends the action in good faith.

2. The permittee shall be strictly liable for interference caused by its facilities with county communications systems. The permittee shall be responsible for costs for determining the source of the interference, all costs associated with eliminating the interference (including but not limited to filtering, installing cavities, installing directional antennas, powering down systems, and

engineering analysis), and all costs arising from third party claims against the county attributable to the interference.

3. Subsequent submittals for this project shall be in substantial compliance with the plans date-stamped received by the Department of Regional Planning on . The project shall comply with all conditions of approval stipulated in the referral sheets attached to the agenda report for this project. In the event the project plans conflict with any condition of approval, the condition shall take precedence and revised plans shall be submitted and approved by the Director of Planning prior to plan check.

4. The permit and rights conferred in this approval shall not be effective until the permittee signs, notarizes and returns the Acceptance of Conditions Affidavit accepting the conditions set forth herein. The applicant shall file this form with the Department of Regional Planning within 30 days of this decision or prior to issuance of any development, conditional use, building, electrical or encroachment permit.

5. The applicant shall digitally submit a complete set of plans, including the items required in Condition No. 6 to the Department of Regional Planning for consistency review and approval prior to plan check and again prior to the issuance of any building or development permits.

6. The Notice of Decision (including the signed and notarized Acceptance of Conditions Affidavit) shall be copied in its entirety and placed directly onto a separate plan sheet(s) to be included in the development plans prior to submitting any development permits.

7. A Ministerial Permit or CPD issued under this Chapter shall be valid for a period of ten (10) years from issuance, unless pursuant to another provision of the Code or these conditions, it expires sooner or is terminated. At the end of ten (10) years from the date of issuance, such development or conditional use permit shall automatically expire, unless an extension or renewal has been granted. A person holding a permit must either (1) remove the facility within thirty (30) days following the permit's expiration (provided that removal of support structure owned by the county, a utility, or another entity authorized to maintain a

support structure need not be removed, but must be restored to its prior condition, except as specifically permitted by the county); or (2) prior to expiration, submit an application to renew the permit, which application must, among all other requirements, demonstrate that the impact of the wireless facility cannot be reduced. The wireless facility must remain in place until it is acted upon by the county and all appeals from the county's decision exhausted.

8. The installation and construction authorized by a permit shall be completed within three (3) years after its approval, or it will expire without further action by the county unless prior to the three (3) years the applicant submit an extension request and the county, in its sole discretion, grants a time extension for due cause. The installation and construction authorized by a permit shall conclude, including any necessary post-installation repairs and/or restoration to the property, within thirty (30) days following the day construction commenced. The permittee must provide written notice to county within ten (10) days after completing construction, and may not begin operations until all county and Fire Department (if applicable) inspections have been completed and the project is found to be consistent with the permit. The expiration date shall be suspended until an appeal and/or litigation regarding the subject permit is resolved.

9. The Director of Planning may grant up to four one-year extensions of the timeline, in Condition 8 above, for completing the installation and construction authorized by a development or condition use permit, if the Director of Planning finds that the conditions, including but not limited to changes in the wireless ordinance under which the permit approval was issued, have not significantly changed.

10. Any questions of intent or interpretation of any condition of approval will be resolved by the Director of Planning upon written request of such interpretation.

11. All structures shall conform to Los Angeles County Fire Department requirements and all other applicable environmental, health and safety laws.

Cultural Resources

12. In the event that potentially important cultural resources are found

in the course of geologic testing, work shall immediately cease until a qualified archaeologist can provide an evaluation of the nature and significance of the resources and until the Department of Regional Planning can review this information. Where, as a result of this evaluation, the Department of Regional Planning determines that the project may have an adverse impact on cultural resources, an evaluation of cultural resources shall be required.

13. If human bone is discovered, the procedures described in Section 7050.5 of the California Health and Safety Code shall be followed. These procedures require notification of the coroner. If the coroner determines that the remains are those of a Native American, the applicant shall notify the Native American Heritage Commission by phone within 24 hours. Following notification of the Native American Heritage Commission, the procedures described in Section 5097.94 and Section 5097.98 of the California Public Resources Code shall be followed.

Facility Conditions

14. All antennas shall meet the minimum siting distances to public/uncontrolled areas required for compliance with the FCC regulations and standards governing the environmental effects of radio frequency emissions. Permittee shall keep up-to-date on current information from the FCC in regards to maximum permissible radio frequency exposure levels. In the event that the FCC changes its guidelines for human exposure to radio frequency, permittee shall, within 30 days after any such change, submit to the Director a report prepared by a qualified engineer that demonstrates actual compliance with such changed guidelines. The Director may, at permittee's sole cost, retain an independent consultant to evaluate the compliance report and any potential modifications to the permit necessary to conform to the FCC's guidelines. Failure to submit the compliance report required under this condition, or failure to maintain compliance with the FCC's guidelines for human exposure to radio frequency at all times shall constitute grounds for permit revocation.

15. All antennas shall be located so that any person walking adjacent to the transmitting surface of the antenna will be walking on a grade, which is a

minimum of eight and one-half feet below the transmitting surface.

16. All antennas, equipment, and support structures shall be engineered and designed to prevent unauthorized climbing.

17. The wireless facility shall be erected, operated, and maintained in compliance with the general requirements set forth in the Guidelines and any specific requirements in the permit.

18. The antenna and electrical support equipment shall, at all times, be operated in a manner that conforms to the applicable health and safety standards, including those imposed by this Chapter 17.46 and the Guidelines.

19. Wireless communications facilities and equipment must comply with the applicable noise ordinances, and prevent noise and sound from being plainly audible at a distance of fifty (50) feet from the facility or within ten (10) feet of any residence.

20. The Director's approval is required if a generator is to be placed onsite for temporary or permanent use.

21. All non-ground-mounted equipment associated with the application shall be located no lower than eight feet above grade or ground level on the monopole or support structure.

22. The county or its designee may enter onto the facility area to inspect the facility upon 48 hours prior notice to the permittee. The permittee shall cooperate with all inspections and may be present for any inspection of its facility by the county. The county reserves the right to enter or direct its designee to enter the facility and support, repair, disable, or remove any elements of the facility in emergencies or when the facility threatens imminent harm to persons or property. The county shall make an effort to contact the permittee prior to disabling or removing any facility elements, but in any case, shall notify permittee within 24 hours of doing so.

23. Testing of any equipment shall take place on weekdays only, and only between the hours of 8:30 a.m. and 4:30 p.m., except that testing is prohibited on holidays that fall on a weekday. In addition, testing is prohibited on weekend days.

24. Permittee shall obtain and maintain throughout the term of the permit commercial general liability insurance with a limit of five million dollars ($5,000,000) per occurrence for bodily injury and property damage and six million dollars ($6,000,000) general aggregate including premises operations, contractual liability, personal injury, and products completed operations. The relevant policy(ies) shall name the county, its elected/appointed officials, commission members, officers, representatives, agents, and employees as additional insureds. A true and correct copy of the policy of insurance shall constitute proof of insurance required by this Subsection. Permittee shall use its best efforts to provide thirty (30) days' prior notice to the county of to the cancellation or material modification of any applicable insurance policy. Failure to maintain insurance consistent with this Condition shall automatically void the permit, and the permittee shall immediately deenergize and remove the facility from operation. The policy shall not have a pollution or other exclusion which excludes injuries or damages from EMF/RF exposures.

25. Prior to issuance of a county permit or encroachment permit, the permittee shall file with the county, and shall maintain in good standing throughout the term of the approval, a performance bond or other surety or another form of security for the removal of the facility in the event that the use is abandoned or the permit expires, or is revoked, or is otherwise terminated. The security shall be in the amount equal to the cost of physically removing the facility and all related facilities and equipment on the site, based on the higher of two contractor's quotes for removal that are provided by the permittee. The permittee shall reimburse the county for staff time associated with the processing and tracking of the bond, based on the hourly rate adopted by the county Board of Supervisors. Reimbursement shall be paid when the security is posted and during each administrative review.

26. Permittee shall not move, alter, temporarily relocate, change, or interfere with any existing structure, improvement, or property without the prior consent of the owner of that structure, improvement, or property. No structure, improvement, or property owned by the county shall be moved to accommodate

a permitted activity or encroachment, unless the county determines that such movement will not adversely affect the county or any surrounding businesses or residents, and the Permittee pays all costs and expenses related to the relocation of the county's structure, improvement, or property. Prior to commencement of any work pursuant to any permit, the permittee shall provide the county with documentation establishing to the county's satisfaction that the permittee has the legal right to use or interfere with any other structure, improvement, or property to be affected by permittee's facilities.

27. No possessory interest is created by a Ministerial Permit or Conditional Use Permit. However, to the extent that a possessory interest is deemed created by a governmental entity with taxation authority, permittee acknowledges that county has given to permittee notice pursuant to California Revenue and Taxation Code Section 107.6 that the use or occupancy of any public property pursuant to a development or conditional use permit may create a possessory interest which may be subject to the payment of property taxes levied upon such interest. Permittee shall be solely liable for, and shall pay and discharge prior to delinquency, any and all possessory interact taxes or other taxes, fees, and assessments levied against permittee’s right to possession, occupancy, or use of any public property pursuant to any right of possession, occupancy, or use created by this development or conditional use permit.

28. If not already completed, permittee shall enter into the appropriate agreement with the county, as determined by the county, prior to constructing, attaching, or operating a facility on county-owned infrastructure. This permit is not a substitute for such agreement.

29. If a facility is not operated for a continuous period of three (3) months, the Ministerial Permit or Conditional Use Permit and any other permit or approval therefor shall be deemed abandoned and terminated automatically, unless before the end of the three (3) month period (i) the Director has determined that the facility has resumed operations, or (ii) the county has received an application to transfer the permit to another service provider. No later than ninety (90) days from the date the facility is determined to have ceased

operation, or the permittee has notified the Director of its intent to vacate the site, the permittee shall remove all equipment and improvements associated with the use and shall restore the site to its original condition to the satisfaction of the Director. The permittee shall provide written verification of the removal of the facilities within thirty (30) days of the date the removal is completed. If the facility is not removed within thirty (30) days after the permit has been discontinued pursuant to this subsection, the site shall be deemed to be a nuisance, and the county may cause the facility to be removed at permittee's expense or by calling any bond or other financial assurance to pay for removal. If there are two (2) or more users of a single facility or support structure, then this provision shall apply to the specific elements or parts thereof that were abandoned but will not be effective for the entirety thereof until all users cease use thereof.

30. In the event the county determines that it is necessary to take legal action to enforce any of these conditions, or to revoke a permit, and such legal action is taken, the permittee shall be required to pay any and all costs of such legal action, including reasonable attorney's fees, incurred by the county, even if the matter is not prosecuted to a final judgment or is amicably resolved, unless the county otherwise agrees, in its complete discretion, to waive said fees or any part thereof.

31. Interference with county communications systems and other governmental emergency systems is prohibited. Further, no permits issued pursuant to this chapter of the County Code establish any guarantee or warranty that Licensee's facility will be free from interference from county or third-party communication systems.

Construction

32. Installation hours shall be limited to Monday through Friday from 7:00 a.m. to 7:00 p.m. and Saturdays from 8:00 a.m. to 5:00 p.m. No installation activities shall be permitted on Sundays and county-designated holidays. The restricted work hours described in this condition do not apply to emergency maintenance necessary to protect health or property. The county may issue a Stop Work Order if permittee violates this condition. Construction activities shall

be conducted in compliance with, and abide by, all applicable safety codes and permit conditions.

33. All sites built to the standards of ANSI/APCO Public Safety Grade Site Hardening Requirements, also referred to as “APCO ANSI 2.106.1-2019”.

Site Specific Conditions

34. In the event that the electric service provider does not currently offer an alternative metering option, the permittee shall remove the above-grade electric meter when such option becomes available. Prior to removing the above-grade electric meter, the permittee shall apply for any encroachment and/or other ministerial permit(s) required to perform the removal. Upon removal, the permittee shall restore the affected area to its original condition that existed prior to installation of the equipment.

35. The permittee acknowledges that the county specifically includes conditions of approval related to (a) painting, coloring or finishing the equipment to match the monopole or support structure; (b) undergrounding all equipment to the extent possible; (c) installing equipment within shrouds, conduits and risers as concealment elements engineered and designed to integrate the wireless facility with the surrounding built and natural environment; and (d) specific structural, seismic, electrical, fire and operating/maintenance requirements. Any future modifications to the permittee’s wireless facility must maintain or improve all concealment elements and safety precautions.

36. Before the permittee submits any applications for construction, encroachment, excavation or other required permits in connection with this permit, the permittee must incorporate a true and correct copy of this permit, all conditions associated with this permit and any approved photo simulations into the project plans (collectively, the “Approved Plans”). The permittee must construct, install and operate the wireless facility in substantial compliance with the Approved Plans as determined by the Director or the Director’s designee. Any substantial or material alterations, modifications or other changes to the Approved Plans, whether requested by the permittee or required by other departments or public agencies with jurisdiction over the wireless facility, must be

submitted in a written request subject to the Director's prior review and approval, who may refer the request to the original review authority if the Director finds that the requested alteration, modification or other change substantially deviates from the Approved Plans or implicates a significant or substantial land-use concern.

37. The permittee shall install and at all times maintain in good condition a "Network Operations Center Information" and "RF Caution" sign on the utility pole no less than three (3) feet below the antenna (measured from the top of the sign) and no less than nine (9) feet above the ground line (measured from the bottom of the sign). Signs required under this condition shall be installed so that a person can clearly see the sign as he or she approaches within three (3) feet of the antenna structure. If any person on or within the property is or may be exposed to emissions that exceed applicable FCC uncontrolled/general population limits at any time the sign shall expressly so state, and provide instructions on how persons can avoid any such exposure. The sign shall also include the name(s) of the facility owner(s), equipment owner(s) and operator(s)/carrier(s) of the antenna(s), property owner name, as well as emergency phone number(s) for all such parties. The sign shall not be lighted, unless applicable law, rule or regulation requires lighting. No signs or advertising devices other than required certification, warning, required seals or signage, other signage required by law, this Chapter, any county or applicable state code or the Los Angeles County Fire Department Chief or his or her designee shall be permitted. The sign shall be no larger than two (2) square feet.

38. The permittee shall ensure that all signage complies with FCC Office of Engineering and Technology Bulletin 65, CPUC General Order 95 or American National Standards Institute C95.2 for color, symbol, and content conventions. All such signage shall at all times provide a working local or toll-free telephone number to its network operations center, and such telephone number shall be able to reach a live person who can exert transmitter power-down control over this site as required by the FCC.

39. In the event that the FCC changes any of radio frequency signage requirements that are applicable to the project site approved herein or ANSI

Z535.1, ANSI Z535.2, and ANSI C95.2 standards that are applicable to the project site approved herein are changed, the permittee, within 30 days of each such change, at its own cost and expense, shall replace the signage at the project site to comply with the current standards.

40. The permittee shall maintain the paint, color and finish of the facility in good condition at all times.

41. All improvements, including foundations, and appurtenant ground wires, shall be removed from the property and the site restored to its original pre-installation conditions within 90 days of cessation of operation or abandonment of the facility.

Build-Out Conditions.

42. Permittee shall not commence any excavation, construction, installation or other work on the project site until and unless it demonstrates that the project complies with these Conditions along with all applicable laws, regulations, codes and other rules related to public health and safety, including without limitation all applicable provisions in California Public Utilities Commission General Order 95 and this Chapter.

43. To the extent that a pole owner or any provision in the County Code or Guidelines require greater or more restrictive standards than California Public Utilities Commission General Order 95, if applicable, those standards shall control.

44. Permittee shall at all times maintain compliance with all applicable federal, State and local laws, regulations, ordinances and other rules, including Americans with Disabilities Act (ADA) requirements and Title 22, Chapter 22.182.

45. The permittee shall cooperate with all inspections. The county and its designees reserve the right to support, repair, disable or remove any elements of the facility in emergencies or when the facility threatens imminent harm to persons or property.

46. Permittee shall at all times maintain accurate contact information for all parties responsible for the facility, which shall include a phone number, street mailing address and email address for at least one natural person. All such contact information for responsible parties shall be provided to the Department of

Regional Planning at the time of permit issuance and within one business day of permittee's receipt of county staff's written request.

47. Permittee shall undertake all reasonable efforts to avoid undue adverse impacts to adjacent properties and/or uses that may arise from the construction, operation, maintenance, modification and removal of the facility.

48. The site and the facility must be maintained in a neat and clean manner and in accordance with all approved plans and conditions of approval.

49. Permittee shall promptly remove any graffiti on the wireless facility at permittee's sole expense within 48 hours after notice.

Prior to Operation

50. The applicant shall request a final Department of Regional Planning inspection and final building inspection immediately after the wireless facility has been installed and prior to the commencement of services.

51. Within thirty (30) calendar days following the installation of any wireless communications facilities, the applicant shall provide to the Department of Regional Planning with a field report prepared by a qualified engineer verifying that the unit has been inspected, tested, and is operating in compliance with FCC standards. Specifically, the on- site post-installation radiofrequency (RF) emissions testing must demonstrate actual compliance with the FCC OET Bulletin 65 RF emissions safety guidelines for general population/uncontrolled RF exposure in all sectors. For this testing, the transmitter shall be operating at maximum operating power, and the testing shall occur outwards to a distance where the RF emissions no longer exceed the uncontrolled/general population limit. Such report and documentation shall include the make and model (or other identifying information) of the unit tested, the date and time of the inspection, a certification that the unit is properly installed and working within applicable FCC limits, and a specific notation of the distance from the transmitter at which the emissions are equal to or less than the uncontrolled/general population limit.

52. The operation of the approved facility shall commence no later than one (1) month after the county completes its post-installation inspections of the facility, any issues with the facility are resolved, and the county receives the RF

testing report required in the condition of approval above, or the development or conditional use permit will expire without further action by the county.

Fixed Conditions

53. Violation of any of the conditions of this approval shall be cause for revocation and termination of all rights thereunder.

Eligible Facilities Requests

All permits for an eligible facilities requests shall be subject to the following conditions and all of the other conditions of approval placed on a Ministerial Permit or Conditional Use Permit, unless modified by the review authority:

54. Any permit granted in response to an application qualifying as an eligible facilities request shall be subject to the terms and conditions of the underlying permit.

55. The county's grant or grant by operation of law of an eligible facilities request permit constitutes a federally-mandated modification to the underlying permit or approval for the subject tower or base station. Notwithstanding any permit duration established in another permit condition, the county's grant or grant by operation of law of a eligible facilities request permit will not extend the permit term for the underlying permit or any other underlying regulatory approval, and its term shall be coterminous with the underlying permit or other regulatory approval for the subject tower or base station.

56. The county's grant or grant by operation of law of an eligible facilities request does not waive, and shall not be construed to waive, any standing by the county to challenge Section 6409(a) of the Spectrum Act, any FCC rules that interpret Section 6409(a) of the Spectrum Act, or any modification to Section 6409(a) of the Spectrum Act.

Small Cell Facilities

In addition to the other conditions of approval placed on a Ministerial Permit or Conditional Use Permit, all permits for a small cell facility shall be subject to the following additional condition, unless modified by the review authority:

57. The county's grant of a permit for a small cell facility request does not waive, and shall not be construed to waive, any standing by the county to challenge any FCC orders or rules related to small cell facilities, or any modification to those FCC orders or rules.

58. The permittee and the personal wireless facility shall comply with Americans with Disabilities Act (ADA) requirements and Title 22, Chapter 22.182.

~~K~~L. Waivers.

1. For personal wireless service facilities subject to Subsection ~~CD~~D.2, above, the Commission or Hearing Officer may grant a waiver to one or more of the development standards in this Section if the Commission or Hearing Officer determines that the applicant has established through clear and convincing evidence that the denial of an application would:

a. Prohibit or effectively prohibit the provision of personal wireless services pursuant to 47 U.S.C. § 332(c)(7)(B)(i)(II);

b. Otherwise violate applicable laws or regulations; or

~~c.~~ Require a technically infeasible design or installation of a wireless facility.

2. When a determination is made to grant a waiver, one or more of the applicable design or location standards may be waived, but only to the minimum extent required to avoid the prohibition, violation, or technically infeasible design or installation, and that does not compromise public safety.

SECTION 14. Section 22.250.010 is hereby amended to read as follows:

22.250.010 Filing Fees and Deposits.

A. For the purpose of defraying the expense involved in connection with any application or petition required or authorized by this Title 22, the following fees, as provided in Table 22.250.010-A, below, shall accompany the application or petition. Table 22.250.010-A may be referred to as the Filing Fee Schedule.

TABLE 22.250.010-A: FILING FEE SCHEDULE		
…	…	
Site Plan Review, Ministerial	…	…

	Small cell wireless facilities on existing structures – for up to five facilities	$500
	Small cell wireless facilities on existing structures– for each facility beyond the first five facilities	$100
	Small cell wireless facilities on new structure – for each new structure	$1,000
…	…	…

~~Table 22.250.010-A may be referred to as the Filing Fee Schedule.~~

SECTION 15. Severability. If any section, subsection, provision, sentence, clause, phrase or word of this Ordinance is for any reason held to be illegal or otherwise invalid by any court of competent jurisdiction, such invalidity shall be severable, and shall not affect or impair any remaining section, subsection, provision, sentence, clause, phrase or word included within this Ordinance, it being the intent of the County that the remainder of the Ordinance shall be and shall remain in full force and effect, valid, and enforceable.

ATTACHMENT

TITLE 16 ORDINANCE – Fiber First Revisions to Proposed Ordinance

ORDINANCE NO. _____

An ordinance amending the Los Angeles County Code, Title 16 – Highways to establish regulations for small cell personal wireless service communication facilities in highways.

The Board of Supervisors of the County of Los Angeles ordains as follows:

SECTION 1. Chapter 16.25 is hereby added to Title 16 (Highways) of the County Code to reads as follows:

CHAPTER 16.25 SMALL CELL WIRELESS COMMUNICATION FACILITIES

16.25.010 Purpose and Scope.

The purpose of this chapter is to establish procedures and standards for the installation and modification of Personal Wireless Service small cell wireless communication facilities (SCF) and Eligible Facilities Requests (EFRs) associated with a SCF located within a Highway as defined in ~~highways.~~Section 16.04.100. Wireless facilities, including temporary wireless facilities, that are not SCF or Eligible Facilities pertaining to an SCF must comply with applicable provisions of Title 22 (Planning and Zoning) of the Los Angeles County Code, other applicable laws, ordinances and regulations, and obtain required approvals from county departments and public agencies. This chapter and Chapter 22.14 should be construed in *pari materia*.

16.25.020 Definitions.

The terms as used in this chapter are defined as follows~~:~~, but should be read in *pari materia* with the definitions contained in Section 22.14.230-W:

A. Applicant. "Applicant" means a person or entity applying for a permit pursuant to this chapter to install, maintain, modify or remove SCF or Eligible Facilities pertaining

to an SCF within a Highway. to provide Personal Wireless Service.

B. Base station. "“Base station"” means a structure or equipment, as defined in 47 C.F.R. § 1.6100(b)(1), or any successor provision, at a fixed location within a Highway that enables FCC-licensed or authorized SCF wireless communications between user equipment and a communications network. This term does not include a tower or any equipment associated with a tower..

C. C.F.R. "C.F.R." means the Code of Federal Regulations and references to such provisions in this chapter also includes successor provisions to those cited.

D. County infrastructure. “County infrastructure” means county-owned property, structures, objects, and/or equipment located within highwaysa Highway as defined in Section 16.04.100, including without limitation, free standing streetlights, traffic signals, and pedestrian lights.

E. Eligible Facilities Request. "Eligible facilities request" or "EFR" means a request for modification of an existing tower or base station that does not substantially change the physical dimensions of that tower or base station, and involves collocation, removal, or replacement of transmission equipment, as defined in 47 C.F.R. § 1.6100(b)(3) and within the meaning of the Spectrum Act or any successor provisions.. For the purposes of eligible facilities requests, collocation is as defined in 47 C.F.R. § 1.6100(b)(2), or any successor provisions.

F. FCC. “FCC” means the Federal Communications Commission or its lawful successor.

G. Owner. "Owner" means the party responsible for the SCF or Eligible Facility who is authorized to control and maintain the SCF or Eligible Facility, including the owner, licensee, or any other party who has authority and control over the SCF or Eligible Facility

Commented [wsmc1]: Sorry Ben was trying to clean up numbering and your comment was deleted. The definition of base station comes from FCC rules and it too excludes the "tower." "(1) Base station. A structure or equipment at a fixed location that enables Commission-licensed or authorized wireless communications between user equipment and a communications network. The term does not encompass a tower as defined in this subpart or any equipment associated with a tower. " Tower is also defined in (9) "Tower. Any structure built for the sole or primary purpose of supporting any Commission-licensed or authorized antennas and their associated facilities, including structures that are constructed for wireless communications services including, but not limited to, private, broadcast, and public safety services, as well as unlicensed wireless services and fixed wireless services such as microwave backhaul, and the associated site.

and their successors and/or assigns.

H. Permittee. “Permittee” means any person or entity granted a permit in accordance with this chapter.

I. Personal wireless services. As defined in 47 U.S.C. Section 332(c)(7)(C)(i), or any successor provision, commercial mobile services, unlicensed wireless services, and common carrier wireless exchange access services.

J. Small cell wireless communication facility or SCF. “Small cell wireless communication facility” or "SCF" means a “small wireless facility” as defined in 47 C.F.R. 1.6002(l), and in any successor provisions. and meets the conditions:

1. The facility Is mounted on a structure up to 50 feet in height, including antennas, as defined in 47 C.F.R. Section 1.1320(d), or is mounted on a structure and extends no more than 10 percent in height above other adjacent structures, whichever is greater;

2. Each antenna associated with the facility, excluding associated antenna equipment (as defined under “antenna” in 47 C.F.R. Section 1.1320(d)), is no more than three cubic feet in volume;

3. All other wireless equipment associated with the structure, including the wireless equipment associated with the antenna and any pre-existing associated equipment on the structure, is no more than 28 cubic feet in volume;

4. The facility does not require antenna structure registration under 47 C.F.R. Part 17;

5. The facility is not located on Tribal lands, as defined under 36 C.F.R. Section 800.16(x); and

6. The facility does not result in human exposure to radiofrequency radiation in excess of the applicable safety standards specified in 47 C.F.R. Section 1.1307(b).

K. Substantial change. As defined in 47 C.F.R. Section 1.6100(b)(7).

~~K.~~L. Support structure. As defined in 47 C.F.R. Section 1.6002(m) for "structure", a pole, tower, base station, or other building, whether or not it has an existing antenna facility, that is used or to be used for the provision of personal wireless service (whether on its own or comingled with other types of services). "Support structure" includes county infrastructure, streetlights, towers or utility poles.

~~L.~~M. Temporary SCF. "Temporary SCF" means an SCF intended or used to provide personal wireless services on a temporary or emergency basis, such as a large-scale special event in which more users than usual gather in a single location or following a duly proclaimed local or state emergency as defined in California Government Code Section 8558 requiring additional service capabilities. Temporary SCFs include without limitation, cells on wheels, sites on wheels, cells on light trucks, or other similar wireless facilities: (1) that will be in place for no more than six months (or such other longer time as the County may allow in light of the event or emergency); (2) for which required notice is provided to the FAA; (3) that do not require marking or lighting under FAA regulations; (4) that will not exceed the height limit in the applicable zone; and (5) that will either involve no excavation or involve excavation only as required to safely anchor the facility, as approved by the road commissioner.

~~M.~~N. Tower. "Tower" A structure that is built for the sole or primary purpose of supporting any FCC-licensed or authorized antennas as defined in 47 C.F.R. § 1.6100(b)(9), including on-site fencing, equipment, switches, wiring, cabling, power sources, shelters, or cabinets associated with that tower but not installed as part of an antenna. This definition does not include utility poles or light poles.

O. zz Wireless facility. The antenna facility used for the provision of personal wireless services at a fixed location, including, without limitation, any associated support

structure(s).

16.25.030 Permit required.

A. Permit. A permit issued pursuant to this chapter is required to authorize the installation, replacement, maintenance, modification or removal of any SCF in a Highway, including any temporary SCF, and any ~~eligible facilities requests~~EFRs pertaining to an SCF that received approval pursuant to this Division 1. All other ~~eligible facilities requests~~EFRs should be made pursuant to Title 22, Chapter 22.~~14.~~140 and Chapter 22.158, as applicable.

B. General Conditions: The general conditions for issuance of a permit under this section shall be the general conditions contained in Chapter 22.140.700 Wireless Facilities Section D.

C. Application~~.~~ Procedure

1. Application submittal. An applicant for an SCF shall submit an application for a permit on forms provided by the road commissioner~~,~~ containing all information that is required in this chapter ~~and in~~, section 16.08 of this Division 1 and Section 22.141.700.D.4, and providing payment of all application fees required pursuant to this Division 1. The applicant shall identify the written approval for use of the support structure or base station proposed for SCF consistent with section 16.25.060 and provide supportive documentation to the satisfaction of the road commissioner.

2. Design guidelines and permit checklist. The road commissioner may develop and issue design guidelines for SCFs, permit conditions for SCFs and EFRs, and permit checklists for SCFs and EFRs implementing the provisions of this chapter. The completed permit application and checklists for SCFs and EFRs shall demonstrate compliance with this chapter ~~for the application to be deemed complete.~~ and those guidelines.

3. ~~Installation~~The application shall contain detailed engineering plans, sealed by a California licensed professional engineer. The plans shall include, at minimum:

a. Address;

b. GIS coordinates;

c. a list of ~~county infrastructure. If the SCF is~~all associated equipment necessary for its operation;

d. a one-line diagram of the electrical system;

e. load calculation;

f. plot plan showing the location of the service disconnecting means;

g. short circuit and coordination study ("SCCS") calculated pursuant to ~~be mounted on new~~the IEEE 551-2006: Recommended Practice for Calculating AC Short-Circuit Currents in Industrial and Commercial Power Systems or ~~replacement county infrastructure, engineered plans shall be submitted for approval by~~ the latest version of that standard. The study must demonstrate the protection devices will ensure the equipment enclosure will not be breached. The SCCS must include analysis of Voltage Transient Surges due to contact of conductors of different voltages;

~~a.~~h. sufficient information for the road commissioner~~.~~ or his designee to verify that the facility will comply with all applicable zoning and safety codes and provisions, including but not limited to Title 22 (Planning and Zoning), the Electrical Code (Title 27), Mechanical Code (Title 29), Fire Code Title 32, and Building Code (Title 32);

i. a demonstration that the SCF and its supporting facility will meet APCO

ANS 2.106.1, Public Safety Grade Site Hardening Requirements.

~~3.~~4. Emergency work. For emergency SCF work, the permit application shall be submitted no later than one business day after the emergency SCF work is commenced.

~~4.~~5. Incomplete application. An application will be screened for completeness in conformity with this chapter, and applicable law, including any FCC-issued order(s). If the application is incomplete, the road commissioner shall notify the applicant in writing and specify the information or material(s) omitted from the application in a timely manner pursuant to any applicable law or order.

6. Notice and opportunity for hearing. The road commissioner shall verify that notice consistent with that required by Government Code Sections 65090-65094 and as provided by Section 22.222.110 is provided, using the Notification Radius provisions in Section 22.222.150.B. Notice pursuant to Government Code Section 25537 shall also be required. The road commissioner shall conduct a hearing prior to any issuance of the requested permit, using the procedures set out in Section 22.228.040.

~~5.~~7. Processing. An application shall be processed within the time period as specified by applicable law, including any FCC-issued order(s), in accordance with all applicable requirements and procedures for a permit identified in Title 16 – Highways, Division 1 – Highway Permits.

~~6.~~8. Decision on permit application. The road commissioner shall grant a permit when the road commissioner is satisfied that the SCF or EFR meets all applicable requirements for a permit under this chapter. Permits processed and granted pursuant to this chapter are subject to all provisions of Title 16 – Highways, Division 1 – Highway Permits, including the requirements of this chapter and any permit conditions imposed by

the commissioner. ~~The denial of a permit application shall be issued in writing and state the reasons for denial.~~ The road commissioner shall issue findings and decisions consistent with the requirements in Section 22.22.200. Provided, the road commissioner shall provide a notice to the supervisorial district office in which the property is located at least five working days prior to grant and issuance of the permit.

~~7.~~9. Final decision. The road commissioner's decision on an application submitted pursuant to this Chapter shall be the final action of the county~~.~~, subject to any objection by the supervisorial district office in which the property is located within five working days pursuant to Government Code Section 25537(c)(3). In the event of such objection and consistent with Government Code 25537 and 25538.1, the permit shall be subject to final approval by the board of supervisors at a regular meeting.

~~C~~D. County authority over Highways. The county's grant of a permit for a SCF or EFR does not waive, and shall not be construed to waive, any claims, authority or standing by the county to challenge any FCC orders or rules related to SCF or EFR in a Highway.

16.25.040 Other requirements.

A. ~~A.~~ Other applicable permits. Prior to the issuance of a permit for a SCF or EFR, the applicant shall obtain all required county and public agency permits and approvals, as applicable~~.~~, except that, consistent with Section 22.140.B, a ministerial or conditional use permit under Section 22.140.D.1 or 2 is not required.

B. ~~1.~~Issuance of a permit for SCF or EFR issued under this Title does not excuse the applicant from any requirement to obtain the necessary approvals from any other authority, including but not limited to required permits or approvals from a municipality within the county.

~~B.~~C. Regional Planning. A SCF or EFR on a ~~new~~ support structure located or to be located in a Highway identified as a Scenic Highway in the County General Plan, or to be located within the boundaries of a Coastal Zone or Significant Ecological Area, or within 50 feet of a Significant Ridgeline, as described in Title 22 of the county code, shall obtain land use approvals from Regional Planning.

~~C.~~D. Pre-existing SCF in the Highways. Any existing SCF in a Highway as of the adoption date of this chapter shall remain subject to the provisions of the county code and any applicable master license agreement or authorization in effect prior to this chapter, unless and until the agreement or authorization for such SCF to remain in the Highway expires, at which time the provisions of this chapter shall apply. Notwithstanding the above, any existing SCF in a Highway is subject to provisions of Title 16 – Highways, Division 1 – Highway Permits of the county code.

~~D.~~E. Public use. Except as otherwise provided by applicable law, any use of a Highway or county infrastructure authorized pursuant to this chapter is subordinate to the county's use and use by the public.

~~E.~~F. Order of use. To the extent feasible, the SCF shall utilize support structures in this order of preference: 1. Existing support structures, other than traffic signal poles; 2. Replacement support structures; 3. Traffic signal poles; 4. New ~~towers.~~ support structures.

~~F.~~G. Compliance with law, permits and agreements. SCF owners and permittees shall comply with all applicable federal, state and local laws, regulations, and other rules, permits, conditions, and any agreement with the county related to SCF.

H. Consistency with Comprehensive EIS under CEQA/NEPA. All permits under this Section require a finding of consistency with any programmatic EIS prepared

pursuant to NEPA or CEQA. If the permitting authority and applicant believe the proposed project is Categorically Exempt or subject to a Negative Declaration, it shall provide an Interim Analysis demonstrating a good faith effort to justify such claim.

16.25.050 Development Standards for SCFs.

In order to obtain a permit, SCFs shall comply with the following development standards and the design guidelines and checklist developed by the road commissioner pursuant to section 16.25.030.B.2:

A. ~~A.~~ Support structure concealment. All SCFs shall be stealth, meaning designed to look like something other than a wireless facility. The SCF and associated equipment, including antennas, radios, and cables, shall be concealed on or within the support structure, consistent with the design guidelines for SCF.

B. ~~B.~~ Location.

1. Preferred Locations. To better assist applicants, minimize unnecessary visual clutter, promote safety and limit other impacts to aesthetics and community character, the preferred locations for personal wireless service facilities are as follows:

a. Most Preferred: Industrial zones

b. Less Preferred: Commercial zones

c. Least Preferred: Residential & Rural Zones

2. Applications that seek a permit involving a Least Preferred location may be approved if the applicant proves with clear and convincing evidence that the denial of an application would prohibit or effectively prohibit the provision of personal wireless services pursuant to 47 U.S.C. § 332(c)(7)(B)(i)(II) or otherwise violate applicable laws or regulations.

~~1.~~3. The location or placement of SCF shall not interfere with the use of the Highway; impede the flow of vehicular or pedestrian traffic; impair the primary use and

purpose of traffic signals, streetlights, utility poles, other support structures, signs, or other county infrastructure in the Highway; interfere with outdoor dining areas or emergency facilities; or otherwise obstruct the accessibility of the Highway. SCFs and associated equipment in the Highway shall comply with Americans with Disabilities Act (ADA) requirements. and Title 22, Chapter 22.182.

2.4. Temporary facilities. In addition to the standards set forth in this section, temporary SCFs shall be located at least six feet from existing wireless communication facilities, support structures, or county equipment, and comply with Americans with Disabilities Act (ADA) requirements.

C. Structural integrity. All SCFs shall comply with applicable utility facilities construction standards including but not limited to California Public Utilities Commission General Order 95, and APCO ANS 2.106.1, Public Safety Grade Site Hardening Requirements or their successor provisions. A SCF and its associated equipment to be mounted on an existing support structure shall not compromise the structural integrity of the support structure. If the SCF or its equipment to be mounted on the support structure affects its structural integrity, a replacement support structure shall be installed that will accommodate the SCF and its associated equipment. If the proposed new or replacement support structure is county infrastructure, the structure shall adhere to all terms, conditions, and guidelines of any agreement or master license agreement between the county and the owner. If any SCF is requested to be placed on county infrastructure, then a structural analysis of the effect of such placement on the county infrastructure, including wind impacts on traffic signal poles and mast arms of traffic signals, shall be provided for review and approval to ensure there is no overburden on county infrastructure.

~~infrastructure.~~

D. Height. The combined height of the support structure and antenna(s) for a SCF shall not exceed the lesser of:

1. The height limitation in 47 C.F.R. 1.6002(l), and any successor provisions, or

2. The height of other support structures in the surrounding area, or

3. The height limit of the zone in which the new or replacement support structure is to be located.

In no event shall the antenna(s) on the support structure be placed lower than eight feet above the ground.

E. ~~E.~~ Placement of pole-mounted antennas and associated equipment.

1. Streetlights. Antennas or other associated equipment to be mounted on or integrated in a streetlight shall be placed in a manner that does not block or otherwise impede the illumination of the lighting to the ground.

2. Utility poles. If a cross-arm is the only technically feasible option to mount SCF and any associated equipment on a utility pole, then each side-arm assembly shall not extend further than four feet from the center of the pole in either direction. A ~~crossarm~~cross- arm shall not exceed a total length of eight feet. No additional extensions or mounting equipment are permitted between the side-arm and the pole. Antennas or associated equipment to be mounted on or integrated in a utility pole shall be placed in a manner that does not block or otherwise impede the illumination of street lighting to the ground.

3. All antennas or associated SCF equipment shall be installed at least five feet from any existing radio equipment on county infrastructure. If the county requires radio equipment to be installed on the support structure, the SCF antenna(s) and its

associated equipment shall be relocated to maintain the five feet separation at the cost of the permittee and/or owner.

F. Power supply. Co-mingling or sharing circuits used for county power service is prohibited.

G. Prohibition of generators. Separate, above-ground generators for SCFs shall be prohibited in any Highway.

H. Lighting. No SCF shall contain artificial lighting that is in addition to any existing illumination provided by the support structure, such as a streetlight luminaire, unless otherwise required by applicable county, state or federal regulations.

I. Strand mounting. Strand mounted antennas are prohibited.

~~I.~~J. Waiver of Development Standards.

1. Requests for waivers of any development standards identified in this section shall be made in writing to the road commissioner. A deposit pursuant to Chapter 16.10.130 shall be collected for a waiver request for consideration by the road commissioner to cover the county's review and processing costs.

2. The road commissioner may grant a waiver of the development standards if the applicant establishes ~~to the satisfaction of the road commissioner~~with clear and convincing evidence that the denial of such request would:

a. Prohibit or effectively prohibit the provision of personal wireless services;

b. Violate applicable laws, regulations or the written agreement or master license agreement with the county; or

c. Require a technically infeasible design or installation of SCF.

When a waiver is granted by the road commissioner, the waived development

standard(s) may be waived only to the minimum extent required to avoid the prohibition, violation or technically infeasible design or installation, as determined by the road commissioner.

3. The road commissioner may deny a waiver request upon determining any one of the following apply:

a. The request does not satisfy any condition in subsection I.2,

b. A waiver from one or more development standards would result in a violation of applicable legal requirements, or

c. The development standard is needed to maintain public safety or public use.

16.25.060 Authority to use Support Structures.

A. County Infrastructure. The placement of SCFs on county infrastructure in the Highway shall be subject to a written agreement or master license agreement with the county. The agreement shall specify the compensation to the county for use of the county infrastructure, including additional maintenance costs incurred by the county due to the placement of the SCF and associated equipment on county infrastructure. Any person or entity seeking an agreement or master license agreement with the county shall reimburse the county for all costs incurred in connection with its review of, and action upon such request. Such agreement or master license agreement shall be signed by the county and the owner prior to the issuance of a permit on county infrastructure pursuant to this chapter. Every agreement or master license agreement approved by the county for placement of SCF in the Highway shall be granted upon and be subject to such rules, regulations, restrictions, terms and conditions as are incorporated therein by reference, and except as otherwise expressly provided in the agreement or master license

agreement, is subject to the rules, regulations, restrictions, terms and conditions set forth in this chapter.

B. Other Support Structures. The placement of SCF on support structures in the Highway that is not county infrastructure shall be authorized by the entity that owns, operates and/or controls the support structure.

16.25.070 Violations, unpermitted facilities, revocations and relocations.

A. Violations. Any violation of this chapter, including violations of federal, state, and country laws, by a permittee or owner shall be subject to the same penalties described in Chapter 16.28 of the county code. Penalties for violations of any agreement or master license agreement between the owner and the county, if applicable, are in addition to penalties for violations of the county code.

B. Unpermitted facilities. A SCF installed without a permit and/or authorization to utilize the support structure consistent with section 16.25.060, shall be removed within 90 days, following the issuance of a written notice from the road commissioner, or as otherwise determined by the road commissioner; provided that the support structure owned by the county, a utility, or other entity authorized to maintain the support structure in a Highway need not be removed, but the structure shall be restored to its condition prior to such unpermitted work, except as specifically allowed by the county. A permit shall be required for the removal of such SCF. All costs incurred by the county in connection with the removal shall be paid for by the owner.

C. Revocations. A permit may be revoked for failure to comply with applicable standards, law, or the agreement with the county. Upon revocation, the SCF shall be removed at the expense of the owner or permittee within 90 days or as determined by the road commissioner, or in accordance with the terms and conditions of a license

agreement between the owner and the county.

D. Relocations. A SCF shall be relocated within 90 days of a request by the county when the road commissioner determines a paramount need of the county, due to a change in street alignment, construction, expansion, permanent closure of a street, sale of county property, public improvement project, or other determination by the road commissioner. The owner of the SCF shall relocate the equipment at its own expense to an alternative location. Required permit(s), and other approvals as applicable, shall be obtained prior to relocation.

SECTION 3. Severability. If any section, subsection, provision, sentence, clause, phrase or word of this Ordinance is for any reason held to be illegal or otherwise invalid by any court of competent jurisdiction, such invalidity shall be severable, and shall not affect or impair any remaining section, subsection, provision, sentence, clause, phrase or word included within this Ordinance, it being the intent of the county that the remainder of the Ordinance shall be and shall remain in full force and effect, valid, and enforceable.

From: Beate <newdna@gmail.com>
Sent: Wednesday, October 19, 2022 10:50 AM
To: DRP Public Comment <comment@planning.lacounty.gov>
Subject: PROJECT NO. 2021-002931-(1-5)

Re. CASE NOS. RPPL2021007939-(1-5) and RPPL2021007941-(1-5) SMALL CELL FACILITY

My name is Beate Nilsen, residing in Malibu CA, email above, phone 310-456-6984, and not the applicant.

I'd like to make it known that I strenuously disapprove of placing small cell broadcasters every 650 feet within my town. I presume you know this is a high-real estate zone with home prices ranging from $7 million for "just the sand," up to $57 million - for Kanye West's Japanese architectural icon - to Max Pavlevsky's ex-pad, going for $125 million in northern Malibu.

Property values are not pleasantly affected by broadcasting devices every few houses blasting frequencies. Might as well paint in a High-tension electrical pylon and wash yr hands of ever selling anything.

Laws now streamline the installation of CPMRA-WTFs in public rights-of-way — installing many CPMRA-WTFs as close as 15 to 50 feet from homes — create hazards for residents' safety, privacy and property values.

Wireless antennas attached to utility poles, light poles and other street furniture emit pulsed, data-modulated, Radio-frequency Electro-magnetic Microwave Radiation (RF-EMR) just like macro cell towers. Many of the Amphenol antennas being installed for 4G CPMRA-WTFs have a maximum rated power input of 2,200 Watts, with an additional 3 dB of headroom, allowing them to accept a power input of 4,400 Watts. This is before an antenna gain of 10x to 12x is applied to focus and amplify the signal (see http://scientists4wiredtech.com/santarosa/cell-tower-specs/).
As first installed, the antennas are typically fed by power from the radios at half or less than the maximum 240 Watts of output power from three Ericcson radios, peak RF microwave radiation exposures at ground level 100 feet from the antenna of 162,100 μW/m² (microwatts per square meter) of RF-EMR exposure. Since one only needs about 0.02 μW/m² of RF-EMR to get five bars on a cell phone, 162,100 μW/m² RF-EMR exposure is clearly overkill.

We all have fiberoptic here in Malibu, installed at great cost to the customer by Verizon. Again, using OUR money. The fiberoptic signal, completely clean and radiation-free, can be hardwired directly into the house, and provides faster and better computer service without wireless broadcasting devices 15 feet from our front doors.

Let's use what we have instead of clogging the neighborhood with radiation. Thank you.

--

All the Best, Beate Nilsen
Malibu Rd 90265
Click to
Feed the Hungry: Free !!

Gmail **Jodi Nelson <jnelson10987@gmail.com>**

Vote "no" on the current version of Title 16 & 22

1 message

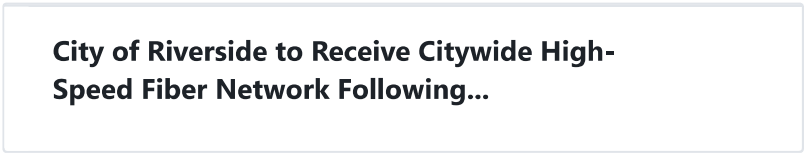
Katie Stone <katiestone90@yahoo.com> Fri, Nov 4, 2022 at 1:03 PM
To: "Firstdistrict@bos.lacounty.gov" <Firstdistrict@bos.lacounty.gov>, "HollyJMitchell@bos.lacounty.gov" <HollyJMitchell@bos.lacounty.gov>, "Sheila@bos.lacounty.gov" <Sheila@bos.lacounty.gov>, "Fourthdistrict@bos.lacounty.gov" <Fourthdistrict@bos.lacounty.gov>, "Kathryn@bos.lacounty.gov" <Kathryn@bos.lacounty.gov>, "executiveoffice@bos.lacounty.gov" <executiveoffice@bos.lacounty.gov>

Dear Board of Supervisors:

I urge you to vote "no" on the current version of Title 16 & 22

Immediate federal funding under BEAD and Infrastructure Act is being denied to underserved, poor, and minority communities that demand superior optical fiber Internet access. Based on the assumption that fiber to the home will require disruptive practices with noisy equipment and digging up streets and extending deployment for months or years. This is not true as there are many processes that can hasten fiber infrastructure and minimize any disruption to communities. Fiber to the Home (FTTH) Fiber Optic Solutions | OFS (ofsoptics.com); Deployment Methods of FTTH - Meldium

The BOS recognizes the **superiority of fiber** to the home as noted in BOS meetings, but are under the impression that it will be too expensive and take too long. But many communities have found that in the long run, this is not true. As well, fiber services are more affordable **to the end user** without suprise add-ons for additional services and is therefore a more **equitable choice** for financially strapped unserved and underserved communities. See this article for more information. City of Riverside to Receive Citywide High-Speed Fiber Network Following Approval of Agreement with SiFi Networks | riversideca.gov



I urge you to prioritize futureproof fiber to the home (FTTH) for the very reasons outlined by our federal government agency the NTIA which is based on the clear superiority of fiberoptic systems in terms of security, scalability, safety, long-term cost and consumer preference. Fiber to the home is the only way to solve the digital divide once and for all.

Katie Smith

I live in Stevenson Ranch where AT&T is proposing a 75-95 foot cell tower in the middle of the residential community (zoned at 35 feet) and next to the elementary school. During the hearing approving the cell tower (which has been appealed) Regional Planning testified that they do not have sufficient resources to review AT&T's technical materials. To ensure Regional Planning has the necessary resources, an amendment to the Wireless Facility Ordinance requiring applicants pay for the County to hire an independent consultant to review technical materials is necessary. Such a process ensures transparency and provides reassurance to the families living in the communities that will be impacted by the cell towers.

I also believe that cell towers should be prohibited from being within 1500 feet of schools.

Holly J. Mitchell, Chair
Sheila Kuehl Chair, Pro Tem
Hilda L. Solis, Supervisor
Janice Hahn, Supervisor
Kathryn Barger, Supervisor
Celia Zavala, Executive Officer

November 15, 2022 Agenda Item 7
Hearing on Project No. R2021-002931-(1-5), for the Wireless Facilities Ordinance
Hearing on Project No. R2021-002931-(1-5), Advance Planning Case No. RPPL2021007939-(1-5), amending County Codes, Title 16 - Highways and Title 22 - Planning and Zoning, to establish application requirements and land use regulations, including zoning and development standards, for wireless communication facilities
(Departments of Public Works and Regional Planning) (22-3462)

Children's Health Defense Written Comments on Wireless Facilities Ordinances

To the Honorable Board of Supervisors:

Please accept these written comments submitted by Children's Health Defense ("CHD"). CHD is organized under California law. We have many members in Los Angeles County. These comments are submitted on behalf of the organization and in a representational capacity for its Los Angeles County members, all of whom will be affected by any revision to the County's wireless-related ordinances.

CHD is one of the organizations that, along with many individuals, has joined in the collaborative efforts led by Fiber First Los Angeles County ("FFLA"). We support the FFLA recommendations and positions. Specifically, we oppose the amendments brought forward by County staff on the merits. We support the FFLA red-lines to the Staff's draft ordinances. We adopt and agree with the FFLA California Environmental Quality Act ("CEQA") legal analysis demonstrating that the claimed CEQA exemptions do not apply and/or there are exceptions that eliminate any exemptions. There must be a far more engaging analysis of the significant environmental impacts that would obtain if the Staff's proposed ordinances are adopted and the wireless facility permitting regime contemplated by those proposed ordinances goes into effect.

Assuming (without admitting) the Staff's position on CEQA is correct, the proposed ordinance terms should still not be adopted. Instead, the FFLA red-lines that are also before you should form the basis of your deliberations. There are many compelling reasons this is so. We will list only some of the more significant reasons below:

- The Staff proposals are part of a larger policy decision to emphasize wireless-centric "digital divide" "solutions" that will actually worsen the divide. Historically disadvantaged communities, families and small businesses will continue to suffer lower quality broadband options in comparison to the traditionally privileged that already have fiber-based solutions. Wireless

broadband is not and will never be an adequate or affordable source for those who need and rely on truly advanced network capabilities. The Board must direct Staff to focus on policies and actions that emphasize fiber to the premises, not just fiber to some wireless node.

- The Staff proposals eliminate all public notice and will functionally prevent Los Angeles County residents from being able to know about and contest many types of proposed wireless facility permit applications, even those that would directly abut or even be located on their property. People will learn about a project that directly impacts them and their property interests only when construction begins and it is too late to do anything about it. This violates due process and is simply unfair. Nor is it allowed under state law, including but not limited to CEQA and the several relevant Government Code provisions that directly and indirectly apply to wireless land use and encroachment permits.[1]
- The Staff proposal to institute "ministerial" review of wireless applications in both Title 16 and 22 is particularly inappropriate. First, the particulars of the proposal do not meet the definition of "ministerial" in CEQA because they still allow some amount of discretion and subjective judgment. But more importantly, even this limited amount of discretion and judgment is inadequate. Every permit application for an individual project will necessarily demand far more flexibility depending on the specific circumstances. Each will give rise to some level of policy decision-making. These are not cookies that can be shaped for baking by a formalistic, always-applied cutter.
- The Staff proposals are not sufficiently protective of local values and choices in terms of location preferences, aesthetics or residential property values. They would allow many wireless facilities to be placed far too close to homes and other locations like schools and open spaces.
- The Staff proposals would allow placement in environmentally-sensitive and/or historically important areas where they simply do not belong.
- The Staff proposals completely ignore the significant fire risks posed by wireless facilities. This is so despite the fact that Los Angeles County has already experienced several devastating fires that were caused or made worse by telecommunications equipment failures. The Staff proposal does not consider the fact that Los Angeles County is in an earthquake-prone area that demands far more by way of structural integrity design.

[1] There are many applicable state laws that contemplate notice and hearing. Only two examples will be cited. Government Code Sec. 65850.6(a)(1) and (b) require that any colocation authorization be a "discretionary permit." It therefore does not contemplate a "ministerial" process. Section 65850.6(a)(2) and (b)(4) require a CEQA "negative declaration or modified negative declaration" and accordingly it does not allow proceeding under a claimed "exemption." Subsection (c) mandates "at least one public hearing on the discretionary permit." The state-level shot-clock based "deemed approved" remedy for certain facility types also expressly contemplates "public notice." *See* Government Code Sec. 65904.1(a)(2).

- The Staff proposals lack sufficient application content requirements. As a result it will not be possible to fully identify potential issues at the beginning. This will lead to more, not fewer, "shot clock" issues and failures.
- The Staff proposals lack essential permit conditions.
- The Staff's primary rationale for all this – that it is necessary or even mandated by the federal Communications Act or FCC rules (and in particular those relating to "shot clocks") – is simply false. The Communications Act expressly leaves many of these decisions to local permitting authorities – for both facilities on right-of-way and on private property. The FCC has made it clear that the "shot clock" rules do not override local and state notice and hearing or other procedural requirements. Nothing in any federal rule or statute preempts CEQA requirements.

The FFLA red-lines address and resolve all of the foregoing problems. For that reason CHD commends and adopts them and we respectfully request that the Board use them instead of the Staff proposals as the basis for your deliberation. Equally important, CHD strongly suggests that the Board not adopt the Staff's recommendation that the Board find that this project is exempt from CEQA environmental review.

Respectfully Submitted,

Mariam Eckenfels-Garcia
Director, EMR & Wireless Program
Children's Health Defense

Susan Foster

PO Box 1444
Lyons, CO 80540
susan.foster04@gmail.com

November 15, 2022

Holly J. Mitchell, Chair
Sheila Kuehl Chair, Pro Tem
Hilda L. Solis, Supervisor
Janice Hahn, Supervisor
Kathryn Barger, Supervisor
Celia Zavala, Executive Officer

Agenda Item 7 – Wireless Ordinances

To the Honorable Board of Supervisors:

Please accept these written comments submitted by California Fires and Firefighters. This nonprofit is organized under Colorado law.

As Co-Founder of California Fires and Firefighters, much of my experience working on fire prevention in California is reflected in multiple local zoning ordinances and appeals on behalf of California firefighters from San Diego County in 2001 to the City of Malibu in 2021.

The comments are contained within the attached White Paper:

PROTECTING LA COUNTY'S FUTURE:

HOW FIRE RISKS FROM TELECOMMUNICATIONS EQUIPMENT, CLIMATE CHALLENGES & A DANGEROUS SHIFT AWAY FROM ENVIRONMENTAL REVIEW THREATEN LOS ANGELES COUNTY'S FUTURE

These comments are submitted on behalf of the organization and in a representational capacity for all of Los Angeles County residents, including the firefighters who live and work in Los Angeles County and their families, who will be affected by any revision to the County's wireless ordinances.

Respectfully submitted,

Susan Foster
Co-Founder, California Fires and Firefighters

Attachment

Gmail **Jodi Nelson <jnelson10987@gmail.com>**

vote "no" on the current version of Title 16 & 22.

1 message

Bar Par <barpar1120@hotmail.com> Fri, Nov 4, 2022 at 9:33 PM
To: "Firstdistrict@bos.lacounty.gov" <Firstdistrict@bos.lacounty.gov>, "HollyJMitchell@bos.lacounty.gov" <HollyJMitchell@bos.lacounty.gov>, "Sheila@bos.lacounty.gov" <Sheila@bos.lacounty.gov>, "Fourthdistrict@bos.lacounty.gov" <Fourthdistrict@bos.lacounty.gov>, "Kathryn@bos.lacounty.gov" <Kathryn@bos.lacounty.gov>, "executiveoffice@bos.lacounty.gov" <executiveoffice@bos.lacounty.gov>
Cc: "jnelson10987@gmail.com" <jnelson10987@gmail.com>

Dear Board of Supervisors:

I urge you to vote "no" on the current version of Title 16 & 22.

The magnitude of finally solving the digital divide once and for all is a subject that the BOS does not take lightly, as clearly expressed during past hearings. But it is **socially unjust** and unconscionable to streamline Title 16 & 22 and rush services to communities that have been notoriously redlined. Inferior wireless will not give these communities equitable broadband and will not solve the digital divide. It will only prolong it.

The industry is making false claims relating to wireless solving the Digital Divide. Wireless service will not be able to provide the robust services that a family needs and that new technology will demand. **Equitable, futureproof** service is fiber to the home!

Fiber to the home has been prioritized by the Federal Government because it's superior to wireless based on access, overall cost of infrastructure, equitable service, enhancing economic growth, specific speeds for upload and download; reliability of service, consistency in quality of service, and affordability to the end user. Wireless doesn't compare to fiber when it comes to any of these issues.

I urge you to prioritize futureproof fiber to the home (FTTH) for the very reasons outlined by our federal government agency the NTIA which is based on the clear superiority of fiberoptic systems in terms of security, scalability, safety, long-term cost and consumer preference. Fiber to the home is the only way to solve the digital divide once and for all.

Barbara Paris

I live in Stevenson Ranch where AT&T is proposing a 75-95 foot cell tower in the middle of the residential community (zoned at 35 feet) and next to the elementary school. During the hearing approving the cell tower (which has been appealed) Regional Planning testified that they do not have sufficient resources to review AT&T's technical materials. To ensure Regional Planning has the necessary resources, an amendment to the Wireless Facility Ordinance requiring applicants pay for the County to hire an independent consultant to review technical materials is necessary. Such a process ensures transparency and provides reassurance to the families living in the communities that will be impacted by the cell towers.

I also believe that cell towers should be prohibited from being within 1500 feet of schools. The Newhall District, which will be impacted by the cell tower, supports such a prohibition. The safety of the families, especially the children, requires that more attention and care be given when such an intrusive project is proposed within a residential community.

Thank you.

From: ExecutiveOffice
Sent: Monday, November 7, 2022 2:08 PM
To: PublicComments
Subject: FW: cell phone tower ordinance

Follow Up Flag: Follow up
Flag Status: Completed

The following correspondence is being forwarded to you for your review/information.

From: Jennifer LaPorta <jenniferlaporta1@gmail.com>
Sent: Monday, November 7, 2022 8:48 AM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: cell phone tower ordinance

Dear LA County Board of Supervisors,

Regarding your vote on 11/15/22, I urge you to adopt the "redlined" versions of Title 16 and 22 that were submitted by Fiber First LA. The placement of wireless infrastructure must have public knowledge and input. It is UNDEMOCRATIC to pass a measure that would omit public notice, setbacks, oversight, safety or environmental review or any opportunities for appeal.

Sincerely,
Jennifer LaPorta

From: ExecutiveOffice
Sent: Monday, November 7, 2022 2:00 PM
To: PublicComments
Subject: FW: cellphone tower ordinance

The following correspondence is being forwarded to you for your review/information.

From: t <sloowlearner@yahoo.com>
Sent: Monday, November 7, 2022 10:24 AM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: Re: cellphone tower ordinance

On Monday, November 7, 2022 at 08:47:51 AM PST, Jennifer LaPorta <jenniferlaporta1@gmail.com> wrote:

Dear LA County Board of Supervisors,

Regarding your vote on 11/15/22, I urge you to adopt the "redlined" versions of Title 16 and 22 that were submitted by Fiber First LA. The placement of wireless infrastructure must have public knowledge and input. It's not right to pass a measure that would omit public notice, setbacks, oversight, safety or environmental review or any opportunities for appeal.

Sincerely,
Tom LaPorta, RN,EET

From: ExecutiveOffice
Sent: Thursday, November 10, 2022 4:55 PM
To: First District; Holly J. Mitchell; Sheila; Supervisor Janice Hahn (Fourth District); Barger, Kathryn; PublicComments
Subject: FW: changes to title 16 and 22 LA County code for November 15 meeting

The following correspondence is being forwarded to you for your review/information. Note: This is in regards to Agenda Item #7 for Tuesday, November 15, 2022 Board meeting.

From: bibicaspari@gmail.com <bibicaspari@gmail.com>
Sent: Thursday, November 10, 2022 3:22 PM
To: ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: changes to title 16 and 22 LA County code for November 15 meeting

To the Board of Supervisors - I do not want a cell tower put up outside my home, on my street, or in my community without safety provisions, regulation, oversight, informed consent, or opportunity for appeal. The thought of this terrifies me! I urge the supervisors to incorporate into the LA County code the redlined copy of title 16 and title 22 that was submitted by Fiber First LA. Please! To protect us and our children. Thank you. Sincerely, Bibi Caspari
3771 Glenfeliz Blvd, Los Angeles, CA 90039
323-660-3027

From: ExecutiveOffice
Sent: Friday, November 4, 2022 7:37 AM
To: PublicComments; PublicHearing
Cc: ExecutiveOffice
Subject: FW: I urge you to vote NO to the current amendments for Titles 16 & 22/

From: David Scharff <dscharff2005@yahoo.com>
Sent: Thursday, November 3, 2022 3:12 PM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: I urge you to vote NO to the current amendments for Titles 16 & 22/

PLEASE ADD THIS TO THE PUBLIC RECORD FOR TITLE 16 & 22 - 11/15/22 HEARING

Please forward this letter to the Board of Supervisors

- I urge the BOS' s to vote no on its current version of Title 16 & 22.

- I urge you to prioritize futureproof fiber to the home (FTTH) for the very reasons outlined by our federal government agency the NTIA which is based on the clear superiority of fiberoptic systems in terms of security, scalability, safety, long-term cost and consumer preference. Fiber to the home is the only way to solve the digital divide once and for all.

Fairness and Due Process

- I do not want a tower showing up in my front yard with no hearing and no ability to have my voice heard in the public record. It' s simply illegal.

- The draft Title 16 & 22 amendments remove public notification and public hearings. They will remove the public - the most important stakeholders from these decisions - those who will be directly affected by individual projects and infrastructure as a whole. These are the ones most impacted by a facility siting decision. Removing the public is not only unfair, it' s undemocratic. It also violates basic due process because it will impact their personal and property interests. There must be adequate notice and an opportunity for hearing.

Environmental Concerns

- Research finds bees and pollinators absorb between 3% to 370% more of the higher frequencies of 5G, leading the scientists to warn, "This could lead to changes in insect behavior, physiology, and morphology over time…." California agriculture depends on healthy bee populations. Wireless wireless frequencies also interfere with birds' navigation systems and circadian rhythms, and can harm their development and reproduction and trees can be harmed by the standard radiation emissions from antenna equipment. Effects include altered growth, thinner cell walls and adverse biochemical changes
- Serious environmental impacts from plastic faux trees discharging hazardous waste involving microplastics, lead, and other Proposition 65 listed chemicals are being observed. What is the impact in environmentally sensitive areas? (See: https://www.theguardian.com/us-news/2022/oct/23/environmental-toxins-neurological-disorders-parkinsons-alzheimers?CMP=share_btn_link)
- Designated environmentally sensitive areas have not been considered and wireless frequencies pose a threat to these sensitive areas.
- Wireless deployments are highly energy intensive and inefficient, and therefore climate change unfriendly and violative of federal and state policy. A 2020 ABI Research DataCenter Forum white paper Environmentally Sustainable 5G Deployment reports that 5G could increase power consumption by 61 times from 2020 to 2030. This is one of numerous industry report stating that 5G and the phenomenal growth in internet traffic from the internet of things will dramatically increase energy consumption.

- Title 16 & 22 remove all **CEQA, NEPA, & NHPA**. The courts, the FCC and Telecommunications Act all preserve local environmental oversight. United Keetoowah Band of Cherokee Indians, et al v. FCC, 933 F.3d 728 (D.C. Cir., Aug 19, 2019). Some areas of LA County are near sensitive and historic areas that the courts have determined are covered under CEQA, NEPA & NHPA. The FCC has not preempted, and cannot preempt state environmental rules that go farther than do NEPA or NHPA, and its own rules (47 C.F.R. §§ 1.1307 and 1.1320) require an environmental assessment for any facility that "may have a significant environmental effect" on wilderness areas, wildlife preserves, threatened or endangered species, and designated critical habitats.
- Four major wildfires in Southern California have been started, in whole or in part, by telecommunications equipment. That includes the Woolsey Fire. Fire risk needs to be considered, especially in high fire risk areas. Title 16 & 22 remove any checks and balances to address these unique, very important, life threatening concerns.
- An Oct, 2022 Science Direct study shows that wildfire emissions in 2020 were 127 million metric tons (mmt); seven times the 2003–2019 mean. It also found that wildfires are the second most important source of emissions in 2020 and that these wildfires negate reductions in greenhouse gas emissions from other sectors. It also states that it's contributing to global damages due and climate change at a cost of $7.1 billion.
- **Wireless infrastructure harms bees, birds, and trees.** Scientific studies confirm that radiofrequency radiation (RFR) emissions from wireless infrastructure have contributed to the sharp decline in bee populations and have adversely affected navigation of birds as we as their growth and reproductive cycles. They also have identified harm to trees causing thinner cell walls and increased terpenes that make them more flammable. *https://www.sciencedirect.com/science/article/abs/pii/S0176161714001710*
- **Fake trees that contain camouflaged cell antennas discharge hazardous microplastics a well as lead (and other Prop 65 chemicals) into the environment.** **https://ehtrust.org/cell-towers-disguised-as-trees-create-microplastic-pollution-an-environmental-nightmare/**

Designated Historic Preservation Sites

- Title 16 & 22 remove any historical site protections. The courts, the FCC and the Telecommunications Act all preserve historical oversight. United Keetoowah Band of Cherokee Indians, et al v. FCC, 933 F.3d 728 (D.C. Cir., Aug 19, 2019). The FCC' s rules (47 C.F.R. §§1.1307 and 1.1320) require an environmental assessment for any facility that may have an adverse effect on districts, sites, buildings, structures or objects, significant in American history, architecture, archeology, engineering or culture, that are listed, or are eligible for listing, in the National Register of Historic Places." historic areas that the courts have determined are covered under CEQA, NEPA & NHPA. The FCC has not preempted, and cannot preempt state environmental rules that go farther than do NEPA or NHPA.

Health Impacts

- General health effects from RF/EMF exposure resulting from intensifying small cell and macro towers in highly densified populations with no monitoring or measurement of continuous, aggregate, and cumulative exposures. The FCC exercises no meaningful regulatory oversight over the location, operation or the levels of radiation emitted by wireless facilities. Therefore, local governments are citizens' first and only line of defense against the irresponsible placement and construction of telecommunications equipment. Title 16 & 22 are void of any safety precautions. RF Safety FAQ | Federal Communications Commission (fcc.gov)
- Health effects on already disabled communities, including those with EHS. https://ehtrust.org/science/electromagnetic-sensitivity/

Research Documents Children' s Vulnerability to Cell Phone Radio-frequency Radiation

- Children have smaller heads than adults. Cell phones and wireless radiation can go deeper into their brains because children have a shorter distance from their skull to their brain center. Government regulations were based on a 220-pound man' s head, not a child' s head. Our skulls actually slow down wireless as it moves into our brain. The thicker the skull, the more roadblocks to the wireless radiation moving forward. Since children have much thinner skulls than adults, they have less protection. Research shows that children can absorb up to ten times the radiation in the bone marrow of their skulls than adults https://ehtrust.org/childrencellphoneradiationeffects

  https://ehtrust.org/research-on-childrens-vulnerability-to-cell-phone-radio-frequency-radiation

- **There will be Health Impacts. This is no longer up for debate! The densification of the wireless radiation (RFR) in our environment is taking a biological toll on humans.** Continuous, aggregate, and cumulative exposure with no monitoring by any agencies is irresponsible at best. Well over a thousand studies have documented this harm. Especially vulnerable are the disabled, elderly, and environments such as schools, hospitals, retirement communities, airports, and essential emergency services (e.g. fire stations). https://ehtrust.org/science/top-experimental-epidemiological-studies

Social/Environmental Justice and the Digital Divide

- Special lack of information and vulnerability of minority populations. Despite outreach from LA County, most of the people in unserved and underserved areas are not informed about any available service, let alone fiber to the home. If they understood the superiority of fiber; it' s futureproof and end user affordable qualities, why would they choose wireless?

- The industry is making false claims relating to wireless solving the Digital Divide. Wireless service will not be able to provide the robust services that a family needs and that new technology will demand. **Equitable, futureproof** service is fiber to the home!

- Immediate federal funding under BEAD and Infrastructure Act is being denied to underserved, poor, and minority communities that demand superior optical

fiber Internet access. Based on the assumption that fiber to the home will require disruptive practices with noisy equipment and digging up streets and extending deployment for months or years. This is not true as there are many processes that can hasten fiber infrastructure and minimize any disruption to communities. Fiber to the Home (FTTH) Fiber Optic Solutions | OFS (ofsoptics.com); Deployment Methods of FTTH - Meldium

- The BOS recognizes the **superiority of fiber** to the home as noted in BOS meetings, but are under the impression that it will be too expensive and take too long. But many communities have found that in the long run, this is not true. As well, fiber services are more affordable **to the end user** without suprise add-ons for additional services and is therefore a more **equitable choice** for financially strapped unserved and underserved communities. See this article for more information. City of Riverside to Receive Citywide High-Speed Fiber Network Following Approval of Agreement with SiFi Networks | riversideca.gov

- Like many communities around the country L.A. County is currently addressing the digital divide and the BOS is in a unique position to be a leader in solving the digital divide in an **equitable,** thoughtful manner using fiber to the home. 2022 Fiber-To-The-Home Top 100 (bbcmag.com)

- In the haste of wanting to quickly address this issue, we can not let go of the prudence necessary to do it right. This is a **social justice** issue. If we do not get this right today, we will extend the digital divide into the next decade.

- The magnitude of finally solving the digital divide once and for all is a subject that the BOS does not take lightly, as clearly expressed during past hearings. But it is **socially unjust** and unconscionable to streamline Title 16 & 22 and rush services to communities that have been notoriously redlined. Inferior wireless will not give these communities equitable broadband and will not solve the digital divide. It will only prolong it.

- **Fiber to the home has been prioritized by the Federal Government** because it's superior to wireless based on access, overall cost of infrastructure, equitable service, enhancing economic growth, specific speeds for upload and download; reliability of service, consistency in quality of service, and affordability to the end user. Wireless doesn't compare to fiber when it comes to any of these issues.

- If we are truly concerned about **digital equity** we would be looking at ways to fund fiber instead of making it a "future" ambition as noted by the BOS's in meetings going back to November, 2021. http://file.lacounty.gov/SDSInter/bos/supdocs/163611.pdf

- The BOSs must think of the **long term** when considering broadband and changes to their ordinance for both wireless infrastructure and fiber. You must fight the temptation to cave in to industry spin with **underwhelming service that will not address the fundamental need of equitable broadband**. As some of the BOS's have stated many times in the past, this is a **civil rights issue**. Therefore, we must address this **equitably** and with the mindset that we will find a way to serve our communities with **robust, futureproof broadband** that will finally give unserved and underserved communities what they deserve, fiber optics.

- **They Remove Due Process. This is simply undemocratic and illegal!**
  There will be NO public notification, NO public hearings and NO opportunity for appeal. We can literally wake up one morning and see a tower or array being put up right next to our house or apartment. This removal of due process will apply to all sitings of telecommunications facilities (cell towers, small cells, and antenna arrays).

  ALL oversight from environmental rules such as CEQA, NEPA & NHP will be removed!
  The courts, the FCC and Telecommunications Act all preserve local environmental oversight. Environmental assessments are required for any facility that "may have a significant environmental effect" on wilderness areas, wildlife preserves, threatened or endangered species, and designated critical habitats.

Social Justice Issues and the Digital Divide- False Claims: The availability of viable alternatives- Fiber to the Premises (FTTP) are being suppressed.

It is **socially unjust** and unconscionable to streamline Titles 16 & 22 and rush wireless to communities that have been notoriously ignored by faster, safer, more future-proof fiber connectivity. Inferior wireless will not give these communities equitable broadband and will not solve the digital divide. It will only prolong it.

Fiber to the home has been prioritized by the Federal Government. It's superior to wireless based on access, overall cost of infrastructure, equitable service, enhancing economic growth, specific speeds for upload and download; reliability of service, consistency in quality of service, and affordability to the end user. Wireless doesn' t compare to fiber when it comes to any of these issues.

I urge you to vote no to the current amendments for Titles 16 & 22/

David Scharff

From: ExecutiveOffice
Sent: Monday, November 7, 2022 1:37 PM
To: PublicComments
Subject: FW: Must have public knowledge and input!

The following correspondence is being forwarded to you for your review/information.

From: Sangita Moskow <lisamoskow@rocketmail.com>
Sent: Sunday, November 6, 2022 2:30 PM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: Must have public knowledge and input!

Adopt "redlined" versions of Title 16 and 22 submitted by FiberFirstLA.

Thank you, L.S. Moskow

From: ExecutiveOffice
Sent: Thursday, November 10, 2022 3:12 PM
To: PublicComments
Subject: FW: No on Title 16 and 22 of LA Code, Our FCC Lawsuit Proved No Safe Level of Wireless Radiation for Children or Environment...

The following correspondence is being forwarded to you for your review/information.

From: contact thepeoplesinitiative.org <contact@thepeoplesinitiative.org>
Sent: Tuesday, November 8, 2022 8:00 AM
To: Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Fouthdistrict@bos.lacounty.gov; Barger, Kathryn <Kathryn@bos.lacounty.gov>; info@isd.lacounty.gov; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: No on Title 16 and 22 of LA Code, Our FCC Lawsuit Proved No Safe Level of Wireless Radiation for Children or Environment...

Dear Supervisors,

My name is Liz Barris and I am the director of ThePeoplesinitiative.org, a Los Angeles based 501c3 non profit whose focus is EMFs and human rights and the environment. I write you today on behalf of myself and the many members of our org who are electrosensitive (civilian term) microwave radiation poisoned (military term) and live in the Los Angeles area.

Recently, I was a party to the FCC lawsuit on EMFs and health effects, which the FCC ended up losing, as they had ignored the science and taken industry advice only on the safety standards or guidelines. Our suit proved there is no safe level of wireless radiation exposure for children or the environment including plants, animals, birds, tress and insects. Adults too, but due to politics in rule making, we were effectively prohibited from including them in our win, although as adults we are not prohibited from suing carriers, installers and municipalities, etc., but who wants to do that? Lawsuits are expensive, lengthy, an undesirable way to shape or create legislation and always a last resort. We really beg of you not to make us have to sue on this.

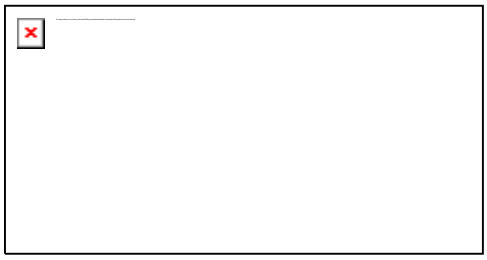
The proposed changes to Titles 16 and 22 of the Los Angeles County Code are a violation of human and environmental rights, could be a death sentence to some of us and surely will make previously healthy people, electrosensitive or worse. If any of you currently suffer from loss of energy, headaches, kidney, liver, digestive, lymph gland, heart, blood problems, cancer or any other serious or not so serious health problem but are not sure why, you may have to look no further than to your friendly neighborhood cell tower, WIFI, smart meter, cordless phone or cell phone for your answers. However, 5G will exacerbate nearly all health problems we currently are experiencing and would be illegal were it not for the lies the wireless industry and FCC continue to fabricate on this issue. We should all be able to have a say in where a cell tower or "small cells" are placed. And BTW, small cell = big radiation, it is much higher in frequency, power density and could have different pulse modulations than 4G, which is bad enough. The proposed changes to these titles would eliminate our right to be informed, let alone be able to block one of these damaging and deadly transmitters prior to installation, even were it to go up right outside our childrens bedroom window.

As our FCC lawsuit has proven, there is NO SAFE LEVEL OF WIRELESS RADIATION FOR CHILDREN. Until such time as the FCC has re-written their safety standards or guidelines, we should hold off on rolling out the red carpet for 5G transmitters appearing overnight right outside childrens bedrooms or anywhere else until the FCC has stepped up to the plate, reviewed the current science on this issue and re written the safety guidelines to incorporate them.

There are alternatives to 5G for high speed internet and video calls that do not involve cancer and other serious illnesses and that is through hard wired communications/fiber optics. In fact there is also federal money for this safe alternative. Fiber optics deliver high quality, high speed internet and voice calls with no health problems as an insidious side order. The changes to titles 16 and 22 are not necessary for us to receive those federal funds for fiber optics.

Please vote for fast internet for all, fairness and equality, health and life over illness and death and of course bridging any digital divides by and voting NO on the proposed changes to titles 16 and 22 and say YES to federal funding for fiber optics!

Sincerely,
Liz Barris
https://thepeoplesinitiative.org/
https://citizensforaradiationfreecommunity.org/
https://stopsmartgrid.org/
https://americanassociationforcellphonesafety.org/
https://www.prnewswire.com/news-releases/pilot-study-shows-dramatic-difference-in-brain-activity-with-ehs-electrohypersensitive-cases-as-compared-to-controls-non-ehs-300566854.html



Pilot Study Shows Dramatic Difference In Brain Activity With EHS (Electrohypersensitive) Cases As Compared To Controls (Non EHS). - PR Newswire

Pilot Study Shows Dramatic Difference In Brain Activity With EHS (Electrohypersensitive) Cases As Compared To Controls (Non EHS). PRESS TELE-CONFERENCE, THURS., Dec. 7th, 12 NOON PST.

www.prnewswire.com

From: ExecutiveOffice
Sent: Monday, November 7, 2022 8:20 AM
To: First District; Holly J. Mitchell; Sheila; Supervisor Janice Hahn (Fourth District); Barger, Kathryn; PublicComments
Subject: FW: PLEASE ADD THIS TO THE PUBLIC RECORD FOR TITLE 16 & 22 - 11/15/22 HEARING

The following correspondence is being forwarded to you for your review/information.

From: Larry Nelson <lnelson900@yahoo.com>
Sent: Friday, November 4, 2022 3:28 PM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: PLEASE ADD THIS TO THE PUBLIC RECORD FOR TITLE 16 & 22 - 11/15/22 HEARING

Dear Board of Supervisors:

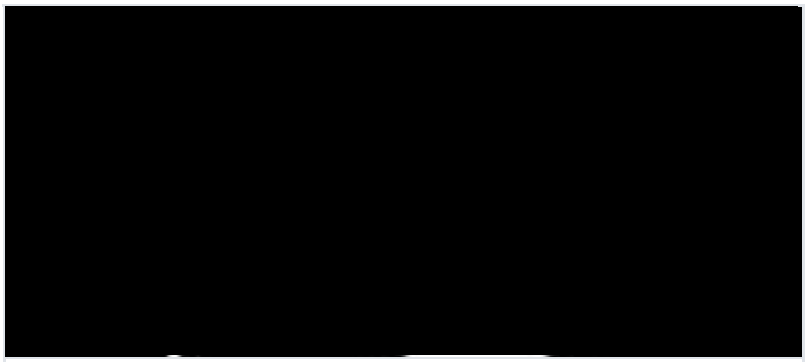
I urge you to vote "no" on the current version of Title 16 & 22.

General health effects from RF/EMF exposure resulting from intensifying small cell and macro towers in highly densified populations with no monitoring or measurement of continuous, aggregate, and cumulative exposures are dangerous. The FCC exercises no meaningful regulatory oversight over the location, operation or the levels of radiation emitted by wireless facilities. Therefore, local governments are citizens' first and only line of defense against the irresponsible placement and construction of telecommunications equipment. Title 16 & 22 are void of any safety precautions. RF Safety FAQ | Federal Communications Commission (fcc.gov)

This infrastructure also has a disproportionate impact on children. Children have smaller heads than adults and and wireless radiation can go deeper into their brains because children have a shorter distance from their skull to their brain center. Government regulations were based on a 220-pound man's head, not a child's head. Our skulls actually slow down wireless as it moves into our brain. The thicker the skull, the more roadblocks to the wireless radiation moving forward. Since children have much thinner skulls than adults, they have less protection. Research shows that children can absorb up to ten times the radiation in the bone marrow of their skulls than adults https://ehtrust.org/childrencellphoneradiationeffects https://ehtrust.org/research-on-childrens-vulnerability-to-cell-phone-radio-frequency-radiation Research on Children's Vulnerability to Cell Phone Radio-frequency Radiation - Environmental Health Trust

The changes to Title 16 & 22 give ministerial review of permits for wireless infrastructure. This will have a profound impact on the health of our children. The densification of the wireless radiation (RFR) in our environment is already taking a biological toll on humans**.** Continuous, aggregate, and cumulative exposure with no monitoring by any agencies or anybody is irresponsible at best. **That's right, there isn't anybody monitoring these antennas after they're installed.** Harm has been documented by thousands of studies, even studies that have been completed by our own government and then buried. People most vulnerable to wireless radiation are the disabled, elderly, and environments such as schools, hospitals, retirement

communities, airports, and essential emergency services (e.g. fire stations). Key Studies on Cell Phone and Wireless Radiation - Environmental Health Trust



RF Safety FAQ

Frequently asked questions about the safety of radiofrequency (RF) and microwave emissions from transmitters and...

Key Studies on Cell Phone and Wireless Radiation - Environmental Health ...

On this page we have a small sampling of the top Experimental and Epidemiological Studies on Wireless Radiation.

I urge you to prioritize futureproof fiber to the home (FTTH) for the very reasons outlined by our federal government agency the NTIA which is based on the clear superiority of fiberoptic systems in terms of security, scalability, safety, long-term cost and consumer preference. Fiber to the home is the only way to solve the digital divide once and for all.

Larry Nelson

From: ExecutiveOffice
Sent: Friday, November 4, 2022 2:11 PM
To: PublicComments; PublicHearing
Cc: ExecutiveOffice
Subject: FW: PLEASE ADD THIS TO THE PUBLIC RECORD FOR TITLE 16 & 22 - 11/15/22 HEARING

From: Kristina Stone <krisestone85@aol.com>
Sent: Friday, November 4, 2022 1:18 PM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: PLEASE ADD THIS TO THE PUBLIC RECORD FOR TITLE 16 & 22 - 11/15/22 HEARING

PLEASE ADD THIS TO THE PUBLIC RECORD FOR TITLE 16 & 22 - 11/15/22 HEARING

Dear Board of Supervisors:

I urge you to vote "no" on the current version of Title 16 & 22

Title 16 & 22 remove all **CEQA, NEPA, & NHPA**. The courts, the FCC, the Federal Government and the Telecommunications Act all preserve local environmental oversight. United Keetoowah Band of Cherokee Indians, et al v. FCC, 933 F.3d 728 (D.C. Cir., Aug 19, 2019). Some areas of LA County are near sensitive and historic areas that the courts have determined are covered under CEQA, NEPA & NHPA. The FCC has not preempted, and cannot preempt state environmental rules that go farther than do NEPA or NHPA, and its own rules (47 C.F.R. §§1.1307 and 1.1320) require an environmental assessment for any facility that “may have a significant environmental effect” on wilderness areas, wildlife preserves, threatened or endangered species, and designated critical habitats.

I urge you to prioritize futureproof fiber to the home (FTTH) for the very reasons outlined by our federal government agency the NTIA which is based on the clear superiority of fiberoptic systems in terms of security, scalability, safety, long-term cost and consumer preference. Fiber to the home is the only way to solve the digital divide once and for all.

Kristina Stone

From: ExecutiveOffice
Sent: Monday, November 7, 2022 8:17 AM
To: First District; Holly J. Mitchell; Sheila; Supervisor Janice Hahn (Fourth District); Barger, Kathryn; PublicComments
Subject: FW: Please do not adopt redlined versions of Title 16 and 22

The following correspondence is being forwarded to you for your review/information.

From: Tina Neuhausel <tkneuhausel@gmail.com>
Sent: Friday, November 4, 2022 2:23 PM
To: ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: Please do not adopt redlined versions of Title 16 and 22

LA County Executive Staff,

Installing cell towers close to our homes, schools, etc. is irresponsible. Do you want one outside your home?
Please do not support this action that will be detrimental to the lives of so many people and set a precedent for other areas to do the same.

I am writing to urge you to adopt the "redlined" versions of Title 16 and 22 that were submitted by Fiber First L.A." It is unconscionable to allow irresponsibly placed wireless infrastructure in community neighborhoods without public knowledge!

Kindly,
Tina Neuhausel

From: ExecutiveOffice
Sent: Thursday, November 10, 2022 3:10 PM
To: PublicComments
Subject: FW: Redlined versions of Titles 16 and 22

The following correspondence is being forwarded to you for your review/information.

From: S L <shirleylue@gmail.com>
Sent: Wednesday, November 2, 2022 9:13 PM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: Redlined versions of Titles 16 and 22

I am writing to urge you to adopt the "redlined" versions of Title 16 and 22 that were submitted by Fiber First L.A." ***It is unconscionable to allow irresponsibly placed wireless infrastructure in community neighborhoods without public knowledge!***

Thank you for keeping the option available of reasonable oversight of cellphone antennas.

Shirley Lue Shearer

From: ExecutiveOffice
Sent: Monday, November 7, 2022 1:39 PM
To: PublicComments
Subject: FW: Title 16 and Title 22

The following correspondence is being forwarded to you for your review/information.

From: Kim Hahn <dakimbobs@sbcglobal.net>
Sent: Sunday, November 6, 2022 8:29 PM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheils@bos.lacounty.gov; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: Title 16 and Title 22

District 1: Hilda L. Solis	**Firstdistrict@bos.lacounty.gov**	**213-974-4111**
District 2: Holly J. Mitchell	**HollyJMitchell@bos.lacounty.gov**	**213-974-2222**
District 3: Sheila Kuehl	**Sheila@bos.lacounty.gov**	**213-974-3333**
District 4: Janice Hahn	**Fourthdistrict@bos.lacounty.gov**	**213-974-4444**
District 5: Kathryn Barger	**Kathryn@bos.lacounty.gov**	**213-974-5555**
Executive Office	**executiveoffice@bos.lacounty.gov**	

I urge you to adopt the "redlined" versions of Title 16 and 22 that were submitted by Fiber First LA. The placement of wireless infrastructure must have public knowledge and input.

Thank you!

Kim Hahn, M.A.
Private Tutor
San Rafael, CA

From: ExecutiveOffice
Sent: Thursday, November 10, 2022 3:07 PM
To: PublicComments
Subject: FW: Titles16 and 22 and wired broadband vs. wireless

The following correspondence is being forwarded to you for your review/information.

From: Lonnie Gordon <magiclg@verizon.net>
Sent: Monday, October 31, 2022 4:11 PM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Fouthdistrict@bos.lacounty.gov; Barger, Kathryn <Kathryn@bos.lacounty.gov>; info@isd.lacounty.gov; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: Titles16 and 22 and wired broadband vs. wireless

Dear Los Angeles Board of Supervisors and other Departments included in this email,

I apologize if this email is a little long. I know how precious your time is, but please read. Only *you* can make a difference.

On behalf of myself, (a previous county employee at the District Attorney's Office and step daughter of Ernie Debs who was Supervisor of the 3rd District for many years), and the many People in Los Angeles County who suffer from electromagnetic sensitivity (EMS, also known as EHS), I am writing to sincerely plead with all of you not to approve the proposed changes to Titles 16 and 22 of the Los Angeles County Code because of the serious health impacts associated with the densification of wireless technology which these changes will permit. I learned the hard way about how the emissions can affect our electro-magnetic bodies.

A large, robust and growing body of scientific evidence is linking exposure to RF (wireless) radiation with serious health problems, including the constellation of symptoms associated with EMS, including headaches, dizziness, nausea, insomnia, tinnitus and inability to concentrate. For the tens of thousands of people who suffer from this condition, these symptoms can make life unbearable.The FCC lost a case in the 9th circuit court this year, because they are unable to prove that these invisible and silent emissions from these installations are safe.

More serious illnesses are also possible. A recent ten-year study by the National Toxicology Program of the National Institutes of Health, released in 2019, found "clear evidence" of increased cancer risk among lab animals exposed to RF radiation, as well as evidence of DNA damage and other biological impacts. This study adds to the thousands of published, peer-reviewed studies which demonstrate biological harm from exposure to RF radiation, even at levels considered safe by the FCC. Because we are all women I have included a link below about breast cancer and cell phones.

As small cells proliferate in communities across the country, a threshold is being crossed, from voluntary exposures to involuntary exposures.

Luckily I live in an HOA community that has Verizon FIOS underground cable so I have fiber direct to my townhouse. My entire unit is hardwired and I do not need the wireless internet even for my cell phone. However I cannot go out to areas that have wireless antennas or installations, as I become affected by the emf's and RF's after periods of exposure. We are surrounded by invisible electronic soup, and the more wireless that is installed the more people will become sensitized to it. Our underserved communities do not deserve this.

Fiber optic connections provide complete safety for users, as well as being faster, more reliable, less expensive, and less prone to accidents and fires. I urge you to use your influence to bring about the safe deployment of broadband connections for all the citizens of the County. Please do not be persuaded by telecom who care only about their bottom line. Money. They know their products are not safe and include that fine print with every device they sell.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3789302/?emci=7f57ca62-b157-ed11-819c-002248258d2f&emdi=0674d6c4-4f59-ed11-819c-002248258d2f&ceid=8208672

I have also included an important report you may want to read for additional input before making a decision: https://www.benton.org/publications/FixedWireless (Should you or your staff have any questions please feel free to reach out to me.)

Sincerely,

Ms. Lonnie Gordon

Exec. Director

MalibuForSafeTech.org

www.malibuforsafetech.org

From: ExecutiveOffice
Sent: Thursday, November 10, 2022 3:04 PM
To: PublicComments
Subject: FW: Urgent: Adoption of "redlined" versions of Title 16 and 22 (Agenda Item 7 of 11/15/22 Board Meeting)

The following correspondence is being forwarded to you for your review/information.

From: Kim Schroeder <kim_schroeder@sbcglobal.net>
Sent: Thursday, November 10, 2022 9:01 AM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Subject: Urgent: Adoption of "redlined" versions of Title 16 and 22

I urge you to adopt the "redlined" versions of Title 16 and 22 that were submitted by Fiber First LA. The placement of wireless infrastructure must have public knowledge and input.

Thank you.
Kim Schroeder

From: ExecutiveOffice
Sent: Monday, November 7, 2022 8:21 AM
To: First District; Holly J. Mitchell; Sheila; Supervisor Janice Hahn (Fourth District); Barger, Kathryn; PublicComments
Subject: FW: vote "no" on the current version of Title 16 & 22.

The following correspondence is being forwarded to you for your review/information.

From: Bar Par <barpar1120@hotmail.com>
Sent: Friday, November 4, 2022 9:34 PM
To: First District <firstdistrict@bos.lacounty.gov>; Holly J. Mitchell <HollyJMitchell@bos.lacounty.gov>; Sheila <Sheila@bos.lacounty.gov>; Supervisor Janice Hahn (Fourth District) <fourthdistrict@bos.lacounty.gov>; Barger, Kathryn <Kathryn@bos.lacounty.gov>; ExecutiveOffice <ExecutiveOffice@bos.lacounty.gov>
Cc: jnelson10987@gmail.com
Subject: vote "no" on the current version of Title 16 & 22.

Dear Board of Supervisors:

I urge you to vote "no" on the current version of Title 16 & 22.

The magnitude of finally solving the digital divide once and for all is a subject that the BOS does not take lightly, as clearly expressed during past hearings. But it is **socially unjust** and unconscionable to streamline Title 16 & 22 and rush services to communities that have been notoriously redlined. Inferior wireless will not give these communities equitable broadband and will not solve the digital divide. It will only prolong it.

The industry is making false claims relating to wireless solving the Digital Divide. Wireless service will not be able to provide the robust services that a family needs and that new technology will demand. **Equitable, futureproof** service is fiber to the home!

Fiber to the home has been prioritized by the Federal Government because it's superior to wireless based on access, overall cost of infrastructure, equitable service, enhancing economic growth, specific speeds for upload and download; reliability of service, consistency in quality of service, and affordability to the end user. Wireless doesn't compare to fiber when it comes to any of these issues.
I urge you to prioritize futureproof fiber to the home (FTTH) for the very reasons outlined by our federal government agency the NTIA which is based on the clear superiority of fiberoptic systems in terms of security, scalability, safety, long-term cost and consumer preference. Fiber to the home is the only way to solve the digital divide once and for all.

Barbara Paris

From: Annette Peterson <amgpeterson@yahoo.com>
Sent: Friday, November 11, 2022 5:22 PM
To: PublicComments
Cc: Barger, Kathryn; Supervisor Janice Hahn (Fourth District); Sheila; Holly J. Mitchell; First District
Subject: November 15, 2022 Agenda No. 7 Project No. R2021-002931-(1-5) Wireless Facilities Ordinance
Attachments: Amendment to Wireless Facilty Ordinance.pdf; School - Newhall School District.docx

Dear Los Angeles County Board of Supervisors,

I am requesting an amendment to the Wireless Facility Ordinance to require an independent, unbiased consultant at the Applicant's expense. Cell towers are a specialized area of science requiring technical expertise that the Regional Planning Commission does not have.

On December 20, 2022, you will be hearing a matter pertaining to Project No. PRJ2021-000295 which is a request by AT&T to build a 75–95-foot cell tower near an elementary school and in the middle of a community.

The process of going before the Planning Commission has been very frustrating. They have not been given the tools to properly analyze AT&Ts position. Because they lacked the tools, they felt compelled to accept all assertions made by AT&T without question. In making their ruling, the Planning Commission stated that they were taking AT&T's assertions at "face value" and making "no independent review".

We are asking that you give the Planning Commission the tools they need to conduct an independent review with an independent expert. I am attaching Tiffany Hedgpeth's drafted amendment to the ordinance.

Additionally, during the process of the Planning Commission's hearing we learned that AT&T did NOT inform the School District impacted by the proposed cell tower. This is the Newhall School District. AT&T said they weren't required to notify the School District. I am requesting an amendment to require notification to a School District within 1500 feet of a proposed cell tower. I am attaching the Newhall School District Resolution that was provided to the Planning Commission.

Thank you for your time and consideration in this matter.

Annette Peterson

Stevenson Ranch, CA

Subject: FW: Wireless Facility Ordinance (Advance Planning Case No. RPPL2021007939): Necessary Amendment

Importance: High

From: Chris Gaff <cc.gaff5@gmail.com>
Sent: Monday, November 14, 2022 11:26 AM
To: English, Stephanie <senglish@bos.lacounty.gov>
Cc: DRP Ordinance Studies <ordinance@planning.lacounty.gov>; Bruce Durbin <bdurbin@planning.lacounty.gov>; Amy Bodek <ABodek@planning.lacounty.gov>; CG <cc.gaff5@gmail.com>
Subject: Wireless Facility Ordinance (Advance Planning Case No. RPPL2021007939): Necessary Amendment
Importance: High

Hi Stephanie. I'm one of the hundreds of families opposing the 75-95-foot Stevenson Ranch cell tower. As part of our work opposing the tower, we learned of a critical flaw in Regional Planning's review process (it does not actually review the technical materials because staff lacks expertise). To correct this problem, the below email was sent to the Board of Supervisors, requesting an amendment to the Wireless Facility Ordinance that the Board will hear on November 15. The proposed amendment is consistent with what other municipalities are doing to ensure they have the capability to review wireless facility applicant's materials. Please make sure Supervisor Barger is aware of the need for this amendment. I'm also copying Alsyson Stewart, Bruce Durbin, and Amy Bodek of Regional Planning, as the proposed amendment would significantly benefit their department.

Dear Supervisor Barger:

On November 15, 2022, the Board of Supervisors will be voting on a wireless facilities ordinance for the County of Los Angeles. The below proposed amendment is critical to ensure that Regional Planning staff is able to retain consultants having the expertise required to appropriately evaluate the technical materials submitted for those projects that are subject to non-ministerial review**.**

Requested amendment: Requirement of an independent, unbiased consultant at Applicant's expense.

Reason for request: Specialized area of science requiring technical expertise that Regional Planning lacks.

The amendment is necessary because Regional Planning staff have stated under oath before the Planning Commission that they do not have the expertise to perform a substantive review of application materials submitted by wireless providers. As a result, the County of Los Angeles is not performing its required obligation to perform a substantive review of applicants' materials, putting communities at risk of improper and detrimental projects and subjecting the County to potential litigation.

Background: I am one of hundreds opposing a 75-95 foot macrosite in the center of the Stevenson Ranch community, which is zoned as residential. While the 75-95-foot height of the cell tower clearly violates the current Wireless Facilities Policy and the draft Ordinance, which limit wireless facilities to 35 feet in residential

communities, and 10 realtors have represented to the County that property values will decline by up to 10 percent or more (therefore not meeting the CUP requirements of not negatively impacting nearby property values), AT&T represented to Regional Planning that there is a significant gap in coverage and the proposed location and 75-95-foot tower is the only way to address the gap (no alternatives analysis was submitted).

Residents submitted evidence into the record refuting AT&T claims, establishing that the propagation maps submitted by AT&T were inaccurate. Evidence included information establishing AT&T used an incorrect standard for assessing coverage strength, video establishing areas that were purported to have no vehicle coverage had vehicle coverage, other AT&T coverage maps that show AT&T was misrepresenting the coverage area in what was submitted to the County, and resident statements.

In a shocking admission, at the Planning Commission hearing, Commissioner Louie and staff confirmed that as a Department, Regional Planning takes "the gap coverage at face value" and "no independent review" is performed. August 17, 2022 Transcript, pp. 34-35. Thus, Regional Planning accepted the coverage gap simply because AT&T said so. Regional Planning's failure to perform anything more than a ministerial review of the purported coverage gap is inconsistent with the County's current municipal code and the proposed wireless facilities ordinance.

Other municipalities have likewise determined that they lack the expertise necessary to perform a proper review of materials submitted by wireless providers. To address this, they have included provisions in their wireless facilities ordinances that allow the municipalities to hire a consultant to review the applicant's materials at the expense of the applicants. Municipal entities that have done this include, but are not limited to, Cerritos, Gardena, Palo Alto, Encinitas, Coachella, San Bruno, Sebastopol, Ripon, San Mateo, El Monte, Los Altos, Monterey and West Sacramento.

Proposed amendment: Below is a proposed amendment to the draft ordinance, which is modeled after Monterey's code:

Section 22.140.700(D)(5)

> " 5. The Director or designee may request independent consultant review on any issue that involves specialized or expert knowledge in connection with the permit application. Such issues may include, but are not limited to:
>
> a. Permit application completeness or accuracy;
>
> b. Planned compliance with applicable radio frequency exposure standards;
>
> c. Whether and where a significant gap exists or may exist, and whether such a gap relates to service coverage or service capacity;
>
> d. Whether technically feasible and potentially available alternative locations and designs exist;
>
> e. The applicability, reliability and/or sufficiency of analyses or methodologies used by the applicant to reach conclusions about any issue within this scope; and
>
> f. Any other issue that requires expert or specialized knowledge identified by the Director or designee.
>
> The applicant shall pay for the cost of such review and for the technical consultant's testimony in any hearing as requested by the Director or designee and shall provide a reasonable advance deposit of the

estimated cost of such review with the County prior to the commencement of any work by the technical consultant. The applicant shall provide an additional advance deposit to cover the consultant's testimony and expenses at any meeting where that testimony is requested by the Director or designee. Where the advance deposit(s) are insufficient to pay for the cost of such review and/or testimony, the Director or designee shall invoice the applicant who shall pay the invoice in full within 10 calendar days after receipt of the invoice. No permit shall issue to an applicant where that applicant has not timely paid a required fee, provided any required deposit or paid any invoice as required in the code."

Thank you for considering this important addition to the Wireless Facility Ordinance.

Chris Gaff
Stevenson Ranch, CA

Subject: FW: Wireless Facility Ordinance (Advance Planning Case No. RPPL2021007939): Necessary Amendment

From: Tiffany Hedgpeth <thedgpeth@edgcomb-law.com>
Sent: Saturday, November 5, 2022 5:16 PM
To: English, Stephanie <senglish@bos.lacounty.gov>
Cc: DRP Ordinance Studies <ordinance@planning.lacounty.gov>; Bruce Durbin <bdurbin@planning.lacounty.gov>; Amy Bodek <ABodek@planning.lacounty.gov>
Subject: FW: Wireless Facility Ordinance (Advance Planning Case No. RPPL2021007939): Necessary Amendment

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Tiffany Hedgpeth
Stevenson Ranch, CA