

20-1025 (Lead); 20-1138 (Consolidated)

**UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

ENVIRONMENTAL HEALTH TRUST; CONSUMERS FOR SAFE CELL
PHONES; ELIZABETH BARRIS; THEODORA SCARATO

CHILDREN'S HEALTH DEFENSE; MICHELE HERTZ; PETRA BROKKEN;
DR. DAVID O. CARPENTER; DR. PAUL DART; DR. TORIL H. JELTER; DR.
ANN LEE; VIRGINIA FARVER, JENNIFER BARAN; PAUL STANLEY, M.Ed.

Petitioners

v.

FEDERAL COMMUNICATIONS COMMISSION;
UNITED STATES OF AMERICA

Respondents

Petition for Review of Order Issued by the
Federal Communications Commission

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Reply Comments, Mar .4, 2013

Before the
Federal Communications Commission
Washington, D.C., 20554

In the Matter of
Reply Round for ET Docket #03-137 and WT Docket #12-357

Reply Filed by
R. Paul and Kathleen Sundmark

Reply Comments on FCC Notice of Proposed Rulemaking

We, R. Paul and Kathleen Sundmark, deem that our statements are true to the best of our knowledge.

1. Our mailing address is P.O. Box 9, Tujunga, CA 91043.
2. R. Paul Sundmark is a retired Outside Plant Technician for AT&T. Kathleen Sundmark is a licensed Doctor of Chiropractic. She practiced for 30 years specializing in neurology and internal disorders.
3. We believe that there has been sufficient research to establish the non-thermal biologic effects of RF at present exposure limits. The FCC should therefore promptly update its guidelines and implement measures to slow the exponential growth of wireless technologies in this society to protect the general public as well as workers from these effects. We urge an immediate reduction of exposure limits to a precautionary biologically-based level. The 2012 BioInitiative Report is incorporated by reference herein in its entirety (<http://www.bioinitiative.org/>)
4. The present “time-averaged” exposure standards do not account for pulsations and other signal modulations, time-varying exposures from multiple fixed and mobile sources, variations in the health status of exposed individuals, and more. We urge FCC to establish guidelines based upon true, often involuntary, exposure variations in the general and worker populations.
5. The GAO has reported that the FCC said it relies on federal health and safety agencies to determine exposure limits. It has not requested updated information on public and environmental safety for current exposures levels, nor an assessment of the wisdom of increasing exposure limits. We specifically urge the FCC to defer to the EPA for reliable exposure guidelines which protect the public, including vulnerable

subpopulations such as – but not limited to – young people, ill and disabled people, pregnant women, people of reproductive age, workers and the elderly, and the environment, including vulnerable species such as – but not limited to -- birds, bees and other pollinators, and amphibians.

6. FCC appeared to describe a conflict of interest when it stated in a case that serves both the public in terms of health and safety and the telecommunications industry that provides services. This is another reason for deferring to the EPA or other biological experts for a complete literature review and preparation of appropriate and precautionary exposure guidelines that adequately protect health and safety of the public.
7. Closing, we urge FCC to reevaluate its ability to uphold its responsibility to establish appropriate RF exposure guidelines based on public health and safety, not industry requirements. If it considers itself to be sufficiently expert in this task, we urge FCC not to raise, but to greatly reduce allowable exposures to precautionary levels in the face of research on non-thermal biological effects upon humans and the environment.
8. Further, a moratorium should be placed on sales of new spectrum, transmitting utility meter installation, and installation of additional base stations for wireless service while biologically-based safety limits are being developed.

Respectfully submitted,
R.Paul and Kathleen Sundmark

Individual Rights & ADA; Cynthia Edwards Comments, Feb. 5, 2013

FCC 12-152

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Notice of Proposed Rulemaking)	
18 FCC Rcd 13187, 13188 ¶1 (2003)	)	ET Docket No. 03-137
)	
And)	
)	
Service Rules for the Advanced Wireless Services	)	WT Docket No. 12-357
H Block---Implementing Section 6401 of the)	
Middle Class Tax Relief and Job Creation Act of)	
2012 Related to the 1915-1920 MHz and)	
1995-2000 MHz Bands ¶53 footnote 95)	

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

Comment Filed by:
Cynthia Edwards
1985 Upland Dr.
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734-761-2036

Feb 5, 2013

AFFIDAVIT OF Cynthia Edwards

State of Michigan

County of Washtenaw

I, Cynthia Edwards, attest that my statements are true to the best of my knowledge.

Comment round for ET Docket No. 03-137 and WT Docket No. 12-357.

1. My name is Cynthia Edwards—. My address is 1985 Upland Dr. Ann Arbor MI 48105.

2. I work in retail sales and landscaping.

3. I am writing to comment on the existing FCC guidelines for smart meters because the radio frequencies coming from SmartMeters are making me sick, as they are many other people. Once the meters started being installed in my city in 2012, I began having trouble sleeping, developed a loud ringing in my ears, started feeling exhausted all the time, have experienced brain fog and an inability to concentrate, and my irregular heartbeat that had been under control suddenly was wildly irregular, and nothing has been able to stop it. This is terrifying because it predisposes me for a stroke or heart attack. All of this is putting my health and my life at risk. This is completely unacceptable and I want to know why my government is not protecting my life.

I am writing to demand that the FCC take responsibility for the mess it has allowed to happen and for putting my life at risk. I demand that the installation of smart meters and digital meters be stopped immediately until independent research can be done and ALL the research taken into account, not just that done by the industry.

Several people in my community have had to move out of their houses because of becoming so ill after the meters were installed. Many others are now constantly ill. People's blood pressures have spiked and they have had to go on medication to controll it. A young boy with juvenile diabetes, which had been completely under control, had his numbers spike into the danger zone. ALL OF THIS HAPPENED DIRECTLY AFTER SMART METERS WERE INSTALLED.

It is important to note that it is not only the RF smart meters but the digital meters that are causing these problems as well. And there seem to be no regulations regarding these meters at all. In Michigan , DTE is forcing the removal of analog meters and the installation of the digital meters, even if a person is opting out of the smart meter installation. Consumer's Energy is allowing analog meters to be retained so there is clearly no reason for DTE's absolute refusal to do this. THESE DIGITAL METERS ARE ALSO MAKING PEOPLE SICK AND NEED TO BE REGULATED.

There are as many as 8% of the population who are technically "electronically sensitive". The Americans With Disabilities Act recognizes

electronic sensitivity as a legitimate disability and yet smart meters and digital meters are making their lives a living hell. This means that the FCC standards are allowing a violation of the ADA. This cannot be allowed to continue.

Current FCC guidelines are based on physics and engineering rather than biological studies, which has nothing to do with the reality being faced by humans and other animals, birds, insects etc.

The guidelines currently used by the FCC were adopted in 1996, are thermally based, and are believed to protect against injury that may be caused by acute exposures that result in tissue heating or electric shock. FCC guidelines have a much lower certainty of safety than standards. Meeting the current FCC guidelines only assures that one should not have heat damage from SmartMeter exposure. It says nothing about safety from the risk of many chronic diseases that the public is most concerned about such as cancer, miscarriage, birth defects, semen quality, autoimmune diseases, etc. Therefore, when it comes to nonthermal effects of RF, FCC guidelines are irrelevant and cannot be used for any claims of SmartMeter safety unless heat damage is involved (Li, 2011).

There is no scientific literature on the health risks of SmartMeters in particular as they are a new technology. However, there is a large body of research on the health risks of EMFs. Much of the data is concentrated on cell phone usage and as SmartMeters occupy the same energy spectrum as cell phones and depending on conditions, can exceed the whole body radiation exposure of cell phones. In terms of health risks, the causal factor under study is RF radiation whether it be from cell phones, Wi-Fi routers, cordless phones, or SmartMeters. Therefore all available, peer-reviewed, scientific research data can be extrapolated to apply to SmartMeters, taking into consideration the magnitude and the intensity of the exposure.

Since the mid-1990's the use of cellular and wireless devices has increased exponentially exposing the public to massively increased levels of RF. There is however, debate regarding the health risks posed to the public given these increased levels of radiation. It must be noted that there is little basic science funding for this type of research and it is largely funded by industry. An intriguing divide, noted by Genuis, 2011 is that most research carried out by independent non-government or non-industry affiliated researchers suggests potentially serious effects from many non-ionizing radiation exposure. Research funded by industry and some governments seems to cast doubt on the potential for harm. Elements of the controversy stem from inability to replicate findings consistently in laboratory animal studies. However, analysis of many of the conflicting studies is not valid as the methodology used is not comparable. Despite this controversy, evidence is accumulating on the results of exposure to RF at non-thermal levels including increased permeability of the blood-brain barrier in the head (Eberhardt, 2008), harmful effects on sperm, double strand breaks in DNA which could lead to cancer genesis (Phillips, 2011), stress gene activation indicating an exposure to a toxin (Blank, 2011), and alterations in brain glucose metabolism (Volkow, 2011).

There are no current, relevant public safety standards for pulsed RF involving chronic exposure of the public, nor of sensitive populations, nor of people with metal and medical implants that can be affected both by localized heating and by electromagnetic interference (EMI) for medical wireless implanted devices. Many other countries (9) have significantly lower RF/MW exposure standards ranging from 0.001 to 50 \sim W/cm² as compared with the US guideline of 200-1 000 \sim W/cm². Note that these recommended levels are considerably lower than the approximately 600 \sim W/cm². (time-averaged) allowed for the RFR from SmartMeters operating in the low 900 MHz band mandated by the FCC based on only thermal consideration. In summary, there is no scientific data to determine if there is a safe RF exposure level regarding its non-thermal effects. The question for governmental agencies is that given the uncertainty of safety, the evidence of existing and potential harm, should we err on the side of safety and take the precautionary avoidance measures?

The two unique features of SmartMeter exposure are: 1) universal exposure thus far because of mandatory installation ensuring that virtually every household is exposed; 2) involuntary exposure whether one has a SmartMeter on their home or not due to the already ubiquitous saturation of installation in every community. Governmental agencies for protecting public health and safety should be much more vigilant towards involuntary environmental exposures because governmental agencies are the only defense against such involuntary exposure.

My health and my life are in danger and I am asking the FCC to do the right thing –

- 1. Stop the use of SmartMeters and digital meters IMMEDIATELY until independent research is done and real safety standards can be created**
- 2. Require that power companies install shielding on every house and business to protect people from the RF they are now constantly exposed to.**
- 3. Require testing of both Smart Meters and digital meters on a variety of homes around the country and NOT IN A LABORATORY, so that the problems they are creating can be seen and understood where they are happening, in relation to the huge amount of RF coming from Cell towers, WiFi, portable phones, etc.**

Respectfully submitted by

Cynthia Edwards

1985 Upland Dr.

Ann Arbor, MI 48105

February 5, 2013

Individual Rights; Diana Ostermann Comments, Feb. 4, 2013

FCC 12-152

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
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Notice of Proposed Rulemaking)	
18 FCC Rcd 13187, 13188 ¶1 (2003))	ET Docket No. 03-137
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Service Rules for the Advanced Wireless Services)	WT Docket No. 12-357
H Block---Implementing Section 6401 of the)	
Middle Class Tax Relief and Job Creation Act of)	
2012 Related to the 1915-1920 MHz and)	
1995-2000 MHz Bands ¶53 footnote 95)	

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

Comment Filed by: Diana Ostermann
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Dianaost09@gmail.com
(Telephone Number)

February 4, 2013

AFFIDAVIT OF Diana Ostermann

State of Michigan

Allegan County

I, Diana Ostermann attest that my statements are true to the best of my knowledge.

Comment round for ET Docket No. 03-137 and WT Docket No. 12-357.

1. My name is Diana Ostermann. My address is 7364 North Shore Drive, South Haven, MI 49090.
2. I am self-employed, working as my husband's radiology practice manager.
3. When researching the safety of wireless smart meters, I found much evidence that the FCC RF exposure standards are set thousands of times higher than the levels that have been shown to harm health. The current guidelines are based on engineering convenience, not biological studies of negative health effects. Published in 2007, the original BioInitiative Report analyzed thousands of scientific studies of these biological effects. The updated Bioinitiative 2012 (<http://www.bioinitiative.org/table-of-contents/>) published 12/31/12 looks at 1800 new studies and finds that the risks to health have significantly increased since the 2007 report. The 2007 report recommended a standards level of 0.1 microWatts/cm². The 2012 report found biological effects at 0.003 microWatts/cm². New standards must be set based on these very real biological effects not just thermal effects.
4. The current FCC guidelines allow devices operating in the 900 MHz range (including cell phones and smart meters) to emit up to 600 microWatts/cm². Yet the scientific studies summarized above find that wireless RF exposure in the range of 0.002 – 10.0 microWatts/cm² cause a host of negative biological effects including damage to DNA and genes, which can lead to cancer after 10 or more years of exposure; interruption of neurotransmitters and cell communication; EEG changes which cause memory problems and reduction in learning; lowered melatonin production which reduces

sleep and affects testosterone levels; causes reduced sperm production and damaged sperm; affects the natural rhythm of the brain; affects heart rate and heart arrhythmias; and breeches the blood brain barrier which allows toxins to enter the brain. Involuntary exposures in public places to wireless devices such as cell phones and laptops anywhere from 10 feet to 100 yards away cause exposures in the range of 0.001 to 0.08 microWatts/cm² PER DEVICE. How many active cell phones and laptops are within a 10-50 foot radius of a pedestrian on a busy urban sidewalk or in a café with wifi? These exposures are additive, and the resulting damage is cumulative over time.

5. The current FCC certification testing process ignores the reality of urban environments, where the proliferation of wireless devices and the resulting ‘electrosmog’ consume much of the permitted RF emissions. Devices submitted for FCC certification are tested in isolation, and approved so long as the RF emissions for that single device are below the maximum limit. An example is the Tropos 7320 wireless broadband router whose weighted cumulative RF exposure (for 2 co-located radios) is 98.62% of the allowed maximum at a distance of 23cm. Obviously, this approval assumes there are no other sources of RF operating anywhere near the Tropos router; no cell towers, no wifi networks, no smart phones, tablets or any other RF emitting devices, when in fact the ambient RF in many urban areas is now as high as 100 microWatts/cm². This amount added to the Tropos router’s emissions would likely exceed the current FCC limits (which are too high).
6. The current definition of “co-location” of transmitters as being within 20cm (8 inches) of another transmitter is absurd. The reality is, multiple (omnidirectional) transmitters can be significantly further apart than 20 cm. yet have RF waves from each transmitter simultaneously affecting a person. The Tropos example given in item 5 above is such a scenario. Since the FCC standard is for EXPOSURE not for EMISSION LEVEL, perhaps the standard should define bands of distance (ie, 10 feet, 25 ft, 50 ft), list the possible emitters within that distance, with an associated discounting of the nearby transmitters’ emissions based on distance, and then add that to the emissions of the device seeking FCC approval to determine total exposure.

7. The current standards make no distinction between continuous wave (CW) frequencies and pulsed signals, even though pulsed signals have been shown to be up to 28 times as damaging as CW signals. There should be a significantly lower limit for pulsed than for CW signals.
8. The current standards were set based upon tests done on healthy, 6 foot tall, young adult males. Children, fetuses, and sickly individuals suffer effects at much lower levels. The standards should be revised downward to reflect safe levels for the most vulnerable.
9. The measurement of power density averages the exposure over a 30 minute period. This practice hides the momentary peak RF emission. Wireless smart meters utilizing a pulsed signal can have peak measurements 10,000 times the averaged measurement. The standards should contain a cap on the momentary peak emission, since that is what the human body is responding to.
10. The current standards ignore the fact that the impacts of RF exposure are cumulative. FCC Certification is based upon a single exposure as if that is the only time an individual will ever be near that device. Given that people are exposed to RF daily (such as from cell phones and laptops) and even continuously (from cell towers and smart meters), the standards need to determine a safe annual or even 10 year cumulative exposure level in order to certify an emitter.

Respectfully submitted by

Diana Ostermann

7364 North Shore Dr.

South Haven, MI 49090

February 4, 2013

Individual Rights; Chris Nubbe Comments, Jul. 13, 2016

July 13, 2016

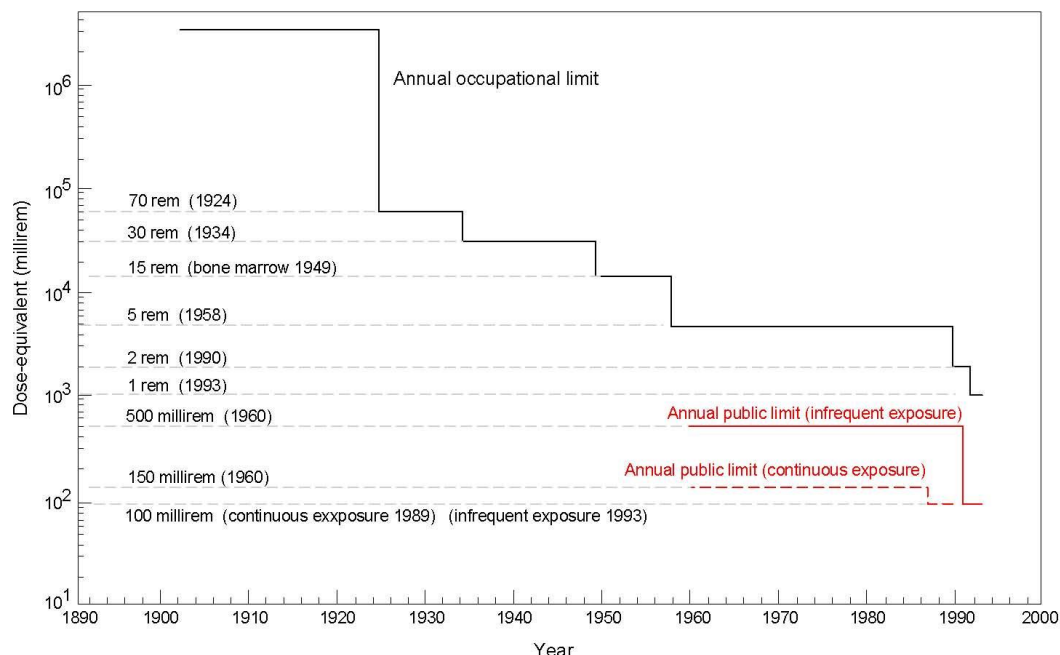
To: Federal Communications Commission
445 12th St., S.W.
Washington, D.C. 20554

From: Chris Nubbe
PMB 377, 1001 Cooper Pt Rd SW Ste 140
Olympia, Washington [98502]

Re: The following public comments are submitted in regards to the FCC
Spectrum Frontiers Proposal for Wireless 5G Broadband, as reflected in GN
Docket No. 14-177, IB Docket Nos. 15-256, 97-95, WT Docket No. 10-112,
RM-11664

I have read the FCC Fact Sheet on the Spectrum Frontiers Proposal, as well as Tom Wheelers Speech and Presentation to the Press Club June 20, 2016 on this topic as well as reviewed other documents such as FCC Record 15-138 regarding this matter. I find that the stated intent, to turn innovators loose upon the additional frequency and bandwidth to be made available by this proposal for wireless 5G Broadband, without any consideration of safety, and for the express purpose of speeding up new wireless product development for greater profit and market share, is both reckless, irresponsible, and unconstitutional.

One need only examine the historical record of X-Ray technology in this country to see both a repeating pattern here as well as a precautionary tale. The following logarithmic plot of the recommended limits on annual exposures to ionizing radiation shows a continual decrease from 1890 to the present.
<http://www.fas.org/sqp/othergov/doe/lanl/00326631.pdf>



In 100+ years, Ionizing Radiation Dose limits went from 10 Rad per day in 1902 down to present levels of 100 millirem per year which is a 36,500 times lower limit of radiation exposure. Early reductions in X-Ray exposure levels were prompted when the necrotic fingers of X-Ray technicians began falling off. The shoe fitting fluoroscope was another terribly unsafe application of the new X-ray technology as it radiated all of the reproductive, internal organs, and brains of its users while they looked at the fit of the bones in their feet in the new shoes. There have been many examples of technological adolescence over the years covering a wide range of materials, like the radium girls who painted clock faces with radium paint, asbestos fibers used in insulation, pipes, building materials, etc.

The current Personal Communications Service Standard for Public Exposure to (non-ionizing microwave radiation) was set by FCC in 1996 at 1000 $\mu\text{W}/\text{cm}^2$. Less than 20 years later, precautionary levels now recommended in the Bioinitiative Report are 0.0003 to 0.0006 $\mu\text{W}/\text{cm}^2$, which are over a million times less than the 1996 FCC standard still in use.

<http://www.bioinitiative.org/research-summaries/>

<http://www.bioinitiative.org/rf-color-charts/>

Given that scientists have documented irreversible infertility in mice after five (5) generations of exposure to RFR at cell phone tower exposure levels of less than one microwatt per centimeter squared ($\mu\text{W}/\text{cm}^2$), a level which is a thousand times lower than the current FCC standard, there is cause for concern. Even the National Institute of Health (NIH), National Toxicology Program (NTP) has recently confirmed what many studies from around the world have already documented that cell phone radiation causes very rare and specific types of cancer in rats, the same types of cancers that have been occurring in humans from cell phone usage. Links to the NIH NTP Study are here.

<http://biorxiv.org/content/early/2016/06/23/055699>

<http://www.saferemr.com/2016/05/national-toxicology-program-finds-cell.html>

<http://www.motherjones.com/environment/2016/05/federal-study-links-cell-phone-radiation-cancer>

http://www.naturalnews.com/054165_cell_phone_radiation_brain_tumors_government_study.html

<http://www.wsj.com/articles/cellphone-cancer-link-found-in-government-study-1464324146?mg=id-wsj>

The obvious concern here is that the allowable levels of microwave radiation are already too high and are already causing serious damage to living organisms. Current FCC levels for microwave radiation for the wireless industry are the highest in the world. To put that into perspective the following chart compares current exposure guidelines to speed limits around the world.

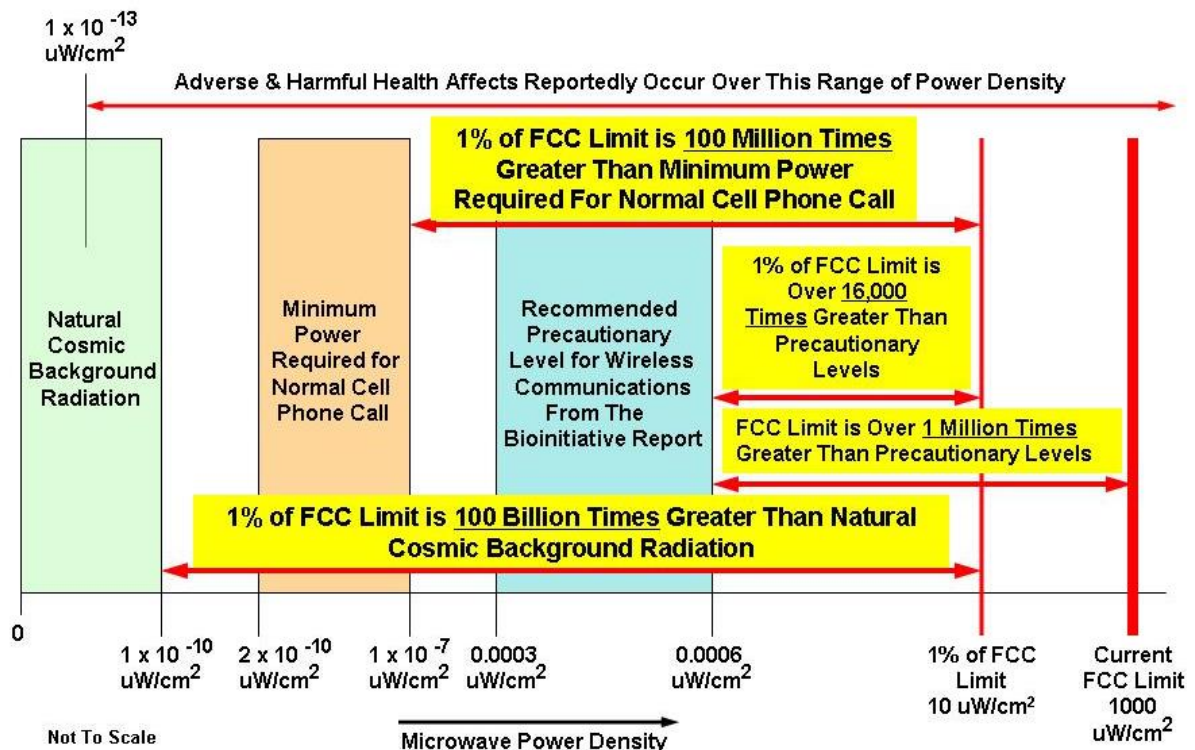
As 'volts per metre' is not a unit that most people are familiar with, we have arbitrarily taken the 1998 Salzburg level of 0.6 V/m as being 'equivalent to' a 30 mph vehicle speed limit in residential areas and then scaled the other levels relative to this. It is easy to see that the ICNIRP guidance is not very precautionary.

1800 MHz Public Exposure Guidelines	PFD $\mu\text{W}/\text{m}^2$	Equivalent V/m	c.f. speed m.p.h.
FCC (USA) OET-65	10,000,000	61	3000
ICNIRP (1998), WHO	9,000,000	58	2847
Belgium (excluding Wallonia)	1,115,000	21	1002
Italy (sum of frequencies)	100,000	6	300
Russia, PRChina	100,000	6	300
Switzerland, Lichtenstein, Luxembourg	95,000	6	292
Belgium Wallonia	24,000	3	147
Typical 100m from a base station (0.2 to 6 V/m)	10,000	1.9	95
Vienna (sum GSM)	10,000	1.9	95
Italy (single frequency)	1,000	0.6	30
Salzburg 1998 (sum GSM)	1,000	0.6	30
EU-Parl, GD Wissenschaft, STOA GSM (2001)	100	0.2	9
Median level, 15 US cities 1977 (mainly VHF & TV)	48	0.14	7
Salzburg GSM/3G outside houses (2002)	10	0.06	3
Salzburg GSM/3G inside houses (2002)	1	0.02	1
Burgerforum BRD proposal, waking areas (1999)	1	0.02	1
Burgerforum BRD proposal, sleeping areas (1999)	0.01	0.002	0.1
Mobile phone handsets can work down to about	0.000002	0.00003	0.0015
Natural background level (all RF frequencies)	0.000001	0.00002	0.001
Cosmic background at 1800 MHz average approx	0.00000000001	0.00000006	0.000003

This chart taken from <http://www.powerwatch.org.uk/science/intguidance.asp>

The following graphic representation shows just how unnatural and huge the amount of microwave radiation has been increased as a result of the rapid proliferation of wireless technology.

WIRELESS COMMUNICATIONS POWER DENSITY



From this we see that current FCC Radiation limits are BILLIONS of times greater than the microwave radiation levels that life on this planet evolved to. The problem with this proposal to push 5G into service before resolving the basic issue of the safety of microwave radiation already widely in use, is that in stead of extinguishing the fire that is currently burning your house down, 5G will just throw more gasoline on it. This proposal will greatly increase the exposure levels of microwave radiation everywhere as one of its stated goals is to provide wireless 5G coverage in rural areas not already served. The result will be to greatly increase the number of people who will not be able to tolerate these levels of radiation. The Americans with Disabilities Act (ADA) and the U.S. Constitution require cities to protect the rights of people injured by wireless technology. "The telecommunications Act should not be interpreted to injure an identifiable segment of the population, exile them from their homes and their city, leave them no place where they can survive, and allow them no remedy under City, State or Federal laws or constitutions."

http://www.cellphonetaskforce.org/?page_id=400

This country demonstrates its resolve to protect the rights of minorities in every ADA accessible and tobacco free public space we use. Its only a matter of time before that same resolve is applied to cell phone radiation.

Several interesting points taken from the Fall 2008 edition of the American Trial Lawyer are as follows: "More than 1000 peer-reviewed, published studies form the basis for establishing the link between mobile phone use and a variety of health problems..... The expanding telecommunications and internet industries have perpetrated a dangerous fraud upon the public, withholding information that would expose the risk that cell phones pose to humans and the environment". Evidence of the true health risks of wireless technology can be seen in the "insurance carriers' decision to exclude health risk claims from product liability policies marketed to the wireless industry. Beginning in 2002, major insurers excluded health risks from cell phone usage as a covered loss under policies sold to the industry..... Because the FDA granted the industry a variance on the requirement for premarket safety, it is unlikely that the FDA will take further steps at protecting the public..... Further, the cell phone industry routinely misrepresents as safety standards the emission guidelines for wireless radiation promulgated under the Telecommunications Act of 1996 and administered through the FCC. The FCC has no safety authority. Thus no safety standards exist to protect consumers from the dangers of cell phones an other wireless devices.....In the absence of sound Federal Guidelines or vigilant regulation, Litigation is the only option to compensate victims and deter the continued disingenuous and dangerous behavior of the wireless industry". A copy of this article from the American Trial Lawyer Magazine is attached.

The Fall 2011 edition of the Trial Lawyer Magazine contains an article about the warning signs of radiation and cell phones which states "In May 2011 the World Health Organization (WHO) elevated cell phones to Group 2B in its internationally recognized rankings of carcinogens According to the WHO, cell phones are possibly carcinogenic to humans, now being classified alongside the pesticide DDT, lead, chloroform and gasoline engine exhaust.....children using cell phones are exposed to RF energy rates two times higher in the brain

and up to 10 times higher in the bone marrow of the skull compared to adults' use..... because their tissue normally contains a larger number of ions and thus has higher conductivity....With its five billion subscribers, massive marketing presence, high degree of social acceptance, irresistible gadgets, unrivaled convenience and habit-forming pastime, the cell phone industry has reached limits well beyond "Big Tobacco.... it has denied the existence of any danger and has spent millions of dollars trying to discredit the research that points to problems regarding safety — all the while registering patents responsive to the dangers associated with cell phone use..... A good student of history might find striking parallels emerging from the position put forward today by the cell phone industry as compared to the earlier actions of the industries that produced and, for many years, protected tobacco and asbestos through coordinated efforts to stymie research and constantly deny the hazards truly presented by products to which the consuming public had become attached". A copy of this Fall 2011 article from the Trial Lawyers Magazine is attached and can be found here:
<http://www.thenationaltriallawyers.org/the-trial-lawyer-magazine/archived-issues/>

On August 11, 2014, Arthur Firstenberg from the Cellular Phone Task Force, reported that Twenty-nine high-profile lawsuits brought by people whose brain tumors were caused by their cell phones are finally moving toward trial in Washington DC. Six of these cases were originally filed in 2001 and 2002. Many of the plaintiffs are no longer alive. The 12- and 13-year-old cases will now move into the discovery phase and each of the plaintiffs is asking for more than \$100,000,000. There are 46 defendants including Motorola, Nokia, AT&T, Bell Atlantic, Cellular One, Cingular Wireless, SBC Communications, Verizon, Vodafone, the Telecommunications Industry Association, the IEEE, ANSI, the CTIA, and the FCC. From Judge Frederick H. Weisberg, Washington D.C. Superior Court: Expert Preemption Order (page 5): "Federal law is the supreme law of the land, but there is no constitutional provision that says federal facts are the supreme facts of the land. Federal law can preempt state law, but it cannot preempt scientific fact. The scientific truth, whatever it may be, lies outside of the FCC's regulations about what is 'safe' or 'unsafe.' The experts have offered their opinions on the state of the scientific knowledge and general causation. They have testified about the methodology they used to reach those opinions. Their testimony on these points, at this stage of the case, is not subject to preemption."
<http://www.saferemr.com/2014/08/major-breakthrough-in-cellphone.html>

Unlike the cases of past technological adolescence where limited numbers of people and limited areas of the environment were affected, this experiment of wireless technological proliferation is global and has the goal of blanketing the globe everywhere to facilitate uninterrupted wireless service. The continued push of this dangerous technology solely for profit and without responsible safety considerations and limitations is genocide in terms of causing irreversible sterility and in terms of causing cancer and other sickness in the population qualifies as a weapon of mass destruction. The definition of Weapons of Mass Destruction (WMD) taken from a Federal Government web site http://www.fbi.gov/about-us/investigate/terrorism/wmd/wmd_faqs "are defined in US law (18 USC §2332a) as: ... (C) any weapon involving a biological agent, toxin, or vector (as those terms are defined in section 178 of this title)(D) any weapon that is designed to

release radiation or radioactivity at a level dangerous to human life. WMD is often referred to by the collection of modalities that make up the set of weapons: chemical, biological, radiological, nuclear, and explosive (CBRNE). These are weapons that have a relatively large-scale impact on people, property, and/or infrastructure.” On page 10 of the Criminal and Epidemiological Investigation Handbook <http://www.fbi.gov/about-us/investigate/terrorism/wmd/criminal-and-epidemiological-investigation-handbook> the term biological agent as it refers to WMD’s is further defined as it “includes any weapons involving a disease organism. However, it does not require the actual use of a biological agent. Also, it does not require that the biological agent be a select agent only that that agent is capable of causing biological malfunction, disease, or death in a living organism (Title 18 U.S.C. Section 178).” The International Criminal Court http://www.icc-cpi.int/en_menus/icc/about%20the%20court/frequently%20asked%20questions/Pages/12.aspx defines “Crimes against humanity include any of the following acts committed as part of a widespread or systematic attack directed against any civilian population, with knowledge of the attack: ... extermination; enforced sterilization, other inhumane acts of a similar character intentionally causing great suffering or serious bodily or mental injury.” The term Genocide as defined by the United States Holocaust Memorial Museum is taken from this site <http://www.ushmm.org/wlc/en/article.php?ModuleId=10007043> “United Nations approved the Convention on the Prevention and Punishment of the Crime of Genocide. This convention establishes genocide as an international crime, which signatory nations undertake to prevent and punish. It defines genocide as: ... any of the following acts committed with intent to destroy, in whole or in part, a national, ethnical, racial or religious group, as such: ... Killing members of the group; ... Causing serious bodily or mental harm to members of the group; ... Deliberately inflicting on the group conditions of life calculated to bring about its physical destruction in whole or in part Imposing measures intended to prevent births within the group...”.

It should now be apparent from the gravity of this situation that our elected and appointed government officials have failed to honor their oath and obligation to support and defend the constitution by failing to refuse to obey unconstitutional regulations/laws, failing to protect the life, liberty, and the pursuit of happiness for their fellow countrymen, by failing to prevent the approval/proliferation of wireless technologies which are essentially Weapons of Mass Destruction, making them complicit in ongoing Crimes Against Humanity and the Genocide of their fellow countrymen as well as themselves. As you should be aware, the Constitution Limits your ability to take actions which you are not authorized to do. Likewise International Laws and Treaties further prohibit Genocide and Crimes Against Humanity. While some of you would make the excuse that you did not know about the damage microwaves cause, that cannot be said in this case. There are 1000’s of government studies performed since at least the 1940’s documenting many adverse effects of microwave exposure.

While people sometimes posthumously nominate individuals for the Darwin Award for removing themselves from the gene pool (as in death by stupidity), clearly no population of people on this earth would ever grant to their elected

officials the authority to sterilize and sicken with cancer life upon this earth on a local or global basis. Certainly no such authority has been granted to the United States Government by the American People. Whenever public officials take actions not authorized by their official capacity, they become liable in their personal capacity. You now stand before a perfect storm of litigation for which no amount of unconstitutional preemption will protect you. One of the most landmark cases decided by the US Supreme Court which established the doctrine of judicial review was Marbury v. Madison (1803) “ the particular phraseology of the Constitution of the United States confirms and strengthens the principle, supposed to be essential to all written Constitutions, that a law repugnant to the Constitution is void, and that courts, as well as other departments, are bound by that instrument”, a full copy of that decision is available here:

<http://supreme.justia.com/cases/federal/us/5/137/case.html> .

The people of this country and of the world at large are becoming more and more aware of the unresolved safety issues of microwave technologies. As such they are watching closely what actions the FCC and other elected and appointed officials take on this issue. I have no doubt that current and future victims harmed by this technology will hold you accountable for your part in creating this problem.

To be clear, I do not consent to be radiated at any time and in any way by microwave technologies now in use or future microwave technologies planned for development and use. It is my contention that an immediate moratorium on these microwave technologies is needed until they can be made absolutely safe or are replaced altogether by other technologies which have no such adverse effects.

Sincerely,

By: Autograph of Chris Nubbe

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Individual Rights & ADA; Katie Singer Comments, Nov. 8, 2013

FCC 13-39

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Reassessment of Federal Communications	)	ET Docket No. 13-84
Commission Radiofrequency Exposure Limits and)	
Policies)	
)	
Proposed Changes in the Commission's Rules	)	ET Docket No. 03-137
Regarding Human Exposure to Radiofrequency)	
Electromagnetic Fields)	
)	

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

REPLY Filed by: Katie Singer
PO Box 6574
Santa Fe NM 87502
Katie@KatieSinger.com
505.820.0773

November 8, 2013

AFFIDAVIT OF KATIE SINGER

State of New Mexico

County of Santa Fe

I, Katie Singer, attest that my statements are true to the best of my knowledge.

REPLY round for FCC ET Docket No. 013-84 and ET Docket No. 03-137

1. My name is Katie Singer. My address is PO Box 6574, Santa Fe NM 87502.
2. I am a writer. My next book, *An Electronic Silent Spring: Facing the Dangers and Creating Safe Limits*, will be published by Steiner Books in 2014.
3. and onward. I endorse the following COMMENTS filed in ET Docket No. 03-137 and ET Docket No. 13-84:

COMMENT by The EMR Policy Institute

COMMENT by Cindy Sage and David O. Carpenter, Co-Editors, The BioInitiative Report 2007 and 2012

COMMENT by Sage, Hardell, Herbert on RF Radiation Effects on Sperm, Reproduction, Brain Tumors, Adverse Fetal and Neonatal Effects, and Autism

COMMENT by The American Academy of Pediatrics

In addition, I submit the following list of solutions compiled from government agencies, an IEEE engineer and health organizations. They can move us toward a safer electrical grid, safer electronics, safer telecommunications--and a healthier world.

First Steps for individuals and society

1. Recognize that electricity, electronics and wireless devices have brought great benefits to humanity. Recognize that electricity and electromagnetic radiation can harm health and the environment. (BioInitiative Report 2012; The Seletun Scientific Statement 2009; and EMR Policy Institute--see EMR Policy's proposed definition of biological harmful interference in box below)
2. Recognize that electronic innovations and inventions have outpaced testing, monitoring and regulating of health. Recognize that safety standards do not exist for children, pregnant women, people with medical implants or other vulnerable populations. Recognize that current standards do not consider the effects of exposure to second-hand radiation, multiple frequencies or multiple transmitters. (FCC Notice of Inquiry 13-39)
3. Commit to guiding ourselves by the Precautionary Principle and first do no harm. Do not deploy or purchase any new technology until third party,

independent testing proves that it does not cause biological harm. (See Precautionary Principle defined in the glossary.)

NEXT STEPS

Next Steps for legislators

1. Mandate a clearly stated federal law that FCC standards do not pre-empt the ability of injured citizens to go to court and recover damages caused by the trespass of electro-magnetic radiation into their bodies. (EMRpolicy.org)
2. Mandate Whitney North Seymour Jr.'s amendment to Section 704 of the Telecommunications Act, which will allow localities to determine their own setback policy on telecom equipment. (EMRpolicy.org)
3. In Congress, re-introduce and mandate the Cell Phone Right to Know Act (HR 6358 2012). It will give the EPA authority to determine biological safety standards on cell phones, require SAR labeling on mobile phones, and fund research about the health effects of wireless devices. All EMR-emitting devices should be included in this Act. (12.12.12 letter from the American Academy of Pediatrics, in the appendix.)
4. Mandate warning labels on all mobile devices that 1)show a picture of how far radiation penetrates the head when the device is near it and 2)state, "This device emits electromagnetic radiation, exposure to which may cause brain cancer. Users, especially children and pregnant women, should keep this device away from the head and body." (Maine Children's Wireless Protection Act, proposed by legislator Andrea Boland, electromagnetichealth.org)
5. Enforce National Environmental Policy Act (NEPA) requirements of Environmental Assessment before deploying new technology near schools or sensitive habitats. (epa.gov)
6. Repeal the FCC's reclassifying the pinna (outer part) of the ear as an extremity in its 2013 Reassessment of RF Exposure Limits and Policies. (Radiofrequency Interagency Work Group, 2003 letter to FCC)
7. Allow people with medical implants and Electro-hypersensitivity reasonable accommodation (i.e. shut off wireless devices and services) in public spaces. (1991 Americans with Disabilities Act.)
8. To provide immediate relief, allow every ratepayer in every state the option of a mechanical, analog meter for their utilities.

Next Steps for regulators

1. Mandate a nationwide, standardized and regulated electrical code-- instead of our current (voluntary) National Fire Protection Association- National Electrical Code. Recognize that "interference" can harm electrical equipment *and* cause thermal and non-thermal effects that harm human health and the environment. OSHA should regulate this code for workers' safety; FDA should regulate the electrical grid's impact on public health, including medical devices and equipment; and EPA should regulate the grid's environmental impacts. This code should be applied to

- the "smart" grid and "smart" appliances and all sources of electricity, including unconventional sources. (BioInitiative.org; HR 6358 2012)
2. Revise our National Electrical Safety Code (NESC) so that there is no more than 1.0 mG (0.1 microtesla) of magnetic field within habitable space. (BioInitiative 2012, p. 37)
 3. NESC must also require utilities to separate neutrals and grounds correctly to prevent return current from flowing over the earth, metallic water and gas piping, building steel and other conductive materials--and to prevent shocking or even electrocuting people in showers or swimming pools. (Donald Zipse, "Are the National Electrical Code and the National Electrical Safety Code Hazardous to Your Health?" *Industrial Commercial Power Systems Technical Conference*, 1999.)
 4. Mandate single-point grounding-transformer isolation on all transformers so that neutral wires are not shared, and ground current and magnetic fields are significantly reduced. (*Practical Grounding, Bonding, Shielding and Surge Protection*, by G. Vijayaraghavan, M. Brown and M. Barnes, Newnes/Elsevier, 2004, p. 237.)
 5. Quantify levels of electromagnetic radiation that cause biological harm. Establish a standard for reaching safe levels for all segments of the population and the environment. (BioInitiative.org) Note: In 1971, OSHA issued a protection guide for workers' exposure to RF radiation (29 CFR 1910.97). This guide was later ruled to be advisory, not mandatory. osha.gov/SLTC/radiofrequencyradiation/.
 6. Mandate regulations that limit electrical and electromagnetic radiation to levels that protect human health and the environment. (BioInitiative.org; HR 6358 2012)
 7. Require periodic testing (by independent third parties) for the presence of hazardous levels, similar to current testing for and enforcement of air quality standards. Require mitigation when hazardous levels are reached, followed by re-testing. (EMRpolicy.org)
 8. The FCC should require installation of sensors at all building-mounted and tower-mounted locations. Emissions levels should be recorded on a regular, ongoing basis and sent to a computer interface via a cabled phone line. These readings should be monitored and posted on a website accessible to the public. High levels should be mitigated promptly. (EMRpolicy.org, Americans Beware)
 9. The FCC should promote cabled Internet in residences, at public institutions and in localities. Fiber optics should be installed for *cabled* (not wireless) services, including Internet, TV and telephone. (EMRpolicy.org)
 10. Congress should fund the FDA to regulate the effects of RF signals and emissions on people who depend on medical devices and medical equipment. (Center for Devices and Radiological Health *and* Electronic Product Radiation Control Program at FDA)
 11. Require licensed electricians to learn (through continuing education)

to identify and eliminate wiring errors on utility wiring and in public and private buildings that generate magnetic fields and ground current --and that may cause biological harm. (*Soares Book on Grounding and Bonding, 10th ed.* International Association of Electrical Inspectors, 2008, p. 429.)

12. Require health care providers, educators, electricians, city planners, architects, electronics designers, solar and wind power manufacturers and others to take annual continuing education about how electronics, wireless devices and transmitters create hazards for children, pregnant women, people with medical implants, people with EHS and the environment, similar to OSHA and EPA mandated periodic training to deal with hazardous materials. (OSHA.gov, EPA.gov and, for example, 29 Code Federal Regulation.)

Next Steps for utility and telecommunications companies

1. Replace every digital wireless transmitting utility meter with an analog mechanical one. (BioInitiative.org; see also letters from epidemiologist De-Kun Li, MD and the American Academy for Environmental Medicine in the appendix.)
2. Keep TV and radio broadcast facilities far from populated areas. (emrpolicy.org)
3. Maintain landlines, a known, safe technology. (BioInitiative.org)

Next Steps for manufacturers

1. Recognize that high frequencies generated by linear and switch-mode power supplies (SMPSs) generate square waves and harmonics that interfere with electronic equipment *and* may cause biological harm. Eliminate fluorescent lights, including compact fluorescent bulbs (CFLs), which use electronic ballasts (aka SMPSs); they generate high frequency harmonics, and they usually contain mercury. Replace them with bulbs such as LEDs that save energy and do not generate square waves and harmonics. Eliminate dimmer switches that generate square waves and harmonics; replace them with dimmers that do not generate harmonics or with standard switches. Revisit standards for electronics and appliances, including 12-volt DC electronics and appliances, that are currently used on boats, RVs and in some solar-powered homes. (BioInitiative.org)
2. Design solar-powered systems that do not generate high frequency fields. Eliminate DC-AC inverters. Whenever possible, use propane or DC-powered appliances and electronics in solar-powered homes and buildings.
3. Create safer electric and hybrid cars, whose existing computerized systems (charging, LCD display, windows, etc.) trap drivers and passengers in a metal box filled with electro-magnetic fields.
4. Create safer medical implants by installing a hazard-overload interrupter in every implant, similar to ground-fault interrupters in household wiring. (Dr. Gary Olhoeft, Colorado School of Mines)

5. Reduce or eliminate ads for wireless devices that target children, as France has done. Reduce or eliminate depictions of substance abuse or violence in films or videos and create more prosocial programs, as the American Academy of Pediatrics (AAP) suggests.

Next Steps for health care providers

1. Since pediatricians who watch more TV are less likely to advise families to reduce their media exposure, physicians need to examine their own media habits. (DA Gentile, C. Oberg et al, "Well-child visits in the video age: pediatricians and the American Academy of Pediatrics' guidelines for children's media use," *Pediatrics* 2004;114(5)L: 1235-1241; and "Children, Adolescents and the Media," *Pediatrics* 2013;132958-961.
2. Require continuing education for physicians, first responders, public health assessors and other health care providers about creating electrically safe living, learning and working environments for pregnant women, children, people with medical implants and those with Electro-hypersensitivity. Physicians must be trained to recognize Electro-hypersensitivity; to educate parents about creating an electrically safe environment for children; to perform common procedures (i.e. dental work and hernia surgery) safely on people with medical implants. (Austrian Medical Association Guidelines, aerztekammer.at/documents/10618/976981/EMF-Guideline.pdf; Dr. Gary Olhoeft, Colorado School of Mines)
3. The AAP encourages pediatricians to ask, at every well-child visit, *How much recreational screen time does your child or teen consume daily? Is there a TV or Internet-connected device in the child's bedroom?* Physicians could encourage parents to establish a plan for all home media use. *Pediatrics* 2013;132958-961.
4. Create centers that treat children and adults who use mobile devices addictively, similar to centers that address gambling, alcohol and drug addictions.
5. Require every hospital to employ an electrical interference specialist (as many already do) to monitor potentially hazardous interference between devices *and* between personnel, patients and devices. Health care providers should educate themselves and their clients about plausible and known risks to health caused by RFs; they should encourage precautionary behavior among themselves and their clients.

Next Steps for schools

1. Remove Wi-Fi and wireless devices from schools and libraries. Provide wired learning environments for students and faculty. (Dr. Martha Herbert and Cindy Sage, MA, "Autism and EMF? Plausibility of a pathophysiological link-- Parts 1 and 2," *Pathophysiology* 2013.)
2. Remove digital wireless transmitting utility meters from schools and libraries. Replace them with analog mechanical meters.
3. Provide guidance for educators to recognize Electro-hypersensitivity in children and about the addictive nature of using interactive electronic

devices and the Internet--similar to guidance issued by the CDC for identifying children with food allergies, preventing exposures and managing reactions (cdc.gov/healthyyouth/foodallergies/). Strengthen students' communication skills in non-electronic, eye-to-eye contact. (*Alone Together*, by Sherry Turkle; see also "Children, Adolescents and the Media," a 10.28.13 Policy Statement from the AAP.)

4. Eliminate fluorescent lights. Use incandescent or CLED lights.
5. Before granting licenses, master electricians and plumbers could require apprentices to identify and clear magnetic fields in their own homes.
6. Create institutes that teach people how to measure ELF's, RF's and SAR's; how to identify whether electricity is safely installed; whether the levels of electromagnetic fields in an area are safe; how to mitigate unsafe levels (and how to identify when an environment cannot be mitigated without major infrastructure changes); and how to live with less electronics.

Next Steps for environmental, citizen, religious and professional groups

1. Encourage awareness about the biological effects of emissions from electronics and wireless services on pregnant women, children, people with medical implants and others. Encourage schools, doctors' offices, libraries, places of worship, restaurants, other areas of public accommodation--and your own workplace--to dismantle wireless services, including digital wireless utility meters.
2. As an immediate step to accommodate Electro-Sensitive members, congregations could dismantle wireless services and request that members leave wireless devices at home for weekly or monthly services.
3. Push a solution-based agenda with local and federal legislators and regulators that will make our society safer and healthier. (BioInitiative.org)

Respectfully submitted by
Katie Singer
PO Box 6574

Santa Fe NM 87502

November 8, 2013 15, 2013

Katie Singer

(your signature)

Sworn to before me

This 15 day of Nov²⁰, 2013

Kay Carlson
Notary Public

my commission expires 11-6-17

Individual Rights; BC Human Rights Tribunal
approves smart meter class action,
Citizens for Safe Technology; Aug. 22, 2013

Citizens for Safe Technology Society



BC Human Rights Tribunal approves smart meter class action

On August 28, 2012, the BC Human Rights Tribunal (BCHRT) issued a decision approving a representative complaint (akin to a class action) against BC Hydro on behalf of “those persons allegedly diagnosed with electromagnetic hypersensitivity and who have been advised to avoid exposure to wireless technology.”

A copy of the Tribunal’s decision is available at:

<http://www.bchrt.bc.ca/decisions/2012/August.htm>

The Tribunal approved the representation of that class by the Citizens for Safe Technology Society, which it found to have authority to bring the representative complaint. The Society may be contacted at www.citizensforsafetechnology.org by any person wishing to join in the complaint.

The Tribunal found that the complaint brought by the Citizens for Safe Technology Society properly alleges a breach of the Human Rights Code in that it alleges a disability, adverse treatment in respect of a service customarily available to the public, and a nexus or connection between the disability and the adverse treatment.

By way of the Complaint, the Citizens for Safe Technology Society seeks:

- A declaration that BC Hydro has discriminated against each person in the Class by failing to provide each person in the Class with an unconditional written commitment that BC Hydro will refrain from installing and/or operating a wireless smart meter at the individual’s place of residence and/or residential complex.
- An order that BC Hydro cease and desist forthwith from the said discrimination by offering to refrain from installing and/or operating a wireless smart meter at the individual’s place of residence and/or residential complex.

On May 31, 2011, the World Health Organization recognized that radiofrequency electromagnetic fields are a Class 2B possible human cancer risk. The emissions generated by the Microwave Device fall under this classification of emissions and risk.

The Citizens for Safe Technology Society is currently fundraising to bring a tort action against BC Hydro so as to prohibit the imposition of microwave emitting smart meters on BC residents regardless of whether they have electromagnetic hypersensitivity.

Individual Rights; Wireless Technology Violates Human Rights,
Catherine Kleiber, Sep. 30, 2016

Wireless Technology Violates Human Rights

How universal exposure to radiation from wireless devices complying with existing inadequate safety limits violates the Nuremberg Code of Ethics

Catherine Kleiber, www.electricalpollution.com

The report “Wi-Fi – A Thalidomide in the Making. Who Cares?” by Barrie Trower makes it clear that **exposure to radiation from wireless technology will cause DNA damage, including damage to the mitochondrial DNA that is irreparable and will transmit to all future progeny** of affected females. In a mouse study, “*RF Radiation–Induced Changes in the Prenatal Development of Mice*” (http://avaate.org/IMG/pdf/magras_mice_study.pdf), six months of real-life ambient exposure to a medley of radiation sources at levels well below those allowed by FCC RF limits resulted in total sterility, which did not reverse. It would be expected to take longer in humans, however this finding supports the urgency of the points Mr. Trower makes in his report which can be found at <http://www.electricalpollution.com/documents/WiFiAThalidomideInTheMakingWhoCares.pdf>.

Thus, there is NO possible way that the FCC can both promote wireless technology and protect the public health and safety, as directed by the House Committee on Commerce in H.R. Report No. 104-204, p. 94.

Obviously, Congress made clear with the stipulation that it was the FCC's responsibility to adopt uniform RF regulations "with adequate safeguards of the public health and safety" (H.R. Report No. 104-204, p. 94) that they were not interested in promoting wireless technology at the expense of the public health and safety.

The **FCC is obligated by the directive in H.R. Report No. 104-204, p. 94 to inform Congress it is impossible to both promote wireless and protect the public health and safety** since it is now clear that wireless technology has the potential to compromise the genetic integrity of individuals for all future generations. Continued promotion of wireless technology in spite of that and the following evidence:

- Report of Partial Findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats (Whole Body Exposures) bioRxiv preprint first posted online May. 26, 2016 (<http://dx.doi.org/10.1101/055699>)
- *Tumor Promotion by Exposure to Radiofrequency Electromagnetic Fields Below Exposure Limits for Humans* (<http://www.ncbi.nlm.nih.gov/pubmed/25749340>)
- The BioInitiative Reports (www.bioinitiative.org)
- Biological Effects from RF Radiation at Low-Intensity Exposure, based on the BioInitiative 2012 Report, and the Implications for Smart Meters and Smart Appliances (<http://emfsafetynetwork.org/wp-content/uploads/2013/08/Biological-Effects-From-RF-Radiation-and-Implications-for-Smart-Meters-June-5-2013-2.pdf>)
- “Provocation study using heart rate variability shows microwave radiation from 2.4 GHz cordless phone affects autonomic nervous system” (<http://www.magdahavas.com/wordpress/wp-content/uploads/2010/10/Havas-HRV-Ramazzini1.pdf>) and replicated (<http://www.ncbi.nlm.nih.gov/pubmed/23675629#>)
- “Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation” (<http://www.ncbi.nlm.nih.gov/pubmed/26151230>)

- "Impacts of radio-frequency electromagnetic field (RF-EMF) from cell phone towers and wireless devices on biosystem and ecosystem – a review" (http://www.biolmedonline.com/Articles/Vol4_4_2012/Vol4_4_202-216_BM-8.pdf)
- "Report on Possible Impacts of Communication Towers on Wildlife Including Birds and Bees" (http://www.moef.nic.in/downloads/public-information/final_mobile_towers_report.pdf)
- "CRITICISM OF THE HEALTH ASSESSMENT IN THE ICNIRP GUIDELINES FOR RADIOFREQUENCY AND MICROWAVE RADIATION (100 kHz - 300 GHz)" (www.electricalpollution.com/documents/Cherry2000EMR_ICNIRP_critique_09-02.pdf)
- "Swedish review strengthens grounds for concluding that radiation from cellular and cordless phones is a probable human carcinogen" (<http://www.ncbi.nlm.nih.gov/pubmed/23664410>)

would not only violate the directive in H.R. Report No. 104-204, p. 94 which said it was the Commission's responsibility to adopt uniform RF regulations "with adequate safeguards of the public health and safety" and the principles of public health protection, but also be in direct violation of the entire Nuremberg Code of Ethics (<http://www.hhs.gov/ohrp/archive/nurcode.html>).

Prior to approval of wireless technology for civilian use, it is clear from "Wi-Fi – A Thalidomide in the Making. Who Cares?" that it was already known that there were bio-effects from exposure to pulsed microwave radiation that were separate from tissue heating and it is clear from Cellular Telephone Russian Roulette: A Historical and Scientific Perspective (http://microondes.files.wordpress.com/2010/03/robert_c_kane_cellular_telephone_russian_roulette.pdf) that extensive scientific literature existed showing that harmful tissue heating could occur extremely quickly and locally at levels well below those allowed by the ICNIRP and IEEE limits and also that ample evidence existed of disabling effects on organisms when chronically exposed to RF radiation.

Reasonable people with full access to the data could and did think a dangerous situation was being created by 1984, see "Biological Effects of Radiofrequency Radiation" (EPA 600/8-83-026F, 1984) (<http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=300065H1.txt>) and then again prior to the passage of the 1996 Telecommunications Act (http://www.emrpolicy.org/litigation/case_law/docs/epa_to_fcc_3nov_93.pdf). In spite of this, no biologically protective safety limits were implemented to protect citizens during daily life.

It violates the Nuremberg Code of Ethics to experiment on non-consenting people who cannot stop the experiment, especially when harm can reasonably be expected to result. That is exactly what has happened and is happening. The fact that those reasonable expectations have been fulfilled can be seen in The BioInitiative Reports and in many of the documents submitted for consideration within these FCC dockets (ET Docket No. 13-84, and ET Docket No. 03-137).

Industry continues to generate uncertainty, in spite of the numerous well-designed studies showing harm, and continues to call for additional studies instead of action. Results of the society-wide human experiment continue to roll in which demonstrate the harmfulness of the technology. A small sample of these studies are below:

- "Prenatal and Postnatal Exposure to Cell Phone Use and Behavioral Problems in Children" (<http://www.ncbi.nlm.nih.gov/pubmed/18467962>)
- "Apparent decreases in Swedish public health indicators after 1997—Are they due to improved diagnostics or to environmental factors?," Hallberg and Johansson ([http://www.pathophysiologyjournal.com/article/S0928-4680\(09\)00002-9/abstract](http://www.pathophysiologyjournal.com/article/S0928-4680(09)00002-9/abstract))

- “The Influence of Being Physically Near to a Cell Phone Transmission Mast on the Incidence of Cancer” (http://emrstop.org/index.php?option=com_docman&task=doc_details&gid=4&Itemid=18)
- “Changes of Clinically Important Neurotransmitters under the Influence of Modulated RF Fields- A Long-term Study under Real-life Conditions” (http://www.radiationresearch.org/images/RRT_articles/Buchner%20Eger%20Rimbach%20Study%202011%20ENG%20FINAL%20Revised%2029%20July%202011.pdf)
- “How does long term exposure to base stations and mobile phones affect human hormone profiles?,” Eskander et al. (<http://www.sciencedirect.com/science/article/pii/S0009912011027330>)
- “Microwave frequency electromagnetic fields (EMFs) produce widespread neuropsychiatric effects including depression.” (<http://dx.doi.org/10.1016/j.jchemneu.2015.08.001>)

Indeed, in light of evidence that harm could be expected from its use and exposure is involuntary in many cases, there has been a violation of the entire Nuremberg Code of Ethics since RF technology was approved for civilian use without biologically-meaningful RF safety limits in place, specifically “1. The voluntary consent of the human subject is absolutely essential ...” and “9. During the course of the experiment, the human subject should be at liberty to bring the experiment to an end...”. Millions of people are being exposed to a dangerous toxin in an open-ended non-consenting experiment which they cannot bring to an end and over which they have no control.

Performing additional studies without immediate action to put protective safety limits in place based on the array of existing studies showing harm, only continues the massive violation of human rights.

The fact that any new microwave-based technology might be safer is no excuse to contend that this open-ended non-consenting experiment should continue. Any new possibly safer technology should be studied in double-blind placebo controlled medical-style laboratory safety studies using approved protocols carefully designed to detect health effects before being allowed to undergo controlled consenting medical-style human studies. The track record of previous microwave-based (wireless) technology and the Nuremberg Code of Ethics demands it!

Therefore, the **FCC is obligated** by H.R. Report No. 104-204, p. 94, by the principles of public health protection, and by the Nuremberg Code of Ethics **to immediately place a moratorium on additional spectrum sales, antenna installations, transmitting utility meter installations, new wireless technologies, and sales of wireless devices**, while notifying Congress, The Environmental Protection Agency, The Center for Disease Control, The National Institute of Health, and The U.S. Department of Health and Human Services of the **serious health hazard posed by wireless technology and seeking their professional support in developing RF safety limits that truly protect the public health from biological harm.** If further experiments are needed, they should be done immediately using approved medical-style protocols, not using the entire population in an inescapable uncontrolled study done without consent.

If the FCC would like to argue that this is not an experiment because data collection is not consistent enough and negative outcomes were expected or known, then population-wide exposure to this toxin is still either “inhuman treatment” or “torture,” both of which are human rights violations. **Money is not a justifiable reason to expose an entire population to a potentially lethal agent that can be reasonably expected to isolate and disable many, impairing their ability to reach their full potential and live their life fully and freely.**

Individual Rights; Kate Reese Hurd Comments, Oct. 29, 2013

FCC 13-39

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Reassessment of Federal Communications	)	ET Docket No. 13-84
Commission Radiofrequency Exposure Limits and)	
Policies)	
)	
Proposed Changes in the Commission's Rules	)	ET Docket No. 03-137
Regarding Human Exposure to Radiofrequency)	
Electromagnetic Fields)	
)	

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

Comment Filed by: Kate Reese Hurd
P.O. Box 331
High Falls, NY 12440
E-mail: kreehu@gmail.com
845-687-2035

October 29, 2013

I wish to submit a further comment.

1 The **NYS Public Service Commission** recently sent me copies of 3 documents pertinent to their program of digital utility metering in New York State:

1. The FCC OET Bulletin 56, Fourth Edition, August 1999, Authors Robert F. Cleveland, Jr. and Jerry L. Ulcek, "Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields;"
2. The article "No Health Threat From Smart Meters" from the fourth quarter 2010 Utilities Telecom Council journal, UTC; and
3. The Electric Power Research Institute, EPRI, article of February 2010, "A Perspective on Radio-Frequency Exposure Associated With Residential Automatic Meter Reading Technology."

2 In these articles, I am given to understand that the FCC's current limits on exposures to RF radiation are based on the amounts needed to heat body tissues sufficiently to cause rats to change their behavior. The UTC article states that radio frequencies "emitted by smart meters, cell phones, wireless routers...can only damage the body at extremely high levels." **Recent science shows this assumption is far off the mark.** Extremely low levels are bio-active and many effects stem directly from the pulsing nature of wireless RF radiations.

3 The **BIOINITIATIVE REPORT OF 2012**¹ peer-review of over 1800 new studies urges an immediate international limit of no more than .03 **milliWatts** per **meter** squared², because biological effects are seen at levels at least this low. The **AUSTRIAN MEDICAL ASSOCIATION**³ has issued guidelines which set the limit far lower than that, at .001mW/m². Please see their document of March 3, 2012, [Guideline of the Austrian Medical Association - Freiburger Appell](#) (Consensus paper of the **Austrian Medical Association's** EMF ...diagnosis and potential **treatment** of unspecific stress-related health problems.) See pp. 9-10 for their limits and ranges for both RF radiation and electromagnetic fields (EMFs). We must pay attention.

4 More and more people ARE becoming electrohypersensitive, experiencing a wide range of symptoms brought on by chronic and exponentially increased exposures to RF radiation and EMFs - headaches, etc., and even now a Type 3 Diabetes. All three documents, listed above, convey grossly out-dated material on the biological effects of RF and electrical transmissions and fields.

5 The FCC OET Bulletin 56 of August 1999 cites that *"two areas of the body, **the eyes and the testes**, are know to be particularly vulnerable to heating by RF energy because of the relative lack of available blood flow to dissipate the excessive heat load.... Temporary sterility, caused by such effects as **changes in sperm count and mobility** is possible."* It also states that *"although not commonly observed [in 1999], a microwave 'hearing' effect has been shown to occur under certain very specific conditions of frequency, signal modulation, and intensity where animals and humans may perceive an RF signal as a **buzzing or clicking sound**. Although a number of theories have been advanced to explain this effect, the most widely-accepted hypothesis is that the microwave signal produces thermoelastic **pressure within the head** that is perceived as sound by the auditory apparatus within the ear. This effect is not recognized as a health hazard, and the conditions under which it might occur would rarely be encountered by members of the public."*

6 But, regardless of the conclusions of the FCC in 1999, it must be fully respected that citizens, now in 2013, ARE experiencing exactly these nerve-wracking buzzings, tinnitus and pressures, in their homes and workplaces, on account of exposure to non-thermal, RF radiations from wireless devices (such as digital utility meters). We must not be forced to live with these conditions.

7 On p. 8, the article states that effects have been seen at “*relatively low levels of RF radiation. These reported effects have included certain changes in the **immune system, neurological effects, behavioral effects**, evidence for a link between microwave exposure and the action of certain drugs and compounds, a ‘**calcium efflux**’ effect in brain tissue (exposed under very specific conditions), and **effects on DNA**.*” [my bold]

8 → Please: I would have thought that in 1999, when confronted with these clear intimations of something going very wrong in our biologies on account of our readiness to expose ourselves to low level RF radiation such as this, the FCC would have taken a strongly precautionary stance, not the ‘monitor-the-evidence’ and ‘wait-and-see’ approach it did (as in the article) while opening the floodgates for RF radiation to saturate our entire biosphere in an “innocent until proven guilty” manner that applies ONLY to human beings, that does not belong to a technology that has never been a part of the natural process of life and could not be trusted to be compatible with it.

9 If you do not decrease the limits drastically, to where the **BIOINITIATIVE REPORT OF 2012** documents suggest, and better yet to the level urged by the Austrian Medical Association, it may be too late for us to assure our well-being and our reproductive viability into the future. **I understand that it is being seen that in just five generations of RF exposures such as ours, rats can’t reproduce.** And rat DNA does not differ from human DNA in its essential nature and vulnerability. We must pay attention.

10 And where will those of us who are children, elderly, frail or sensitive go to live when digital, wireless utility meters in HAN, NAN and WAN grids electrify our environs in all directions? This is not a time for saying, “let’s try it and wait and see.” We know enough to be able to say that if we do not retreat now, we are in terrible trouble. Who will tend all those who are increasingly born with ASD and those who succumb to brain cancers, other cancers, Alzheimer’s? And what about all the suffering from insomnia and heart a-rhythmias, ADHA, etc. All of this leads back to, are effects from far too much RF radiation, 24/7, unremittingly. The constant on/off pulsing of all wireless devices harasses cellular functions that depend on clear bioelectrical signals that regulate nerve, heart, hormone and immune system responses. We cannot avoid becoming sick from this sooner or later, because the effects are also cumulative, as in the case of cancers from it.

11 I discovered that the direct cause of the disquiet in my own chest, in my heartbeat, was the cordless phone base station and wireless router in my home emitting pulsing WiFi 24/7. Since silencing this WiFi, my heartbeat has settled down. I connect by ground phone and ground cables. The difference is night and day. *I am glad that I have that choice. Other places I go, I do not.*

12 In many cases, because the FCC limits are so astronomically high compared to the levels that are being verified to be bio-disruptive, the devices we use everyday often expose us to shockingly excessive amounts of RF radiation - not because they need to be so high, but because the FCC and the manufacturers simply regard these amounts of exposure as harmless. We are coming to know how very far from harmless they are, and how very true the earlier research was in its indications.

13 Using a **CORNET ED-78S RF/LF FIELD STRENGTH POWER METER** sensor I’ve found that many cordless phone, DECT, base stations emit pulsing WiFi constantly and in the range of up to 1827 mW/m² - mostly in the upper range. When the handset is activated it can deliver up to 1900 mW/m² **directly to the ear**. These DECTs are Verizon, Panasonic, and AT&T. The Motorola model I only briefly checked was emitting constant RF pulsing of at least 400 mWm².

However, some base stations are designed to be silent unless a handset is activated, at which time they emit at 1-13 mW/m² - still far too much but hugely less than the absolutely shocking 1800 of

these others I've mentioned. The silent ones happen to be RadioShack and VTech - which is not to say that all of their models 'shut up' between calls. When the handset is activated, the ear receives 3-17 mW/m², not the amounts up to 1900, where even at 3 feet away the exposures are unsafe in light of the recent research. I've seen the photographs of the adolescent rat brain as it looks normally on the surface and then as it looks after the equivalent of only two hours of talking on one of these DECT phones.⁴ The surface has lesions. Even 50 days later it is abnormal with lesions - no recovery in that time. No wonder we have blood-brain-boundary problems and such trouble with microorganisms that can too easily cross it, such as Lyme. We must pay attention.

14 EVERY wireless device must have on/off switches for the wireless function - none of this constant on with no off button. Regardless of lowered RF emissions limits, warnings must be placed on all such devices at point-of-purchase. None can be assumed safe. We need to know that we take into our hands both our lives and those of all generations to come within our family tree, in the event that we care about the longevity of our personal lineage if not our collective longevity.

15 **And herein is my sense of alarm about wireless meters in particular, upon which your proceedings bear: It is argued (in the articles I was sent by the NYS Public Service Commission) that metering contributes little to the RF we are exposed to. Not so. People can choose to frequent coffee shops or not, choose to hook up their computers and devices by WiFi, etc., or not, as they please. And they can choose not to when they understand how high the stakes are to their health. But meters are PERMANENT installations. Whatever their emissions are now with no 'grid', where they spike wireless radio frequencies at least 4-5x a minute 24/7 whether transmitting or not, these emissions will be on the increase. Each meter is to keep constant contact with "smart chips" in all household appliances and with up to a thousand neighboring meters. → All of this wireless pulsing must go through my dwelling, my workplace and through me, permanently. THIS IS TOXIC TRESPASS. I have the freedom to choose to remove wireless WiFi from within my home for health reasons. I will have no freedom and no control over this unremitting trespass from meters, and no escape from it.**

And it is being shown that near proximity to these devices causes trauma to the blood.⁵ This alone directly endangers the well-being of anyone doing work in the vicinity. We must pay attention.

16 Please drastically reduce the limits for RF radiations as urged in the BioInitiativeReport, mandate the total revamping of all existing devices and terminate all "SmartGrid" plans.

Sincerely,

Kate Reese Hurd

¹ BioInitiative Report of 2012, Conclusions Section: <http://www.bioinitiative.org/conclusions/> In the Report itself see "Section 22: Precaution in Action - Global Public Health" for the **International Advisories** (<http://www.bioinitiative.org/>). We must pay attention.

² .03 mW/m² = .003 uW/cm² as in the Report (i.e .03 milliWatts/meter² = .003 microWatts/centimeter².)

³ Austrian Medical Association - Google "Guideline of the Austrian Medical Association" for the diagnosis and treatment of EMF- related health problems and illnesses (EMF syndrome). Link is above, in the text.

⁴ See the presentation of Dr. Karl Maret, M.D. and BioMedical Engineer in the YouTube which is not only about so-called "Smart" meters: <http://www.youtube.com/watch?v=p-nmaYU6kek&list=PL63B0143B3C354D88>

"The Truth About Smart Meters" Sept 15, 2010. CTVsantacruz Freedom Forum 1:53:42. Also see another YouTube on RF technology and what has been known of the terrible health effects of it: <http://www.youtube.com/watch?v=v4HsxNG2-4M> Brian Thiesen CSTinBC Aug 15, 2012 1:08:15- "The Truth about Smart Meters" - meters being just the most present and egregious form of RF, now flooding the biosphere.

⁵ <http://www.youtube.com/watch?v=y4JDEspdx58> "Live Blood Analysis - Observable Effects of RF/MW Radiation via Smart Meters"

Individual Rights; Wireless “Revolution” Must Be Supported by
Scientific Proof of Safety for Human Health and the Environment,
Patricia Burke, Sep. 30, 2016

Wireless "Revolution" Must Be Supported by
Scientific Proof of Safety for Human Health and the Environment

Until the US takes steps to insure that the conflict between the Americans with Disabilities Act and the Telecom Act of 1996 are resolved, any further action by the FCC to increase the radio frequency exposure of the citizen population is an assault on the human rights codified by the United Nations, including the United Nations Convention on the Rights of the Child.

U.S. FCC guidelines are essentially being used as a weapon against the citizen population to justify assault on human health in pursuit of financial gain. The FCC's intent to fuel economic growth and competition, with no independent investigation of health and environmental issues, is inhumane and immoral.

In addition to violations of human rights, the unrelenting consumption of resources to build out infrastructure to fuel the demand for faster, more powerful, more ubiquitous coverage is an assault on the planet's natural resources.

Evidence of harm already exists and has been emerging for decades, including historical documents compiled by Zory Glaser of the US Navy, and the EPA. In addition, other nations recognize harm at levels far lower than the FCC limits.

When these technologies are subsequently accepted as unsafe, (because proof already exists that they are not safe, including the NTP study) further consumption of resources will be required to address safety.

The FCC's vision for the future does not represent progress. It is stupefying that a nation like the US with such an abundance of intellectual and scientific resources could be operating on invalid, outdated, insufficient assumptions regarding radio frequency exposure for so long, while ignoring direct evidence of harm.

I experience pain and torture as the result of inadequate protections for microwave radio frequency exposure. The sustained stress has had a significant impact on my quality of life, and the dis-regulation of my nervous system will most like restrict the length of my life.

As an informed environmentalist I oppose any further expansion of wireless technology in the US until appropriate investigation of health and environmental issues can be conducted in a fully transparent manner, with independent oversight, with binding liability assigned for any health damages, and accommodation under the protections of the ADA.

Thank you,
Patricia Burke

Individual Rights; Transcript of Hearing, Vol. 10, Application 11-03-014,
Application of Pacific Gas and Electric Company for Approval
of Modifications to its SmartMeter™ Program and Increased Revenue
Requirements to Recover the Costs of the Modifications,
California Public Utilities Commission; Dec. 20, 2012

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE
STATE OF CALIFORNIA

ADMINISTRATIVE LAW JUDGE YIP-KIKUGAWA, presiding

Application of Pacific Gas and	)	PUBLIC
Electric Company for Approval of	)	PARTICIPATION
Modifications to its SmartMeter™	)	HEARING
Program and Increased Revenue)	
Requirements to Recover the Costs of)	
the Modifications. (U39M))	Application
)	11-03-014;
And Related Matters.)	A.11-03-015;
)	A.11-07-020
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REPORTER'S TRANSCRIPT
Santa Rosa, California
December 20, 2012
Pages 982 - 1139
Volume - 10

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1 SANTA ROSA, CALIFORNIA
2 DECEMBER 20, 2012 - 2:00 P.M.

3 * * * * *

4 ADMINISTRATIVE LAW JUDGE YIP-KIKUGAWA:
5 We are on the record.

6 The Commission will come to order.
7 This is the time and place set by the
8 Commission for public participation hearings
9 in Applications 11-03-014, 11-03-015, and
10 11-07-020 addressing cost and cost allocation
11 issues related to providing an option for gas
12 and electric residential utility customers
13 who do not wish to have a wired smart meter
14 installed at their location.

15 Good afternoon, everyone. I am
16 Administrative Law Judge Amy Yip-Kikugawa.
17 The assigned Commissioner to this proceeding
18 is President Michael Peevey.

19 Public participation is exactly what
20 the name implies. It is an opportunity for
21 me to hear from all of you and for the
22 Commissions to receive public comment from
23 ratepayers. Therefore, if you wish to speak,
24 you should have signed up with the Public
25 Advisor's Office in the back, and if you have
26 not done so, please do so now.

27 And before we begin I do want to go
28 over a couple of ground rules. First, this

1 and security. They forced smart meters on us
2 with more of a push as the protests grew and
3 despite the fact that smart meters were never
4 made mandatory by federal or state law. PG&E
5 tried to disguise their trucks by hiring
6 Wellington and by making installation
7 surreptitiously where there were clear signs
8 of individual and community opposition.

9 They infiltrated our web site. They
10 knew we wanted to keep our analog meters, but
11 they took the meters and discarded them
12 knowing this and now want to charge us for
13 getting them back.

14 During your opt-out hearing you
15 forced PG&E to admit their meters did not
16 pulse six times a day as they had claimed but
17 anywhere from 10 to 190,000 times a day at a
18 power of not 1 watt but 2.5 to 4 watts. PG&E
19 continues to state erroneously that a cell
20 phone is stronger than a smart meter.
21 Meanwhile experts conclude that one smart
22 meter is equivalent to ten to a hundred cell
23 phones.

24 All in all, PG&E has acted
25 unconscionably. Rather than profiting, PG&E
26 should be fined for their repeated fraudulent
27 stances, unethical and illegal behaviors. We
28 need no-fee opt-outs for individuals,

1 apartment buildings, communities, government
2 buildings, schools, and medical smart meter
3 free zones for people with disabilities to
4 shelter us all from the toxic environment
5 created by smart meters. Thank you.

6 (Applause)

7 ALJ YIP-KIKUGAWA: Ursula Abee followed
8 by Linda Brauner.

9 STATEMENT OF MS. ABEE

10 MS. ABEE: Good afternoon.

11 ALJ YIP-KIKUGAWA: Okay. Off the
12 record.

13 (Off the record)

14 ALJ YIP-KIKUGAWA: Back on the record.

15 MS. ABEE: I am a resident of San
16 Raphael and have been living in my house
17 since 1956. I watched it being built on a
18 lot that we have bought with the
19 understanding that all utilities would be
20 underground, when that did not happen and the
21 City had not told the contractor responsible.

22 I have witnessed many changes not
23 necessarily improving the environment. At
24 the present PG&E forces and dictates
25 customers to accept a new system that has not
26 thoroughly been researched and besides
27 penalizes us to pay \$120 a year for something
28 we never got. It is customary, ladies and

1 gentlemen, you pay for something you buy and
2 not for something you have not received.

3 (Applause)

4 MS. ABEE: That is plain arithmetic and
5 the law of the land. Ladies and gentlemen,
6 the public should not have to pay to the
7 utility companies that reap billions of
8 profit, give millions to their CEOs and have
9 no concern for our environment. We need to
10 stand together and wake up. We should not
11 pay for the mistakes that these highly paid
12 executives of big utility companies have
13 made.

14 (Applause)

15 ALJ YIP-KIKUGAWA: Linda Brauner
16 followed by Amy Hartley.

17 STATEMENT OF MS. HARTLEY

18 MS. HARTLEY: Good afternoon. Thank
19 you, your Honor, for being here and for
20 putting in such hard work for so many weeks
21 and for everything you wrote for us. We
22 appreciate it.

23 There is a strange juxtaposition
24 between the questions we are asked to address
25 today and the reality of our experience over
26 the last few years. First, the responses to
27 the questions that must be addressed. One.
28 Any opt-out option must include

1 noncommunication, no-cost analog meters.
2 Vermont's precedent of free opt-out will
3 prevail in California. It is unconscionable
4 to extort money for safety from any one
5 including those who cannot afford to pay to
6 have this toxic product removed from their
7 homes.

8 Two. All opt-out true costs must be
9 born by shareholders and those opting in to
10 the SmartMeter program. Three. Any fees
11 must be on a per-location basis because, for
12 example, tenancy in an apartment building can
13 turn over frequently and create a cash cow
14 simply for PG&E while on the other hand
15 providing nothing that was not in place for
16 new tenants.

17 Four. There should be no exit fee.
18 Rather, the only fee should be for those
19 opting into the SmartMeter program. Five.
20 The future of energy is sustainable and
21 therefore local. Opt-out must be community
22 wide including apartment buildings, condo
23 associations, governments, cities, schools,
24 counties, and therefore any conglomerate of
25 persons.

26 In fact, for the reality, we all
27 know there can be no opt-out for none of us
28 have opted into the SmartMeter program. For

1 the last two years PG&E has without warning
2 many times forcibly trespassed upon our
3 property, invaded our privacy, endangered our
4 safety, installed cancer-producing, heart-
5 damaging, DNA-breaking surveillance devices
6 upon our property without informed consent
7 instilling psychological terror in our hearts
8 and our minds, setting us up for
9 posttraumatic stress disorder.

10 For many years I have made my living
11 assessing the probability of dangerous
12 behavior. One of the prime predictors is
13 present and past dangerous violent behavior.
14 PG&E has a long history of corporate
15 violence. We are asking for your protection.
16 Please, do this for us as communities. Thank
17 you.

18 (Applause)

19 ALJ YIP-KIKUGAWA: Ami Hartley followed
20 by Deborah Tavares.

21 STATEMENT OF MS. HARTLEY

22 MS. HARTLEY: Good afternoon, Judge.
23 My name is Ami Hartley, and I'm a San
24 Francisco resident. I've always slept like a
25 baby until several months ago I started
26 experiencing insomnia and darting headaches
27 in 10 second intervals. Did I mention that I
28 don't get headaches. After discussing

1 various possibilities with my friends, I
2 decided to go check my meters, and lo and
3 behold, there they were, 11 newly installed
4 smart meters. No coincidence here.

5 I'm concerned about health, safety,
6 and privacy. This is an outrage. The
7 federal government never made smart meters
8 mandatory. Residential customers should have
9 the option to not receive service pursuant to
10 time variant pricing and to incur no
11 additional charges. Analog meters should be
12 included in the opt-out program. People who
13 choose to opt out should not be required to
14 pay increased fees. Customers who elect to
15 have smart meters installed should pay costs
16 of the new meters and installation. All who
17 live within buildings that are in proximity
18 to any populations including persons with
19 disabilities should be mandated to not have
20 smart meters installed in these public
21 facilities including schools and public
22 government buildings.

23 In Maine the Supreme Court has
24 determined that smart meters are illegal
25 because they never did a health study. In
26 Vermont there is a no-fee opt-out program.
27 Why has a health study never been conducted
28 here in California? We need one here now and

1 surveilling and irradiating us, it is an
2 indication that the public is ripe for
3 surrender and is consenting to enslavement
4 and legal encroachment. This is the silent
5 weapons, quiet wars document, and that is a
6 document as well which I will be handing to
7 you as part of the record when I finish.

8 Something is very, very, wrong. We
9 know that when we accept the intolerable, we
10 wake up to a nation that is enslaved. The
11 utility companies along with our government
12 are engaged in illegal lethal assaults upon
13 us, period. Using microwave frequencies that
14 the military adopted as weapons described in
15 the Fort Meade military documents through a
16 Freedom of Information Act. The [inaudible]
17 document also discusses this as well.

18 Many people are sick, and you want
19 to discuss opt-out fees. We cannot negotiate
20 our rights, safety and health away. Giving
21 up these things damages us. This is layer
22 upon layer of disinformation, misinformation
23 and secrets.

24 But concerning the costs, even the
25 I triple E smart grid thought leaders are
26 questioning and asking why politicians and
27 public agencies have not discussed the
28 unknown costs of the grid to the people.

1 Certainly their concerns would give rise to
2 why the increases are being discussed today.
3 This is cover up to extort more money from us
4 to fund this diabolical assault. Therefore,
5 Phase 2 of these hearings --

6 ALJ YIP-KIKUGAWA: Ms. Tavares.

7 MS. TAVARES: Are you planning to
8 broaden --

9 ALJ YIP-KIKUGAWA: Off the record.

10 (Off the record)

11 MS. TAVARES: There's no record.

12 ALJ YIP-KIKUGAWA: There is a record.
13 We're on the record right now. You may give
14 that to the Public Advisors.

15 MS. TAVARES: And they're located?

16 (Applause)

17 ALJ YIP-KIKUGAWA: Back on the record.

18 Pat Sworsen followed by Dannean
19 Farris.

20 STATEMENT OF MS. FARRIS

21 MS. FARRIS: Your Honor, I represent
22 101 residents of a low-cost, three-story
23 senior complex in Marin County. May of 2012
24 most of us collectively agreed to opt out of
25 the SmartMeter program because the meters are
26 clustered in five locations between four
27 buildings. For example, my apartment lies 12
28 feet between a total of 89 meters. Many of

1 us have been treated with cancer, have
2 pacemakers and may have -- the radiation
3 treatments may have extended my life, but the
4 effects from the treatments are debilitating.
5 Certainly I do not need additional EMF and
6 the RF radiation from a nearby 89 meters.

7 What I am imploring you is to take
8 into consideration the additional impact
9 multiple meters clustered together can have
10 on human health. We feel assaulted, and the
11 last latest assault arrived in our bills
12 warning us that by opting out of the
13 SmartMeter program fees may rise for all
14 customers opting out or not.

15 We opt-outs have already been
16 penalized by what we feel are illegal fees,
17 and now PG&E wants to impose fees on every
18 one. For many of the seniors living in our
19 complex the opt-out fee was a serious
20 hardship. Can't we not ask for a moratorium
21 until all of these issues can be
22 scientifically resolved and reasonable fiscal
23 responsibility be implemented. Thank you.

24 (Applause)

25 ALJ YIP-KIKUGAWA: Dannean Farris
26 followed by Sangita Moskow.

27 MS. MOSKOW: Sangita Moskow from -- oh.

28 STATEMENT OF MS. FARRIS

1 (Applause)

2 ALJ YIP-KIKUGAWA: Angela Flynn
3 followed by Lois Robin.

4 UNIDENTIFIED SPEAKER: Sorry. Couldn't
5 hear you.

6 ALJ YIP-KIKUGAWA: Angela Flynn.

7 STATEMENT OF MS. FLYNN

8 MS. FLYNN: Good afternoon. Angela
9 Flynn from Santa Cruz County. I first had a
10 wi-fi router in my bedroom for two years
11 before I realized that I was suffering
12 symptoms from microwave exposure. I couldn't
13 sleep. I had muscle aches. I had creaky
14 joints. I was in my mid-30s. I worked as a
15 landscaper, a very healthy life-style. It
16 took me moving into a house next to a cell
17 tower and getting more severe symptoms to
18 realize what had happened.

19 I've gone to a lot of work to
20 eliminate microwave transmitters from my
21 home. I can do that to a large degree.
22 However, smart meters are a toxic trespass
23 that I can't keep out of my home. Even
24 though I don't have one in my house, my
25 neighbors have one. It gets on to the wire
26 and it puts transients on to the wiring that
27 gets carried all through everyone's homes. I
28 also work as a house-sitter, and this has

1 unprecedented application of the tax.

2 Digital smart meters are aggravating
3 existing disabilities and medical conditions.

4 It's a violation of the ADA to discriminate
5 against people with disabilities by charging
6 them more for essential services. These
7 meters are causing life-threatening house
8 fires, injuries, disabilities, and toxic
9 eviction. Charging people who protect
10 themselves from assault and displacement is a
11 protection racket and against the law.

12 The meters also mine personal data
13 without permission, which constitutes illegal
14 search and seizure. It's illegal to charge a
15 fee to protect one's constitutional rights.
16 PG&E has a long history of injuring workers,
17 the public, and the environment including
18 lost plutonium, toxic waste dumping,
19 diverting maintenance funds to profits, and
20 on and on and on and on and on.

21 People have been dying because of
22 these mistakes, and now it's the smart meter
23 fiasco. Why do you keep letting them get
24 away with it? It's time that the CPUC does
25 the job it's supposed to. Prove to us that
26 you are truly a watch dog for the public, not
27 a lap dog of corporate utility CEOs. If you
28 are serving the public, then the justice to

1 week.

2 First year and a half: fatigue,
3 insomnia, pain. Blood pressure dropped to 75
4 over 55. Doctors are baffled. Next six
5 months: physical breakdown, electricity in
6 my limbs from working computer, ringing in my
7 ears. I discovered the 22 smart meters.
8 Eventually unable to sleep at all. I moved
9 to my house in Fairfax to escape the smart
10 meters.

11 Yet my health breaks down further.
12 I feel as though I'm being electrocuted in my
13 bed a few times each night. I never know
14 when it will start or stop. I am finally
15 being tortured. I discover a cell phone
16 tower is hidden on a hill above my house. I
17 close my business. My marriage is worn very
18 thin.

19 Verizon will soon install an
20 enormous 4,000 cell foot tower on the
21 opposite hill from my house. PG&E is still
22 trying to install digital meters in our
23 house. Having already undergone extensive
24 radiation poisoning, I need to move. I am
25 now, however, too sensitive to live near a
26 digital meter and a cell phone tower or a
27 satellite dish. I cannot go to any public
28 building without increasing pain. I cannot

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE
STATE OF CALIFORNIA

Application of Pacific Gas and)	
Electric Company for Approval of	)	Application
Modifications to its SmartMeter™	)	11-03-014;
Program and Increased Revenue	)	A.11-03-015;
Requirements to Recover the Costs of	)	A.11-07-020
the Modifications. (U39M))	
)	
And Related Matters.)	
)	
)	

CERTIFICATION OF TRANSCRIPT OF PROCEEDING

I, Thomas C. Brenneman, Certified Shorthand Reporter No. 9554, in and for the State of California do hereby certify that the pages of this transcript prepared by me comprise a full, true and correct transcript of the testimony and proceedings held in the above-captioned matter on December 20, 2012.

I further certify that I have no interest in the events of the matter or the outcome of the proceeding.

EXECUTED this 20th day of December, 2012.

Thomas C. Brenneman
CSR No. 9554

Individual Rights; Letter of Complaint and Appeal, and Notice of Liability
Regarding 'Smart Meter' and Wireless Networks, Julianne Battalia,
Washington State, Dec. 1 2013

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			Washington State Bar Association

**NOTICE OF LIABILITY CONCERNING THE
INSTALLATION OR ACTIVATION OF SMART METERS
AND OTHER WIRELESS NETWORKS IN AND AROUND
THE AREA KNOWN AS WASHINGTON STATE**

TO: Office of Attorney General Bob Ferguson
1125 Washington Street SE
PO Box 40100
Olympia, WA 98504-0100

FROM: Karen Nold
Means For Change
P.O. Box 1461
Snoqualmie, WA 98065
Karen@MeansForChange.com

NOTICE

Whereas, it would appear there is a global agenda to implement comprehensive wireless network coverage, using radio waves instead of copper or fiber optic cable and transmitting radio signals through antennas, and is also known as “Wireless Networks”; and

Whereas, it would appear there is a global agenda to implement a so named “Smart Grid”; and

Whereas, it would appear the said agendas are being, or are to be implemented, in the landmass known as the State of Washington and or Washington State; and

Whereas, it would appear there is an agenda of false information of various kinds regarding health, safety, privacy, and other various concerns or considerations, due to the direct or indirect effects of “Wireless Networks” and or some of its components, sometimes referred to as “2G”, “3G”, “4G”, “LTE”, “Wi-Fi”, “WiMax”, etc.; and

Whereas, it would appear there is an agenda of false information of various kinds regarding health, safety, privacy, and other various concerns or considerations, due to the direct or indirect effects of the so named “Smart Grid” and or some of its components, including but not limited to, the wireless digital electrical devices utilized to measure electrical consumption, among other things, sometimes referred to as “Smart Meters”; and

Whereas, it would appear the agendas of false information are being utilized to deceive lawmakers and safety regulatory organizations, et al., or in the alternative give plausible deniability to the same groups for those members of said groups, et al, that appear to be complicit with the “Wireless Networks” agenda and or said “Smart Grid” agenda; and

Whereas, it would appear that “Wireless Networks” and or some of its components, including but not limited to “2G”, “3G”, “4G”, “LTE”, “Wi-Fi”, “WiMax”, etc., do cause harm of various kinds; and

Whereas, it would appear the so named “Smart Grid” and or some of its components, including but not limited to, “Smart Meters”, do cause harm of various kinds; and

Whereas, it would appear some or all of the various forms of harm caused by “Wireless Networks” and or its various components, and the so named “Smart Grid” and or its various components, can be considered a tort and are compensable by law; and

Whereas, it would appear there is no bond of record, nor any source of indemnification regarding “Wireless Networks” and the so named “Smart Grid”, and their various effects that may be considered as causing harm of various kinds; and

Whereas, a person with full knowledge of a potential harm, whether caused directly by the person or not, and that person is endowed the ability and or duty to act upon the said knowledge in a way to avoid or otherwise mitigate the potential harm, and fails to do said actions, is liable for the inevitable harm caused, and or may be considered negligent at law.

Therefore you, **Mr. Bob Ferguson, Washington State Attorney General**, have been given this notice, inclusive of the enclosed Means For Change Letter of Complaint and Appeal, and *Take Back Your Power* DVD, all of which constitute full disclosure of the “Wireless Networks” agenda and so named “Smart Grid” agenda as of the date of this notice. This notice in full will be made available to anyone who chooses to use it in a subsequent claim regarding “Wireless Networks” and or the so named “Smart Grid” and any effect thereof, directly or indirectly causing harm of any kind to anyone or anything.

Respectfully, govern yourself accordingly.

Karen Nold, Means For Change

October 7, 2013

Terry Losansky, Witness

October 7, 2013

San Juan Citizens for Safe Technology, Signatures
Washington Wireless Awareness, Signatures

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TO: **Washington State Government and Professional Leaders,**

I am writing to address the serious public health concern of Radiofrequency radiation (RFR) exposure from the unprecedented, reckless employment of wireless technology in Washington State, which has driven me from my home, community and lifestyle; and to seek leadership of State regulators in the absence of Federal Communication Commission (FCC) commitment to public health, observed with the recent reclassification of "the ear as an extremity, subjecting it to nearly three times the level of radiation previously allowed." (1) This document serves as a:

1. Formal complaint to the Attorney General against the:
 - a. Washington Utilities and Transportation Commission (WUTC) for authorizing Puget Sound Energy (PSE) to negligently install wireless smart meters without prior safety testing; and continuing to approve the mandatory and involuntary exposures to a known Group 2B Carcinogen from said smart meters; and
 - b. Washington State Board of Health (WSBOH), Department of Health (DOH), and 37 local boards of health (LBOH) for failing to recognize that "beyond any reasonable doubt...adverse human health effects occur at far lower levels of RF/MW radiation exposure than those that cause noticeable heating" (the gauge for federal public exposure guidelines), "some...at several hundred thousand times below...public exposure guidelines." Recognition of the hazards and abatement of non-ionizing radiation belongs in WSBOH, DOH and 37 LBOH programs and publications; lack thereof may constitute a violation of RCW 43.20.050(2)(d)(f); RCW 43.70.130(2), RCW 70.05.060(3) for allowing exposures to multiple and chronic RFR, a known Group 2B Carcinogen, and possible neurotoxin and genotoxin. (2)
2. Formal appeal to all State Legislators for:
 - a. An allocation of funds for an immediate safety review of RFR, given the FCC reclassification of the ear further degrades public safety, and neglects full body radiation exposures from involuntary, cumulative, and mandatory RFR sources; and
 - b. A moratorium on the installation and or activation of non-transient wireless networks including, but not limited to, Wi-Fi, WiMax, 4G, LTE, and smart meter infrastructures, until determined safe, including, but not limited to, Seattle City Light's 2014/2015 smart meter program, and the Broadband Wi-Fi Canopy over the San Juan Archipelago.

This document is evidence of the health and safety issues associated with RFR wireless networks and 'smart' meters. "Take Back Your Power," an investigation of the 'smart' grid program, was sent with this document to the Attorney General; Representatives Ross Hunter, Dawn Morrell, Christopher Hurst, Jeff Morris; Senators Doug Ericksen and Andy Hill, to further exemplify the health, safety, and privacy issues of the 'smart' meter infrastructure. Others can view this documentary at www.TakeBackYourPower.net. Smart meter wireless technology creates cyber security problems - leaving homes and communities vulnerable to hacking; privacy issues - real-time data on energy usage reveals private activities within the home, with no guarantee of who will have access to that data; and higher bills. In Canada, "80% of Smart Meter users complain of higher bills within a year of installation, often more than 50% higher." (3)

"Scientific certainty is not the benchmark for intelligent action..." (4) "Apply the precautionary principle to protect the world's richest resource - our children." (5) "The literature raises serious concern regarding the levels of radio frequency... exposures produced by 'smart meters' to warrant an immediate and complete moratorium on their use and deployment until further study can be performed." (6) While the FCC, with clear ties to industry, has taken steps to loosen already lax RFR exposure standards, and the WSBOH, DOH and 37 CBOH do not recognize the hazards of non-ionizing radiation, Washington State residents are left unprotected against this biologically harmful radiation.

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The Communications Industry is the Largest Lobbying Industry in Politics – Three Times More

Powerful than Big Pharma (7) and "...if measured by GNP... would rank as the 46th largest country in the world." (8) Its products employ radio frequencies of the electromagnetic spectrum, including microwave (MW) radiation and can be analog or digital, as well as modulated and/or pulsed. Some of the popular wireless devices using MW radiation include cell phones, cordless phones, DECT phones/products (*reaching up to 1000 feet*), Bluetooth, iPads, wireless interactive white boards, paging systems, countless home automation applications, (9) cell towers, masts, antenna (*littering the landscape*), smart meter infrastructures (*blanketing entire neighborhoods*), Wi-Max (*reaching a radius of 30 miles*), TETRA, and Wi-Fi (*reaching up to 300 feet*) - with schools using Wi-Fi power densities and frequencies similar to those used as Cold War weapons. (10)

Our society is saturated in RFR, spreading like wildfire, in schools, libraries, hospitals, daycares, retirement homes, businesses, malls, grocers, diners, hotels, campgrounds, ferry boats, cars, buses, and homes. Microwaves are preferred for communication over radio waves due to "*superior penetrative properties*," of living tissues and most structures. No safe level is known for a child, embryo, or fetus. (10) Chronic microwave radiation exposure is quite harmful to plants, animals and humans, particularly children, pregnant women, the elderly, and those with preexisting illness. (2)

People are being driven to society's edge as they succumb to widespread, chronic RFR exposures.

In an effort to study the safety of its product, the cell phone industry hired Dr. George Carlo in 1993 to head their \$28.5 million program. He found the microwave radiation from cell phone antennas could affect pacemakers, penetrate the developing skulls of children, compromise the blood-brain barrier, and inflict genetic damage. His research funds were terminated in 1999, and the industry sought to discredit him and suppress his findings. In his book, *Cell Phones: Invisible Hazards in the Wireless Age*, Dr. Carlo examined "the hard science and the shady politics of a reckless high tech industry now mired in personal injury and class-action litigation." (11)

Many people love the benefits of this Wireless Age, as many did of other earlier advancements, but today very few would choose DDT, or asbestos, lead pipes or paint, or a smoke-filled airplane, once touted as safe in our culture. So was having radioactive wrist watches with glowing digits (in the 1950s), having children's shoes fitted in a strong X-ray machine (in the 1940s), keeping radium in open trays on scientist's desks (in the 1930s), and X-raying our friends at physician's garden parties (in the 1920s). "The knowledge at the time was deficient, as was a competent risk analysis coupled to a parallel analysis of public needs." (12) Thankfully, our culture changed.

Wireless Standards are Unsafe and Misleading, even though industry and our government assured us for many years that cell phones were completely safe. Electronics customarily receive Underwriters Laboratory safety testing which wireless devices lack. (13) The World Health Organization (WHO), in May 2011, classified all types of RFR as possibly carcinogenic, (14) "including the radiation emitted by base-station antennas, radio/TV towers, radar, Wi-Fi, smart meters, etc.," (15) This same determination was made for DDT in 1991 and lead in 1987, both State-listed contaminants. In 1999 the US NIEHS National Toxicology Program cited RFR a 'potential' carcinogen; safety standards were termed 'not protective of public health' by the Radiofrequency Interagency Working Group (FDA, FCC, OSHA, EPA, etc.). (6) The wireless industry funded most of the "two dozen case-control studies of mobile phone use" reporting no increase in cancer. Flawed, these studies followed groups that "were too small and for a too short period of time." (16)

Lack of government funded programs leaves industry with the most influence over RFR guidelines. FCC standards are 17 years old, based on limited data from one set of experiments in the 1980's; (17) apply to 30-minute exposures to a 6-foot tall man; are believed to protect us from burns and shock, not damage to health; (2) and protect us "from whole-body heating" not exposure to critical organs like the brain and the eyes. (18)

"Cell and cordless phone radiation closely resembles that of Wi-Fi," however Wi-Fi is more dangerous due to frequency, duration, and involuntary exposure. (2) Children spend over 35 hours/week bathing in possibly cancerous Wi-Fi at school; saturate at the library, mall, or work; then sleep immersed in radiation from smart meters, Wi-Fi, incoming cell

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towers, and for many, a cell phone alarm near their head. Most of the damage from incoming cell phone radiation occurs at night, "when the parasympathetic nervous system is active..." (7) and for the pregnant, or young, may lead to "neurological impairments in children, including autism." (19)

The U.S. Lags in Public Health Standards and Actions for RFR Exposure. The current RFR standard in Switzerland, Lichtenstein, and Luxembourg is $9.5 \mu\text{W}/\text{cm}^2$, and $10 \mu\text{W}/\text{cm}^2$ in China, Poland and Russia, while in the U.S. and Canada the standard is 600-1000 $\mu\text{W}/\text{cm}^2$ (20). Federal action to protect public health is long overdue.

The federal government's ability to take swift and effective action in the name of public health was observed in the case of ephedra: After California, Illinois, and New York banned ephedra supplements, and after medical groups and Congressional members called for the ban, the FDA in 2003, announced its intentions with a Consumer Alert "to stop buying and using [ephedra] products immediately." The Secretary of Health and Human Services said, "They are simply too risky to be used," he was, "pleased...to take the strong action against ephedra," and "the FDA could not have acted any sooner because DSHEA does not require manufacturers to prove a product safe prior to bringing it to ...market." (21)

The WUTC, in the case of smart meters, 'does not require manufacturers to prove a product safe prior to bringing it to market.' How can the voluntary purchase of risky herbal products be more epidemically dangerous than the involuntary and mandatory exposure of Americans to a known Group 2B Carcinogen – 24/7? I implore State Legislators, the WSOH, DOH, and 37 CBOH to exert their authority and 'take a strong action' against smart meters and wireless networks, because they are 'simply too risky.' Smart meters are subsidized and promoted by our government when safer, more secure metering exists – as former CIA Director James Woolsey points out, on security grounds alone, the Smart Grid is "...a really, really stupid grid." (22)

Examples of RFR reduction: Deputy Health Minister of Israel implored the Education Minister to immediately stop wireless Internet installation in schools (23); India High Court gave service providers two months to remove telecom towers near play grounds, schools and hospitals (24); Italian Supreme Court confirmed ruling — National Institute for Workmen's Compensation must compensate worker with head tumor due to long-term, heavy mobile phone use (25); and in the U.S., the GAO in July 2012 recommended the FCC reassess the current RF energy exposure limit and its human health effects (26).

Even with a history of legislative efforts and world-wide appeals, the FCC responded with industry in mind. In March 2013, the FCC issued an Order, Notice of Proposed Rulemaking and a Notice of Inquiry, as a single document, resulting in numerous comments being filed requesting the FCC reduce current exposure standards. One in particular was filed jointly by B. Blake Levitt – a medical/science journalist, and Henry C. Lai – U.W. Research Professor. (17) Making RFR exposure limits more lenient is not in the interest of public health. "...It is obvious why the IEEE, as an industry group with no medical training, would push for this [ear] reclassification but a complete mystery why the FDA went along with it," Levitt and Lai said. "...No agency takes chronic exposure or cumulative effects into consideration. Therefore, today's true exposures are unknown." Additionally, the smart meter/smart grid, forces involuntary RFR into homes and businesses creating blanket low-level exposures at ground level. Levitt and Lai said:

In the case of smart meters, RF couples with domestic wiring and travels throughout a building. Because of such coupling with conductive material, no distance from the transmitting source would be effective regulation here. And peak exposures during the device's duty cycle, which is the most pertinent exposure parameter, is time-averaged away. This is not protective of public health.

"We have now filled in most of the lower nonionizing bands with commercial, private, and military use; split the signals; digitized them; and are now branching into higher frequencies such as in frared to be used in communications," Levitt and Lai explained. Harmful to humans, plants and animals, RFR affects bird breeding, nesting, and roosting, plumage deterioration, locomotion, and death in various species. Bird species abandoned areas with highest RF backgrounds from cell phone base stations. Also affected are invertebrates, insects, bats, domestic animals, bushes and trees. Levitt

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and Lai advise, given the ever-increasing voluntary and involuntary background levels of RFR, with no regulatory oversight, "we can no longer afford a presumption of safety." They suggest the FCC decrease maximum permissible exposures, reminding the FCC they are there to enforce safety first, and assist industry thereafter.

Adverse Health Effects of RFR are well documented including "reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity." (27) "Chronic exposure to [pulsed] MW radiation harms every individual in a population in some ways," even if the person doesn't recognize it or attribute it to the responsible radiation sources. Based on the tens of thousands of studies on EMF science and RF/MW radiation since the 1920's, many public health experts believe, in the future, society will likely face epidemics of cancers, and neuro-and-genotoxicities. (2)

The main symptoms in all of Dr. Klinghardt's patients include a loss of zest, sex drive, enthusiasm and joy. People are still living, but it's more of a "half-life." Colleagues in other practices in the U.S., Canada, and Europe report consistent findings. Chronic neurological illness has increased exponentially, including insomnia, low grade depression, fatigue, muscle aches and pains, and symptoms of numbness, tingling and vibration. Autism, ALS, MS, Parkinson's, learning disabilities and behavioral problems in children are all neurological diseases which have increased exponentially in the last 15-20 years. "The only thing that fits from an environmental...[and]...epidemiological perspective... is the increased exposure to man-made electromagnetic fields, largely in the high frequency range..." (7)

Using RF meters, Canadian researcher, Dr. Magda Havas, demonstrates the biological effects of Wi-Fi, and "how wireless household appliances such as portable phones, Wi-Fi base stations and DECT baby monitors broadcast constant microwave radiation that are similar in intensity a few hundred meters away from a large cell phone tower." (28)

What will be the long-term consequences of this exposure?

Today's children are the first generation to be exposed to constant, long-term microwave radiation.

Children absorb "as much as twice the microwave radiation as adults," and their risk from exposure to a carcinogen and neurotoxin, like RF MW radiation, increases "as age decreases." (29) While Washington State works to protect children from the 'possible carcinogen' lead; it fails to recognize the 'possible carcinogens' Wi-Fi, smart meters, and other wireless networks, which are authorized in schools, homes and public areas. (30)

Symptoms Of Microwave (RadioWave) Sickness include: "Insomnia, headaches, dizziness, nausea, memory loss, difficulty concentrating, irritability, respiratory illness (bronchitis, sinusitis, pneumonia), flu-like illness, asthma, fatigue, weakness, pressure or pain in the chest, increase in blood pressure, altered pulse rate (usually slowed), pressure behind the eyes, other eye problems, swollen throat, dry lips or mouth, dehydration, sweating, fever, shortness of breath, muscle spasms, tremors, pain in the legs or the soles of the feet, testicular or pelvic pain, joint pain, pains that move around the body, nosebleeds, internal bleeding, hair loss, digestive problems, skin rash, ringing in the ears, impaired sense of smell, pain in the teeth (especially with metallic fillings)." (31)

Effects Of Low-Level (Below Thermal) Microwaves: "arrhythmia, heart attack, cell death, diseases of the blood, interference to bone marrow, brain tumours, DNA damage, altered calcium level in cells,... suppression of the immune system, arthritis, rheumatism, skin problems, lymphatic diseases, vaginal discharge, vascular system disease, tinnitus, leukaemia, childhood cancer, sleep problems, mental problems involving depression, irritability, memory loss, difficulty in concentrating, headache, dizziness and fatigue, suicidal tendencies, miscarriage and infertility," (10) "changes in brain function including... retarded learning, performance impairment in children,... neurodegenerative conditions,... melatonin suppression...hormonal imbalances, immune dysregulation such as allergic and inflammatory responses, cardiac and blood pressure problems,... and more." (2)

The WUTC Does Not Require Safety Testing and PSE was Misleading when I spoke with them in December 2012. After a daunting exchange of words I learned that a Cellnet Data Systems, Automatic Meter Reading

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(AMR) system was installed on both our gas and electrical meters just months before we moved into our home in 2001. All of the over 1.2 million customers, but the extreme rural, have them as well. A third wireless device was installed by the City of Snoqualmie water department who promptly forwarded their Sensus product spec sheet. I did not receive the same accommodation from PSE and had to research Cellnet Data Systems for a contact, who would not help me because of their relationship with the utility.

Evasive communications continued with PSE as they told me I didn't have a smart meter – like in California. They said our meter only sends a one-way signal, whereas smart meters send two ways. A manager said our AMR system “puts out less rays than a smart meter – about the same as a phone module.” I was told a signal is transmitted up to 4x/day or 1x/day near midnight, only to hear from another that our meter sends a signal 1x/5minutes. Actually, “the smart meter sends a microwave impulse at 900 megahertz, between 17,000-190,000 times a day...” through the entire home. This radiation has been measured “up to 600 times higher” than the existing already high standards. (7)

PSE told me the location of the routers, or “pole top storage devices,” cannot be released for security reasons. Those living near the routers have a right to this information as they receive more radiation. When I asked if I could forward a video about the health effects of smart meters, PSE said they have all the information out there and their meters are not smart meters. By definition, a smart meter is an electrical meter measuring consumer energy usage which is sent back “to the utility by a wireless signal in the form of pulsed frequencies within the 800 MHz to 2400MHz range.” (32)

Furthering their evasive tactic, PSE would not address the Switching Mode Power Supply (SMPS) which all smart meters use to change the grid AC to DC, thereby generating dirty electricity. PSE admits they do NOT track this information. **It appears utility companies are not required to track thorough health and safety data of devices they force upon us.** After written placation, PSE verbally acknowledged their awareness of the issue, but said there were no opt-outs since there were no analog meters. PSE emailed me methods other customers had shared to protect themselves from radiation, evidence that other customers are experiencing health effects from their smart meters. After having many of the Microwave Sickness effects myself, including cancer, PSE, attempting to reassure me of their product safety, **chose** to cite the 2011 California Council on Science and Technology [CCST] report, “Health Impacts of Radio Frequency Exposure From Smart Meters”; (33) However, this was discredited at least five times when:

1. California radiation expert and UCSD instructor, Daniel Hirsch wrote that “rather than being an independent, science-based study, the CCST largely cuts and pastes estimates from a brochure by the Electric Power Research Institute...It is strongly recommended that CCST revise its Draft Report and conduct actual measurements of cell phone, microwave oven, and SmartMeter RF cumulative whole body power densities.” (34)
2. Santa Cruz County Public Health Officer wrote, “...CCST did not account for the frequency of transmissions, reflection factors, banks of SmartMeters firing simultaneously, and distances closer than three feet...[and]...it has been aptly demonstrated by computer modeling and real measurement of existing meters that SmartMeters emit frequencies almost continuously, day and night, seven days a week.... it is not possible to program them to not operate at 100% of a duty cycle (continuously) and therefore it should not be possible to state that SmartMeters do not exceed the time-averaged exposure limit...” (32)
3. Greek researchers countered “...any relation with health hazards has been bypassed. It is however ‘common secret’ between the researchers in the field of electromagnetic biology that such a statement has absolutely no scientific validity...” (35)
4. Sage Associates rebutted with, “Conclusions Are Not Supported by” FCC Compliance and “Disregard Evidence in the Report for Possible Health Risk” and are “inconsistent with the report’s...warnings [of] possible risks to health...overall legitimacy... cast into doubt...; FCC Violations and Excessively High RF Exposures are Ignored; Misleading Comparisons Are Made to Cell Phones; RF Levels from Smart Meters are Unreconciled and Need Assessment; Cumulative RF is Not Assessed Prior to Meter Installation...” (36)

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5. Senior Research Fellow of the Environmental Health Trust, L. Lloyd Morgan, countered, “the exposure standard is based on acute (short-term/immediate) thermal (measured temperature change) effects...not...on chronic (long-term) effects... With human, animal and cell studies all showing harmful effects [of non-ionizing, non-thermal electromagnetic radiation], it is hard to imagine why the exposure standard has not been changed.” (37)

The WUTC vetted and approved PSE's AMR system, but did not require UL certification, only FCC compliance. When I asked WUTC their position, in January 2013, about smart meter negative health impacts, mandatory exposure, lack of biological testing, and PSE's admittance to having no replacement analog meters –they did not reply.

Changing Public Perception of this Wireless Age is documented with the 2013 AAEM *Open Letter to the Superintendents of the School Districts of the United States* – “While more research is being conducted children must be protected” (38); When Rep. Boland recalled people asking for cigarette warning labels and Big Tobacco made all the same arguments, delaying public health policy “to the grief and economic costs of our people.” She warned, “There should be no industry so powerful or so proud as to compromise our health and safety” (39); and numerous public groups, including *EMR Policy Institute*, *Citizens for Safe Technology*, *Cellular Phone Task Force*, *WEEP*, and many more...

Safety Review and Public Health Program Essentials for the protection of public health from RFR:

1. An effective RFR safety review will **document the funding of each study**; avoid reports funded by the wireless industry; and include the longstanding global scientific consensus (40), national legislative efforts (41), [and worldwide RFR reduction efforts \(42\) compiled at MeansForChange.com.](#)
2. An effective public health program will mandate the WSBOH, DOH, and 37 CBOH to recognize and publish the adverse health effects of non-ionizing radiation; draft and implement RFR reduction rules for public areas; implement awareness programs of the dangers of RFR, which products employ it, and such information as:
 - a. To turn off cell phones and PDAs (Personal Digital Assistant or hand-held computer device) when not in use, while in pocket, holster, on belt near body, and while sleeping. Keeping away from head and body, and using for emergencies only, text, or use speaker phone for calls. Avoid using phones in elevators, cars, buses where radiation is higher.
 - b. Keep cell phone, wireless toys/games out of front pocket, which can affect male fertility and female reproduction; and away from developing children and pregnant women.
 - c. Replace Wi-Fi with wired Internet; or at least disable when not in use.
 - d. Replace cordless phones with corded models.
 - e. Using wired keyboard, keep laptops away from body. Disable built-in, default-Wi-Fi in laptop.

Washington State is blanketed in mandatory and involuntary, possibly neurotoxic, carcinogenic and genotoxic RF MW radiation, under the jurisdiction of the WSBOH, DOH, 37 LBOH, and State Legislature. The dangers of RFR are no longer a secret. Given there is a safe alternative for connecting to the Internet and phone, and for utility metering, there is no good reason to have widespread, chronic RFR exposures in our communities. An immediate moratorium on installation and or activation of non-transient wireless networks including, but not limited to, Wi-Fi, WiMax, 4G, LTE, and smart meters, until determined safe, is in the best interest of public health.

Thank you for your time. I look forward to your reply.

Respectfully,

Karen Nold

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Precautionary Principle; Mobile Phone Infrastructure Regulation
in Europe: Scientific Challenges and Human Rights Protection,
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Mobile Phone Infrastructure Regulation in Europe: Scientific Challenges and Human Rights Protection

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Abstract

As the progress of mobile phone technology accelerates throughout Europe, the regulatory framework necessary for its safe and extended use has been slow to develop. This article analyses the relationship between scientific knowledge and regulation concerning the health effects of increasing emissions of electromagnetic fields (EMF). From a conservationist perspective, no other example of industrial impact on the natural environment has achieved such extended penetration so quickly. From a theoretical standpoint, stakeholders are faced with a difficult choice between comprehensive risk assessment versus immediate application of the precautionary principle. By exploring the interaction between citizens, governments, and international bodies, we first analyse the challenges faced by regulators in the presence of uncertain scientific knowledge and standards of measurement. We then highlight the inadequacy of current risk assessment parameters. Lastly, within the context of State and European regulation of EMF exposure, we expand scholarship on the human rights framework to protect vulnerable populations from environmental pollution. We conclude that, because scientific knowledge is incomplete, a precautionary approach is better suited to State obligations under international human rights law.

Keywords: EMF, Human Rights, Technology and Health, Mobile Phones

1. Introduction

The use of mobile phones is ubiquitous, and is estimated to have reached 96% penetration worldwide (ITU, 2013, 1). Mobile broadband, used for wireless access to the Internet, has more than 2 billion subscriptions worldwide, with penetration levels that reach 68% in Europe (ibid. 6). Scientific research has attempted to determine whether exposure to Electromagnetic Fields (EMF) during mobile phone use is dangerous to human health. Yet, while the public remains focused on the possible dangers of the mobile device itself, the rapidly growing infrastructure necessary for mobile communication is interfering with human physiology, as ‘the antennae of broadcast stations are the most powerful continuous sources of RF energy intentionally radiated into free space’ (ICNIRP, 2009, 11). From a conservationist perspective, no other example of industrial impact on the natural environment has achieved such extended penetration so quickly.

Base Transceiver Stations (BTS) – equipment normally connected to elevated structures that relay electromagnetic signals between mobile devices and a network – emit electromagnetic energy. EMF emission is widespread; the European Union, for example, requires maximal coverage for its citizens.¹ However, virtually no national legislation exists to protect the same consumers from the possible effects of prolonged EMF exposure via BTS, nor do most governments require public hearings concerning the placement and number of BTS. Such hearings are mandatory for many other potential sources of environmental pollution. The International Agency for Research on Cancer (IARC), a World Health Organization’s (WHO) specialised agency, recently classified EMF as Group 2B: possibly carcinogenic to humans (IARC, 2013). The Lancet Oncology (Baan et al., 2011) reports that the IARC committee mainly focused on two types of exposures: those due to use of personal devices and those due to occupational sources. A third type of exposure, due to environmental sources, such as BTS, was not included because the committee found ‘the available evidence insufficient for any conclusion’ (ibid. 625). This is of obvious concern because a large part of the population is exposed to the compound effect of radiation from BTS, handsets radio transmitters, WLAN, Wi-Fi, portable computers, and other devices; more importantly, children are at higher risk according to many studies (e.g. Blank and Goodman, 2009; ICNIRP, 2009).

As scientific research on possible health effects of exposure to EMF sources continues, we aim to contribute to existing scholarship on European environmental policy by (1) explaining the current biological research on the impact of EMF on the living environment and the difficulty in establishing EMF protection standards in Europe due to a complex, controversial risk assessment procedure and measurement paradigm; (2) evaluating the extent of the resulting inadequacies in national regulatory systems (France is our example); and (3) expanding the human rights construct to ‘protect, respect and remedy’ vulnerable populations by including State and European regulation of EMF

¹ The Digital Agenda for Europe (DAE) required Member States to devise and make operational by 2012 national broadband plans with the objective of meeting the broadband targets for Europe by 2020.

exposure within a “due diligence” environmental pollution framework. From a theoretical standpoint, the regulator’s dilemma encompasses a choice between the principle of precaution and long-term risk assessment. This article suggests that, due to the lack of scientific consensus and contradictory standards of measurement, the international and European human rights frameworks on the protection of vulnerable populations may oblige States to adopt a precautionary approach in the short and medium term, until a majority of peer-reviewed scientific publications establish the danger, or safety, of electromagnetic wave emissions.

2. The Regulator’s Dilemma

Regulators may draw upon two bodies of theoretical knowledge in formulating a viable policy strategy to protect vulnerable populations from the potential health risks associated with EMF exposure. One set of theories underpins risk assessment, developed primarily in the fields of economic, financial, and behavioural theory, while the other draws from the German concept of *Vorsorge*,² an expansion of 19th century British law and its evolution into an obligatory due diligence framework for governments and the private sector.³ In their work on prospect theory, Tversky and Kahneman (1981) demonstrate that human beings are hardly rational when it comes to risk assessment: the majority of respondents in one of their studies, for example, found that the certain death of 400 people is less acceptable than the two-in-three chance that 600 will die, despite the fact that the statistical risk is nearly identical. Scholarship over the course of the past ten years has attempted to address human irrationality in risk assessment by integrating due diligence and risk evaluation into a coherent paradigm that allows regulators to know when and how to favour one over the other. Economist Christian Gollier presents what he calls a “reasonable interpretation” of the precautionary principle (Gollier et al., 2001). When the basic scientific data of the decision problem are uncertain, Gollier suggests that the “learn then act” principle should be applied only when a careful costs-benefits analysis establishes that current and future preventative actions are close substitutes for one another. In all other circumstances, there is a clear benefit in acting to prevent long-term risk.

In the case of EMF exposure from BTS, preventative action would require application of the ALARA (As Low As Reasonably Achievable) principle to curb BTS emissions, an action that resembles reduction in exposure to tobacco smoke: the earlier reduction to exposure occurs, the fewer potential health problems. Thus, current and future preventative actions are not close substitutes; Gollier’s normative paradigm would suggest application of the precautionary principle in these circumstances. This approach is reinforced by scholarship on the Dutch government’s vigilant response to EMF generated by electric pylons (de Jong et al., 2012). Environmental history points to the importance of acting sooner, rather than later to protect vulnerable populations and ecosystems from air and

² ‘Foresight’ in German, an idea developed in the 1930s by German social scientists.

³ *Heaven v. Pender* (1883) 11 QBD 503, Court of Appeal, United Kingdom, introduced the ‘duty of care’, a wider duty to be responsible in tort to those who might be injured if ‘ordinary care and skill’ were not exercised.

water pollution.⁴ Hence, from a theoretical point of view, the regulator's dilemma may well be resolved.

3. Contested Science and Technology

From an empirical standpoint, however, three questions underlie the debate about the safe use of mobile phones and BTS: Do EMFs generated by mobile phone technology affect human health? If so, what are the appropriate safety standards? And finally, who is responsible for BTS installation, implementation and monitoring? This section explores the controversies associated with the first two questions, while latter sections examine the third question.

In mobile telephony, electromagnetic waves of a certain frequency range are generated by a source that introduces information in the form of changes to the waves. A receiver, capable of interpreting the information, then picks up the waves. Electromagnetic waves are propagating EMF, and their strength is measured in terms of their fields (electric and magnetic). EMF of different frequencies interact with the body in different ways depending on the amount of energy associated with the electromagnetic waves. Gamma rays and x-rays have frequencies (and energies) high enough to knock an electron off its atom and break bonds between molecules; this phenomenon is called ionizing radiation. Fields at lower frequencies produce non-ionizing radiation.

All electrical devices, power supply networks, and telecommunications technology generate EMF in frequencies lower than those of ionizing radiation (unless they are purposely designed to do so). Therefore, everyone is exposed to multiple EMF radiations in the non-ionizing frequency range. For example, power grids and electrical devices are a source of Extremely Low Frequency (ELF) fields, while wireless devices and BTS are a source of Radio Frequency (RF) radiations. These exposures induce currents within the human body and cause two types of effects: either thermal or non-thermal. The WHO explains that 'the strength of these currents depends on the intensity of the outside magnetic field. If sufficiently large, these currents could cause stimulation of nerves and muscles or affect other biological processes.' (WHO, 2012).

3.1 Measuring the Biological Impact of EMF

Both the telecoms industry and the public sector have multiplied peer-reviewed scientific studies to determine whether prolonged exposure to electromagnetic waves poses a danger to human health. Biologists concede a wide range of opinion on the subject. While numerous scientific studies report that exposure to EMF has an impact on human tissues and cell development (reviews are provided in: Bioinitiative Report, 2012; Genuis, 2008; IARC 2013; Kostoff and

⁴ The 1972 Oslo Convention on dumping waste at sea and the 1974 Paris Convention on land-based sources of marine pollution were early attempts to protect the marine environment. It took another twenty years for Europe to ramp up regulation through the 1992 OSPAR Convention on protection of the marine environment in the North-East Atlantic, an initiative reinforced by the promulgation of REACH in 2010. Asbestos is another striking example of the lag-time between knowledge of the danger, first recognized by courts in the 1970s, protection of workers in 1983 (Council Directive 83/477/EEC) and an outright European ban on its use in 2005 (Parliamentary Directive 2003/18/EC). In both cases, one to two generations of citizens were sacrificed before definitive legislative action was taken.

Lau, 2013; Levitt and Lai 2010), experts do not agree on how much exposure may lead to health risks for adults or children and some research results seem to contradict previous results (e.g. Consales et al. 2012; Feychting and Forssen, 2006; Gaestel, 2010; Merhi 2012; Sommer et al. 2009). One trend is clear, however - the number of recently published, peer-reviewed scientific studies that link EMF exposure to health risks is expanding rapidly and appearing in extremely well-respected journals; see, for example, (Foliat et al. 2006; Green et al. 1999; Lowenthal et al. 2007) for ELF effects; (Aldad et al., 2012; Aslan et al. 2013; Christ et al. 2010; Gutschi et al. 2011; Hardell et al. 2005, 2013; Panagopoulos and Margaritis 2010) for RF effects caused by the use of wireless devices; and (Abdel-Rassoul et al. 2007; Khurana et al. 2010; Levitt and Lai, 2010; Otitoloju et al. 2010; Shahbazi-Gahrouei et al. 2013) for RF effects caused by exposure to BTS stations.

Effects have been reported on the reproductive system (Agarwal et al. 2009; La Vignera et al. 2012; Otitoloju et al. 2010; Panagopoulos and Margaritis 2010), on foetal and neonatal development (Aldad et al., 2012; Divan et al. 2008; Li et al., 2012), on increased risk of childhood leukaemia, adult brain tumours and acoustic neuromas (Hardell et al. 2005, 2013; Kheifets et al. 2010; Levis et al. 2011), on breast cancer (Chen et al. 2013; Erren 2001), and on neurodegenerative diseases (Hug et al. 2006); EMF exposure has also been linked to sleep disturbance (Abelin et al. 2005; Shahbazi-Gahrouei et al. 2013) headaches, memory changes, and depressive symptoms (Abdel-Rassoul et al. 2007; Hagström et al. 2013); numerous effects on plants and animals have also been reported (Cucurachi et al. 2013). Although more studies report effects on human health due to mobile phone use rather than proximity to BTS radiation, scientists indicate that 'the two kinds of radiation are very similar and effects produced by mobile phones at certain distances, can be extrapolated to represent effects from base station antennas, of the same type of radiation, at about 100 times longer distances' (Panagopoulos 2011, 12).

Scientific studies may focus on exposure to EMF with specific characteristics (e.g. frequency range; source position relative to the subject; emission duration). However, as indicated by Blank and Goodman, the same biology may occur across the range of the electromagnetic spectrum: 'While low energy EMF interacts with DNA to induce the stress response, increasing EMF energy in the RF range can lead to breaks in DNA strands. (...) The intensity of EMF interactions with DNA leads to greater effects on DNA as the energy increases with frequency' (Blank and Goodman, 2009, 71 and 76) and the effects of simultaneous exposure to several EMFs could be additive. The same authors explain that DNA has the structural characteristics of fractal antennas and therefore the same wide frequency range of interaction with EMF. This would 'contribute to greater reactivity of DNA with EMF in the environment, and the DNA damage could account for increases in cancer epidemiology' (Blank and Goodman, 2011).

In addition to the nature of EMF exposure, the characteristics of the exposed subject (e.g. age, gender, general health state) have an impact on the possible health consequences of radiation. Particularly relevant to our argument are

studies about the age-related differences in tissue response to EMF exposure and the impact on children (e.g. Byun et al. 2013; Davis et al. 2013; Divan et al. 2012; Hardell et al. 2013; Peyman et al. 2009; Sudan et al. 2012; Wiart et al. 2008). A research team led by Andreas Christ suggests that, 'in general and on average, children suffer a higher exposure of their brain regions than adults. This higher exposure is due to differences in anatomical proportions' (Christ et al., 2010, 1780). In a study where clinical and growth pattern data were collected for up to 13 years from 733 children whose mothers carried a magnetic field (MF) measuring meter during pregnancy, De-Kun Li and colleagues conclude that 'Maternal exposure to high MF during pregnancy may be a new and previously unknown factor contributing to the world-wide epidemic of childhood obesity/overweight.' (Li et al., 2012, 1). Even those scientists who believe there is no causal effect between mobile phone use and health problems for the general population have called for further studies and suggest caution with respect to childhood exposure to EMF (Aydin et al., 2011; Valentini et al., 2010).

Levitt and Lai conducted an extensive literature review of studies related to the biological effects from exposure to EMF radiated by BTS and other RF antennae. They reported that children are impacted differently than adults by electromagnetic wave emissions from mobile phones and BTS:

Children absorb energy differently than adults because of differences in their anatomies and tissue composition... For instance, radiation from a cell phone penetrates deeper into the head of children ... The same can be presumed for proximity to towers, even though exposure will be lower from towers under most circumstances than from cell phones. This is because of the distance from the source. The transmitter is placed directly against the head during cell phone use whereas proximity to a cell tower will be an ambient exposure at a distance (Levitt and Lai, 2010, 373).

Determining the risks of ambient exposure at a distance highlights a key issue in the regulatory framework discussed in greater detail below. In mobile phone communication, BTS distribute a signal, received by a landline, and send it to a receiver (mobile phone) within a certain area using the available frequency spectrum (bandwidth). The broader the available bandwidth, the more information can be transmitted in a given unit of time. This means that increasing download speed, increases emission⁵. Accessing an online movie or playing an online game, for example, requires more bandwidth than accessing a web site with still images and text. Users employ their smartphones to access services requiring high data transmission rates and they expect their connection to be maintained in a variety of locations including indoor and on public transport. Consequently, as demands for bandwidth and connectivity coverage have increased, telecom companies have responded by augmenting the number of BTS to partition each area into smaller coverage areas so that the available bandwidth is reused, the capacity is increased and more people can be served at the same time within the original area.

⁵ As the download speed increases, the number of bits per second increases. Since the energy per bit must remain the same in order to maintain the same quality of service, there is an increased energy per second, which is an increased radiated power.

Thus, as the number of BTS increases, more people are living in close proximity to a mobile phone tower than ever before.⁶ The only way to reduce the biological impact of exposure to electromagnetic fields is either to reduce the number of BTS or their transmission power. This means that either fewer customers will be served at the same time, which could be a problem in densely populated European cities, or that these same customers will be served, but with a lower data transmission rate.⁷ A lower data rate may imply, for example, that access to Web sites and emails is available, but video download is not. Consequently, the application of the ALARA principle regarding health risks needs to be weighed against the benefits of accessibility required by the Digital Agenda for Europe (see footnote 1). On the one hand, regulators will need to evaluate which technologies are safe to use for delivering the desired accessibility, and on the other hand, where, when, how much and what type of information or services need to be made available to citizens. Protection measures may include: reducing exposure limits, prohibiting specific “windows” of exposure (Belyaev, 2010; Blackman, 2009; Kostoff and Lau 2013), establishing age limits for the use of mobile communication devices, barring installations from sensitive areas such as schools and hospitals, requiring maximisation of wired rather than wireless networks, and establishing procedures for citizens’ exposure measurements. In order to define which measures should be implemented, regulators need accurate and comprehensible information allowing them to weigh the trade-offs between large data services availability and the protection of human health. When the health risk cannot be determined with sufficient certainty, the precautionary principle should be applied as recommended by Council of Europe Resolution 1815.

3.2 Setting Standards

In order to establish regulations and recommendations, several national and international bodies have used guidelines made available by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).⁸ ICNIRP offers two types of guidelines: *basic restrictions* on ‘exposure to time-varying electric, magnetic, and electromagnetic fields’ (ICNIRP, 1998, 495) and *reference levels* ‘provided for practical exposure assessment purposes [...] Compliance with the reference level will ensure compliance with the relevant basic restriction’ (ibid. 495).

⁶ France’s Agence Nationale des Fréquences (ANFR, 2013a) reports that in January 2012, 157,000 installations had been authorized – this number includes installations on French territories overseas, but it does not include installations of the defence, civil aviation or interior ministries. Of the 157000 installations, the ones dedicated to mobile communication include 52600 for GSM 900 or GSM 1800, 47600 for UMTS and 1300 for WIMAX. For example, according to ANFR data (ANFR, 2013b), the first arrondissement of Paris, which only extends over 1.83Km², hosts 107 GSM 900, 173 GSM 1800, and 355 UMTS antenna units. The map, available on the Web site in the reference, shows that no location in the arrondissement is more than 500 meters away from a BTS, with most installations hosting more than one antenna. In the period November 2012 – August 2013 the approved installations for 4G communication in France have increased from 507 to 6931 (ANFR 2013c)

⁷ Although alternative technical solutions are being explored (Ezri and Shilo, 2009).

⁸ The IEEE also provides similar guidelines (IEEE, 1999; IEEE, 2005).

As summarized in Table 1, which only covers the frequency range typical of BTS operation, *basic restrictions* for human exposure are expressed in terms of Specific Absorption Rate (SAR), and power density (S). SAR defines the rate of energy absorption per unit mass (how much energy the body absorbs), is expressed in Watts per Kilogram (W/kg), and is not directly measurable. Power density represents the rate of energy flow through a given surface area and is measured in watts per square meter (W/m²). For practical purposes however, the values used to establish regulations are those in the *reference levels* column of table 1. Emission limits are frequently indicated in terms of the electric field strength in Volts per meters (V/m).

< insert Table 1 >

There is a good deal of controversy over the reliability of the ICNIRP guidelines (as well as other, less referenced, guidelines), which are questioned on several grounds:

- 1) A possible conflict of interest exists between the ICNIRP and the telecoms industry and has been raised in the report to the Council of Europe (Huss, 2011) that eventually led to the adoption of Resolution 1815⁹
- 2) It has been argued that ICNIRP's *reference levels* don't actually ensure that corresponding *basic restrictions* are met. In particular, Georgiou explains that using the electric field strength reference level for expressing EMF radiation exposure limits, as several countries do and the Council of Europe recommends (Council of Europe, 2011), may misrepresent the SAR basic restrictions¹⁰ (Georgiou, 2010).
- 3) The measures used to define *basic restrictions* are contested. Some scientists argue that both SAR and power density measures have several limitations, including the fact that 'the existing standardized phantom is not optimal for SAR measurements of large base station antennas' (Hansson et al., 2011, 664), that current SAR recommendations do not take into account 'the smaller size and greater physiological vulnerability and increased absorption to the heads of children and females' (Han et al., 2010, 301), and that SAR needs to be integrated with other measures in order to be a useful tool for the evaluation of health risks associated with EMF exposure (Belyaev, 2010; Fragopoulou et al., 2010).
- 4) Most contentious, the ICNIRP guidelines do not offer protection against non-thermal effects of EMFs, particularly with respect to prolonged

⁹ In his report to the council Rapporteur Jean Huss states 'it is most curious, to say the least, that the applicable official threshold values for limiting the health impact of extremely low frequency electromagnetic fields and high frequency waves were drawn up and proposed to international political institutions (WHO, European Commission, governments) by the ICNIRP, an NGO whose origin and structure are none too clear and which is furthermore suspected of having rather close links with the industries whose expansion is shaped by recommendations for maximum threshold values for the different frequencies of electromagnetic fields'. (Huss 2011: Section B Explanatory Memorandum by Mr Huss, Rapporteur, point 29)

¹⁰ 'For a 250-fold exposure increase from 0.01 to 2.5 mW/m², the corresponding exposure increase in mV/m (from 61 to 955) is only 16 fold. Radiation exposure misrepresentation using V/m gets even worst at lower exposure values' (ibid. 79).

exposure (Belyaev, 2010; Bioinitiative Report, 2007, 2012; Blackman 2009). In fact, current restrictions are based only on short-term thermal health effects, because the ICNIRP committee concluded that 'Whilst it is in principle impossible to disprove the possible existence of non-thermal interactions, the plausibility of various non-thermal mechanisms that have been proposed is very low'. (ICNIRP 2009, 260)

Thus, the fundamental question of what constitutes sufficient evidence for setting restrictions is still open. Some scientists argue that current standards for risk assessment are inappropriate (Bioinitiative Report, 2007, 2012; Fragopoulou et al., 2010) and that long-term effects on citizens' health are due to a heightening, over time, of exposure to several EMF sources, a phenomenon normally more difficult to measure than acute effects (Belyaev, 2010; Kostoff and Lau, 2013). So, while certain experts deem the epidemiological studies on long-term effects of EMF exposure inconclusive on the basis of their potentially biased results or an unconvincing demonstration of risk, other scientists argue that studies of this type should be considered more carefully (Axelson, 2004; Blair et al., 2007; Georgiou, 2010). This is similar to the IARC assessment of environmental risk mentioned above, which found 'the available evidence insufficient for any conclusion' (Baan et al., 2011, 625) and highlights the current paucity of studies addressing the complex problem of interaction amongst effects of multiple agents (Kostoff and Lau, 2013). We are facing a conflict of epistemic cultures of non-knowledge (Böschén et al., 2010) with some scientists placing a higher value on more controlled experiments, but disregarding 'contextual factors or persisting real-world uncertainties' (ibid. 792) - such as exposure to multiple EMFs and long-term effects - and others who attempt to address the complexity and context of the problem, but at the cost of scientific reproducibility and predictability.

Regulatory bodies that are tasked with appropriate protective actions for EMF exposure are in a difficult situation: research aimed at assessing its potential danger has so far produced mixed results (especially for long-term exposure), and controversies are not limited to the magnitude of values that would limit health hazards, but also extend to the definition of what should actually be measured. The difficulty in establishing measurement standards, as well as the scarcity of long-term impact studies of EMF on the living environment, may explain why the WHO has only recently recognized the danger related to radiofrequency fields and maintains a classification of 'possibly' carcinogenic to humans (IARC-WHO, 2011). And yet, issues remain, such as which policy framework should be applied when evidence of risk is inconclusive, and whether the burden of proof should be on demonstrating risk or on demonstrating the safety of the technology (the latter being regularly applied to medical products). In section 4, we examine how European bodies and States have addressed the former issue, albeit with non-binding norms, and in 5 we propose that the latter, infrequently addressed issue be resolved on the basis of State compliance with binding international human rights law.

4. Legislative Dearth

As mobile-phone technology has progressed from first to fourth generation, requiring ever more powerful antennae, the Council of Europe responded in 2011 with Resolution 1815 (Council of Europe, 2011), a set of non-binding norms defining an emissions limit of .6V/m for wireless devices, along with recommendations to reduce 'threshold values for relay antennae in accordance with the ALARA principle and install systems for comprehensive and continuous monitoring of all antennae' (ibid. section 8.4.3). Resolution 1815 also articulates strategies for better protection of children. But, these guidelines do not have the power of law. The Council must thus rely on its 47 members to regulate electromagnetic emission levels at the national or municipal level.

Moving from recommendations on standards of measurement to legislation is a slow process¹¹. Throughout Europe, no new national legislation on BTS emissions has been established since national governments aligned their norms (e.g. Direction Générale de la Santé, 2002) with recommendations fixed by the European Union at 41-61 V/m (Council of Europe, 1999).¹² These recommendations were based on the ICNIRP guidelines discussed above. Given the controversies surrounding the guidelines, grassroots organizations have demanded more protective regulation from their national and local governments. Government responses have often been contradictory, since public officials are guided by the conflicting needs of protecting citizens' health, responding to the commercial logic of the telecom companies (frequently major employers within their jurisdictions), and meeting the obligations of information accessibility under the Digital Agenda for Europe. The analysis of the case of Paris, presented below, clearly illustrates these competing demands and the inadequacy of current regulation.

4.1 French law and jurisprudence

The principle of precaution, inscribed in the French Constitution in 2005, functions as a guiding standard when determining how to evaluate environmental risk, especially with respect to the most vulnerable members of society, such as children. Unfortunately, the precautionary principle has been substantively weakened by a series of court rulings over the course of 2011-2012. In October 2011, the Conseil d'Etat, the highest court overseeing French administrative matters, handed down a decision that circumscribed the role of mayors in determining whether a BTS installation was appropriate in their commune or municipality. Instead, the Council indicated that responsibility for BTS installation was in the hands of the Autorité de Régulation des Communications Electroniques et des Postes (ARCEP) and the Agence nationale des fréquences (ANFR), two national bodies that regulate the emission of electromagnetic waves and the placement of mobile phone towers, with a mandate to assure full coverage throughout France (Conseil d'État, 2011). The decision would have garnered less national attention had the rapporteur of the Council's decision not been a former affiliate of a leading French telecom

¹¹ The authors of one of the major studies that prompted the IARC carcinogenic classification recently remarked that the measure 'does not seem to have had any significant impact on governments' perceptions of their responsibilities to protect public health from this widespread source of radiation.' (Hardell et al. 2013, 85)

¹² Limits are set at 41V/m for GSM 900; 58V/m for GSM 1800; and 61V/m for UMTS.

company (Thénard, 2012), and had the state not just pocketed 968 million euros in licensing fees¹³ for fourth generation bandwidth for mobile phone towers (Chicheportiche, 2011; ARCEP, 2011).

Another example is a series of rulings in May 2012 by the French Jurisdictional Court, a hybrid super-court that is called upon to decide whether France's civil or administrative courts have jurisdiction in the event of a dispute. After losing a seminal Court of Appeals decision in 2009 that required a telecom company to pay minor damages and dismantle a contested mobile phone tower,¹⁴ the company decided to challenge the jurisdiction of the First Instance Court and its appellate court to adjudicate the installation of BTS. Claiming that the authority to dismantle was under the jurisdiction of the administrative, rather than the civil court system, the plaintiff brought a suit that rightly emphasized the lack of pertinent national legislation on this issue. The Tribunal rendered an odd decision, declaring that the civil court was competent to determine financial damages for health risks incurred due to exposure to emissions from a BTS, whereas only the administrative court could order the dismantling of a mobile phone tower, concluding that it is the administrative court that has policing jurisdiction in this domain under French law (Tribunal des conflits de la cour de cassation, 2012). With these two decisions - the first of which places the obligation to protect in the hands of a national body mandated to provide full coverage, and the second of which provides the administrative court with the power to adjudicate what is essentially a civil matter - the French judicial system appears to have rendered jurisprudence that is at odds with the constitutional principle of precaution.

4.2 Regulation in Paris

Paris has been considered a leader in calling for extremely low levels of electromagnetic wave emission from BTS, with a ten-year norm of 2 V/m from 2003-2011 (Ville de Paris, 2003). This Charter of Voluntary Compliance was suspended in Fall 2011 as the City moved to decrease emissions in accordance with the Council of Europe Resolution 1815 cited above, while the operators hoped to increase their emissions to accommodate fourth generation (4G) mobile phone technology (Maussion, 2011). In October 2012, despite the determined opposition of local NGOs and the Green Party, the Mayor's Office ceded to the demands of the telecom companies, and raised emission limits to 5-7 V/m (Ville de Paris, 2012). A 2013 report from the French government has indicated that citizen exposure to EMF is expected to rise 50% due to 4G emissions from BTS (DGRP, 2013, 95).¹⁵

¹³ A further, significantly larger, licensing fee has been collected recently with the attribution of frequencies in the 800MHz range (ARCEP, 2012).

¹⁴ Cour d'Appel de Versailles, *S.A Bouygues Telecom v. Eric Lagouge*, R.G. N° 08/08775, 4 February 2009.

¹⁵ According to the report, the average simulated exposure for the cities under study was increased by approximately 50% with the addition of 4G (LTE) antennas. For example, in the 14th arrondissement of Paris, the simulated ground exposure levels rose from approximately .6 V/m to 0.9 V/m (DGRP 2013,95, authors' translation)

France has four telecom companies that compete for installation sites on Parisian rooftops. The city was home to nearly 2053 base transceiver stations in 2012 (Ville de Paris, 2012, 2). Zoning regulations are extremely strict and focus on aesthetics, or what the French call *l'aspect*.¹⁶ Thus, mobile phone towers are virtually invisible, hidden by camouflage structures resembling chimneys or brick walls. Equally invisible is the type of public information sharing that citizens have come to expect for the installation of high-impact structures, such as wind-parks or power plants.¹⁷ Public property rights allow building cooperatives to approve rooftop installations in exchange for an annual fee, without prior consultation with their neighbours, many of whom live on the upper floors in surrounding buildings and will be exposed to stronger EMF than those who actually approved the installation. Once the project has been endorsed by a home-owners' cooperative, the ANFR must vet the level of emissions and the technical capacity of the BTS, while the aesthetic aspect is scrutinized by the Monuments Nationaux de France. Once approved at the national level, the project is examined at the municipal level, where a Preliminary Declaration is filed with the Département d'urbanisme. Only once the Preliminary Declaration has been approved, does the first indication of a BTS installation appear in the public domain. A small white sign posted on the building door informs passers-by that a construction project will take place, in this case the installation of a new BTS. In several instances, especially when the white sign has appeared near schools or day-care centres, citizens have mobilized to insist on the removal of the installation to a different location.¹⁸ The fact remains, however, that the State safeguards the aesthetic beauty of Paris and obliges the telecom companies to provide maximal coverage to consumers, while providing no regulation to protect children from the potentially harmful effects of EMF exposure from BTS.

5. Extending the Regulatory Framework

International human rights law constitutes a possible means to address the current regulatory impasse. The painstaking work after the end of the Second World War to build an edifice of binding international treaties, ranging from the international bill of human rights to more specific protection for women, children and minorities, culminated with the entry into force of the Convention on the Rights of the Child in November 1989. Recent international instruments, such as the OECD Guidelines for Multinational Enterprises or the Ruggie Report, oblige State parties to 'protect, respect and remedy' human rights violations by businesses against individuals or groups, bringing corporations into the international human rights paradigm through State compliance with binding treaty law.

In this section, we argue that (1) because protection of children is a high threshold norm in HR law and (2) the binding language of the Convention on the Rights of the Child obliges States Parties to provide a higher standard of protection for children than adults, any widespread or systematic form of

¹⁶ Historic zoning is especially strict. See Art. R111-21, amended by decree no. 2007-18 of 5 January 2007, *Code de l'Urbanisme*.

¹⁷ Commissariat Générale au Développement Durable 2009, 73/1 and 84/1.

¹⁸ See, for example, the *Collectif Rue Lobineau*: www.ruelobineau.org

environmental pollution that poses a long-term threat to a child's rights to life, development or health may constitute an international human rights violation. Thus, when EMF exposure is too high, the State must legislate to implement the 'protect, respect and remedy' framework.

5.1 BTS Installations and Children Rights

Articles 3, 6 and 24 of the UN Convention of the Rights of the Child (United Nations High Commissioner for Human Rights, 1989) constitute a legally binding responsibility on the part of States Parties to protect children from verified and potential threats to health and safety. We have argued, in a submission to the UN Committee on the Rights of the Child, that electromagnetic pollution poses a critical threat to the 'highest attainable standards of health' for children, as articulated in article 24 of the Convention on the Rights of the Child, and can be analysed using constructs similar to those employed to assess trafficking and forced labour violations involving minors (Perry et al., 2012). Scientists from both industry and the academy recognize that children's physiology places them at greater risk to electromagnetic pollution from mobile phones and BTS (see Section 3.1 above), triggering stricter legal thresholds and precautions under articles 2 and 3 of the Convention. Regular testing of emission limits by an independent body of experts, with 'appropriate sanctions' for widespread or systematic pollution under article 32 of the Convention, coupled with regular monitoring of both voluntary and legally binding compliance by the telecoms industry, constitutes a minimum level of protection as required by the Convention (*ibid.*). According to the Convention, decisions on where to place BTS and on what constitutes safe levels of EMF exposure for children should be made by competent health specialists guided by viable national legislation that requires public consultation and the lowest emissions possible in proximity to day-care and schools. The principle of precaution thus functions as a guiding standard when determining how to evaluate environmental risk with respect to children.

The question of accountability is complicated by the problem of multiple sources of environmental pollution, a reality which means that a business may bear no legal responsibility as a corporate entity because the impact is cumulative. The rapid increase in all sorts of environmental pollutions, ranging from diesel particle emissions to multiple sources of EMF, renders it difficult to isolate the precise cause of a particular environmental cancer or disease. But, what if EMF exposure constitutes one environmental pollutant too many for the infants and toddlers exposed to a disputed installation? While the main difficulty in legislating to protect has to do with the science - both the complex measurement paradigm for EMF emissions and the on-going biological research on EMF impacts on the living environment - theory and practice suggest that the lack of agreement on scientific knowledge can only be addressed through the principle of precaution. Moreover, Council of Europe Resolution 1815 and the Convention on the Rights of the Child ratified by all EU members oblige Member States to protect the most vulnerable from this relatively new form of environmental pollution.

6. Conclusions

We have explored the difficulties inherent to EMF emission regulation and argued that they are due to a lack of scientific knowledge on long-term impact, along with a contested understanding of what constitutes appropriate assessment of risk. We have demonstrated how inadequate regulation on BTS emissions has generated contradictory policies at the national and local level, and has failed to reassure citizens that their health and the health of their children is sufficiently protected. Given this situation we have posited that the human rights framework to 'protect, respect and remedy' vulnerable populations from corporate violations of international law should also apply to State and European regulation of EMF exposure. In particular we have explained how the dearth of legislation to regulate the installation of BTS in close proximity to children's facilities and schools clearly constitutes a human rights concern according to the language of the Convention on the Rights of the Child, a treaty that has been ratified by all European States.

If we are to deliver on the promise of digital technology to enhance democratic dialogue and facilitate human lifestyles, then we have to make sure it is environmentally safe to use – particularly for the generations to come.

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Biographies

Professor Claudia Roda's research focuses on the impact of digital technology on human behavior and social structure. She recently published the book "Human Attention in Digital Environments" with Cambridge University Press. Claudia holds a bachelor degree in Computer Science from the University of Pisa, and a PhD from the University of London.

Professor Susan Perry, a specialist in international human rights law, holds degrees from Yale, Oxford and the Ecole des Hautes Etudes en Sciences Sociales (Paris). She recently served as a child rights expert and US Delegation member in Chad for the drafting of the N'djamena Declaration to End the Recruitment of Child Soldiers.

Table 1 – Guidelines for the frequency range of BTS

Frequency	Basic Restrictions (ICNIRP 1998)	Reference Levels ^a (ICNIRP 1998)				
		Frequency range	Electric field strength (V/m)	Magnetic field strength		Electrom. field strength
100 kHz–10 GHz	Restrictions on Specific energy absorption rate (SAR) prevent whole-body heat stress and excessive localized tissue heating 0.08 W/kg			H-field (A/m)	B-field (μT)	power density (W/m ²)
		3–150 kHz	87	5	6.25	
		0.15–1 MHz	87	0.73/f	0.92/f	
		1–10 MHz	87/f ^{1/2}	0.73/f	0.92/f	
		10–400 MHz	28	0.073	0.092	2
		400–2000 MHz^b	1.375f^{1/2}	0.0037f^{1/2}	0.0046f^{1/2}	f/200
		2–300 GHz	61	0.16	0.20	10
10–300 GHz	Restrictions on power density (S) prevent excessive heating in body tissue 10 W/m ²	Same as 2–300 GHz range above				

^a The limits reported are those for public exposure; different (higher) limits are specified for occupational exposure.

^b If calculated, the E-field strength level ranges between 27.5 and 61.5 V/m (sqrt(400) * 1.375 = 27.5 and sqrt(2000) * 1.375 = 61.49).

Precautionary Principle; Wi-Fi - Children; Saying Good-Bye
to WiFi A Waldorf School Takes a Precautionary Step,
Dr. Ronald E. Koetzsch, PhD.

Saying Good-Bye to WiFi

A Waldorf School Takes a Precautionary Step

BY RONALD E. KOETZSCH, PhD

In the summer of 2010, a prospective parent walked into the office of Caroline Askew, admissions director at the City of Lakes Waldorf School in Minneapolis. The parent was an attorney with two young daughters. Caroline is accustomed to answering all kinds of questions from parents, but this mother had questions and concerns that Caroline had never heard before.

The parent first inquired whether or not the school utilized a WiFi system—an array of wireless transmitters that allows persons with laptop computers or smartphones to access the Internet and their email from any location in the building. On learning that WiFi was in use, she asked Caroline, “Would the school be open to the possibility of removing the system?” WiFi transmitters constantly emit pulsed radio frequency radiation (RFR), and this mother was concerned about the possible effect on the health of her children. She had done much research and had compiled a collection of documents—articles from scientific journals and abstracts of scientific papers—that pointed to the possible dangers of microwave radiation in a WiFi environment. She asked Caroline if the school would be willing to consider those documents in order to make an informed judgment.



A WiFi router, which typically can transmit radio frequency radiation about 150 feet in all directions indoors and about 300 feet outdoors

City of Lakes first installed a WiFi router in 2004 in preparation for an accreditation team visit by the Association of Waldorf Schools of North America. WiFi use was limited until 2008, when the school hosted the Association’s annual summer conference. In time, staff members came to depend on the wireless network to work throughout the day on personal laptops. The majority of faculty and staff did not question the safety of the WiFi system. One class teacher was an exception and frequently caused havoc and frustrated his colleagues by intentionally disabling the system.

This teacher was very sensitive to electrical influences (electrosmog) and tried to raise awareness about the problem. He left his class in the middle of fourth grade due to health issues.

At the close of her interview with the concerned parent, Caroline Askew, herself a mother of young children and a person with broad interests, agreed to read through the binder of material. Most of the documents were abstracts of scientific studies on the effects of cell phone use and exposure to the pulsed radio frequency radiation emitted by cell phones. The studies also included research on possible health concerns related to WiFi routers, cordless phones, and cell phone towers. The research had been conducted at various universities and research centers in Sweden, Australia, China, the United States, and other places around the world.

Two documents from the Parliamentary Assembly of the Council of Europe expressed deep concern about the “potential dangers of electromagnetic fields and their effect on the environment.” One article mentioned that the World Health Organization had identified pulsed radio frequency radiation as a class two carcinogen. Another reported that some public school systems in Canada had removed WiFi from their schools out of concern for the health of the children. A letter from David O. Carpenter, MD, Director, Institute for Health and the Environment, University at Albany–SUNY, strongly advised against the use of WiFi in schools. One recurring point was that whatever ill effects pulsed radio frequency



The City of Lakes Waldorf School building was originally an insurance company building, built in 1923. Its brick walls minimize WiFi penetration from external sources into the building.

emissions may have, children, because of their size and ongoing, rapid growth and development, would be particularly vulnerable.

Caroline shared the concerns with her colleagues. She asked Betsy Leighton, director of IT at the school, and Bob Amis, a science teacher, to read through the material and offer additional perspectives. In February 2011, Caroline and other City of Lakes staff attended the regional Great Lakes conference at the Chicago Waldorf School. The keynote presenter was Michael D'Aleo, a highly respected Waldorf high school science teacher. Caroline asked Michael if he thought the concerns about WiFi were credible. He answered in the affirmative and added that he is one of the small percentage of the population (about 3%) who are electrosensitive (ES), i.e., extremely sensitive to electromagnetic and radio frequency influences.

Following the regional conference, a presentation of the issue was made at a City of Lakes weekly staff meeting. Most staff members were open to further investigation, although there was significant reluctance to eliminate the convenience of WiFi. Some people had recently purchased iPads, which cannot function without a wireless connection to the Internet. A few faculty and staff were and remained staunchly skeptical.

At this point, the mother who had initially raised the concern and was now a parent in the school offered

to pay for an inspection of the school building by a company called Intentional Environment. The company specializes in creating healthy environments by identifying and eliminating energetic interference created by electromagnetic fields (EMFs), pulsed radio frequency radiation, and other factors.



Marti Stewart, administrator, and Caroline Askew, director of admissions, at City of Lakes Waldorf School

One weekend, the company's two owners spent many hours assessing electromagnetic fields and radio frequency radiation throughout the school

building, using a variety of electronic meters and measuring devices. In many places they found high levels of RFR from the school's WiFi routers as well as from WiFi transmitters outside the building.

When the building WiFi was turned off, they were able to assess the levels of the AC (alternating current) electric fields coming from building wiring, appliances and other electronic devices. In some areas, they detected what is called "dirty electricity." This is AC current that has tiny energy spikes in the sine wave of the current flow. Dirty electricity is also considered a possible health risk.



A sign in the school lobby

The team discovered other problematic factors:

- Fluorescent lights emitting unnecessary RFR
- Electric cords wrapped around metal water pipes and creating very strong electromagnetic fields
- A strong EMF created by a large transformer located on a pole right outside one of the lower-grade classrooms
- "Dirty electricity" being generated by the motor for the school elevator

Following the assessment, the company gave the school a sixteen-page report, describing the problems present and recommending measures for remediation. The first and most important recommendation was to remove the WiFi routers from the school and have staff and faculty connect to the Internet by Ethernet cables instead. Other recommendations included rewiring lights, putting long extension cords in metal conduits, using outlet filters to eliminate dirty electricity, installing metal window screens to prevent radio frequency radiation from coming in from the outside, and not placing student desks in particular areas of certain classrooms. The recommendations were not particularly costly, and the school was able to implement many of them. Additional improvements have been made each year since.

City of Lakes Waldorf School has not chosen to publicize its decision to remove WiFi. Staff and faculty have adapted to the nonwireless environment. Parents and visitors to the school are not surprised when they discover they cannot get a WiFi connection to the Internet with their laptop or smartphone. There are, after all, "Cell Phone Free Zone" signs in the school lobby. A visitor with a laptop can, if necessary, access the Internet via a hardwired connection.



This window in the second-grade classroom is now equipped with metal screening, which shields the room from WiFi radiation from outside the building.

Is WiFi Really Harmful?

In the binder presented to the school by that first concerned parent, there were about fifty abstracts of scientific studies. Some focused on the effects of cell phone use: the combined impact of the heat and

the pulsed radio frequency radiation that cell phones generate. Those studies indicate the following problematic effects of relatively long-term (ten years or more) cell phone use:

- Oversecretion from the parotid (saliva) gland on the side used for the cell phone
- Increased risk of tumors in the parotid gland
- Increased risk of glioma (a brain tumor that develops from glial cells)
- Increased risk of acoustic neuroma (a tumor in the ear that develops from nerve cells)
- A correlation between the amount of cell phone use and behavioral and mental health problems

Most of the studies involved the effects of short-term exposure to pulsed radio frequency radiation on human beings, on animals (rats, mice, rabbits), and on plants. Some of the studies were carried out on the actual subjects (in vivo), and others involved cells taken from the subject and exposed while in a test tube or other vessel (in vitro). These various studies indicated that exposure to pulsed radio frequency radiation does the following:

- Changes electroencephalogram (EEG) patterns in the brains of human beings—in particular, a reduction in alpha waves, associated with relaxation, with women being more affected than men
- Reduces the ability of human adults to do tasks involving spatial memory
- Decreases the attentiveness of young adults when performing memory tasks
- Affects melatonin levels during sleep
- Affects the changes in blood chemistry related to the circadian rhythms of waking and sleeping
- Causes breakdown in DNA strands and thus changes the structure and functioning of genes, i.e., is genotoxic (an in vitro study of human cells and

an in vivo study involving brain cells of rats both indicated this effect)

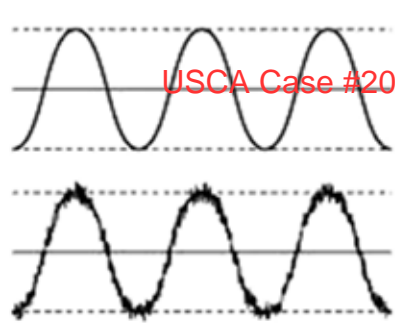
- Adversely affects the quality, viability, duration and motility of sperm cells (this effect also was observed with human cells in vitro and rat cells in vivo)
- Negatively affects the function of the thyroid gland (in rats)
- Decreases the function of endocrine cells that secrete digestive hormones (in rats)
- Affects the function of the inner ear (in rabbits)
- Affects the function and structure of normal human hemoglobin (in vitro)
- Disturbs the normal functioning of worker honeybees
- Causes genetic damage in mung beans and inhibits their germination and root formation
- Compromises the blood-brain barrier (the BBB is a selective permeable barrier that allows into the brain fluid the nutrients, water, and other things the brain needs, but keeps out potentially toxic substances; the relevant study involved rats)

These and many other studies are readily available on the Internet. The website of the National Center for Biotechnology Information, whose mission is to advance science and health by providing access to biomedical and genomic information, can be found at www.ncbi.nlm.nih.gov/pubmed

It should be noted that there are also studies that indicate little or no ill effect from cell phone use and exposure to WiFi. These studies, like the studies just cited, are of necessity short-term studies. Even a study focusing on the effects of ten years of cell phone use is, in the context of a normal human life span, a short-term study. In any case, there is as yet no unanimity in the scientific community about these issues. Studies funded by the communications industry tend to find no harmful effects.

Rudolf Steiner, founder of Waldorf Education, considered electricity a realm of “subnature.” Early in the 1900s, Steiner predicted that by the end of the century there would be so much electrical influence in the environment that it would be detrimental to human health.

Dr. Michaela Glöckler, who is head of the Medical Section at the Goetheanum, the center of the world anthroposophical movement located in Dornach, Switzerland, has for some years been warning about the dangers of WiFi. This past February at a conference on technology in education at Rudolf Steiner



Wave profile of normal alternating current (above), contrasted with the wave profile of “dirty electricity” (below)

College in California, she addressed the issue. Dr. Glöckler explained that a WiFi router, even when it is not in use, is constantly emitting a very regular high frequency pulse of energy. The human body also operates with electrical energy, and the cells communicate by means of electromagnetic fields. However, the pulsation is slightly random and irregular and not exactly the same speed as that of the router. Thus, the pulsed WiFi signal can interfere with the natural, optimal functioning of the body.

Dr. Glöckler stated that we can and should use electronic technology. However, we should use it only when it is necessary. She strongly advised against the use of WiFi in schools when wired connections can serve the same purpose. She emphasized that children, due to their small size and rapid development and growth, are particularly at risk. Dr. Glöckler also advised people with serious health problems to avoid WiFi environments, since exposure may compromise the immune system. She pointed out that work spaces can usually be arranged to provide Internet access via a cable and, if WiFi is an absolute necessity, at least the router can be turned off when not in use.



Dr. Michaela Glöckler, internationally known medical expert and pediatrician

In Dornach, Switzerland, the Goetheanum contains many offices, lecture rooms, a cafeteria, and other spaces

where one would expect to find WiFi. However, WiFi is available only in a limited area on the ground floor of the building and only for visiting conference participants. In talks and private conversations, Dr. Glöckler has often speculated that WiFi may be the asbestos of the twenty-first century—something universally accepted as perfectly safe and then, in time, after much harm has been done, discovered to be a serious hazard.

Recent research has provided some evidence of the possible short-term effects of electromagnetic fields and pulsed radio frequency radiation. At this point, however, no one can know or predict the long-term

effects. WiFi networks and the continuous exposure to radio frequency radiation are recent—only within the past fifteen years—factors in our daily lives. Long-term studies have not yet been possible. Until time allows such studies to be conducted, we and our children are subjects in an extended biological experiment.

In the decision to have WiFi in a school or in our homes, it is perhaps wise to apply the Precautionary Principle. This principle, developed in the early 1980s, is meant to guide decision making regarding ecological and health policies. In the agencies of the European Union, the Precautionary Principle is officially recognized as a determinative guideline in making decisions that affect the environment and public health.

The Precautionary Principle states that when a new device, activity, or policy is proposed, and before it is implemented, those who will provide and profit from it must prove conclusively that it is not harmful. The burden of proof should be on those proposing and promoting the innovation. Those who question or oppose the innovation should not be required to prove that it is harmful.

At this time, no one, including the very powerful electronic communications industry, has proven conclusively that exposure to WiFi is safe. There is no proof that short- or long-term exposure to WiFi for children or for adults is benign.

City of Lakes Waldorf School took a courageous and perhaps prescient step in eliminating WiFi and going back to hardwired access to the Internet. The school ran the risk of being perceived as alarmist and for taking a side in an unresolved scientific controversy. However, the school chose to act out of concern for the health and well-being of the students entrusted to its care.

The school is in good company, though. The Israeli Department of Education, the French National Assembly, the European Environmental Agency, the Council of Europe, and the German government are but a few of the many governments, government agencies, and scientific authorities which are now warning about and/or banning WiFi in schools. ☺



An outlet filter that reduces dirty electricity

Precautionary Principle; Wireless Devices, Standards, and Microwave
Radiation in the Education Environment, Dr. Gary Brown, Ed.D.
(Instructional Technologies and Distance Education)

Wireless Devices, Standards, and Microwave Radiation

in the Education Environment

**By Gary Brown, Ed.D. in Instructional
Technologies and Distance Education**

from Nova Southeastern University

and

Public School District Educational Technology and Distance Learning Specialist

Introduction

Since there is a shortage of space in schools, many school districts often use portable trailers to serve as classrooms for school students. Up to this point in their technology upgrade program, many school districts have not funded the broad scale deployment of technology within portable classrooms. Schools must decide whether such deployment will utilize the same building wiring standards that have guided efforts within the permanent campus or utilize wireless local area networking technology. To make this decision, public schools are analyzing the feasibility of placing wireless computers into classrooms, especially portable classrooms (portables) used by schools with rapidly-expanding enrollments. Such computers would interact with servers in the central processing site via the proposed Wireless Local Area Network (WLAN). Promoters of wireless technology state that it is less expensive, and can be installed easily and quickly because there is no need to dig trenches or open walls and ceilings to install cables as would be required for hard-wired systems. Another element favoring the utilization of wireless technology is its inherent mobility; that is, devices can more easily be moved and reactivated in other portables or conventional classrooms.

However, on the flip side, there are many negative aspects to “going wireless” in schools related to health and safety. This analysis provides information regarding health effects associated with wireless radiofrequency/microwave (RF/MW) radiation transmitting technologies, specifically the WLAN.

How the Technology Works

Digital Bits – Conduction of Pieces of Information Via Electric Pulses

Technology builds on this foundation. Thus, in principle, the purpose and requirements of the Wireless Local Area Network are like that of Morse code. In this electronic age, instead of mechanically tapping codes, computers use digital bits (electric pulses) that signal: Yes (1), I am carrying data; or No (0), I have nothing. Several million electric pulses (megabits) travel in streams of invisible energy (radio waves) carrying true characters (1) that form words, or spaces (0) that separate words. Morse code consisted of intermittent tapping that produced sound which was transported in slow rolling waves of air particles. But digital pulses of radio waves move fast at the speed of light. They are precise, consistent, and travel along specially engineered waves. Therefore, data moves rapidly and smoothly through the digital system.

Wireless Local Area Network (WLAN) – Movement of Data in Air to Remote Devices

Wireless computers rely on transmitters to push data to and through the air, which offers resistance, and are therefore inherently less reliable than wired networks. Computer transformers operate at several thousand volts. In a wireless computer system, transformers send millions of bits of information to transmitters atop the desk or through the lap top antenna. In turn, the data is packaged onto a signal and sent to a microwave antenna that is usually perched on the wall of a room or mounted on doors or on tall structures. The wall antenna downloads the data into its attached waveguide, which channels the information, via outdoor and indoor antennas, to users in the WLAN or to the antenna(s) receiver/transmitter located on the main campus building for further processing. The transmitter's receiver located on the main campus building is connected to the school's wired network. Since WLANs would be on during the school day, the RF/MW transmitters attached to these wireless systems are transmitting continuously. Electric pulses in the RF/MW region (radio waves), the band of the electromagnetic spectrum used for communications, can pass through nearly all types of matter, including children.

Standards, Rules, and Guidelines

Commercial wireless products are designed to comply with industry-based standards that are created by industry-appointed professional associations for industry use in achieving uniformity and compatibility in the manufacture and application of wireless communication technologies. These standards are different from government rules that are enforced by the government agency with regulatory authority over signal interference between licensed carriers, i.e., the Federal Communications Commission (FCC). Since the FCC is only a licensing and engineering agency it does not test, fund, or conduct biological research. FCC does not monitor communications installations to ensure compliance with FCC guidelines governing human exposure to RF/MW radiation. The FCC relies on other agencies to recommend safety standards for wireless technologies.

The organizations responsible for developing RF/MW safety standards include the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE) associations. The committee that sets RF/MW exposure standards was first sponsored by ANSI and then by IEEE. It is basically the same group

of people. It is important to understand that industry standards and government guidelines are two different things. The IEEE committee is mainly comprised of engineers and physicists who deal with the non-living sciences. They have traditionally been charged with the task of making these technologies work, not with the understanding of health effects from the technologies' RF/MW radiation exposures that are within the purview of the living sciences of biology and medicine. The health physicists who serve on these committees have traditionally been active in high intensity (energy) radiation research primarily from defense-related industries. These scientists have conducted research on the ionizing band and are not as knowledgeable about physical and biological effects related to exposure to non-ionizing RF/MW radiation used in wireless technologies. There are many biologists working in the field of bioelectromagnetics, the study of non-ionizing radiation in living organisms. But somehow most of them have left these committee.

FCC Guidelines- Human exposure to Radiofrequency/Microwave Radiation

In August 1997, following the enactment of the Telecommunications Act of 1996, the Federal Communications Commission (FCC) published revised guidelines governing human exposure to RF/MW radiation. These guidelines are difficult to enforce because the FCC lacks the man-power and the necessary funding to carry out monitoring and enforcement from exposure to wireless technologies' radiation. These guidelines were adopted by the FCC to protect the health and safety of the general public and certain high risk occupational groups, such as telecommunications workers. For example, the guidelines outline the power density exposure level permitted for the general public (1mW/cm² for 30 minutes) and workers (5mW/cm² for 6 minutes). The rationale for the difference in permissible exposure levels is that workers are aware of the presence of radiation and can protect themselves, whereas the public is considered to be unaware of radiation, and would not be aware that protection is needed. We add that children would be even less apt to understand the concept of "awareness" when studying or playing near to transmitting signals from a WLAN to wireless classroom computers.

WLAN technologies are regulated by the FCC under Section 47 Part 15 rules. Section 47 Part 15 rules specify compliance with FCC rules regarding RF/MW interference. FCC Part 15 rules for WLAN applications are concerned primarily with RF/MW power output as it relates to the prevention of RF/MW interference with other electronic devices. [See FCC 99-149 pl, sec 2.]

Depending on its intensity, RF/MW radiation can cause heating of body tissues. No heating will occur if the exposed body can compensate for the heat load. In general, the intensity of exposure to radiation from cell phones, cell towers, and WLANs is low and does not cause significant tissue heating.

X-rays are classified as ionizing radiation. Ionizing radiation exposures are also regulated by government and industry standards. Unfortunately, when setting guidelines for products emitting RF/MW radiation, industry uses only the thermal level of radiation where the body increases in temperature and would go into shock or burn if over-exposed as a basis for defining adverse biological effects. It is important to note that WLANs

operate in the non-ionizing, RF/MW part of the electromagnetic spectrum. The FCC RF/MW exposure guidelines apply for wireless devices operating in the non-ionizing part of the electromagnetic spectrum which includes devices such as mobile phones, wireless internet, and mobile phone base stations (often called cell towers).

How could the FCC guidelines for wireless devices operating in the non-ionizing, RF/MW spectrum be based upon standards that are not internationally accepted nor proven safe? That question can best be addressed by this statement from the international electromagnetics research and policy publication, *Microwave News*:

Standard setting bodies do more or less as industry wants. Their members are often current, past, or future employees of the very companies they are supposed to regulate. Meanwhile government agencies have no appetite for confrontation.

While the wireless industry has stated that its standards and the FCC guidelines are safe and do not pose a risk to workers or the general public, many in the wireless community do not agree. Morton Bahr, President of the 600,000-member U.S. Communications Workers of America (CWA), a national union with a membership dominated by telecommunications workers, filed a legal challenge in November, 1997, in the U.S. Court of Appeals against the FCC rules on human exposure to RF/MW radiation. Mark Wilson, CWA's legal representative, stated recently, "The President of CWA is very concerned about protecting the health and safety of our workers who are exposed to wireless radiation on a daily basis." The CWA is objecting to the hazardous radiation exposure levels its workers are subjected to under FCC's RF/MW exposure guidelines.

A November 30, 1998, letter from David Nghiem, Ph.D., president and CEO of USA Wireless Inc., a manufacturer of mobile phone components, to FCC Chairman William Kennard, raises questions regarding the current industry standard and FCC guidelines. The letter suggests the need for a "much more stringent standard than the established Specific Absorption Rate (SAR)."

Although there is no question that the SAR measurement is important for establishing how much radio-frequency (RF) power is deposited in human tissues, the SAR level relates only to the electric field inside the tissue, and ignores any possible biological effects from the magnetic field. We must take into account, however, that the SAR only relates to thermal effects; it does not take into consideration the possible non-thermal effects.

U.S. exposure guidelines are not universally accepted in many parts of the world. See:

<http://www.emrnetwork.org/regulation/charts.htm>

According to the FCC, "Some published exposure limits in Russia and some eastern European countries have been generally more restrictive than existing or proposed recommendations for exposure developed in North America and other parts of Europe." Russian limits for RF/MW radiation exposures are up to 100 times stricter than those in the U.S. and Western Europe. In January 2000, Swiss health and environmental officials adopted strict rules for public exposures from new sources of RF/MW radiation. Switzerland has

one of the most stringent exposure guidelines in the world requiring power levels effectively 100 times lower than those of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and ANSI. Salzburg, Austria's standard is approximately 5800 times lower than the FCC guidelines for RF/MW base station radiation.

Health officials in Canada are also concerned with regulations governing potentially harmful RF/MW radiation in the air over Toronto. Dr. Sheela Basrur, Medical Officer of Health (November, 1999) urged the Toronto Board of Health to increase the safety margin a hundred-fold. It is recommended, as an added margin of safety, that exposures to the public be kept at least 100 times below Canadian federal exposure limits. Basrur said RF/MW radiation has been demonstrated to have adverse effects on the blood brain barrier, and some evidence suggests a link to leukemia and other cancers. On December 6, 1999, the Board of Health approved the Prudent Avoidance Policy recommended by Basrur. That policy would impose an output limit on cellular base stations 100 times more stringent than the current Canadian Safety Code 6.

The FCC rules suggest that manufacturers of transmitters that have antennas located next to individual(s), as in the application of the WLAN transmitter antennas, provide certain operating and warning usage instructions. Those instructions should be included in the operator's manual to caution users to maintain a specific distance from the transmitter/antenna. In addition, FCC advises that a warning label should be affixed to the transmitter/antenna to caution users or other persons close to the transmitter/antenna to limit exposure duration and/or maintain certain specific usage conditions.

IEEE 802.11 Standard -- A Boilerplate or Matrix for an Engineering Design?

To ensure the compatibility of electronic systems, the IEEE agreed on specific and uniform criteria, an industry standard, for the design of wireless technology. In the hierarchy of rules for the design of the products in its domain, IEEE assigned Section 802.11 to WLAN components. This section stipulates that WLAN antennas are required to have a certain number of channels; data can move at the rate of a specified number of bits (electric pulses) in each antenna channel. This frequency range is non-licensed, which means that industry is not required to obtain a construction or operation license from the FCC before deploying WLAN systems..

Presentations made by industry to this writer referenced the IEEE 802.11 industry standard. Many industry representatives mistakenly inferred that since their products comply with the IEEE 802.11 standard, their products automatically are safe and without the threat of health issues from RF/MW exposure. This writer also contacted members of the IEEE 802.11 industry standards committee requesting information on the health and safety aspects. This writer specifically requested information pertaining to specific absorption rates (SAR) and power density of WLANs. Mr. Vic Hayes of Lucent Technology and member of the IEEE 802.11 standards committee supplied an IEEE.802.AA document. The second and third paragraphs of the document address the industry's opinion on health and safety.

No verified reports exist of injury to human beings who have been exposed to electromagnetic fields within the limits of frequency and (specific absorption rate) specified by previous ANSI standards, including ANSI-C95 1-1982.

Measurements have shown that routine exposure of users and other persons to low-power portable, mobile-power portable, mobile transceivers, and cellular telephones do not induce rates of radio frequency absorption that exceed any of the maximum permissible rates of energy absorption defined by these guidelines (ANSI/IEEE). Therefore, based on present knowledge, the exposures from low-power transceivers are considered to be without risk for the user and the public."

The August 2000, Volume 37, Number 8 edition of *IEEE SPECTRUM* online states (See Attachment P) the following: http://www.goaegis.com/articles/ieee_spectrum_0800.html

The body of research is controversial in several respects. It includes many reports of effects of RF fields on cells and animals, sometimes at low exposure levels, which are understood and often not reproducible. It also includes a scattering of reports of human effects from low-level exposure to RF-fields. Standards-setting committees while acknowledging this research, has concluded that it provides insufficient basis for exposure guidelines.

In a letter to the FCC (available on request), Margo T. Oge, Director, Office of Radiation and Indoor Air with the U.S. Environmental Protection Agency (EPA) made the following responses concerning ANSI/IEEE standards, including ANSI-C95 1-1982.

*Therefore the generalization that the 1992ANSI/IEEE guidelines protect human beings from harm by any mechanism is not justified. **The 1992 ANSI/IEEE standard is based on literature published before 1986, except for a few papers on shock and burn. While studies continue to be published describing biological responses to non-thermal ELF modulated RF radiation, the effects information is not yet sufficient to be used as a basis for exposure criteria to protect the public against adverse human health effects.***" (Emphasis added.)

On June 17, 1999, the federal Radiofrequency Interagency Work Group (RFIAWG) issued a RF Guidelines Statement. RFIAWG members come from the U.S. agencies responsible for RF/MW safety policy including: the Food and Drug Administration (FDA) Radiation Biology Branch, National Institute for Occupational Safety and Health (NIOSH), EPA, Occupational Safety and Health Administration (OSHA)Health Response Team, and the National Telecommunications and Information Administration (NTIA)/Department of Commerce. In particular, the RFIAWG emphasized that current RF/MW exposure guidelines:

- Do not take into account chronic, as opposed to acute exposures
- Do not take into account modulated or pulsed radiation (digital or pulsed RF/MW radiation that is employed in WLAN systems)

- Rely on time-averaged measurements that may erase the unique characteristics of an intensity-modulated RF radiation that may be responsible for reported biologic effects
- lacked a comprehensive review of current, long-term, low-level exposure studies, neurological-behavioral effects and micronucleus assay studies (showing genetic damage from low-level RF/MW radiation).

This writer also spoke with W. Gregory Lotz, Ph.D., Chief, Physical Agents Effects Branch Division of Biomedical and Behavioral Science (MS C-27) for NIOSH and NIOSH's representative to RFIACWG. When questioned about the health and safety concerns of the WLAN computer in the classroom environment, Dr. Lotz stated his personal opinion: **"While we still don't have all the answers on this issue, it would be advisable to use the Precautionary Principle."** (Emphasis added.) "The Precautionary Principle is an important guiding principle in handling inevitable scientific uncertainty, especially in situations of potentially irreversible or catastrophic impacts" (UNESCO, 1999). Consistent with the Precautionary Principle, Dr. Lotz also indicated that a hard-wired portable classroom connected to a rooftop antenna would be a safer option than wireless-laptops, work stations, and base stations in a classroom environment.

The author also spoke with Senior Scientist Norbert Hankin, of the EPA Office of Radiation and Indoor Air and Chairman of RFIACWG. The writer discussed possible wireless portable classroom scenarios with Mr. Hankin. When questioned about the health and safety concerns of the wireless computer in the classroom scenario, Mr. Hankin said: **"In my personal opinion, I wouldn't do it."** (Emphasis added.) He further stated that there are animal studies showing health issues with short-term exposures to non-ionizing RF/MW radiation. Mr. Hankin expressed concern about children who would be close to transmitting antenna(s) (wireless-laptops, work stations, and base stations) and exposed to prolonged low intensity transmissions. He likened it to being in a room of cellphones running all day long. Mr. Hankin suggested that the hard-wired portable classroom scenario, connected to a rooftop antenna, was a safer way to go.

In May 2000, the American Cancer Society bulletin stated: "No solid evidence yet exists regarding cell phones and cancer". Cell phone technology is new, "data from large studies are not yet available on long term use." The bulletin also states, "that a scientific panel that was commissioned by the government of Britain to evaluate research to date on health risks of cell phones, warns that children may be at greater risk of injury from cell phone radiation because their central nervous system, including the brain is still developing. The group, The Independent Expert Group on Mobile Phones (IEGMP) contends that: **"While most studies have found few, if any, health risks from cell phones, research has not proven conclusively that cell phones are safe, particularly for children."** (Emphasis added.)

According to the conclusion of Britain's IEGMP Summary & Recommendations- Report -Mobile Phones and Health:

We conclude therefore that it is not possible at present to say that exposure to RF radiation, even at levels below national guidelines, is totally without potential adverse health effects, and that the gaps in knowledge are sufficient to justify a precautionary approach. (Emphasis added.) Available at: <http://www.iegmp.org.uk/>

In February 2000, Russell D. Owen, Chief of the Radiation Biology Branch of the Center for Devices and Radiological Health, FDA, commented that there is: “currently insufficient scientific basis for concluding whether wireless communication technologies pose any health risk. . . Little is known about the possible health effects of repeated or long-term exposures to low level RF of the sort emitted by such (wireless communication) devices. . . Some animal studies suggest the possibility for such low-level exposures to increase the risk of cancer...” Although Dr. Owen’s comments appear to be directed primarily to users of cell phones, the same questions are pertinent for long-term RF/MW exposure from antenna sites (*Epidemiology*: Vol. 1, No. 2, March 2000, Commentary).

A recent federal district court decision in Louisiana opined that FCC and FDA have no programs in place to assure safety. This means that the public cannot depend on either the FDA or the FCC to protect people. Additionally, Dr. David Feible, Chief of FDA Center for Devices and Radiological Effects, stated in his letter dated January 16, 2001, accompanying the fiscal 2000 annual report: **"We don't have the money to protect consumers from wireless technology."** *RCR News*, February 19, 2001, “FDA ill-equipped for health issue,” by Jeffrey Silva.

The National Toxicology Program (NTP), is a part of the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH). NTP has requested comments on whether to add RF/MW radiation to its list of substances to be tested as carcinogens. The FDA made a recommendation to the NTP urging that RF/MW be tested for carcinogenicity (www.fda.gov.us). It is based in part on FDA’s written testimony stating:

Animal Animal experiments are crucial because meaningful data will not be available from epidemiological studies for many years due to the long latency period between exposure to a carcinogen and the diagnosis of a tumor. . . There is currently insufficient scientific basis for concluding either that wireless communication technologies are safe or that they pose a risk to millions of users. . . FCC radiofrequency radiation 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.

Further, the FDA notes that for mobile phone users:

The 84 million mobile phone subscribers and the 25,000 that sign up daily translates into a potentially significant health problem should the use of these devices even slightly increase the risk of adverse health effects.”

Areas of Concern

Wireless technology is relatively new and many diseases, especially cancer, have latency periods of 6 to 10 years or more before tumors and other symptom surface. Research has demonstrated that biological effects from RF/MW radiation exposure are dependent upon several compounding factors.

1) The first exposure factor is the length of time a person is exposed to RF/MW transmitters. In the WLAN classroom environment, the exposure to children from RF/MW radiation starts the moment the students enter the classroom. The exposure to RF/MW radiation does not end until students leave the classroom or move outside the perimeter of the wireless network of RF/MW radiation antennas and transmitters that most likely extends beyond the boundaries of the classroom.

A child entering the school system in Kindergarten could face the potential for 13 years of RF/MW radiation exposure emanating from WLAN transmitters while attending K-12 schools. Teachers and other school district personnel, many of child bearing age, might have an even longer exposure period resulting from a professional career in a wireless school district environment. Wireless school campuses that are in close proximity to nearby residential areas risk exposing the children and their families to RF/MW radiation in their homes depending on how those wireless networks/antennas and power output are implemented.

2) The second exposure factor of concern is the distance between the transmitters and the person. Exposure and absorption of non-ionizing RF/MW radiation are greatest next to a transmitting antenna. In the wireless classroom WLAN environment, transmitters and antennas can be located on the computer, printer, ceiling, walls, on the outside of the portable classroom, and on the outside of the main campus building. The exposure distances a child might encounter from a transmitting antenna(s) could vary depending on how the classroom environment is designed. A child can be as close as 1.5 feet when operating a wireless computer or when playing near an outdoor omni-directional transmitting antenna.

Outside antennas can also expose children in a classroom to RF/MW radiation even though the antenna is mounted outside. RF/MW radiation radiates through the walls of most structures depending on construction materials. A good example of this fact is the cell phone. In many instances, cell phones can be used within a building because the wireless RF/MW signal radiates through the walls of the building. The U.S. government recommends affixing exposure warning labels to each transmitter and antenna of RF/MW transmitting devices, warning people to keep safe distances from transmitters/antennas. The government also has requested the wireless industry to include information in their owner's operating manuals about overexposure. Children who would be exposed may not be able to read or follow these instructions.

Dr. Neil Cherry, Ph.D. in Physics, senior lecturer at Lincoln University in Canterbury, New Zealand, and an elected member of the Canterbury Regional Council, has written that studies indicate that non-ionizing RF/MW radiation causes everything from cancer in lab rats to neurological changes in humans. Dr. Cherry describes human beings are

very good conductors of RF/MW transmitted signals. This means that most RF/MW signals radiate through us and **are absorbed** with very little going to the main transmission point. He further states that wireless technology should be redesigned not to radiate into us, but rather go directly to the main transmission site. Living organisms are themselves electromagnetic instruments of great sensitivity that can support a variety of electrical vibrations; these can be interfered with by external radiation - both at RF/MW and at very much lower (ELF) frequencies - in a number of ways, from which adverse health effects can follow. <http://www.nzine.co.nz/thesis.html>

3) The third exposure factor is the frequency of the RF/MW radiation. The RF/MW radio signals that are being discussed for classrooms are located in the 2.4 GHz frequency range. The 2.4 GHz frequency is two to three times higher than a cell phone. In some instances, this technology can also operate in the 5 GHz frequency range. Researchers are concerned that these higher radio frequencies compounded with power density, length of exposure, distance from antennas, and absorption rates may produce adverse health effects. The body is comprised of 65% water by weight and has a high absorption rate to RF/MW radiation. Radiation absorption in body tissue is commonly referred to as Specific Absorption Rate (SAR). The rate of absorption of RF/MW radiation into the body increases as the frequency of the radiation climbs. See: http://www.emrnetwork.org/schools/curry_broward.pdf

Research scientists, such as Dr. Martin Blank of Columbia University, are calling for biologically based standards rather than thermally based standards in order to prevent harmful exposure conditions which occur at certain frequencies. According to a study conducted by University of Utah scientist, Om Gandhi published in 1996, greater distribution and penetration of RF/MW radiation was found in the heads of 5- and 10-year-old children using a cell phone than in those of adults using a cell phone. Significantly larger amounts of the radiation were absorbed by children when compared to the absorption rates of adults.

At the University of Washington, researchers Lai and Singh (1996) showed single and double DNA breaks and long- and short-term memory loss in laboratory animals exposed to RF/MW radiation. Lai said, "Because mobile phone RF penetrates deeper into a child's brain, more brain tissue would be exposed." He added that not all brain cells have been developed in children, with some cells in the cerebellum (in the back of the brain) taking 10 years to develop. Cumulative damages in DNA may in turn affect cell functions. DNA damage that accumulates in cells over a period of time may be the cause of slow onset diseases, such as cancer (Lai letter available on request). The Motorola funded group headed by Joseph Roti Roti was unsuccessful at duplicating Lai's findings when using a different, less sensitive method to measure DNA breaks. However, during his study Roti Roti unexpectedly found an effect from the RF/MW radiation (an oncogene, genes related to cancer development).

Research has shown that exposure to RF/MW emissions from a transmission tower demonstrate **significant differences in visual reaction time and reduced memory function in students in a close-by school** (Chiang, 1989). Studies by Dr. Lai at the

University of Washington (1996, 2000) showed long- and short-term memory loss in rats from exposure to 2.45 GHz RF/MW radiation, the frequency used in WLAN systems.

In 1997, a study conducted by Professor Leif Salford, a Swedish neurologist, stated: "We saw the opening of the blood-brain barrier (BBB) even after a short exposure to radiation at the same level as mobile phones. We are not sure yet whether this is a harmful effect, but it seems that molecules such as proteins and toxins can pass out of the blood while the phone is switched on and cross into the brain. Within two minutes of exposure, the rat's brain tissue was found to be opened up to proteins and toxins contained in the blood after the defense mechanism (BBB) was disabled." **Salford found that the blood brain barrier opened at exposure levels 4,000 times lower than the current FCC guidelines.**

4) The fourth exposure factor is the power output levels from the wireless RF/MW radiation devices. The conventional method of measuring exposure is called power density. Power density is defined by the FCC as "power per unit area." Power density is expressed in terms of milliwatts per square centimeter or microwatts per square centimeter.

When industry vendors, engineers, and marketing officials were questioned during their presentations to this writer, they were unfamiliar with key health and safety aspects of their products. Industry representatives were unaware or confused regarding the standards and guidelines. None of the vendors knew the power density of their products nor were they familiar with the term. One vendor admitted wireless technology was new to him, while another commented that they were aware of health effects but claimed none.

Health and Safety Issues

The wireless industry conducted extensive research on cell phone health and safety risks for six years, under contract with the Wireless Technology Research Group (WTR) in Washington, D.C. Dr. George Carlo, Ph.D., M.S., J.D., former Director of the WTR, a now defunct organization, recently gave an advanced look on his research results in a series of multimedia interviews. A formal report has yet to be released. To the surprise of the wireless industry which funded the \$27 million research program, the results indicated health issues from exposure to wireless technologies. The lack of responsiveness by industry to the WTR report caused Dr. Carlo to write to the Chairman and CEO of AT&T, Mr. C. Michael Armstrong.

The following sentences were extracted from Dr. Carlo's letter dated October 7, 1999:

The rate of death from brain cancer among hand held phone users was higher than the rate of brain cancer deaths among those who used non-hand held phones that were away from their head. Today, I sit here extremely frustrated and concerned that appropriate steps have not been taken by the wireless industry to

protect consumers during this time of uncertainty about safety. The question of wireless phone safety is unclear. Therefore, from a public health perspective, it is critical for consumers to have the information they need to make an informed judgment about how much of this unknown risk they wish to assume in their use of wireless phones.

In October, 1998, seventeen scientists of international standing signed the Vienna EMF Resolution, stating that the biological effects from low-intensity exposures to RF/MW radiation are scientifically established, a statement which undermines the validity of current FCC safety guidelines. <http://www.irf.univie.ac.at/emf/>

In June, 2000, in Salzburg, Austria, an international conference was convened to discuss RF/MW radiation studies relevant to wireless voice and data communications. Researchers and public policy makers who participated at that conference signed a resolution which included this statement on the biological effects of exposures to RF/MW radiation from mobile phone base stations:

http://www.land-sbg.gv.at/celltower/english/start_e.html

4. *Presently the assessment of biological effects of exposures from base stations in the low-dose range is difficult but indispensable for protection of public health. There is at present evidence of no threshold for adverse health effects.*

Recommendations of specific exposure limits are prone to considerable uncertainties and should be considered preliminary.

The Los Angeles Unified School Board as of June 2000, passed a resolution opposing the future placement of cellular telecommunication towers on or adjacent to school property because of the potential health effect. California PUC (Public Utility Commission) issued an advisory on siting towers near schools and residences in 1995 which is not being enforced. <http://www.lausd.k12.ca.us/lausd/board/secretary/html/agendas/mt/mt06-27-00.html> Scroll down to Agenda Item IX. Motions and Resolutions for Action

Libby Kelley, former public health policy analyst at the U.S. Department of Health and Human Services, who now directs the Council on Wireless Technology Impacts, calls for greater caution regarding the introduction of wireless signals and devices near our children. She states: “Until we know beyond the shadow of a doubt that this technology can be safely used by children, we are behaving like irresponsible adults by treating our children as guinea pigs in this uncontrolled experiment.”

Liability and Lloyd's of London

In an article entitled, “UK Insurers Balk at Risks of Phones,” Sarah Ryle, a consumer affairs correspondent for *The Observer*, London, describes concerns about the safety of mobile phones which has prompted a leading Lloyd's of London underwriter to refuse to insure phone manufacturers against the risk of damage to users' health. The move comes amid mounting concern about the industry's influence on research into the long-term

effects of using a mobile phone. The London market provides insurance for everything from aircraft to football players' legs. But fears that mobile phones will be linked to illnesses, such as cancer and Alzheimer's disease, have prompted John Fenn of underwriting group Stirling, to refuse to cover manufacturers against the risk of being sued if mobiles turn out to cause long-term damage. New research published last year by Bristol University scientist Dr. Alan Preece showed a 'highly significant' effect from mobile phone signals on brain function. http://www.goaegis.com/articles/observer_041199.html

Another opinion comes from journalist Charles Moore of the on-line *Mac Opinion*. Mr. Moore writes software reviews and features for *MacToday* magazine and does his best to endorse the Macintosh platform wherever and whenever he can in his writing. In his December, 1999, column entitled: "How Safe is Wireless Computer Networking?" he states the following: (Emphasis added.)
<http://www.macopinion.com/columns/roadwarrior/99/12/09/index.html>

*However, I am suggesting that the issue of wireless networking ought to be addressed with a lot more prudent caution than seems to be the case. **The thought of classrooms full of schoolchildren using Airport equipped iMacs or iBooks day in and day out, being exposed to radio frequency emissions at close range, makes me distinctly uneasy given the level of ignorance on this issue . . .***

And this is the point that pertains most strongly to wireless microwave frequency computer networking. Until there is a lot more research available on this issue from disinterested third parties, my own personal policy of "prudent avoidance" will include prudently avoiding wireless LANs, the same as I refuse to use cellular and cordless phones. Happily, in my case that will not be difficult. For many others who will be exposed in work or educational settings, prudent avoidance will be virtually impossible.

As I said at the beginning of this article, I expect that a lot of people who read it will be annoyed that I brought the topic up. There is understandable enthusiasm for the convenience of wireless technology (for a quite comprehensive resource on the topic, check out this Website -- <http://hydra.carleton.ca/info/wlan.html>), and getting rid of all those pesky wires.

It could be that I am being hyper-cautious about this, and if it can be proven beyond reasonable doubt that exposure to low-level radio emissions is safe, I'm willing to listen. However, I want to hear it from sources other than those financed by industry or politically-sensitive government regulatory agencies.

The roll out of WLAN technology appears to be in the early stages of development, hence WLANs have not, at this stage, fully matured. Industry standards for both hardware and software have been under debate for years. Industry standards are still evolving. One example is the frequency hopping/direct sequence ruling process now before the FCC (FCC ET Docket No.99-231) . The FCC will be issuing its ruling on ET Docket No.99-231 on or after June 2000. The ruling will decide the issue of frequency expansion requested by some manufacturers and contested by others. The FCC adopts

guidelines for the health and safety aspects of this wireless license-less technology. Please note that guidelines are voluntary.

Presentations made to this writer by industry representatives demonstrated the newness with many aspects of this technology, especially the health and safety aspects. The writer has requested power density and specific absorption rates of each company's wireless product. The requests were made during and after wireless vendor presentations, phone calls to vendors, and e-mails. **So far, all wireless companies have failed to furnish this writer with the requested information.**

School District Liability Questions

1. In light of the current scientific controversy surrounding RF/MW radiation, what kind of financial liability would a school district incur if long-term exposure to wireless communications is found to cause cancer or other disorders? See: "CIOs warned of cell phone risks."
http://www.computerworld.com/cwi/story/0,1199,NAV47_STO47766,00.html
2. If a decision is made to move forward with WLANS, what is the responsibility of the school district relative to disclosing any potential risks to parents, employees, and the public at large?
3. Since the level of risk is yet to be defined, what procedures should be adapted by a school district to integrate this technology into the classroom in the safest possible manner?
4. The issue of exposure of children and others to RF/MW radiation is currently being discussed by those in the legal profession. A plaintiff could request punitive damages on the grounds that the defendants knew or should have known that RF/MW radiation is harmful to human health, and that defendants failed to take affirmative steps to prevent exposure that was at harmful levels. Thus how great could the potential liability for doing nothing be?
5. Are there safer alternatives?
6. On what criteria should the school district base the decision to place wireless technology within its classrooms and schools?
7. If cost savings is the determining factor in this decision, what level of health risk is acceptable and supportable in a broad-scale deployment of wireless technologies in environments populated largely by children who will be subjected to long periods of exposure to RF/MW radiation?

Precautionary Principle; Dr. Richard H. Conrad Reply Comments, Nov. 18, 2013

FCC 13-39

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of:

Reassessment of Federal Communications
Commission Radiofrequency Exposure Limits and
Policies

ET Docket No. 13-84

Proposed Changes in the Commission's Rules
Regarding Human Exposure to Radiofrequency
Electromagnetic Fields

ET Docket No. 03-137

To: Office of the Secretary
Federal Communications Commission (FCC), Washington, DC 20554

As officially presented in the Federal Register/ Vol. 78, No. 107 / Tuesday, June 4, 2013 /
Proposed Rules. Federal Communications Commission, 47 CFR Parts 1, 2, 15, 24, 25,
27, 73, 90, 95, 97, and 101 [ET Docket Nos. 03-137 and 13-84; FCC 13-39],
Reassessment of Exposure to Radiofrequency Electromagnetic Fields Limits and
Policies, Federal Communications Commission

Reply Comment Filed by: Richard H. Conrad, Ph.D. Biochemist
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November 18, 2013

Reply Comment, to comment to FCC filed by Richard Tell in September 2013:

Richard Tell has freely admitted (to the author over the phone) that he knows nothing about biology or medical science, and yet in his September 2013 comments to the FCC on safe levels for human exposure (what is this if not biology), he sets himself up as qualified to judge the research on non-thermal effects, summarily discounting all research showing non-thermal effects. He commented (text in italics below):

227. In a practical sense, the only real hazard of RF exposure is the production of RF burns. This is particularly true when considering RF fields with magnitudes in the range of the present FCC MPE values.

228:RF burns are the only known and demonstrated hazard related to RF exposure that are associated with field strengths equivalent to the present FCC MPEs

In his paragraphs 227 and 228 above, Tell has cherry-picked what is “known and demonstrated”. Paragraphs 227 and 228 are simply not true, as shown by many hundreds of peer-reviewed research papers demonstrating non-thermal effects. The vast majority of the research showing effects was publicly funded, whereas the vast majority of research showing absence of effects was funded by the telecom industry (see the attached document: “Business Bias as Usual”, particularly Fig 1. on page 21).

240: *The suggestion by some of applying extremely stringent, precautionary limits would have the severe consequence of impacting broadcasting and telecommunications as they are currently known and appreciated in the U.S. For example, a recent proposal to apply an RF power density limit of 0.3 nW/cm² is, simply, not practical.*

Tell's comment in his paragraph 240 above about precautionary limits impacting telecommunications reveals that he feels communications are the only priority of concern, and human health and well-being (aside from outright burns) do not even enter into the equation.

243: *There is no need to recommend minimizing exposure below present SAR based limits. The safety factor of 50 associated with the present SAR based lower tier exposure values, for the general public, are already so far below the threshold of established adverse biological effects as to represent a practical zero probability of harmful effect.*

In Tell's paragraph 243 above, his: *threshold of established adverse biological effects* is **the current FCC position**, which is based on not cooking (bulk heating) flesh. This is completely out of line with reality, and **is analogous to a hypothetical FDA approving all drugs that aren't acid enough to burn, regardless of side effects (and automatically discounting all side effects, because after all, the acidity is not high enough to cause burning)**. In the light of the many demonstrated non-thermal effects of EMF, Tell's statement: *a practical zero probability of harmful effect* is totally erroneous, rash and irresponsible.

Richard Tell is a highly competent (in electronics) engineer who mindlessly defends the FCC's current standards without giving any credence to the huge amount of biological evidence of possible and actual harm. He does not want it to exist, and it does not make sense to him - he can't imagine a mechanism. Well, in addition to his not knowing enough molecular biology to do this, it is a myth that in good science one must be able to imagine a mechanism before accepting a demonstrated phenomenon. Often mechanism only comes later, after much research. We don't yet know how smoking causes lung cancer.

If the FCC and telecom industry would cease denial and face the truth, they could sponsor extensive honest research into non-thermal effects on humans and come up with biologically safer ways to accomplish their goals. For example, by finding the least harmful frequencies and modulation schemes. That would be a lot more sensible and

humane than hands on ears, eyes squeezed shut and screaming in denial like the response of a child being told something he doesn't like.

Precautionary Principle; Smart Meters-Firefighters; Letter from Susan Foster
to San Diego Gas & Electric, California Public Utilities Commission;
Nov. 8, 2011

Susan Foster , MSW

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November 8, 2011

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Gentlemen:

I am writing with a matter of great concern regarding my neighbor, Patricia Manion, and I want answers as do her family members as to why SDG&E picked Mrs. Manion's home, a 91-year old neighbor of mine, for what appears to be an undocumented and unauthorized experiment by SDG&E.

I am writing on Mrs. Manion's behalf because 1) I have dealt with SDG&E on the issue of avoiding a smart meter on my home due to my own cardiac problem, and 2) I am a medical social worker/medical writer and therefore have medical knowledge and can describe to you that you made what could have been a deadly mistake by picking out Patricia Manion's home for this highly questionable installation of an unidentified meter in Whispering Palms, Rancho Santa Fe, California 92091.

I am also writing this letter and copying it to people who I know will find the following fact of

urgent and utmost importance. It has to do with comparing the readings from Mrs. Manion's meter with a cell tower outside a firestation for over 5 years -- and the insight we gained from a medical study of 6 firefighters in California who had lived with a large cell tower 9 feet from their front door for over 5 years. All of the men exposed complained of neurological symptoms following the installation of the tower that beamed over their living quarters 24/7, and all firefighters tested with SPECT brain scans and TOVA testing were found to have brain abnormalities, delayed reactions time, lack of impulse control and cognitive changes. I am very familiar with this study because I organized it, and it was conducted by Gunnar Heuser, MD, PhD.

The reason this is so important is because the cell tower outside the firestation was only a fraction of what we measured from the "unknown Itron telemetering Remote " that was attached to an existing gas meter outside Mrs. Manion's home. It would appear the level of radiation from the "unknown meter" or the combination of meters in very close proximity in the neighborhood outside Mrs. Manion's home is **10x more powerful** than that of the cell tower at the firestation.

Why is that significant? Those previously healthy firefighters -- the strongest of the strong among us -- had a lower exposure than Mrs. Manion, and still displayed measurable brain and other neurological damage upon objective testing. This is alarming information.

Here are the facts surrounding the application of an "unknown **additional** meter" for Mrs. Manion's home, her ensuing decline, and our resulting actions which I considered urgent from a medical and humanitarian point-of-view: On June 16, 2011 an unsolicited man showed up at Mrs. Manion's residence. He was in a brown van with "VSI" on the side. He spoke to a gentleman who was working at the Manion home and said he was there to install "a free upgrade for Mrs. Manion that would connect her meter directly to a satellite."

Following installation of this experimental meter, which our investigation shows was the only such "free upgrade" in a neighborhood with 400 homes, Mrs. Manion was clearly not feeling well, and her symptoms of lethargy, complaints regarding her vision, and a subtle but general lack of clarity in her speech and focus, and constant ringing in her ears did not let up. Unfortunately, her bedroom is the room closest to the smart meters. During what we believe was the first week after the installation of the mysterious meter, Mrs. Manion fell for no apparent reason. She did not trip on anything, but went down hard in the bathroom and necessitated cleaning and dressing of several cuts and abrasions. She also sustained severe bruising. The change in Mrs. Manion was perceptible and unexplained.

We obtained equipment for taking measurements of the smart meters at the side of the house. I have read and heard from SDG&E employees that your smart meters take readings hourly, or several times a day. What we discovered at the side of Mrs. Manion's house was shocking. There appeared to be burst of radiation emitted constantly. The analyzer did not have time to recover between rapid-fire bursts of radiation. Readings were far in excess of what is allowable for the total ambient surroundings of 1000 $\mu\text{W}/\text{cm}^2$. Studies show biological changes at 1/10th of 1 μW or microwatt. What were you people thinking at SDG&E to put this on a 91-year old woman's home?

We immediately made a decision this meter had to come down, and having been deceived by the unsolicited man in the "VSI" vehicle, and having been given this extraordinarily odd information about the unidentified meter "communicating with a satellite" when SDG&E never informed any of your customers satellites were part of this mesh grid, we strongly suspect Mrs. Manion's home was being used, and maybe even Mrs. Manion was being used, to test this yet unidentified meter added onto the existing meter and connected with a thick electrical cord.

If this is your meter that we have taken off the Manion home, please, by all means, claim it. We would like to know who is responsible for this 91-year old woman feeling as if, over a period of four or five weeks, that she was: 1) going blind, 2) suffering sudden onset and unrelenting lethargy and those who observed would say "confusion", 3) edema of her legs indicative of the heart slowing, 4) unexplained high blood pressure 5) unexplained collapse/fall in the home causing cuts, abrasions, severe bruising, 6) constant ringing in her ears.

Within 24 - 48 hours of this meter being removed, Mrs. Manion returned to the reasonably good health she was in for a 91-year old woman prior to June 16, 2011. This letter is being copied to Prosecutor Greenwood because we suspect Mrs. Manion's home was selected for what appears to be a horrible experiment *because* she is elderly; and by herself, indeed Mrs. Manion would never have identified the source of her sudden onset symptoms. She still has a hard time grasping how something could be toxic if it is odorless, invisible, and is provided by SDG&E, her reliable utility provider.

SDG&E is hiding behind the FCC threshold of 1000 microwatts per centimeter squared ($\mu\text{W}/\text{cm}^2$), but that does not mean a smart meter or any wireless product is safe under 1,000 microwatts per centimeter squared, or $\mu\text{W}/\text{cm}^2$. Even at these high levels permitted by the FCC, our measurements indicate **the smart meters are not in compliance with the FCC limit.**

The utility companies are frequently known to answer questions about smart meters "safety" by assuring their consumers that the smart meter limits are "well below the FCC standard." Considering the US limit is the second highest in the world (Britain is higher), it is irrelevant if the arbitrary limit set primarily by engineers and a far-too-cozy relationship between the FCC and the telecommunications industry. The FCC standard was originally intended to prevent interference between pieces of electronic equipment. It was later modified to protect workers exposed to microwaves from heating effects (the only effects recognized at the time; we now know there can be profound biological changes at non-thermal levels). The US standard of $1000 \mu\text{W}/\text{cm}^2$ was not created to protect the general public, including those most vulnerable (the unborn, children, the elderly, those with compromised immune systems). Therefore, none of us should feel reassured that the smart meter output of microwave radiation pulsing through our homes is below the FCC standard. Smart meters emit the worst kind of radiation for the body to handle -- pulsed digital RF (microwave) radiation. The cells do not have time to recover between these rapid spikes of radiation.

The FCC standard is unrealistically and I would argue recklessly high. Many countries do not permit levels anywhere near the FCC standard, (*See chart below*).

Country	Exposure level ($\mu\text{W}/\text{cm}^2$)
---------	---

United Kingdom	1000–10,000
Canada, Germany, Japan, New Zealand, U.S.	200–1000
Australia	200
Auckland, New Zealand	50
Italy	10
China	7–10
Bulgaria, Hungary, Russia, Switzerland	2–10
Salzburg, Austria (pulsed transmissions)	0.1
New South Wales, Australia	0.001

Source: [Radio Wave Packet](#), Cellular Phone Taskforce

What the FCC standard protects you from is high thermal levels of radiation. It does not offer protection for the brain which is the first major organ adversely affected. Symptoms of cognitive impairments, balance, vision, tinnitus (ringing in the ears), lethargy, depression, and vertigo or loss of balance are all brain functions.

Because FCC standards are set for workers in the industry, and that was later "adapted" for the general public, the measurements were for heat only, and often for 6 minute exposures, not 24/7 exposure to pulsed, digital microwave radiation. The telecom industry ignores this fact—billions of dollars are at stake and no industry will voluntarily admit that its product could cause adverse health effects. But we are indeed finding adverse health effects. With great concern for Mrs. Manion and the high readings we were getting with an analyzer, I called the Office of Engineering & Technology at the FCC.

What I learned was shocking. With so many health complaints, misrepresentations of the truth, and false reassurances by utility companies, do you know how many times the FCC has gone out in the field to measure the RF from smart meters attached to most people's homes? Zero. Not once have they checked a single smart meter attached to the side of someone's home. Something is horribly wrong with the sort of experimentation and deception perpetrated by the installer of the "free upgrade" on Mrs. Manion's home that "beamed up to a satellite."

- If this meter belongs to SDG&E and was installed by a representative of SDG&E, we would like to know if this unidentified smart meter truly does communicate with a satellite?
- How does that work? What are the risks?
- Why don't you inform your customers of the possible cancer causing effect of the RF (microwave) radiation as per the World Health Organization's recent classification of RF radiation as a Group 2B "possible human carcinogen? DDT, chlordane, and diesel exhaust are in the same category.
- What testing do you have, by an independent source that is not associated with the industry that is reaping billions in profits by installing smart meters, that proves smart meters are safe? I believe you will find none.

- Shouldn't SDG&E be held criminally responsible for harm caused to anyone who becomes ill following installation of a smart meter?
- Could the experimentation on a 91-year old woman's home be considered elderabuse? After all, if Mrs. Manion had died from cardiac arrhythmia, high blood-pressure, or a fall when her balance was disturbed following installation of the meter, SDG&E could have shrugged and chalked it up to old age.
- How was Mrs. Manion's home chosen for this experiment? Who made the selection? The man who installed the meter did this to Mrs. Manion's house and no others in the neighborhood. Did SDG&E make Mrs. Manion's home the "hub" or central collections home for the entire neighborhood?

We want answer to these questions, but our concerns go way beyond what has happened to Patricia Manion. The FCC is not a health agency, the EPA had admitted that RF radiation has never been proven to be safe, and many people are suffering disabling symptoms following smart meter installations. SDG&E has been defending these meters as "safe" when not a single smart meter has been tested by the FCC in the "real world."

I therefore urge and implore an immediate moratorium on the installation of smart meters in California until the infinitely safer option of either no smart meters or smart meters using fiber optics can be deployed.

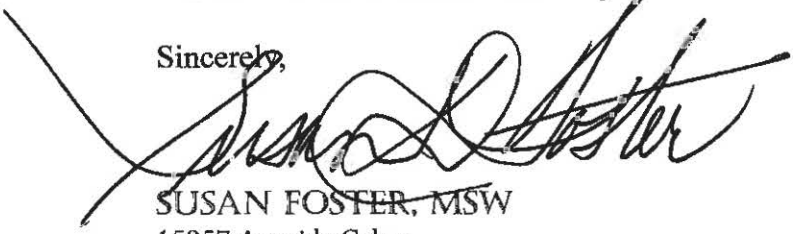
The Manion family is asking for and deserves an explanation. I am profoundly sorry this has occurred, but I am extremely glad Mrs. Manion is recovering following our removal of this meter. This case highlights two things to us. First, your meters are still in experimental stages, and second, you are experimenting on human beings -- in this case, an elderly woman living alone.

Attached please find a copy of Dr. Olle Johansson's letter to the CPUC dated July 9, 2011. Dr. Johansson is one of the world's foremost authorities on the health impacts of RF (microwave) radiation. He has profound concerns about the looming health consequences from deployment of wireless smart meters.

I again urge and implore an immediate moratorium on the installation of smart meters in California until the infinitely safer option of either no smart meters or smart meters using fiber optics can be deployed.

It is not too late to create a better system.

Sincerely,



SUSAN FOSTER, MSW
15957 Avenida Calma
Rancho Santa Fe CA 92091

cc:

Dr. Olle Johansson, Karolinska Institute, Stockholm, Sweden

Gunnar Heuser, MD, PhD

Cindy Sage, Sage Associates



Karolinska Institutet
Department of Neuroscience
Experimental Dermatology Unit

**FILED**

08-01-11
04:59 PM

Stockholm, July 9, 2011

California Public Utilities Commission

Cc Susan Brinchman, Director, Center for Electromog Prevention, P.O. Box 655, La Mesa,
CA 91944-0655, USA

To: The California Public Utilities Commission,

I understand that you at present are concerned about the fast deployment of smart meters on homes in California, without adequate sharing of information with the public.

I work as an associate professor at the Karolinska Institute; we are world-famous for our Nobel Prize in Physiology or Medicine, which we many times have awarded to your fellow countrymen and –women. I also uphold a professorship at the Royal Institute of Technology; it being closely tied to the Nobel Prizes in Physics and Chemistry. For many years I have been studying health effects of wireless gadgets, such as Smart Meters.

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 may result in highly unwanted health effects. This has been demonstrated in a very large number of studies and includes cellular DNA-damage (which may lead to an initiation of cancer as well as mutations that carry down generations), disruptions and alterations of cellular functions like increases in intracellular stimulatory pathways and calcium handling, disruption of tissue structures like the blood-brain barrier (which may allow toxins to enter the brain), impact on vessel and immune functions, and loss of fertility. It should be noted that we are not the only species at jeopardy, practically all animals and plants may be at stake.

Because the effects are reproducibly observed and links to pathology can not be excluded, the precautionary principle should be in force in the implementation of this new technology within the society. Therefore, policy makers immediately should strictly control exposure by defining biologically-based maximal exposure guidelines also taking into account long-term, non-thermal effects, and including especially vulnerable groups, such as the elderly, the ill, the genetically and/or immunologically challenged, children and fetuses, and persons with the functional impairment electrohypersensitivity (which in Sweden is a fully recognized functional impairment, and therefore receives an annual governmental disability subsidy).

Prompted by all this, a group of international experts recently published a very important paper, The Seletun Scientific Statement (2011). Among its points are:

- 1) Low-intensity (non-thermal) bioeffects and adverse health effects are demonstrated at levels significantly below existing exposure standards.
- 2) ICNIRP/WHO and IEEE/FCC public safety limits are inadequate and obsolete with respect to prolonged, low-intensity exposures.
- 3) New, biologically-based public exposure standards are urgently needed to protect public health world-wide.

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Department of Neuroscience
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4) EMR exposures should be reduced now rather than waiting for proof of harm before acting. It is not in the public interest to wait.

5) There is a need for mandatory pre-market assessments of emissions and risks before deployment of new wireless technologies. There should be convincing evidence that products do not cause health harm before marketing.

6) The use of telephone lines (land-lines) or fiber optic cables for SmartGrid type energy conservation infrastructure is recommended. Utilities should choose options that do not create new, community-wide exposures from wireless components of SmartGrid-type projects. Future health risks from prolonged or repetitive wireless exposures of SmartGrid-type systems may be avoided by using fiber-optic cable. Energy conservation is endorsed but not at the risk of exposing millions of families in their homes to a new, involuntary source of wireless radiofrequency radiation, the effect of which on their health not yet known.

Many smart meters are close to beds, kitchens, playrooms, and similar locations. These wireless systems are never off, and the exposure is not voluntary. The smart meters are being forced on citizens everywhere. Based on this, the inauguration of smart meters with grudging and involuntary exposure of millions to billions of human beings to pulsed microwave radiation should immediately be prohibited until 'the red flag' can be hauled down once and for all.

The recent determination of the World Health Organization (WHO) to include radiofrequent radiation on the 2B list of carcinogens also applies to devices such as smart meters. Already September 4, 2008, the European Parliament voted 522 to 16 to recommend tighter safety standards for cell phones (Europ. Parl. resolution on the mid-term review of the European Environment and Health Action Plan 2004-2010). In light of the growing body of scientific evidence implicating cell phone use with brain tumors, the Parliament said, "The limits on exposure to electromagnetic fields [EMFs] which have been set for the general public are obsolete." The European Parliament "was greatly concerned at the Bioinitiative international report concerning EMFs, which summarises over 1500 studies on that topic and which points in its conclusions to the health risks posed by emissions from mobile-telephony devices such as mobile telephones, UMTS, WiFi, WiMax and Bluetooth, and also DECT landline telephones, and now it is again – and more firmly and seriously - repeated in the form of WHO's recent cancer classification.

With my very best regards,
Yours sincerely,

Olle Johansson, Assoc. Prof.,
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&
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Precautionary Principle; Letter to the Montgomery County
Board of Education Members, Theodora Scarato, Feb. 8, 2016

Montgomery County Board of Education
Montgomery County Schools
Carver Educational Services Center
850 Hungerford Drive
Rockville, MD 20850

February 8, 2016

Dear Montgomery County Board of Education Members,

I would like to bring to your attention the following- The [MCPS Statement Concerning Deployment of Wireless Computing Technologies](#) and [Radiofrequency Monitoring Summary Report](#) contains:

1. False Statements: This document details the over 32 false statement on the MCPS RF webpage and provides documentation to each erroneous statements. I personally made inquiries as to the factual nature of MCPS statements from agencies such as the FCC, FDA, NCI and the American Cancer Society. *These agencies all confirmed certain statements to be 100% inaccurate.*

2. Outdated Statements: Why is MCPS using decade old scientific reviews as “proof”? Each outdated document is cited. The MCPS community deserves best available science, not outdated reviews.

3. Wireless Funded Statements: MCPS copiously cites sources that are either directly *fully funded* by the wireless industry itself and/or by persons whose jobs involve consulting for the wireless industry or making money by designing products for the wireless industry. The funding source of such statements should at least be noted *if not removed*.

4. Misleading Statements: Statements are made that validate the opinion of MCPS but are not a true representation of the body of science nor the organization MCPS references. MCPS seems to be cherry-picking in that MCPS puts forth “quotes” which are missing *the rest of the statement the cited organization made*. Such selective information presentation is misleading to families and staff who should be given *all information in a transparent fashion*.

5. No Proof of Safety For Students and Staff: Multiple experts have written to MCPS detailing problems with the 14,000 dollar measurement report citing inadequate instrumentation, imprecise measurements and a lack of adequate documentation on exposure scenarios. There is a sufficient number of concerns that it seems this Measurement Report *cannot* be used to verify whether the radiation levels are safe for students and staff. The parents, teachers and staff of Montgomery County Schools deserve accurate responsible information on the radiation levels in MCPS schools.

For MCPS to put forth information such as is on their website as proof of safety is an egregious error. Comparing MCPS’s measurements to FCC standards is meaningless as FCC limits are known to be hundreds of thousands times too high to protect public health.

A total of 15 experts have written MCPS about the health risks of wireless school networks and their concerns with the radiofrequency webpage and measurement report. They all recommend the schools use safe technology. Why are these expert letters not posted? Why is their information not integrated into the webpage for the public? Why isn’t MCPS responding to the concerns they are raising?

[Dr. Martha Herbert's Letter](#), [Dr. Anthony Miller's Letter](#), [Dr. Lennart Hardell's Letter](#), [Dr. Carpenters Letter](#), [Dr. Olle Johansson's Letter](#), [Dr. Devra Davis' Letter](#), [Cris Rowan, occupational therapist Letter Here](#), [Dr. Martin Pall's letter](#), [Katie Singer's Letter](#), [Cindy Sage and Trevor Marshal Letter](#), [Ellie Marks Letter](#), [Arthur Firstenberg Letter](#), [Mikko Ahonen PhD, Lena Hedendahl MD and Tarmo Koppel MSc PhDs Letter](#), [Cece Doucette's Letter](#), [Alisdair Philips Letter](#), [Lloyd Morgan's Letter](#)

The MCPS site was already changed twice after we repeatedly wrote MCPS to remove the unfactual statements. Only two statements were removed. The MCPS Statement *still contains an abundance of false and misleading statements- over 30 false statements in fact*. Once all of these false, misleading, and wireless funded statements are removed, MCPS *would have little text left on the webpage*.

MCPS did get one thing right. The webpage states “*It is not ethical to test a substance by exposing people to it and seeing if they get cancer from it.*” Right now MCPS students are the equivalent of guinea pigs and are being exposed to unprecedented levels of radiofrequency radiation without their knowledge or consent. We adults were not exposed to such levels as children.

Appendix V in this letter contains information on the mice and rat studies underway at the National Institute of Health Science (NIEHS) National Toxicology Program (NTP) where rats are being exposed to low level (FCC compliant levels just like MCPS) radio-frequencies at very low levels for hours a day *just like our children in schools*.

Wouldn't it be ethical *to wait* until the NTP research results are available before the school system is de-facto performing what is basically the same study but instead of rats *it is on children and teachers and staff*. The rats, the mice *and MCPS children are being exposed to* what the National Toxicology Program calls “chronic exposure to modulated radiofrequency radiation”.

Our children are not lab rats. Yet, just like the NTP rats, today's schoolchildren will be “the statistics”. I imagine that a decade from now, researchers will count up the numbers of young adults with cancer, neurological disease and infertility and look at the connection with lifetime wireless exposures.

It is unethical to knowingly post false information and not to act to protect children when such a serious matter is brought to your attention. You have a duty of care to every student and your job is to ensure their safety. Wireless is not safe and MCPS has yet to provide any documentation of safety.

Please remove the false and misleading information on the MCPS webpage. I ask that MCPS take **immediate action** to minimize radio-frequency exposures in classrooms. Please hardwire the chromebooks and tablets, install safe technology communication networks and teach students and staff how to minimize exposures to cell phone and wireless radiation to protect their health and future.

Sincerely,
Theodora Scarato LCSW-C

APPENDIX 1: False Statements Itemized with documentation

APPENDIX II: Outdated References

APPENDIX III Wireless Funded Research and Statements

APPENDIX IV: Misleading Statements including Details on Why the RF Measurement Report is Inadequate to Assess Student Safety

APPENDIX V: **The National Toxicology (NTP) Study on Rodents and Radio-Frequency**

APPENDIX 1 FALSE STATEMENTS

FALSE STATEMENT 1

On the Radiofrequency FAQ's MCPS states, "The FCC guidelines are not outdated."

MCPS's statement that the FCC regulations are 'not outdated' contradicts what the United States Government states about the over *twenty years old* regulations:

- **The Department of the Interior states** that *"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."* Read The [2014 Letter](#).
- **In 2012, the Government Accountability Office (GAO)** published a [2012 Report](#) that states, "The Federal Communications Commission's (FCC) RF energy exposure limit *may not reflect the latest research*" and the report officially recommended that the FCC "Formally *reassess* the current RF energy exposure limit, including its effects on human health, the costs and benefits associated with keeping the current limit, and the opinions of relevant health and safety agencies, and change the limit if determined appropriate."
- **The FCC is formally in review of these 20 year old standards** and has stated it is not a health and safety organization and has called for expert comments. The FCC has so far received over 900 comments and they can be accessed at the FCC here: go to the FCC's web site for Proceeding Number 13-84: <http://bit.ly/1aGxQiq>.
- **The 2008 National Academy of Sciences (NAS) Report, [Identification of Research Needs Relating to Adverse Health Effects of Wireless Communication](#)**, was tasked to identify any inadequacies in the research upon which the current US Radiofrequency radiation (RF) safety guidelines are based. The NAS Report found numerous inadequacies in that research record. An inadequate research record results in safety regulations that fail to address all exposures encountered by the public. Based on the 2008 NAS findings it cannot be asserted that US RF safety policy protects all members of the public from all mechanisms of harm in all exposure scenarios.
- **The American Academy of Pediatrics** has repeatedly called on the government to update its regulations stating that "Current FCC standards do not account for the unique vulnerability and use patterns specific to pregnant women and children." [Read it here](#).
- **The California Medical Association** passed a Wireless Resolution that states :
Whereas scientists are increasingly identifying EMF from wireless devices as a new form of environmental pollution with a growing body of peer reviewed scientific evidence finding significant adverse health and biologic effects on living organisms with exposure

to low levels of non-ionizing microwaves currently approved and used in wireless communication, and

Whereas peer reviewed research has demonstrated adverse biological effects of wireless EMF 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; and...Resolved, That CMA support efforts to implement new safety exposure limits for wireless devices to levels that do not cause human or environmental harm based on scientific research. [Read it here](#). [Read a magazine article on their resolution here](#).

- **In May 2015, over 200 scientists from 39 nations** 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 cell phones and other wireless devices. 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.” See the International EMF Scientist Appeal at <https://emfscientist.org>.
- **The LA School District Uses a RF-EMF Exposure Threshold 10,000 Less Than the FCC Limits:** The OEHS supported a precautionary threshold level that is 10,000 times lower than the current Federal Communications Commission standard. Read the RF Report the LA School District Used to recommend a cautionary exposure level. If the FCC limits are “not outdated” then why would they do this? [RADIOFREQUENCY \(RF\) EVALUATION REPORT Use of Wireless Devices in Educational Settings](#)

Dr. De Kun Li sums up the problem with FCC regulations:

“In summary, we do not currently have scientific data to determine where the safe RF exposure level is regarding the non thermal effects. Therefore, it should be recognized that we are dealing with uncertainty now and most likely for the foreseeable future. The question for government agencies especially those concerned with public health and safety, is, given the uncertainty, should we err on the side of safety and take precautionary measures avoidance measures? *Unknown does not mean safe.* ”

[Letter from Dr. De-Kun Li, MD, PhD, MPH to the FCC](#)

It is erroneous for MCPS to assert that FCC levels are “not outdated” when the US government and health authorities state otherwise. What scientific expertise does MCPS have in this area to make such a statement that contradicts the US government?

FALSE STATEMENT 2

MCPS states that, “Using the Group 2B classification of the entire spectrum of radiofrequencies as an indication that Wi-Fi is harmful when the classification came about due to extremely heavy cell phone use and not Wi-Fi does not accurately represent the intention of the classification.”

What MCPS should be saying: The World Health Organization specifically and repeatedly has stated the carcinogenic classification is for radiofrequency radiation *from any source*. Note this documentation:

- Wireless *radiofrequency* radiation is classified as a “Possible Human Carcinogen” by the International Agency for Research on Cancer (IARC) of the World Health Organization(WHO) [Read The Lancet’s published statement by the IARC from 2011 on cancer risk of wireless radiation.](#)
- The Class 2B classification includes wireless radiation from *any transmitting source* such as “cellphones, baby monitors, tablets, cell towers, radar, other wifi, etc”. It applies to RF-EMF in the range of 30 KHz to 300 GHz emitted from any device. These statements are detailed in [The Lancet article](#) and in the related WHO IARC [press release in 2011](#). All wireless electronic devices emit RF-EMF (wireless radiation). It *does not matter* what type of device is the source.
- Dr. Robert Bann, the World Health Organization International Agency for Research on Cancer Secretary has stated (on several occasions) how the WHO experts *specifically intended this classification to apply to the full range of radio frequency radiation which includes wifi as well as cell tower radiation*. Here Dr. Bann spell this out in his [detailed lecture in 2011](#) found here and in his writing [found here](#).

*“It should be noted that the working group in the overall evaluation decided to make a generic evaluation of radio frequency fields and did not want to limit it to mobile telephone use and all other exposures .. that was based on the diversity of the exposures in the animal cancer studies where different types of radiation with different frequencies across the radio frequency part of the emf spectrum were noted and **the radiation from the environmental sources.(i.e Wi-Fi, Cell Towers etc) . and from the mobile telephones is basically and physically speaking the same type of agent .**”*

I decided to write the World Health Organization’s Head of the IARC Monographs Programme Dr. Kurt Straif *myself* last month about this. I asked him if the classification applies to Wi-Fi. I was told the following:

“IARC's evaluation of the cancer hazards from exposure to Radiofrequency Electromagnetic Fields covers all sources of RF-radiation.” and “IARC classified radiofrequency electromagnetic fields (including Wi-Fi signals and mobile phone signals) as possibly carcinogenic to humans (Group 2B) “

[Read the Email exchange here.](#)

FALSE STATEMENT 3 through 6

MCPS states that “The FCC, the American Cancer Society (ACS), the Food and Drug Administration (FDA), and the National Cancer Institute (NCI) all have conducted reviews as recently as 2013 and found that there is no basis to establish a different safety threshold.”

This is false. I wrote the FCC, American Cancer Society, and the National Cancer Institute *and they all came back with the same response*. MCPS statement is false and and inaccurate. None of these institutions have done such a review nor do they have the mandate to speak to the issue of safety thresholds *just the FCC*, and that review was initiated because of the GAO report stating the “thresholds may not reflect latest research”. The review has not been completed and at this time it is unknown if there has been any action on the over 900 submissions by experts calling for more stringent regulations.

Here are the responses I got when I inquired into MCPS’s statement asking if it was accurate that they had done a review that “**found that there is no basis to establish a different safety threshold.**”

American Cancer Society

“I know of no ACS finding or statement regarding safety thresholds of radio frequency fields.”

-Statement by Dr. Otis Brawley| Chief Medical Officer of the American Cancer Society

“First, the American Cancer Society was not the organization who conducted the 2013 scientific review. So, we suggest you go back to the source and clarify what organization the school district consulted to make that statement.”

Read the Email from the [American Cancer Society to Scarato here](#).

The Federal Communications Commission

“...we are not aware of any report attributable to the FCC that would support the statement that you quote.”

“It looks like the statement you quoted might be a slight misinterpretation of an FCC consumer guide on RF radiation, in conjunction with FCC action in 2013 opening an Inquiry into its RF Safety rules.”

Read the [FCC Response to Scarato on December 15, 2015](#)

The National Cancer Institute

The National Cancer Institute (NCI) wrote back that the “review” was in fact- a webpage content review, *not a review of research* and *certainly not* a review of the adequate protection from safety thresholds. Please read these excerpts from our email exchange with NCI.

*“We are unclear as to the source of this language indicating that the NCI “conducted a review (on FCC) limits as recently as 2013 and found that there is no basis to establish a different safety threshold.” **This statement, as written, is incorrect.** As I describe above, and as I have noted in our previous correspondence, NCI staff have conducted literature reviews to update our fact sheets and will continue to do so. **Neither the literature reviews, nor the fact sheets, make safety determinations.**”*

The literature reviews I describe above are not intended to establish or evaluate standards or set or evaluate recommendations.”

Clearly, a website update or literature review of a few studies is not the same thing as a review of research to determine safety threshold adequateness.

[Read the Email Exchange with the National Cancer Institute here.](#)

The Food And Drug Agency

“After extensive research, we were unable to find any public information regarding a review of radiofrequency radiation.”

Division of Drug Information | Center for Drug Evaluation and Research

Food and Drug Administration on Feb 2 2016

“FDA did not conduct a formal meta-analysis nor a formal review of RF studies in 2013.”

Daniel Kassiday SME: Electronic Product Radiation Control

[Read the FDA letters to Scarato Here.](#)

In conclusion, no such review showing these safety thresholds has been done by any of these agencies. These statements are FALSE.

Such a statement by MCPS represents a myth many people have about our federal regulations in regards to wireless exposures. We think that our government health agencies have appropriately dealt with wireless. In fact, the US has not a single health and science agency mandated to focus on the issue. The EPA, FDA and NCI are not tasked to ensure the RF safety thresholds are safe. In fact , the EPA was working on this issue two decades ago, but then Congress gave jurisdiction to the FCC and told the EPA not to do anything more.

Please read the following by the FCC, “**is not a health and safety agency**, we defer to other organizations and agencies with respect to interpreting the biological research necessary to determine what levels are safe. As such, the Commission invites health and safety agencies and the public to comment on the propriety of our general present limits and whether additional precautions may be appropriate in some cases, for example with respect to children. [Read that statement here.](#)

Over 900 submissions with dozens of scientists have submitted to the FCC review. The FCC which is NOT a health agency and has no medical experts on staff, is supposedly tasked to deal with this issue *and defer to these organizations, but has not acted*. In fact, the Open Docket from 2013 that supposedly is a review is just sitting there, now three years old.

“We recognize our responsibility to both protect the public from established adverse effects due to exposure to RF energy and allow industry to provide telecommunications services to the public in the

most efficient and practical manner possible. In the Inquiry we ask whether any precautionary action would be either useful or counterproductive, given that there is a lack of scientific consensus about the possibility of adverse health effects at exposure levels at or below our existing limits. Further, if any action is found to be useful, we inquire whether it could be efficient and practical.” [Read it here.](#)

Note that the FCC *can wait years* to do anything as there is no timetable they must follow. *It could be when the kids in kindergarten have all graduated.* The current FCC Chair Tom Wheeler is in charge of this decision and Wheeler was accused of suppressing the science showing harm from radiofrequency radiation in the 90’s by his top scientist *when he headed the wireless lobby group, the CTIA.*

Read the Harvard Law publication *Captured Agency: How the Federal Communications Commission is Dominated by the Industries it Presumably Regulates* detailing how the Wireless Industry has unchecked influence on our government stating, *"It is these hardball tactics that recall 20th century Big Tobacco tactics."*

[Read Harvard Book here.](#)

FALSE STATEMENT 7

In the Memorandum by MCPS Office of Technology it states that “All levels were below the Bioinitiative 2007 precautionary level . These are the very level the Safe Tech for Schools Maryland group has argued is safe for human exposure.” [Read it here.](#)

This is false. No one in our group has ever stated that the Bioinitiative 2007 level is safe and we challenge MCPS to show where any of the members of our group cited the Bioinitiative 2012 level as safe or where we have even presented that limit as a number for MCPS to follow. *Why would we use that outdated Report as it is superseded by the Bioinitiative 2012.* We certainly have used the Bioinitiative 2012 levels to share information on what that group advises. Such a false statement and should be removed.

FALSE STATEMENT 8 through 17

In the MCPS FAQs section, there is a list of what “public health organizations have to say about radiofrequency” . I have detailed here the information given on 8 countries which is erroneous and misleading to the reader. MCPS neglects to give the actual full statements, position and recommendations of these countries’ expert reports. Additional, MCPS basically cut and pasted from a research review paper but cherry picked on which sentence to pull leading to a ninth false statement.

It is false to state something is a “concluding” statement *when it is not the conclusion of the agency.*

1. France: MCPS states that [the French ANSES Report](#) concludes “No new proven health effects”.

MCPS has neglecting to state that in the conclusion of [The French ANSES Report](#) which specifically recommends precautions, it is stated,

- **ANSES details these health effects:** *“following exposure to RF fields, the following effects have been observed: various effects on neuronal cell death depending on the type of study (in vitro or in vivo): changes (increase or decrease) in the total number of neurones and increase of cells in apoptosis following chronic exposure in vivo (in a limited number of studies); an effect on the astrocyte marker (GFAP) related to inflammation (probably transient effect) following chronic exposure in vivo; an oxidative stress-type effect following prolonged exposure to radiofrequencies on mitochondrial DNA in neurones (on the basis of a single in vitro study). Mitochondrial DNA is particularly sensitive to oxidative stress due to a lack of histone-type protective proteins, a reduced repair ability, and proximity of the respiratory chain in the mitochondrial inner membrane. This could explain the discrepant results here compared to most studies that did not target this type of DNA; changes in electrical activity in the brain (especially the power of alpha rhythm).”*
- **ANSES made recommendations to reduce exposure to children,** to study the effects of cell towers and investigate how to reduce public exposures.¹ Read the [specific recommendations](#).
- **This ANSES Report led to the passing of one of the most strong National EMF reduction Laws in any country whereby Wi-Fi is banned in France for young children,** companies are fined for not showing radiation reductions methods in advertisements and a public health awareness campaign is being developed.²

2. Belgium: MCPS only cites Belgium’s Superior Health Council as concluding that “No proven health risks. Long-term health risks cannot be ruled out.” This is inaccurate.

MCPS leaves out the following:

- “Experts – including those on the [Superior Health Council](#) – advise everyone to limit their exposure to mobile phone radiation.”³ [Read it here.](#)
- Belgium has banned cell phones for children: As of March 2014, mobile phones for young children were banned because of radiation concerns.⁴ Also left out of the MCPS summary were the Council’s statements that “The concern is also that the cumulative exposure of the current generation of children and adolescents in their adult lives will be much higher than that of the current adults. The recent classification of mobile phone radiation as possibly carcinogenic is an additional reason to be cautious.”
- **The municipality of Ghent has specifically banned Wi-Fi for young children due to health concerns.**⁵

¹ [ANSES issues recommendations for limiting exposure to radiofrequencies](#)

² [France: New National Law Bans WIFI](#)

³

<http://health.belgium.be/eportal/Environment/ElectroWavesAndNoise/ElectromagneticRadiation/MobilePhone/TipsForPrudentUse/index.htm?fodnlang=en#.VqwBIjYrJR4>

⁴ [Belgium: New regulation for the sale of mobile phones as of 1 March 2014](#)

http://www.health.belgium.be/eportal/Environment/19096020_EN?ie2Term=phones&ie2section=83#.VipiON-rR2Q

⁵ Ghent bans wi-fi from pre-schools and day

care <http://www.flanderstoday.eu/education/ghent-bans-wi-fi-pre-schools-and-day-care>

- **The government of Belgium recommends precautions:** “to reduce your exposure” which includes specific tips for Wi-Fi installations and I quote, “ In order to limit the exposure, the following simple measures can be taken: Only switch on your wireless network connection when it is needed. This concerns the wifi adapter in your laptop in particular. Otherwise, your laptop tries to continually connect to the network, and that leads to unnecessary exposure and decreases the life expectancy of the batteries. Place the access point away from places where you spend lots of time.”⁶

3. Australia: MCPS says the conclusion by ARPANSA is that *“No substantiated evidence for health risk for people living near base stations. Insufficient evidence for higher risk for children. No need to reconsider exposure limits.”*

- Yet MCPS leaves out critical facts about ARPANSA recommendations to reduce exposure! In the published 2014 article **International and National Expert Group Evaluations: Biological/Health Effects of Radiofrequency Fields in the International Journal for Environmental Research in Public Health** the authors state than in Australia the “Radiation Protection and Nuclear Safety Agency (ARPANSA) : *“considers that the classification by IARC corresponds to the current ARPANSA advice, including its advice on practical ways in which people can reduce their exposure”*. ARPANSA has also recommended *“parents should encourage their children use the methods to reduce exposure”*.⁷
- **ARPANSA recommends that parents encourage children to reduce exposure.** “It is recommended that, due to the lack of sufficient data relating to children and their long term use of mobile phones, parents encourage their children to limit their exposure by reducing call time, by making calls where reception is good, by using hands-free devices or speaker options, or by texting.”⁸
- **ARPANSA details several specific recommendations to reduce exposure with other wireless devices.** Concerning wireless computer networks ARPANSA states that, “if you use them with their antennas very close to the body, you can be exposed to levels closer to the limits of the standard. You can reduce your exposure from these devices by: keeping them at a distance, for example placing the wireless router away from where people spend time reducing the amount of time you use them.”⁹

4. Switzerland: MCPS quotes the Federal Office for the Environment FOEN as simply concluding *“No new confirmed health effects. “Absence of proof of health risks” does not automatically mean proof of their absence.”*

Clearly MCPS quoted from [the review paper](#) but forgot to mention what the research review actually fully states which is *also*, *“In view of the fact that there are gaps in the available data, the absence of proof of health risks does not automatically also mean proof of their absence. From the scientific point of view, a*

⁶ [Belgiums Health, Food And Safety Agency Handout on Wireless Devices](#)

http://www.health.belgium.be/internet2Prd/groups/public/@public/@mixednews/documents/ie2divers/19104272_en.pdf

⁷ [International and National Expert Group Evaluations: Biological/Health Effects of Radiofrequency Fields](#)
<http://www.mdpi.com/1660-4601/11/9/9376>

⁸ <http://www.arpansa.gov.au/mobilephones/index.cfm>

⁹ ARPANSA RF FACTSHEET http://www.arpansa.gov.au/pubs/factsheets/ReduceExposure_wirelessDevices.pdf

cautious approach in dealing with non-ionising radiation is still called for. There remains a need for extensive research into the potential long-term effects”.

In fact Switzerland goes *much further* than this and in fact has a very strong precautionary policy in place.

- MCPS leaves out the following [2015 Federal Office for the Environment FOEN Environmental Report Chapter on Electrosmog](http://www.bafu.admin.ch/publikationen/publikation/01794/index.html?lang=en&download=NHZLpZig7t,lnp6lONTU042lZ26ln1ad1lZn4Z2qZpnO2YUq2Z6gpJCHd4R2gmym162dpYbUzd,Gpd6emK2Oz9aGodetmqaN19Xl2ldvoaCVZ,s-.pdf) that states” Effects can also be detected for weak radiation intensity.” and “here is no definitive answer, however, concerning the impacts of long-term exposure” and “Reliable data are needed to monitor the temporal and spatial development of radiation exposure and identify possible health impacts.” and “Federal Council imposed stricter installation limit values in this ordinance as a precautionary measure. These values are intended to ensure that exposure is kept as low as possible in locations where people spend time regularly and for extended periods (e.g. in homes, offices and schools). This will help to reduce the risk of possible, as yet unidentified, impacts on health.

“The federal authorities base the definition of the installation limit values on the precautionary principle enshrined in the Environmental Protection Act (EPA):² radiation levels should be limited as much as technology and operating conditions allow, provided that this is economically acceptable. Because major gaps still exist in our knowledge about the health impacts of long-term exposure to weak non-ionising radiation, the adopted protective strategy should be pursued consistently.”¹⁰

- **MCPS failed to note** that Switzerland specifically recommends to “Prefer wired over WiFi/WLAN in schools and/or pre-schools “
- **MCPS failed to note** that **Switzerland gives a** detailed description on how to reduce exposure including turning the Wi-Fi off when not in use, installing the access point one metre away from places where you work, sit or rest for long periods of time and keeping laptops off laps. They state that “It is currently not known whether the electromagnetic fields created by WLANs pose a risk to health. WLAN devices generally emit a low level of radiation, *and caution should be exercised primarily when using devices held close to the body, such as laptops, PDAs and Internet telephones.* We would offer the following advice to people who prefer to minimise their personal exposure by keeping the electromagnetic fields in their home or office as small as possible.”¹¹
- **MCPS failed to note** this full statement in the conclusion from their 2012 **Radiation of radio transmitters and Health** “*In view of the fact that there are gaps in the available data, the absence of proof of health risks does not automatically also mean proof of their absence. From the scientific point of view, a cautious approach in dealing with non-ionising radiation is still called for. There remains a need for extensive research into the potential long-term effects*”¹²

¹⁰ [2015 Federal Office for the Environment FOEN Environmental Report Chapter on Electrosmog](http://www.bafu.admin.ch/publikationen/publikation/01794/index.html?lang=en&download=NHZLpZig7t,lnp6lONTU042lZ26ln1ad1lZn4Z2qZpnO2YUq2Z6gpJCHd4R2gmym162dpYbUzd,Gpd6emK2Oz9aGodetmqaN19Xl2ldvoaCVZ,s-.pdf)
http://www.bafu.admin.ch/publikationen/publikation/01794/index.html?lang=en&download=NHZLpZig7t,lnp6lONTU042lZ26ln1ad1lZn4Z2qZpnO2YUq2Z6gpJCHd4R2gmym162dpYbUzd,Gpd6emK2Oz9aGodetmqaN19Xl2ldvoaCVZ,s-.pdf

¹¹ Federal Office of Public Health on WLAN <http://www.bag.admin.ch/themen/strahlung/00053/00673/03570/index.html?lang=en>

¹² Switzerland FOEN 2012 **Radiation of radio transmitters and Health**
<http://www.bafu.admin.ch/publikationen/publikation/01739/index.html?lang=de>

5. Finland: MCPS quotes STUK as concluding that, “Mobile phone use is not detrimental to health”

This is inaccurate. The Radiation and Nuclear Safety Authority (STUK) website states that, *‘The level of exposure to radiation from a mobile phone held next to user’s ear can approach the exposure limits. Never before have humans been exposed to equally strong sources of radiation in their living environments. Identifying any health impacts is highly important because practically everybody uses a mobile phone today.’*

- “STUK recommends that unnecessary exposure to radiation from mobile phones be avoided. In particular, children’s unnecessary exposure should be avoided as their life-long exposure will be longer than that of those who begin using mobile phone as adults and as only scant research exists on health effects to children.”
- [Read STUK Recommendations to Reduce cell phone exposure HERE](#): Use a hands free device, don’t use phones reception is poor, the phone should be kept on a table or similar location instead of in the user’s pocket.
- [Read a news article from 2009](#) when STUK first recommended restricting the use of mobile phones by children.

6. Germany: MCPS quoted the German Federal Office for Radiation Protection in 2011 as concluding that “Risk perception is linked to media coverage”. This is inaccurate. Note the following:

- The Federal Office for Radiation Protection (FORP) provides tips for reducing radiation exposure to smartphones, tablets and wireless devices stating, *“Since long term effects could not be sufficiently examined up to now the Federal Office for Radiation Protection (BfS) recommends to keep exposures to these fields as low as reasonably achievable.”* [Read the precautionary advice here.](#)
- The FORP recommends landline phone instead of mobile phone base stations and that schools should not connect wirelessly to the internet. [Read a 2015 statement here.](#)
- [See their poster “Less radiation when Telephoning” here.](#)
- [The German Federal Ministry](#) for Radiation Protection stated in 2007, “supplementary precautionary measures such as wired cable alternatives are to be preferred to the WLAN system.” See original German Bundestag document [here](#), and an English translation [here](#).

MCPS quotes SSK the German Commission on Radiological Protection. All topics. 2011 as concluding that *“Discrepancy between scientific evidence and risk perception. No overall risks.”*

Please note these conclusions by SSK in 2013

- A [2013 Report Electromagnetic Fields of New Technologies](#) - ends its summary with the statement that “In the past, the Commission on Radiological Protection (SSK) has repeatedly emphasised that *devices should be designed with a view to minimizing emissions and user exposure, especially in cases in which technically and economically equivalent alternatives are available* (SSK 2001, SSK 2003).

Furthermore Germany has states that have banned wireless in schools. In [Bavaria](#): The State Ministry of Education and Cultural Affairs: “For precautionary reasons the Federal Office for Radiation Protection recommends for schools that if a wireless network is used to place its components in suitable

locations and to prefer the use of wired network solutions whenever possible.” In 2007 Parliament recommendation to all schools to *not* install wireless LAN networks. [Frankfurt](#): “In Frankfurt’s schools there will be no wireless networks in the short or mid term. The Local Education Authority did not wish to conduct a “*large scale human experiment*,” said Michael Damian, spokesperson of the Head of the School Department Jutta Ebeling.

7.England: MCPS once again selectively quoted from the research review. MCPS states of the ISLE of MAN Phone Masts/ Children that it concludes, “*no definite demonstrable effects on children*”, [leaving out the full statement directly quoted in the review which is:](#)

“The Chief Minister of Isle of Man [122] in UK had set up a committee to review the scientific publications on health impact of mobile telephone masts. The recommendations of the committee in 2009 [123] were: “...although there are no definite demonstrable effects on children, it would be prudent not to site base stations in locations where children are likely to be exposed to the beams for a long duration”. The committee also recommended “The use of precautionary principle in the siting of mobile phone masts”.

8. MCPS cites Tanzania’s TCRA as a “public health body” concluding “No substantial evidence for harmful health effects. Many benefits of modern technology.”

First, TCRA is *not a public health body* but in fact **The Tanzania Communications Regulatory Authority (TCRA)** is a quasi independent Government body responsible for regulating the communications and broadcasting sectors in Tanzania and it is in no way a health and safety organizations with any Doctors on staff who have the credentials to make such a safety determination. Its mission is to develop an effective and efficient communications regulatory framework. Why is MCPS quoting *not a study* but simply a ‘public statement’ by the agency from 2010 that is nowhere to be found online anymore? This should be removed from the list as it is not a public health body and is outdated.

9. MCPS states of the countries they cite on their chart that, “In reviewing the large body of existing scientific evidence, health organizations across the world have all reached the same conclusion: there are no proven negative health effects from Electromagnetic Fields (EMF) that is within existing safety guidelines.”

This is not even the conclusion of the paper they pulled the quotes from. In fact, the authors of **International and National Expert Group Evaluations: Biological/Health Effects of Radiofrequency Fields in the International Journal for Environmental Research in Public Health** end with their review by stating that “*In general, the expert groups suggested a reduction in exposure levels, precautionary approach, and further research.*”¹³

What is the international policy response to children and radiofrequency fields?

¹³ [International and National Expert Group Evaluations: Biological/Health Effects of Radiofrequency Fields](http://www.mdpi.com/1660-4601/11/9/9376)
<http://www.mdpi.com/1660-4601/11/9/9376>

I point you to a more recent 2015 published review on international advisories by Dr. Redmayne entitled [International policy and advisory response regarding children's exposure to radio frequency electromagnetic fields \(RF-EMF\)](#) which states that, “Over 20 countries and municipalities have issued precautionary advice to the public concerning wireless exposures. This review of policy and advice regarding children's RF-EMF exposure shows a wide variety of approaches which I have categorized and tabulated ranging from ICNIRP/IEEE guidelines and “no extra precautions needed” to precautionary or scientific much lower maxima and extensive advice to minimize RF-EMF exposure, ban advertising/sale to children, and add exposure information to packaging.” This review concludes with the statement, “Therefore, minimum exposure of children to RF-EMF is recommended.”¹⁴

FALSE STATEMENT 18

MCPS has erroneously defined the Precautionary Principle. MCPS says, “*The “Precautionary Principle” dictates that unless something is proven absolutely safe, then it should be avoided.*”

This is false and not the definition of the Precautionary Principle in any dictionary I am familiar with and by using such an inaccurate definition it misleads parents and the Montgomery County Community.

- **American Journal of Public Health Definition:** “*The precautionary principle asserts that the burden of proof for potentially harmful actions by industry or government rests on the assurance of safety and that when there are threats of serious damage, scientific uncertainty must be resolved in favor of prevention.*” [Read it here.](#)
- **Wikipedia definition:** “The precautionary principle or precautionary approach to [risk management](#) states that if an action or policy has a suspected risk of causing harm to the [public](#) or to the [environment](#), in the absence of [scientific consensus](#) that the action or policy is not harmful, the [burden of proof](#) that it is *not* harmful falls on those taking an action.” [Read it here.](#)
- **Collaborative on Health and the Environment Definition:** “The precautionary principle is a guide to public policy decision making ([Raffensperger and Tickner 1999](#), [Schettler et al. 2002](#)). It responds to the realization that humans often cause serious and widespread harm to people, wildlife, and the general environment. According to the precautionary principle, precautionary action should be undertaken when there are credible threats of harm, despite residual scientific uncertainty about cause and effect relationships.” [Read it here.](#)

For MCPS to use a definition like this makes a mockery of those calling for it. If that were truly the definition then we would not use any product or go anywhere, as nothing can be absolutely proven safe.

The main point behind the precautionary principle is that there is **a large body of compelling research** pointing to evidence of serious harm from wireless *and* although it has not been 100% proven, it would

¹⁴ International policy and advisory response regarding children's exposure to radio frequency electromagnetic fields (RF-EMF) <http://www.ncbi.nlm.nih.gov/pubmed/26091083>

be prudent to take action. **If we don't** take action now- we are talking about generations of children with cancer, fertility damage, neurological issues and illness *which could have easily been prevented*.

Over 20 countries are taking precautionary action because of the potential for serious harm.

FALSE STATEMENT 19 through 23

MCPS states, "However, it is important to note that, the "Precautionary Principle" is already implemented in the Wi-Fi guidelines and exposure limits set by WHO, FCC, Health Canada, Public Health England, and other public-health bodies."

MCPS's statement is nonsensical and false. How can MCPS state that there is no evidence wireless could be harmful and then states they already use precautions? Such a false statement also speaks to a lack of understanding of the complexity of this issue by MCPS. MCPS (in that sentence) has grouped the FCC with the WHO and Public Health England, *which are three very different entities with different expertise, different mandates and different missions*.

Nonetheless, technically neither the WHO, FCC, Health Canada or England have implemented the precautionary principle in regards to public exposure limits.

The World Health Organization (WHO)

The WHO is not tasked to implement anything and specifically states that its role is not to

Canada

See below documentation that Canada has certainly not implemented the precautionary principle.

"Currently, RF exposure guidelines in various countries (China, Russia, Italy, Switzerland), based on biological effects, are 100 times more stringent than the guidelines based on an outdated understanding of RFR that relies primarily on thermal effects that includes Health Canada's Safety Code 6. ...Furthermore, Health Canada does not adhere to the Precautionary Principle used by states when serious risks to the public or the environment exist but lack scientific consensus."

- **Scientific Declaration to Health Canada (International Doctors) 2014**

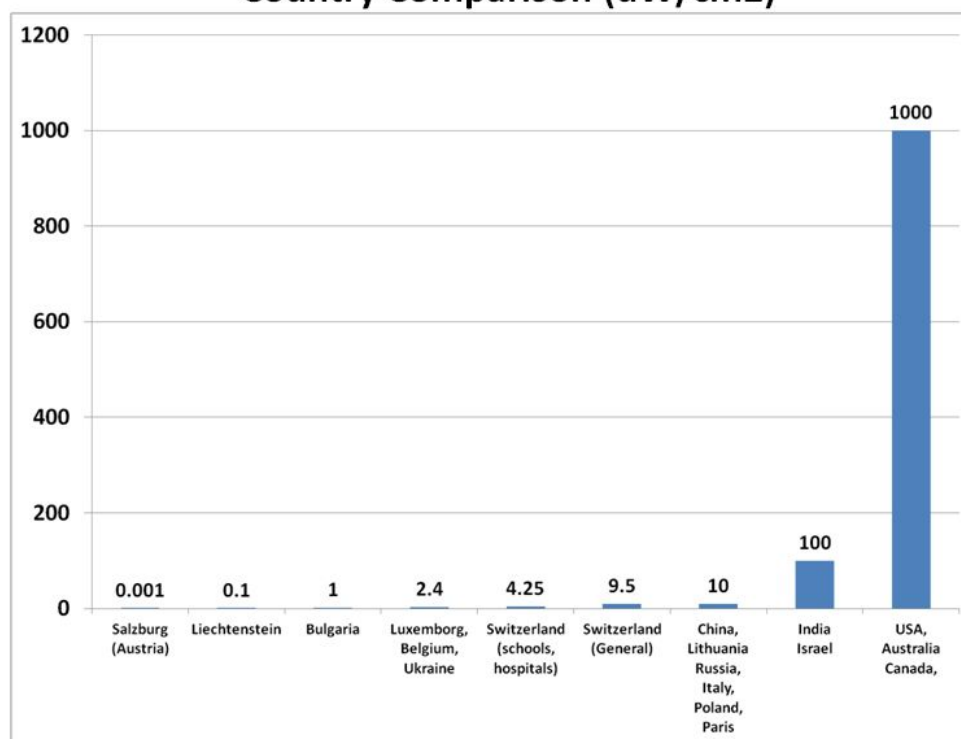
Why would Doctors write Health Canada asking them to utilize the precautionary principle if they were already doing it?

The FCC

The FCC (not a health and science agency) states that

Want proof? If the US followed the Precautionary Principle *then why do their regulations look like this below.*

Outdoor Pulsed RF Radiation Exposure Limits Country Comparison (uW/cm²)



FALSE STATEMENT 24 through 28

MCPS Technology Staff stated in a BOE meeting that *wireless RF-EMF is arguably “not radiation”*. Watch it at the September 21, 2015 BOE meeting.

This is false. MCPS needs to be honest with the MCPS community that this is *non-ionizing radiation*.

- The FCC states that, “Radio waves and microwaves are forms of electromagnetic energy that are collectively described by the term “radiofrequency” or “RF.” RF emissions and associated phenomena can be discussed in terms of “energy,” “radiation” or “fields.” Radiation is defined as the propagation of energy through space in the form of waves or particles. Electromagnetic “radiation” can best be described as waves of electric and magnetic energy moving together (i.e., radiating) through space...”¹⁵
- The United States Navy states very clearly that, “Radio waves and microwaves emitted by transmitting antennas, illustrated in Figure 3, are one form of electromagnetic energy. They are collectively referred to as “radiofrequency” radiation (RFR).”¹⁶

¹⁵ https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf

¹⁶ http://www.public.navy.mil/navsafecen/Pages/acquisition/radio_frequency-radiation.aspx

FALSE STATEMENT 29

In the FAQs section “What were the findings of the RF Monitoring conducted in MCPS schools?” MCPS states that “because students are not expected to be using their Chromebooks continually during the day, actual RF exposure for any given day is expected to be similar or less than the measured values.”

- This is non-factual, conjecture and based on no science. Measurements presented were for 6-minute time-averaged, whole body exposure. Clearly, there is no documentation that the radiation levels can be *less*. Indeed, the power levels may be similar or more or less for every 6 minutes of exposure depending on various factors that MCPS neglected to detail in their “Report”. What is missing is that that different schools have different curriculum using Chromebooks. Many parents report children are on Chromebooks in several classes, some less. In some classes all may have cell phones on, actively transmitting adding to top RF exposure in the room. No where did MCPS document how many Chromebooks were on in the room nor what they were doing. When 30 kids are downloading a video, for example, the radiation exposure *will be more*. None of this was taken into account for the radiation readings and MCPS cannot state that RF exposures could be “less”. That is false.

FALSE STATEMENT 30

MCPS quotes the 2003 [Non-Ionizing Radiations–Sources, Biological Effects, Emissions and Exposures](#) which is from the [Proceedings of the International Conference on Non-Ionizing Radiation at UNITEN \(ICNIR2003\) Electromagnetic Fields and Our Health 20th –22nd October 2003 Non-Ionizing Radiations –Sources, Biological Effects, Emissions and Exposures](#) as an example of statements by “major public health organization.” Read it here <http://www.who.int/peh-emf/meetings/archive/en/keynote3ng.pdf>

This is false and should be removed. This is not a statement by a public health body! It is an abstract of a 2003 paper but by one person, Kwan-Hoong Ng of the Department of Radiology University of Malaya Kuala Lumpur Malaysia. *Why is this on a list of statements by public health organizations?* Furthermore, this is clearly outdated from 2003 and should be removed.

FALSE STATEMENT 31

In section 4.2.4 of the RF Summary Report it is stated, “As discussed above, the Bioinitiative Report (2007 and 2012) is a publication released on the internet by a group of 14 “...scientists, public health and public policy experts to document the scientific evidence on electromagnetic fields.”

This is false. **The Bioinitiative 2012 report was written by 29 authors from ten countries including ten MDs and 21 PhDs who are worldwide experts in the field.** Authors include three former presidents and five members of the Bioelectromagnetics Society. One author is Chair of the Russian National Committee on Non-Ionizing Radiation, and another is Senior Advisor to the European Environmental Agency.

Dr. Carl F. Blackman former research scientist in the Environmental Carcinogenesis Division of the US Environmental Protection Agency who served on the World Health Organization committee to evaluate the health implications of radiofrequency radiation exposure (Environmental Health Criteria #137, 1993), on a committee of the International Agency for Research on Cancer (IARC) to evaluate the carcinogenic potential of low frequency electric and magnetic fields in 2001 (Volume 80, 2002) and as chair of the genetic studies group of the ANSI/IEEE committee that issued the US 1992 Radiofrequency Radiation exposure guidelines.

[See the 29 authors of the Bioinitiative here.](#)

FALSE STATEMENT 32

MCPS states that, The World Health Organization (WHO) has concluded that, “In the area of biological effects and medical applications of non-ionizing radiation approximately **25,000** articles have been published over the past **30** years. Scientific knowledge in this area is now more extensive than for most chemicals. Based on a recent in-depth review of the scientific literature, **the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields.**” Please review the information on the following website for further details: <http://www.who.int/peh-emf/about/WhatisEMF/en/index1.html>.”

This is false because **it is not the conclusion of the WHO/IARC.**

The World Health Organizations International Agency for the Research on Cancer classified RF-EMF (radiofrequency electromagnetic fields, otherwise known as “wireless radiation”) as a Class 2B Possible Human Carcinogen in 2011 based on credible evidence that linked long term wireless exposure to brain cancer.

- [Read The Lancet’s published statement by the IARC from 2011 on cancer risk of wireless radiation.](#)
- The 2013 published Monograph shows the current evidence that led to that classification and states, “the average exposure from use of the same mobile phone is higher by a factor of 2 in a child’s brain and higher by a factor of 10 in the bone marrow of the skull.” Read these details on page 34 of the World Health Organization’s International Association for Research on Cancer’s published [Monograph on Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields](#).

APPENDIX II

OUTDATED DOCUMENTS

Why is MCPS using reviews dated over a decade ago to show wireless is not a risk?

MCPS uses OUTDATED documents to justify its current position and MCPS’ stated opinion that wireless is not a health hazard. However, any report before 2011 is inadequate because it was not until

2011 that most long term research on wireless (Interphone studies from several countries) was even published. The World Health Organization made its determination of RF as a Class 2 B Carcinogen in 2011. So looking at pre 2011 reviews is not the current best available science.

Nonetheless, MCPS presents these outdated reviews *which is misleading*.

OUTDATED DOCUMENT 1

MCPS cites the WHO Workgroup Report: Base Stations and Wireless Networks—Radiofrequency (RF) Exposures and Health Consequences

The possibility of RF health effects has been investigated in epidemiology studies of cellular telephone users and workers in RF occupations, in experiments with animals exposed to cell-phone RF, and via biophysical consideration of cell-phone RF electric-field intensity and the effect of RF modulation schemes. As summarized here, these separate avenues of scientific investigation provide little support for adverse health effects arising from RF exposure at levels below current international standards. Moreover, radio and television broadcast waves have exposed populations to RF for > 50 years with little evidence of deleterious health consequences.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1849947/>

MCPS forgets to state that this quote is from 2006. There is “little support for adverse health effects “ because the major long term research studies were not even published at that time. *Why is MCPS quoting ten year old science?*

OUTDATED DOCUMENT 2 and 3

MCPS invalidates the Bioinitiative Report using two outdated references

1. The Australian Centre for Radiofrequency Bioeffects Research (ACRBR) published a position statement on the BioInitiative Report. <http://www.acrbr.org.au/FAQ/ACRBR%20Bioinitiative%20Report%2018%20Dec%202008.pdf> (OOPs this organization funded by the wireless industry closed its doors years ago and that might explain why the link does not work anymore.)
2. [Health Council of the Netherlands 2008 Statement](#) (not a report but a statement from 2008)

First of all these are 2008 Documents referencing the Bioinitiative Report 2007

Why is MCPS minimizing the Bioinitiative 2012 recommendations by referring to 2008 reviews to a 2007 Report? It makes no sense and all should take a minute to ponder this. These 2008 reports are inaccurate as they are outdated and do not incorporate current peer reviewed publications. The research has substantially increased since 2008 and of course the 2011 World Health organization Monograph was 4 years after that report. We have continuously provided MCPS with best available peer reviewed science. We have sent abstracts from peer reviewed published science where scientists call for precautions from wireless radiation. MCPS should use the current best available science instead of the outdated -non peer reviewed reports put out by known industry scientists as MCPS is currently doing on it's website.

Some facts about the Australian Centre for Radiofrequency Bioeffects Research: It seems the wireless industry itself provides funding for the work that they do. Read what it states on their website

‘The ACRBR wishes to acknowledge the Australian Mobile Telecommunications Association for providing funding for this project,’¹⁷ It also notes that Telstra is a funder of the organization. Perhaps most notably, there have been no position papers issued since 2009.¹⁸

*Notably: I have never sent MCPS the Bioinitiative recommendations asking that MCPS use them as thresholds so I do not understand why MCPS is assuming this? I have simply asked for MCPS to reduce unnecessary exposures by using safe technology whenever possible.
For example Why are kindergarteners being exposed to this radiation all day long? MCPS could easily decrease the radiation exposures to these young children by making simple changes to the wireless radiation installations.*

OUTDATED DOCUMENT 4

The MCPS Summary Report states, “In addition, the World Meteorological Organization (WMO) conducted ambient RF EMF measurements in a variety of settings across the United States, including urban, suburban, rural, and airport environments (Leck, 2006). The WMO found no difference between the magnitudes of the RF EMF power density regardless of location.”

The scientific citation Lerk 2006 is for a 2006 Report on results from measurements taken in 2004 and 2005. Leck, R. World Meteorological Organization, Results of Ambient RF Environment and Noise Floor Measurements Taken in the U.S. in 2004 and 2005, Commission for Basic Systems Steering Group on Radiofrequency Coordination, Geneva, March 16-18, 2006.

Why are 2005 measurements being used considering that *wireless was barely rolled out a decade ago, in 2005*. A lot has changed since 2005.

Note the following from a 2015 published paper, “**the contribution made to RF exposure from wireless telecommunications technology is continuously increasing and its contribution was above 60% of the total exposure.**”

The decade since 2005 is when Wi-Fi has been rolled out to schools, homes and public spaces, not to mention coffee shops. Furthermore there was not the saturation of Smartphones with the public and that will raise ambient RF levels in highly populated areas. This reference is clearly inapplicable today. It is outdated

OUTDATED DOCUMENT 5

MCPS cites the Center for Disease Control:

¹⁷ <http://acrbr.org.au/Research.aspx>

¹⁸ <http://acrbr.org.au/FAQ.aspx>

“In the last 15 years, hundreds of new research studies have investigated whether health problems can be linked to cell phone use. Some of these studies have suggested the possibility that long-term, high cell phone use may be linked to certain types of brain cancer. These studies do not establish this link definitively.”

http://www.cdc.gov/nceh/radiation/factsheets/224613_fa_cell-phones-and-your-health.pdf

This Fact sheet is outdated and exists online as an example of the OLD cell phone page. Please see the CDC website explaining this in full at http://www.cdc.gov/nceh/radiation/cell_phones_faq.html The CDC changed its website in 2014: Read about how the CDC initially called for caution. [Read about this here.](#)

OUTDATED DOCUMENT 6

Foster, K. R. Exposure Limits for Radiofrequency Energy: Three Models. World Health Organization, Conference on Criteria for EMF Standards Harmonization. Available at http://www.who.int/peh-emf/meetings/day2Varna_Foster.pdf.

page 3-3 Note: This is outdated at around the year 2000 as that is the most recent year cited. .

OUTDATED DOCUMENT 7

MCPS selectively quotes a 2010 Latin American Review. (It seems MCPS did not really do research to look at the review but instead just selectively took statements from a published article that cites the Latin American review International and National Expert Group Evaluations: Biological/Health Effects of Radiofrequency Fields) nonetheless this review is outdated and pre 2011, when the WHO made its classification. Perhaps more importantly the Chairman of this group Prof. Renato M.E. Sabbatini fyi has this on [his resume](#).

- Scientific advisor, [National Association of Cell Phone Operators](#) (ACEL)
- Collaborator, [Mobile Manufacturers Forum](#)
- Collaborator, [GSM Association](#)

This brings us the final concern with MCPS's radiofrequency page- the use of wireless funded data.

APPENDIX III

Wireless Funded Research and Statements

MCPS Utilizes “Scientific” Reviews funded by the Wireless Industry or by Scientists who Are Consultants to the Wireless Industry.

WIRELESS INDUSTRY FUNDED SCIENCE REFERENCE 1

MCPS presents the 2010 “Latin American Review”. This was organized by President of the Organizing Committee and Chairman, Prof. Renato M.E. Sabbatini who is also Scientific advisor to the

[National Association of Cell Phone Operators](#) and works with the [Mobile Manufacturers Forum](#) and [GSM Association](#).

WIRELESS INDUSTRY FUNDED SCIENCE REFERENCE 2

MCPS says “Unequivocally, the RF exposures from Wi-Fi and wireless networks are far below U.S. and international exposure limits for RF energy.”

MCPS has this link as the citation:

http://www.researchgate.net/publication/258102960_Wi-Fi_and_Health

MCPS forgets to say:

Acknowledgments—This work was funded by the Wi-Fi Alliance, Washington, DC, and Mobile Manufacturers Forum, Brussels, Belgium. Neither organization had any role in the research for, or preparation of, the manuscript; and they had no knowledge of the contents or conclusions of this review prior to submission for publication. The opinions in this review are those of the present authors only.

The research study that MCPS quotes here was fully funded by the wireless industry and the scientists authoring it are long known to be industry consultants and collaborators. Author John Moulder for example is an industry consultant and decades long expert witness in various court cases for the wireless and energy company industry. Author Kenneth Foster also publishes papers financed, like this one, fully funded by the industry. Oh, he also goes on trips to Greece *funded by the industry*. In fact, scientists are calling for one of his recent works to be retracted because an analysis found systematic errors.

“The first possibility is that many authors of the 22 individual studies misinterpreted and/or misrepresented their review findings in their text summaries. This seems unlikely given the number of authors involved and the fact that the peer review process would need to have failed repeatedly for this to occur. The only other explanation is that a bias in the methods used by Foster and Chou introduced a systematic error in their abstraction of review results,” stated the authors.”

[Read more about that here.](#)

Who is the WiFi Alliance?

They are all the top tech companies from Cisco to Samsung to Intel. [Read the list of companies here.](#) When schools inquire as to the health risks of wireless they also have [a handy response that basically says](#)- nothing to worry about, we met all regulations- plus *nothing is proven. This research was fully funded by the wireless industry and then is used to justify wireless deployment.*

WIRELESS INDUSTRY FUNDED SCIENCE REFERENCE 3

Section 2.5.1 of the MCPS Radio Frequency Monitoring Report also quotes a study of Foster’s “In 2007, Foster measured the RF signal from wireless devices in multiple settings (academic, commercial, health care) and multiple countries (USA and Europe). Foster found a number of interesting results...”

We assume this is a reference to the following 2007 study, RADIOFREQUENCY EXPOSURE FROM WIRELESS LANS UTILIZING WI-FI TECHNOLOGY found here <http://medfordumc.org/celltower/wifirfexposure.pdf>

This research study states very clearly:

Acknowledgments— This work was supported by the Wi-Fi Alliance.

Such funding might explain why the almost decade old study has so many problems. It purports to show “low exposures” yet did not even test near field exposures and did not even get a statistically valid sampling! . As it states, “No attempt was made in this study to assess near-field exposures to a user of the laptop itself.” and “The measurement locations were chosen as a matter of convenience, not to provide a statistically valid sample of the environments (however that may be defined). “ Despite the lack of looking at exposure to the laptop user and the lack of a statistically valid sample, , the paper is continuously used to show “safety”. It seems to me to be an attempt to publish something that allays fears reiterating regulations are not surpassed and stating that, “any health concerns would seem to be moot.”

WIRELESS INDUSTRY FUNDED SCIENCE REFERENCE 4

MCPs cites England’s MTHR as concluding that, “No increased cancer risk from wireless technologies. No robust evidence of harmful effects. No definite demonstrable effects in children.”

MCPs neglects to clarify that MTHR is the Mobile Telecommunications and Health Research Programme and its **Report 2012** gives the findings of 31 individual research projects, *funded by the telecommunications industry.*

WIRELESS INDUSTRY FUNDED SCIENCE REFERENCE 5

MCPs pulled most of its statements about international organizations from a 2014 paper entitled “International and National Expert Group Evaluations: Biological/Health Effects of Radiofrequency Fields” which states, “We thank Chung-Kwang Chou (chairman, SC-95 of the international committee on electromagnetic safety, Institute of Electrical and Electronic Engineers) for critical reading of the manuscript and helpful suggestions.”

Left out is that CK Chou is just retired Chief EME Scientist for Motorola and published papers funded by the Wireless Alliance. [Read about the scientific calls for his recent industry funded work on children and cell phones to be retracted here.](#)

WIRELESS INDUSTRY FUNDED SCIENCE REFERENCE 6

MCPs says the Committee on Man and Radiation (COMAR “concluded that the weight of scientific evidence in the RF bioeffects literature does not support the safety limits recommended by the BioInitiative Group.”

“One of the many organizations that have refuted the science behind the report is the Institute of Electrical Engineers, Inc., Engineering in Medicine and Biology Society, Committee on Man and Radiation (COMAR). The committee concluded that the weight of scientific evidence in the RF bioeffects literature does not support the safety limits recommended by the BioInitiative Group. For this reason, COMAR recommends that public health officials continue to base their policies on RF safety limits recommended by established and sanctioned international organizations such as the Institute of Electrical and Electronic Engineers International Committee on Electromagnetic Safety and the International Commission on Non-Ionizing Radiation Protection, which is formally related to WHO.” See the COMAR outdated 2009 Report here <http://www.ncbi.nlm.nih.gov/pubmed/19741364>

This report is from 2009 (so an example of outdated material) *Since when was COMAR an expert group worth listening too above the Bioinitiative authors?* COMARs website is here <http://ewh.ieee.org/soc/embs/comar/> and it shows that the IEEE Engineering in Medicine and Biology Society, Committee on Man and Radiation (COMAR) *is basically mostly industry funded engineers who made a group.*

COMAR has a total of 3 officers, and 24 members and includes

- **Ken Foster:** Multiple industry funded research studies plus the trip to Greece.
- **Jerrold T. Bushberg:** He runs a health and medical physics consulting firm and has long served as an expert witness for the cell phone and broadcast industries on the health effects of RF energy, servicing, among others, Cingular Wireless, Crown Castle, Newpath Networks, and Verizon. Bushberg has also helped town officials evaluate proposals for siting cellular antennas and has testified for broadcasters who wanted to site high-power antennas on Lookout Mountain outside of Denver.
- **C-K Chou** - former Chief Scientist for Motorola
- **Antonio Faraone** of Motorola Labs – Corporate EME Research Laboratory
- **Ralf Bodemann** PhD Radiation Physicist for Siemens AG
- **Linda Erdreich**, is Exponent’s Sr. Managing Scientist Exponent is the energy's Industry GO TO consulting firm to testify as “expert witness” when defending claims of harm.
- **Rob Kavet, ScD** * EMF Business Area Manager EPRI

(EPRI is an “independent” nonprofit scientific organization funded by the electric power industry in the United States.)

- **The Chair is Richard Tell** of Richard Tell Associates, Inc. which is “a scientific consulting business focused on electromagnetic field exposure assessment”

In fact, it is stated plain as day that their “technical information statement” reports are theirs alone and that their statements represent ‘The statement of the committee’. Their statements do not even represent IEEE as a whole.

No one is even reviewing these propaganda like statements and the MCPS tech group is putting it forward as some sort of truth? None of the COMAR members have medical degrees. They are a self selected group of people writing their own statements with a very big fancy name. As they state “COMAR does not establish safety standards, but it has an interest in the standards activity within its scope.” and their papers ‘represent the consensus of the Committee’.

I recommend that you take a look at the people who make up COMAR and compare their background and funding *to the people who wrote the Bioinitiative report.*

Why is MCPS using industry funded work to invalidate research showing wireless could be harmful?

WIRELESS INDUSTRY FUNDED SCIENCE REFERENCE 7

Another one of Ken Foster’s articles is cited in the AECOM RF Report (total of 3)

Foster, K. R. Exposure Limits for Radiofrequency Energy: Three Models. World Health Organization, Conference on Criteria for EMF Standards Harmonization. Available at http://www.who.int/peh-emf/meetings/day2Varna_Foster.pdf.
page 3-3 Note: This is also outdated at around the year 2000.

WIRELESS INDUSTRY FUNDED SCIENCE REFERENCE 8

Yet another Foster article is cited in the AECOM RF Report

Foster, K. R. Response to Lora Lee Martin Regarding Smart Meters and EMFs, September 23, 2010, available at http://www.ccst.us/projects/smart/documents/foster_response.pdf.

APPENDIX IV

Misleading Statements

MISLEADING STATEMENT 1

The MCPS webpage selectively cites Group 2 B agents by naming others in the category which seem silly. “[Here is a sampling of Group 2B agents classified by the IARC: magnetic fields \(extremely low-frequency\), aloe vera \(whole leaf extract\), coconut oil, coffee, dry cleaning, engine exhaust \(gasoline and diesel\), ginkgo Biloba extract, nickel \(metallic and alloys\), pickled vegetables, talc-based body powder, titanium dioxide \(found in personal care products and in sunscreen\), and amaranth.](#)”

- MCPS forgets to mention the dozens of *other* Group 2 B carcinogens such as lead, Chloroform, [Welding](#) fumes, Hexachlorobenzene, *many of which were pulled off the market before further testing was done.* Would we want these substances in our classrooms?

- MCPS also neglects to mention that many now 100% proven carcinogens that *used to be on the Group 2 B list* for a decade have since **moved** to a higher risk category such as styrene, DDT . These used to be on the Class 2 B list but have since moved up in risk.

It is misleading to put amaranth and aloe vera next to RF radiation. The WHO is clear that being in the same category does not mean that the risk is the same. Furthermore, the body of research is incomparable.

MISLEADING STATEMENT 2

MCPS quote the WHO as below

Non-Ionizing Radiations—Sources, Biological Effects, Emissions and Exposures

NRPB has made many measurements of exposure levels at publicly accessible locations around base stations. One study [12] reported measurements taken at 118 locations from 17 different base station sites. Average exposures were found to be 0.00002% of the ICNIRP public exposure guidelines and at no location were exposure found to exceed 0.02% of the guidelines.

The maximum exposure at any location was 0.00083 mWcm⁻² (on a playing field 60 meters from a school building with an antenna on its roof). Typical power densities were less than 0.0001 mWcm⁻² (less than 0.01% of the ICNIRP public exposure guidelines). (See Fig. 2) Power densities indoors were substantially less than power densities outdoors. When RF radiation from all sources (mobile phone, FM radio, TV, etc.) was taken into account the maximum power density at any site was less than 0.2% of the ICNIRP public exposure guidelines. [12, 13]

<http://www.who.int/peh-emf/meetings/archive/en/keynote3ng.pdf>

MCPS left out that this statement was from cell tower radiation readings in 2003.

Cell Tower radiation has substantially increased since 2003 as far more people are using cellphones and the radiation densities have increased because of this. The quotes information is from the Proceedings of the International Conference on Non-Ionizing Radiation at UNITEN (ICNIR2003) Electromagnetic Fields and Our Health 20 th–22 nd **from October 2003** .

Why is MCPS quoting a paper on cell towers radiation that is entirely inapplicable to today's radiation exposures and using it to show RF is not a problem? This is misleading.

Concerning the World Health Organization WHO IARC scientists continue to publish research and commentary in medical journals detailing that there are *no safety assurances with wireless*.

Please note the following:

Dr. Samet, Senior Scientist, Chair of the World Health Organization's International Agency for the Research on Cancer 2011 RF-EMF Working Group stated, "*The IARC 2B classification implies an assurance of safety that cannot be offered—a particular concern.* given the prospect that most of the world's population will have lifelong exposure to radiofrequency electromagnetic fields." in his [2014 Commentary calling for more directed research](#) published in the journal *Epidemiology*.

It is misleading that MCPS has left out the following:

Many WHO scientists who served as IARC advisors on RF Radiation for the 2011 working group now state *that additional scientific evidence indicates that wireless radiation should be re-classified as a “probable human carcinogen.”*

- “Radiofrequency fields should be classified as a Group 2A ‘probable human carcinogen under the criteria used by the International Agency for Research on Cancer (Lyon, France).” Read the 2015 published review *by a group of scientists that includes World Health Organization EMF Working Group Experts* in the *International Journal of Oncology* entitled [Mobile phone radiation causes brain tumors and should be classified as a probable human carcinogen \(2A\) \(review\)](#) which also advises that the *as low as reasonably achievable* (ALARA) principle be adopted for uses of this technology.

The following experts were part of the WHO IARC’s RF-EMF Review in 2011. Read their statements:

- **Dr. Chris Portier** “*A careful review of the scientific literature demonstrates there are potentially dangerous effects from RF,*” stated Portier, a recently retired CDC Director, Center for Environmental Health and the Agency for Toxic Substances and Disease [in his official call for invoking the precautionary principle with wireless](#). See also a poster presentation he penned for the conference here.
- **Dariusz Leszczynski**, WHO IARC expert, former Finnish government researcher, lectures widely on the urgent need for the precautionary principle. [See slides from a recent lecture in Belgrade, Serbia attended by governmental officials. Read his laypersons article on the need for the Precautionary Principle here.](#)
- **Dr. Anthony Miller** publishes research, lectures, testifies to government officials *on the increased evidence of risk from wireless technology*, and has four decades of expertise with the WHO IARC. [See his testimony to the City of Toronto against cell towers here.](#) [Watch his 2014 lecture at Women’s College Hospital here.](#) [Read his published research here.](#)
- **Dr. Igor Belyaev** “There are many publications showing health effects of radiofrequency radiations. Approximately half of all published papers show such effects. This apparent discrepancy can be accounted for various conditions of exposure, because non-thermal RF effects are critically dependent on various parameters and also biological variables.” Dr. Igor Belyaev is the Head Research Scientist at the Cancer Research Institute at the Slovak Academy of Science in Bratislava, Slovakia. Dr. Belyaev was one of the 30 members of the IARC Working Group tasked with classifying the carcinogenicity of cell phone radiation—the Group that produced the 2013 IARC Monograph. [Please watch him speak at the National Press Club at this video link.](#)
- **Dr. Lennart Hardell** published research in the *International Journal of Oncology* entitled [Case-control study of the association between malignant brain tumours diagnosed between 2007 and 2009 and mobile and cordless phone use](#) concluding, “This study confirmed previous results of an association between mobile and cordless phone use and malignant brain tumours. These findings provide support for the hypothesis that RF-EMFs play a role both in the initiation and promotion stages of carcinogenesis”. [Read his scientific blog with a letter to the WHO here.](#)

Dr. Hardell is an International Agency for the Research on Cancer expert and now states that wireless “should be regarded as human carcinogen requiring urgent revision of current exposure guidelines.”

- Read his 2014 research published in the *Journal of Environmental Research and Public Health* entitled [Decreased Survival of Glioma Patients with Astrocytoma Grade IV \(Glioblastoma Multiforme\) Associated with Long-Term Use of Mobile and Cordless Phones](#) which determined the use of wireless phones in the >20 years latency group (time since first use) was correlated to decreased survival for those diagnosed with astrocytoma grade IV. The conclusion reads, "Due to the relationship with survival the classification of IARC is strengthened and RF-EMF should be regarded as human carcinogen requiring urgent revision of current exposure guidelines."

In 2015 over 200 scientists appealed to the WHO and the United Nations to take immediate action to reduce health risks of wireless radiation and “the emerging public health crisis related to cell phones, wireless devices, wireless utility meters and wireless infrastructure in neighborhoods.”

- [Read the Medical Doctor and Scientists’ Appeal here.](#)
- [Read the names of the Doctors and Scientists and their qualifications here.](#)

MISLEADING STATEMENT 3

Spain: MCPS cites The Scientific Advisory Committee on Radio Frequencies and Health as stating that “To date, no scientific evidence that exposure to the low emissions levels of these systems produces adverse health effects in school children.”

Interestingly, this organization does not exist anymore and as far as we know it is not the official position of the Spanish government's position on RF. (Often these “scientific” committees are created to invalidate the research and are funded by the industry.) MCPS misleads by putting it forward as a public health organization when it is NOT and forgot to mention this information about Spain:

- [The Parliament of Navarra voted to urge removal of WIFI in schools](#) and to apply the precautionary principle in relation to exposure limits to electromagnetic fields whose boundaries have become "obsolete".
 - The Parliament voted to adopt a resolution which calls to implement the Parliamentary Assembly of the Council of Europe resolution 1815 of 2011, which recommends to "review the scientific basis for the standards of exposure to electromagnetic fields" and "set thresholds for levels of preventive long-term exposure in all indoor areas not exceeding 0.6 volts per meter".
- [The Vitoria City Council unanimously approved](#) a precautionary approach with wireless: Citizens will be informed of the location of wireless transmitters in civic centers and municipal buildings. It is recommended that children's spaces such as playgrounds and family libraries, will be free of WiFi or have decreased wifi and wifi free zones will be established in playgrounds and building entrances.
- **The Basque Parliament** joined the resolution of the Parliamentary Assembly of Council of Europe in 2011, which warns of the "potential risk" of electromagnetic fields and their effects on the environment and urged the promotion of campaigns against "excessive use" of mobile phones

among children. In a statement, the parliamentary Aralar, Dani Maeztu stated, "To protect children's health, recommends the implementation of information campaigns and portable devices that emit microwaves, and prioritizes the use of cable connections in schools."

- **City of Tarragona Municipal Government (Tarragona is a major city 100 kilometres south of Barcelona) approved the "Institutional Declaration of support for people with Central Sensitivity Syndromes" including electromagnetic fields.** This means spaces are being set aside that are "white zones" meaning no RF radiation.

MISLEADING STATEMENT 4

MCPS states this about the BioInitiative Report "This report was compiled, self-edited, and published by Cindy Sage and David Carpenter in 2007 and claims to be based in science." MCPS then goes on to negate the 2012 Report validity (addressed more in industry funded science section of this document as they reference a group made up of industry consultants)

This is a misleading and seems to be an attempt to delegitimize and discredit and neglects to inform readers that the Bioinitiative 2012 report was written by 29 authors from ten countries including ten MDs and 21 PhDs who are worldwide experts in the field. Authors include three former presidents and five members of the Bioelectromagnetics Society. One author is Chair of the Russian National Committee on Non-Ionizing Radiation, and another is Senior Advisor to the European Environmental Agency.

Dr. Carl F. Blackman former research scientist in the Environmental Carcinogenesis Division of the US Environmental Protection Agency who served on the World Health Organization committee to evaluate the health implications of radiofrequency radiation exposure (Environmental Health Criteria #137, 1993), on a committee of the International Agency for Research on Cancer (IARC) to evaluate the carcinogenic potential of low frequency electric and magnetic fields in 2001 (Volume 80, 2002) and as chair of the genetic studies group of the ANSI/IEEE committee that issued the US 1992 Radiofrequency Radiation exposure guidelines.

See the authors here.

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MISLEADING STATEMENT 5

MCPS quotes England's IET which is The Institution of Engineering and Technology as concluding that "No new robust evidence for adverse effects. Policy makers should consider all evidence including cost and benefits of mobile phone use."

Why is this misleading ? Because first, IET is not a public health institution. It is an engineering group whose website is filled with logos for various companies. They have an interest in promoting this technology and you can read their countless documents *all about using radiofrequency in the world*. This is not a scientific organization who understands biology and I am at a loss as to why MCPS would cite this as a public health group. That is tantamount to putting forth information on the toxicity of lead by an organization funded by paint companies.

MISLEADING STATEMENT 6

In the MCPS RF FAQs section on "Additional Information". MCPS shows " statements from major health organizations that have been involved in studying Radiofrequency for years but have not concluded

that Radiofrequency poses any adverse health effects” The entire section is misleading as it is cherry picking specific statements and leaving out others. For example:

MCPS quotes the World Health Organization:

“To date, no adverse health effects have been established as being caused by mobile phone use.”

“Studies to date provide no indication that environmental exposure to RF fields, such as from base stations, increases the risk of cancer or any other disease.”

<http://www.who.int/features/qa/30/en/>

As mentioned and documented earlier in this document, the WHO has far more to say about RF than that quote. For example, later on this very same page it states that *“While an increased risk of brain tumours from the use of mobile phones is not established, the increasing use of mobile phones and the lack of data for mobile phone use over time periods longer than 15 years warrant further research of mobile phone use and brain cancer risk. In particular, with the recent popularity of mobile phone use among younger people, and therefore a potentially longer lifetime of exposure, WHO has promoted further research on this group and is currently assessing the health impact of RF fields on all studied endpoints.”*

MCPS should be providing the whole story and not selectively quoting statements on the WHO’s position.

MISLEADING STATEMENT 7

Previously MCPS stated and then removed the following:

“The 2B classification was based on studies of extremely heavy cell phone use: 1,640 hours or more per year, which is equal to holding a cell phone to the side of one’s head for four hours a day, every day for an entire year.”

The facts:

1. The 1640 hours linked to increased brain tumors in the [Interphone Study](#) pertained to **lifetime cumulative cell phone use** (**not** annually as MCPS falsely states).
2. Heavy use in the long term cell phone research informing the Class 2 B classification **was often defined** as 30 minutes a day over ten years (**not** 4 hours a day as MCPS falsely states). Watch WHO IARC expert Dr. Bann state this clearly in [this video](#) here.

Then MCPS wrote “Using the Group 2B classification of the entire spectrum of radiofrequencies as an indication that Wi-Fi is harmful when the classification came about due to extremely heavy cell phone use and not Wi-Fi does not accurately represent the intention of the classification.”

and “The International Agency for Research on Cancer (IARC) classification of exposure to radiofrequency as possibly carcinogenic was based on heavy mobile phone use.”

MISLEADING STATEMENT 7

What is misleading? MCPS removed it's clearly incorrect fact about what "heavy cell phone use" was but then *did not replace that text with easy to understand information*. "heavy cell phone use" is equivalent to 30 minutes a day and long term research shows an association between this amount of use and brain cancer. *Why won't MCPS post this information?*

MCPS states that "MCPS has made sure to review the exposure limits set by the FCC and the Occupational Safety and Health Administration and have ensured that the wireless networks in MCPS remain well below these established guidelines."

However the Occupational Safety and Health Administration states:

- "There are no specific standards for radiofrequency and microwave radiation issues." [Read it on OSHA's website here.](#)
- **OSHA has stated that RF could act as a cancer promoter:** OSHA also states that, "in 1987, the Hazard Evaluation and Technical Assistance Branch of the National Institute for Occupation Safety and Health (NIOSH) conducted a field investigation into possible health hazards at an acceleration laboratory⁹. NIOSH's report addressed both radio frequency (rf) and static magnetic fields. The report at its conclusion indicates that evidence that rf radiation alone can produce cancer was weak but it might act as a cancer promoter in animals." Read it here https://www.osha.gov/dts/hib/hib_data/hib19900207.html
- **NIOSH lists reproductive damage as concern.** "There have been reports which suggest an association between RF exposure and reproductive damage in animals and humans. These reports, primarily from Eastern Europe and the Soviet Union, list a variety of reproductive and developmental effects resulting from occupational exposures of workers and experimental exposures of laboratory animals to electromagnetic energy at frequencies in the RF and microwave ranges. Reported effects from exposure of women to fields of relatively high intensity RF and microwave energy have included changes in menstrual pattern, increased incidence of miscarriage, and decreased lactation in nursing mothers.¹³ Retarded fetal development and increased congenital anomalies have been noted among exposed offspring.¹³ Laboratory studies have shown that exposure of pregnant rats to RF energy (at levels believed to have been relatively high) resulted in numerous fetal malformations including abnormalities of the central nervous system, eye deformities, cleft palate, and deformation of the tail.¹⁴ There is a report of changes in spermatogenesis (production of male germ cells in the testicles) among workmen exposed to nonionizing electromagnetic energy.¹⁵ Reproductive effects in male experimental animals, including testicular damage, debilitated or stillborn offspring and changes in spermatogenesis, have been reported to be related to exposure to electromagnetic energy at microwave frequencies.^{16,17}"
- **NIOSH validated that nonthermal effects can occur at levels that do not produce heating.** "Absorption of RF energy may also result in "nonthermal" effects on cells or tissue, which may occur without a measureable increase in tissue or body temperature. "Nonthermal" effects have been reported to occur at exposure levels lower than those that cause thermal effects. While scientists are not in complete agreement regarding the significance of reports of "nonthermal" effects observed in laboratory animals, NIOSH believes there is sufficient evidence of such effects to cause concern about human exposures. NIOSH and OSHA recommend that precautionary measures be instituted to minimize the risk to workers from unwarranted exposure

to RF energy.” While this is from a very outdated report it is interesting that his is the information presented on the webpage. Read it here <http://www.cdc.gov/niosh/docs/80-107/>

- “While scientists are not in complete agreement on the interpretation of available data on biological effects, NIOSH believes there is sufficient evidence of such effects to cause concern about human exposures. **NIOSH and OSHA recommend that precautionary measures, as listed in [Section V](#) of the attached [Appendix](#) , be instituted to protect workers from unwarranted exposure to RF energy.**”
- **Read it here.** <http://www.cdc.gov/niosh/docs/80-107/default.html>

It is notable that a [December 2013 Report](#) by the U.S. Department of Health and Human Services Centers for Disease Control and Prevention National Institute for Occupational Safety and Health finds that education on RF and EMF exposures safety is lacking at a site and speaks to [health concerns about low level exposures](#) stating that:

*“Much of what is known about RF biological effects pertains to acute (short-term) exposure; **relatively little is known about the effects of long-term low-level RF exposure.** Human and animal studies show that exposure to RF fields above OELs may cause harmful biological effects as a result of heating of internal tissues. The extent of heating depends primarily on the RF frequency, intensity of the RF field, and duration of exposure.*

However, some researchers have reported that absorption of RF radiation may result in nonthermal effects that occur without a measurable increase in tissue temperature, and at RF field strengths lower than those that cause thermal effects [NIOSH/OSHA 1979; FCC 1999]. Read it here <http://www.cdc.gov/niosh/hhe/reports/pdfs/2011-0097-3200.pdf>

NIOSH pointed to weakness in US standards in 1994 "While the maximum permissible exposure levels defined by ANSI/IEEE C95.1-1992 are similar to those defined by other related publications [NCRP 1986; WHO 1993], NIOSH is concerned about the lack of participation by experts with a public health perspective in the IEEE RF standards setting process. For example, epidemiology studies were categorically rejected as not useful in the process of setting the ANSI/IEEE C95.1-1992 limits. **This lack of public health perspective creates a weakness in the ANSI/IEEE C95.1-1992 standard that should be acknowledged by the FCC in adopting these guidelines for regulating occupational and environmental exposures to RF radiation.**"

“The exposure levels that would be set by the standard are based on only one dominant mechanism -- adverse health effects caused by body heating. Nonthermal biological health effects have been reported in some studies and research continues in this area [NCRP 1986; WHO 1993]. The standard should note that other health effects may be associated with RF exposure and that exposure should be minimized to the extent possible.” page 54 <http://www.cdc.gov/niosh/hhe/reports/pdfs/1993-0424-2486.pdf>

On OSHA’s Hazards locations and Solutions webpage it states:

“Non-thermal effects, such as alteration of the human body’s circadian rhythms, immune system and the nature of the electrical and chemical signals communicated through the cell membrane have been demonstrated. However, none of the research has conclusively proven that low-level RF/MW radiation causes adverse health effects.” [Read it here.](#)

A 2002 Slide Presentation Implement an RF program where exposures exceed FCC "General Population" or Public limits

“Because of the scientific uncertainty, no Federal limits for worker exposures to EMFs have been recommended or established in the United States.” states NIOSH on a webpage last reviewed in 2014. Read it here <http://www.cdc.gov/niosh/docs/96-129/>

It is misleading for MCPS to present this agency as validating that MCPS is compliant when OSHA posts contradictory information on their website. They link to copious information (although very outdated) recommending precautionary measures on their website and talk about “insufficient information” and concerns with the FCC guidelines.

“Research continues on possible biological effects of exposure to RF/MW radiation.” In the first paragraph of their Safety and Health section.[Read it here.](#)

Teachers and staff at MCPS *do* have a possible work safety issue which OSHA and NIOSH has clearly not adequately dealt with. All the information from these agencies websites points to outdated reviews and “insufficient evidence”. In my opinion, this speaks to a dropping of the ball and a lack of accountability to workers. OSHA should responsibly be looking at exposures in schools, hospitals and government buildings now that such buildings have multiple transmitting antennas in addition to cell towers placed on the grounds. This issue has not received the attention needed considering the recent increase in exposure for workers throughout the country. MCPS should not be citing this agency and if so *MCPS should cite which specific regulation* they are even referring to (as no where on OSHA’s website did I find details pertaining to safety in work environments such as schools with dozens of access points, hundreds of cell phones and laptops transmitting continuously.)

PERHAPS THE MOST EGREGIOUS MISLEADING STATEMENT

Under the heading “**What were the findings of the RF Monitoring conducted in MCPS schools?**” MCPS seems to put forth the radiofrequency reading from AECOM as proof that the radiation is not a health risk stating that, “*All of the average power density results were several orders of magnitude below FCC regulatory limits. Note that measurements and regulatory limits were for six-minute time-averaged, whole body exposure. Average power density results were also below recommended levels from non-regulatory agencies, including the IEEE, the ICNIRP, and the Bioinitiative Report 2007.*” MCPS does not actually state that such levels are safe in any sentence but continuously states that the levels meet FCC guidelines. Most parents will view this as a statement that the level is too low to cause harm. Furthermore parents will not understand that such statement is meaningless when it comes to understanding the risk to students and staff.

Such a statement is inaccurate and misleading. Why?

1. 6 minutes is not in accordance with FCC limits for public exposures: In the US, regulations look at averages over 30 minutes, not 6 minutes as was done at MCPS. This is pointed out by [Arthur Firstenberg in his letter to MCPS here](#). Therefore testing was not done in accordance to FCC regulations.

2. Average power density is not a way to understand the effect on biological systems. This report displays average power readings and does not report *peak pulses*. Best available science speaks to the importance of the pulsed nature of the signal. The measurements did not take into account peak pulses and therefore they are not helpful in understanding risk to students.

- Department of the Navy, Aerospace Med Research Laboratory:** In *Some considerations concerning the use of magnetron generators in microwave biological research*, written by Vernon R. Reno for the Department of the Navy, it shows that the waveform, as well as the type of instrumentation used to both create and measure the waveform are important when considering the biological effects of microwave radiation. Reno clearly states that “average” power density is an inadequate metric for assessing the effects on animals in experimental studies. By extension, it should be inadequate for monitoring exposure of human populations as well.

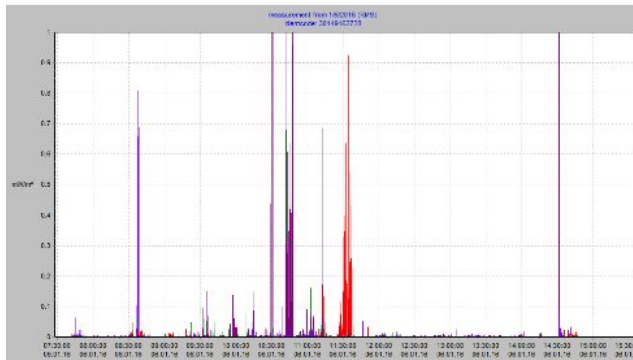
“Pulsed radiation is underestimated when “averaging” is used. That is a simple math fact. This fact is one reason that FCC regulations are outdated. Do the math. See below an example of how averaging is a method that skews understanding exposures. The first Figure shows all frequencies. The second shows just WLAN 2.45 frequencies.

Measurements From An MCPS High School 7:45 am to 3:00pm

All Frequencies Shown Graphed up to 1mW/m²

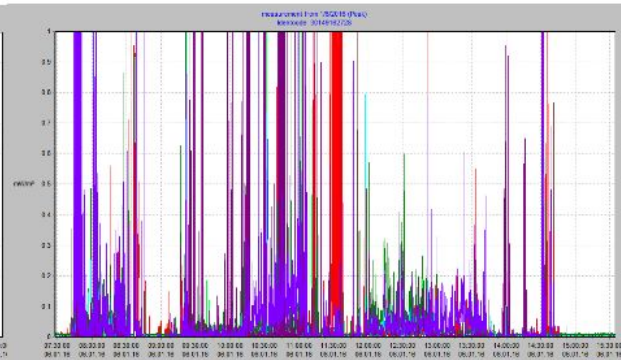
Average Exposures

This is how MCPS measures radiation.



Peak Exposures

This is the actual exposure to the student.



Averaging minimizes the peak levels.

These graphs show the results of measurements done with an ESM 140 Dosimeter worn on the arm for a 2015 school day at an MCPS School.

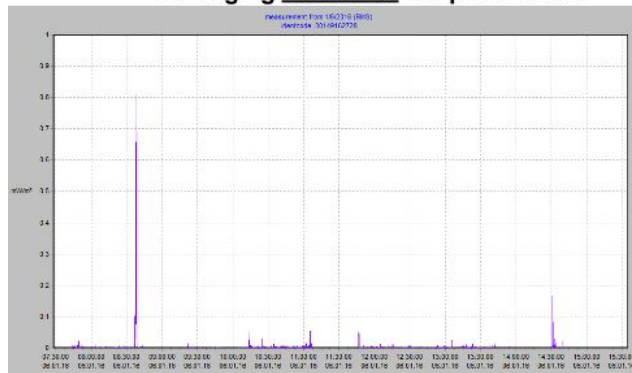
Measurements From an MCPS High School 7:45 am to 3:00pm

WLAN Wi-Fi 2.45 only, Graph until 1 mW/m²

Average WLAN Exposures

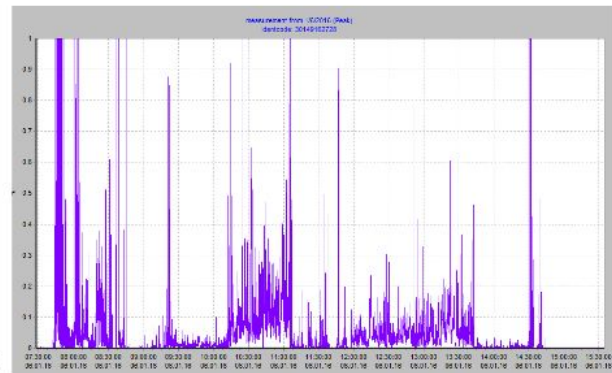
This is how MCPS measures radiation.

Averaging minimizes the peak levels.



Peak WLAN Exposures

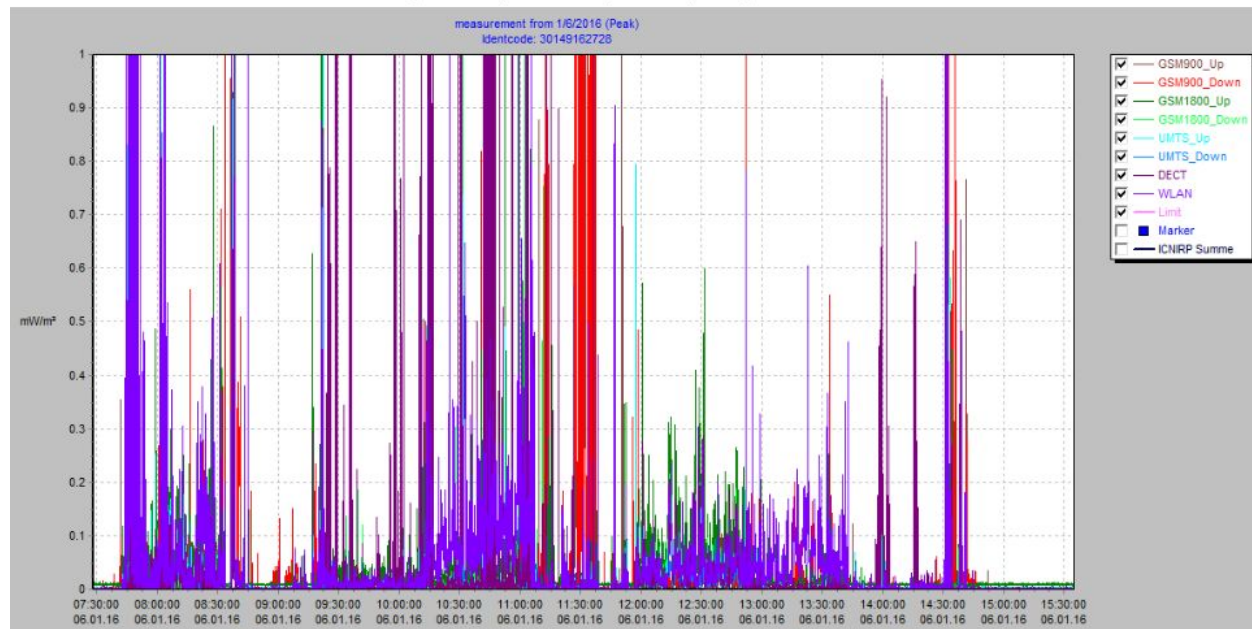
This is the actual exposure to a student.



These graphs show the results of measurements done with an ESM 140 Dosimeter worn on the arm for a 2015 school day at an MCPS School.

A child in a classroom is exposed to the sum of frequencies from transmitters in the room. MCPS only looked at WLAN. Therefore, MCPS did not fully detail exposures in classrooms because they did not account for cell phone use in class as a source of exposure. See below the same graph as in Figure 1 with the Key showing all frequencies.

Measurements at MCPS High School
All Frequencies, Peak Exposures, Graph until 1 mW/m²



The above graphs are from a specialized instrument that took measurements at a local MCPS High School a few weeks ago. A report will soon be prepared showing the results for the community. The Dosimeter used is a ESM-140 and it is able to identify and measure all of the frequencies in the classroom from GSM 900 to WLAN at 2.45 GHz. It does not measure 5 GHz so it in fact is an underrepresentation of exposure in the school.

3. Exposures could be 100 fold more than average power densities. Please read what Mikko Ahonen PhD, Lena Hedendahl MD and Tarmo Koppel MSc wrote MCPS in December 2015

“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).” [Read it here.](#)

4. The RF Summary did not document the transmitting sources in the room measurements were taken. None of the following was noted: Distance from the AP for the Chromebooks tested, Number of end devices in use at the time nor the type or amount of data transferred, Number of cell phones transmitting in room nor their location (some classes have policies stating no phones in the class and others encourage cell phones so that should have been noted) , Location of antennae on Laptop and angle from antennae,

Why is this important? The AP can only service one end user at a time. Multiple end users generates additional EMFs because of the need to reconnect. The closer the end device is to the

AP, the lower the signal strength necessary to transmit the information between the two devices. Similarly, the farther away the end device is from the AP, the stronger the signal that must be employed for the AP to accurately receive and transmit. Yet at the same time, a very close access point results in continuous exposures to those seated nearby. Sitting near an access point when no laptops are in use will present a different exposure than if all laptops are in use. The exposures might be far higher depending on these variables.

Without any of this exposure information, the numbers are simply not useful and do not thoroughly document actual exposure to children in MCPS schools.

Common scenarios are not accounted for in the MCPS Report:

What about the child using the laptop to download a video at a location far from the AP?

What about the child sitting directly under the AP while the room of 30 are downloading a video at the same time?

What about the teacher standing directly under the AP with their head a few feet from the AP while all 30 kids are downloading?

What about the children sitting with laptops on their laps huddled together on the floor close together so in circles of 4 or more children? (that would mean each child is receiving exposures for the other laptops.)

What about the use of cell phones as classroom tools? What about how students transport these cell phones around the school building?

The MCPS Report did not detail these critical scenarios and thus cannot present its “findings” as applicable to the students exposure. It is important to note the I have addressed issues of radiofrequency exposures from laptops as well as cell phones and other wireless devices in my communications with MCPS and yet MCPS did not account for any exposures from cell phones in this measurement report.

MCPS has the students using the MCPS network ON STUDENTS phones. Therefore MCPS is accountable and should be responsible for cell phone exposures as well as any exposures from devices brought in as part of the Bring Your Own Device Policy.

4. Multiple experts have written to MCPS detailing technical concerns about the Radiofrequency report. They state the instrumentation was inadequate, the scenarios were not documented and the measuring set up inadequate to properly represent children’s exposures. Equally important, the reference standards employed are **out of date**. There is a sufficient number of concerns that it seems this Measurement Report *cannot* be used to verify whether the radiation levels are safe or harmful.

“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.”

“ 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).”

-Cindy Sage And Professor Trevor Marshall in their letter to MCPS [found here](#).

“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).”

“In order to assess power density exposure in near field one needs to measure both electric and magnetic field components.”

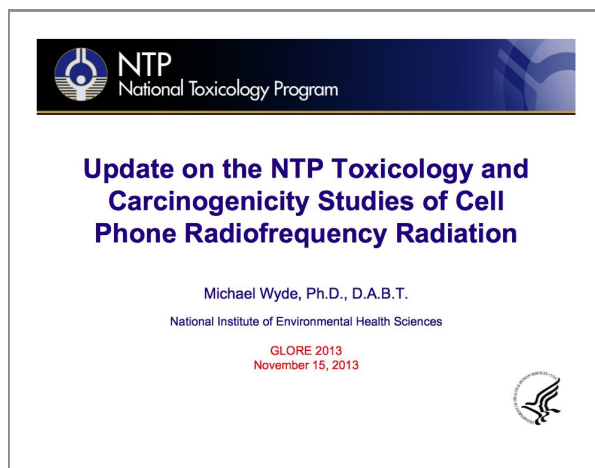
“The MCPS has not provided information about Wi-Fi technology, namely it’s beacon signal.”

-Technical Experts Mikko Ahonen PhD, Lena Hedendahl MD and Tarmo Koppel MSc
[Read it here.](#)

Overall, MCPS’ Website Statement on Radiofrequency is filled with false facts and not therefore a reliable source of information. The MCPS Measurement Report does nothing to progress an understanding of safety at Montgomery County Schools. Therefore there is no proof of safety.

APPENDIX V

The National Toxicology (NTP) Study on Rodents and Radio-Frequency



Objective: To identify potential toxic and carcinogenic effects associated with chronic exposure to modulated cell phone radiofrequency radiation (RFR) and to characterize dose-response relationships in animals.

First proposed in 2001, the laboratory studies on mice and rats examine exposure to frequencies centering around 900 megahertz and 1900 megahertz, as well as the two 2G (second generation) modulations used for voice transmission—CDMA and GSM. The study is

seriously behind schedule.

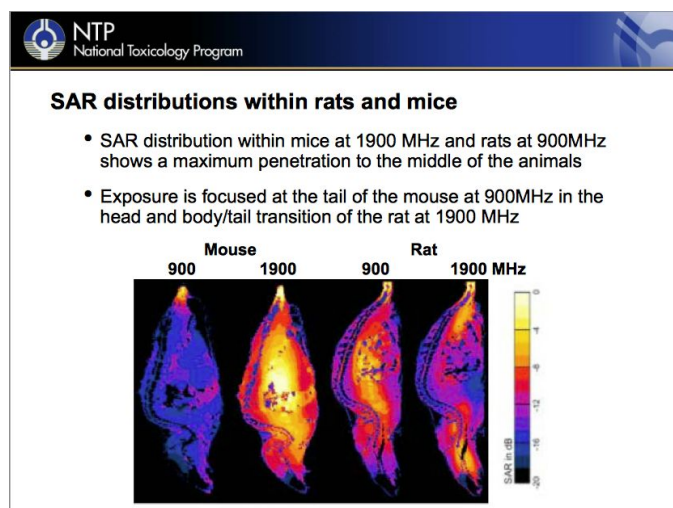
2009 NTP Update: At a [Senate hearing in 2009](#), Dr. John Bucher, Associate Director of the National

Toxicology Program of the National Institutes of Health, made the following apologetic statement regarding the aforementioned \$25+ million NTP research project:

"The pilot studies are nearly complete. Subchronic studies will begin early next year and the chronic toxicology and carcinogenicity studies will start in late 2010, finish in 2012, with peer review and reporting in the 2013-2014 time frame."

See slides from NTP in 2009 about the set up including this image of the mice below.

<http://mommath.cy1000.com.tw/register/download/PPT5.pdf>



"These studies will be conducted at multiple power levels and will include special emphasis on potential adverse effects in the brain. In addition to histopathological evaluations for toxic or neoplastic lesions, special studies will examine effects on the blood brain barrier, neonatal cell migration patterns in the brain, and DNA strand breaks in brain cells."

[Read a fact sheet on the way the study will be set up here.](#)

2013 NTP Report: "Pilot NTP experiments found that rats did respond to both GSM and CDMA cell phone radiation. Those exposed before and after birth gained weight more slowly. The exposure levels were lower than government regulations and low enough to challenge the widely-held view that wireless radiation is harmless. Importantly, the observed effects were dose-dependent." In english this means that these low levels did cause biological changes.

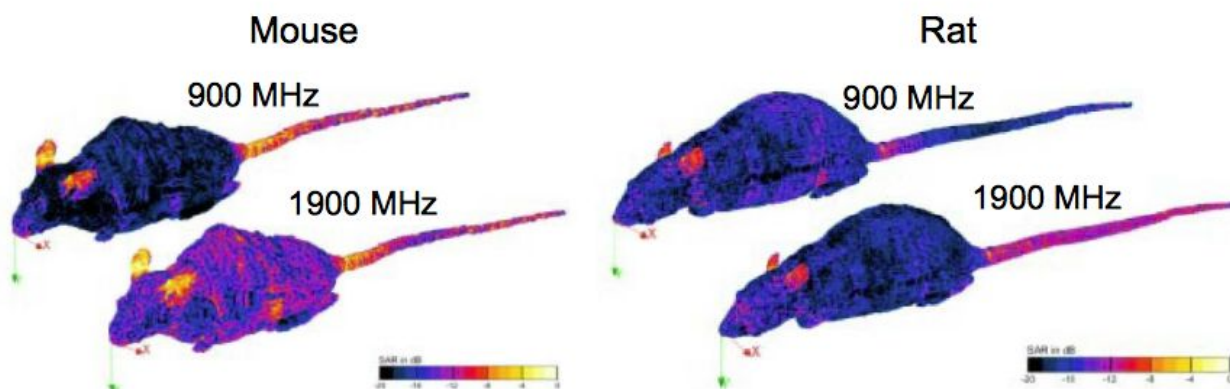
[Read more at Microwave News](#) and see the [Powerpoint Slides from NTP](#) in 2013

**NTP**

National Toxicology Program

Dosimetric modeling study results

- Surface distributions clearly indicated overexposure of the tail in mice at 900MHz and rats at 1900 MHz



- Considerable difference in the whole-body averaged absorption efficiency of the mouse at 900 and 1900 MHz
 - Poor uniformity of absorption at 900 MHz in mice

Precautionary Principle; Diane Hickey Comments, Oct. 30, 2013

Background

This letter has been sent to the Federal Communications Commission (FCC), National Institute of Health (NIH), Federal Department of Education, Fullerton School District Board of Education, the California State and regional PTA. The Fullerton School District school board has remained silent on the health issues that have been brought before them for the last 6 to 7 months. They continue to proceed with their 1 to 1 wireless technology plan and ignore the evidence.

Harms to Our Children's Health from Classroom Wireless Radiation: Enough Is Enough

To: The FCC

Mignon Clyburn, Acting Chairwoman, FCC

Jessica Josenworcel, Commissioner, FCC

Ajit Pai, Commissioner, FCC

I am a mom in Southern California and have a child in a school that is implementing one to one technology in the classroom. It was not until I stumbled upon information regarding wireless radiation that I became aware of the extremely critical health implications of such an environment in which 30+ wireless devices, operating 6 hours/day, 180 days/year for a child's school career, are emitting an unprecedented amount of radiation on our children. In the process, I discovered a bottomless pit of studies and information that attest to the harms of wireless radiation.

The parents do not know that they are sending their children into an environment, surrounded by a Class 2b Carcinogen, classified as such by the World Health Organization. That is the same classification as lead, DDT, and engine exhaust.

In what context would a classroom filled with engine exhaust ever be okay? The parents do not know that medical doctors, scientists, and researchers are identifying the following wireless radiation health effects: ADHD, autism, infertility, DNA damage to human sperm, childhood leukemia, neurological and cardiovascular problems, cognitive dysfunction, pain, fatigue, mood disorders, dizziness, nausea, weakness, and skin problems. The question is: what is this wireless radiation doing to the human eggs in our daughters? Additionally, many of these health problems are not immediately evident and manifest themselves years after exposure, which makes everyone think that there are no harms from these emissions. The parents do not know that research into wireless radiation has been going on for decades and has yielded thousands of studies indicating harm: <http://www.justproveit.net/content/prove-it-initiative-main>

The parents do not know that something that they cannot see, hear, touch, smell or taste is a danger to their children. The parents do not know the numerous websites that have cropped up addressing just the subject of wireless

classrooms:

WiFi In Schools, United States
WiFi In Schools, United Kingdom
WiFi In Schools, Australia
Citizens 4 Safe Technology
Center For Safer Wireless
Safe In School
Safe School
School Radiation Dot Com

The time is past due for the FCC to acknowledge the dangers of wireless radiation. Wireless technology has an implied safety that is dangerous and not justified. People, if they were aware of this information, would feel that there is immediate need for the FCC to step in and re-establish guidelines to ensure the public health.

The general population will begin finding out the following facts about the FCC's role in allowing the unfettered proliferation of wireless radiation on our children and loved ones:

Facts

- 1) The FCC guidelines were last updated in 1996; that was 17 years ago. *Why is that?*
- 2) The FCC guidelines are based on thermal exposure and completely ignore non-thermal biological effects. *Why is that?* Non-thermal effects are the concern with wireless radiation.
- 3) No long-term studies have been funded on the non-thermal effects of wireless radiation. *Why is that?*
- 4) FCC current exposure guidelines allow for millions of times more exposure than our parents were exposed to as children. *Why is that?*

Parents are unknowingly sending their children back to school this Fall into classrooms filled with wireless radiation and there is no choice in the matter.

These decisions are being made for the parents. School districts, when confronted with the harms of wireless classrooms, ignore or discount it because it conflicts with their one to one technology plans. They stand on the FCC's guidelines and tech industry funded studies as reason for safety and are dismissive of parents raising concerns. Wired technology is known to be safe and a healthy choice for our children. Why take the risk with our children's health with wireless?

Parents and the general public are trusting in the FCC to be taking care of this and, clearly, with 1996 guidelines, that is not the case. In the schools,

knowledgeable parents are caught between administrators who falsely proclaim wireless radiation as "totally safe," that there is no "absolute proof" of the harms of wireless radiation, resting on outdated FCC guidelines, and, what is now, decades of research that says it is not.

Please consider the application of the Precautionary Principle, as stated by Joel Moskowitz, Ph.D., Director, Center for Family and Community Health, University of California, Berkeley, in a letter dated February 8, 2013, to the Los Angeles Unified School District writes: "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." Our school children should not be in classrooms with wireless radiation until it can be proved that it is safe.

The urgency of this matter cannot be overstated. The health issues of wireless radiation are not going away. Many of these issues, such as dramatic growth rates of autism diagnosis and ADHD, are unaccounted for. The causes have not been identified. Our autism rate in Orange County CA is now 1 in 63. The FCC has a tremendous responsibility and a great opportunity to step forward and do the right thing. Please, incorporate the Precautionary Principle in the FCC guidelines, now, and call a halt to wireless radiation in our classrooms until it can be proven safe.

Finally, what does it say about us if we, as human beings, do not ensure the safety of our most vulnerable, our children?

Thank you.

Diane Hickey

Fullerton, CA

Precautionary Principle; Monnie Ramsell, Comments, Sep. 4, 2013

FCC 13-84

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Reassessment of Federal Communications)	
Commission Radiofrequency Exposure Limit Policies	)	FCC Docket No. 13-84
)	
And)	
)	
Proposed Changes in the Commission's Rules	)	EF Docket No. 03-137
Regarding Human Exposure to Radiofrequency)	
Electromagnetic Fields)	
)	

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

Comments for FCC ET Docket No. 013-84 and EF Docket No. 03-137

Comment Filed by: Monnie Ramsell
50 Bronco Drive
Sedona AZ 86336

September 3 , 2013

Comment round for ET Docket No. 013-84 and ET Docket No. 03-137

AFFIDAVIT OF Monnie Ramsell

State of Arizona]

Yavapai County]

I, Monnie Ramsell, attest that my statements are true to the best of my knowledge.

Comment round for ET Docket No. 013-84 and ET Docket No. 03-137

My name is Monnie Ramsell . My address is 50 Bronco Drive, Sedona, AZ 86336.

I am a business owner for over fifteen years and I have a Masters Degree in Business Administration.

I have been doing researches on this topic for the past few years. I am enclosing studies that showed EMF and RF are harmful to human health even with the level of the present guidelines.

Federal health and safety agencies have not yet developed policies concerning possible risk from long-term, nonthermal exposures. When developing exposing standards for other physical agents such as toxic substances, health risk uncertainties, with emphasis given to sensitive populations, are often considered. Young children in school with WiFi, the elderly, the sick are among this group of sensitive populations. And the latest assault is smart meters installed in every single home, schools and even hospitals. 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, pregnant women and people with various debilitating physical and medical conditions, is necessary in delineating appropriate protective exposure guidelines.

The FCC guidelines are outdated and not adequate to protect any public health and safety and needed to be revised as soon as possible.

Respectfully submitted by

Monnie Ramsell

50 Bronco Drive

Sedona, AZ 86336

September 3, 2013

Precationary Principle; Kevin Kunze Comments, Aug. 29, 2013

FCC 13-39

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Reassessment of Federal Communications	)	ET Docket No. 13-84
Commission Radiofrequency Exposure Limits and)	
Policies)	
)	
Proposed Changes in the Commission's Rules	)	ET Docket No. 03-137
Regarding Human Exposure to Radiofrequency)	
Electromagnetic Fields)	
)	

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

Comment Filed by: Kevin Kunze
1508 Parker Street, Apartment C
Berkeley, California, 94703
k@kevinkunze.com
(203) 331-5581

August 29th, 2013

AFFIDAVIT OF KEVIN KUNZE

State of California

Contra Costa County

I, Kevin Kunze, attest that my statements are true to the best of my knowledge.

Comment round for FCC ET Docket No. 013-84 and ET Docket No. 03-137

1. My name is Kevin Kunze. My address is 1508 Parker Street, Apartment C, Berkeley, California, 94703.
2. I am an Instructional Media Technician and small business owner.
2. For the past three years, I've been interviewing doctors, researchers, and politicians about the potential long-term health effects from cell phones. Below is a transcript from the documentary. If you would like a copy of this film, please just let me know.

Black screen. A cell phone rings. More phones go off, louder. The ringing stops and there is silence.

KEVIN KUNZE (V.O.)

The first cell phone I ever had was one that I shared with my family. We passed it back and forth whenever my brother and I were going out to the high school football games. I used to pretend like I was Zack Morris on *Saved by the Bell*. When I entered high school, I got my first real phone all to myself. Since then I've owned numerous brands, models, and styles. I honestly can't imagine living without my phone and I'm not only one.

Vintage footage of antique mobile phones.

KEVIN KUNZE (V.O.)

Since the 1920's people have had ideas about wireless communication. In the 1970's, handheld mobile phones began to gain notoriety. Forty years later, cell phones have revolutionized how the world stays connected. They allow us to

communicate information across the globe faster than ever before. They're powerful computers that fit neatly in our pockets. As cell phones continue to evolve, the number of young users is also increasing. In the United States, one third of eleven year olds own their own phone.

Young children talk on cell phones.

KEVIN KUNZE (V.O.)

I experienced this firsthand when I moved to San Francisco and was surrounded by all of the technology sprouting out of Silicon Valley. I gained a newfound appreciation for technology and began to rely on my cell phone more and more. It became my TV remote, my camera on the go, and I even used it to buzz people into my apartment.

Kunze uses his phone in different scenarios.

KEVIN KUNZE (V.O.)

It wasn't until my last year at college I started to think about the real impact technology could have on our lives. Zack, a friend of mine at school told me a story about his father who had been diagnosed with a brain tumor. Alan Marks' family and doctors attributed the disease to his twenty years of cell phone use. It was the first time I had heard a story about a cell phone harming someone.

The screen flickers with static and a 20/20 news report turns on.

DIANE SAWYER

We are going to be raising new questions about the safety of cell phones. You'll remember there were alarming reports a few years ago about brain cancer.

Static changes the channel to FOX.

SHEPARD SMITH

Every cell phone emits some radiation. Whether it's enough to cause cancer most scientists say is still frankly unknown.

Static changes the channel to Comedy Central.

STEPHEN COLBERT

But cell phone manufacturers are looking out for us folks. They recommend that you hold the device 15mm away from your head which conveniently happens to be the thickness of an Amy's frozen burrito. A quick ten minute call to Nanna and lunch is ready.

KEVIN KUNZE (V.O.)

We all know that Stephen Colbert is funny but was this just another case of truthiness? I was surprised to find online that nearly every cell phone manual includes fine print information about radiation exposure and the safer ways people could use their phone. I even looked in my own iPhone manual and found that I also was warned to "keep [my phone] at least 5/8 inch away from [my] body and only use carrying cases or belt clips that maintain at least 5/8 inch separation." Some manuals such as the Blackberry Torch, go as far to say: "keep the device at least .98 inch from your body (including the abdomen of pregnant women and the lower abdomen of teenagers)."

KEVIN KUNZE (V.O.)

Needing to find out whether cell phones could cause harm, I decided to arrange interviews across the country with the top experts. I met with doctors, researchers, patients, politicians, and the telecommunications industry. I hoped through my interviews, I would finally uncover the the truth about cell phone radiation.

Title card: **MOBILIZE**

KEVIN KUNZE (V.O.)

I started locally and learned that in 2010, San Francisco had passed a Right to Know bill to better inform consumers about the potential risks of radiation and the safer ways people could use their phone. The bill was passed unanimously by the Board of Supervisors and former Mayor Gavin Newsom.

GAVIN NEWSOM

Lt. Governor of California

San Francisco Mayor (2004-2011)

Requiring specific absorption rates, which is basically what's emitted in your cell phone to be made available at point of sale when you purchase a cell phone. I can assure you this is controversial legislation.

DEBBIE RAPHAEL**Director, Dept. of Toxic Substances Control, Cal/EPA****Director, Toxics Reduction, City of San Francisco (1999-2011)**

We had to develop regulations to show how we would actually implement the ordinance: what the stickers would look like, what the material will look like that are given out at the retail site. We got slapped with a lawsuit by the telecom industry. The CTIA is the name of the organization that represents cell phone manufacturers and service providers.

KEVIN KUNZE (V.O.)

The CTIA or the Cellular Telecommunications Internet Association was founded in 1984 and is a powerful, multi-billion dollar, trade organization, which lobbies for major cell phone manufacturers and service providers.

A spinning rolodex shows the CTIA board members

KEVIN KUNZE (V.O.)

Their officers and board of directors includes Apple, Sprint, Verizon, AT&T, Samsung, Microsoft, Motorola, Ericsson, Nokia, BlackBerry, T-Mobile, LG, and Qualcomm. The CTIA claims that the safety bill is "alarmist" and would cause "consumer confusion" and "widespread panic." They argue that requiring these precautionary statements violates their First Amendment rights or their freedom of speech as corporations.

JOHN WALLS**Vice President, CTIA**

We think that their activity is certainly false. It's harmful in that it creates misperceptions and that's why we've taken them to court.

KEVIN KUNZE (V.O.)

In spite of the cell phone companies claims, brain tumor victims picketed the CTIA's conference in San Francisco earning major media attention.

LAWRENCE LESSIG, J.D.**Director, Edmond Safra Center for Ethics, Harvard University**

Framework of First Amendment analysis is that it forbids the government from banning and restricting speech. And in the context of providing more information, indeed just adding a bold

mark to information that's already provided by the technology companies, the government isn't restricting anybody's speech at all. It's just making people aware of information that's out there and giving them the opportunity to judge what to do with that information. And I think that's absolutely a legitimate step for the government to take.

GAVIN NEWSOM

There's a lot of studies around the world, particularly with younger people, people who are pregnant, that there could be some harmful impacts. The industry is paranoid of these and is absolutely vehement that that's nonsense and they have all their data to prove that it's nonsense. I actually got convinced that there was something to this and all I said is 'right to know.' I said, "I don't know if it's true or not but I think people have a right to know what this is."

Headlines about the cell phone safety bill and the lawsuit.

GAVIN NEWSOM

The industry came down hard on us. They actually canceled their conference here in San Francisco. I was running for higher office. Trust me this is not an industry you want to infuriate. I'm a big believer in technology. I'm writing a book about this - technology, social media. And I use my iPhone. I love it and I'm not encouraging you not to or discouraging you. But I just think you have a right to know about this so the question is a good one. And we got a lot of grief. A lot of blowback and I'm still paying a big price for that.

An iPhone notepad types out:

**In June 2010, San Francisco passed cell phone safety legislation.
The bill has not been implemented because of the CTIA's lawsuit.**

EXT. 9TH CIRCUIT COURT - DAY

FADE IN:

**CTIA vs. San Francisco
9th Circuit Court
August, 9th, 2012**

FADE OUT:

VINCE CHHABRIA, J.D.

Deputy City Attorney, San Francisco

Part of the reason it's been two years since San Francisco enacted it's original bill is because the policy makers were very conscientious about listening to reasonable objections from the wireless industry about the content of the materials. And the policy makers responded to the reasonable objections. After the city changed it's disclosure requirements, to address many of those objections, that wasn't enough for the wireless industry and they continued to sue. And you're right that this has been delayed for several years now in light of the fact that there is no reasonable First Amendment argument that this ordinance is unconstitutional, it's inappropriate to have further delay.

INT. SAN FRANCISCO CITY HALL

GERARD KEEGAN

CTIA, Director of Legislative Affairs

While these assertions have gained increased public attention currently no scientific evidence establishes a causal link between wireless device use and cancer or other illnesses.

ERIC MAR

San Francisco Supervisor, District 1

There's a Shoemaker study from the British Journal of Cancer from 2005 showing an 80% risk of acoustic neuroma on the same side of the head as reported phone use was found for people who used cell phones for 10 years or longer. The Sadetzki study from the American Journal of Epidemiology showing a 49% - 58% risk of salivary gland tumors among the highest value users on the side of the head where the phone is used. And lastly the study from 2007 from the Environmental Health Perspectives showing and analyzing 59 peer reviewed publications found that those funded by the industry, I guess your industry, were 10 times less likely to show adverse effects associated with cell phone use compared to those studies funded by public agencies or public health charities and other groups. Could you just respond to those?

GERARD KEEGAN

Sure. First, we don't fund any studies here in the United States. CTIA's not involved in researching anything.

KEVIN KUNZE (V.O.)

Mr. Keegan's statement wasn't exactly true. In 1993, when fewer than 1% of Americans used cell phones, the mobile phone industry faced a serious challenge to its public reputation. David Reynard filed a lawsuit against Motorola claiming that cell phone use had caused or accelerated the growth of his wife Susan's brain tumor. Susan died a month after filing the lawsuit, David spoke out on Larry King Live.

DAVID REYNARD

Well we're suing the carrier. We're suing the manufacturer.

KEVIN KUNZE (V.O.)

The negative publicity generated by the episode caused telecommunication stocks to lose more than 10% of their value and within the next decade, dozens of additional lawsuits would follow. To ease public concern and avoid government pressure, the CTIA, in partnership with the federal government began a \$28 million dollar research program called Wireless Technology Research led by George Carlo. Carlo's job was to produce a body of studies on the human and experimental impacts of cell phones. Carlo had no previous experience with radiation research but had conducted research for Dow Chemical, the Chlorine Chemistry Council, and Philip Morris, which tried to produce a 'safer cigarette.'

KEVIN KUNZE (V.O.)

The Wireless Technology Research studies were primarily funded by the CTIA, the same association that's currently suing over the cell phone safety bill. Carlo's industry-sponsored studies would be over after only six years. Photos of Carlo fishing with then CTIA chief, Tom Wheeler suggest the two got along quite well. However, when Carlo's research began to show biological damage, his relationship with the CTIA turned sour. Documentation shows that Carlo suggested a second run of studies for \$50 million but was denied by the CTIA.

GEORGE CARLO, Ph.D.

When they found that we had findings of genetic damage and increasing the risk of cancer, they cut off our money completely.

KEVIN KUNZE (V.O.)

Shortly thereafter in 2001, Carlo released a book about the industry's suppression of research with journalist Martin Schram entitled Cell Phones: Invisible Hazards in the Wireless Age. To

date Carlo's studies are one of the largest U.S. research efforts ever conducted on cell phones and the potential health effects.

GEORGE CARLO

There are no studies that have been done on people that use mobile phones that provide conclusive evidence of safety. Now the industry spins the science and they put it out there for public consumption as though these studies are evidence of safety. It is scientific fraud.

KEVIN KUNZE

Around the same time Carlo's studies were being defunded, President Bill Clinton and Al Gore passed the Telecommunications Act of 1996, which deregulated the cell phone industry by allowing them to control placement of cell towers regardless of health or environmental concerns. In 2012, the CTIA invited Clinton to deliver the keynote speech at their conference. Other previous CTIA speakers include President George Bush Sr. and Gore. **In 2013, President Obama nominated cell phone lobbyist Tom Wheeler to be the next chairman of the FCC, the organization which regulates the radiation levels for cell phones.**

INT. CETECOM Phone Testing Facility

FADE IN:

CETECOM
Cell Phone Testing Facility
Milpitas, California

KEVIN KUNZE (V.O.)

To find out more about the radiation exposure from phones, I arranged an interview at CETECOM, an accredited cell phone testing facility with about 20 years of experience in mobile technologies. CETECOM is a neutral partner of the industry that ensures they meet international safety standards for radiation exposure. They have labs all around the world but I went to their facility in Northern California to have my phone tested.

HEIKO STREHLOW
Director, Compliance Services, CETECOM

The Daisy system is a system to scan the radiation, which is emitted from a mobile phone and absorbed by your body or brain. The Daisy system is computer controlled executing first an area scan to determine the so called "hot spot" of radiation.

DEBBIE RAPHAEL

What's interesting about the regulation of cell phones is it's looking at the heat effect so SAR (Specific Absorption Rate) is how much heat is absorbed into the head, into the body. The way they measure the penetration into the head is they take a fake head, a model of a head and they assume that there's an ear that's 10 mm thick. And then they put the cell phone next to the ear so 10 mm away from the head and then they stick a probe inside that fake head and see how much heat is absorbed. So there's some assumptions with that. Number one is that everyone's got the same head size as a 200 lb male and the other is that everyone's ear is 10 mm thick and that you're not pressing your phone squishing it to your ear to get it closer. So those are the assumptions that are made for the head.

DEVRA DAVIS, Ph.D., M.P.H.

Former White House Health Advisor

The specific absorption rate or SAR of phones was first developed almost two decades ago based on the top 10% of military recruits. This Standard Anthropomorphic Mannequin, we call him SAM for short, stood a little more than 6'2, weighed a little more than 220 lbs. His head weighed about 11 lbs. His brain is bigger, his skull is thicker than most of the world's cell phone users today. When my eight month old grandson showed that he was really smart with a phone, I began to get curious about what we knew about cell phones and what I found really concerned me. I learned that other countries, mainly Israel and England, had already issued warnings that children should not even use cell phones. Then I began to do research on this about seven years ago. The brain of a child absorbs twice as much radiation as an adult. That's a stunning fact, few people are aware of it. And we're marketing phones and pushing advertising with E-Trade babies talking into cell phones and children running businesses with little phones as though they're benign devices.

JOEL MOSKOWITZ, Ph.D.

Director, Center for Community Health, UC Berkeley

I don't think SAM and whole the test of the SAR is a good simulation in terms of the typical user today. These tests have been mandated since 1996 with an act that the Federal Communications Commission regulates. The problem with the SAR is that it assumes that there is a thermal mechanism and that there is only a thermal mechanism that can harm you namely heating and yet we know quite well now that the harm being produced by these phones is not due to a heating mechanism.

DEBBIE RAPHAEL

What's been interesting about the science now is that we're learning that there are different ways that the brain might be affected by cell phones beyond heat. There's a new study that just came out showing that the brain cells are stimulated when a cell phone is on. You're not on the phone, the cell phone is just on next to your head. So it's communicating to that cell tower, it's going into your head at the same time and it's causing chemical changes in your brain cells showing some sort of activity. So that's interesting. That's not part of the regulatory process. That's not part of the safety determination at this point in the way the FCC is regulating cell phones.

HUGH TAYLOR, M.D.

Director, Yale Center for Reproductive Biology

Even when you're not talking on the phone, as long as the phone is turned on, it is emitting radiation. It is in constant communication with the tower so you do not have to be talking on the phone 24/7 to have an exposure 24/7. If you're pregnant and walking around with your cell phone in your pocket near your abdomen or in your handbag held next to your abdomen or clipped to your belt you're getting that exposure continuously. Radiation varies with the square of the distance from the object that's emitting the radiation so you move it twice as far away you might have a fourfold reduction in the amount of radiation exposure. It doesn't take a lot of distance to start dramatically reducing your exposure.

STEVE WOZNIAK

Co-Founder, Apple Inc.

Well I'd been into radio and ham radio all my life so I had heard such things about radio phones, ship to shore telephones and these sort of things. Even before we had what we call smartphones, there were phones that were kind of doing a lot of those things. Eventually, phones worked themselves up to the way Blackberrys could do messaging. Then it moved up to where Blackberrys used real cell frequencies and got higher bandwidth and started building in ability to do internet. The radio frequencies in today's cell phones often include GPS (operated on one frequency up to some satellites), cellular (operating to the nearest towers and switching towers and frequencies all the time), Bluetooth is often built in to speak to headsets or your car hands free arrangement, and Wi-Fi so you can tap on to Wi-Fi networks.

STEVE WOZNIAK

Four different radios in one place! Radios tend to interfere with each other. You have to isolate them, you have to test them, you have to find in the laboratory you have to find exactly what compartments, parts, placement. Move something a couple millimeters sometimes fixes a problem. Or put a little metal shield between two pieces. It's a very difficult thing to have two radios in one place. You know one radio's tough to begin with. Two radios they interfere with each other. Three, four! It's a nightmare. And how do you get them inside, so small, with the antennas inside the case.

HEIKO STREHLOW

The system is capable of testing multiple antennas at one time if these antennas are capable to transmit at the same time on the same frequency. The measurements are done frequency dependent, which is of course a limitation by the liquid. We use different liquids for the different frequencies for example different liquids for 850 MHz cellular frequency or 1900 MHz cellular frequencies. The different liquids used for testing are developed by the FCC and corresponding agencies for example ANCE, in order to simulate both head liquid or brain tissue, dielectric properties, and body tissue.

RENEE SHARP, M.S.

Senior Scientist, Environmental Working Group

The liquid that is used in these models. How confident do we feel that this liquid is really truly representing our brain tissues accurately? I think that's a good question.

LELAND YEE, Ph.D.

California State Senator, District 8

As a child psychologist I know that the child's brain is very susceptible to outside influences. It is still developing, it is still maturing.

KEVIN KUNZE (V.O.)

Many companies sell products that encourage babies to play with cell phones including Fisher Price's Apptivity Case. This baby rattle, which can hold an iPhone4, is recommended for toddlers 6 months or older.

LELAND YEE, Ph.D.

We've got to take a more precautionary note. There's good evidence now that indicates the harmful effects of these cell phones to human beings, particularly to children that one ought to be very very careful and cautious about buying and making these kind of toys to young individuals.

HEIKO STREHLOW

Modern antenna device has to compromise for many different scenarios. Phones are held to the head. They can be used body worn so the manufacturers, developers have to accommodate for all these different cases and find the best compromise in order to minimize the impact on the human body and brain but at the same time maintain best connectivity toward the network.

DEBBIE RAPHAEL

For the body, the assumption is that you're wearing the phone in a holster outside your pants. That distance is anywhere from half an inch to an inch away from your body. So if you are using the phone differently than that, if you are putting it in your pocket, which is obviously not a half to an inch away from your body, it's not clear how much you're absorbing compared to the safety factor.

JOEL MOSKOWITZ, Ph.D.

Keeping the phone a reasonable distance away from your body substantially reduces the amount of radiation you're being exposed to. You also have to be aware of where you keep the phone on your body when you're carrying it around, particularly if you're a male, you keep it in your pocket. There's at least eight studies that I've found that have shown evidence of sperm damage.

DAVID CARPENTER, M.D.

Founding Dean, University at Albany School of Public Health

The evidence to date shows clearly that men who have their cell phone in their pocket or on their belt leaving it on for long periods of time suffer reduced sperm count. Nobody has really done this study yet but I will predict that men that wear their cell phone on the on mode on their belt are going to be found to have elevated risks of GI cancer, prostate cancer and other pelvic cancers.

KEVIN KUNZE (V.O.)

According to research conducted in the following nations cell phone radiation was found to damage sperm: the United States,

China, Australia, India, Poland, Japan, Turkey, Hungary, and Greece.

HEIKO STREHLOW

The typical test duration is extremely variable. So for a single scan, that means for one setup the test duration is typically between fifteen and twenty minutes plus setup time.

RENEE SHARP, M.S.

Who uses their cell phone for just 15 minutes over the course of their whole life time? No one. We're talking about very long term exposure; using a cell phone for probably more than 15 minutes every single day for years. When know from about 10 studies that cell phone radiation can damage sperm or decrease sperm count and this is concerning because we also know that there are many countries around the world that are seeing sperm count declines and increases in infertility rates including the U.S., China, many other countries. Now I would never say that these overall declines in sperm count and declines in infertility are caused directly and only by cell phones. It's probably a large number of different factors.

KEVIN KUNZE (V.O.)

Numerous medical experts have issued warnings about cell phones and sperm damage telling users, "[Their] future is in [their] hands." But new research from doctors at Yale has shown pregnant women may also be at risk.

INT. YALE CENTER FOR REPRODUCTIVE BIOLOGY

FADE IN:

Yale Center for Reproductive Biology
New Haven, Connecticut

FADE OUT:

HUGH TAYLOR, M.D.

They had the same environment, the same diet, the same exercise regiment, they were the same genetic background. The only difference between our mice were one group had an inactive cell phone and the other had an active cell phone. We chose to look at the effects on the fetus, the exposure during pregnancy because in the fetus the brain is still developing. It's one of the most fragile and vulnerable times. The cell phones were then removed

at the time of birth and we watched these mice as they developed became adults and what we found were lasting permanent effects in their behavior based on whether they were exposed to cell phones or not.

HUGH TAYLOR, M.D.

The mice that were exposed to cell phones had very different behaviors. These mice were more active. They were in some sense hyperactive. They had decreased memory. They were not able to recognize objects with repeated exposures to the same object. In some sense this resembles attention deficit hyperactivity disorder that we see in children or ADHD. This is a disease that is increasing in the United States and has paralleled the increase in cell phone use. What we find in mice may not necessarily be true for humans but certainly it does show that these biological effects are real and it gives us concern and shows the importance of investigating this further in humans.

An iPhone types out:

WHO Knew

STEPHEN COLBERT

But it turns out that my cell phone may be a hazard to me because the World Health Organization is now warning that cell phone use is quote "possibly carcinogenic to humans." Possibly? Well then I am possibly crapping my pants. Isn't there a simpler way to put this?

World Health Organization Press Recording

CHRISTOPHER WILDE, Ph.D.

I'm pleased to have with me in the IARC studios Dr. Jonathan Samet, Chairperson of the IARC working group.

JONATHAN SAMET, M.D., M.S. U.S. National Cancer Advisory Board

We reviewed all relevant epidemiology studies finding evidence particularly coming from the two largest such studies that wireless phone use was associated with higher risk for glioma, a malignant type of brain cancer, particularly in those who had the most use. These studies were carried out between roughly the major studies 1997 til 2003, 2004. There were a number of

individuals in these studies who had used their phones as long as ten to fifteen years but that is approximately the longest window on which we have observation. So we don't know what may happen as people use their mobile phones longer and longer and presumably and potentially across their full life spans.

STAN GLANTZ, Ph.D.

Director, Center for Tobacco Research and Education, UCSF

The conclusion by IARC that cell phones radiation is a class 2B human carcinogen got a lot of people's attention. I think that the level of seriousness with which this issue was being considered got ratcheted up quite a lot partially because IARC does have a reputation of being so cautious and so hard to convince of anything. I mean if you look at this list of Class 2B carcinogens that IARC has, many of them, things like diesel exhaust, are identified as proven human carcinogens by organizations like the California Environmental Protection Agency. So if you look at environmental toxins broadly, anything that makes it on the IARC list - you know there's very strong evidence of the problem.

DAVID KATZ, M.D., M.P.H.

Director, Yale Prevention Research Center

I think it's important that the World Health Organization has identified cell phone use as a potential cancer risk and I agree with the conclusion. I think what really pertains here is the precautionary principle. The burden of proof is on the industry and on those who want to say there is no risk involved. And the simple reality is that epidemiological data are inconclusive but what they suggest is that there is an unexplained increased incidence of cancer with long term use of cell phones and the cancers tend to occur preferentially on the side of the brain closest to the handheld phone. Of course, the big worry is that children are now using mobile phones extensively and that was never the case before so we're now looking for the first time at lifelong exposure, decades of exposure, and nobody knows what the implications of that might be.

An iPhone types out:

The Interphone study ended in 2004.

**Final results from the study weren't published
until seven years later in 2011.**

DAVID CARPENTER, M.D.

Well the reason was that there were a number of people who were part of that Interphone team who were absolutely adamant that cell phone use had no biological effects. And they refused to accept the evidence that the study demonstrated. While other people on that team felt that the results showed that there was a statistically significant risk and that this risk was real not an artifact of the study design. So they were at loggerheads and could not agree until a new director Christopher Wild was appointed to head the International Agency for Research on Cancer and he basically banged their heads together and said you must publish it. But the agreement was then to hide the significant results in the appendix and to have the headlines and the abstract read as though there was no relationship. I think in my judgement this is simply scientifically unethical.

JACK SIEMIATYCK, Ph.D.

Canadian Interphone Study, IARC Panel Member

My own feeling is that there is no compelling evidence that there is a relationship between cell phone use and brain cancer but there are some pieces of evidence that still point in that direction and that have not been adequately explained.

DAVID CARPENTER, M.D.

Age is important even though the Interphone study did not look at children. The work of Hardell and his colleagues in Sweden suggests that there is a fivefold greater risk of development of brain cancer if you're under the age of twenty when you began to use a cell phone. This is a study by Hardell and Carlberg published in the International Journal of Oncology in 2009. For use of a cell phone if you're under the age of twenty, they report an elevated risk of 7.8 statistically significant for ipsilateral cancer - brain cancer. Whereas if you're between the age of 20 and 49 the risk is 2.1, and if you're over the age of 50 the risk is 1.8. This is clear evidence that younger individuals are more likely to develop a brain tumor. Certainly one wants to have confirmation of reports and not take results from only one study or one particular research group but the evidence is very strong that younger people are more vulnerable to the development of brain cancer as a result of using a cell phone.

JOEL MOSKOWITZ, Ph.D.

And much to my surprise we did indeed find a significant association between tumor risk and mobile phone use and that includes cordless phones as well as cell phones. When you look across the twenty three studies you don't see the effect. However

if you partition the studies based on the research quality of the funding source and they're highly confounded you find two distinctly different patterns of results. And the non-industry funded studies found a consistent pattern of harmful effects and the effects grew stronger when you looked at people who used the phones for ten or more years or you looked for tumors on the side of the head where people reported using their phone the most.

JONATHAN SAMET, M.D., M.P.H.

Here I think it might be reasonable to look for ways to fund research that involve the industry as a partner in identifying ways to provide funds to researchers. There are models for government industry cooperation, the Health Effect Institute for example which supports research on air pollution is strongly funded by the U.S. EPA and the automotive industry. So I think seeking funding models to support research in a peer reviewed vigorous fashion is potentially a good idea.

DAVID CARPENTER, M.D.

It sometimes is easier to get funding from industry but industries, whether it's chemical industries or telecommunications companies, have a point of view - have a conflict of interest. They want results that are consistent with their bottom line. And even if that industry does not interfere directly in interpretation of the results. There is a pressure on the scientist that's doing the study to give the industry what they want because that is going to increase the probability that they could get more funding from that particular industry.

KEVIN KUNZE (talking to Samet)

So based on the IARC announcement a lot of other countries have started to take precaution-

JONATHAN SAMET, M.D., M.P.H.

Let me just check one thing.

Samet unclips his mic and walks out of the room.

An iPhone types out:

\$ELL PHONE

A scene from *Thank You For Smoking* with cell phone lobbyists.

NICK NAYLOR
Is it true?

CELL PHONE LOBBYIST 1
It could be.

CELL PHONE LOBBYIST 2
There are very few cases.

CELL PHONE LOBBYIST 3
It's not scientifically proven.

NICK NAYLOR
Look, gentlemen, practice these words in front of the mirror. Although we are constantly exploring the subject, currently there is no direct evidence that links cell phone usage to brain cancer.

The men breathe a sigh of relief.

CUT TO:

**Senate Committee on Environmental Quality
Sacramento, California**

**JOE SIMITIAN
California State Senator (D-11)**

I guess what I'm having trouble understanding is the argument that you're making which is that there is no issue here because the FCC has clearly chosen to address this as an issue worthy of their consideration. I mean you made the case, and I thought it was an important point, that there was a margin of error essentially fiftyfold. But my point is that if there is a margin of error fiftyfold now we're arguing not about whether there's an issue but about how serious of an issue it is and I think that's an implicit acknowledgment that there is an issue and please feel free to suggest to me where the flaw in my reasoning may lie.

**DANE SNOWDEN
Vice President, CTIA (2005-2011)
FCC Chief, Governmental Affairs (2001-2004)**

Well I think that you're assuming that the phones are getting to a point well above the fiftyfold safety factor, which is never happening. And that is important because how we comply with the FCC's standard based on information here.

Snowden points at some papers on his desk.

JOE SIMITIAN

No let me interrupt and make my comments clearer. Clearly there is a debate going on out there and clearly the fact that there's a debate has been recognized by the FCC then I'm harder pressed to understand the argument, Mr. Snowden.

DANE SNOWDEN

I would disagree with your last statement that there's a debate going on out there particularly among the scientific community and the governmental bodies they're responsible for doing this-

KEVIN KUNZE (V.O.)

It's interesting Mr. Snowden would say this considering his former work experience was with a governmental body responsible for regulating the safety of cell phones. Prior to joining the CTIA, Snowden worked for the Federal Communications Commission as the Chief of Consumer and Governmental Affairs. Then in 2004, he went to work for the CTIA, the organization he was regulating. Snowden left CTIA shortly after this video of him from a hearing was posted online.

DANE SNOWDEN

It tells you that we're not making this up. And I'm going to be very clear. Industry has not said once...once...that cell phones are safe.

DANE SNOWDEN

There's no debate with the FCC. There's no debate with the EPA. There's no debate with the World Health Organization. There's no debate with the National Cancer Institute or the FDA.

JOE SIMITIAN

Well then let me interrupt you again and say tell me why your manufacturers have put this information in their brochures? This is a-

DANE SNOWDEN

To comply with the FCC standards.

Laughter comes from the crowd at the committee hearing.

JOE SIMITIAN

You know candidly what I'm wondering is: is it there in order to avoid liability if and when a problem does arise?

DANE SNOWDEN

There was a big laugh when I said to comply with the FCC's standards but that is why it's there. If you read the OET bulletin it clearly states what we're supposed to say and it gets to even suggested language as to what we should say.

JOE SIMITIAN

Then if it's in your brochure because the FCC told you to put there,
your argument is we don't want the consumer to see the language that the FCC wants them to see.

KEVIN KUNZE (V.O.)

In order to get clear answers, I went to the CTIA's Conference held at the San Diego Convention Center. I met with John Walls, a former Fox Sports Anchor and current spokesperson for the CTIA.

JOHN WALLS

Ummm I don't want to talk about what a federal agency does. That's not- I'm not privy to their processes. I know that there's an interagency working group. A collaborative working group of about ten federal agencies that deal with radio frequency issues. We completely defer to what the science is and the science according to the National Cancer Institute-

JONATHAN SAMET, M.D., M.S.

U.S. National Cancer Advisory Board

The most important bottom line out of it was an increased risk in those in the highest decile, the highest ten percent.

JOHN WALLS

...the American Cancer Society...

OTIS BRAWLEY, M.D.

CMO, American Cancer Society

They consider cell phones a possible cause of brain tumors.

JOHN WALLS

...the World Health organization still...

ALI VELSHI

Journalist, CNN

The World Health Organization has added cell phones to the list of substances that are possible carcinogenic, meaning they might cause cancer.

JOHN WALLS

-the FCC, the FDA. There's a litany of organizations on whose opinion or position we put great credence and we suggest other people do that same.

DAVID CARPENTER, M.D.

To my mind, this is equivalent to people in the Middle Ages saying the Earth is flat because you can't see the horizon. These are not people who have an expertise in health effects and they are simply denying the evidence from multiple sources.

JOHN WALLS

We look to what the agencies say and that is what a well educated and well informed and balanced person would do too.

KEVIN KUNZE

Has the CTIA ever lobbied to these organizations?

JOHN WALLS

Sure. As far as educating them to what we think is appropriate in terms of the relationship or responsibility - San Francisco for example. We had numerous meetings with the city of San Francisco. If you want to call that lobbying or discussion, whatever you want to call it. We have been very clear with that group what our intent is. We haven't hidden behind any - there's no hidden agenda here.

DENNIS KUCINICH

U.S. Congressman (D-OH) (1997-2012)

From the last year on record, the telephone industry and associated communications industries spent close to \$65 million dollars in lobbying. That buys them a pretty loud voice on Capitol Hill. You can call that pressure. You can call that 'an opportunity to inform members about their concerns.'

INT. CTIA CONFERENCE

KEVIN KUNZE

Do you guys lobby financially to any of these organizations or politicians?

JOHN WALLS

No - no. I mean, to say, we make contributions to politicians but I- Nobody has any role in this whatsoever. Not that I'm aware of. But we do go to the FCC. I bet our people, our organization have had 500 meetings with the FCC over the past year on 25 different topics. So the fact that we would ever go to the FCC, if somebody thought that unusual they don't understand what's going on in regard to the give and take in the form relation of policy.

RENEE SHARP, M.S.

So the city of Burlingame in California was having a hearing on their own cell phone ordinance that was going to educate people about the potential effects of cell phone radiation. And what was interesting was that literally the day before or the day of the hearing, the FCC took down the information that they had on their website that addressed what consumers could do to protect themselves from cell phone radiation.

The FCC's site on cell phone radiation before and after the hearing.

MICHAEL BROWNRIGG

Burlingame City Council (2009-2013)

When it comes to the federal government, it would be helpful to have the FDA or one of the health agencies involved with it so one didn't have the feeling that the FCC, which is principally working with industry... It sometimes feels as if the FCC is working against local and state governments.

DENNIS KUCINICH

This is an industry that has a staggering presence in our economy. Over \$408 billion dollars in the last year in sales. Over \$21 billion in profits. Any change in the public awareness or any public apprehension of the issue would cause sales to drop and profits to drop. There's just no question about it. So I think that the industry is very concerned not to participate in any kind of form that would raise questions about safety concerns. So they don't.

An iPhone types out:

In 2008, a Congressional hearing was held on cell phones and the health effects. The CTIA was invited to speak but refused to appear.

Congress footage of Kucinich from September 25th, 2008.

DENNIS KUCINICH

The CTIA, the association of the wireless telecommunications industry declined our invitation to testify. By their refusal, unfortunately they deny this Congress and the public the benefit of their testimony and the opportunity to pose questions and hear answers.

KEVIN KUNZE (V.O.)

Because a national cell phone safety bill wasn't implemented several cities and states across the U.S. began to introduce their own precautionary legislation. To find out more about the east coast bills, I went to Portland, Maine to interview politicians and activists.

The following states turn red on a map: Maine, California, Oregon, Pennsylvania, New York, Connecticut, Wyoming, New Mexico, Hawaii, and Florida.

CUT TO:

Stuart Cobb pours out a plastic bag full of seven cell phones.

Stuart Cobb used a cell phone since age 19.

STUART COBB

Brain Tumor Patient

This is the very first flip phone I ever bought - Motorola. My second flip phone I ever bought.

He was diagnosed was a brain tumor at age 34.

STUART COBB

Then this is the first- Actually, I didn't mind this one because it was a push to talk. Then this is the first kind of smartphone I bought. Then this was my first Blackberry. And this is the last phone I own. Blackberry, a newer one. I think it's 3G or something.

KRISTEN COBB

The company that my husband worked for would supply cell phones for all their employees. When my husband was diagnosed, the day before my daughter's birthday, it was heartbreaking hearing it from the doctor that he had a brain tumor. My heart sank, I felt like I couldn't hear. I became dizzy and I just felt like my whole world just felt like it was crashing. What stuck out the most the day he was diagnosed was his physician asked him a variety of questions and the last two questions were: How often do you use your cell phone? And I'm thinking to myself what an odd question to ask.

NICK MAVODONES

Mayor, Portland, Maine (2010-2011)

I and other neighbors knew Stuart was sick and a very young man with a brain tumor and his doctor felt it could be attributed to his cell phone use and in fact he had a lot of cell phone use since he was a fairly young man. So Stuart brought it to my attention and I offered to sponsor a resolution at our city council making October of 2010, Cell Phone Awareness Month in the city of Portland.

STUART COBB

I had an awake craniotomy. So in other words I was awake through the whole surgery. The recovery was pretty long. I mean after the surgery, I couldn't talk or walk. So I had to relearn how to walk and talk over again. It's just hard being so active during your life and then have everything come crashing down around you. And basically, I've lost my whole career because of this. I've been a hard worker my whole life. This isn't like me - not being able to provide for my family. Currently, I'm on Social Security at age 36.

STUART COBB

I always held it on my right side, right here. The industry should have put warnings on these phones a long time ago.

KRISTEN COBB

We learned that there was a state representative, Andrea Boland, that lived in our state, that actually tried to get warning labels like a month prior I believe. And we were just shocked because we listen to the news, we read the paper and we hadn't a heard. You know I'm like, how could this have happened in our own state and us not know.

ANDREA BOLAND

Maine House of Representatives

Wireless industry has been very powerful in trying to confuse the issue but that's what big industry lobbyist do. They did it was tobacco. They did it was asbestos. The adoption will really I think only come with more media attention and more public outcry.

An iPhone types out:

In 2009, Main Representatives voted no to pass a statewide cell phone safety bill.

MINDY BROWN

Brain Tumor Widow

My name is Mindy Brown, my husband was Dan Brown. He was a defensive coordinator at Fresno State football team. He died March 13th, 2009. Just 18 months ago. I'm here because I'm supporting Mayor Newsom for this bold move that he's making. You guys don't know how much awareness- if anything it's bringing to the nation. People need to know. We didn't know. We didn't know your phone emits radiation. We joked about it. When my husband's ear would get bright red. He'd have to hold his phone out to here on his recruiting calls. He lived on his phone for two decades and it ended up killing him.

She holds up a photograph of his brain tumor.

MINDY BROWN

Here's a statistic, this is my husband. You're looking at him face forward just like you looking at. Here's his ear canal. You hold the phone up, ear canal, tumor.

INT. CALIFORNIA STATE CAPITOL

JOE SIMITIAN

Before we go to witnesses in opposition, Senator Strickland.

TONY STRICKLAND

California State Senator(D-19)

Let me say my heart goes out to the families. And here's one that really caught my eye. And Senator again as you know, we always get conflicting information from different organizations and different research. But this one actually has a chart. And I'm sorry I can share this after. It has a chart of growing cell phone usage among people. Dramatic, right? But then brain tumors is flat lined. So if there's such a dramatic increase in use of cell phones, why is the brain tumor not following. If it's because of the cell phone use, why is the - flatlined and not growing with the amount of cell phone usage. I mean those are the kind of questions and this is the one chart that really caught my eye.

An iPhone types out:

These statistics do not take into account data after 2006.

DAVID SERVAN-SCHREIBER, Ph.D., M.D.

Author, *Anticancer: A New Way of Life*

Realizing that I knew a lot less than I thought I did, I went to the scientific literature on that question and what I found baffled me. First, yes it's true that the vast majority of studies that have looked for a risk of cancer for people using their cell phones didn't find any. But typically they only looked at less than five or six years of cell phone use. Now think about that two seconds. Some of them looked at less than two years of cell phone use. If you had people smoke two packs of cigarettes a day for five or six years, would you see an increase in the risk of lung cancer? Absolutely not. So you look at these studies that have examined less than six years of cell phone use. You take them. You tear them. Throw them. You don't even need to read them. They're irrelevant. Now there's a handful of studies that have looked at ten years or more of cell phone use. Now they're too small and there aren't enough of them so we don't have a definitive answer but these studies all find roughly a doubling of the risk of brain tumors on the side on which people say they have been using their phone. Now this is a signal. It's not a

proof. It's a signal to me that we should be paying more attention to this issue.

JOEL MOSKOWITZ, Ph.D.

We're beginning to see some evidence coming through in the tumor registry data. I think we will see increasing evidence over time. We're not just talking about brain tumors, by the way. There is evidence of other kinds of tumors particularly acoustic neuroma or the nerve going from the brain to the ear. Also, the salivary or parotid gland there's a couple of studies. The country of Israel, for example, has already shown substantial increases in parotid gland tumors in their tumor registry data.

An iPhone types out:

**In Israel, 1 out of 4 parotid gland tumors
is in someone under the age of 20.**

**In 2000, Israelis were the heaviest
cell phone users in the world.**

TONY STRICKLAND

Again going to the chart I understand the but you have dramatic increases 15-20 years ago. You're saying now it's a 30 year window? Because again it goes way back and becomes dramatic 15, 16, 17 years ago and it has flat lined.

The following text fades over his face:

**Tony Strickland received \$87,000 from
interest groups that opposed this bill.**

LAWRENCE LESSIG, J.D.

When research is funded by an interested party and the conclusion correlates with the interested party's views, people wonder is it because of the funding or because of the truth. When a Congressman or a Senator or a state representative receives an extraordinary amount of money from an interested party and then goes out and does things that are consistent with what the interested party does. People wonder is that because the representative thinks that it's in the public interest or thinks that it's in the interest of the interest group that's giving them all the money.

SAM BLAKESLEE**California State Senator (D-15)**

I guess one of my concerns is the degree to which we desensitize people when there are so many things we do want to sensitize people to with regard to what the risks are. Obviously, with a pack of cigarettes we've great lengths and we don't simply... We go to great lengths. We put on the package this will kill you in effect.

BRET BOCOK**Brain Tumor Survivor**

I was an early adaptor. I used a cell phone immediately when it came out. There's a lot of good benefits from a cell phone. It's not like a cigarette where there's no benefit and that's one of the more dangerous things about cell phones. So I used a cell phone from 1988 up until - and I still do use a cell phone but I take precautions. I never put a cell phone up to my head - ever. I text and or use speaker phone and I limit my time to a cell phone. And these are all basic precautions that if I had been told about over the last twenty years I wouldn't have found myself with a brain tumor and put my life in jeopardy. Basically, I think it's my moral and ethical duty to inform other people who are not in the know on the issue as I wasn't for twenty of the years. I'm really lucky to be alive right now after the experiences I've had over the last year which I attribute unequivocally, categorically, for sure to cell phones.

CRISTIN PRISCHMAN**Brain Cancer Widow**

My name's Cristin Prischman. My husband died December of 09. He was 42. He was an avid cell phone user. We lived in LA. He was in the entertainment industry. When we found out we went to Dr. Keith Black at Cedars-Sinai and we asked him how this could happen and he said cell phone. They know it causes brain cancer but what's the harm of letting people know that it does.

STEVE CARLSON**California Government Affairs Counsel, CTIA**

Steve Carlson for CTIA the Wireless Association, the trade industry organization for the wireless industry and handsome manufacturers Apple, Google, Qualcomm, ect. We believe it would be a huge policy mistake even with the bill in the form that it is now. To question the safety, which in fact this does, and which certainly is the intent of the proponents.

SIEGLINDE JOHNSON

California Retailers Association

Many products that we sell come with various warnings on the label or in the users guide. Anything from iron to itch creams, in the retail environment our customers would be extraordinary confused if we had to post each of those warnings at the point of sale and our retail stores would end up looking like a NASCAR driver's suit. And consumers would be confused and possible afraid.

QUALCOMM

Qualcomm believes the only purpose this bill will serve is to create fear and uncertainty amongst consumers and that will eventually just be hurtful to the wireless industry which is really a California based industry.

ROBERT CALAHAN**Director, Government Affairs, TechAmerica**

Robert Calahan was TechAmerica representing 1,200 technology companies nations wide and we are opposed to the bill.

BILL DEVINE**Vice President, AT&T**

Bill Devine with AT&T. We oppose the legislation and I will take the liberty with that one sentence Mr. Chairman. One concern we have is the point Senator Leno just made moments ago and that is this label may stimulate conversation in the retail establishment.

MICHAEL BECKLER

Michael Beckler of Verizon Wireless in opposite to the bill. Thank you Chairman.

ANNE PERKINS**Manager, State Government Affairs, Sprint Nextel**

Anne Perkins with Sprint in opposite to the bill.

SUSAN LIPPER**Senior Manager, Government Affairs, T-Mobile USA**

And Susan Lipper with T-Mobile USA in opposite. Thank you.

INT. MARK LENO OFFICE

MARK LENO

Industry has resisted even the most minimal amount of information being disclosed. Finally we just said in our bill read your owners manual for the safest usage of your phone and they fought that as well. The more they resist the more it makes me wonder: what in fact are they hiding from us?

JOEL MOSKOWITZ, Ph.D.

The cell phone industry seems to be using the playbook of the tobacco industry in fighting any efforts particularly at the local level right now to try to do any kind of information and education or legislation around the use of cell phones. And I think in large part they're doing this to have a chilling effect at the local level. They sue San Francisco then a lot of other communities who are on the verge of adopting a similar law will probably hold back for awhile. There are about a dozen countries now that have adopted precautionary health recommendations with regard to cell phones. So I think the industry is being short sighted trying to play this game saying we have First Amendment rights. I think our system of law had really gone too far in the direction of giving rights to corporations.

INT. BERKELEY CITY HALL

FADE IN:

**Berkeley City Council
Public Forum on Cell Phone Safety**

MAX ANDERSON

Berkeley City Council, District 3

The oppressive boot of finance and money and influence on the legislative process that spills over invariably into the scientific community. I can sight you a number of reports around the issues of asbestos, smoking, and other forms of radiation. So we know what the influence and the power of money and vested interest can do to the welfare and body politics of this country. We have a responsibility to employ those principals that were developed from our life experiences having to do with how people have been bamboozled by bad products with lots of money behind them and congress people and others being bought off to look the other way. We're not looking the other way.

An iPhone types out:

Connecting the Dots

DAVID CARPENTER, M.D.

The responsible thing for the cell phone industry to do would be to provide to researchers access to the data on actual usage. The limitations of the studies to date are the exposure assessment. The cell phone industry has that data of how much time each cell phone is being used. Maybe not if it's shared among people but most cell phones are not. That's the kind of information that would really allow one to do the proper kind of study.

CUT TO:

INT. CTIA CONFERENCE

KEVIN KUNZE

If researchers had access to the call records they might be able to make better assessments about this to either prove or disprove the fact that they might have any association with cancer risk. Are you opposed to this?

JOHN WALLS

Well the federal government doesn't control any call records whatsoever. So I would be highly opposed to that. I think anybody who's a believer in the American system of life wouldn't want the federal government snooping into their-

KEVIN KUNZE

But Homeland Security has access to those records. That's what I'm saying. If Homeland Security has access would you be opposed to giving that same access to researchers just looking at the health effects.

JOHN WALLS

There's no reason to grant that access based on the overwhelming evidence of the scientific pieces of-

KEVIN KUNZE

It's kind of mixed though.

JOHN WALLS

Well we could argue about that.

An iPhone types out:

The U.S. government collects the phone records from billions of cell phone customers.

In 2011, AT&T made \$8.2 million selling call records to U.S. law enforcement.

LAWRENCE LESSIG, J.D.

Everyone's concerned about privacy in the context of access to cell phone records and rightfully so. But there are ways to architect that access so that nobody would have any fear about ever being tied specifically to particular usage patterns and instead those usage patterns can be anonymized so we can begin to understand whether there is some connection.

JOEL MOSKOWITZ, Ph.D.

Obviously we need a whole lot more research on all of these issues, which is one of the really frustrating things. So little research has been done. There's almost no funding for research and I even hear this from my European colleagues, where there's been a fair amount of research, that they've had a very difficult time finding funding outside of the industry to do anything. So we've been quite remiss on doing research on this issue. We've been very resistant to the whole issue as a nation. At least in terms of our governmental health authorities, we seem to be in denial.

DEBBIE RAPHAEL

The Mobi-Kids study is happening now in Europe. What's interesting about that study is twofold. One, that it's focusing on the safety of cell phones for children. The second thing that's interesting is that the U.S. is not participating in that study. I don't understand why that's true.

ROBERT NAGOURNEY, M.D.

Director, Rational Therapeutics

In December of 2009, I first met Donna. She was very healthy, vigorous, athletic. No predisposing factors for cancer. Family history was negative. From everything I could see there was no obvious explanation for this young woman to have breast cancer, particularly multifocal breast cancer. And the only possible association I could identify was she had a habit of always carrying her cell phone under her right brassiere strap. Breast

cancers are characteristically diagnosed in women in their fifties and sixties. The Asian population have a lower incidence overall. Due to Donna's young age, lack of risk factors, multifocal disease, Asian history, normal medical history, with no predisposing factors, I would say that she would be an unusual case.

DONNA JAYNES

Breast Cancer Patient

I don't have any history of breast cancer in my family and I also had the BRCA-1 and BRCA-2 genetic tests conducted on me and it came up negative. So I don't have the genetic mutations for breast cancer. And with each following doctor appointment it seemed as if they kept finding another tumor and another tumor. We connected the dots of where the locations of the tumors were based off the biopsy. We made marks on me of where the location of the tumors were and realized that it formed the shape of the cell phone underneath the footprint of the phone or where I used to keep it.

ROBERT NAGOURNEY, M.D.

The breast tissue in the young child-bearing years menstruating women is a fertile ground for cellular activity, metabolic activity, and arguably cancer causation. Causation in this situation may be difficult to prove. The issue here is that if there is even a small possibility that the thermal or piezoelectric effect or other pulsed electromagnetic field influences could even remotely influence the behavior biology and possible carcinogenicity in this setting, I would urge people to avoid exposure. After all, cancer is wound that will not heal. It's a chronic inflammation that we can not address. And so thermal injury is well established as one of many causative factors in disease and cancer.

JOHN WEST, M.D.

Director, Breast Care & Imaging Center of Orange County

The pattern seemed to be established from what I could see is these women tended to be younger, late thirties, early forties, some up into the late forties, that they had the cell phone in the bra for five to ten years, and the cancer occurred primarily in the upper inner aspect of the breast, which is kind of an unusual place for breast cancers, but all of them had it in the same place except for one. And the final example, the one that had it in her lower breast is even more striking. This is a woman in her late thirties who worked in a cell phone factory where she would check cell phones. They would come across underneath her breasts on a conveyor belt. She checked the phones regularly on

the conveyor belt. They were on and active. And she did this for years and she turned up with breast cancers in the lower aspect of both breasts. Now to have a young woman with mirror image breast cancer in the lower aspects of both breasts pop up sort of out of the blue in somebody with no family history. This is really unusual.

ROBERT NAGOURNEY, M.D.

I would say that would be extraordinary rare. I mean to have mirror multifocal disease in the opposite breasts in similar locations would certainly speak to some form of exposure. These tissues where there's a high degree of estrogen metabolism constituting rich lipid sources partly associated with the production of milk. The water and fat would be very good vibratory substrates for heating which is the mechanism by which microwaves work.

JOSH WOLF, M.J.

Journalist of Year (2006)

If news is a business, the consumer of the news suffers because good business decisions may not be good decisions for spreading information. Anytime you're dealing with some sort of new scientific data that runs afoul of the general common thought there is hesitance to report on it

JONATHAN SAMET, M.D., M.S.

I think the mainstream media make their choices depending on what they want to communicate. They're not, unfortunately, necessarily communicating as public health - for public health purposes they're communicating for media purposes and those may be divergent.

MARK LENO

I was taken by the fact that after a five year international study had been conducted that there was not a single story in the New York Times, the Washington Post, or LA Times. It was as if the story had been blacked out.

FADE TO BLACK:

JOSH WOLF, M.J.

Stories that are critical of cell phones aren't being put on the front page because they'd be going next to a Sprint ad and clearly Sprint has a bias in what they're going to tell you and we need to be much more mindful of who is telling us what they're telling us and why they may be telling us that.

LAWRENCE LESSIG, J.D.

You know it's absolutely clear that cell phone companies use whatever leverage they can to undermine the spread of information that's raising questions about this. Chris Ketcham, when he published his piece in GQ about cell phone radiation. GQ, I was told by former editors of GQ, had to sit on that piece for more than a year as they fought with their editorial and business units about the fact that cell phone companies were threatening to pull all advertising from GQ if they ran this article. So there's no doubt that they're going to use the pressure they can.

An iPhone types out:

**Cell phone companies threatened to withdraw an estimated
\$1 million in advertisements from an issue of GQ.**

**GQ stood strong against the threats
and the article was eventually published.**

GAVIN NEWSOM

What's remarkable is that there was no headline. There was no story about it. It was just lost in the back of an article. Apathy. People are disconnected. They just don't care. They don't believe. And why does that matter? Because that's the foundational principle that makes everything possible. Look special interest on both sides guys. They buy silence. They buy apathy. They buy politicians. In a pessimistic and fearful environment you're going to fight for your patch.

News article with headline: Motorola faces bribery probe.

KEVIN KUNZE (V.O.)

While at Dr. Robert Nagourney's office in Long Beach, I noticed a portrait of John Wayne that was donated to the doctor in recognition of his fight against cancer. Nearly 50 years ago, Wayne starred in cigarette commercials. What would people say about our ads in 50 years?

ROBERT NAGOURNEY, M.D.

Advertising is psychological warfare. I'm not a big defendant of our modern advertising agencies. Celebrities are basically for

sale and if you offer them enough money they'll advertise anything.

A montage of celebrities in cell phone commercials including: Brad Pitt, Cameron Diaz, Jean-Claude Van Damme, Megan Fox, Samuel L. Jackson, Lady Gaga, Beyonce Knowles, Eric Clapton, Mary J. Blige, Jermaine Dupri, Ozzy Osbourne, Justin Bieber, John Malkovich, Zooey Deschanel, Tom Jones, Catherine Zeta Jones, Martin Scorsese, Quentin Tarantino, Wes Anderson, and Leonardo DiCaprio.

A article with the following headline: Leonardo DiCaprio to reportedly earn \$5 million for cell phone ad.

RAFFI CAVOUKIAN
Musician / Author

I've been asked to endorse many products. I've been asked to do commercials and I've never done one in all the years that I've been entertaining children. Out of respect for the child as a whole person. Out of respect for that young audience. In terms of my song "Bananaphone" being used for a commercial, I wouldn't go for it.

INT. RICHARD BRANSON'S LIMO

A black limo drives through a LA street.

October 1999
20/20, ABC News

Richard Branson sits in the backseat of a limo with his cell phone.

RICHARD BRANSON
Founder, Virgin Group

Do not put your phone up to your ear because it could fry your brain. There is the phone, there's the earpiece. And you just keep the phone away from the body and put the earpiece in either ear. And you've got the microphone here, and you can talk. It could be like the early days of cigarette smoking. You know, we just don't know at this stage and since there's quite a big question mark over it, one might as well play it safe.

Branson demonstrates how he uses a cell phone with an earpiece.

KEVIN KUNZE (V.O.)

A month after this interview, in November 1999, Branson founded the cell phone company Virgin Mobile. He launched his company by standing nude in Times Square with a sign saying, "Nothing to hide."

Branson waves and displays a cell phone covering his privates.

KEVIN KUNZE (V.O.)

In 2006, Branson sold Virgin Mobile to the UK phone company NTL for \$1.7 billion. In 2009, Branson sold Virgin Mobile USA to Sprint for \$483 million. While Branson no longer owns a cell phone company, he continues to star in their commercials.

Richard Branson fires a gun at bad guys in an Indian Virgin Mobile ad.

ROBERT NAGOURNEY, M.D.

I think that companies that sell products are probably not overly motivated to provide reasons not to buy them. I would hope and believe that the cell phones companies, if confronted with evidence that there is a risk, would encourage their consuming public to simply use the phones more intelligently. I don't think anyone is calling for a ban on cell phones.

KEVIN KUNZE (V.O.)

I decided to make copies of my cell phone manual to show cell phone representatives at the CTIA conference.

INT. CTIA CONFERENCE

KEVIN KUNZE

The documentary is about cell phones and the health effects and I'm kind of curious to know Sprint's position on this.

SPRINT REPRESENTATIVE #1

Hey I have a gentleman here from...and he is doing a documentary on the effects of cell phones to the human body and wanted to know if Sprint would be willing to speak on camera in regards to

what we're doing about the fact that it causes...What? What did you say?

KEVIN KUNZE

Umm just in general the health effects of cell phones.

SPRINT REPRESENTATIVE #1

So I told him you needed to speak with someone in PR media. You'll send somebody right now. You can? Okay I'll send him to the lounge. Okay I'll bring him down there. Okay bye.

Kevin is taken to a tented off section of the conference.

KEVIN KUNZE

Many cell phone manuals come with a warning about keeping it about an inch away from the body.

SPRINT REPRESENTATIVE #2

Yea.. Um... We don't really have anybody here who can speak on this topic today at the show so I don't know if maybe there's a follow up that we could do separately.

KEVIN KUNZE

Definitely.

SPRINT REPRESENTATIVE #2

We can check into that.

Security escorts Kunze out of the Sprint media lounge. The following text fades in: **Sprint did not follow up for an interview.**

INT. VERIZON BOOTH

KEVIN KUNZE

I'm interested to speak with someone in PR. Would you speak with me?

VERIZON REPRESENTATIVE

I'm the PR guy.

KEVIN KUNZE

I'm interested to know...Is it okay I'm recording?

VERIZON REPRESENTATIVE

Well what do you want to know and then I can put you to the right person.

INT. SAMSUNG MOBILE BOOTH

KEVIN KUNZE

Is it okay if I record?

SAMSUNG MOBILE REPRESENTATIVE #1

Umm actually. Oh you're media! Oh yes! It's okay but I'm not a spokesperson so...

KEVIN KUNZE

I understand. I'm interested to speak with someone that would be a spokesperson.

SAMSUNG MOBILE REPRESENTATIVE #1

Let me get you to somebody. Just one second.

Kevin is introduced to another Samsung Mobile representative.

KEVIN KUNZE

Basically in all the cell phone manuals in fine print it says to keep about an inch away from the body and they also offer ways that people can reduce their exposure by using wired earpieces and things like that.

SAMSUNG MOBILE REPRESENTATIVE #2

Oh okay. I don't have a spokesperson right now to comment on that.

KEVIN KUNZE

Can I just speak with you a little bit about it?

SAMSUNG MOBILE REPRESENTATIVE #2

No I'm not an on camera spokesperson.

KEVIN KUNZE

Can I give you some information about it and maybe we can organize something with the spokesperson?

SAMSUNG MOBILE REPRESENTATIVE #2

Ok yeah. He'll be on the show floor later. If you want to come back by this afternoon.

KEVIN KUNZE

Yeah just let me know a time and I would definitely love to speak with them.

SAMSUNG MOBILE REPRESENTATIVE #2

You know I'll have to double check and see umm but let me. What's the best way to get in touch with you? Do you want to come back by maybe this afternoon?

KEVIN KUNZE

Sure what time would be best to stop back?

The representative pants heavily.

SAMSUNG MOBILE REPRESENTATIVE #2

See that I'm not sure about right now.

The following text fades in:

**The CTIA warned us to stop filming
companies at their conference.**

Kunze interviews John Walls in front of a giant CTIA logo.

KEVIN KUNZE

So I'm kind of curious to know a little bit more about the fact that this is a conference that used to be in San Francisco and you guys pulled this conference from San Francisco. I want to know was this because of the fact that they tried to pass a law that would provide more safety?

JOHN WALLS

Sure, sure. Well first off just for the record we had a contract with San Francisco that we honored and fulfilled that. And didn't have a contract to go anywhere for this year and so it was after that show last year we took open bidding. We've been here in San Diego in the past so this was nothing new to come here but frankly and we've made no bones about it some of our decision was about what the city did. What we thought was irresponsible and in some cases alarmist with the kind of materials and the kind of representation of the facts we think they're playing with right now and that's why we've filed suit against them in court. So we're challenging them based on the First Amendment of the U.S. constitution and we think we're on pretty good ground and they've gone way out of bounds.

STAN GLANTZ, Ph.D.

There's no way to get rid of the tobacco problem without getting rid of the tobacco industry. You could make much safer cell phones without really hurting the telecommunications industry. It might make the phones a little less profitable but you could make changes to the way the phones are designed and the way use is promoted that would substantially reduce the risks.

JOHN WALLS

Science tells us that these devices are safe and that is what we therefore really ground our position on.

KEVIN KUNZE

Could they be safer though?

JOHN WALLS

I think, I mean-

CTIA REPRESENTATIVE (O.S.)

No, that was the last one.

KEVIN KUNZE

OK, alright. Well thank you very much.

Kunze walks down an escalator.

DEVRA DAVIS, M.P.H., Ph.D.

I think this problem is far too big for the government. This a problem where the private sector is already stepping up to the plate by making phones that are lower powered and turn themselves off automatically. Steve Jobs apparently didn't want to have an off switch on an iPhone because it would be death. Ironical isn't it. All you need is an off switch so we can turn them on and off whenever we want to do so. That would be a great way of reducing your exposure.

An iPhone types out:

Call to Action

Gavin Newsom tests out the new Google Glasses cell phone.

KEVIN KUNZE (V.O.)

No one knows what the future holds for cell phones. Expensive new inventions worn on the face could push the boundaries of communication but also might come with an even greater cost.

DAVID CARPENTER, M.D.

Are we facing...are we going to face an epidemic of brain tumors in the coming years because of this enormous expansion of use of cell phones, of wireless technology. Everyone is exposed, whether you use a cell phone or not. You can't go into a McDonalds or a Starbucks without being in a wireless environment. Most of us have wireless in our homes and offices. We live near cell towers. Smart meters are being installed everywhere. Almost all of these give much lower levels of exposure than holding a cell phone to your head, they all emit the same kinds of frequencies and like any other toxic exposure, it is almost certain that the adverse health effects are a function of both duration of exposure and intensity.

MITCHEL BERGER, M.D.

President, American Association of Neurological Surgeons

I think it's definitely out there. Everybody is aware of the fact that it's controversial. And I think it's only going to take more time, more research, more follow up on individuals who've used a device to see if it is harmful. Absolutely we need to do more research on it and more population based studies to see whether or not there is a deleterious effect or not.

ALI VELSHI

It is a growth opportunity. A whole new industry can spring up around technology designed to keep our phones a safe distance from our heads or our hearts or our reproductive organs. Imagine all the new headsets and the radiation proof cases that can be sold.

DAVID SERVAN-SCHREIBER, M.D.

And that we and certainly people like me with brain tumors should learn how to use a cell phone with precaution. You know cars kill people, right? Motor vehicle accidents kill people all the time. Do we stop using cars? No. We're not going to stop using cell phones either...even if they are dangerous. But we use our cars in a way that reduces risk. Well we can learn to use our cell phones in a way that reduces risk.

KEVIN KUNZE (V.O.)

While we may have to wait for more research, legislation, and media coverage, the power of stardom still exists. Many celebrities have begun advocating for safer cell phone usage, and their endorsement has helped to spread awareness.

Montage of celebrities with retro phones including: Lenny Kravitz, Daniel Craig, and 2 Chainz.

CUT TO:

INT. ANDERSON COOPER SHOW

ADAM LEVINE

And the coolest thing you gave me. I can't lie-

Adam takes out a black retro phone.

ANDERSON COOPER

I'm obsessed with it.

ADAM LEVINE

Is this thing, which is like a phone but it's not a phone, you plug it into your cell phone.

CUT TO:

EVA LONGORIA

And it's great because it keeps the phone away from your face.

ANDERSON COOPER

Right but it's also very satisfying to talk to.

EVA LONGORIA

Yea-

ANDERSON COOPER

Cause you feel you could-

EVA LONGORIA

Shut up Anderson! Can you do that?

Eva holds out the phone. Anderson and the crowd chuckles.

CUT TO:

ANDERSON COOPER

So you're not actually putting the thing up to your head. So it's like you're talking on a real phone.

JANET JACKSON

Oh cool. Is this for me?

ANDERSON COOPER

Yea you can keep that one and since it's our 100th show, everyone in the audience is going home with the same phone!

The crowd claps and cheers.

CUT TO:

STEVE AOKI

Music Producer / DJ

CEO, Dim Mak Records

I became more informed and I think in general the public just needs to be more informed because we all have cell phones. This is a cell phone culture. Everyone uses a cell phone like this. For me, I always have a headset. Always. Or I use speaker phone.

JOEL MOSKOWITZ, Ph.D.

It's really pretty easy to protect yourself from cell phone radiation. Just keep the phone away from your body whenever it's turned on. When you're making a call use a wired earpiece, your speaker phone, or text. And if you keep the phone in your pocket but sure it's turned off and just periodically check your messages.

KEVIN KUNZE (V.O.)

Cell phones are not going away. They will only continue to play a bigger role because they make our lives better. But along with these new advances, it's our responsibility to educate ourselves on how to use phones safer. And only when we get connected with the facts can we regain some control and protect our loved ones. It's time for our voices to be heard. If cell phones aren't going to come with warnings labels, then we need to warn each other.

FADE OUT:

FADE IN:

FADE OUT:

FADE IN:

President Obama nominated CTIA lobbyist Tom Wheeler to be the Chairman of the FCC. Wheeler raised \$700,000 for Obama's presidential campaigns.

FADE OUT

FADE IN:

**Richard Branson continues to make cell phone ads.
Although he doesn't use them next to his head.**

FADE OUT

FADE IN:

**San Francisco's Board of Supervisors settled with the CTIA to
abandon it's cell phone safety legislation.**

FADE OUT

FADE IN:

In March 2013, the FCC released a report reassessing radiation policies. The FCC invites comments to be submitted over the next six months.

FADE OUT:

FADE IN:

There are over 688,000 people in the U.S. living with a primary brain tumor.

Brain tumors are the second leading cause of cancer-related deaths in people under 20 years of age.

The U.S. wireless industry is valued at almost \$200 billion.

FADE OUT:

FADE IN:

Take Action and #Mobilize

Learn More at
Mobilize Movie.com

FADE OUT:

FADE IN:

THE INTERVIEWEES

CUT TO:

GAVIN NEWSOM

Lt. Governor of California

And I like to think San Francisco has always been a city as they say of dreamers, doers, entrepreneurs, innovators, always on the leading cutting edge.

VINCE CHHABRIA, J.D.

Deputy City Attorney, San Francisco

If they receive this information, of course they're still going to use their cell phones. We don't want them to stop using their cell phones but they're going to use their cell phones in a different and safer way.

DEBBIE RAPHAEL

Director, Dept. of Toxic Substances Control, Cal/EPA

There's this movement in marketing circles to use cell phones younger and younger.

DENNIS KUCINICH

U.S. Congressman (D-OH) (1997-2012)

I personally would be very careful about letting any child use a cell phone.

RAFFI CAVOUKIAN

Musician / Author

Corporate social responsibility has to come into play.

GERARD KEEGAN

CTIA, Director of Legislative Affairs

It puts cell phones on par with coffee and pickled vegetables. Now-

ERIC MAR

San Francisco Supervisor, District 1

But children don't put pickles and coffee next to their head or their salivary gland tumors that the studies are showing so I think there's a bit of a difference there.

MAX ANDERSON

Berkeley City Council, District 3

Vegetables! You know, come on! Are you talking to children here? You're not!

JOSH WOLF, M.J.

Journalist of Year (2006)

Commercial interest will shape the flow of information.

ANDREA BOLAND

Maine House of Representatives

They don't do their research. If they did the evidence is there and has been there for decades.

JOEL MOSKOWITZ, Ph.D.

Director, Center for Community Health, UC Berkeley

I think there is a lot of denial at the individual level. People don't want to know that these devices are harmful because they've become highly dependant on them.

JOHN WALLS

Vice President, CTIA

We knew with whom we have to work whether it's Congress on a given issue or the FCC or administration or state.

GEORGE CARLO, Ph.D.

Chairman, WTR (1993 - 1999)

In effect, this industry is regulating itself.

HEIKO STREHLOW

Director, Compliance Services, CETECOM

The mobile manufacturers are trying to avoid additional testing.

DEVRA DAVIS, Ph.D., M.P.H.

Former White House Health Advisor

And there's no basis for standards for teenager or for children or for that matter pregnant women.

KEVIN KUNZE (O.S.)

Have there been other studies conducted in the United States on cell phone radiation and pregnancy?

HUGH TAYLOR, M.D.

Director, Yale Center for Reproductive Biology

Let's see...Not that I know of.

DAVID CARPENTER, M.D.

Founding Dean, University at Albany School of Public Health

Given all the evidence we have for adverse health effects from radio frequency radiation, to have the federal agency that regulates not even have the remotest expertise.

STEVE WOZNIAK
Co-Founder, Apple Inc.

I like his. His card is really cool. I did some plastic ones that didn't turn out good. They were kind of like too thick and this one's really nice.

RENEE SHARP, M.S.
Senior Scientist, Environmental Working Group

I think we're going to be fighting about this for a long time.

LELAND YEE, Ph.D.
California State Senator, District 8

Tremendous lobbying efforts that go on to try to persuade members to not support Senator Leno's legislation.

MARK LENO
California State Senator, District 3

As soon as we can get publicly financed campaigns in place we'll see a significant shift to people power.

STAN GLANTZ, Ph.D.
Director, Center for Tobacco Research and Education, UCSF
One of the big difference between cell phones and tobacco is that cell phones are actually useful. I mean the only thing that tobacco does is kill people and make some money for big multinational corporations.

JONATHAN SAMET, M.D., M.S.
U.S. National Cancer Advisory Board
While a study may not show a statistically significant association, that does not mean there is no risk.

DAVID KATZ, M.D., M.P.H.
Director, Yale Prevention Research Center
We don't need to see a massive increase in the rates of brain tumors if you're the one individual who develops a brain tumor that wouldn't have happened if you didn't have this exposure.

STUART COBB

Brain Tumor Survivor

This is the United States where we scrutinize vitamins before we put them out for sale but we can't do premarket testing on phones.

KRISTEN COBB

Why didn't our government in the beginning test against the skin. That's something that needs to be looked at.

MICHAEL BROWNRIGG**Burlingame City Council (2009-2013)**

There was a very serious threat of litigation. We're a small town. We can't afford to be sued and go to court with the cell phone industry.

NICK MAVODONES**Mayor, Portland, Maine (2010-2011)**

When I'm not using my cell phone, instead of keeping it in my pocket or on my hip, I leave it in my briefcase or somewhere in my office.

STEVE AOKI**Music Producer / DJ****CEO, Dim Mak Records**

(wearing headphones)

I'm like this all the time. Plus, when you have this on when you're walking around, people don't really bother you.

ROBERT NAGOURNEY, M.D.**Director, Rational Therapeutics**

I have two boys, ages twelve and fifteen, and they both own cell phones. And they are both instructed to keep their telephones not away from their bodies but turned off during the day.

JOHN WEST, M.D.**Director, Breast Care & Imaging Center of Orange County**

And based on some of our other information it just leads me to believe that we should be cautious.

LAWRENCE LESSIG, J.D.**Director, Edmond Safra Center for Ethics, Harvard University**

The very cell phone companies they're selling a cell phone and telling us that they're us are at the same time telling us we

should hold them an inch from our head. We should wonder what exactly does that mean.

FADE OUT:

FADE IN:

**This film is dedicated to all those who attribute
their cancer to long-term cell phone exposure.**

FADE OUT:

FADE IN:

**Dedicated to the Following Cancer Patients and Their Families
Alan, Ellie, Zachary and Amanda Marks**

Andy Solomon

Bret Bocook

Cristin and Paul Prischman

Dan, Mindy, and Larry Brown

David Servan-Schreiber

Jean and Mark Brooks

Jimmy Gonzalez

Keith Phillips

Kristen and Stuart Cobb

Milton and Abigail Marks

Mindy, Larry and Dan Brown

Steven and Daphne Jasperes

Teresa Gregorio

FADE OUT:

If you've made it this far I hope you strongly consider reevaluating the radiation standards for cell phones.

Respectfully submitted by

Kevin Kunze

1508 Parker Street, Apartment C

Berkeley, California, 94703

August 29th, 2013

Precautionary Principle; Clara de La Torre Comments, Feb. 6, 2013

To: The Federal Communications Commission
RE: Proceeding Numbers 03-137 and 12-357
From: Clara de la Torre, Santa Fe, NM
Dated: February 4th, 2013

Dear Federal Communications Commission members,

The FCC's current safety guidelines pertaining to RF radiation exposure are outdated and do not reflect the large body of internationally accepted scientific evidence showing significant detrimental health effects from RF radiation. Current FCC guidelines pertain only to "thermal effect" and not to the non-thermal effects of this radiation. Likewise, in a statement issued by the Food and Drug Administration (FDA) on November 10, 1993, the FDA stated that "FCC rules do not address the issue of long-term chronic exposure to RF fields." In order to remedy these shortcomings, the documented non-thermal effects of RF radiation and the effects of long-term chronic exposure to RF need to be studied in depth by the FCC, with comprehensive reforms being made to protect the citizens of the United States.

In support of this statement I am submitting the 2012 *BioInitiative Report: A Rational for a Biologically-based Public Exposure Standard for Electromagnetic Radiation* (available at HYPERLINK "<http://www.bioinitiative.org>" www.bioinitiative.org, as the file size was too large to include with this comment filing.) This report reviews thousands of studies of the bioeffects and adverse health effects of non-ionizing radiation—electromagnetic fields including extremely low frequency ELF-EMF and radiofrequency/microwave or RF/EMF fields—and concludes that public exposure guidelines for emissions from cellular antennas, WiFi and other mobile/wireless devices are set too high to protect health.

As the *BioInitiative Report: A Rational for a Biologically-based Public Exposure Standard for Electromagnetic Radiation* is 1,484 pages long and you may not have adequate time to review it, I'd like to list some of the documented non-thermal effects of RF radiation. The following are cited in the references on the website of the International Association of Firefighters (HYPERLINK "<http://www.iaff.org/HS/Facts/CellTowerFinal.asp>" www.iaff.org/HS/Facts/CellTowerFinal.asp):

- increased cell growth of brain cancer cells
- increased single- and double-strand breaks in DNA
- more childhood leukemia amongst children who are exposed to RF
- changes in sleep patterns and REM type sleep
- headaches
- detrimental neurological changes including
 - changes in the blood-brain-barrier
 - changes in cellular morphology (including cell death)
 - changes in neural electrophysiology (EEG)
 - changes in neurotransmitters (which affect motivation and pain perception)
 - metabolic changes
 - cytogenetic effects (which can affect cancer, Alzheimer's, and neurodegenerative diseases)
- decreased memory and attention, with slower reaction times in schoolchildren
- increased blood pressure in healthy men

Other effects reported from studies around the world include an increase in breast cancer rates, malignant melanomas, sleep disorders like insomnia, hormonal effects, male infertility, skin rashes, and increases in the rates of diseases or disorders such as Autism, Alzheimer's, Multiple Sclerosis, and Attention Deficit Hyperactivity Disorder. This list is not inclusive of all of the detrimental health effects that have been documented, rather, it is just a sampling

Studies including the *Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil* (document submitted along with this letter

and also available at HYPERLINK "<http://www.emrsa.co.za/documents/brazilresearch.pdf>" www.emrsa.co.za/documents/brazilresearch.pdf) show a pronounced increase in cancer deaths within 500 meters of a cellular telephone base station. It is for this reason that I believe the 1996 Federal Telecommunications Act, Section 704—which prevents state and local governments from influencing (including opposing or preventing) the siting of telecommunications towers and antennas in communities on health or environmental grounds—is both a gag order and a death sentence for many Americans. When health concerns are disallowed from the public conversation, we have blatant proof that our FCC safety guidelines are failing us.

Even if the negative health effects from RF exposure were just speculation and not a thoroughly documented (and haunting) reality, a reasonable and responsible course of action would be to:
Urge precaution in cell tower placement, keeping towers away from densely populated areas including schools & hospitals
Create laws that protect human health in the interim until a thorough study of the highest scientific merit is conducted, and
Err on the side of caution, by assuming the documented health risks may indeed be true.

Therefore, I ask you, the members of the Federal Communication Commission, to study in depth the non-thermal and long-term effects of chronic RF exposure, and to institute comprehensive RF policy reform. The health & life-safety of Americans depends upon it.

Thank you, and with sincerity,

Clara de la Torre
Santa Fe, NM



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Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil ☆

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ABSTRACT

BS = cellular antenna Base Station

Pollution caused by the electromagnetic fields (EMFs) of radio frequencies (RF) generated by the telecommunication system is one of the greatest environmental problems of the twentieth century. The purpose of this research was to verify the existence of a spatial correlation between base station (BS) clusters and cases of deaths by neoplasia in the Belo Horizonte municipality, Minas Gerais state, Brazil, from 1996 to 2006 and to measure the human exposure levels to EMF where there is a major concentration of cellular telephone transmitter antennas. A descriptive spatial analysis of the BSs and the cases of death by neoplasia identified in the municipality was performed through an ecological–epidemiological approach, using georeferencing. The database employed in the survey was composed of three data banks: 1. death by neoplasia documented by the Health Municipal Department; 2. BSs documented in ANATEL (“Agência Nacional de Telecomunicações”: ‘Telecommunications National Agency’); and 3. census and demographic city population data obtained from official archives provided by IBGE (“Instituto Brasileiro de Geografia e Estatística”: ‘Brazilian Institute of Geography and Statistics’). The results show that approximately 856 BSs were installed through December 2006. Most (39.60%) of the BSs were located in the “Centro-Sul” (‘Central-Southern’) region of the municipality. Between 1996 and 2006, 7191 deaths by neoplasia occurred and within an area of 500 m from the BS, the mortality rate was 34.76 per 10,000 inhabitants. Outside of this area, a decrease in the number of deaths by neoplasia occurred. The greatest accumulated incidence was 5.83 per 1000 in the Central-Southern region and the lowest incidence was 2.05 per 1000 in the Barreiro region. During the environmental monitoring, the largest accumulated electric field measured was 12.4 V/m and the smallest was 0.4 V/m. The largest density power was 40.78 $\mu\text{W}/\text{cm}^2$, and the smallest was 0.04 $\mu\text{W}/\text{cm}^2$.

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1. Introduction

Mobile phone radio base stations (RBSs) are now found in cities and communities worldwide. They can be found near or even on top of homes, schools, hospitals, daycare centers and offices. In Brazil, the number of mobile phone users is estimated to be over 200 million and there are more than 5 billion users worldwide. In the municipality of Belo Horizonte, the capital of the state of Minas Gerais, there are approximately 1000 base stations (BSs) with 128.77 accesses by

mobile phones per 100 inhabitants and in Brazil, there are 49,979 BSs licensed through April 2011 (ANATEL, 2011).

The non-ionizing electromagnetic radiation from the BSs is of low intensity compared to the current guidelines on human exposure limits. However, its emission is continuous. This raises concerns as to whether the health and well-being of people living or working close to the BSs are at risk Khurana et al., 2010; Alanko et al., 2008.

The emission of a BS is usually described by its effectively radiated power in watts (W), which describes the total amount of radiation emitted by the antenna of the BS. Their intensity, called the power density, is commonly measured in milliwatts per square centimeter (mW/cm^2) or microwatt per square centimeter ($\mu\text{W}/\text{cm}^2$) and it expresses the power per unit area impinging normally to the external surface of the subject. The immission (absorption) of the subject is measured by the specific absorption rate (SAR), which is reported in

☆ All the authors declare that they have no conflicts of interest.

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watts per kilogram of body tissue (W/kg). The SAR reflects the power that is locally absorbed in a certain volume of biological tissue and is proportional to the square of the local magnitude of the electric field intensity. For ethical reasons, the SAR can only be assessed on animal models or inferred from virtual (computational) models of animal or human subjects (Lai, 2000).

Some scientific studies have shown evidence of increased numbers of cancer cases for people living less than 500 m from the BSs (Eger et al., 2004; Wolf and Wolf, 2004; Eger and Jahn, 2010).

In the Belo Horizonte municipality and in many other urbanized cities and communities in Brazil, the mobile phone network is deployed in regions of high demographic density close to homes and on the facades and roofs of public or private buildings. It is also common to have several antennas sharing the same support structure.

This situation motivated the research of Dode (Dode, 2003) in the Belo Horizonte municipality, where a methodology designed to assess the levels of electromagnetic radiation exposure of the dwellers was used, based on the technical specifications of a sample of the installed BSs. Those estimated data were then compared to measured *in situ* data for the same set of BSs. Fig. 1 illustrates the site of a typical BS (Base Station BH 20) in a residential area of the Serra neighborhood, in the Belo Horizonte municipality and Fig. 2 shows its geographical location. Fig. 3 represents the horizontal and vertical radiation patterns per sector of the same BS. This diagram has been obtained from the technical archives documented by the operators in the Secretaria Municipal de Meio Ambiente (Municipal Environmental Department), the official organization of the municipality that is responsible for the environmental licensing of the BSs.

Some studies have shown evidence of general risks to health and specific risks of cancer associated with the physical proximity of the transmitter antennas of the telecommunication network.

One of the first of these studies indicated an association between cancer growth and a residence near a transmitter antenna (Cherry, 1999). Later, Santini et al. (Santini et al., 2002) carried out a qualitative survey of 530 people living within 300 m of a certain BS. Despite the

subjective methodology, the study showed a peak of symptoms occurred at locations in the interval between 50 and 100 m from the BS, which coincided with the typical distances at which the main lobe reached the ground. In another study, also in France, Santini et al. (2003) surveyed dwellers living 300 m from the BS and others who lived farther away and found more complaints about irritability, depressive tendency, memory loss, problems with concentration, dizziness, within 100 m; headache, sleeping disorder, discomfort, skin problem within 200 m; and fatigue within 300 m, among those living closer to the BS and showed more variability in disease occurrence with distance. Again, this study contained some biases because it was subjective and therefore did not result in a conclusion about the relationship between cancer and the amount of radiation exposure.

Navarro et al. (2003) conducted a study of 145 people in Múrcia, Spain, but only included 101 questionnaires in the analysis. Two groups of participants were formed: one that was living within 150 m of the BS and another beyond 150 m. The average measured power density was $1.1 \mu\text{W}/\text{cm}^2$ at locations within 150 m and $0.1 \mu\text{W}/\text{cm}^2$ beyond 150 m. This study also showed that complaints (insomnia, headaches, difficulty in concentration, discomfort) were greater at locations where the power density was higher, inside the 150 m range.

In Poland, Gadzicka (Gadzicka et al., 2006) also used a questionnaire to conduct a neurobehavioral clinical study involving 500 subjects. The most important finding was the incidence of frequent headaches in subjects living less than 150 m from the BS. However, the study was limited because of the lack of information about the technical characteristics of the BS and the measurements of electromagnetic exposure.

Eger et al. (2004) carried out research in the city of Naila, Germany, to examine whether people who live near mobile phone BSs were at any risk of becoming ill with malignant tumors. Their data bank consisted of records of patients from 1994 to 2004. While preserving the privacy of the information, the personal data of almost 1000 subjects were examined. The analysis showed that the number of newly developed cancer cases was significantly higher among those



Fig. 1. BS site BH 20 in a residential area of the Serra neighborhood in Belo Horizonte municipality.

BS	Site BH 20 – Maxitel
Address	1373 Rua do Ouro Street - Bairro Serra neighborhood - Belo Horizonte municipality
Latitude	S 19° 56' 33,7"
Longitude	W 43° 55' 8,7"

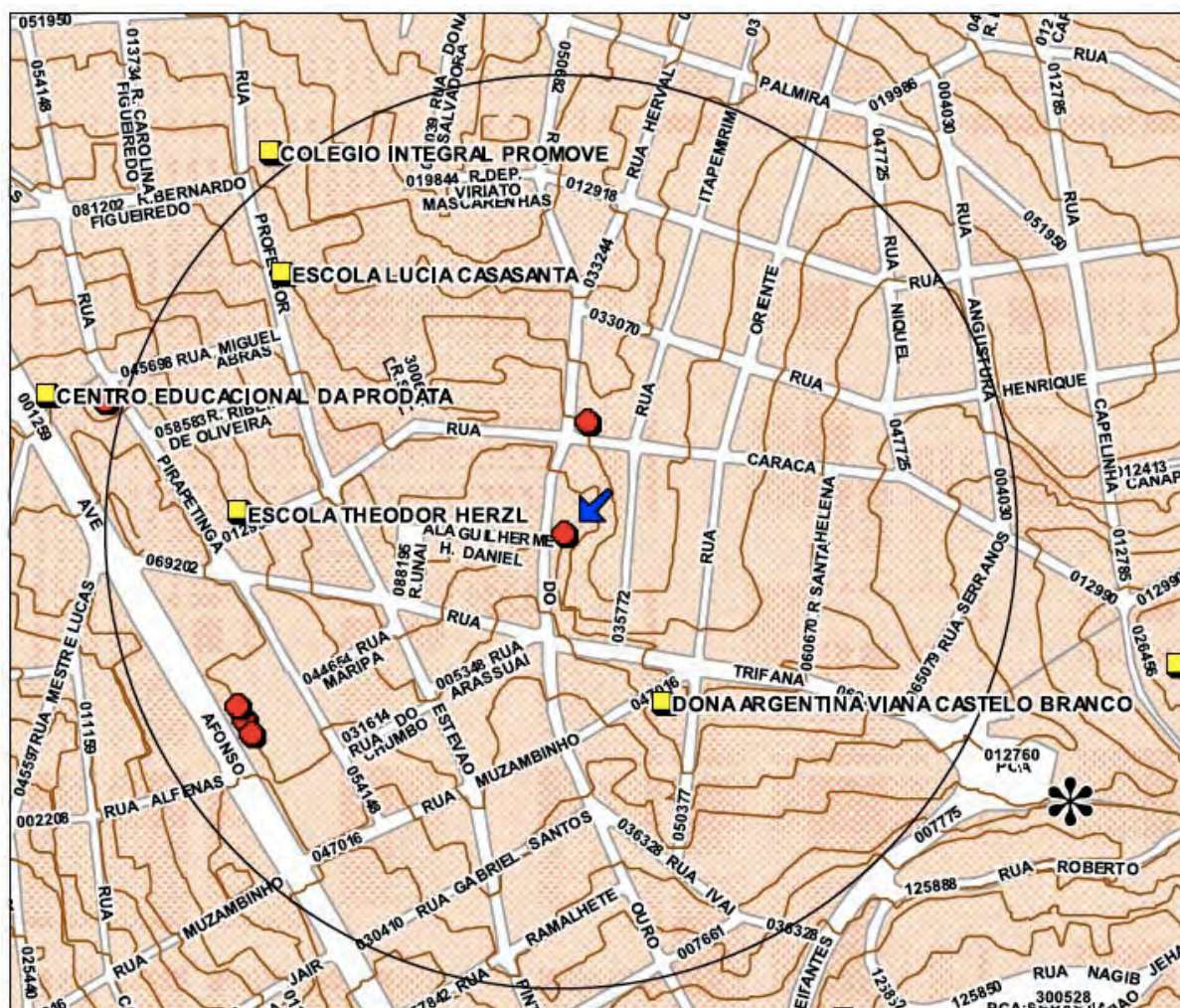
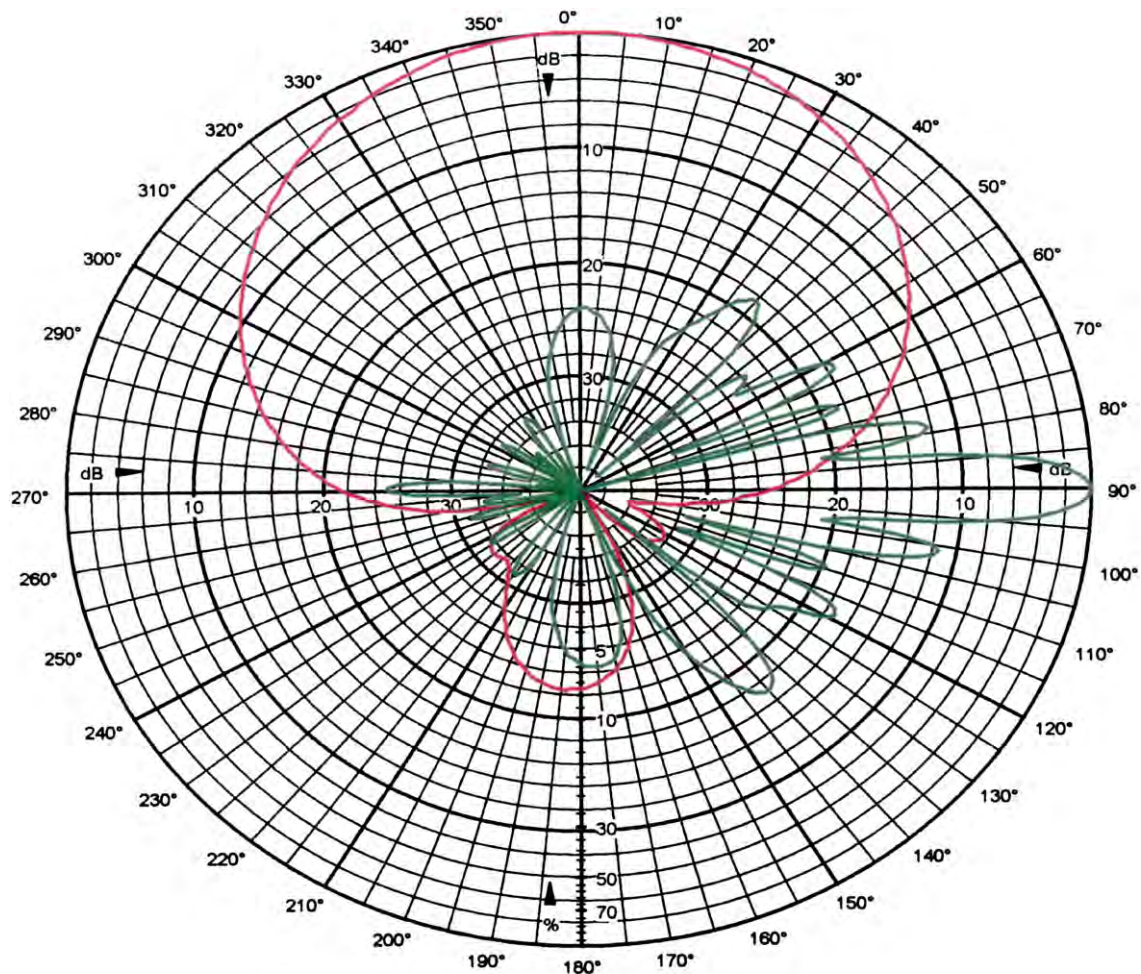


Fig. 2. Geographical location of BS Site BH 20 at 1373 Rua do Ouro Street, in the Serra neighborhood, Belo Horizonte municipality (Dode, 2003).

patients who had lived at distances within 400 m of the BS site, compared to the number of subjects who had lived beyond 400 m in the same period of time. The former subjects became sick eight years earlier, on average, than the latter subjects. The BS came into operation in 1993. From 1999 to 2004, that is, after five years' operation of the transmitting installation, the relative risk of suffering from cancer was three times higher for the subjects living within 400 m of the BS, compared to the dwellers beyond that distance. This study represents a milestone in the field because its results clearly demonstrate that the radiation from the BS may contribute to an increase in the clinical manifestation of the disease and the general development of cancer, even at exposure levels several orders of magnitude lower than the limits of the current guidelines.

Wolf and Wolf (2004) led a study in the town of Netanya, Israel, which showed an increase of 4.15 times in cancer incidence among subjects living within 350 m of the BS, compared to those who had lived

further away. The total number of participants ($n = 622$, group A) were individuals who had lived for a duration of three to seven years near a mobile phone BS and were also patients of a health care clinic. The exposure took place one year before the beginning of the study, when the BS came into operation. A second group of individuals ($n = 1222$, group B), who received medical care in a clinic near the BS and had environmental, socioeconomic and occupational characteristics similar to the first group was used as the control group. In group A, eight types of cancer had been diagnosed within a period of only one year. This rate was compared both to the rate of 31 cases per 10,000 people per year in the general population and the rate of two cases per 1222 people recorded in group B. A 95% confidence interval to each rate was calculated and the rate of cancer occurrence in group A was found to be significantly higher than the rates of group B and the entire population. The relative cancer rate was 10.5 among the exposed women of group A, 0.6 among the women of group B and 1.0 for the entire town of Netanya. Therefore, the cancer



This is the pattern of a sector antenna. You need 4 for 360 degree spread.

KATHREIN	Date 21.06.1995	Horizontal and Vertical Radiation Patterns 870 MHz	Type 737656
	Name		

Fig. 3. Horizontal and vertical radiation patterns per sector of BS site BH 20 (KATHREIN MOBILCOM BRASIL LTDA. HUEMER E. and LENSIG KI-, 1999).

incidence in the women of group A was significantly higher ($p < 0.0001$) than the cancer incidence of group B and the city as a whole. A relative risk comparison revealed that there were approximately 4.15 more cases of cancer in group A than in the population as a whole. The results, although still not conclusive, indicated a necessity to revise the current exposure limits in favor of more protective levels. Both the estimated and measured power densities in the entire exposed area in Netanya were far below $0.53 \mu\text{W}/\text{cm}^2$, that is, approximately 800 times lower than the exposure limit of $425 \mu\text{W}/\text{cm}^2$ for the frequency of 850 MHz from the ICNIRP guidelines.

The aforementioned studies, which aimed to find evidences of an increase in cancer incidence with proximity to mobile phone BSs, warrant additional research, because the cellular phone technology is relatively new and the associated total amount of environmental radiation is far from negligible.

The inhabitants of the Belo Horizonte municipality and the scientific community in general are also concerned about the number

of already installed BSs and the proliferation of new wireless BSs, not only for telephony but also for television. The number of mobile phone BSs, which equaled 474 in 2003, had reached approximately 856 in 2006.

Thus, this research to study health was conducted in a broad environmental context, aiming to verify if there is a spatial correlation between the cellular telephony system BS location and the cases of death by neoplasia during the period between 1996 and 2006.

2. Materials and methods

2.1. Area of study

The Belo Horizonte municipality, with an area of approximately 300 km^2 of area, has a tropical climate and is located at an average altitude of 900 m (minimum of 800 m and maximum of 1200 m)

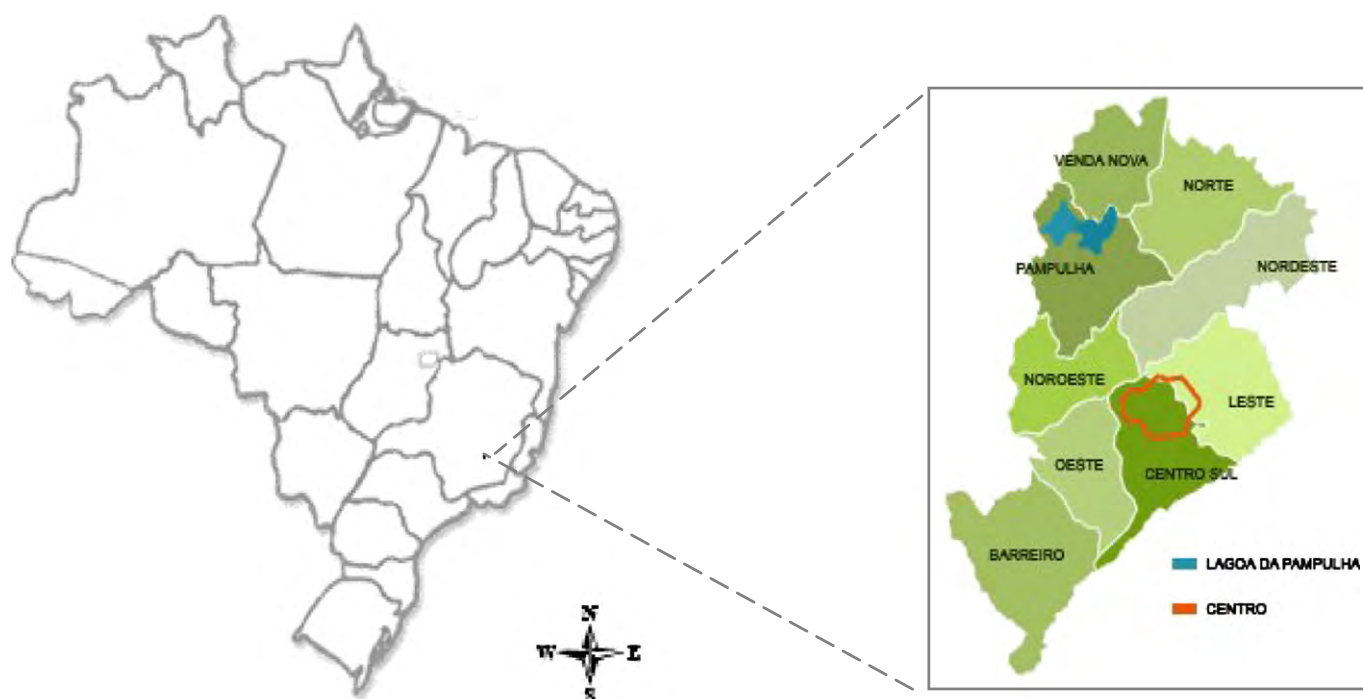


Fig. 4. The Belo Horizonte municipality and the nine SDs.

above sea level. The geology of the city includes several kinds of minerals and its soil of crystalline rocks is composed of dolomite, quartzite, phyllite and various schists. Constructed over many hills, the city is surrounded by a mountain named “Serra do Curral”. The municipality is divided into nine regions or sanitary and administrative districts (SDs): “Centro-Sul” (“Central-Southern”), “Norte” (“Northern”), “Leste” (“Eastern”), “Oeste” (“Western”), “Noroeste” (“Northwestern”), “Nordeste” (“Northeastern”), “Venda Nova”, “Pampulha” and “Barreiro”. Fig. 4 shows the Belo Horizonte municipality and the nine SDs.

The municipality has 55 universities and colleges, 36 hospitals, and a subway system containing 19 stations and 29 km of track, which transports 145,000 passengers a day. The majority of households are served by potable water (99.3%), garbage collection (96.6%), sewage (93.2%), electric power (99.83%), and landline phones (81.43%) (UNDP, 2008) and 128.77 accesses by mobile phones per 100 inhabitants through April 2011 (ANATEL, 2011). With these data, one can conclude that much of the population possesses a cellular phone and more than 28% of the inhabitants have more than one. The city has road and railroad networks that link it to the main centers of the country, as well as three airports.

More than 80% of the municipal economy is focused on commerce, financial services, real estate activities and public administration. The metallurgical industries, including iron and steel metallurgy, and ore mining are located in the areas surrounding the metropolitan region but not in the Central-Southern region.

The city of Belo Horizonte has been selected by the Population Crisis Committee of the United Nations (UN, 2007) as the metropolis with the best quality of life in Latin America and was ranked 45th in the world. Its health system is considered very good, according to the Atlas of Human Development (2000)/United Nations Development Programme (UNDP, 2008).

The city had 2,238,332 inhabitants in 2003 and 2,258,096 in 2010 (IBGE, 2010), which suggests that the population in the city is stable. However, the city, as in any urban area in Brazil, has a concentrated

population, with a large number of people living in apartment buildings. This fact, along with the mountainous landscape, force mobile phone operators to install their BSs at strategic points in the city, mainly on top of towers and poles, as on the terraces of public or residential buildings, to ensure good coverage of the mobile phone network.

Of the nine SDs, the Central-Southern region is the richest region of the city and is the third largest in number of inhabitants with 249,862. There are plenty of commercial and service shops, several shopping centers, and many households with one or more families. This SD also has several hospitals, parks and leisure areas. Most of the dwellers are highly educated and belong to the middle and upper classes. The traffic is heavy because of the large number of vehicles that travel in that region. The Western region is less densely populated, has no skyscrapers and its inhabitants have low revenues. The Barreiro region is the most populated after the Central-Southern SD, and has many industries. The most populated region, with 338,753 inhabitants, is the Northwestern (IBGE, 2000).

2.2. Study design

This ecological study consists of an exploratory spatiotemporal analysis to determine whether there is an association between clusters of BSs and deaths by neoplasia in the Belo Horizonte municipality, in the southeastern part of Brazil. This design was chosen because of the possibility of using geographic areas as units of analysis, where each unit of analysis is composed of a group of individuals or communities. Therefore, it is possible to determine whether there is a correlation between a certain risk and the occurrence of certain grievances within the population. In this type of study, it is not possible to consider individual characteristics, such as food and life habits, activity level, smoking, self-medication, individual pathologies, or genetic factors (GORDIS, 2004).

The analysis was based on the following databases: 1. A database of deaths by neoplasia documented in the Mortality Information

System (SIM: “Sistema de Informação em Mortalidade”), provided by the City Health Department; 2. A database of the site register of BSs, provided by the Brazilian Telecommunications Agency (ANATEL); 3. A database of the city census, including demographic information provided by the Brazilian Institute of Geography and Statistics (IBGE).

The death, BS and population data were geocoded according to census tracts (CTs) or censitarian sectors (CSs), which are “territorial units defined by IBGE (IBGE, 2000) to orient the spatial distribution of a population”. The definition of a CT is related to a specific geographical zone whose population can be counted by local

interviewers, taking into account the existence of geographical barriers, the population size and traffic flow. There were a total of 2563 CTs in the Belo Horizonte municipality (IBGE, 2000).

2.2.1. Cancer death variable

The main outcome that was studied was the number of deaths by neoplasia of Belo Horizonte municipality residents that occurred from 1996 to 2006, were reported to the City Health Department and were routinely confirmed by established criteria, under the responsibility of

Table 1
International classification of diseases – ICD-10.

Disease	ICD-10 – According to WHO ICD10 homepage		Bibliographical references
	Primary	Secondary	
Primary: Malignant melanoma of skin; Other malignant neoplasms of skin./Secondary malignant neoplasm of skin.	C43 and C44	C79.2	Eger et al., 2004.
Primary: Malignant neoplasm of breast./Secondary malignant neoplasm of other specified sites.	C50	C79.8	Eger et al., 2004; Wolf and Wolf, 2004; Bioinitiative Report, 2007; Guenel et al., 1996; Feychting et al., 1997; Wakeford, 2004; Mack et al., 1991; Beall et al., 1996; Benishvili et al., 2005; Hardell and Sage, 2007.
Primary and secondary: Malignant neoplasm without specification of site.	C80	C80	Khurana, 2008; Hardell et al., 2007; Bioinitiative Report, 2007; Mack et al., 1991; Beall et al., 1996; Guenel et al., 1996; Wakeford, 2004.
Primary: Malignant neoplasm of ovary./Secondary malignant neoplasm of ovary.	C56	C79.6	Eger et al., 2004; Wolf and Wolf, 2004
Primary: Hodgkin's Disease/Secondary and unspecified malignant neoplasm of lymph nodes.	C81	C77	Wolf and Wolf, 2004.
Primary: Malignant neoplasm of bronchus and lung./Secondary malignant neoplasm of lung	C34	C78.0	Eger et al., 2004; Wolf and Wolf, 2004
Primary: Malignant neoplasm of kidney, except renal pelvis./Secondary malignant neoplasm of other sites.	C64	C79.0	Wolf and Wolf, 2004.
Primary: Malignant neoplasm of prostate./Secondary malignant neoplasm of other specified sites.	C61	C79.8	Eger et al., 2004.
Primary: Malignant neoplasm of pancreas; Pancreas, unspecified./Secondary malignant neoplasm of other and unspecified digestive organs.	C25 and C25.9	C78.8	Eger et al., 2004.
Primary: Malignant neoplasm of other and ill-defined digestive organs: Intestinal tract, part unspecified; Malignant neoplasm of small intestine; Malignant neoplasm of colon; Malignant neoplasm of rectosigmoid junction./Secondary malignant neoplasm of small intestine; Secondary malignant neoplasm of large intestine and rectum.	C26.0; C17; C18; C19	C78.4; C78.5	Eger et al., 2004.
Primary: Malignant melanoma of skin; Melanoma <i>in situ</i> ./Secondary malignant neoplasm of skin	C43 and D03	C79.2	Eger et al., 2004; Hallberg, 2004; Johansson, 2006.
Primary: Malignant melanoma of skin./Secondary malignant neoplasm of skin.	C43	C79.2	Stang, 2001.
Primary: Malignant neoplasm of kidney, except renal pelvis; Malignant neoplasm of renal pelvis./Secondary malignant neoplasm of kidney and renal pelvis.	C64 and C65	C79.0	Eger et al., 2004.
Primary: Malignant neoplasm of stomach./Secondary malignant neoplasm of other and unspecified digestive organs.	C16	C78.8	Eger et al., 2004.
Primary: Malignant neoplasm of bladder./Secondary malignant neoplasm of bladder and other and unspecified urinary organs.	C67	C79.1	Eger et al., 2004.
Primary: Multiple myeloma and malignant plasma cell neoplasms; Lymphoid leukemia; Myeloid leukaemia; Monocytic leukemia; Other leukemias of specified cell type; Leukemia of unspecified cell type; Other and unspecified malignant neoplasms of lymphoid, haematopoietic and related tissue.	C90; C91; C92; C93; C94; C95 and C96		Eger et al., 2004.
Primary: Hodgkin's disease; Follicular [nodular] non-Hodgkin's lymphoma; Diffuse non-Hodgkin's lymphoma; Peripheral and cutaneous T-cell lymphomas; Other and unspecified types of non-Hodgkin's lymphoma./Secondary and unspecified malignant neoplasm of lymph nodes.	C81; C82; C83; C84 and C85	C77	Hardell et al., 2007.
Primary: Malignant neoplasm of brain./Secondary malignant neoplasm of brain and cerebral meninges.	C71	C79.3	Khurana, 2008; Hardell et al., 2007; Schoemaker et al., 2005.

the epidemiology officers of the city, accredited by federal and local health authorities (BRAZIL, 2011).

All deaths by neoplasia, based on death certificates, were provided. Then, they were re-selected according to a subset of the International Classification of Diseases (ICD) previously organized and extracted from a careful review of the scientific literature, linking cancer and non-ionizing electromagnetic radiation, as can be seen in Table 1.

Out of 22,493 deaths that occurred in the analyzed period (1996 to 2006), 7191 were initially eligible for the study. The selected death by neoplasia cases were grouped according to the CT of the residences, based on the residents' postal address. The data bank of SIM did not possess the address of the persons who died by neoplasia in 1998. So, about 780 deaths that occurred in that year could not be georeferenced. To identify the CT, the cartographic map was used, within the borders delimited by IBGE (IBGE, 2000). Fig. 5 shows the fluxogram of deaths by neoplasia in the period from 1996 to 2006.

The death cases were further analyzed according to age, gender, site of residence and year of occurrence and the death rates were determined as described below. After aggregation of the deaths and BS exposure (explained below) in the CT, differing numbers of deaths were determined, depending on whether the date of first exposure was taken to be the date of the first license of the BS (7191 deaths) or the date of the register of the BS (8082 deaths). We opted to work with the date of first license; an option that makes our analysis even more conservative.

2.2.2. Base stations

The BS database and their respective geographical locations were obtained from the ANATEL database (site: <http://www.anatel.gov.br>) and were further geoprocessed according to their CT in two distinct years: 2003 and 2006. In 2003, there were approximately 474 BSs, and in 2006, there were approximately 856 in the city. Clusters (the so-called “hotspots”) were the identified in each SD. This explanatory analysis was carried out through thematic maps, using the software MAPINFO™, version 7.0, and the Kernel estimator.

2.2.3. Data processing and mapping of the BSs and deaths in the Belo Horizonte municipality

Eligible deaths by neoplasia were then plotted inside circles with radii varying from 100 m to 1000 m, centered at the location of the first transmitter antenna of the mobile phone network to which the resident was possibly exposed. This selection took into account the date of the death and either the date of registration or of the first

license of the given BS. To detect case conglomerates in space, the total amount (2563) of CTs and the corresponding nine DSs of the city were used again. Software was developed to calculate the shortest distance between the death and the antenna and to estimate the time of exposure of the deaths to the radiation of the antennas.

2.2.4. Death rates

The mortality by neoplasia rates per CT were determined from the neoplasia diagnoses in compliance with the ICD-10 during the period of the study, using the CT as defined by IBGE for the 2000 national census as the spatial analysis unit. The deaths in every CT were used as the numerator. The temporal unit was the calendar year. The death data were then georeferenced to the address of the subject's and the IBGE census data (IBGE, 2000) for each CT. The estimated population at risk was used as the denominator.

The accumulated incidence in the Belo Horizonte municipality was calculated by dividing the total amount of deaths in each region by region's entire population.

2.2.5. Estimates of the mortality rates according to distance and duration of exposure to the radiation of the BSs

To understand the spatiotemporal exposure to the radiation of the BSs, the duration of possible exposure corresponding to each death was estimated, using a proxy to the subject's residential addresses, in terms of the duration of his or her exposure to the first installed transmitter antenna of the mobile phone network. To estimate the number of days of exposure, the elapsed time period from the date of installation of the first antenna to the date of the death was calculated, in spite of the exposure to the radiation of other antennas that might have been installed afterward. Some subjects may have been exposed to many antennas at different times, but in this study we considered only the date of installation of the first antenna. The delimitation of the distance intervals of the BSs was then performed. Each interval with a radius of 100 m had a BS as its center, from which the distance was increased to 1000 m. For each 100-meter interval, the deaths that occurred within the elapsed period of time, as well as the estimated population living within that radius, was then observed. To obtain the population at risk, the estimates of all of the CTs were considered, even those which were only partially included within those radii. Therefore, the population at risk was conservatively overestimated.

To estimate the mortality rate within each radius, the number of deaths was divided by the estimated population included in the radius of each CT. For example, for the 100-meter radius, the 3569 deaths were divided by the 821,890 estimated exposed subjects living inside that radius. For the rates between 200 m and 1000 m, both the number of deaths and the included population were cumulatively considered. This was necessary because the subjects included in the 100-meter radius must be considered to perform the calculation inside the 200-meter radius (Fig. 6) (Table 5).

2.3. Environmental monitoring of the electromagnetic field (EMF)

In 2008, one began monitoring the environmental EMF in the CT with the largest concentration of antennas in the Belo Horizonte municipality. The survey used an electric field meter and isotropic probe, with a frequency range of 0.2 MHz to 3.0 GHz; a spectrum analyzer, with a frequency range of 10.0 MHz to 6.0 GHz; a datalogging multimeter; a GPS unit and a laptop. For the field measurements, the following guidelines were observed: IEEE, 1999, 1992; NCRP, 1993; ANATEL Annex to Resolution no. 303 (ANATEL, 2000a, 2000b), and the environmental field survey of two particular nearby BSs, carried out by Dode (Dode, 2003). The analyzed frequencies of the BSs were corresponded to the bands A, B, C and D. During the measurements, stronger electric field intensities were usually found when the probe was far from the ground. Approximately 400 points in the Central-Southern

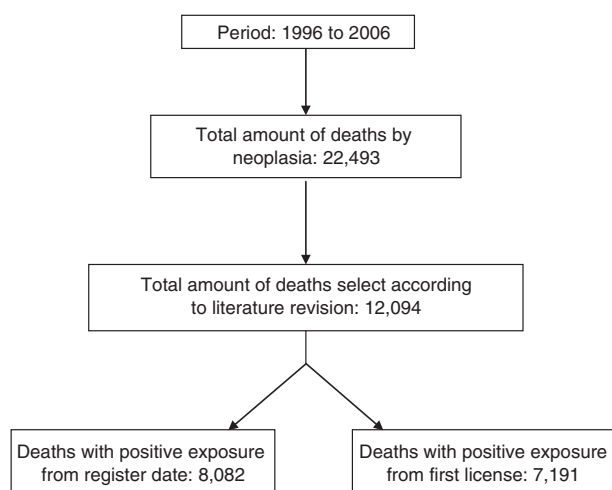
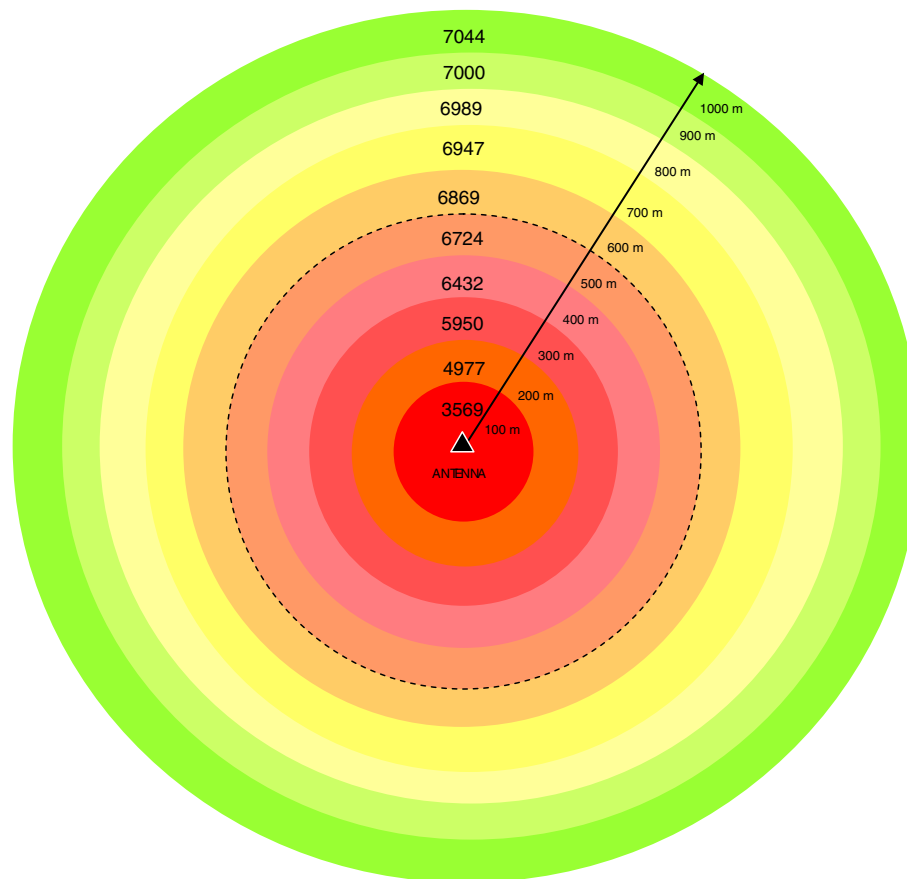


Fig. 5. Fluxogram of deaths by neoplasia in the period from 1996 to 2006.



Within 100 meters = 3,569 deaths

Within 200 meters = 3,569 + 1,408 deaths = 4,977 deaths

Within 300 meters = 4,977 + 973 deaths = 5,950 deaths

Within 400 meters = 5,950 + 482 deaths = 6,432 deaths

Within 500 meters = 6,432 + 292 deaths = 6,724 deaths and so on within 1000 meters

Beyond 1000 meters + 147 deaths

Total amount of = 7,191 deaths

Fig. 6. Total amount of deaths by neoplasia per 100-meter distance band, in census tracts inside a radius of up to 1000 m from the mobile phone transmitter antennas, in the Belo Horizonte municipality, from 1996 to 2006. Total: 7044 deaths.

region of the municipality, which were located in squares, parks, schools and households nearby BSs, were considered in the survey.

2.4. Ethical committees

Because this study includes data on human beings, it was approved by the ethical committees of the Institutional Review Boards of the Federal University of Minas Gerais and the Belo Horizonte City Health Department, with the purpose of accomplishing the Resolution 196/1996 of the Brazilian Health Ministry.

3. Results

3.1. Total deaths by neoplasia selected in the period from 1996 to 2006

Fig. 7 shows the geographic location of the cases of deaths by neoplasia that were confirmed in the literature and selected according to Table 1, totaling 7191 deaths. The detailed geographic description of

deaths location can be seen in Table 2. The Central-Southern SD contained the greatest absolute number of deaths, followed by the Northwestern and Eastern SDs.

3.2. Base station

All registered BSs that were georeferenced through 2006 are plotted in Fig. 8. The percentage of BSs installed through December 2003 was the greatest in the Central-Southern region, comprising 38.60% (182 out of 474); until December 2006, the percentage was approximately 39.60% (338 out of 856). The BS percentage by region in the Belo Horizonte municipality in 2003 and 2006 can be seen in Fig. 9.

3.3. Data processing and mapping of the base stations and deaths in the Belo Horizonte municipality

Fig. 10 portrays a sample of the georeferencing of the BSs and the deaths by neoplasia in downtown Belo Horizonte City located

Table 2

Description of the death coding and geographic location.

Deaths codification	Regions or sanitary districts									
	Barreiro	Central-Southern	Eastern	Northeastern	Northwestern	Northern	Western	Pampulha	Venda Nova	Total
C16	83	143	132	124	183	75	125	57	89	1011
C17	2	3	4	1	3	2	4	4	0	23
C18	1	2	2	2	1	1	3	0	1	13
C19	4	8	13	9	16	2	7	1	5	65
C25	30	155	88	74	137	23	77	42	39	665
C26	4	27	17	12	17	19	23	14	14	147
C34	88	300	194	140	233	89	187	75	99	1405
C43	0	0	0	0	0	0	0	0	1	1
C50	43	210	145	68	177	23	94	35	34	829
C61	42	174	131	84	186	51	122	56	58	904
C64	17	40	28	19	28	16	20	10	11	189
C65	0	1	0	1	0	0	1	0	3	6
C67	18	51	42	28	40	10	30	21	12	252
C71	37	105	54	37	94	23	63	30	28	471
C80	36	86	71	55	83	36	61	21	34	483
C81	5	19	8	4	9	3	9	3	5	65
C83	0	2	0	0	1	0	0	0	0	3
C84	0	0	0	0	0	0	1	0	0	1
C90	11	40	39	21	41	14	33	13	16	228
C91	4	11	6	10	12	3	15	7	7	75
C92	19	62	34	24	43	13	34	14	16	259
C93	0	1	0	0	1	0	0	0	1	3
C94	0	2	0	0	0	0	0	0	0	2
C95	7	17	10	4	18	7	12	4	12	91
Total	451	1459	1018	717	1323	410	921	407	485	7191

in Central-Southern region. A given BS can have three, six, nine, twelve or more antennas, depending on the requirements in the region.

To detect clusters of cases in space, the nine SDs in the Belo Horizonte and their 2563 CTs were used as units of analysis. In Fig. 11, there are CTs with 12, 13, 14 and even 18 deaths.

Table 3

Percentage of deaths by age and gender in Belo Horizonte municipality.

Age	Male	Female	Deaths total	Percentage%
00–04	10	16	26	0.36
05–09	13	10	23	0.32
10–14	12	8	20	0.28
15–19	11	8	19	0.26
20–29	34	34	68	0.95
30–39	80	120	200	2.78
40–49	247	322	569	7.91
50–59	535	559	1,094	15.21
60–69	920	686	1,606	22.33
70–79	1,217	797	2,014	28.00
80–89	708	550	1,258	17.49
90–99	136	158	294	4.08
TOTAL	3,923	3,268	7,191	

Table 4

Accumulated incidence rate of all deaths in the Belo Horizonte municipality.

Regions or sanitary districts	Population	Death number	Accumulated incidence rate/1000
Centro-Sul	249,862	1459	5.83
Leste	251,118	1018	4.05
Noroeste	338,753	1323	3.90
Pampulha	106,330	407	3.82
Oeste	249,059	921	3.69
Nordeste	248,406	717	2.88
Norte	153,821	410	2.66
Venda Nova	198,475	485	2.44
Barreiro	219,873	451	2.05
TOTAL	2,015,697	7191	

3.4. Death rate

The percentage of deaths by neoplasia per year in the Belo Horizonte municipality from 1996 to 2006, considering the start of exposure to be the date of the first license, is shown in Fig. 12. The accumulated incidence rate per 1000 residents for each SD is shown in Table 4. Again the Central-Southern SD presented the highest accumulated incidence rate, i.e., 5.83 incidents per 1000 inhabitants and the lowest rate was 2.05 incidents per 1000 inhabitants in the Barreiro SD.

The same trend was observed for both women and men with similar profiles during the studied years. As expected the incidence of death of women and men was higher in those older than 40, and in this group, the number of deaths was 3923 for men and 3268 for women. After the age of 40, the death rate (7.91%) grew for both sexes, as shown in Table 3. After the age of 60, the rate was even higher (22.33%).

Supplementary Graphics 1 shows the rate of death by neoplasia, according to ICD classification. The most significant causes were malignant neoplasm of bronchus and lung (C34), 19.55%; malignant neoplasm of stomach (C16), 14.05%; malignant neoplasm of prostate

Table 5

Mortality rates by neoplasia in the Belo Horizonte municipality, according to distance from the BS.

Distance (meters)	Deaths total	Population total	Mortality rate/ 10,000	Relative risk
Until 100	3569	821,890	43.42	1.35
Until 200	4977	1,237,368	40.22	1.25
Until 300	5950	1,602,869	37.12	1.15
Until 400	6432	1,796,604	35.80	1.11
Until 500	6724	1,934,032	34.76	1.08
Until 600	6869	2,030,093	33.83	1.05
Until 700	6947	2,055,325	33.80	1.05
Until 800	6989	2,086,712	33.49	1.04
Until 900	7000	2,107,277	33.21	1.03
Until 1000	7044	2,148,327	32.78	1.00
Null hypothesis	7, 191	2,238,332	32.12	1.00

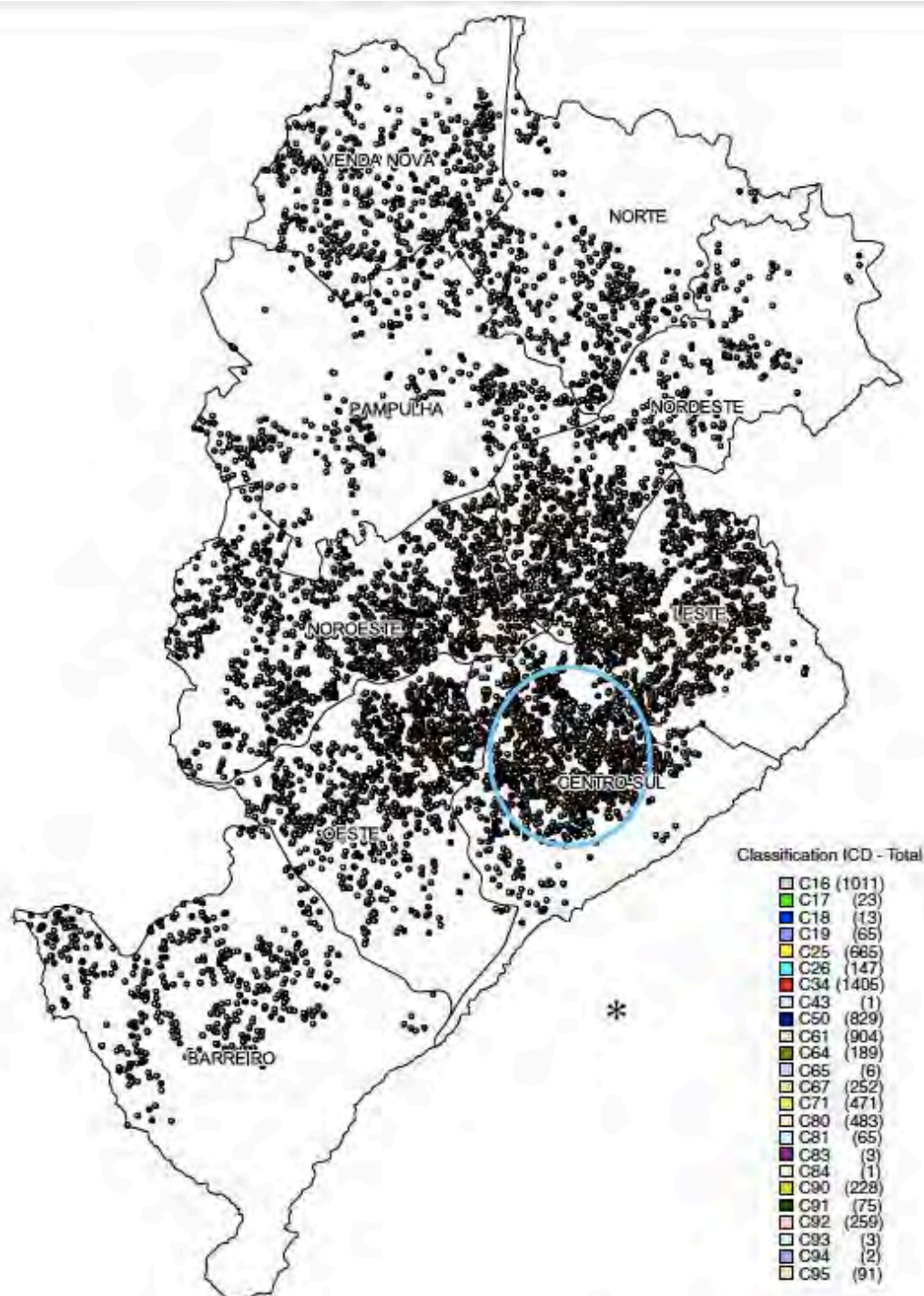


Fig. 7. Map of the total deaths by neoplasia in the Belo Horizonte municipality from 1996 to 2006, classified according to ICD. Total: 7191 deaths.

(C61), 12.57%; and malignant neoplasm of breast (C50), 11.53%. The largest absolute number of deaths was found in the Central-Southern region, followed by the Northwestern region. Also, the highest absolute numbers of lung cancer deaths (300 cases) and breast cancer deaths (210 cases) were found in Central-Southern SD (Table 2). The proportional mortality by gender can be seen in Figs. 13 and 14.

3.5. Estimates of the mortality rates by distance and time of exposure to BS

The mortality rates were estimated by correcting the population mortality by 10,000, according to the radius of distance from the BS within 1000 m. In the region within 100 m, the absolute number of

deaths was 3569 (a percentage of 49.63%), and the mortality rate was 43.42 persons per 10,000 inhabitants. Compared to with the total population mortality rate, the relative risk in this area was 1.35. In the area up to 200 m there was a growth of 1408 deaths, a total of 4977 deaths, a mortality rate of 40.22 persons per 10,000 inhabitants and a relative risk of 1.25 (Table 5). In this way, the estimates of mortality by neoplasia were calculated inside radii up to 1000 m from the BSs. The relative risks presented a decreased dose-response gradient with residents' distance from the first licensed BSs.

Fig. 15 shows the mortality rate by neoplasia according to the distance from the BS in the Belo Horizonte municipality, during the studied period. The accumulated mortality rates by neoplasia,

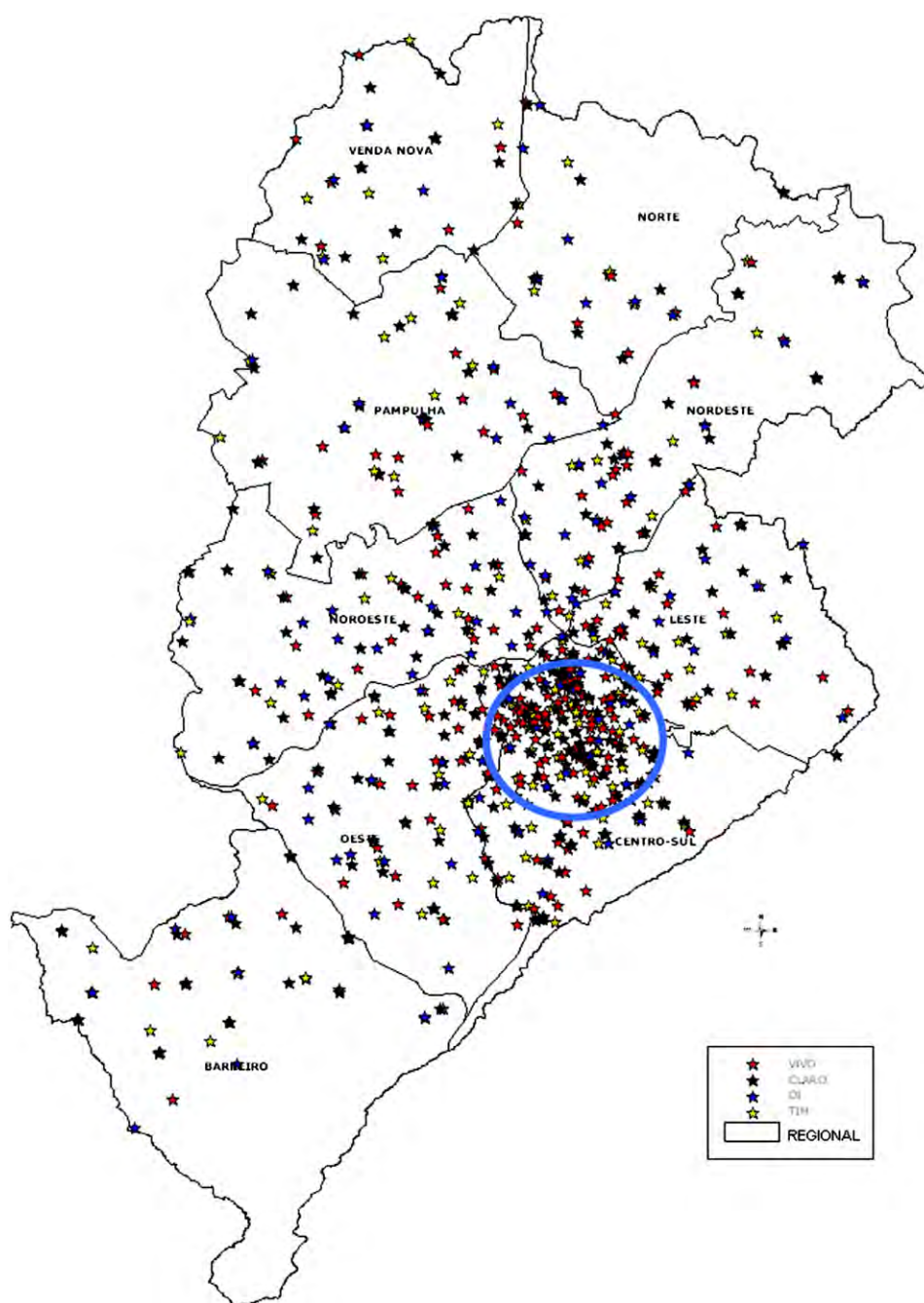


Fig. 8. Installed BSs in the Belo Horizonte municipality until 2006. Total amount = 856.

determined by dividing the total number of deaths during the period ($n = 7191$) by the total population living in the municipality (2,238,332), showed that there was a risk of dying of 32.12 per 10,000 inhabitants, as seen in Fig. 15. In this study, this figure represents the null hypothesis, i.e., the total number of deaths occurring in the period divided by the population, independent of the proximity to the BSs. Fig. 16 shows the distribution of the number of deaths by neoplasia versus duration of exposure since the date of operation of the first antenna in each analyzed CT.

3.6. Environmental monitoring of the electromagnetic field

The EMF results provided essential information for the assessment of risks to the health of the exposed persons in the community. A total of

400 points were measured in the Central-Southern region in 2008, where a major concentration of cellular telephony antennas was found. The mean intensity of the measured electric field was 7.32 V/m, varying from 0.4 to 12.4 V/m. It was common to find a stronger electric field at locations above the ground. The BS frequency bands ranged from approximately 800 MHz to 1800 MHz. In 2003, the power density varied from $0.898 \mu\text{W}/\text{cm}^2$ to $3.066 \mu\text{W}/\text{cm}^2$.

4. Discussion

Electric and EMFs interact with biological systems because they penetrate into organs and tissues, and the biological systems are ruled by delicate bioelectrochemical reactions that sustain the vital processes and receive the influence from those fields. As demonstrated in the literature

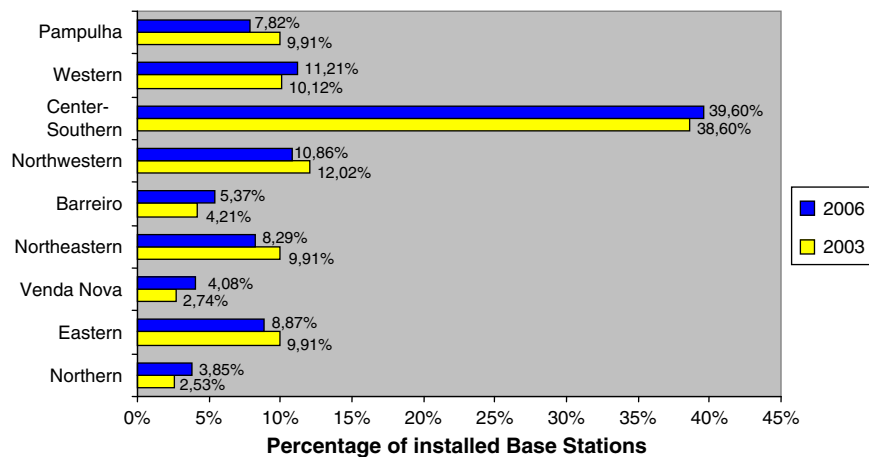


Fig. 9. BS percentage by Sanitary Districts in the Belo Horizonte municipality in 2003 and in 2006.

(Kundi and Hutter, 2009; Sage and Carpenter, 2009; Khurana, 2008; BIOINITIATIVE REPORT, 2007; Cherry, 2006; Cherry, 2007; Hardell and Sage, 2007), exposure to electromagnetic radiation of low intensities for long periods of time is a determinant for the aggravation and the emergence of diseases in humans. Studies point to observations of environmental carcinogens as an alert to the scientific community (Hardell et al., 2007). Bioeffects and adverse health effects occur at frequencies much lower than RF and extremely low frequencies (ELF), without any heating effect.

Khurana et al. (2010) identified by searching PubMed ten epidemiological studies that indicate the occurrence of neurobehavioral effects or cancer. In eight of those studies, the population lived within 500 m of a BS. However, all exposures were under the accepted international guidelines. Therefore, it is suggested that those guidelines may be inadequate in protecting the health of human populations. Additionally, more comprehensive epidemiological studies are necessary to evaluate long-term exposure to RF from mobile phones BSs to understand its health impact.

This research bases on the ecological study that uses geographical areas as units of pre-existing data to identify areas of risk. The data is already aggregated, and one does not know about the genetic characteristics, life habits, food choices and other factors of each individual. The ecological studies frequently begin the epidemiological process, and the discoveries are considered to be an alert.

In the Belo Horizonte municipality, the mortality rate was concentrated near the antennas and was not diffuse over the whole city. At a distance of up to 100 m, the absolute number of deaths was 3569, 49.63% of all deaths, the mortality rate was 43.42 persons per 10,000 and the relative risk was 1.35. When one does not consider the distances from the BSs for all the entire population of the Belo Horizonte municipality (2,238,332 inhabitants), the mortality rate was 32.12 per 10,000 inhabitants, which is the null hypothesis.

In this research, we found a mortality rate for the residents living within 500 m of the transmitter antennas of a BS greater than 34.76 per 10,000 inhabitants. This rate decreased for residents living farther from the BS, as shown in Fig. 15.

We concluded that the relative risk of death by neoplasia, according to the distance from a BS in the Belo Horizonte municipality, from 1996 to 2006, was greater within a radius of up to 500 m from the BSs (Table 5). In the town of Netanya, Israel, in 2004, the authors also found an increase of 4.15 times in the cancer incidence of the residents of a zone up to 350 m from the BS, compared to those who lived outside that area (Wolf and Wolf, 2004). A retrospective study in Naila, Germany, showed that the risk of new cancer cases was three times greater among the patients who had lived at a distance less than 400 m from a cellular telephone transmitter antenna during the last ten years (1994 and 2004), compared to those who lived at greater distances (Eger et al., 2004).

In addition, only the deaths of those who were exposed since the first license date of the BS were included in the study, even though there were antennas that were installed in the register date (before the licensing date).

Also, we observed that the Central-Southern SD possessed the greatest antenna concentration in the city and the most electromagnetic contamination. This region contained 38.60% of the installed antennas in 2003 and 39.60% in 2006. Again, through georeferencing, we observed a greater concentration of specific cases of death by neoplasia in the region. The accumulated incidence rate per 1000 residents was the largest in Central-Southern SD, reaching 5.83; this rate was the lowest (2.05) in Barreiro region.

In the Central-Southern SD, there are no factories; it is a strictly residential area, with some services and commerce. No power lines, highways, airports or railroads exist in the area. However, many private vehicles come and go in the region, and its inhabitants possess higher social status and affluence. It contains many wooded streets and gardens. The Central-Southern SD has other aggravating exposures, including noise, gases, fumes, aerodispersoids, and hydrocarbonates, each of which also damage human health. Despite the presence of diverse and aggressive potential agents that may have influenced the quality of life and the health of the dwellers living in the area, the mortality rates remained concentrated near the antennas, with a dose-response gradient, and were not diffuse all over the city.

Age and sex did not appear to be a confounder in this study. In Belo Horizonte municipality, like all of Brazil, the population suffers from a demographic transition characterized by the aging of the population, and this is a possible confounder for all chronic degenerative diseases. Looking at the profile of the proportional mortality by age and gender throughout the 10 years studied, there is no specific trend for either men or women, and the highest percentage started at age 40 and increased to age 60. Irrespective of the year, the proportional mortality by gender and age remained stable during the period, suggesting there is no relevant change in the proportion of deaths by cancer when age is taken into consideration.

According to the ICNIRP guidelines, the human levels to the public at large (ICNIRP, 1998), for the frequency (f) band ranged from 400 to 2000 MHz, the electric field intensity E ($V \cdot m^{-1}$) equals $1.375 f^{1/2} V/m$, which equals $1.375 \sqrt{f} V/m$.

These values are according to the reference level patterns for the public at large when compared with the current Brazilian federal law which establishes the following limits: for a 900 MHz field intensity an electric field of 41.25 V/m and a power density of 451.34 $\mu W/cm^2$, for a 1800 MHz field intensity an electric field of 58.33 V/m and a power density of 902.49 $\mu W/cm^2$. These human exposure limits are exclusively based on thermal effects.

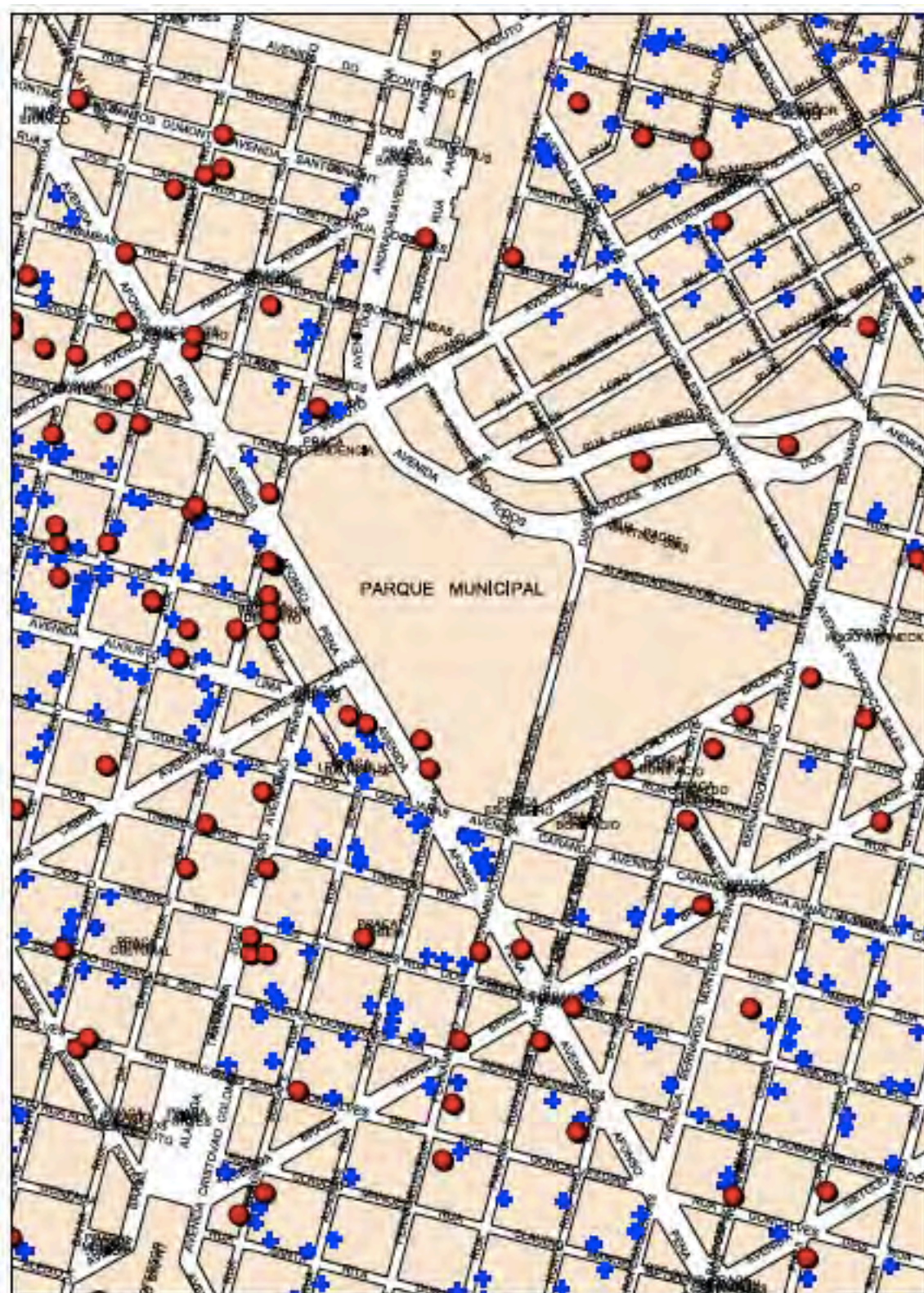


Fig. 10. Sample of geocoded deaths and BS locations in downtown Belo Horizonte City located in Central-Southern region.

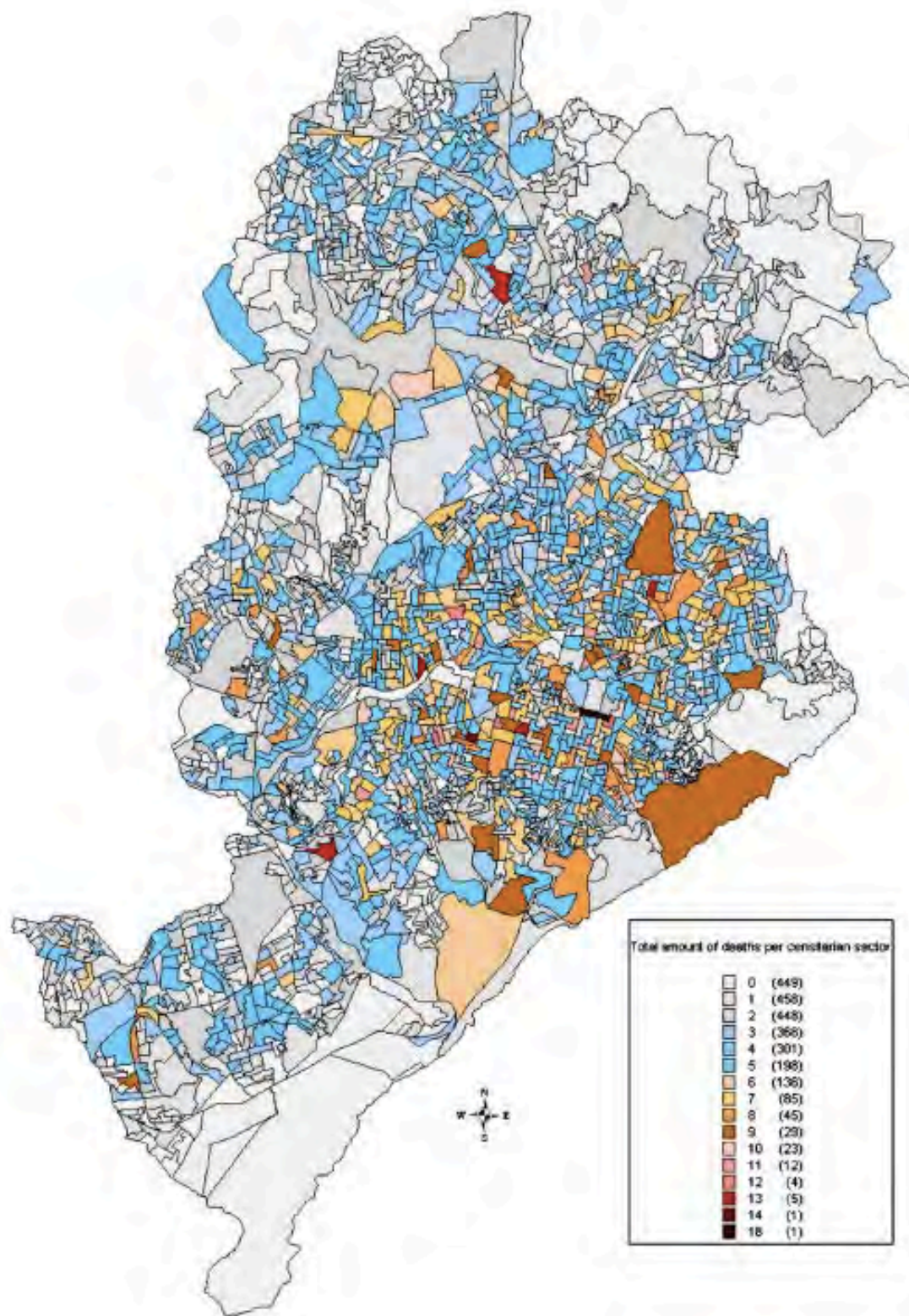


Fig. 11. Map of 7191 cancer deaths geocoded by CT.

In 2003, the largest electric field found during environmental monitoring of the BSs was 3.4 V/m and the greatest power density was 3.06 $\mu\text{W}/\text{cm}^2$. In 2008, the largest electric field found during environmental monitoring of the BSs was 12.4 V/m, and the greatest power density was 40.78 $\mu\text{W}/\text{cm}^2$ near the cellular

antennas in the 890 to 1800 MHz frequency band. These values were much larger than those reported in the Netanya study (approximately 0.53 $\mu\text{W}/\text{cm}^2$). The smallest values found in the measurements were a field intensity of 0.4 V/m and a power density of 0.04 $\mu\text{W}/\text{cm}^2$.

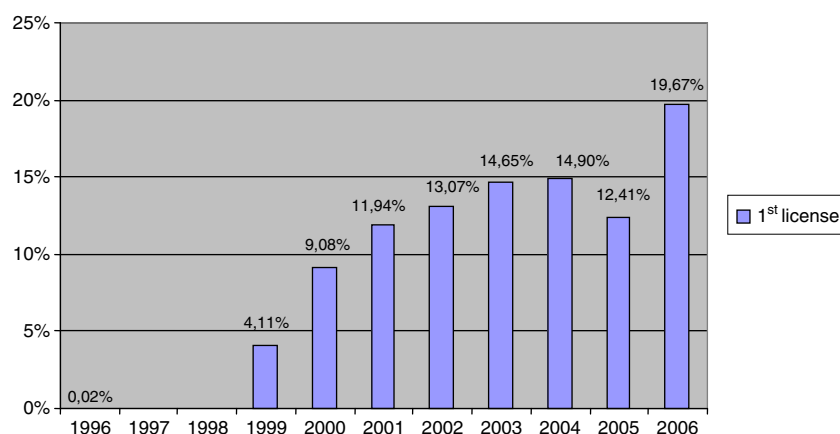


Fig. 12. Percentage of neoplasia deaths per year in the Belo Horizonte municipality, from 1996 to 2006, using the first license date.

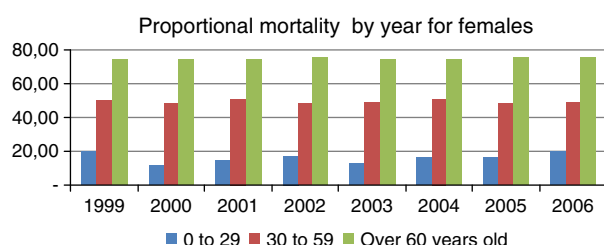


Fig. 13. Proportional mortality by year for females.

The major advantage of this ecological study is that it is the first epidemiological approach to determine the existence of a possible association between a determined exposure and a health outcome using the group characteristics.

The principal limitations of the present study concern the study design and the use of secondary data. By design, the group results could not be extrapolated to each person in the population. Although the data were well standardized and collected from official personnel in the City Health Department, they are subject to misclassification due to lack of information and errors in the entering of data and diagnosis. Finally, neither the life habits nor the genetic factors of the residents could be taken into account.

Despite these limitations, the present study has brought important contributions to the issue, the most important of which is the existence of a cluster of deaths by neoplasia associated with BS clusters. Although the direction of this relationship could not be specified, this work has demonstrated the existence of such clusters. Until more extensive studies are conducted, we urge the adoption of the Precautionary Principle and a revision of national policies toward stronger restrictions of the human limits associated with this

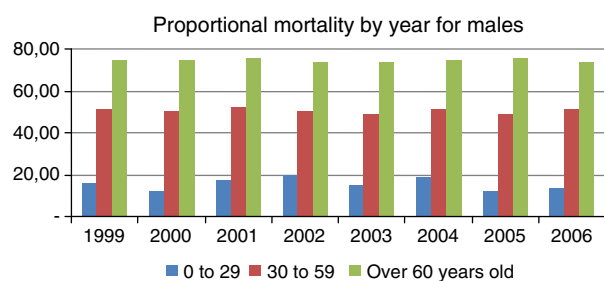


Fig. 14. Proportional mortality by year for males.

technology. The adoption of EMF and radiation levels similar to the more restrictive exposure limits of many other countries and towns would be one important public health provision. On this matter, we refer to the Porto Alegre Resolution.

The Precautionary Principle states that when there are signs of possible adverse effects to health or to the environment, although uncertain, the risks of inaction can be greater than the risks of acting, especially in relation to the control of human exposures to non-ionizing radiation. The Precautionary Principle reverses the burden of proof from those who suspect a risk on those who take the actions and affirm that only when new scientific discoveries will be recognized as the unique criterion to establish or to change guidelines. The principle asserts that precaution be maintained until new proven researches be done.

From May 18th to 19th, 2009, in Porto Alegre City, Rio Grande do Sul State, Brazil, occurred The International NIR (Non-Ionizing Radiation) and Health Workshop ("Seminário Internacional sobre RNI, a Saúde e o Ambiente"), sponsored by the Federal University of Rio Grande do Sul. The purpose of the workshop was to present lectures as a basis to initiate discussions among Brazilian and foreign scientists and public health authorities on the potential biological and health consequences and the setting of exposure limits of non-ionizing electromagnetic fields/radiation (NIR).

The workshop also was under the sponsorship of the Brazilian Ministry of Health, as well as some other governmental and non-

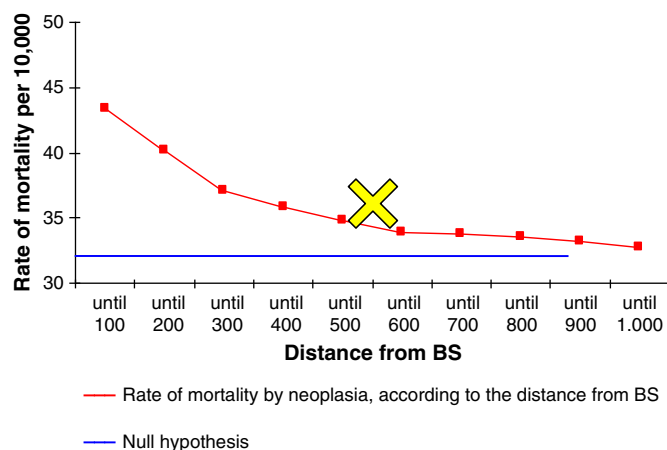


Fig. 15. Rate of mortality by neoplasia, according to the distance from the BS in Belo Horizonte municipality, from 1996 to 2006, and the null hypothesis.

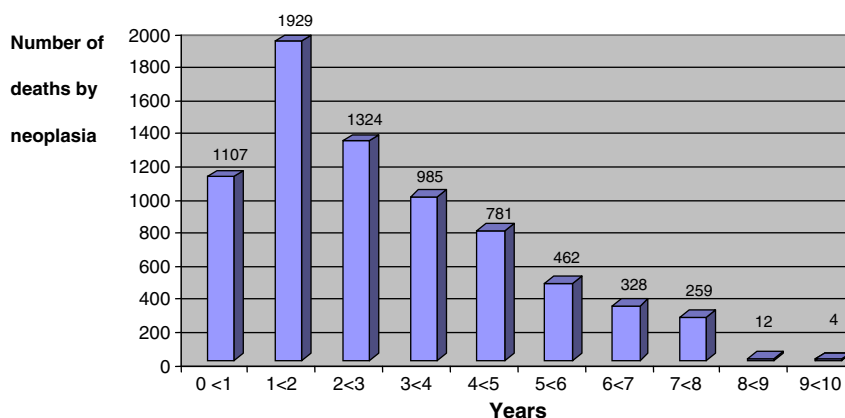


Fig. 16. Distribution of the number of deaths by neoplasia versus duration of exposure since the date that the first antenna in each analyzed CT came into operation.

governmental organizations. International researchers from several countries delivered talks on selected subjects.

Researchers, public health authorities, as well as authorities from the legislative, executive and judiciary governmental bodies from Brazil and other South American countries were also present.

Site: www.ufrgs.br/ppgee/rni.htm

After the event, the Porto Alegre Resolution was approved by the scientists from many countries and participants who have understood that the health protection, the well-being and the environment require the immediate adoption of the Precautionary Principle and some precautionary practices.

Site: http://www.icems.eu/docs/resolutions/Porto_Alegre_Resolution.pdf

5. Conclusion

This research showed the existence of a spatial correlation between cases of death by neoplasia and the locations of the BSs, in the Belo Horizonte municipality from 1996 to 2006.

The mortality rates and the relative risk were higher for the residents inside a radius of 500 m from the BS, compared to the average mortality rate of the entire city, and a decreased dose-response gradient was observed for residents who lived farther away from the BS. The major antenna concentration was located in the Central-Southern SD of the city, which also had the largest accumulated incidence (5.83/1000 inhabitants).

The measured values of the EMF, determined in 2008 and 2003, were substantially below the values allowed by the Brazilian federal law nr. 11934, May 5, 2009. Nevertheless, the values encountered in this study surpassed the limits of human exposure adopted by many other countries and cities in the world, including Italy ($10 \mu\text{W}/\text{cm}^2$); China ($6.6 \mu\text{W}/\text{cm}^2$); Switzerland ($4.2 \mu\text{W}/\text{cm}^2$); Paris, France ($1 \mu\text{W}/\text{cm}^2$); Salzburg, Austria ($0.1 \mu\text{W}/\text{cm}^2$); and Porto Alegre, Brazil ($4.2 \mu\text{W}/\text{cm}^2$).

New epidemiological studies must explore this issue with more timely and appropriate methodology to provide evidence that may confirm the relationship between risk and hazard at an individual level. Meanwhile, we strongly suggest the adoption of the Precautionary Principle until the limits of human exposure, as established in Brazilian Federal Law, can be re-evaluated.

Supplementary materials related to this article can be found online at [doi:10.1016/j.scitotenv.2011.05.051](https://doi.org/10.1016/j.scitotenv.2011.05.051).

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Precautionary Principle; Center for Safer Wireless Comments, Sep. 30, 2016

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Brief Comment

I am in opposition to 5G rollout, because the government has not done any studies on long-term health effects from exposure to 5G spectrum. In May 2016 the NTP showed a statisical increase in rare brain and heart cancers from rats exposed to cell phone radiation below thermal levels, yet the FCC has not done anything to revise its safety guidelines which are thermal based. To roll out 5G without doing studies on health first is NEGLIGENT. My children became sick from 4G LTE cell towers next to their school, and now we have to avoid cell towers. With FCC plan to put MILLIONS of small cells on residential streets, my children will become more ill. Health effects of 5G should be studied, not ignored!

Possible Hazards of Cell Phones and Towers, Wi-Fi, Smart Meters, and
Wireless Computers, Printers, Laptops, Mice, Keyboards, and Routers Book
Three, Gary Vesperman Comments, Sep. 17, 2016

**Possible Hazards of Cell Phones and Towers, Wi-Fi, Smart Meters, and
Wireless Computers, Printers, Laptops, Mice, Keyboards, and Routers
Book Three**

Since 2013 I have been emailed several dozen reports of possible medical and other hazards from intense electromagnetic radiation from cell phones and towers, Wi-Fi, smart meters, and wireless computer accessories including wireless computers, keyboards, mice, routers, printers, and laptops.

I have previously compiled a total of 400 pages of these reports in chronological order in two separate books with the same title as this “Book Three”.

All three ‘EMF Hazards’ books are linked at www.commutefaster.com/vesperman.html and www.padrak.com/vesperman. Over a dozen authoritative EMF-related reports are also linked at these two websites.

This report begins with “Disclaimers”, a table of contents, “Items of Outstanding Interest”, and a new supplementary set of potentially useful “Recommendations for Actions”.

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Special thanks to Bruce. I will be working my way through your suggestions and posting the results on here for everyone.

Again, thank you very much everyone.

Cheers

Bruce Evans

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Health Implications of Long-term Exposure to Electrosmog

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To: garyvesperman@yahoo.com

Sent: Friday, September 9, 2016 1:10 AM

Subject: Mobilfunk-Diskussion: EUROPAEM EMF Guideline 2016

(Excerpt:)

Physicians are increasingly confronted with health problems from unidentified causes. Studies, empirical observations, and patient reports clearly indicate interactions between EMF exposure and health problems ...

MEDICINE

Health Implications of Long-term Exposure to Electrosmog

Karl Hecht's review of the Russian research is published now in English translation: Health Implications of Longterm Exposure to Electrosmog (German edition 2012).

(Excerpt:)

The review findings by Karl Hecht – which disappeared into the government archives as soon as they had been submitted and which we are now making available to the public in this brochure in its most comprehensive form to date – are based on the assessment of 878 Russian studies between 1960 and 1997 ... >>>

About Karl Hecht's brochure

“The information provided in this brochure makes clear that short-term studies cannot answer any questions regarding long-term risks. The current exposure limits, which we mostly owe to the physics way of thinking, are a scientific anachronism. Furthermore, by using the concrete example of a research review, it is shown how the authorities have ignored and continue to ignore that which is important for public health and a sustainable future, but would be contrary to economic interests.” (from the Summary)

"It is astonishing to see that the proponents of thermal effects of electromagnetic fields have learned nothing new over the last 40 years. The incorrect concept affects European and US exposure limits, which cannot claim to provide protection. It affects research projects that only conduct short-term studies. It affects policies that claim safety where a warning would be in order. And it also affects the administration of justice when incorrect judgments are passed – which the court is forced to do within the currently valid legal framework." (from Chapter 5)

The English translation of Karl Hecht's 64 pages long brochure is linked at http://kompetenzinitiative.net/KIT/wp-content/uploads/2016/07/KI_Brochure-6_K_Hecht_web.pdf

"EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses" is linked at <http://www.stralskyddsstiftelsen.se/wp-content/uploads/2016/07/EUROPAEM-EMF-Guideline-2016-for-the-prevention-diagnosis-and-treatment-of-EMF-related-health-problems-and-illnesses.pdf>

European Union's "COUNCIL RECOMMENDATION of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)" is linked at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:199:0059:0070:EN:PDF>

Spanish report on electrosensitivity is linked at <http://www.lavanguardia.com/vida/20160802/403624742652/electrohipersensibilidad-sindrome-neurologico-prestacion-por-incapacidad.html>.

French report on dangers of radio frequencies is linked at http://www.lemonde.fr/sante/article/2016/07/08/alerte-sur-les-dangers-des-radiofrequences-pour-les-enfants_4965884_1651302.html?xtmc=portables_enfants&xtcr=1.

German report on electrosmog is linked at <http://www.strahlentelex.de/aktuell.htm>.

"Thank You for Calling in Deutschland" is linked at <http://kompetenzinitiative.net/KIT/KIT/thank-you-for-calling-in-deutschland/>.

German report from Austria is linked at <https://www.aktion21-austria.at/content/liebe-mitglieder-und-sympathisanten>

Actions of the European Commission regarding electromagnetic health effects and recommendations are linked at http://ec.europa.eu/health/electromagnetic_fields/eu_actions/index_en.htm

The following is linked at <http://kompetenzinitiative.net/KIT/KIT/english-brochures/>:

In December 2007, the Competence Initiative for the Protection of Humanity, Environment and Democracy has started its brochure series Effects of Wireless Communication Technologies. First translations of the brochures of the above-mentioned series are also available online.

Based on a broad scientific body, the publications confirm the conclusion the BioInitiative Report (www.bioinitiative.org) came to in 2012: Overloading the biophysical organization of life with zillions of artificially generated electromagnetic fields is one of the most dangerous aberrations of our time. For the sake of shortsighted economic interests and outdated technological solutions, the democratic constitutional state affords a technical and economic policy that can neither be reconciled with its responsibility for precaution nor with the currently valid fundamental and protective rights of its citizens.

With our print and online publications, we strive not only to show what risks and health impacts are known to independent researchers. We also would like to draw your attention to the social consequences when the truth and humans are treated with disregard.

The Series is published by

Prof. Dr. rer. nat. Klaus Buchner, Bernd Irmfrid Budzinski, Dr. med. Horst Eger, Dr. med. Markus Kern, Prof. Dr. phil. Karl Richter, Dr. rer. nat. Ulrich Warnke

Karl Hecht's brochure is already linked above.

Bees, Birds and Mankind – Destroying Nature by ‘Electrosmog’

Bees, Birds and Mankind

Destroying Nature by ‘Electrosmog’

Ulrich Warnke

The bio-scientist Ulrich Warnke is more familiar with nature's electromagnetic housekeeping than most. In this paper, he shows how wise and sensitive nature was about using electrical and magnetic fields in the creation of life [...]

Warnke's 47 pages long brochure is linked at

http://competence-initiative.net/KIT/wp-content/uploads/2014/09/ki_beesbirdsandmankind_screen.pdf

How Susceptible Are Genes to Mobile Phone Radiation?

How Susceptible Are Genes to Mobile Phone Radiation?

State of the Research – Endorsements of Safety and Controversies – Self-Help Recommendations

With Articles by Franz Adlkofer, Igor Y. Belyaev, Karl Richter, Vladislav M. Shiroff

Since wireless technologies of mobile phones and other communication networks have become big business, we also find conflicting tendencies side by side. Our living environment is being swamped with electromagnetic fields that raise intensity levels and show a wide range of novel characteristics [...]

Precautionary Principle; Cecelia Doucette Comments, Jul .11, 2016

July 11, 2016

Dear FCC Commissioners,

Three years ago an electrical engineering friend mentioned there could be biological harm from wi-fi and cellular technology. I investigated this extensively, and found thousands of peer-reviewed, published scientific studies from all over the world. See the National Institutes of Health PubMed database search on electromagnetic radiation adverse effects for over 3,000 published articles and studies:

<http://www.ncbi.nlm.nih.gov/pubmed/?term=%22Electromagnetic+Fields%2Fadverse+effects%22%5BMAJR>

I worked with my public school district, which did its due diligence to understand this issue, and we have become the [first in the nation](#) to put precautionary measures in place to protect our students and staff. I now get calls from parents all over the country looking to do the same after discovering wireless technology in schools, at home and elsewhere has given their children searing headaches, nose and ear bleeds, tinnitus, skin rashes, inability to concentrate, behavior issues, sleep problems and more. When they hard-wire and turn off the wi-fi the symptoms have resolved over time for most where they can control the radiation emissions. These are just the short-term effects of electrohypersensitivity (EHS); long-term exposure to wi-fi is being shown to cause cancer, infertility, heart disease, DNA damage and more.

We need to teach the public to use their personal devices more safely, but more importantly, we must stop putting antennas and utility “smart meters” on our homes, in our schools, and in our public spaces. 5G will put many more radiation-emitting wi-fi antennas in our neighborhoods.

While it's an exciting business proposition to become the first-to-market with 5G how can the FCC move forward with this when just last month the U.S. National Toxicology Program (NTP) released partial findings from a \$25 million study on cell phone radiation that confirms electromagnetic radiation is carcinogenic? This means all wi-fi is carcinogenic too as it operates off of the same electromagnetic radiation as cell phones.

The NTP informed the FCC, yet Tom Wheeler is still intent on [rolling out 5G](#), which will put even more radiation load on the unwitting public. He suppressed evidence of harm back in the 1990s when the first oncologist declared his patient died from brain tumors that aligned with the antennas in her cell phone, and he remains committed to corporate profit over public health today. I realize Mr. Wheeler is likely your boss, but please take the time to [hear it directly from the scientist](#) who lead the research for Mr. Wheeler back in the 1990s. After learning

cell phones are carcinogenic, Mr. Wheeler went on to discredit Dr. Carlo and never told the public.

If you've seen Will Smith's recent movie, "Concussion", the same is happening with wireless technology motives as the NFL: suppressing evidence of harm, trying to silence the scientists, and creating doubt among the public to perpetuate profits. It is classic redeployment of the tobacco industry playbook – also mentioned in "Concussion" – where the science is conclusive but kept from the public for decades. We cannot afford to wait decades with wireless technology as people are already getting very sick from electromagnetic radiation.

If this topic is new to you, the following 33-minute video with my local Board of Health will bring you up to speed. All of the documents I reference are included in the Comments section under the YouTube video. It will take time to absorb all of this if you are unfamiliar with wi-fi operating off of two-way microwave radiation, but I implore you, please do your independent research and stop the rollout of 5G until technology can be made biologically safe.

<https://www.youtube.com/watch?v=9T-4Aj6gb7A>

Former Microsoft Canada President Frank Clegg assures us we can still have technology, but it must and can be made to be safe. See below for a briefing he and top U.S. scientist Dr. Devra Davis gave to the Massachusetts legislature:

<https://vimeo.com/134411701>

We are all guilty of adopting wi-fi without understanding how it works; now that we know, it is our responsibility to ourselves, our children and future generations to act today to put it right. Please do your part as our public servants and make it a priority to come up to speed on this issue and protect our citizens over corporate profit. Please reach out if I can provide additional information.

Sincerely,

Cecelia Doucette
31 Fatima Drive
Ashland, MA 01721
[508-881-3878](tel:508-881-3878)

Precautionary Principle; Chuck Matzker Comments, Aug. 31, 2016

Proceedings
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Name of Filer chuck matzker
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Address 2008 windsor drive
City framingham
State MA
ZIP 01701

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Date Posted Aug 31, 2016

Brief Comment

Dear Sirs and Madams, I am strongly urging not moving forward in implementing 5G in any fashion until all health and safety risks are assessed honestly, unbiasedly, and with no influence from the telecommunications industry whatsoever. We need scientists who can come up with findings based on real science, without fear of losing their funding, having their credibility questioned, and other intimidation. We need health experts that specialize in how humans and all living biological organisms are affected by electromagnetic technology that is already being unleashed at a pace unknown in human history. I'd like to share my personal story with the current level of technology from the past ten years. I first became aware of microwave radiation in an offhand way in 2013. Firstly, I have to say that I was a huge fan of wireless tech since I got my first macbook in 2002. I had used wifi on train in the pilot program on the commuter rail since its inception, and loved the convenience. I had my whole condo on a wifi network. My entire family had iPhones, iPads, and we all talked with the phone right up next to our heads. Fast forward three years after I bought an iPhone. I kept my iPhone in the same pocket in my pants. And one day, in the interior of my thigh muscle, a very strange extremely fast-rhythmic pulsing would occur. I first thought it was one of those muscle spasms that would go away, but it went on for over a week non-stop. Then into two weeks. It was strange. So, I looked at all the possibilities it could be. I narrowed it down to my phone, after doing some research into how cell phones work. I then realized that the pulses from the phone had somehow entrained my muscles to pulse when the the phone was sending out it's signal to the nearest tower. I was deeply disturbed, but more annoyed that I had a rhythmic pulse in my inner thigh that I had no idea of it would go away. So that led me to learning to keep my phone away from my body, and as it turns out, it's in the phones' operating instructions to keep the phone away from the body. I wondered why it had this guideline, which led me to more and more scientific studies, spanning many years (including Dr. Carlo's studies for the industry). I wondered how much more microwave radiation am I exposing myself and my family to, thinking initially that this was a harmless technology. I am a curious person by nature, so I had to follow-through with the research. It was around that time that I started to experience heart palpitations and trouble sleeping, which I had never experienced before. I'll get to what I found was the cause later. After thoroughly researching the work of Martin Blank, and Henry Li, I acquired an electro-smog meter. I realized my wifi router, my dvd player, printers, and a host of other electronic devices in my living room, along with the four laptops (and corresponding bluetooth devices in my house were all sending out their own signals, night and day. Our phones were left on and charging next to our beds. I realized I was doing all the wrong things with this technology. We changed our behavior overnight. No more phones under pillow or falling asleep with the iPad on the stomach. No more leaving the wifi on all night. Changing our behavior to more safely live with this tech seems like the only option. I live in a condo, however, where we are also exposed to our neighbors wifi and other microwave signals. I ended up figuring out how to hard-wire my entire condo. That did help with my sleep, but not that much. I was still reading a strong signal from directly below my bedroom/workstation, where I work from all day long and sleep at night. I bought an electrosmog meter to see if I had missed any outstanding sources of radiation. I could control the amount of microwaves I was exposing my family to, but not the neighbors. Regarding my sleep problems and heart palpitations: it turns out my new neighbor had just installed a new wifi setup with two strong microwave signals directly below my bed, which I was being exposed to 24 hours a day. I asked her if she could turn off one of them, and she did (Comcast installs both signals by default when setting up, and only switches off the second signal if instructed by the user), and I saw an immediate improvement in my heart palpitations, and my sleep patterns were not noticeably disturbed. So just cutting down on the amount of microwave exposure has helped my health, but I

realize that we should not be exposing ourselves to non-ionizing microwave radiation at the frequencies and duration we currently are. I've had to delve more into the community when my son (whom I hadn't told any of this to at the time) kept coming home with headaches and needing to sleep, which was uncharacteristic of him. I took a tour of this classrooms, and noted that some rooms had industrial strength wifi routers. I made a connection, and read the bioinitiative report that the symptoms my son was exhibiting were consistent with the data levels in the studies. I became concerned that if it's affecting my child, wifi and microwave radiation in our Framingham schools is a threat to our children, and have proposed to the schools that we use the precautionary principle and stick with wired connections, rather than wifi. I have taken measurements in his school and determined that the levels our children are being exposed to is causing cellular damage to our children, which will ultimately affect their learning ability. We're already seeing a correlation between the unleashing of wireless technology in schools and test scores lowering across the board. I inquired about wifi with the Framingham superintendent's office, and I've proposed removing wifi to principal Patrick Johnson at Walsh, his CTO George Carpenter, and Superintendent Stacy Scott, and his CTO Alan Graham, and have received a reply, rather than an opinion, and ultimately forwarded the decision on this matter to the Framingham Board of Health (Chaired by Mike Hugo), which agreed after I presented to them, on the record that this is valid public health issue. We even had more than 50 people attend our international panel of experts here in Framingham who all testified that wifi is dangerous to children and needs to be removed. It was then that I found so many others that were experiencing the same things I was, coming from all over the state, and the country, even. I realized that this was more than just an isolated incident, and it's way bigger than just me and my family. I know that industry dollars and opinion are the norm, and that if one looks at the cursory data without digging in to find the facts, that it seems all but proven that wifi is safe, which is not the case, and I have facts from many reputable publicly available sources that I can cite. This matter is being dealt with in other towns in an thoughtful way (and in contrary to the telecom industry's wishes), and I'm hoping that we in Framingham and Massachusetts act intelligently and cautiously in this case. Waiting until the health effects are 100% proven is what the industry is counting on, but informed and intelligent citizenry sees through their profit-before-health attitude. We need to keep wired technology in schools, and pull out the industrial wifi that's exposing our children to known health hazards. I cannot rest until our children are safe. Feel free to reach out to me if you have any questions. Sincerely, Chuck Matzker

Precautionary Principle; Dr. Diane Schou PhD, Dr. Bert Schou, PhD.,
Comments (letter sent to FCC's OET), Sep. 2, 2013

FCC Comments on Notification of Inquiry,

ET Docket No. 13-84,
Reassessment of Federal Communications
Commission Radiofrequency Exposure Limits and
Policies

ET Docket No. 03-137,
FCC Proposes Changes in the Commission's Rules
and Procedures Regarding Human Exposure to
RadioFrequency Electromagnetic Energy.

Attached is a letter sent to:

Mr. Julius Knapp, Chief
Office of Engineering and Technology
Federal Communication Commission
Washington, D.C. 20554

Dr. Diane Schou
P.O. Box 99
Green Bank, West Virginia
24944
(304) 456-5558
Fax (855) 558-5888
September 3, 2013

Dr. J. Bertel Schou
P.O. Box 249
Cedar Falls, Iowa 50613
(319) 277-6661

Mr. Julius Knapp, Chief
Office of Engineering and Technology
Federal Communication Commission
Washington, D.C. 20554
Fax (202) 418-1944

12 pages

Dear Mr. Knapp

Dealing With EMR

The FCC responded September 14, 2012, to a letter we sent to Senator Grassley, requesting a White Zone and protection. The response was, however, unacceptableⁱ. Our own plight and that of many other individuals who are made ill by electromagnetic radiation can no longer be ignored. Avoiding cell towers, smart-meters, and Wi-Fi emissions are increasingly difficult, if not impossible.

Just as most people can eat a peanut, and just a peanut can kill someone else; we cannot tolerate electromagnetic radiation. The individual, allergic to peanuts, can avoid eating them and can keep peanuts out of their home. Electromagnetic radiation (EMR) cannot be blocked out from entering our homes nor stopped from entering our property, and living spaces.

Sometimes EMR is called electro-smog. The emissions are invisible, far-reaching, penetrating, and have amplitudes (power levels) much higher than quieter, natural background radiation.

Bert and Diane own a farm in Cedar Falls, Iowa, where they lived until a cell tower was erected nearby, and Diane's life became a misery of intolerable pain. Bert continues to cautiously live and work on the farm, but Diane was forced into exile, to live a nomadic existence, until she found a safe place to live in the United State's National Radio Quiet Zone close to the National Radio Astronomy Observatory (NRAO). The FCC knows some people who are harmed by EMR (technological lepers) have gone to Green Bank, West Virginia.

This is a very serious and compelling situation. As the increasing emissions from many sources converge in the atmosphere, we are creating a soup of un-regulated and un-monitored frequencies. This man-made radiation is artificial and is totally new to the environment. Nothing – no plant, no living thing – has ever been exposed to such EMR in the life of this planet until now. Nothing is therefore adapted to it.

We urge you to undertake the following:

- 1) White Zone areas: The government and military protects delicate instruments from EMR, so how is it that human bodies don't need the same? It is urgent that those of us, who are unable to tolerate exposure to EMR, have access to or be provided with areas where we are not harmed, areas where we can safely live in a humane fashion and where we can be productive. It appears the FCC will not entertain any notion regarding regulating emissions. Will the government grant areas to be White Zones that will shield and protect us?
- 2) Housing is difficult to find in Green Bank, an unofficial White Zone. Perhaps housing may be offered as will likely be for victims of Hurricane Sandy or the Nor'easter? Help is needed for those in forced exile too. Perhaps residences in and around the military base of Sugar Grove, which may be (according to rumors) partially shutting down? For some people the choices are to live in a car (to reduce harm) or to return to exposure (to risk harm, to live with continual pain or to possibly be willing to die because there is no relief). This is unjust.
- 3) The Department of Justice needs to recognize technological leprosyⁱⁱ as a disability. Basic civil services cannot be used if the services continue to promote harmful emissions; which cause even more struggles for – those who already have had their lives changed or those whose disabilities are not recognized.
- 4) Keep NRAO. Did the EMR industry influence NSF into closing NRAO? Is this another way to cause harm to technological lepers, because we are viewed as a threat to the EMR industry? Because we are asking for White Zones, is this a way for the EMR industry to prevent Green Bank becoming a White Zone? The economics from NRAO is needed here for residents and those in forced exile.
- 5) Technological lepers need the FCC and the FCC needs technological lepers. People who detect harmful EMR emissions, are useful and irreplaceable.
- 6) Within the FCC and the U.S. government, is there anyone who is a technological leper? How many technological lepers work there? Have there

been people who wished to visit or attend meetings but because they are technological lepers and become harmed when exposed, they cannot be present? How many people worked for the FCC and the U.S. government and had to leave because they became technological lepers? Were changes made so technological lepers could continue working and be productive?

- 7) Put people first. Where is the Precautionary Principle? Can industry, businesses, users of EMR, as well as the FCC be likened to undisciplined orphans?

Undisciplined orphans: without parental guidance, doing as they want, self centered – acting for their own interests or gain, putting EMR everywhere, injuring others, hiding information, not taking responsibility, and no one to control them.

- 8) Technology seems to be addictive. Many addicted users of EMR do little else. Possibly, because it is so addictive, they deliberately ignore the harm their actions are causing to others and even to themselves. It seems the addicting pay, rewards, wins, tweets, become the selected activity, even when people, including the users, are sensing something is wrong (i.e. headaches, numb fingers, forgetfulness, diabetes, dizziness, etc.). They become angry and sometimes abusive when there is interference.

Promote the Precautionary Principle.

- 9) Give power to government agencies to protect technological lepers. Tighten the reins to the powerful EMR industry and EMR economy. Technological lepers are not safe and cannot live in peace, when they become injured by EMR emissions in their homes, outdoors on their own properties, at work, at school, and where their families or friends spend time.

During holidays, it is difficult to reach out to others (i.e. friendship, giving, helping, sharing, celebrating) when an isolated person needs just the basics i.e. food, warmth, and a place to live.

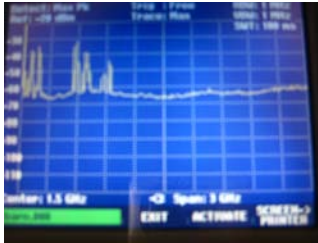
Give power to government agencies to put people first. Technological lepers need to have guaranteed safe places to live, to function, to survive, to be productive and to celebrate life.

- 10) Distribute credible meters to detect, measure, and record invisible, penetrating: electrical fields, magnetic fields, non-ionizing radiation, and ionizing radiation. It's not just enough to be told that everything is well and it would seem the wireless institutions are not out for our well being. Without meters, it may be claimed EMR does not exist. Building the meters and measuring environments could become valuable detective research businesses. See endnoteⁱⁱⁱ

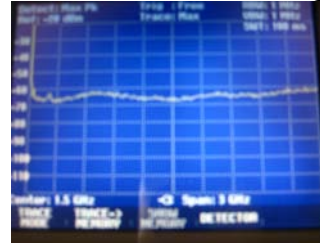
- a) We need to know and be actively aware of what invisible emissions we are living / working / sleeping in on a daily bases. Look at the differences

recorded between

Cedar Falls, Iowa 1996 (left) and Green Bank, West Virginia 2012 (right).

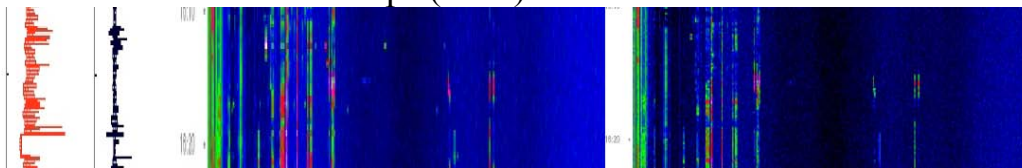


Schou



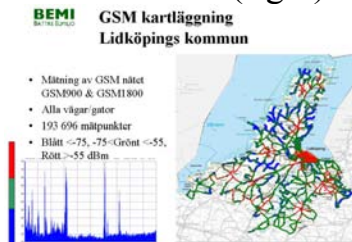
Schou

- b) Emissions logged over while driving, example: document changes in exposure. Electrical fields, magnetic fields, non-ionizing radiation. Time is vertical. Horizontal is frequency, color is amplitude (power level). Twenty second max hold and sweeps (trace). GPS coordinates were also recorded.



Schou

- c) Map EMR within towns, cities and rural areas. Two examples: BEMI by Tegenfeldt (left, he did this as a profession) and map of potassium concentrations (right)



Google

- 11) The EMR industry and our government do not seem to be responsible nor respectful. This is fundamental as most business models still do not recognize or take in to account any consideration for the people. Industry and government agencies repeatedly referenced the FCC. As Diane was being harmed, and requested that emissions be checked, the FCC and government agencies contacted would not do so.
- 12) Wrong assumptions:
- Assuming technological lepers react to all frequencies, is false.
 - Assuming the emission from one cell phone equals or mimics all frequencies is false.

One cell phone does not produce all frequencies.

Technological lepers are individuals, they are not the same. Some technological lepers may be harmed by frequencies others can tolerate and vice versa.

Were technological lepers injured by a single frequency, several frequencies,

other exposures? Were these continual or pulsing? To understand this more, use meters to investigate the unknown frequency at the time and under what conditions. Measure cellular changes, blood changes, heart changes, eye changes, headaches, skin changes, and more effects.

A few technological lepers become disabled when exposed to more than just several frequencies. Over time, observers need to learn what are the unknown frequencies. Questions: is it a combination of frequencies? Are frequencies modulated or pulsed? Is there something else (i.e. a chemical) present?

Technological lepers do not need meters to know what they detect or when they are being harmed. Meters are needed in such places as churches, cities, hospitals, government places, so others (officials or people) may verify and learn what technological lepers are physiologically reacting to.

- 13) EMR detective research: Measure frequencies (*all* frequencies) in the environments where people are harmed.

One technological leper, identified pain – the same pain when exposed to EMR. Two meters showed no emissions from cell phone nor Wi-Fi. The technological leper definitely felt pain and felt certain there was EMR in that environment. A third meter, measuring more frequencies, displayed a powerful emission about 24 GHZ, not of cell phone nor Wi-Fi frequencies. The technological leper was right. If this had been a research study, a report would have incorrectly attributed the pain as imaginary, psychological, or to a placebo. Could this be a flaw in some research reports?

There are many symptoms (Bevington, 2012) and , many frequencies, and people are not alike. One needs to go to an individual's environment and measure the electromagnetic radiation of *all* the frequencies in the environment.

- 14) Allocate dollars for research. While industries will fund their own conclusions, often we the people of this country are the only advocates who can stand up for what is happening. A few research ideas were suggested in “EMR detective research” and other research ideas are in the endnote.^{iv}
- 15) Don't phase out telephone lines or the U.S. Postal Service. Wired telephones and the U.S. Mail and direct contact are often the only access to people in exile. What would be used if EMR were to be discontinued?
- 16) Is anyone aware of a developing problem – Twitter, Facebook, email, “.com” etc. are the only contacts acceptable. When computer usage is required, access is not possible for people harmed or disabled by EMR because being near electronic devices is unbearably harmful for many technological lepers. Require quick access (not always the case with automated telephones) via telephone and U.S. mail with competent people accessible.
- 17) The FCC disregarded testimonies – people reporting harm they witnessed, harm they experienced, and research finding health effects (EMR-Policy-

Institute, 2009a) (EMR-Policy-Institute, 2009b). In a 2012 letter, the FCC did not cite documents correlating health effects from EMR exposure such as: (WHO International Agency for Research on Cancer, 2011), (McCarty et al., 2011), (Rea et al., 1991), or research papers written by Dr. Olle Johansson, Dr. Henry Lai, Dr. Samuel Milham, Dr. Andrew Marino, Dr. Magda Havas.

- 18) The FCC enclosed a biased study in their reply. The study of literature by Rubin seems “Cherry picked”; see (Havas, 2012).
- 19) The FCC would not come to document the toxic environment as Diane was being harmed. They repeatedly informed us either a) the cell tower is safe or b) there are no health effects. Harm from EMR is real; protection for people from EMR has not been obtained but is needed.

Injury from EMR is real. Living in our Iowa home, Diane became ill, eventually overexposed from the emissions of a newly built cell tower. If living at home had been safe, Diane wouldn't have been forced into exile, away from Bert, away from co-managing their research farm business, nor would they have written this letter.

The above requests and requests in the addendum are urgent. The time to act was yesterday, but regulatory action is still possible.

Respectfully Yours,

Diane Schou, Ph.D.

Bert Schou, Ph.D.

Enclosures: The WHO International Agency for Research on Cancer. IRAC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans. Lyon, France: World Health Organization. 2011. (page 1 of 6). Havas M. Science 101: Cherry picking & black swans. 2012 with link to You Tube (please view this).

Cc: Senator Grassley, FCC comments on notification of inquiry dockets 13-84 and 03-137, Senator Harkin, Representative Braley, Senator Rockefeller, Senator Manchin, Representative Rahall.

Bevington, M. (2012). *Electromagnetic Sensitivity and Electromagnetic Hypersensitivity (also known as Asthenic Syndrome, EMF Intolerance Syndrome, Idiopathic Environmental Intolerance - EMF, Microwave Syndrome, Radio Wave Sickness) A Summary*. London: Capability Books.

EMR-Policy-Institute. (2009a). In the Matter of A National Broadband Policy for Our Future: EMR Policy Institute Comment. In FCC (Ed.), (pp. 485). P.O. Box 117 Marshfield, VT 05658: Federal Communications Commission GN Docket 09-51.

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<http://www.magdahavas.com/science-101-cherry-picking-black-swans/> You Tube: <http://www.youtube.com/watch?v=QyzZX-bCiqs>.

McCarty, D. E., Carrubba, S., Chesson, A. L., Frilot, C., Gonzalez-Toledo, E., & Marino, A. A. (2011). Electromagnetic hypersensitivity: Evidence for a novel neurological syndrome. *Int J Neuroscience*. doi: 10.3109/00207454.2011.608139

Rea, W. J., Pan, Y., Yenyves, E. J., Sujisawa, I., Samadi, N., & Ross, G. H. (1991). Electromagnetic field sensitivity. *J Bioelectr*, 10, 241-256.

WHO International Agency for Research on Cancer. (2011). IRAC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans. Lyon, France: World Health Organization.

ⁱ The FCC cited and sent a paper by Rubin. Nicols Fox, harmed by electromagnetic radiation, noted “The paper the FCC enclosed was biased. Search for another paper also written by Rubin which appeared in the British Medical Journal in 2006 (Rubin JG, Hahn G, Everitt BS, Cleare AJ, Wessley S. Are some people sensitive to mobile phone signals? Within participants double blind randomized provocation study. *Br Med J*. 2006;332:886-91). The abstract to this study appears to show that EMR is psychological in origin. However, a close search of the entire study would demonstrate its weakness. For example, truly ES individuals would have been eliminated as subjects by the fact the study was conducted in a) an urban area, b) a modern office building, c) an office furnished with modern office equipment. Any of these would have been a deterrent to the participating of sensitive individuals.”

A paper verifying health effects, McCarty, D. E., Carrubba, S., Chesson, A. L., Frilot, C., Gonzalez-Toledo, E., & Marino, A. A. (2011). Electromagnetic hypersensitivity: Evidence for a novel neurological syndrome. *Int J Neuroscience*. doi: 10.3109/00207454.2011.608139. This paper may have precipitated the media and the BBC to interview people harmed by electromagnetic radiation.

ⁱⁱ Technological leprosy is not a contagious virus – it is a name created to portray the nomadic living conditions experienced by people harmed / injured / disabled by – EMR. To avoid

symptoms linked to EMR exposure (Bevington, 2012), technological lepers avoid areas with cell towers, Wi-Fi, smart meters, battery run devices, power lines, etc.; they shy away from people (who carry, wear or use technological devices), and avoid crowds. Many technological lepers experience stigmas of being shunned, abused, harassed, bullied, excluded, and threatened.

Even in remote areas refugees gather, technological lepers find they still need to be cautious. As individuals, they are not the same; some may react to frequencies others can tolerate and vice versa.

Names for this condition include: electromagnetic hypersensitivity, EHS, electromagnetic sensitivity, EMS, electrical sensitivity, ES, microwave sickness, radio wave sickness, idiopathic environmental intolerance, IEI, EMF sensitivity.

Idiopathic is misleading. Illness, sickness, intolerance, or sensitivity portrays there is something wrong with our bodies, we have been injured. Radio-wave sickness implies one is harmed by AM or FM radio frequencies and not harmed by electrical fields, magnetic fields or frequencies above radio bands. Electromagnetic hypersensitivity implies one can tolerate non-ionizing radiation but not electrical or magnetic fields.

Technological lepers have been injured, harmed, disabled, poisoned, overexposed, and are victims from EMR emissions.

More suitable descriptions include: electromagnetic radiation disabled, electromagnetic radiation injured, electromagnetic radiation wounded, harmed by electromagnetic radiation, overexposed to electromagnetic radiation, electromagnetic radiation poisoned, or electromagnetic radiation victim. These descriptions might be too long, use many words, and people generally do not grasp the concept of EMR.

No one wished to be a technological leper (both disabled and the words). When “technological leprosy” is used, many people immediately understand, make changes, and take precautions to protect us.

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- iii Build meters and antennas to measure: the electrical fields, contaminated (dirty) electrical fields, magnetic fields, frequencies of non-ionizing radiation (to study all frequencies, combinations of frequencies, pulsing or modulation), ionizing radiation (Fukushima, etc.), GPS coordinates, date and times. Build the meters to record and save. Build transportable meters that are accurate, easy to use and easy to understand. Build meters to log emissions over time. Build meters that are similar to black boxes in aircraft and easily accessed for use in vehicles. Build meters that could have revealed EMR influence before and during events such as the Detroit marathon. Build meters that log EMR exposure levels and changes when errors occur in operating rooms. Include EMR meters in black boxes to document when pilots make errors in aircraft. Build meters to report EMR levels and changes when vehicle accidents occur. Install meters in environments where learning or alertness is important, Build meters to measure EMR in environments where people become ill. Build meters in environments where poor decisions are made.

Build meters to map EMR in towns, cities and rural areas. Maps of EMR are helpful for people and officials to compare health effects and location or time of environmental exposures. Maps help people decide where to live. Maps warn of unsafe environments. Get measurements of emissions published and available to people. Build meters to record photos of locations as well as emissions, GPS coordinates, and time.

- iv Research questions from a technological leper:

- Do EMR environmental conditions affect abilities to multi-task? To react quickly? Document changes or accumulations of EMR, look for trends, note incidences, to avoid future disasters. It is not likely the contaminating EMR in the environment can be reliably measured after the fact. If a logging meter were working before, during, and after, precautions could be places to avoid future problems.
- What were the EMR environmental conditions when: a) the airport control tower operators fell asleep? b) pilots forgot to land at the Minneapolis Airport? c) control tower error, planes too close? d) it was unusual that three healthy marathon runners died in Detroit; isn't it suspect when two runners died at the same time, and two runners died at the same location? e) increased suicides by military personnel who were not deployed? f) surgical errors increased at a Rhode Island hospital? Was EMR involved in any of these? Harm can be direct, indirect, or both.
- Where does the radiation created go? Where is it absorbed? Exposed / not exposed / exposure over time: changes in plants, changes in plant location, changes in animals, changes in insects. Is Earth absorbing some and rebelling? Exposed / not exposed / exposure over time: changes in DNA, changes in viruses, changes in the blood brain barrier, changes in blood. What are time frame trends for people to be harmed? How can exposure accumulations be measured? What are the time frames for technological lepers to be healed when not exposed?

International Agency for Research on Cancer



PRESS RELEASE
N° 208

31 May 2011

IARC CLASSIFIES RADIOFREQUENCY ELECTROMAGNETIC FIELDS AS POSSIBLY CARCINOGENIC TO HUMANS

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 cancer¹, associated with wireless phone use.

Background

Over the last few years, there has been mounting concern about the possibility of adverse health effects resulting from exposure to radiofrequency electromagnetic fields, such as those emitted by wireless communication devices. The number of mobile phone subscriptions is estimated at [5 billion globally](#).

From [May 24–31 2011, a Working Group of 31 scientists from 14 countries has been meeting at IARC in Lyon, France, to assess the potential carcinogenic hazards from exposure to radiofrequency electromagnetic fields](#). These assessments will be published as Volume 102 of the IARC *Monographs*, which will be the fifth volume in this series to focus on physical agents, after [Volume 55](#) (Solar Radiation), [Volume 75](#) and [Volume 78](#) on ionizing radiation (X-rays, gamma-rays, neutrons, radio-nuclides), and [Volume 80 on non-ionizing radiation \(extremely low-frequency electromagnetic fields\)](#).

The IARC Monograph Working Group discussed the possibility that these exposures might induce long-term health effects, in particular an increased risk for cancer. This has relevance for public health, particularly for users of mobile phones, as the number of users is large and growing, particularly among young adults and children.

The IARC Monograph Working Group discussed and evaluated the available literature on the following exposure categories involving radiofrequency electromagnetic fields:

- occupational exposures to radar and to microwaves;
- environmental exposures associated with transmission of signals for radio, television and wireless telecommunication; and
- personal exposures associated with the use of wireless telephones.

International experts shared the complex task of tackling the [exposure data](#), the [studies of cancer in humans](#), the [studies of cancer in experimental animals](#), and the [mechanistic and other relevant data](#).

¹ [237 913 new cases of brain cancers](#) (all types combined) occurred around the world in 2008 (gliomas represent 2/3 of these). Source: [Globocan 2008](#)

SCIENCE 101: CHERRY PICKING & BLACK SWANS

July 26, 2012. When I am asked to testify as an **expert witness** at a hearing, I am asked to submit a written document that will accompany my oral testimony. The question I address in my expert testimony is, "What scientific evidence do we have that this form of energy (low frequency electromagnetic fields, radio frequency radiation, or whatever) is harmful below guidelines?"

But that is not the question **adjudicators** want to hear. They want scientists to present a review of ALL literature so they can decide for themselves even though they are not qualified to address that question—no matter how brilliant they may be—if they don't understand the scientific method. **There is a disconnect between the legal system and the scientific method** and *weight-of-evidence* and *falsifiability* are two areas where the legal system fails to understand science.

Journalists often make the same mistake and label scientists as being biased or having preferences when they present information showing that something is harmful without presenting the same number of studies showing that something is safe.

Unfortunately, **policy makers** fall into the same category. *They just don't get it!* And—because *they don't get it*—we have a lag in critical policy decisions that need to be made in a timely fashion. The result is that guidelines remain non-protective for much longer than necessary.

One key that gives this away are statements using the "**c-words**." What are "c-words"? *Conclusive, consistent, convincing* often placed before the word "evidence" and preceded by the word "no".

A typical statement might be, "We have no conclusive, consistent, convincing evidence that bla-bla-bla is harmful below guidelines." As soon as you hear these words you recognize that evidence does exist but the person making

this statement doesn't hold that evidence in high regard. That person seldom expands by indicating what kind of evidence would be classified as *conclusive*, *consistent* or *convincing*, because if that evidence were available s/he would be in a quandary.

Science has a way of dealing with this "confusion" (another c-word) and that is the concept of falsifiability coined by Sir Karl Popper, one of the leading and most influential philosophers of science in the 20th century.

That concept is explained in a 10-minute video entitled "Science 101: Cherry Picking & Black Swans." Click [here](#) for link to video and send it to your favorite journalist, policy maker, and lawyer who deal with issues that involve science.

<http://www.magdahavas.com/science-101-cherry-picking-black-swans/>

<http://www.youtube.com/watch?v=QyzZX-bCiqs> View this You Tube

Precautionary Principle; Evelyn Savarin Comments. Sep. 3, 2013

Rationale for Reassessment of the RF Safety Guidelines

In light of the continuing lack of uncertainty on the safety of RF exposures <http://www.fcc.gov/guides/wireless-devices-and-health-concerns>, and lack of worldwide research consensus on the health impacts of RF products, I ask this FCC to open up debate of the adequacy of current RF standards to protect public health and the environment, especially our children.

Included in this review should be a review of FCC current emission monitoring program, its sufficiency and insufficiency to provide adequate oversight in monitoring the emission of this country's RF installations and product deployments.

The FCC admits it is not a health agency and claims it defers to other health agencies in the government to offer guidance on the subject. When the other health agencies, EPA, FDA have shirked this responsibility over the last 13 years, during our greatest growth and penetration of RF wireless products the public can take little comfort that any agency of government is truly considering the health and safety of this nation and more vulnerable in our population including, children, elderly, and those with chronic and acute illnesses from RF overexposure

One of the more pivotal Federal documents in the last 10 years that points to the rationale for reevaluating our RF safety standards is the 2008 National Institute of Health document entitled [“Identification of Research Needs Relating to Potential Biological and Adverse Health Effects of Wireless Communications”](#). Although the documents main intent was to call for more research based on its review of the scientific evidence at the time, it pointed out one of the most glaring gaps in the research up to 2008 and continuing to the present :

“there is a need to characterize exposure of juveniles, children, pregnant women, and fetuses both for personal wireless devices (e.g., cell phones, wireless personal computers [PCs]) and for RF fields from base station antennas. This characterization includes taking into account gradients and variability of exposures due to the actual use of the device, the environment in which it is used, and exposures from other sources, multilateral exposures, and multiple frequencies. The data thus generated would help to define exposure ranges for various groups of exposed populations.

Please Read the whole “Dosimetry and Exposure” section to fully understand why our current FCC guidelines and negative research findings are insufficient and cannot offer assurance that the public is being protected from the toxic effects from increasing variety of RF exposures and frequencies on a 24 hour, daily basis.

Perhaps recent [High Court of India decision](#) sums it best up why it is paramount that the FCC reevaluate the current standards and guidelines After taking into account and examining Industry evidence pointing to a lack of scientific evidence that current public exposures to RF are harmful, and defendants evidence (State of Rajasthan and the harmed individuals) that shows the health and environmental effects of RF, the Court agreed to support the State's newly restricted laws for RF installation. It allowed the State to restrict cell tower installations away from schools, hospitals, high density areas, parks and permitted the state to proceed

taking those cell towers down that do not conform to the new law. It took into serious consideration fear from cellular providers would not suffer from insufficient coverage. The prescient point that sums up the Court's decision is as follows: (p. 177)

*"..... precautionary approach has to be adopted in such matter and thus, the decision taken by the State Government is in accordance with the dictum laid down by the Apex Court in the case of M.C.Mehta Vs Union of India & ors. (supra) wherein it has been held that even in case of reasonable suspicion or doubt, precautionary principle requires anticipatory action to be taken to prevent harm. **Lack of scientific certainty and direct evidence of harm cannot come into the way so as to take preventive measures.***

FCC has asked that a dollar figure be provided for costs and benefits of reassessing the adequacy of Current standards. I find this appalling. Certainly this is possible in terms of health costs, lost income and perhaps loss to the productivity of the population over time, but it should not be the responsibility of an individual or individuals with limited income to come up to the numbers that Telecom industry can financially furnish to support its position to weaken the standards.

In 1965 the Supreme ruled in (**Scenic Hudson v. Federal Power Commission**)

*If the Commission is properly to discharge its duty in this regards, the record on which it bases its determination must be complete. The petitioners and the public at large have a right to demand this completeness. . . the public is entitled to know on the record that no stone has been left unturned.....**A regulatory commission can insure continuing confidence in its decisions only when it has used its staff and its own expertise in manner not possible for the uninformed and poorly financed public.**In this case, as in many others, the Commission has claimed to be the representative of the public interest. This role does not permit it to act as an umpire blandly calling balls and strikes for adversaries before it; the right of the public must receive active and affirmative protection at the hands of the Commission.*

Under NEPA, "federal officials are required to assume the responsibility that the Congress recognized . . . as the obligation of all citizens: to incorporate the consideration of environmental factors into the [federal] decision-making process." This points to one more reason why Telecommunications Act is clearly in violation of the law in its Section 704, a law that has taken precedence over every other state or local action that desires to be more proactive and preventive of its community environment and public health from RF exposures.

Monetizing My Personal Experiences from RF Exposure;

Although I cannot put a dollar figure on my loss of income I can certainly account how much it has compromised my earning potential. I cannot assess my loss of health for I am relatively healthy because I took the warning signs that my body was giving me to RF/EMF radiating devices as a indicator to change my lifestyle and become more proactive about reducing my exposure.

My problems began over 20 years ago when I was in grad school for Urban planning, hoping to start a new career where I could finally envision gaining sizable new income from my present limited work potential . It was then through a series of trial/error and eliminations did I discover I had a sensitivity to electromagnetic fields of varying frequencies and powers. Only when I could remove myself from the growing umbrella of RF & other EMf frequencies could I be more productive, think more clearly and sleep better. With the growing proliferation of RF devices and this final understanding of my limited ability to participate in this growing wireless and technological revolution, have I suffered immeasurably in sufficient income generating endeavors, and a stable home environment.

My life has been turned upside down. I live almost a nomadic life trying to find a peaceful place to rest and sleep. I was never to realize my dream as an urban planner for after considerable accommodations by my professors to be able to limit my computer use, I was not able to work for more than 2 years after graduation, at which time working continuously in front of a computer and living close to broadcast towers made my health suffer, reflected in rising blood pressure and loss of hand circulation from use of a computer. I had to completely quit urban planning profession to see my blood pressure return to normal. My sleep never improved until I moved far away from all the antenna farms in my area. This was over 14 years ago.

I tried going back to teaching on a more limited bases, but schools have now become a wireless nightmare, once again limiting my ability to work. I would feel dizzy and unfocused as the radiation levels increased.

I have moved over 7 times in the course of 13 years, always trying to find a more peaceful setting. My income from some inheritance has become greatly depleted. My social security is very limited due to my short work career.

My current living environment is not ideal, but its become all I can afford, I live in a mother-in-law where the homeowner is not necessarily electro-sensitive but shares my interest in lowering Rf exposures, so she does not use WIFI in the home at all, and has agreed to turn off all cellular devices when in the home. For this I am trully grateful. The mother-in-law is in a concrete basement with little light, but the concrete offers some mitigation from high outside RF exposures.

I have been forced to spend considerable dollars on RF metering devices, some of which work well while others don't in order to better assess my living environment and understand why at times I am unable to rest properly. Some of those meters have been a godsend.

I yearn for the day I can live free of outside RF interferences as I once did, in housing of my own choosing and work that can gain me some income and more predictable association with my family and others.

Conclusion:

I ask this commission to fully appreciate that Telecom players are not the only sector of society that must be considered in the development of our RF safety standards. Whether many scientific studies like to point to the fact we are imagining are symptoms as EMF/RF induced, the number and level of studies that point to RF/EMF contributing to a series of cellular and health disorders is numerous and growing and should be sufficient in opening up the debate on RF safety guidelines

Preponderance of evidence should not be the overriding factor for evaluating the need to reassess the Rf safety guideline. A potential emission and toxin that is so ubiquitous, invisible to the naked senses, and unpredictable in isolating its effects, should be evaluated for no other reason than 100s of studies from all corners of this world have shown the health and biological adverse effects that can occur from its exposure.

The EPA should be designated to review and reassess thoroughly the Health impacts of Wireless radiation and to determine future Research needs.

The FCC should proceed at limiting exposure for vulnerable population, children, etc.

The FCC should seriously consider allowing local and state bodies the ability to designate areas of land and wireless free zone to give those who wish not to be overly exposed to this form of radiation a chance to live a more productive life.

The FCC should give more authority to the states to rule on its criteria to protect public health from RF exposure.

For Review of the Scientific research:

www.bioinitiative.org

http://www.biolmedonline.com/Articles/Vol4_4_2012/Vol4_4_202-216_BM-8.pdf

https://docs.google.com/document/d/1mEFSvE4XMbrr2N7NYANhXhD3D_8r1EY9STjoSul4aW4/edit

Precautionary Principle; Jamie Lehman, Comments, Jun. 19, 2013

Dear Sir or Madam:

The FCC limits on radio frequency need to be severely lowered. Multiple layers of electro smog are not being accounted for in the safety limits. More and more people are becoming severely sickened, are living out of their cars as a result of the so-called Smart Meters on and about their homes, and some are becoming severely violent from wireless radiation. People are having to give up their life savings and flee to the Radio Free Zone just to escape the unbearable health symptoms of environmental radiation exposure. There are over two thousand studies that have come across my computer indicating the horrific adverse biological effects of wireless radiation. We need to adopt the Precautionary Principle.

A single home may have forced pulsed radio frequency signals continuously, 24 hours a day, 365 days per year from:

- Wireless water meter transmitters
- Electric supplier meter transmitters with two wireless modems
- Gas company wireless meters
- Utility routers on poles

Non-pulsed radio frequency from:

- Cell towers
- Wireless home routers
- Personal cellular phones
- Wireless computer devices
- Wireless home security systems
- Cordless phones
- Baby Monitors

I had serious central nervous system injury and was hospitalized due to pulsed radio frequency via utility Smart

Meters. I began to develop a stutter, my memory was failing, I had heart attack symptoms, my internal organs began to heat up and felt like they would explode, I received shocks to my head and metal on my teeth, lost control of my bladder after walking up to a Smart Meter, had severe insomnia, chronic bronchial infection, numbness and tingling in my extremities, and extreme anxiety just to name a few of my symptoms. Our electric Smart Meter was removed, but I was not able to begin to function again at our home until two neighbors removed their electric Smart Meters. Nine months later, I have still not fully recovered.

The adverse biological effects of wireless radiation affect every cell in a person's body. Your tissue does not have to be on fire in order for damage to occur any more than your tissue has to be on fire to know that there are long term consequences to tobacco smoke, alcohol, and other drugs.

I urge you to act now to lower the permitted wireless radio frequency levels before you or someone you love begins to show the signs of radiation sickness. You too may find yourself facing a horrific health situation that is extremely difficult to cope with.

Sincerely,

Jamie Lehman

Sent From My Plugged In Computer
Wi-Fi Injures Your Family & Pets
doctorsforsaferschools.org
radiationrescue.org

Precautionary Principle; Marlene Brenhouse, Comments, Mar. 7, 2012

I endorse the statement made by Joel Moskowitz, PhD. in his Comment filed on 02/04/2013, as excerpted below.

"In my professional opinion, the FCC should request the EPA to empanel a Working Group composed of health experts who have no conflicts of interest with industry to review the scientific literature on EMR.

The Group should recommend biologically-based EMR standards that ensure adequate protection for the general public and occupational health based upon the precautionary principle. Finally, the FCC should adopt the standards, testing procedures, and appropriate precautionary warning language recommended by the Working Group.

The FCC should not take any actions that may increase exposure of the population to EMR from cell phones, base stations, Wi-Fi, Smart Meters and other RF- or ELF-emitting devices. The FCC 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."

Precautionary Principle; Lynn Beiber Comments, Jul .11, 2016

I'm writing this letter to urge rejection of the 5G technology rollout being voted on this July 14, 2016, during the FCC's Spectrum Frontiers proceeding. I have multiple reasons for this position which I hope you will read and consider.

I have researched extensively, and worked with many others to inform the public about the negative effects of wireless technology. The wireless industry, worth trillions, is dictating public policy and following the play book of big tobacco. Wireless is here to stay. I hold no illusions. However, I do expect and demand that our public policy makers take the necessary, even if costly steps, to inform and protect the public.

Tom Wheeler's sales pitch for 5G cellular technology reads like a bunch of snake oil promises. His remarks to the National Press Club on June 20, 2016 are frightening and I'm not one to be easily scared. Mr. Wheeler says the U.S. Must be first out of the gate in order to win the race. Race for what? I ask.

I find Mr. Wheeler's rhetoric arrogant and sanctimonious. Take off the money goggles and one can see a tecno boondoggle in the making.

Mr. Wheeler wants no time wasted on committees and regulators in order for the the future to be defined. Innovators should be turned loose, he says. Really? Then why do we have an FCC? Does this sound like a way to devise prudent public policy?

Mr. Wheeler paints a rosey picture of a Jetson's World with his Utopian version of wireless interconnectivity. Of course, this all sounds great to the mostly ignorant general population and the profiteers. However, those of us who know the truth want a say in our future. Just because we have the knowledge and ability to create some new technology does not mean that it is necessary and wise. Dr. Frankenstein comes to my mind.

I know Technocracy when I see it and the IoT (Internet of Things), supposedly made better by 5G, is at the heart of it. Technocrats like Tom Wheeler think that hand picked scientists and engineers should make the rules and the rest of us should bow at their feet. How does that work out for the masses when the scientists and engineers are bought and paid for by the industries that profit?

Combine the known but conveniently ignored scientific facts of biological harm from wireless radiation with the demonstrated corruption, and growing carelessness of the FCC and what we have is a nightmare of unintended consequences.

Mr. Wheeler prefers to spin it as a "cornicopia of unanticipated innovative uses". He is good with words but I have no more trust in his leadership at the FCC than I do in any other government agency captured and basically run by the industries they are supposed to be regulating.

How is it that the FCC gets away with using a 20 year old safety "guideline" for cell phone radiation exposure? There are NO standards, just a guideline based on thermal effects after 30 minutes of exposure at a certain distance from a plastic head filled with fluid.

Mr. Wheeler says his 5G proposal is the final piece in the spectrum "Trifecta" of low- band, mid-band and high-band spectrum. Yes, Mr. Wheeler is quite the gambler. The word "Trifecta"

means a bet or betting procedure in which one wins if one correctly picks the first, second and third place finishers in a race. A bet? That's great public policy making for you. It may be a good bet for those who will profit greatly but it's a losing bet for the public. Whatever goes wrong in this grand experiment, the public and the consumers, Mr. Wheeler claims to care about, ultimately pay the price. Whether it's in dollars, health consequences, privacy invasion, interference problems or cyber security, the public pays and pays.

Ever since 1994, when the telecom act, written by the wireless industry, was passed by a Congress deeply on the dole, the corruption has mounted. Why does a section of this act prohibit rejection of cell tower sites based on radiation exposure concerns? The public has been deceived purposefully. Greed is nothing new but the wireless industry, arguably the most profitable industry of all time, has lowered the bar of decency to depths so low it knows no bounds. Profit before People is the mantra of the wireless industry and the FCC and our government, jumped on the band wagon in order to get a piece of this pie in the sky.

A generation of unknowing wireless junkies has been created to support the wireless industries insatiable greed. Public health and safety, privacy, cyber security, reliability and even first responder needs be damned.

Before 1994 assigning spectrum was handled more by engineers through cooperation. Now it's the highest bidder who wins and protection from interference between bands is not "THE" priority. Look at the failure of the D block (700 Megahertz) auctions. The money for the U.S. treasury did not materialize and industry got favors.

I remember that the D Block auction came about because after 911 we were all convinced that we had to change the way TV is broadcast, so first responders could have interoperability. That promise still has not been fulfilled and the interference problems experienced by first responders is getting worse. Just look at the outrageous prices we pay for TV programming now and I think it's obvious we have been conned.

Another example is Verizon, claiming to be concerned for the consumers who don't have access to high speed connectivity, because it's too costly to run fiber to those homes. What happened to all the money and tax breaks that Verizon was awarded in order to build out the fiber optic network they promised? I'll tell you what they did. Verizon built fiber networks only in urban areas where it would be most profitable for THEM and the rest of the country got nothing but the bill. Now, Verizon wants to abandon our most reliable form of communication, copper landlines and is pushing 5G.

Wireless will NEVER have the reliability of wired. I have personally fought with Verizon to keep my copper landline as they try to bully me to go with the fiber optic in my neighborhood. The price was originally tempting but it has gone way up and I'm the only one in my neighborhood with a working phone during a power outage.

Experts who care about our National security have expressed concern over abandoning the copper phone lines. It is the most reliable in a state of national emergency. It is well known that wireless communication and the IoT have created cyber security weaknesses that could threaten the entire power grid.

I am no luddite. I embraced technology like everyone else...until as time passed I saw the

negative effects, both physiological and social. I started questioning and learned the facts. I had no idea that some of the physical symptoms I experienced could be linked to EHS due to EMF/EMR/RF/harmonics and the all the other things associated with not only wireless devices but electrical energy. I took steps to reduce my exposure and my health improved. I got rid of my cordless phones and keep my cell phone turned off and only use for emergency. As a type 1 insulin dependent diabetic since the age of nine (I'm now 58) I've had to be very in tune with my body. My hemoglobin A1c test started improving and my insulin requirements were lowered. I finally figured out why exercising on my treadmill did not lower my blood sugar the way walking around the neighborhood did. I was affected by the EMF from the treadmill. There are studies about this and also something called type 3 diabetes that may be linked to alzheimers.

It was hard to give up the things I did but I was convinced by the scientific studies that I read and the precautionary approach that other countries are taking. The science is there, all one has to do is look for it. How many people actually read, much less know that inside their smart phone is a warning about RF exposure that tells one to keep the phone a certain distance away from the body?

We are just now realizing that it's the long term, cumulative exposure to wireless radiation that is most harmful. Our bodies can only handle so much. Our environment has been bombarded with millions of times more non-ionizing radiation than just a generation ago.

I have been fighting against cell towers at schools and now Tom Wheeler wants to put a mini cell tower for 5G on every lamppost and electric pole? Between smart meters and wi fry everywhere how do we escape?

Lynn Beiber

Precautionary Principle; Kevin Mottus Comments, Sep. 2, 2013

FCC 13-39

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of

Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies ET Docket No. 13-84

Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields ET Docket No. 03-137

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

Comment Filed by: (Kevin Mottus)
(11041 Santa Monica Blvd. #627
(Los Angeles, CA 90025)
(stopwirelessradiation@gmail.com)
(310-479-0299)

August 30 , 2013

JA 10476

AFFIDAVIT OF Kevin Mottus

State of CA]

LA_ County]

I, Kevin Mottus, attest that my statements are true to the best of my knowledge.

Comment round for ET Docket No. 03-137 and ET Docket No. 013-84.

1. My name is Kevin Mottus. My address is 11041 Santa Monica Blvd. #627 Los Angeles, CA 90025.
2. I am a SOCIAL WORKER.
3. The overall cancer rate has remained steady because it was heading down due to the decrease in smoking but no longer. If you look at the numbers more specifically at the 20-29 the group with the highest cell phone use and exposure over time you will see that the cancer rate has increased. You, the FCC and Wireless companies, as represented by the CTIA have manipulated the science studies looking at cancer rates and EMF. You have focused on studies being done for 10 years or less eliminating the key exposure for tumor growth which is seen at 10-15 years. You have grouped very seldom users with heavier users to minimize the effect on heavy users. You have grouped countries with relatively new adoption of wireless technology with countries with more than a decade of use to minimize the obvious correlation between long term use of cells phones and cancer. You have defined heavy use as 30 mins a day for 10 years when no one I know only uses their cell phone for 30 mins a day especially with all of the applications being introduced holding you on the phone longer and longer. But this manipulation and playing with the research ultimately only hurts the innocent end users who become sick

and die due to heavy exposure to RF radiation. You can keep telling people that there is no possible harm and continue to lie to them by manipulating the research but tumors do not lie and they will still get sick and you will still be responsible for this sickness. See all of the studies attached to support this comment/affidavit.

4. No you are marketing your products to children as the tobacco companies use to; this is wrong when you know there is a danger and they are so much more susceptible to the effects of RF radiation. Now you are encouraging people to use their cells longer and longer even though you know that tumor growth is associated with long term heavy use. Verizon and the NFL encouraging people to use their phone for 3 hours at a time the length of game is wrong when such long use has been correlated to disease development with cell users. You have not done studies truly isolating the heavy users with actually average users of 3-6 hours a day. Isolate this group of heavy users and see the causal link between EMF exposure and cancer.

5. You do not really want to see the harmful effects and danger of wireless on people. Our government is in bed with this industry and protecting it is protecting the disease and harm they are causing. Government is not funding studies, Wireless industry is not funding studies. We are not looking for the problem so we are not finding it and we the citizens are paying the price as you experiment on us knowing that this harmful agent will eventually injure some of us with heavy use. But now you are putting WiFi into our classrooms and you are making all of these children heavy users. To promulgate this

technology without safety standards in place is immoral, wrong and criminally malicious giving people cancer that they can die from is absolute evil..

6. To use the lack of research as an excuse for not developing standards and then not do the studies or be sure the studies are not done by independent researchers is irresponsible and evidence of your playing games with the life of our people. To not study the effects of wireless to minimize the health effects on people is criminally wrong as is to prevent the EPA from studying the effects independently as well. To ask the wireless industry to do their own research which if found harmful might put them out of business is a sham and beyond a conflict of interest yet this is what you have done to not protect your people.

7. To have guidelines rather than safety standards and expose 90% of our population to this harmful agent is wrong and you should be held liable in every way. You are playing with the health and well being of us, your citizens. You are playing with the health of our children in schools. You are damaging the genetics of every generation to follow us.

There is nothing more selfish and short sighted than this. Why can't our companies do what is right and see that harming our population is going to reduce your customers, workers and future generations as children's reproductive abilities will be effected by so much microwave exposure. This is based on studies with one source of RF radiation but now we are talking about say 8 sources of microwave for some individuals in their home and work environments and even worse for more vulnerable children as well.

8. To continue to deny the existence of non-thermal biological effects from microwave radiation used with wireless in light of thousands of studies showing effects and to ignore

these studies siting that we do not know the exact mechanism of harm is ridiculous; we do not know the exact mechanism of any cancer yet we take measures to minimize our risk but not in this case. Money and profits of the few has blocked our ability to do what is right and care for other Americans as we should. To increase peoples exposure with the proliferation of wireless is irresponsible to the point of being criminal as innocent people develop tumors, suffer and die as a result of exposure. There are no studies ensuring the long term safety of exposure to WiFi and other sources of RF radiation exposure but there are studies showing an association with cancer development with long term and especially heavy use or exposure. Now we are placing our school students in this environment and as LAUSD school board recently stated “we will just see what happens and if there is a problem we will change courses or stop.” But no one is looking at health effects and if they are shown them they are quick to explain them away. What a sad joke our government is that does not protect us but rather partakes in the harming of innocent Americans.

9. All you have to do is ask new victims of brain tumors, eye tumors, salivary gland tumors, breast cancer, ovarian cancer and even anal cancer as more girls carry their cell phones in their bras and back pockets if wireless is safe. But you keep them in the dark about the connection so they just continue to wonder why they and their friends and family are getting cancer. Amazingly bad and evil. We are leaving them unprotected so wireless companies and government agencies can make new revenues with the innocent American paying the price. Just ask Steve Jobs if wireless is safe. Ask Johnie Cochran if wireless is safe? Ask Lebron James who had a tumor removed from his salivary gland if

wireless is safe? Ask all the lesser known innocent business executives, lawyers, salesman who have died or been disabled buy their phone radiating them. You need to come clean and let the public know about the real risks. This is like a self imposed holocaust what you are doing.

10. When are you going to minimize our exposure to microwave rather than maximize it as you are now and putting WiFi with the microwaves bouncing inside of the walls of an airplane how ignorant can you be and to be exposed for hours at a time intensively and to expose special populations: those children, pregnant women and elderly in those planes is just well. This is an impassioned plea for a sane approach fo the sake of the health of our people. We need wired access to the internet and phone rather than wireless as more and more people, children fall victim to cancer as we insist on microwaving them. People try to explain the increase in cancer on what we eat but it is not what we eat because we all eat different things but we are all being microwaved. Essentially, we are the food as we are slowly microwaved by wireless microwave energy day after day hour after hour and with increasing frequency as the FCC paves the way for complete wireless proliferation.

11. God help us. You need to consult with medical scientists not physicists and engineers who know nothing about how these technologies effect the body. How short sighted can you be it will be wireless executive's families, friends, relatives, and colleagues who will get cancer as well as everyone else. It is not like this is something that will only effect the people over here or in this group or that one. Everyone will be effected and health will be impacted though to different degrees. All of us including you

will pay so you can make short term revenue gains. This is the worst of America-greed without remorse or consideration for how it will effect our people. How do you commissioners call yourself Americans?

12. What a joke-your FCC guidelines are a joke. Asking your vendors if they see health effects another big joke. Why not open your records up to scientists so they can track people's heavy use of wireless and tumor growth as well as other health effects. How many people get a brain tumor and call their vendors to complain because of your thorough job lying and misleading the public with billions of dollars of advertising; these poor people with brain tumors do not know to make the connection between their illness and their cell use. You have successfully kept millions of people in the dark about the association between EMF and a variety of illnesses including cancer, immune system disorders and cardiac dysfunction. If they had any idea of the literature that is out there, the thousands of studies and reports they would protect themselves. Your failure to warn the public of the risks is disgraceful. You should have to warn each and every parent with a kid in a wireless classroom of the risks, have to get a signed consent from each passenger sitting in an airplane where WiFi microwaves them the entire flight and you make it easier for their neighbor to also microwave them with their wireless device in dangerous close proximity. You should have to have them each sign a consent stating that they realize that they are being exposed to a class 2B carcinogen. You should have to get permission in writing.

13. The FCC guidelines regulating RF radiation from wireless are inadequate and do not ensure anyone's safety. The guidelines were found not to be protective of public health by Radiofrequency Interagency working group and to continue to use them to ensure the safety of the public is irresponsible and dishonest. FCC guidelines do not cover special populations: children, pregnant women and the elderly all of which make up a large segment of the traveling public being exposed with wireless in airplanes, do not cover children being exposed in their homes by smart meters, and do not cover children, pregnant women and the elderly using cell phones in close proximity all day long. There is no amount of microwaving of children that has been proven to be safe yet you feel safe exposing children all day long in wireless classrooms. Incredibly bad.

14. In contrast the rest of the world has not been corrupted by the revenues the industry brings in and is looking at health effects. The world consensus in and across Europe is to take a precautionary approach and they have recommended a ban of WiFi in children's classrooms due to health concerns. They are not willing to sacrifice their offsprings health merely for quick access to the internet or to save some money to wire internet access. For us to continue to expose our children to a known Class 2b carcinogen for the is irresponsible.

15. How much longer are we going to ignore the Italian Supreme Court ruling that cell phones can cause cancer when they looked at the latest research and taking into account the biased and poor quality research submitted by the wireless industry themselves to obfuscate the truth that wireless can cause cancer. I realize that I am submitting this

impassioned plea to the same group that has carried out this crime against America, humanity but I guess I am hoping you will wake up to the ill of your ways and right your wrongs by warning people, lowering your allowable exposure level to .0001uW/cm² and move to fund effort to provide wired access to the internet and use fiberoptic connections to the internet. I am hoping you will not continue with your inadequate standards, putting the lives of thousands at risk but I guess I am praying that somehow someday you will see the evil in your ways and do the right thing. Pray to god that your loved ones do not suffer the way I have seen so many around me suffer with cancer who are no more than 50 years old. No way you should further put at risk anyone by allowing WiFi or cell phone use on airplanes, in homes, in our communities, covering our community with microwave radiation exposure. We should eliminate it from airports, our homes, schools, hospitals as we have smoking and treat microwave radiation as the carcinogen that it really is.

16. So let me understand that I cannot keep my cell phone on during take off because the signal is so strong that it can interfere with the instrumentation and take off of the airplane but it is okay to have it on and radiating me with the cell phone of the guy next to me? What a sad uncaring unempathetic joke. It is clear the tremendous influence money has. You buy your FCC appointments with political contributions. Then you influence research by buying your own research. You pay universities to stop doing research which is beginning to show the health effects of wireless. This is a corrupt country and corrupt government and all of it is legal and corporate and proper but the only problem is people get sick and die as a result of your legally corrupt actions to hide

the cancerous effects of wireless. You pay enough money you can hurt anyone and in this case hurt thousands. Wholly conflict of interest. The FCC composed of wireless executives. It is a conflict if one of these members took money from the industry but worse yet they are the industry and will be paid handsomely as soon as they get done serving. This is blood money as others fall to cancer.

17. You are taking advantage of the technical naivete of the American public and abusing the trust that the public has that government will act to protect them rather than serve the interests of the wireless companies. What you are doing is un-American domestic terrorism, corporate murder with our government as an accomplice. You knew about this since at least 1992 when the EPA made their 500 page report on EMF's and cancer and other significant illness. In addition, naval records show you knew about the effects of non ionizing radiation 40 years ago. You have known all along but chosen to hide the truth from the American public. With the 400 page report in 1992 from the EPA, you just ignored the studies, defunded this department and then asked the wireless companies to fund and do their own research. How naïve can you be? You did this because you knew the reality that you had grown an industry who at its core has a technology that is carcinogenic and harmful what is sad is that you are selling cells as a means to security and comfort to family and children. You need to be exposed but more importantly you need to be held responsible for all the pain, suffering you have caused and the lives you have ended. Premeditated murder. Thoughtful, well planned out, well financed murder.

18. Antedotal stories are appropriate because no one is asking the doctors what they are seeing as they see sharp increases in cancer amongst young people. No one is honestly informing the public so they can connect the two and report it, and no one is looking at the rates of cancer from the insurance companies who have the facts and so we can see the real increase. We don't look then we do not have to see the devastation you are causing. Not paying for the research so can we can see the real effects and you could levy a \$1fee a month on cell phone use so we could find the safety frequencies and ways to deliver wireless if they are any but certainly do research to ensure the public's safety. make iensure the safety of the public.

19. People really are getting sick from wireless but no one is looking, asking, making the connection for them. It is just being ignored, people left to think they are crazy, and left to suffer and die. Personally I know 4 people with brain tumors right now all under 50 years old; all were very healthy people other than their cancer; and all were big wireless users. One a producer who used a cell phone to her head for years. I can have her testify if you like. A colleague at work used his cell phone to the head and developed a tumor behind his sinus. Another colleague used a laptop with a wireless card for more than 12 hours a day and developed a brain tumor. Another colleague carried her cell phone in her bra and had a strange cancer in her breast and had to have it removed. We are poisoning our young workforce with this wireless radiation. We are cutting these people down in their prime. All of these people were non-smokers. This wireless microwave radiation is our new carcinogen but three times as lethal as smoking with tumor growth expected after 10-15 years of exposure rather than 30-40 years with exposure to smoking.

20. We are allowing the wireless companies to play with the statistics and manipulate the research while innocent people get cancer. This is as wrong as it gets. When is this going to stop? Now you want to intensely radiate people in another environment? Radiate them inside of a metal container the hull of planes hull where microwaves will bounce and slowly microwave all of us for hours as we fly to our next destination. How ignorant can you be? How much more ignorant can you be. I guess we are finding out. Allowing apps for kids to use with dangerous Ipads; ones that allow the baby to lay on the laptop and be radiated while his mother's voice goes off when he moves. People have no idea how they are putting themselves and their families at risk and are you going to continue to allow this to happen? Where is your decency these are infants? Our next generation.

21. This is like when we let people smoke in the hospital as we used to. But with smoke you could see, smell, feel the danger and try to avoid it but with microwaves the exposure is ubiquitous and the radiating is involuntary. We are very efficiently harming our entire population; how stupid can we be? I guess we are finding out. None of the studies looking at nonthermal effects look at multiple sources of radiation but this is the environment that we are creating. For instance in a house or an airplane, with one person sitting in the airplane or house being able to be radiated by multiple wireless sources around them including the WiFi which will be continually microwaving them, their cell phone if they are using one, a wireless pad if they are using one, the cell phone and wireless device or router of their neighbor etc..

22. I spoke with a doctor who said that it used to be that if you saw one patient with brain cancer in your lifetime as a doctor that was a lot. Now I know 4 people with brain cancer. But no one is looking; no one seems to care about the health of our people. It is your job to care and look out for our health rather than just forward the interests of the wireless industry which is you and blissfully not look at what it is doing to our population. Your biased and closed minded pursuit of ubiquitous exposure of microwave radiation is negligent and evil on its worst level.

23. People are getting sick from the wireless smart meters you are putting on their houses. They are protesting and opting out of smart meters due to deletrious effects of microwave radiation across the nation but you seem oblivious to their suffering, distress and ill health you are creating. Even after hearing after hearing is being held across the nation and thousands of people are testifying to the ill health effects immediately caused by long term effects of microwave radiation on themselves and their families. You are forcing people out of their homes in many cases and for some they feel they have to move out of this country to avoid the effects of microwave energy as they become electrosensitive and unable to travel and live freely in this country. Most are getting sick and have no idea that it is the meter on their house that has been causing it. How do you remain ignorant of the damage you are causing, the interruption to the lives of so many, what happened to our right to the pursuit of peace and happiness?

24. Do we have any rights when we are being microwaved without our permission and exposed to a known class 2b carcinogen in the same class as lead and DDT? Would you knowingly paint the walls of the airplane or our homes or schools or hospitals with lead paint? Or spray our food with DDT on the flight or in our homes or schools? The answer is obviously not but with wireless you are doing even worse because here the agent is ubiquitous, being transmitted through us through us by a very efficient means, and the exposure is constant as we are WiFi'd and exposed to others second hand radiation in oan airplane, at work, in a restaurant. Say no to second hand RF radiation exposure.

Submitted by:

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Precautionary Principle; Mary Paul, Comments, Jul. 13, 2016

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Brief Comment

FCC Commissioners, Millions of people are unable to tolerate wireless frequencies. It is estimated that as much as 10% to 15 % of the population is affected in this way. There is more than enough research from non-industry funded studies to show how harmful electromagnetic fields and radiofrequency radiation are to all life. The FCC has consistently ignored the evidence and failed to carry out its scheduled reassessment of current exposure guidelines. The current guidelines adopted by the FCC are more than 20 years old and have no relevance for the documented harmful biological effects even at very low levels of non-thermal radiation. In 2011 The World Health Organization/IARC classified radiofrequency electromagnetic fields as a Class2B possible human carcinogen. In May of this year, the National Toxicology Program (NTP) at the National Institutes of Health (NIH) published the partial findings of a \$28 million multi-year study of the impact of cell phone radiation on human health. The NTP study found a causal relationship between the radiofrequency radiation emitted by cell phones and the occurrence of malignant brain cancer (glioma). The results were compelling enough to announce them early so that the public could be warned. Description of NTP study: <http://ntp.niehs.nih.gov/results/areas/cellphones/index.html> Published "Partial Findings" of the NTP study: <http://biorxiv.org/content/early/2016/05/26/055699> In May 2015 190 EMF scientists from 39 nations (presently 221 from 41 nations) signed an Appeal calling upon the United Nations, the World Health Organization, and the United Nations Environment Programme, and all member states to develop more protective EMF guidelines and to take precautionary measures to reduce EMF exposure. In February 2016, 105 non-governmental organizations (NGOs) in 23 nations signed a letter of support for the International EMF Scientists Appeal and submitted it to the Secretary General of the UN. These non-governmental organizations, who advocate for greater health and environmental protection from EMF sources (electromagnetic fields and radiofrequency radiation), called upon the UN to recognize that EMF exposure is an emerging health and environmental crisis that requires a high priority response. These NGOs requested a review of currently available EMF exposure information that demonstrates active harm to humankind and nature: a review and revision of current international EMF exposure guidelines and proposals for how they can be lowered, and that precautionary measures must be taken to reduce EMF exposure conditions. The 5G will be even more harmful than the existing wireless infrastructure, requiring a massive amount of antennas. These frequencies do not travel as far as 4G frequencies and will require a massive number of antennas installed in more and more locations. This blanket radiation coverage will make it virtually impossible for anyone to avoid the radiation, especially the more vulnerable – people whose health has already compromised by the existing radiation in the environment, as well as children, pregnant women and the elderly and the infirm. I am asking the Committee to vote against the 5G Spectrum Frontiers on July 14, 2016, which would fast track the release of the more harmful 5G radiation.

Stephanie McCarter Comments, Jul. 11, 2016

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Brief Comment

I am in opposition to 5G rollout, because the government has not done any studies on long-term health effects from exposure to 5G spectrum. In May 2016 the NTP showed a statisical increase in rare brain and heart cancers from rats exposed to cell phone radiation below thermal levels, yet the FCC has not done anything to revise its safety guidelines which are thermal based. To roll out 5G without doing studies on health first is NEGLIGENT. My children became sick from 4G LTE cell towers next to their school, and now we have to avoid cell towers. With FCC plan to put MILLIONS of small cells on residential streets, my children will become more ill. Health effects of 5G should be studied, not ignored!

Precautionary Principle; Rebecca Morr Comments, Feb. 4, 2013

The existing safety standards for wireless technology need to be updated before all of us, but especially children, are routinely exposed to additional wireless devices.

Until more conclusive research is available, higher “temporary” standards need to be adopted.

Extensive use of wireless technology is new enough that no one has all of the answers. However, there is already enough research indicating possible health problems to justify health concerns at our current safety standards; and it is research that has been carried out and reviewed by our most highly respected scientists, from our most prestigious universities and organizations. Although the wireless industry and energy companies promoting smart meters would like us to believe otherwise, it is reasonable to have health concerns at current safety limits.

Three such studies are noted below. There are many others.

May 2011: The World Health Organization (WHO) identified cell phones as a class 2B possible carcinogen. The International Agency for Research on Cancer (IARC), a working group of 30 of the world’s top scientists, representing 14 countries, spent seven days studying the mechanics of wireless technology, reviewing all of the existing research, and examining all other relevant data.

The result: Cell phones were designated as a class 2B possible carcinogen.

http://www.iarc.fr/en/media-centre/iarcnews/2011/Intr_Monog102.pdf

May 2012: Yale School of Medicine Researchers determined that exposure to cell phones during pregnancy affects the brain development of offspring, potentially leading to hyperactivity. “Taylor said that further research is needed in humans to better understand the mechanisms behind these findings and to establish safe exposure limits during pregnancy. Nevertheless, he said, limiting exposure of the fetus seems warranted.”

<http://news.yale.edu/2012/03/15/cell-phone-use-pregnancy-may-cause-behavioral-disorders-offspring>

December 2010: A Danish study found a higher incidence of hyperactivity and behavior problems in children whose mothers used cell phones extensively during pregnancy. The behavior of the children will be evaluated again in a few years to see if the problem behaviors persist.

<http://www.webmd.com/baby/news/20101206/cell-phone-use-in-pregnancy-risks-for-child>

These, and other studies, suggest that a “cautionary” approach to exposing our entire population, especially young children, to even more wireless technology, especially wireless devices using pulsed signals, is warranted.

It is well known that infants and young children, whose brains are still developing, are significantly more at risk for damage; yet the standard does not take this fact into account.

Not surprising, health care professionals, as well as scientists, have expressed their concern about the health risks related to wireless technology. The American Academy of Environmental Medicine (AAEM), a group of physicians whose expertise is environmental medicine, has taken a strong stand against smart meters.

<http://aaemonline.org/pressadvisoryemf.pdf>

The fact that many people have reported health problems with smart meters (with amazingly similar symptoms, many of which suggest heart and/or neurological involvement that began immediately after their smart meters were installed) is yet another indication that current safety standards may not be strict enough.

I am not suggesting that wireless technology be banned.

I am asking that:

- * healthy guidelines be set, based on independent studies, in real life situations,
- * the risks are thoroughly examined before involuntarily increasing entire populations to more wireless technology (such as smart meters)
- * the health risks are made public (such as warning labels, when warranted),
- * Stricter standards are set for companies whose policies affect entire populations (smart meters), or companies whose products affect children (baby monitors): and
- * Higher “temporary” standards be adopted until reliable research is available to set healthy standards.

Updated standards need to take into account:

- * the fact that each of us is exposed to multiple sources,
- * the wireless industry is rapidly growing, and the number of exposures will increase exponentially in the future,
- * pulsating signals result in short, but extremely high exposures, and may be extremely harmful, especially to children. (“averaging” the strength of signals is not an acceptable way of determining the relative safety of a device. The highest signal strength needs to be proven safe)
- * infants and children are more susceptible to harm because their nervous systems are just developing,
- * intersecting RF waves create “hot spots,” increasing the potential harm;
- * laboratory studies are not sufficient in determining safety; devices need to be studied in real life situations; and
- * safety standards need to be based on biological effects from independent research, not on industry funded research.

Precautionary Principle; Nancy Baer Comments, Feb. 2, 2013

FCC 12-152

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)

Notice of Proposed Rulemaking)
18 FCC Rcd 13187, 13188 ¶1 (2003))

ET Docket No. 03-137

And)

Service Rules for the Advanced Wireless Services)
H Block---Implementing Section 6401 of the)
Middle Class Tax Relief and Job Creation Act of)
2012 Related to the 1915-1920 MHz and)
1995-2000 MHz Bands ¶53 footnote 95)

WT Docket No. 12-357

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

Comment Filed by: (Nancy Baer)
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February 2 , 2013

AFFIDAVIT OF Nancy Baer

State of Arizona]

Yavapai County]

I, Nancy Baer, attest that my statements are true to the best of my knowledge.

Comment round for ET Docket No. 03-137 and WT Docket No. 12-357.

1. My name is Nancy Baer. My address is 245 San Patricio Drive, Sedona, AZ
86336.

2. I am retired. I am a thyroid cancer survivor from having received “therapeutic” x-ray “therapy” to my ears as a child for middle ear infections. My thyroid cancer went undiagnosed for 29 years despite having access to excellent medical care. I am a prime example of what can occur when elected officials fail to exercise “the precautionary principle” before allowing “new” technologies to be used on the public. I have been involved in doing my own research on radiation for many years and electromagnetic and radio frequency since 2011.

3. The Commission’s RF safety rules need to be revised in order to comply with its proposal “to amend its rules to ‘ensure that the public is appropriately protected from any potential adverse effects from RF exposure.’ The Rules need to be based on the findings of the biological studies, of which there are many, and if still in doubt, “the precautionary principle” needs to be applied. I have read a lot of studies over the past 18 months and have also noticed that I am sensitive to a specific frequency emitted by certain large building’s heating and cooling systems.

4. I have read studies indicating that all indicate that EMF/RF is harmful and dangerous because those frequencies are not compatible with the body’s natural average 60 Hz frequencies (2012 BioInitiative Report www.bioinitiative.org, Potential Wireless Effects http://www.emfwise.com/science_details.php and Science Overview <http://www.emfwise.com/science.php>, but there are many more.

The affect that those frequencies have on the body include; disrupting our normal speed of light communication between our approximately 100 trillion cells, breaking the blood/brain barrier, lowering the immune system by interfering with the body's normal Circadian cycle and permanently damages our DNA. It affects all biological entities because animals, birds, bees, flowers and fauna all have bio-electromagnetic processes because the manmade frequencies are incompatible with our bodies.

5. The human body has many frequencies within a range of 60-90MHz depending on location.

“Any movement of an object in any frequency can be changed by an external intervention of another frequency and the frequency of the human body and its cells is of no exception. Sets of frequencies directed at inflicted cells of a certain disease had to have these additional elements defined by very precise data parameters in order to create that desirable impact. Those new elements were added to radio, light and sound devices.”

<http://www.healtone.com/pages/the-human-body-frequency.html>

“In 1992, Bruce Tainio, Tainio Technology, an independent division of Eastern State University in Cheney, Washington, built the first frequency monitor in the world. Tainio has determined that the average frequency of the human body during the daytime is 62-68 Hz. A healthy body frequency is 62-72 Hz. When the frequency drops, the immune system is compromised.

Human Body:

Genius Brain Frequency 80-82 MHz	Thymus Gland is 65-68 MHz	Liver is 55-60 MHz
Brain Frequency Range 72-90 MHz	Heart is 67-70 MHz	Pancreas is 60-80 MHz
Normal Brain Frequency 72 MHz	Lungs are 58-65 MHz	
Human Body: from Neck down 60-68 MHz	Thyroid and Parathyroid glands are 62-68 MHz	
Colds and Flu start at: 57-60 MHz	Receptive to Epstein Barr at: 52 MHz	
Disease starts at: 58 MHz	Candida overgrowth starts at: 55 MHz	
Receptive to Cancer at: 42 MHz	Death begins at: 25 MHz	
Processed/canned food 0.	Dried herbs from 12 to 22 Hz	

<http://justalist.blogspot.com/2008/03/vibrational-frequency-list.html>.

6. The plethora of manmade devices emitting frequencies and bombarding us 24/7 are especially dangerous to those with medical implant devices (MIDs), such as pace makers, defibrillators, neurostimulators (deep brain stimulators) for; Parkinson's disease, Obsessive Compulsive Disorder and Depression, insulin pumps, and hearing aids, etc.

According to Professor Emeritus Gary Olhoeft, there is "No tracking for medical implant devices, but NIH says they have been used widely for more than 40 years, and it is estimated that 8-10% of Americans (20-25 million) currently have such a device.

As our population continues to age, and Diabetes increases, use of MIDs increases, and if nothing is done to stop the dangerous EMF and RF, more and more citizens will need to use health care resources. But, over and above all of that, I believe is a moral imperative that accompanies the function of a public servant. Despite being appointed, I believe you have a moral responsibility to protect us from harm.

7. According to Curtis Bennett, Chief Science Officer, Interprovincial Journeyman Electrician (Red Seal), Building Construction Engineering Technologist, Adjunct Faculty for IHF & GEDI, "The FCC declaring safety is only addressing the meter as an end use device, the rest of the wireless circuit; routers, relays, etc.. were not accounted for or included in the FCC's calculations" (Expert Witness testimony submitted to Brady, TX).

"The discussion on cell phone safety isn't including all of the technical data as was reported to Health Canada's Standing Committee on Health. There was an error reported in Health Canada's Safety Code 6 . . . (*identical to FCC's*) . . . when they compared radio frequency emfs with humans, but didn't provide that humans have their own frequency, or the fact they would be unprotected electrical systems in that application (Exhibit 1).

<http://www.thermoguy.com/blog/index.php?itemid=53>

8. Dietrich Klinghardt, MD, PhD notes that the number of children diagnosed with autism is doubling every five years, largely occurring as a result of being exposed to the high frequency range of cell phones while still a fetus. This is now occurring, by the age of eight, on the average of one out of every 88 births!

http://www.nytimes.com/2012/03/30/health/rate-of-autism-diagnoses-has-climbed-study-finds.html?_r=0

I believe this should be declared a public health crisis immediately as a threat to the continuation of all species.

http://www.klinghardtacademy.com/images/stories/neurotoxin/biological_medicine_notes_by_patricia_lemer_2012.pdf

9. "I analyzed weekly mortality statistics, which the US Centers for Disease Control publish for 122 US cities. Each of dozens of cities recorded a 10% - 25% increase in mortality, lasting 2-3 months, beginning on the day in 1996 or 1997 on which that city's first digital cell phone network began commercial service."

"It is harder to show effects today than 10 years ago because now the entire planet is exposed, making it impossible to do experiments with unexposed controls. But most experiments still show effects such as effects on rhythms, brain waves, blood-brain barrier, sleep, eyes, gonad, skin, hearing, calcium, melatonin, glucose, metabolism, and on human well-being."

- **Arthur Firstenberg**, founder and director of the public advocacy group Cellular Phone Task Force in US, and author of the 1996 book, *Microwaving Our Planet: The Environmental Impact of the Wireless Revolution*

<http://www.alternative-magnetic-therapy.com/emf-experts.html>

10. "I am now convinced those electromagnetic fields pose a health hazard. There is statistical association between magnetic fields and cancer that goes beyond the shadow of reasonable doubt. I think there is clear evidence that exposure to electromagnetic field increases the risk of cancer."

"This is most clear with leukemia and brain tumors. But in residential studies, statistical significance increased for all kinds of cancers. And we are just beginning to have a whole body of evidence that reproductive cancers are increased by exposure."

- **Dr David Carpenter**, Dean of State of New York School of Public Health

10. The US Environmental Protection Agency (EPA) now warns "there is reason for concern" with electromagnetic field and advises "prudent avoidance."

"In all my years of looking at chemicals, I have never seen a set of epidemiological studies that remotely approached the weight of evidence that we're seeing with ELF electromagnetic fields."

- **Martin Halper**, EPA director in an article in *Fortune Magazine*, December 1990

Respectfully submitted by



Nancy Baer

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February, 2, 2013

Thermogرافix Consulting Corporation Blog

For news, information and everything related to the exciting world of thermographic imaging.

EXHIBIT 1

23 Feb
2011**Cell Phone Use After One Hour**

Posted by Thermo Guy under General

The discussion on cell phone safety isn't including all of the technical data as was reported to **Health Canada's Standing Committee on Health**. There was an error reported in Health Canada's **Safety Code 6** when they compared radio frequency emfs with humans but didn't provide that humans have their own frequency or the fact they would be unprotected electrical systems in that application.

The method used for cell phone heat is done in a lab, they don't typically get to see the heat because the imaging application exceeds expertise. Here is a picture of before and after cell phone use for one hour. Do you see any changes between sides of the head? Do you see the difference in sides of the neck?

Industry stating to hold the phone a short distance from your head isn't going to work. Can you use your cell phone in a building or basement or car? These frequencies go through walls, roofs, cars and these frequencies go through your head as well as your body. Your brain runs off different frequencies and the mix of the frequencies changes frequencies in the head.

Health Canada uses international safety standards and the law says **if** the tissue is stimulated, experimental studies show it can lead to nerve and muscle depolarization. Human tissue and biologic systems are permeable making it very vulnerable to EMFs. What is it doing to a fetus or reproduction?

People in this discussion need to relate this for what it is, humans are intricate electrical systems and holding an electrical device to their head isn't good for that electrical system. Use a wired headset and keep the phone away from you. The application of the law has changed with the reported error or omission in safety standards, be careful. Have you flown with an airline and they tell you to turn your phone off because it interferes with the communication of the aircraft? It is interfering with your communications. How many men are carrying a radiating device in their pockets next to their baby factory, look at the picture and think of those regions of your body?

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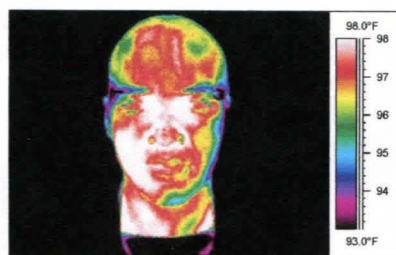
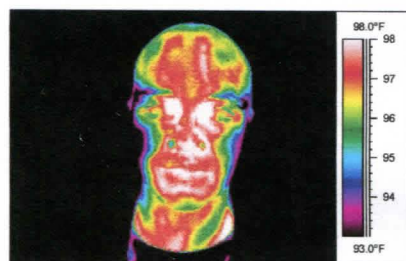
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250-765-9897



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These images are over the same spans of temperatures so you can more easily make references to changes in physiology.

For the same reason we wear lead shield to protect us from x-ray radiation, we need to be aware that cell phone radiation is subtle but a foreign frequency to our body.

COMMENTS

NO COMMENTS YET

ADD COMMENT

This item is closed, it's not possible to add new comments to it or to vote on it

Precautionary Principle; Holly LeGros Comments, Feb. 2, 2013

Currently, I am super hyper sensitive to exposures from various radiofrequency radiation, especially cell phones & cell towers & microwaves. It is critical for those of us who are now having health problems & those who will become health-impacted from this radiofrequency radiation in the future to be more protected from the horrific symptoms & suffering we endure. Please reconsider & revise the current standards to much more restrictive limits for human exposure in order to help prevent & improve the misery & suffering such people do & will endure. This is critical 4 Americans & their loved ones!!! Thank you.

Precautionary Principle; Loe Griffith Comments, Aug. 18, 2013

Comments on Notice of Inquiry, ET Docket No. 13-84

I am a 59 year old former elementary school teacher. I was disabled in 2003. I experience pain, difficulty walking, memory loss, and neuropathy from being around cell phones, wi-fi, smart phones, etc. I cannot get adequate medical care because maintaining the ability to function and communicate in the high EMF environment of medical settings is problematic. I can no longer work, travel, go to church, it is challenging to socialize and I was homeless for several months all due to the pervasiveness of RF radiation. As a former teacher, I especially hate seeing cell towers at schools. There are lots of epidemiological data regarding ill effects in the proximity of towers. I have been injured by and am currently affected by RF radiation that complies with current exposure limits. I urge you to set more restrictive limits.

Loe Griffith
Portal, Arizona

EMR Policy Institute Reply Comments, Nov. 18, 2013

Reply of The EM Radiation Policy Institute
ET Docket No. 03-137 and ET Docket No. 13-84

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Reassessment of Federal Communications)	ET Docket No. 13-84
Commission Radiofrequency Exposure Limits and)	
Policies)	
)	
Proposed Changes in the Commission's Rules)	ET Docket No. 03-137
Regarding Human Exposure to Radiofrequency)	
Electromagnetic Fields)	

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

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November 18, 2013

Reply of The EM Radiation Policy Institute
ET Docket No. 03-137 and ET Docket No. 13-84

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I. INTRODUCTION - Massive Support for RF Safety Limits That Protect People

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1. The EM Radiation Policy Institute (EMRPI) endorses and incorporates the hundreds of substantive Comments urging much more restrictive safety limits on radiofrequency radiation (RF) exposure so that humans are actually protected from electromagnetic radiation that harms their health.

2. EMRPI supports biologically-based RF safety limits that are “as low as reasonably achievable” and are at least 100 times lower than present FCC RF safety limits.

3. EMRPI joins with the many physicians, scientists, local governments, groups and trade organizations that have filed Comments urging limits that actually protect human health such as:

- the International Brotherhood of Electrical Workers (750,000 members)
- the American Academy of Pediatrics (60,000 Medical Doctors)
- the American Academy of Environmental Medicine (235 doctors)
- the American Association for Justice (20,000 U.S. members)
- the City and County of San Francisco (population 800,000 plus)
- the National Association of Telecommunications Officers and Advisors (NATOA)
- the Environmental Working Group
- Grassroots Environmental Education
- the Town of Hillsborough
- the Electromagnetic Safety Alliance
- the Center for Electrosmog Prevention
- Martha Herbert MD, PhD, neurodevelopment specialist at Harvard Medical School
- Om Gandhi PhD, Professor of Electrical and Computer Engineering, University of Utah
- Cindy Sage MA, Co-editor of *The BioInitiative Reports 2007 and 2012*
- Martin Blank PhD, Columbia University Department of Physiology and Cellular Biophysics
- David Carpenter MD, Director of The Institute for Health and the Environment, SUNY Albany
- Magda Havas PhD, Trent University, Ontario
- Devra Davis PhD, Environmental Health Trust

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- Susan Brinchman

and many others, most of whom have volunteered their time to file Comments.

4. Numerous additional Commenters echo EMRPI's position, including the petition signed by twenty-six thousand citizens urging stronger cell phone regulation that protects human health.

5. As for any Comments filed urging more lax standards, such Comments are almost entirely made by Industry officials and advocacy groups trained in business, electrical engineering and lobbying.

6. Common sense dictates that those trained in biology, physiology, medicine, and the health scientists are the experts that the FCC should rely upon in order to formulate RF safety limits that protect people from unsafe exposure to EMR.

7. It is illegal for those without a medical license to "practice medicine." People do not go to an electrician for a medical problem. The FDA does not allow the Chemical Industry to dictate doses and types of chemical medications. The FCC should not allow the Industry that benefits from emitting electromagnetic radiation to set the limits for this radiation, particularly in the face of evidence that this radiation interferes with biological processes in numerous harmful ways and interferes with the proper signaling of medical implants.

8. Documentation that EMR at levels below existing FCC safety limits causes harmful biological responses in some humans presented to the FCC should not be ignored. Numerous affidavits document that the Government is forcing unwanted EMR exposure on citizens despite their protests and documented injuries. Neither the Industry nor the Government has the right to "experiment" on the bodies of millions of Americans.

II. CHILDREN

9. Autism rates have greatly increased as EMR emissions have increased. Autism spectrum disorders are linked to EMR/RFR exposures physiologically. See: Martha R. Herbert, Cindy Sage, Autism and EMF? Plausibility of a pathophysiological link - Parts I and II, published in *Pathophysiology*. **Exhibits 1 and 2** These reports state that, "The evidence is sufficient to warrant new public exposure standards benchmarked to low-intensity (non-thermal) exposure

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levels now known to be biologically disruptive, and strong, interim precautionary practices are advocated.”

10. FCC’s current RF safety limits are inaccurate for protecting children. The FCC employs an exposure model equivalent to the shape of a 220-lb., 6-feet 2-inch tall male for compliance testing even though published research from the U.S., Japan, Spain, Brazil, France, and Switzerland proves that radiation absorption in children (including the pinna – ear lobe) is two times higher than in adults.

11. The FCC, by treating pinna as an extremity tissue “would allow cell phone radiation at levels that are 8-16 times those allowed presently by the FCC. [U.S. 2004] This is because pinna is close to the brain and in fact acts as a conduit for cell phone radiation into the head,” states Om Gandhi PhD, Professor of Electrical and Computer Engineering, University of Utah. He strongly disagrees with Federal Agencies’ conclusion that “classifying the pinna has no practical impact on the human exposure to RF radiation, and is therefore appropriate.” in Comment filed by Grassroots Environmental Education. o/b/o/ Om Gandhi PhD. Also cited by Mary Redmayne, PhD, Standards Australia Committee on Human Exposure to EMR, Scientific Advisor to Environmental Health, etc.

12. Toril Jelter MD submits striking case histories of nine children who suffered dramatic adverse health and behavior changes caused by RF radiation exposure. “Over 1% of America’s children now have autism . . . this problem alone threatens to bankrupt whole school systems...Currently, we are performing large-scale experiments on America’s children without informing children or their parents of the risk.”

III. HARMFUL INTERFERENCE

13. EMRPI reiterates that the FCC’s definition of “Harmful Interference” must be expanded if it is to be relevant to the ubiquitous environmental RF radiation exposure now present in Americans’ daily lives.

14. FCC’s “Harmful Interference” definition must be expanded to include acute, chronic, or prolonged exposure to RF signals and emissions that endangers, degrades, obstructs or repeatedly interrupts biological functioning of a person, plant, animal or

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ecosystem, or results in adverse health effects, or malfunctioning of medical devices or equipment. EMRPI Comment page 13 Paragraph 55.

15. “Harmful Interference that results in biological harm” is defined as “any negative change in a measurable biological, physiological or ecological parameter. “

16. The “Harmful Interference” definition must take into account the fact that RF radiation penetrates children and adults differently.

17. “Harmful Interference” affects the 25 million Americans who now depend on implanted medical devices and medical equipment. “Harmful Interference” with a medical device should be defined as:

- a. Exposure to electronics, metal detectors or wireless services that causes an FDA approved medical device such as a cardiac pacemaker, an insulin pump, a deep brain stimulator, a cochlear implant to malfunction and results in pain, bodily harm or death;
- b. Exposure to metal detectors and/or RF signals while a person is in a metal or electronic wheelchair and results in pain, bodily harm, negative health effects or death;
- c. Exposure to metal detectors and/or RF signals to a person with implanted metallic bone replacement devices that results in pain, bodily harm, negative health effects or death.

18. Smart meters are some of the many devices that can cause such “Harmful Interference” that are described in Comments and affidavits filed in this proceeding. Various individuals filed Comments about RF interference with implants that should be heeded. Laddie W. Lawings, retired Naval Nuclear Inspector; Judi Hangarther, RN; Kate Reese Hurd; and Gary Olhoeft, PhD in Geophysics (in the EMRPI Comment).

19. Medtronic, manufacturer of medical implants, warns of harmful interference to implanted medical devices in uncontrolled or controlled environments at current levels.

20. “Cardiac pacemakers, defibrillators, and drug delivery systems...may exhibit improper operation when subjected to strong RF fields. ...It is critical...that any new RF rules...ensure that RF exposure limits below 300 kHz do not cause harmful interference to implanted medical devices....” pg 7 Laddie W Lawings, retired Naval Nuclear Inspector.

21. The Mayo Clinic advises that cardiac pacemaker patients take precautions to prevent electromagnetic interference with the proper functioning their device:

<http://www.mayoclinic.com/health/pacemaker/MY00276/DSECTION=what-you-can-expect>

IV. COST ANALYSIS

22. The FCC appears to be assuming that there will be a large cost to lowering its current RF safety limits. If setting RF safety limits much more restrictive than the current FCC RF safety limits has a substantial cost, the countries such as Switzerland, Russia, China, and others who use a 0.1 $\mu\text{W}/\text{cm}^2$ RF safety limit would have experienced these costs. No such adverse cost to countries that allow 100 times lower RF safety limits has been substantiated.

23. As for the dollar cost of the health damage caused to millions of Americans from using RF safety limits that allow this radiation to interfere with the health and well-being of citizens, the responsibility and resources for compiling and comparing the dollar cost from lax vs. protective RF safety limits rest on the FCC and relevant Federal Agencies.

24. The EPA should be provided with the extensive Comments on health in this record that indicate damage at the present FCC-allowed levels of RF exposure and asked to provide the dollar value of this damage, insisted upon by the FCC. The FCC can then subtract the documented cost of requiring RF safety limits that are 100 times more protective based on what has happened in the countries using those RF limits and arrive at the cost of not acting to protect human health.

25. Federal Agencies put the economic value of a human life at \$ 6-7.9 million.

<http://www.nytimes.com/2011/02/17/business/economy/17regulation.html?pagewanted=all>

26. Substantial damage occurs when people are disabled from an environmental illness. The Annual Cost to the U.S. of Environmental Illness is between \$57 billion and \$397 billion. Muir & Zegarac-Charyl Zehfus Sept 16, 2013 filing of PMID 11744507 [PubMed-indexed for MEDLINE] PMCID: PMC1240624

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27. Costs of some diseases associated in the peer-reviewed research record with EMR exposure that are found in academic journals and government and foundation resources are:

- Autism - \$137 Billion USD - Xuejun Kong, MD - Christopher McDougale, MD. N. Am J. Med. Sci. 6(3) 2013
- Cancer - \$125 billion USD - (2010) <http://www.ncbi.nlm.nih.gov/pubmed/21228314>
- Cardiovascular Disease - \$444 billion (2010)
<http://www.cdc.gov/chronicdisease/resources/publications/AAG/dhdsp.htm>
- Diabetes – Statistics from the new report of The International Diabetes Foundation:
 1. An estimated 5.1 million people died of diabetes-related complications in 2013.
 2. 17% of babies in 2013 were born to women with high blood sugar levels, a sign of gestational diabetes that will contribute to the global diabetes burden in years to come.
 3. More than 79,000 children developed Type 1 diabetes in 2013; that's up from 77,800 in 2011.
 4. The equivalent of \$548 billion were spent on health care for diabetes patients around the world in 2013.
 5. China, India and the United States top the list for the most cases of diabetes per country; around 24.4 million Americans had the disease in 2013.

28. In addition to the host of diseases linked to EMR at current levels, electrohypersensitivity (EHS), which afflicts 3% of the population, often substantially disables these people.

(Grassroots Environmental Education, Inc. View 97 filed 9/24/13).

29. On October 15, 2013, the French federal agency ANSES (National Agency for Food, Environment and Work Health Security) published an update to its 2009 report (http://www.anses.fr/sites/default/files/documents/PRES2013CPA18EN_0.pdf) on the state of knowledge on risk related to exposure to radiofrequencies “based on a review of the international scientific literature” stating that:

. . . against a background of rapid development of technologies and practices, ANSES recommends limiting the population’s exposure to radiofrequencies – in particular from mobile phones – especially for children and intensive users, and controlling the overall exposure that results from relay antennas. It will also be further developing its work on electro-sensitive individuals, specifically by examining all the available French and international data on this topic that merits attention.

30. Numerous individual Comments on EHS such as Richard Meltzer, Shelley Master, Miriam Weber, M.D. Michele Hertz, Michael Schwaebe, Kevin Mottus, Heather Lane, Scott Spiegel, Kate Reese Hurd, Edna Willadsen, Diane Schou, Deborah Rubin, and many others are of record in this proceeding.

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31. Commenter Kit Weaver presents documentation that Utilities, and others in the smart grid, smart meter and smart home industry are violating the ADA by subjecting people with electromagnetic sensitivity to RF radiation in their own homes. “The FCC should stipulate that no utility, government, or other entity can require installation of an RF-emitting device upon one’s property without consent.”

32. EMRPI strongly opposes the Reply of the Utilities Telecom Council (UTC) that calls for categorical exclusion of Smart Meter facilities from routine evaluation. There is no need to return to the dangerous concept of exclusion by category. There has been no FCC evaluation of the complex emissions scenarios that arise from wireless Smart Meter buildout. The FCC does not know what the radiation patterns and emissions levels are when antennas are clustered on apartment buildings or in neighborhoods where buildings are close to each other.

V. INSURANCE COMPANIES RECOGNIZE SUBSTANTIAL RISK OF DAMAGE CLAIMS

33. Lloyd’s of London is excluding coverage for claims for negative health effects from RF radiation exposure as stated in the submitted affidavit of Michael Schwaebe, Professional Engineer, who swears to physiological effects experience by himself and observed in 13 of his clients:

Two of the world's largest insurance companies, Lloyds and Swiss Re, have recommended to other insurance companies to write in exclusion clauses against paying compensation for illnesses caused by continuous long-term non-ionizing radiation exposure.[\[1,2\]](#) . The recent Austrian insurance company [AUVA report](#) confirms DNA-breaks caused by non-ionising radiation, but the report leaves many issues open. Remember [what Swiss Re wrote in 2005?](#)

For the insurance industry, this standoff gives rise to an extremely dangerous risk of change composed of two parts: the classical development risk, that is, the possibility that new research findings will demonstrate electromagnetic fields to be more dangerous than has hitherto been assumed; and the sociopolitical risk of change, in other words, the possibility that changing social values could result in scientific findings being evaluated differently than they have been thus far.

Update 24th September: This is bad news for those employers who expose their workers heavily to non-ionising radiation. Precedents: There are already several cases where the worker got compensation because their tumours etc., were caused by [mobile phone](#) & other occupational EMF exposure [\[1,2,3,4,5\]](#) . And the amount

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of cases will most likely increase.

<http://beyondradiation.blogs.com/mblog/2010/09/insurance-companies-do-not-cover-health-damage-caused-by-mobile-technologies-disconnect.html>

VI. CONCLUSIONS

34. EMRPI and the endorsed Commenters lay out evidence of widespread present disease and disability with the resultant medical bills and loss of work from over-radiating the public. The future economic impact on young children now being affected will ripple forward in time and amplify as the negative health effects multiply with their cumulative and ever-increasing exposure.

35. The concept that thermal injury is “the only scientifically established mechanism of harm” for EMR and RF effects is simplistic and outdated.

36. Biological Mechanisms are comprised of complex interrelationships at the microscopic level. The FCC must accommodate changes in scientific knowledge found in studies published since 1986 on mechanisms of non-thermal effects of EMR and RF radiation exposure to humans and the environment.

37. The FCC must assess the research needs and gaps relating to potential biological and adverse health effects of wireless communications devices identified in the 2008 National Academies of Science Report 12036.

38. Recent research findings support continuing precautionary actions by various governments and agencies. Current research findings support the concept of biologically-based EMR and RF exposure safety limits.

39. NEPA mandates that it is time for the FCC to establish biologically-based EMR and RF Radiation Safety regulations. The FCC must comply with NEPA requirements.

40. The evidence of the need to revise FCC RF safety limits and exposure regulations to protect all members of the public is overwhelming. The FCC's duty to protect the public is beyond dispute. The Commission has failed to comply with the House Committee on Commerce's mandate to adopt "uniform, consistent requirements, with adequate safeguards of

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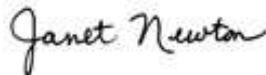
the public health and safety," and that these were to be "established as soon as possible." (H.R. Report No. 104-204, p. 94) This is a core duty imposed on this Commission. The Congressional Committee reiterated this expectation for emphasis on page 95 of House Report 104-204:

The Committee believes the Commission rulemaking on this issue (ET Docket 93-62) should contain adequate, appropriate and necessary levels of protection of the public, and needs to be completed expeditiously.

41. This Congressional statement requires on-going conscientious Commission compliance -- sufficient to protect the public in light of all of the research, health studies and experience now available to the agency.

Respectfully submitted,

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November 18, 2013

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Reply of The EM Radiation Policy Institute
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Exhibits

1. Autism and EMF? Plausibility of a pathophysiological link – Part I. Martha R. Herbert, Cindy Sage, Pathophysiology - June 2013 (Vol. 20, Issue 3, Pages 191-209, DOI: 10.1016/j.pathophys.2013.08.001).
2. Autism and EMF? Plausibility of a pathophysiological link – Part II. Martha R. Herbert, Cindy Sage, Pathophysiology - June 2013 (Vol. 20, Issue 3, Pages 211-234, DOI: 10.1016/j.pathophys.2013.08.002).



Exhibit 1

 ISIP
PATHOPHYSIOLOGY

Pathophysiology xxx (2013) xxx–xxx

www.elsevier.com/locate/pathophys

Autism and EMF? Plausibility of a pathophysiological link – Part I

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Received 10 February 2013; received in revised form 6 May 2013; accepted 15 July 2013

Abstract

Although autism spectrum conditions (ASCs) are defined behaviorally, they also involve multileveled disturbances of underlying biology that find striking parallels in the physiological impacts of electromagnetic frequency and radiofrequency exposures (EMF/RFR). Part I of this paper will review the critical contributions pathophysiology may make to the etiology, pathogenesis and ongoing generation of core features of ASCs. We will review pathophysiological damage to core cellular processes that are associated both with ASCs and with biological effects of EMF/RFR exposures that contribute to chronically disrupted homeostasis. Many studies of people with ASCs have identified oxidative stress and evidence of free radical damage, cellular stress proteins, and deficiencies of antioxidants such as glutathione. Elevated intracellular calcium in ASCs may be due to genetics or may be downstream of inflammation or environmental exposures. Cell membrane lipids may be peroxidized, mitochondria may be dysfunctional, and various kinds of immune system disturbances are common. Brain oxidative stress and inflammation as well as measures consistent with blood–brain barrier and brain perfusion compromise have been documented. Part II of this paper will review how behaviors in ASCs may emerge from alterations of electrophysiological oscillatory synchronization, how EMF/RFR could contribute to these by de-tuning the organism, and policy implications of these vulnerabilities. Changes in brain and autonomic nervous system electrophysiological function and sensory processing predominate, seizures are common, and sleep disruption is close to universal. All of these phenomena also occur with EMF/RFR exposure that can add to system overload ('allostatic load') in ASCs by increasing risk, and worsening challenging biological problems and symptoms; conversely, reducing exposure might ameliorate symptoms of ASCs by reducing obstruction of physiological repair. Various vital but vulnerable mechanisms such as calcium channels may be disrupted by environmental agents, various genes associated with autism or the interaction of both. With dramatic increases in reported ASCs that are coincident in time with the deployment of wireless technologies, we need aggressive investigation of potential ASC – EMF/RFR links. The evidence is sufficient to warrant new public exposure standards benchmarked to low-intensity (non-thermal) exposure levels now known to be biologically disruptive, and strong, interim precautionary practices are advocated.

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Keywords: Autism; EMF/RFR; Cellular stress; Oxidative stress; Mitochondrial dysfunction; Oscillatory synchronization; Environment; Radiofrequency; Wireless; Children; Fetus

1. Introduction

The premise of this review is that although scant attention has been paid to possible links between electromagnetic fields and radiofrequency radiation exposures (EMF/RFR) and Autism Spectrum Conditions (ASCs), such links probably exist. The rationale for this premise is that the physiological impacts of EMF/RFR and a host of increasingly well-documented pathophysiological phenomena in ASCs have remarkable similarities, spanning from cellular and

oxidative stress to malfunctioning membranes, channels and barriers to genotoxicity, mitochondrial dysfunction, immune abnormalities, inflammatory issues, neuropathological disruption and electrophysiological dysregulation – in short, multi-scale contributors to de-tuning the organism. Additional support may be found in the parallels between the rise in reported cases of ASCs and the remarkable increases in EMF/RFR exposures over the past few decades.

Reviewing these similarities does not prove that these parallels imply causality. Moreover, the physiological processes affected by EMF/RFR are also impacted by other environmental factors, and are known to be present in myriad other chronic illnesses. A set of in-depth reviews on the

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science and public health policy implications of EMF/RFR has been published in a special issue of Pathophysiology 16 (2,3) 2009. This two-volume special issue of Pathophysiology offers a broad perspective on the nature of health impacts of man-made EMFs, documenting biological effects and health impacts of EMFs including genotoxicity, neurotoxicity, reproductive and developmental effects, physiological stress, blood–brain barrier effects, immune system effects, various cancers including breast cancer, glioma and acoustic neuroma, Alzheimer's disease; and the science as a guide to public health policy implications for EMF diseases [1]. Many of these reviews have been updated in the BioInitiative 2012 Report [2], with 1800 new papers added. Further reinforcement is published in seminal research reviews including the two-volume Non-Thermal effects and Mechanisms of Interaction between Electromagnetic Fields and Living Matter, Giuliani L and Soffritti, M (Eds.), ICEMS, Ramazzini Institute, Bologna, Italy (2010) [3]; the World Health Organization INTERPHONE Final Report (2010) [4]; and the WHO International Agency for Research on Cancer RFR Monograph [5] designating RFR as a Group 2B Possible Human Carcinogen. The National Academy of Sciences Committee on Identification of Research Needs Relating to Potential Biological or Adverse Health Effects of Wireless Communication Devices (2008) [6] called for health research on wireless effects on children and adolescents and pregnant women; wireless personal computers and base station antennas; multiple element base station antennas under highest radiated power conditions; hand-held cell phones; and better dosimetric absorbed power calculations using realistic anatomic models for both men, women and children of different height and ages. Yet EMF/RFR does not need to be a unique contributor to ASCs to add significantly to system overload ('allostatic load') and dysfunction [7]. Even so these pathophysiological overlaps do suggest that the potential for an EMF/RFR-ASC connection should be taken seriously, and that their biological fragility may make many with ASCs more likely to experience adverse EMF/RFR impacts. This is a sufficient basis to recommend that precautionary measures should be implemented, that further research should be prioritized, and that policy level interventions based on existing and emerging data should be designed and pursued. Moreover, pursuing this link could help us understand ASCs better and find more ways to improve the lives of people with ASCs and of so many others.

This paper is divided into two parts. Part I (<http://dx.doi.org/10.1016/j.pathophys.2013.08.001>) describes the pathophysiology and dynamism of common behavioral manifestations in autism, and pathophysiological damage to core cellular processes that is associated both with ASCs and with impacts of EMF/RFR. Part II (<http://dx.doi.org/10.1016/j.pathophys.2013.08.002>) reviews how behaviors in ASCs may emerge from alterations of electrophysiological oscillatory synchronization and how EMF/RFR could contribute to these by de-tuning the organism. Part II also discusses public health implications,

and proposes recommendations for harm prevention and health promotion.

2. Physiological pathogenesis and mechanisms of autism spectrum conditions

2.1. How are biology and behavior related?

Appreciating the plausibility of a link between ASCs and EMF/RFR requires considering the relationship between ASC's behavioral and biological features. ASCs were first labeled as 'autism' in 1943 by Leo Kanner, a child psychiatrist who extracted several key behavioral features, related to communication and social interaction challenges and a tendency toward restricted interests and repetitive behaviors [8]. There has been some modification of the characterization of these behavioral features, but ASCs are still defined behaviorally, although sensory issues such as hypo- or hyper-reactivity have recently been included in the diagnostic criteria (Diagnostic and Statistical Manual of Mental Disorders or DSM-V) [9,10].

2.1.1. Transduction is fundamental but poorly understood

To evaluate how an environmental factor such as EMF/RFR could lead to autism and/or influence its severity or incidence, we examine how effects of EMF/RFR exposure may be transduced into changes in nervous system electrical activity, and how these in turn generate the set of behaviors we have categorized as 'autism.' [11] This means not taking behaviors as given, or as purely determined by genetics, but exploring the full range of biology that generates these features and challenges.

2.1.2. More than brain

Although 'autism' has long been considered to be a psychiatric or neurological brain-based disorder [12,13], people diagnosed with ASCs often have many biological features including systemic pathophysiological disturbances (such as oxidative stress, mitochondrial dysfunction and metabolic and immune abnormalities) [14–17] as well as symptomatic medical comorbidities (such as gastrointestinal distress, recurrent infections, epilepsy, autonomic dysregulation and sleep disruption) [18–26] in addition to the core defining behaviors [27]. Because of variability among individuals, the relevance of many of these biological features has been dismissed as secondary and not intrinsically related to the 'autism.'

2.1.3. Heterogeneity: more genetic and environmental than physiological

Presently large numbers of genes and environmental contributors to ASCs are under consideration. Over 800 genes have been associated with ASCs, and over 100 different rare genetic syndromes are frequently accompanied by ASCs, but

no clear unifying mechanism has been identified [28–33]. Similarly, a large number of potential environmental contributors are under investigation ranging from toxicants and Vitamin D deficiency or failure to take prenatal vitamins to air pollution and stress or infection in pregnancy [34–41].

By contrast, a smaller set of disturbances are showing up physiologically as common across substantial numbers of people with ASCs – as well as in myriad other chronic conditions whose prevalence also appears to be increasing [42,43]. These include oxidative stress, inflammation, and mitochondrial dysfunction. EMF/RFR exposure is associated with many of the same biological effects and chronic health conditions [1]. This environmentally vulnerable physiology [44], which may serve as final common pathways triggered by diverse genetic and environmental contributors, will be discussed in Section 3 of Part I as well as in Part II; it may or may not need to rest on underlying genetic vulnerability.

2.1.4. EMF/RFR research may help us understand how ASCs ‘work’

Some correlations between biological and behavioral features have been identified – e.g., a higher level of immune abnormalities correlates with more aberrant behaviors [26,45–50]. In order to move beyond correlations to identifying *mechanisms* by which the *transduction of pathophysiology into behavior* might actually occur, an important component is studying the relationship between systemic pathophysiology and nervous system electrophysiology.

The brain is simultaneously a tissue-based physical organ that can be compromised by cellular pathophysiology as well as altered developmental processes and an information processing system that operates through networks of synchronized electrical oscillations (brain waves) – and EMF/RFR impacts may occur directly at both of these levels. To date the emphasis in ASC research has largely been on ‘structure-function’ relationships that have been anatomy-centered. Thus, exploring how EMF/RFR impacts ASCs may answer questions of how pathophysiological and electrophysiological information-processing interacts.

2.2. Time courses of mechanisms

Researchers have mainly looked for causes of autism in mechanisms that occur early and create permanent change or damage. This approach is logical if one assumes that genetic influences are overwhelmingly predominant, and ‘autism’ is a fixed lifelong trait. However evidence is emerging that ASCs may be more state-like and variable than trait-like and fixed.

2.2.1. Plasticity

A remarkable shift is occurring in conceptual thinking about ASCs and brain plasticity [51]. There are growing numbers of reports of improvement and loss of diagnosis, reversal of neurological symptoms in a growing number of mouse models of genetic syndromes that in humans prominently feature autism [52–62], short-term pharmaceutically-induced

improvement in brain connectivity [63], and transient reversal or abeyance of symptomatology under various circumstances (including fever, fluid-only diet, and certain antibiotic treatments [50,64]). Reversals undermine the idea that ASCs derive from an intrinsically ‘broken brain’, and short time frames of marked improvement cannot be accounted for by remodeling of the brain’s anatomical substrate [65]. ‘Brain waves’ and their synchronization, on the other hand, could easily vary over short time periods.

Also, evidence of average to superior intelligence in most people with autism [66,67], as well as of domains of perceptual superiority [68–76], call into question the assumption that ASCs are intrinsically associated with cognitive deficits.

2.2.2. Mechanisms that operate actively throughout the life-course

EMF/RFR effects can occur within minutes (Blank, 2009) and may, in part, explain clinical reports of ‘intermittent autism’ – for example, some children with mitochondrial disease who have ups and downs of their bioenergetics status ‘have autism’ on their bad days but don’t display autistic features on their good days [77]. These children with their vulnerable, barely compensated mitochondria could very well be teetering right at the brink of a minimally adequate interface of metabolic and electrophysiological dysfunction. Everyday exposures to allergens, infection, pesticide on the school playground, as well as EMF/RFR interference with electrophysiology might reasonably contribute to the bad days. Stabilizing more optimal nervous system performance [78] including through environmental control of excessive EMF/RFR exposure could perhaps achieve more ‘good days’.

2.2.3. Pathophysiology and allostatic load

The model of ‘allostatic load’ – the sum total of stressors and burdens [79] – may be central to understanding how the many risk factors interact to create autism – and to create a spectrum of levels of severity across so many of ASD’s associated features. This accumulation increases chronic stress, and a growing number of papers document indicators of chronic stress in individuals with ASCs (as will be discussed in Part II). The ‘allostatic load’ concept dovetails well with a model of progressive exacerbation of pathophysiological disturbances that occurs in the pathogenesis of many chronic diseases [43]. It is also critical to understand that many different environmental factors converge upon a much smaller number of environmentally vulnerable physiological mechanisms [44], so that large numbers of small exposures may have effects from small numbers of large exposures.

EMF/RFR exposures have demonstrated biological effects at just about every level at which biology and physiology have been shown to be disrupted in ASCs. Further EMF/RFR has been shown to potentiate the impact of various toxicants when both exposures occur together [80]; this may be additive or more than additive. This suggests that EMF/RFR may synergize with other contributors and make things worse. A cascade of exposures interacting with vulnerabilities in

an individual can potentially lead to a tipping point for that person, such as the phenomenon of autistic regression experienced by a substantial subset of people with ASCs.

Just a few decades ago, EMF/RFR exposures were not present in the environment at today's levels. Levels have increased several thousand-fold or more in the past two decades from wireless technology alone; with unplanned side effects from pulsed RFR that is a newly classified Group 2B possible human carcinogen [5]. Nearly six billion people globally own wireless phones. Many millions are exposed to wireless exposures from use of wireless devices and wireless antenna facilities [81]. For this as well as for physiological reasons, 'allostatic loading' as a viable concept for the study of ASCs should reasonably address EMF/RFR as one of the exposures of relevance to the overall stress load, since it is now a chronic and unremitting exposure in daily life at environmentally relevant levels shown to cause bioeffects from preconception and pregnancy through infancy, childhood and the whole life-course.

3. Parallels in pathophysiology

This section will review parallels in pathophysiology between ASCs and impacts of EMF/RFR. It will begin with a review of mechanisms of direct impact and damage at the level of molecules, cells, tissues and genes. It will then move on to consider how these levels of damage lead to degradation of the integrity of functional systems including mitochondrial bioenergetics, melatonin metabolism, immune function and nervous system physiology. The review of parallels concludes with electromagnetic signaling and synchronized oscillation from membranes to nervous system. It will discuss how the ensemble of pathophysiological disturbances, which are themselves final common pathways that can be caused or worsened by many stressors, combine to converge upon electrophysiology. This leads to the implication that 'aberrant' neural systems and somatic function and behaviors might be better understood as consequences or 'outputs' of disturbed underlying physiology to which EMF/RFR is a plausible contributor.

3.1. Damage: means and domains

ASCs have been conceptualized as 'neurodevelopmental' which has focused attention on how genes and environment could alter brain development. This leads to the unstated presumption that virtually everything important about the brain in ASCs has to do with differences in the way it was formed, and that all "malfunction" derives from this "malformation." In genetics this has led to a hunt for neurodevelopmental genes. There is no question that environmental impacts can alter brain development, and impact brain function across the lifespan.

However the influence of the environment on neurodevelopmental conditions such as ASCs does not stop there.

Evidence is accumulating showing that increased expression of genes associated with physiological dysregulation, as well as *single-nucleotide polymorphisms* (SNPs) associated with these issues, may be if anything more prominent than alterations of 'neurodevelopmental' genes [82]. In a study of gene expression in ASCs, Down syndrome and Rett syndrome, these authors state, "(O)ur results surprisingly converge upon immune, and not neurodevelopmental genes, as the most consistently shared abnormality in genome-wide expression patterns. A dysregulated immune response, accompanied by enhanced oxidative stress and abnormal mitochondrial metabolism seemingly represents the common molecular underpinning of these neurodevelopmental disorders." Others have also found pathophysiology-related genes as figuring most prominently in alterations of gene expression in ASC [83–86]. SNPs associated with methylation abnormalities, impaired glutathione synthesis and mitochondrial dysfunction also have been identified as significant risk factors.

Genetics may create risk, but the actual nervous system and health consequences probably come from dysfunction at the physiological level. As mentioned, evidence for pathophysiological dysfunction in ASCs increasingly abounds. In particular, a growing body of evidence widely reported in both the EMF/RFR and ASC literature documents immune aberrations, low total and reduced glutathione levels, lower activity of the anti-oxidative stress system and mitochondrial dysfunction. These phenomena may be both genetically and environmentally modulated. As will be discussed further below, they are certainly pertinent to the neurodevelopment of the brain, which has been by far the dominant focus autism research, but it does not stop there as they can significantly modulate brain function in real time, as well as shape the function of the entire organism, including the autonomic system, the cardiovascular, endocrine, immune, gastrointestinal and reproductive systems and more. These systemic impacts may in turn feed back into the nervous system, modulating how it functions.

3.1.1. Cellular stress

3.1.1.1. Oxidative stress. Autism (ASC) research indicates that oxidative stress may be a common attribute amongst many individuals with autism. In the past decade the literature on this has moved from a trickle to a flood. Studies document reduced antioxidant capacity, increased indicators of oxidative stress and free radical damage, alterations in nutritional status consistent with oxidative stress, altered lipid profiles, and pertinent changes not only in blood but also in brain tissue. Associations of ASCs with environmental exposures such as air pollution and pesticides are indirectly supportive as well, since such exposures are linked in other literature to oxidative stress [43,87–101].

Reactive oxygen species are produced as a normal consequence of mitochondrial oxidative metabolism as well as other reactions, but when their number exceeds the cell's antioxidant capacity a situation of oxidative stress develops. It

is certainly the case that oxidative stress can be a consequence of exposures to chemical toxicants, or of the interactive impacts of toxicants, nutritional insufficiencies and genetic vulnerabilities. This set of risk factors has received considerable attention for the potential roles each component and various possible combinations could play in causing or exacerbating autism.

Less often mentioned in the ASC pathophysiology literature is that it is also well established that EMF/RFR exposures can be associated with oxidative damage. Published scientific papers that demonstrate the depth of EMF and RFR evidence reporting oxidative damage in human and animal models are profiled by Lai and colleagues [102–104]. These cellular effects can occur at low-intensity, legal levels of exposure that are now ‘common environmental levels’ for pregnant women, the fetus, the infant, the very young child, and the growing child as well as for adults. Electromagnetic fields (EMF) can enhance free radical activity in cells [105,106] particularly via the Fenton reaction, and prolonging the exposure causes a larger increase, indicating a cumulative effect. The Fenton reaction is a catalytic process of iron to convert hydrogen peroxides, a product of oxidative respiration in the mitochondria, into hydroxyl free radical, which is a very potent and toxic free radical [103,104]. Free radicals damage and kill organelles and cells by damaging macromolecules, such as DNA, protein and membrane components.

Further indications of a link to oxidative stress are findings that EMF and RFR at very low intensities can modulate glutamate, glutathione and GABA, and affect mitochondrial metabolism. Alterations in all these substances and processes have been documented in ASCs [25,86,89,90,92,107–127]. On the EMF/RFR side, Campisi et al. (2010) report that increased glutamate levels from 900 MHz cell phone frequency radiation on primary rat neocortical astroglial cell cultures induced a significant increase in ROS levels and DNA fragmentation after only 20 min with pulsed RFR at non-thermal levels [128].

Fragopoulou et al. (2012) conducted proteomics analysis of proteins involved in brain regulation in mice as a consequence of prolonged exposure to EMF [129]. They identified altered expression of 143 proteins, ranging from as low as 0.003-fold downregulation up to 114-fold overexpression with affected proteins including neural function-related proteins including Glial Fibrillary Acidic Protein (GFAP), alpha-synuclein, Glia Maturation Factor beta (GMF), apolipoprotein E (apoE), heat shock proteins, and cytoskeletal proteins (i.e., neurofilaments and tropomodulin), as well as proteins of brain metabolism such as aspartate aminotransferase and glutamate dehydrogenase. The authors pointed out that oxidative stress was consistent with some of these changes.

Aberrations in glutathione metabolism and deficiencies in reserves of reduced glutathione are increasingly associated with ASCs, both systemically and in the brain. The parallel with EMF/RFR impacts here is strong, since glutathione reduction associated with EMF/RFR is reported in at least

twenty three relevant research studies in both human and animal studies since 1998, including the following citations [130–144]. It is increasingly appreciated that glutathione is a final common pathway, a critical piece of environmentally vulnerable physiology, as glutathione reserves are compromised by an enormous number of environmental stressors, so that the cumulative impact upon glutathione may be far greater than could be predicted by the magnitude of any specific exposure [145], which supports an ‘allostatic loading’ model.

Also of note are studies showing that the effects of EMF/RFR can be reduced by supplementation with antioxidants and radical scavengers. As an example, Vitamins E and C reduced adverse impacts on rat endometrium from 900 MHz EMR exposure [137]. Ginkgo biloba has also prevented mobile phone-induced increases in malondialdehyde and nitric oxide levels in brain tissue as well as decreases in brain superoxide dismutase and glutathione peroxidase activities and increases in brain xanthine oxidase and adenosine deaminase activities, and treated rats were spared the histopathological cell injury found in the untreated rats [146]. Substantial further literature on antioxidants and radical scavengers is reviewed in Belyaev’s contribution to the Bioinitiative 2012 Report [147].

3.1.1.2. Stress protein (heat shock protein) responses.

Another well-documented effect of exposure to low-intensity extremely low frequency and RFR is the creation of stress proteins (heat shock proteins) indicating that a cell is being placed under physiological stress [148–154]. Heat shock proteins are in a family of inducible proteins that are initiated when any increased need for protection from stray electrons occurs [155,156]. The HSP response is generally associated with heat shock, exposure to toxic chemicals and heavy metals, and other environmental insults. HSP is a signal of cells in distress. Plants, animals and bacteria all produce stress proteins to survive environmental stressors like high temperatures, lack of oxygen, heavy metal poisoning, and oxidative stress. It should also be noted that the generation of HSP stress proteins can have constructive medical applications, such as protection from reperfusion of the heart following ischemic injury [157]. Another concomitant impact of cellular stress can be protein misfolding, which has been documented in association with exposure to EMF/RFR [158,159].

Although a number of papers have demonstrated increases in HSPs in people with ASCs [160–164], it has been investigated far less often than oxidative stress. Part of the research needed to study possible influences of EMF/RFR on ASCs would be more careful study of HSPs in ASCs.

3.1.2. Membranes and channels

3.1.2.1. Cell membranes and lipid peroxidation.

Cell and organelle membranes play roles in partitioning cells from the extracellular milieu as well as in sustaining boundaries and regulating flow of materials between cellular compartments needing different metabolic parameters for their activities.

They also play critical roles in maintaining electrical differences and the flow of electricity.

Adey (2002) summarized studies that report cell membranes as the site of initial field transductive coupling.

“Collective evidence points to cell membrane receptors as the probable site of first tissue interactions with both ELF and microwave fields for many neurotransmitters [165], hormones [166,167], growth-regulating enzyme expression [168–171], and cancer-promoting chemicals [172,173]. In none of these studies does tissue heating appear involved causally in the responses.” [174]

Membranes are well-known targets of oxidative stress. Membrane damage is a major route through which free radical damage proliferates through the cellular system. Lipid peroxidation of membranes most often affects polyunsaturated fatty acids such as EPA and DHA which are the most abundant and vulnerable lipids in the brain where the damage they sustain can have serious impacts – DHA is 40% of PUFAs (brain polyunsaturated fatty acids). Lipid peroxidation of membranes has been identified as an effect of EMF/RFR in multiple studies [175,176]. A variety of other mechanisms for membrane alteration related to EMF/RFR have been intimated in the literature. Physicochemical properties of membranes such as phase transition of phosphatidylcholine can be shifted by non-thermal effects of microwave radiation [177]. Membrane potential and currents may also be impacted by pulsed radiofrequency fields [178]. This has been observed graphically in altered cellular movement in *Paramecium caudatum*, with these cells becoming broader, with a broader-appearing cytopharynx, with their pulse vesicles having difficulty in expelling their content outside the cell, and with less efficient movement of cilia [179] which the authors suggested might be due to targeting of the cellular membrane. The impacts on this unicellular organism may help us imagine what the impact of EMF/RFR might be on cells with some structural similarities, such as columnar epithelial cells and ciliated cells in mucosal surfaces in the respiratory system, digestive tract, uterus and fallopian tubes and central spinal cord.

Indications of lipid peroxidation of membranes has been documented in ASCs, including malonaldehyde and isoprostanes, as well as alteration of membrane phospholipids and prostaglandins [98,100,115,162,180–184]. In one study the isoprostane levels showed a bimodal distribution with the majority of ASC subjects showing moderate increase but a smaller group showing dramatic increases [183]. Thromboxane, reflecting platelet activation, was also elevated in one study [98]. Given that this phenomenon has been identified in many people with ASCs, it is plausible that such individuals will likely be more vulnerable to having such cellular injuries caused, worsened or both by EMF/RFR exposures.

3.1.2.2. Calcium channels. EMF/RFR exposures have been shown to alter or disturb calcium signaling [185] through a variety of mechanisms, including membrane leakage [186],

alteration of calcium-binding proteins and GFAP reactivity [187,188], and altered ultrastructural distribution of calcium and calcium-activated ATPases after exposure [189]. Adey (2002) provided an overview of key studies on calcium efflux and the importance of calcium in cell signaling. *“Early studies described calcium efflux from brain tissue in response to ELF exposures [190,191], and to ELF-modulated RF fields [190–193]. Calcium efflux from isolated brain subcellular particles (synaptosomes) with dimensions under 1.0 μm also exhibit an ELF modulation frequency-dependence in calcium efflux, responding to 16 Hz sinusoidal modulation, but not to 50 Hz modulation, nor to an unmodulated RF carrier [194]. In the same and different cell culture lines, the growth regulating and stress responsive enzyme ornithine decarboxylase (ODC) responds to ELF fields [170,195] and to ELF-modulated RF fields.” [168,170,171,196].*

Dutta et al. (1992) reported:

“Radio-frequency electromagnetic radiation (RFR) at 915 and 147 MHz, when sinusoidally amplitude modulated (AM) at 16 Hz, has been shown to enhance release of calcium ions from neuroblastoma cells in culture. The dose-response relation is unusual, consisting of two power-density “windows” in which enhanced efflux occurs, separated by power-density regions in which no effect is observed. Thus RFR affects both calcium-ion release and AChE activity in nervous system-derived cells in culture in a common dose-dependent manner.” [197]

Alterations in calcium signaling impacts are of central importance in ASC pathophysiology, and have been documented to occur with some EMF/RFR exposures. Calcium channels play an important role in regulating neuronal excitability. Disturbance during development may be contributory to the development of ASCs, and is often associated with vulnerability to seizures. Gene alterations associated with a number of voltage-gated calcium channels have been identified in ASCs [198–202]. However, based on an examination of patient laboratory and phenotype data it has been argued that aberrant calcium signaling could be downstream: Palmieri and Persico (2010) suggest that *“an abnormal neuroimmune response as a relevant player in elevating intracellular Ca^{2+} levels, deranging neurodevelopment, driving oxidative stress, and ultimately affecting synaptic function and neural connectivity especially in long-range neuronal pathways physiologically responsible for integrated information processing” [203].* Peng and Jou (2010) have in turn shown how increased intracellular calcium can cause oxidative stress, and a vicious circle: *“... mitochondrial ROS [reactive oxygen species] rise can modulate Ca^{2+} dynamics and augment Ca^{2+} surge. The reciprocal interactions between Ca^{2+} induced ROS increase and ROS modulated Ca^{2+} upsurge may cause a feedforward, self-amplified loop creating cellular damage far beyond direct Ca^{2+} induced damage” [204].*

Environmental as well as genetic routes to calcium signaling dysfunction have been identified [205] including chemicals such as the polyaromatic hydrocarbons.

PCB-95 in particular modulates the calcium-dependent signaling pathway responsible for activity-dependent dendritic growth [206,207]. In fact, once a genetic mutation has been associated with altering a critical signaling pathway and conferring risk for autism, chemicals or other environmental agents can be identified that target the same pathways and also confer ASC risk. Stamou et al. (2012) have reviewed this strategy of identifying multiple mechanisms converging on common signaling pathways regarding Ca(2+)-dependent mechanisms as well as extracellular signal-regulated kinases (ERK)/phosphatidylinositol-3-kinases (PI3K) and neuroligin-neurexin-SHANK [208]. From this point of view, there may be no particular reason to privilege genetic mutations in their contribution to a disturbance of calcium signaling, since whether this function becomes derailed due to a genetic mutation, from a chemical toxin or from EMF/RFR perturbation of calcium signaling, the functional effect is comparable.

3.1.3. Junctions and barriers

The damage discussed so far has been at the molecular and subcellular level. However impacts from this level reverberate up to larger scales in the system. Where membranes create boundaries between cells and subcellular compartments, barriers do this at a larger scale. Cells become capable of forming barriers between each other through tight junctions which block substances and cells from ‘slipping through the cracks,’ so to speak, between the cells. Conversely, gap junctions are subcellular structures providing openings that allow physical passage of materials between cells otherwise separated by membranes.

Such connections between cells can also be altered by electromagnetic fields and radiofrequency exposures, at least under certain circumstances. High frequency magnetic fields have been observed to be associated with a sharp decrease in intercellular gap junction-like structures, in spite of increased gene expression for pertinent proteins [209]. Changes in tight junctions have been observed upon exposure to microwave and x-ray irradiation [210].

A number of papers in the ASC research field document problems pertinent to junctions. Connexin abnormalities have been documented in neuropathological studies [211] and MacFabe and colleagues identified lipid alterations associated with oxidative stress, membrane fluidity and the modulation of gap junction coupling [212]. Decrease in platelet endothelial cell adhesion molecule-1 were reduced and this reduction correlated with repetitive behavior and abnormal brain growth; adhesion molecules modulate permeability and signaling at the blood–brain barrier as well as leukocyte infiltration into the central nervous system [213].

EMF and RFR might also compromise biologically important barrier structures that separate blood flow from organs like the brain [214]. This raises important questions regarding whether other ‘barriers’ that keep blood flow separate from the gut (gut-blood barrier), or the placenta (blood–placenta barrier) or the eye (ocular-blood barrier) may also be

rendered pathologically leaky, and allow albumin, toxins, pro-inflammatory cytokines and infectious agents to cross these barriers, which may invoke immune responses in the intestines, and may impact the developing fetus [215]. While there are a fair number of negative studies, there are also many studies showing an association between EMF/RFR and pathological leakage of the blood–brain barrier (BBB), as well as evidence in animal studies of damage to brain cells and damage to or death of neurons. Such leakage has been shown to be potentiated by physiological factors such as diabetes and insulin (Gulturk et al., 2010) and has also potentiated viral lethality in a dose-dependent fashion (Lange et al., 1991). Many of the positive findings were associated with non-thermal exposures comparable to normal cell phone radiation exposure [216–222]. There are scattered reports of increased permeability across other membranes and barriers, such as the blood–testicle barrier in mice (Wang, 2008; Wang et al., 2010 and the rat liver canalicular membrane [223]). A 1992 study by Kues et al. reported that “*studies in our laboratory have established that pulsed microwaves at 2.45 GHz and 10 mW/cm² are associated with production of corneal endothelial lesions and with disruption of the blood–aqueous barrier in the non-human primate eye*” [224]. A recent study showing impact of high-frequency electromagnetic fields on trophoblastic connexins [209] may indicate the vulnerability of the placenta and placental barrier function to electromagnetic fields. A thorough review and methodological discussion of literature regarding EMF/RFR impacts on the BBB is provided by Salford in Section 10 of the BioInitiative 2012 Report [214].

BBB integrity can be compromised by oxidative stress which can lead to increased permeability [225], and the resultant extravasation of albumin into brain parenchyma can be excitotoxic and neurotoxic [226,227]. The interaction of these factors may contribute to a feed-forward vicious cycle that can result in progressive synaptic and neuronal dysfunction as seen in various neurodegenerative diseases [228].

The evidence suggesting possible existence of barrier function compromise in people with ASCs is largely indirect. The existence of brain neuroinflammation in ASCs has been documented in a growing number of studies [160,229,230], and this is known to be associated with BBB permeability [231–233]. In a review of clinical MRI findings in ASCs 19/59 showed white matter signal abnormalities [234], which in other settings have been associated with cerebral hypoperfusion, though not necessarily in the same locations as the hyperintensities [235,236]. Blood flow abnormalities, predominantly hypoperfusion, documented in a few dozen PET and SPECT studies, could also be caused by and/or associated with physiological phenomena associated with vascular permeability as will be revisited below. Increased intestinal permeability has been documented (although its absence has also been documented) [237–243] and discussed in the context of food exposures, particularly gluten [244–250]. The reactivity to large numbers of different foods, clinically observed in many children with autism, has been framed by

some as a manifestation of indiscriminate exposure of the immune system and the brain to food proteins on account of intestinal permeability as well as BBB permeability [251]. This reactivity could in turn feed in to aberrant immune responsiveness which in turn could further amplify barrier vulnerability [248].

A number of studies have made an association between an increased risk of having a child with autism and maternal infection during pregnancy. This phenomenon looks like it is a result of the maternal immune system response rather than being due to an impact deriving from a specific infectious agent; but the potential for an accompanying compromise of the placental barrier is also conceivable in this setting. Under these circumstances the fetal risk of exposure to maternal blood toxins, cytokines and stress proteins in utero could potentially be increased if placenta barrier (BPB) function were impaired. The integrity, or compromise thereto, of the maternal-fetal interface via the placenta is an important modulator of brain development [252].

3.1.4. Genetic alterations and reproductive impacts

The overwhelming emphasis in recent decades in autism research has been on genetics, and on finding linkages between genes, brain and behavior, in part because of the high heritability of autism that was calculated from the concordance rates of monozygotic (identical) vs. dizygotic (fraternal) twins found in by a series of small twin studies performed some decades ago. In recent years the genetic premises of this seemingly obvious framing of autism as overwhelmingly genetic have been undermined at several levels [253]. First, the number of reported cases is increasing, making it more difficult to maintain that ASCs are purely genetic because these increases can only be partly explained away by greater awareness or other data artifacts [254,255]. Second, the complexity of the ways we understand how genes might relate to autism has grown, from an expectation a decade ago that a small number of genes (even less than a dozen) would explain everything to an identification of close to a thousand genes associated with autism with common threads linking only a small subset [256,257], as well as ‘de novo’ mutations present in ASC children but not their parents and even ‘boutique’ mutations not shared beyond an individual family. Moreover, a recent twin study that was much larger than any of the prior such studies identified a modest genetic role but a substantial environmental role [258]. Indeed even concordance between identical twins appears to be influenced by whether the twins shared a placenta [259]. All of this calls into question the idea that genetics can be presumed to be the ‘cause’ of autism simply based upon heritability calculations, and upgrades the importance of looking not only at the environment and environmentally vulnerable physiology, but also at acquired mutations.

3.1.4.1. Genotoxicity. Genotoxicity has been proposed as a mechanism for the generation of ‘de novo’ mutations (found in children but not their parents) being found in

ASCs [260]. Reviews and published scientific papers on genotoxicity and EMF report that both ELF-EMF and RFR exposures are genotoxic – i.e., damaging to DNA – under certain conditions of exposure, including under conditions of intermittent and/or chronic ELF and RFR exposure that are of low-intensity and below current world safety standards [104,105,261–266]. Types of genetic damage reported have included DNA fragmentation and single- and double-strand DNA breaks, micronucleation and chromosome aberrations, all of which indicate genetic instability [102,103].

Researchers have recently identified large numbers of de novo mutations, more likely to be transmitted by fathers than by mothers to their children [267–269]. This is consistent with the EMF/RFR literature that repeatedly documents DNA damage to sperm from cell phone radiation (see Section 3.1.4.1.2). The Eichler team at the University of Washington found that 39% of the 126 most severe or disruptive mutations map to a network associated with chromatin remodeling that has already been ranked as significant amongst autism candidate genes [268]. Although the relationship between the prominence of chromatin-related gene mutations and the impacts of EMF/RFR on chromatin condensation has not been clarified, the parallels support further investigation.

3.1.4.1.1. Contributors to genotoxicity.

• Oxidative stress and free radical damage to DNA

Oxidative stress and excessive free radical production are very well known to be potentially genotoxic. They can be a consequence of myriad environmental factors, including but by no means limited to EMF/RFR. The DNA damage that can result could very well be one cause of ‘de novo’ mutations which to date have been found in only a small percentage of individuals with ASCs. Although there is not a consensus at this time about the rates or causes of de novo mutations in ASCs, environmentally triggered oxidative stress and free radical damage that we know are present in large numbers of people with ASCs can be genotoxic, and this warrants a serious investigation of the potential contribution of EMF and RFR to de novo mutations in ASC. Further, the huge increases in exposure to EMF/RFR in daily life due to electrification and the global saturation of RFR from wireless technologies [81] reinforce this need.

• Challenge to DNA repair mechanisms

When the rate of damage to DNA exceeds the rate at which DNA can be repaired, there is the possibility of retaining mutations and initiating pathology. Failure to trigger DNA damage repair mechanisms, or incomplete or failed repair, may be a consequence of a variety of commonplace stressors, including EMF/RFR exposure. A decrease in DNA repair efficiency has been reported to result from exposure to low-intensity RFR in human stem cells, and other cells. Mobile phone frequency GSM exposure at the frequency of 915 MHz consistently inhibited DNA repair foci in lymphocytes [270–272]. Belyaev, Markova and colleagues (2005), and Markova et al. (2009)

reported that very low-intensity microwave radiation from mobile phones inhibits DNA repair processes in human stem cells. A significant reduction in 53BP1 (tumor suppressor p53 binding protein 1) foci was found in cells exposed to microwave radiofrequency radiation within one hour of exposure. Fibroblast cells were impacted in this fashion but adapted over time, whereas stem cells were similarly affected (inhibited 53BP1 foci) but did not adapt to microwave radiation during chronic exposure [270,271]. Additional challenges to DNA repair mechanisms include not only toxicants and other damaging inputs but also nutritional insufficiencies of substances important to the proper functioning of DNA repair mechanisms, including Vitamin D, essential fatty acids, and minerals such as selenium and molybdenum [273]. The high possibility that various such contributors may combine supports an 'allostatic load' model of environmental injury and genotoxicity.

• Chromatin condensation

The work of Markova, Belyaev and others has repeatedly shown that RFR exposure can cause chromatin condensation, which is a hallmark of DNA damage. Belyaev (1997) reported that super-low intensity RFR resulted in changes in genes, and chromatin condensation of DNA at intensities comparable to exposures from cell towers (typically at RFR levels of 0.1 to one microwatt per centimeter squared ($\mu\text{W}/\text{cm}^2$)) [274]. Significant microwave (MW)-induced changes in chromatin conformation were observed when rat thymocytes were analyzed between 30–60 min after exposure to MW [275].

In recent studies, human lymphocytes from peripheral blood of healthy and hypersensitive to EMF persons were exposed to non-thermal microwave radiation (NT MW) from the GSM mobile phones [270,271]. NT MW induced changes in chromatin conformation similar to those induced by heat shock, which remained up to 24 h after exposure. The same group has reported that contrary to human fibroblast cells, which were able to adapt during chronic exposure to GSM/UMTS low intensity RFR exposure, human stem cells did not adapt [272].

3.1.4.1.2. Gonadal and germline impacts. De novo mutations have been shown to be more of a problem related to paternal age [268,276–279], and this may be related to the impact of environmental factors such as EMF/RFR on the stem cell genome, particularly in sperm which have no DNA repair capacity. Vulnerability of testes and ova, and of sperm and egg cells, relates to the tissue milieu in which damage to the germline can take place, as well as on the greater vulnerability of stem cells. Several international laboratories have replicated studies showing adverse effects on sperm quality, motility and pathology in men who use and particularly those who wear a cell phone, PDA or pager on their belt or in a pocket [106,280–284]. Other studies conclude that usage of cell phones, exposure to cell phone radiation, or storage of a mobile phone close to the testes of human males affect sperm counts, motility, viability and structure [175,284,285].

Animal studies have demonstrated oxidative and DNA damage, pathological changes in the testes of animals, decreased sperm mobility and viability, and other measures of deleterious damage to the male germ line [134,286–290]. Of note, altered fatty acids consistent with oxidative stress have been found in sperm cells in male infertility [291,292].

There are fewer animal studies that have studied effects of cell phone radiation on female fertility parameters. Panagopoulous et al. (2012) report decreased ovarian development and size of ovaries, and premature cell death of ovarian follicles and nurse cells in *Drosophila melanogaster* [293]. Gul et al. (2009) report rats exposed to stand-by level RFR (phones on but not transmitting calls) caused decrease in the number of ovarian follicles in pups born to these exposed dams [294]. Magras and Xenos (1997) reported irreversible infertility in mice after five (5) generations of exposure to RFR at cell phone tower exposure levels of less than $1.0 \mu\text{W}/\text{cm}^2$ [295].

3.1.4.1.3. Implications of genotoxicity. The issue of genotoxicity puts the contribution of genetic variation into a different light – as something that needs to be accounted for, not necessarily assumed as the starting point. In this regard it has been speculated that the apparent higher rates of autism in Silicon Valley, discussed in the past as related to 'geek genes' [296], might be conditioned by higher levels of exposure to EMF/RFR. The relationship between the greater vulnerability of male sperm than of female eggs to adverse effects of EMF/RFR exposure and the marked (4:1) predominance of paternal origin of de novo point mutations (4:1 bias), also deserves further careful attention [268].

3.1.5. Implications of damage

We have reviewed parallels between ASC and EMF/RFR in molecular, cellular and tissue damage, including cellular stress (oxidative stress, the heat shock response and protein misfolding), injury of membranes, aberrant calcium signaling, and compromise of cell junctions and barriers. The genotoxicity of EMF/RFR was reviewed in relation to issues of environmental contributions to autism and of the phenomenon of de novo mutations. The compromise of the tissue substrate appears to have many commonalities in ASCs and in EMF/RFR exposures. Also notable was the possibility of attenuating some of the damage through increasing antioxidant status.

Regarding Rett syndrome, a genetic syndrome often associated with autistic behaviors, these commonalities come to mind in considering the implications of a recent study documenting arrest of symptomatology in a mouse model of Rett syndrome through a bone marrow transplant of wild-type microglia [297,298]. The introduction of these competent microglia cells did not directly target the neuronal defect associated with the MECP2 gene mutation; instead the benefits of the transplant were due to overcoming the inhibition of phagocytosis caused by the MECP2 mutation that was absent in the wild-type microglia. Phagocytosis involves removing debris. This suggests that while research has focused on how

specific molecular defects, particularly in the synapse, may contribute to Rett pathophysiology, there may also be an important contribution from cellular debris, misfolded proteins and other disordered cellular structure and function. Such disorder could be accumulating in cells under the conditions of pathophysiological disarray reviewed above. Based on this study as well as on the levels of damage just reviewed, cellular problems that are pertinent to ASCs most likely go beyond any specific defect introduced by a mutation. Additionally it is conceivable that many of the mutations may be not part of normal background variation but instead collateral damage from the same environmental factors that are also driving the damage to the physiology.

3.1.6. Summary of Part I and preview of Part II

The data reviewed above in Part I of this two part paper documents a series of parallels between the pathophysiological and genotoxic impacts of EMF/RFR and the pathophysiological underpinnings of ASCs. DNA damage, immune and blood–brain barrier disruption, cellular and oxidative stress, calcium channel, disturbed circadian rhythms, hormone dysregulation, and degraded cognition, sleep, autonomic regulation and brainwave activity all have commonalities between ASCs and EMF/RFR, and the disruption of disruption fertility and reproduction associated with EMF/RFR may also be related to the increasing incidence of ASCs. All of this argues for reduction of exposures now, and better coordinated research in these areas.

These pathophysiological parallels are laid out after identifying the dynamic features of ASCs that could plausibly arise out of such pathophysiological dysregulation. The importance of transduction between levels was also discussed in Part I, and will be elucidated in much more detail in Part II where more detail will be given about the possible interfaces between the cellular and molecular pathophysiology reviewed above and the higher-level disruption of physiological systems, brain tissue and nervous system electrophysiology.

The emergence of ever larger amounts of data is transforming our understanding of ASCs from static encephalopathies based on genetically caused brain damage to dynamic encephalopathies where challenging behaviors emanate from physiologically disrupted systems. In parallel, the emergence of ever larger bodies of evidence supporting a large array of non-thermal but profound pathophysiological impacts of EMF/RFR is transforming our understanding of the nature of EMF/RFR impacts on the organism.

At present our policies toward ASCs are based on outdated assumptions about autism being a genetic, behavioral condition, whereas our medical, educational and public health policies related to treatment and prevention could be much more effective if we took whole-body, gene-environment considerations into account, because there are many lifestyle and environmental modifications that could reduce morbidity and probably incidence of ASCs as well.

At present our EMF/RFR standards are based on outdated purely thermal considerations, whereas the evidence is now overwhelming that limiting regulations in this way does not address the much broader array of risks and harm now known to be created by EMF/RFR.

In particular, the now well-documented genotoxic impacts of EMF/RFR, placed in parallel with the huge rise in reported cases of ASCs as well as with the de novo mutations associated with some cases of ASCs (as well as other conditions), make it urgent for us to place the issue of acquired as well as inherited genetic damage on the front burner for scientific investigation and policy remediation.

With the rising numbers people with ASCs and other childhood health and developmental disorders, and with the challenges to our prior assumptions posed ever more strongly by emerging evidence, we need to look for and act upon risk factors that are largely avoidable or preventable. We would argue that the evidence is sufficient to warrant new public exposure standards benchmarked to low-intensity (non-thermal) exposure levels causing biological disruption and strong, interim precautionary practices are advocated. Further evidence to support the pathophysiological support for parallels between ASCs and EMF/RFR impacts and for taking action will be offered in Part II.

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Exhibit 2

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Autism and EMF? Plausibility of a pathophysiological link part II

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Abstract

Autism spectrum conditions (ASCs) are defined behaviorally, but they also involve multileveled disturbances of underlying biology that find striking parallels in the physiological impacts of electromagnetic frequency and radiofrequency radiation exposures (EMF/RFR). Part I (Vol 776) of this paper reviewed the critical contributions pathophysiology may make to the etiology, pathogenesis and ongoing generation of behaviors currently defined as being core features of ASCs. We reviewed pathophysiological damage to core cellular processes that are associated both with ASCs and with biological effects of EMF/RFR exposures that contribute to chronically disrupted homeostasis. Many studies of people with ASCs have identified oxidative stress and evidence of free radical damage, cellular stress proteins, and deficiencies of antioxidants such as glutathione. Elevated intracellular calcium in ASCs may be due to genetics or may be downstream of inflammation or environmental exposures. Cell membrane lipids may be peroxidized, mitochondria may be dysfunctional, and various kinds of immune system disturbances are common. Brain oxidative stress and inflammation as well as measures consistent with blood–brain barrier and brain perfusion compromise have been documented. Part II of this paper documents how behaviors in ASCs may emerge from alterations of electrophysiological oscillatory synchronization, how EMF/RFR could contribute to these by de-tuning the organism, and policy implications of these vulnerabilities. It details evidence for mitochondrial dysfunction, immune system dysregulation, neuroinflammation and brain blood flow alterations, altered electrophysiology, disruption of electromagnetic signaling, synchrony, and sensory processing, de-tuning of the brain and organism, with autistic behaviors as emergent properties emanating from this pathophysiology. Changes in brain and autonomic nervous system electrophysiological function and sensory processing predominate, seizures are common, and sleep disruption is close to universal. All of these phenomena also occur with EMF/RFR exposure that can add to system overload ('allostatic load') in ASCs by increasing risk, and can worsen challenging biological problems and symptoms; conversely, reducing exposure might ameliorate symptoms of ASCs by reducing obstruction of physiological repair. Various vital but vulnerable mechanisms such as calcium channels may be disrupted by environmental agents, various genes associated with autism or the interaction of both. With dramatic increases in reported ASCs that are coincident in time with the deployment of wireless technologies, we need aggressive investigation of potential ASC–EMF/RFR links. The evidence is sufficient to warrant new public exposure standards benchmarked to low-intensity (non-thermal) exposure levels now known to be biologically disruptive, and strong, interim precautionary practices are advocated.

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Keywords: Autism; EMF/RFR; Cellular stress; Oxidative stress; Mitochondrial dysfunction; Oscillatory synchronization; Environment; Radiofrequency; Wireless; Children; Fetus; Microwave

1. Recap of part I and summary of part II

Part I of this two-part article previously documented a series of parallels between the pathophysiological and genotoxic impacts of EMF/RFR and the pathophysiological, genetic and environmental underpinnings of ASCs. DNA

damage, immune and blood–brain barrier disruption, cellular and oxidative stress, calcium channel dysfunction, disturbed circadian rhythms, hormone dysregulation, and degraded cognition, sleep, autonomic regulation and brainwave activity—all are associated with both ASCs and EMF/RFR; and the disruption of fertility and reproduction associated with EMF/RFR may also be related to the increasing incidence of ASCs. All of this argues for reduction of exposures now, and better coordinated research in these areas. These

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pathophysiological parallels are laid out after identifying the dynamic features of ASCs that could plausibly arise out of such pathophysiological dysregulation. The importance of transduction between levels was also discussed in Part I.

Part II elucidates in much more detail the possible interfaces between the cellular and molecular pathophysiology reviewed above and the higher-level disruption of physiological systems, brain tissue and nervous system electrophysiology. It addresses mitochondrial dysfunction, immune system dysregulation, neuroinflammation and brain blood flow alterations, altered electrophysiology, disruption of electromagnetic signaling, synchrony, and sensory processing, de-tuning of the brain and organism, and behavior as an emergent property. The emergence of ever larger amounts of data is transforming our understanding of ASCs from static encephalopathies based on genetically caused brain damage to dynamic encephalopathies where challenging behaviors emanate from physiologically disrupted systems. In parallel, the emergence of ever larger bodies of evidence supporting a large array of non-thermal but profound pathophysiological impacts of EMF/RFR is transforming our understanding of the nature of EMF/RFR impacts on the organism. At present our policies toward ASCs are based on outdated assumptions about autism being a genetic, behavioral condition, whereas our medical, educational and public health policies related to treatment and prevention could be much more effective if we took whole-body, gene-environment considerations into account, because there are many lifestyle and environmental modifications that could reduce morbidity and probably incidence of ASCs as well. Our EMF/RFR standards are also based on an outdated assumption that it is only heating (thermal injury) which can do harm. These thermal safety limits do not address low-intensity (non-thermal) effects. The evidence is now overwhelming that limiting exposures to those causing thermal injury alone does not address the much broader array of risks and harm now clearly evident with chronic exposure to low-intensity (non-thermal) EMF/RFR. In particular, the now well-documented genotoxic impacts of EMF/RFR, placed in parallel with the huge rise in reported cases of ASCs as well as with the de novo mutations associated with some cases of ASCs (as well as other conditions), make it urgent for us to place the issue of acquired as well as inherited genetic damage on the front burner for scientific investigation and policy remediation. With the rising numbers people with ASCs and other childhood health and developmental disorders, and with the challenges to our prior assumptions posed ever more strongly by emerging evidence, we need to look for and act upon risk factors that are largely avoidable or preventable. We argue that the evidence is sufficient to warrant new public exposure standards benchmarked to low-intensity (non-thermal) exposure levels causing biological disruption and strong, interim precautionary practices are advocated. The combined evidence in Parts I and II of this article provide substantial pathophysiological support for parallels between ASCs and EMF/RFR health impacts.

2. Parallels in pathophysiology

2.1. Degradation of the integrity of functional systems

EMF/RFR exposures can yield both psychological and physiological stress leading to chronically interrupted homeostasis. In the setting of molecular, cellular and tissue damage, one would predict that the organization and efficiency of a variety of organelles, organs and functional systems would also be degraded. In this section we will review disturbances from EMF/RFR in systems (including include oxidative and bioenergetics metabolism, immune function and electrophysiological oscillations) that include molecular and cellular components subject to the kinds of damage discussed in the previous section. We will review disturbances that have been associated with EMF/RFR, and consider the parallel disturbances that have been documented in ASCs.

2.1.1. Mitochondrial dysfunction

Mitochondria are broadly vulnerable, in part because the integrity of their membranes is vital to their optimal functioning—including channels and electrical gradients, and their membranes can be damaged by free radicals which can be generated in myriad ways. Moreover, just about every step in their metabolic pathways can be targeted by environmental agents, including toxicants and drugs, as well as mutations [1]. This supports a cumulative ‘allostatic load’ model for conditions in which mitochondrial dysfunction is an issue, which includes ASCs as well as myriad other chronic conditions.

Mitochondria are commonly discussed in terms of the biochemical pathways and cascades of events by which they metabolize glucose and generate energy. But in parallel with this level of function there also appears to be a dimension of electromagnetic radiation that is part of the activity of these organelles. For example, electromagnetic radiation can be propagated through the mitochondrial reticulum, which along with the mitochondria has a higher refractive index than the surrounding cell and can serve to propagate electromagnetic radiation within the network [2]. It is also the case that “*The physiological domain is characterized by small-amplitude oscillations in mitochondrial membrane potential ($\Delta\psi(m)$) showing correlated behavior over a wide range of frequencies. ... Under metabolic stress, when the balance between ROS [reactive oxygen species, or free radicals] generation and ROS scavenging [as by antioxidants] is perturbed, the mitochondrial network throughout the cell locks to one main low-frequency, high-amplitude oscillatory mode. This behavior has major pathological implications because the energy dissipation and cellular redox changes that occur during $\Delta\psi(m)$ depolarization result in suppression of electrical excitability and Ca^{2+} handling. . .*” [3].

These electromagnetic aspects of mitochondrial physiology and pathophysiology could very well be impacted by EMF/RFR.

Other types of mitochondrial damage have been documented in at least some of the studies that have examined the impacts of EMF/RFR upon mitochondria. These include reduced or absent mitochondrial cristae [4–6], mitochondrial DNA damage [7], swelling and crystallization [5], alterations and decreases in various lipids suggesting an increase in their use in cellular energetics [8], damage to mitochondrial DNA [7], and altered mobility and lipid peroxidation after exposures [9]. Also noted has been enhancement of brain mitochondrial function in Alzheimer's transgenic mice and normal mice [10]. The existent of positive as well as negative effects gives an indication of the high context dependence of exposure impacts, including physical factors such as frequency, duration, and tissue characteristics [11].

By now there is a large amount of evidence for biochemical and other abnormalities in a large portion of children with autism that are consistent with mitochondrial dysfunction [12–14]. Recently published postmortem brain tissue studies that have added a new dimension of evidence for mitochondrial abnormalities in ASCs will be reviewed in the section on alteration of brain cells below.

Secondary mitochondrial dysfunction (i.e. environmentally triggered rather than rooted directly in genetic mutations) [15–18] could result among other things from the already discussed potential for EMF/RFR to damage channels, membranes and mitochondria themselves as well as from toxicant exposures and immune challenges. In a meta-analysis of studies of children with ASC and mitochondrial disorder, the spectrum of severity varied, and 79% of the cases were identified by laboratory findings without associated genetic abnormalities [16].

2.1.2. Melatonin dysregulation

2.1.2.1. Melatonin, mitochondria, glutathione, oxidative stress. Melatonin is well-known for its role in regulation of circadian rhythms, but it also plays important metabolic and regulatory roles in relation to cellular protection, mitochondrial malfunction and glutathione synthesis [19–21]. It also helps prevent the breakdown of the mitochondrial membrane potential, decrease electron leakage, and thereby reduce the formation of superoxide anions [22]. Pharmacological doses of melatonin not only scavenge reactive oxygen and nitrogen species, but enhance levels of glutathione and the expression and activities of some glutathione-related enzymes [21,23].

2.1.2.2. Melatonin can attenuate or prevent some EMF/RFR effects. Melatonin may have a protective effect in the setting of some EMF/RFR exposures, apparently in relation to these functions just described. EMF/RFR can impact melatonin; one example is exposure to 900 MHz microwave radiation promoted oxidation, which reduced levels of melatonin and increased creatine kinase and caspase-3 in exposed as compared to sham exposed rats [24].

Melatonin can attenuate or prevent oxidative damage from EMF/RFR exposure. In an experiment exposing rats to microwave radiation (MW) from a GSM-900 mobile

phone with and without melatonin treatment to study renal impacts [25], the untreated exposed rats showed increases of lipid peroxidation markers as reduction of the activities of superoxide dismutase, catalase and glutathione peroxidase indicating decrement in antioxidant status. However these negative effects were inhibited in the exposed rats treated with melatonin. Melatonin also inhibited the emergence of preneoplastic liver lesions in rats exposed to EMFs [26]. The development of DNA strand breaks was observed in RFR exposed rats; this DNA damage was blocked by melatonin [27]. Exposure of cultured cortical neurons to EMF led to an increase in 8-hydroxyguanine in neuronal mitochondria, a common biomarker of DNA oxidative damage, along with a reduction in the copy number of mitochondrial DNA and the levels of mitochondrial RNA transcripts; but these effects could all be prevented by pretreatment with melatonin [7]. In a study of skin lesion induced by exposure to cell phone radiation, the skin changes in the irradiated group (which included thicker stratum corneum, epidermal atrophy, papillomatosis, basal cell proliferation, increased epidermal granular cell layer and capillary proliferation, impaired collagen tissue distribution and separation of collagen bundles in dermis) were prevented (except for hypergranulosis) by melatonin treatment [28]. Melatonin as well as caffeic acid phenylethyl ester (an antioxidant) both protected against retinal oxidative stress in rates exposed long-term to mobile phone irradiation [29]. Nitric oxide (NO) was increased in nasal and sinus mucosa in rats after EMF exposure, with this NO possibly acting as a defense mechanism suggesting tissue damage; but this was prevented by pretreatment with melatonin [30]. Melatonin treatment significantly prevented the increase in the MDA (malondyaldehyde, a marker of lipid peroxidation) content and XO (xanthine oxidase) activity in rat brain tissue after 40 days of exposure, but it was unable to prevent the decrease of CAT activity and increase of carbonyl group contents [31].

Of note, the melatonin production of infants in isolettes in neonatal intensive care units appears to be impacted by the high ELF-EMF environment, in that when infants were removed from those exposures they showed an increase in melatonin levels [32]. There is an increased prevalence of ASCs in children who were born prematurely [33–43]. There are many potential prematurity-associated factors that could contribute to increased risk for ASCs, but proper melatonin regulation warrants EMF/RFR controls in the newborns' environment.

2.1.2.3. Melatonin and autism. Regarding melatonin status in people with ASCs, a recent meta-analysis summarized the current findings as indicating that “(1) Physiological levels of melatonin and/or melatonin derivatives are commonly below average in ASC and correlate with autistic behavior; (2) Abnormalities in melatonin-related genes may be a cause of low melatonin levels in ASD, and (3) . . . treatment with melatonin significantly improves sleep duration and sleep onset latency in ASD.” [44].

The meta-analysis also showed that polymorphisms in melatonin-related genes in ASC could contribute to lower melatonin concentrations or an altered response to melatonin, but only in a small percentage of individuals, since pertinent genes were found in only a small minority of those screened.

Based on the common presence of both sleep disorders and low melatonin levels, Bourgeron [45] proposed that synaptic and clock genes are important in ASCs, and that future studies should investigate the circadian modulation of synaptic function [45]. A number of melatonin-related genetic variants have been identified as associated with ASCs. Polymorphisms and deletions in the ASMT gene, which encodes the last enzyme of melatonin synthesis, have been found [46–48], and variations have been found as well for melatonin receptor genes [46,47,49]. CYP1A2 polymorphisms have been found in slow melatonin metabolisers, in whom melatonin levels are aberrant and initial response to melatonin for sleep disappeared in a few weeks [50].

2.1.2.4. Autism AND melatonin AND glutathione. Whereas PubMed searches for “autism AND melatonin” and “autism AND glutathione” each coincidentally yielded 72 citations, and “melatonin AND glutathione” yielded 803 citations, the search for “autism AND melatonin AND glutathione” yielded zero citations. This is interesting given the strong connection of melatonin and glutathione metabolically, as discussed above, alongside of the strongly established interest in both glutathione and melatonin in ASC research and increasingly in clinical practice. Hopefully one contribution of an investigation of EMF/RFR links to ASCs will be to help bring attention to this relationship, which may help identify potential environmental and physiological causes for low melatonin in those without pertinent mutations. Of pertinence, tryptophan hydroxylase (TPH2) – the rate limiting enzyme in the synthesis of serotonin, from which melatonin is derived – is extremely vulnerable to oxidation, and tends to misfold when its cysteine residues are oxidized, with the enzyme being converted to a redox-cycling quinoprotein [51–54].

2.1.3. Disturbed immune function

There is by now a broad appreciation of the presence of immune disturbances in ASCs, to the point where there is an emerging discussion of ASCs as neuroimmune disorders [55,56]. Research identifying immune features in ASCs spans from genetics where risk genes have been identified to epigenetics where altered expression of immune genes is being reported as prominent in ASC epigenetics [57–59], and also includes prenatal infectious and immune disturbances as risk factors for autism as well as other neurodevelopmental and neuropsychiatric diseases as well as other conditions such as asthma [60–62]. Immune disturbances in infants and children with ASC are heterogeneous, with some but not all manifesting autoimmunity [63,64]. Anecdotally, recurrent infection is common while on the other hand some get sick less often than their peers. It is common for people with autism to

have family members with immune or autoimmune diseases [65]. The immune system is turning out to have an important role in brain development [66–68]. As mentioned, glial activation associated with brain immune response has been identified in a growing number of studies. Whether or not EMF/RFR contributes to these features of ASCs causally, based on the evidence below regarding immune impacts of EMF/RFR exposure [69], it is certainly plausible that such exposures could serve as aggravating factors.

2.1.3.1. Low-intensity exposures. The body's immune defense system is now known to respond to very low-intensity exposures [70]. Chronic exposure to factors that increase allergic and inflammatory responses on a continuing basis is likely to be harmful to health, since the resultant chronic inflammatory responses can lead to cellular, tissue and organ damage over time. Many chronic diseases are related to chronic immune system dysfunction. Disturbance of the immune system by very low-intensity electromagnetic field exposure is discussed as a potential underlying cause for cellular damage and impaired healing (tissue repair), which could lead to disease and physiological impairment [71,72]. Both human and animal studies report that exposures to EMF and RFR at environmental levels associated with new technologies can be associated with large immunohistological changes in mast cells as well as other measures of immune dysfunction and dysregulation. Mast cells not only can degranulate and release irritating chemicals leading to allergic symptoms; they are also widely distributed in the body, including in the brain and the heart, which might relate to some of the symptoms commonly reported in relation to EMF/RFR exposure (such as headache, painful light sensitivity, and cardiac rhythm and palpitation problems).

2.1.3.2. Consequences of immune challenges during pregnancy. As mentioned, infection in pregnancy can also increase the risk of autism and other neurodevelopmental and neuropsychiatric disorders via maternal immune activation (MIA). Viral, bacterial and parasitic infections during pregnancy are thought to contribute to at least 30% of cases of schizophrenia [73]. The connection of maternal infection to autism is supported epidemiologically, including in a Kaiser study where risk was associated with psoriasis and with asthma and allergy in the second trimester [65], and in a large study of autism cases in the Danish Medical registry [74] with infection at any point in pregnancy yielding an adjusted hazard ratio of 1.14 (CI: 0.96 – 1.34) and when infection occurred during second trimester the odds ratio was 2.98 (CI: 1.29 – 7.15). In animal models, while there is much variation in study design, mediators of the immune impact include oxidative stress, interleukin-6 and increased placental cytokines [61,68,75]. Garbett et al. [76] commented on several mouse models of the effects of MIA on the fetal brain that “The overall gene expression changes suggest that the response to MIA is a neuroprotective attempt by the

developing brain to counteract environmental stress, but at a cost of disrupting typical neuronal differentiation and axonal growth.” [76]. Maternal fetal brain-reactive autoantibodies have also been identified in some cases [62,77–82].

Although we have evidence of immune impacts of EMF/RFR, the impact of repeated or chronic exposure to EMF and RFR during pregnancy is poorly studied; could this trigger similar immune responses (cytokine production) and stress protein responses, which in turn would have effects on the fetus? Although this has been poorly studied, we do have data that very low cell phone radiation exposures during both human and mouse pregnancies have resulted in altered fetal brain development leading to memory, learning, and attention problems and behavioral problems [83].

2.1.3.3. Potential immune contributions to reactivity and variability in ASCs. Immune changes in ASCs appear to be associated with behavioral change [84–88], but the mechanisms are complex and to date poorly understood [89] and likely will need to be elucidated through systems biology methods that capture multisystem influences on the interactions across behavior, brain and immune regulation [90], including electrophysiology.

Two of the particularly difficult parts of ASCs are the intense reactivity and the variability in assorted symptoms such as tantrums and other difficult behaviors. Children with ASCs who also have gastrointestinal symptoms and marked fluctuation of behavioral symptoms have been shown to exhibit distinct innate immune abnormalities and transcriptional profiles of peripheral blood monocytes [91]. It is worth considering EMF/RFR exposures could be operating through related mechanisms so as to add to ‘allostatic loading’ in ways that exacerbate behavior. In Johansson 2006 and 2007 a foundation is provided for understanding how chronic EMF/RFR exposure can compromise immune function and sensitize a person to even small exposures in the future [72,92]. Johansson discusses alterations of immune function at environmental levels resulting in loss of memory and concentration, skin redness and inflammation, eczema, headache, and fatigue. Mast cells that degranulate under EMF and RFR exposures and substances secreted by them (histamine, heparin and serotonin) may contribute to features of this sensitivity to electromagnetic fields [92]. Theoharides and colleagues have argued that environmental and stress related triggers might activate mast cells, causing inflammatory compromise and leading to gut–blood–brain barrier compromise, seizures and other ASC symptoms [93,94], and that this cascade of immune response and its consequences might also be triggered in the absence of infection by mitochondrial fragments that can be released from cells in response to stimulation by IgE/anti-IgE or by the proinflammatory peptide substance P [95].

Seitz et al. [96] reviewed an extensive literature on electromagnetic hypersensitivity conditions reported to include sleep quality, dizziness, headache, skin rashes, memory and concentration impairments related to EMF and RFR [96].

Some of these symptoms are common in ASCs, whether or not they are due to EMF/RFR exposure, and the experience of discomfort may be hard to document due to difficulties with self-reporting in many people with ASCs.

Johansson [72] also reports that benchmark indicators of immune system allergic and inflammatory reactions occur under exposure conditions of low-intensity non-ionizing radiation (immune cell alterations, mast cell degranulation histamine-positive mast cells in biopsies and immunoreactive dendritic immune cells) [71,72]. In facial skin samples of electro-hypersensitive persons, the most common finding is a profound increase in mast cells as monitored by various mast cell markers, such as histamine, chymase and tryptase [97]. In ASCs, infant and childhood rashes, eczema and psoriasis are common, and they are common in family members as well [98].

2.1.4. Alteration of and damage to cells in the brain

Brain cells have a variety of ways of reacting to environmental stressors, such as shape changes, metabolic alterations, upregulation or downregulation of neurotransmitters and receptors, other altered functionality, structural damage, production of un-metabolizable misfolded proteins and other cellular debris, and apoptosis; these range along a spectrum from adaptation to damage and cell death. These types of alterations can be looked at in animals under controlled conditions, but in human beings direct cellular examination can only be done on surgical biopsy tissue – which is hardly ever available in people with ASCs – or after death, at which point there has been a whole lifetime of exposures that are generally impossible to tease apart if there were even motivation to do so. This complicates the comparison of brain cell and tissue-related pathophysiology between what is seen in ASCs and what is associated with EMF/RFR exposures.

2.1.4.1. Brain cells. Impact of EMF/RFR on cells in the brain has been documented by some of the studies that have examined brain tissue after exposure, although the interpretation of inconsistencies across studies is complicated by sometimes major differences in impact attributable to differences in frequencies and duration of exposure, as well as to differences in resonance properties of tissues and other poorly understood constraints on cellular response. These studies and methodological considerations have been reviewed in depth in several sections of the 2012 BioInitiative Report [11,99]. A few examples of observations after exposure have included dark neurons (an indicator of neuronal damage), as well as alteration of neuronal firing rate [100], and upregulation of genes related to cell death pathways in both neurons and astrocytes [101]. Astrocytic changes included increased GFAP and increased glial reactivity [102–105], as well as astrocyte-pertinent protein expression changes detected by Fragopoulou et al. [322] as mentioned above. Also observed has been a marked protein downregulation of the nerve growth factor glial maturation factor beta (GMF) which is

considered as an intracellular signal transduction regulator in astrocytes, which could have significant impact on neuronal-glial interactions as well as brain cell differentiation and tumor development. Diminution of Purkinje cell number and density has also been observed, [106] including in two studies of the impacts of perinatal exposure [107,108]. Promotion of pro-inflammatory responses in EMF-stimulated microglial cells has also been documented [109].

Neuropathology findings in ASCs have been varied and have been interpreted according to various frameworks ranging from a regionalized approach oriented to identifying potential brain relationships to ASC's behavioral features [110] to identifying receptor, neurotransmitter and interneuron abnormalities that could account for an increased excitation/inhibition ratio [111–115]. Studies have documented a range of abnormalities in neurons, including altered cellular packing in the limbic system, reduced dendritic arborization, and reductions in limbic GABAergic systems [116]. Over the past decade a shift has occurred from presuming that all pertinent brain changes occurred prior to birth, to an acknowledgement that ongoing cellular processes appear to be occurring not only after birth but well into adulthood [117]. One of the reasons for this shift was the observation that head size (as well as brain weight and size) was on average larger in children with autism, and the head sizes of children who became diagnosed with autism increased in percentile after birth [118].

2.1.4.2. Neuroinflammation, glial activation and excitotoxicity. Although much attention has been paid in ASC brain literature to specific regions manifesting differences in size and activity in comparison to those without ASCs, there are other observations that are not strictly regional in nature, such as more widely distributed scaling differences (e.g. larger brains, wider brains, increased white matter volume, along with altered functional connectivity and coherence to be discussed below). Recently more studies have appeared identifying pathophysiological abnormalities such as neuroinflammation, mitochondrial dysfunction and glutathione depletion in brain tissue. Neuroinflammation was first identified in a study of postmortem samples from eleven individuals aged 5–44 who had died carrying an ASC diagnosis, in which activated astrocytes and microglial cells as well as abnormal cytokines and chemokines were found. Other research has identified further astrocyte abnormalities such as altered expression of astrocyte markers GFAP abnormalities, with elevation, antibodies, and altered signaling having been documented [119–121]. Increased microglia activation and density as well as increased myeloid dendritic cell frequencies have also been documented [87,122,123], as has abnormal microglial-neuronal interactions [124]. Recently, through use of the PET ligand PK11105, microglial activation was found to be significantly higher in multiple brain regions in young adults with ASCs [125]. Genes associated with glial activation have been documented as upregulated.

Garbett et al measured increased transcript levels of many immune genes, as well as changes in transcripts related to cell communication, differentiation, cell cycle regulation and chaperone systems [126]. Voineaugu and colleagues performed transcriptomic analysis of autistic brain and found a neuronal module of co-expressed genes which was enriched with genetically associated variants; an immune-glial module which showed no such enrichment for autism GWAS signals was interpreted as secondary [127], but this seems to involve circular thinking, since it implies that the primary cause must be genetic, which is an assumption deriving from a dominant model, but is not a proven fact.

Neuroinflammation also does not appear to be strictly localized in a function-specific fashion, and it may contribute both to more broadly distributed and more focal features for tissue-based reasons. It may be that brain regions with particular prominence in ASCs may have distinctive cellular characteristics—e.g. the amygdala [128–138], which may have a larger or more reactive population of astrocytes [139] or the basal ganglia which may have greater sensitivity to even subtle hypoxia or perfusion abnormalities. In this case it may be the histology of these areas that makes them vulnerable to environmental irritants, and this may contribute to how environmental factors such as EMF/RFR might trigger or aggravate some of ASC's features. More widely distributed brain tissue pathology be part of what leads to differences in ASCs in brain connectivity. However these types of tissue-function relationships have been poorly investigated. Belyaev has intensively reviewed physical considerations including the contribution of tissue differences to variability in measured EMF/RFR impacts [11].

Various signs of mitochondrial dysfunction and oxidative stress have also been identified in the brain. Findings include downregulation of expression of mitochondrial electron transport genes [140] or deficit of mitochondrial electron transport chain complexes [141], brain region specific glutathione redox imbalance [142], and evidence of oxidative damage and inflammation associated with low glutathione redox status [143]. Oxidative stress markers were measured as increased in cerebellum [144].

Additional support for the presence of tissue pathophysiology-based changes in brains of people with ASCs comes from the various studies documenting reduction in Purkinje cell numbers [117,145–150], possibly due to oxidative stress and an increased excitation/inhibition ratio that could potentially be acquired [150]. Also of note are changes in the glutamatergic and GABAergic systems, which when imbalanced can disturb the excitation/inhibition ratio and contribute to seizure disorders; reductions in GABA receptors as well as in GAD 65 and 67 proteins that catalyse the conversion of glutamate into GABA have been measured [151–153]. A consensus statement on the cerebellum in ASCs stated that, “*Points of consensus include presence of abnormal cerebellar anatomy, abnormal neurotransmitter systems, oxidative stress, cerebellar motor and cognitive deficits, and neuroinflammation in subjects with autism*” [150].

Some indirect corroboration for these findings has come from neuroimaging, where the initial hypothesis regarding the tissue basis of the larger size of brains in so many people with autism – that it was due to a higher density of neurons and more tightly packed axons – came under question with the emergence of contradictory findings, well reviewed a few years ago by Dager and colleagues [154]. These include reduced rather than increased density of NAA (*n*-acetylaspartate, a marker of neuronal integrity and density that is produced in the mitochondria), reduced rather than increased fractional anisotropy suggesting less tightly packed axonal bundles [155–161] and greater rather than lower diffusivity, all of which may be more consistent with lower density of tissue and tissue metabolites and more fluid, which could be consistent with neuroinflammation and/or oxidative stress. The early postnatal development of such lower fractional anisotropy and increased diffusivity was measured in the process of occurring recently, in the first large prospective longitudinal imaging study of infants, who trended from 6 months to 2 years in the direction of these findings becoming more pronounced—but still with substantial overlap with those infants who did not develop autism [160]. This trend was consistent with prior studies showing increase in head size after birth, and added some information about what was happening in the brain to drive this size increase, although due to its methods it could only indirectly address the possibility that emergence during the first few years of life of tissue pathophysiology disturbances such as neuroinflammation might be contributing to these trends [162].

There is also substantial variability across many different types of brain findings. Of interest is that a number of functional brain imaging and electrophysiology studies have identified greater heterogeneity in response to stimuli between individuals in the ASC group than individuals in the neurotypical control group [163,164]. This may make more sense from the point of view of non-linear response—i.e. a disproportionality between output and input (as well as state and context sensitivity), in a pathophysiologically perturbed brain system. Nonlinearity has also been a significant methodological issue in EMF/RFR research because linear methods of study design and data analysis have often been insensitive to effects, whereas nonlinear methods have been argued to show greater sensitivity [165–175].

It is important to entertain how environmental agents could contribute individually and synergistically to brain changes in ASCs, how different exposures may disturb physiology similarly or differently, and how these changes may develop over progress over time after the earliest periods in brain development. EMF/RFR exposures could be pre-conceptional, prenatal or postnatal—or all of the above; it is conceivable that this could be the case in ASCs as well.

2.1.4.3. Altered development. There is some evidence for altered brain and organism development in relation to EMF/RFR exposure. Aldad et al. [83] exposed mice in-utero

to cellular telephones, with resultant aberrant miniature excitatory postsynaptic currents, and dose-responsive impaired glutamatergic synaptic transmission onto layer V pyramidal neurons of the prefrontal cortex [83]. Lahijani exposed preincubated chicken embryos to 50 Hz EMFs, and made the following morphological observations: “*exencephalic embryos, embryos with asymmetrical faces, crossed beak, shorter upper beak, deformed hind limbs, gastroschisis, anophthalmia, and microphthalmia. H&E and reticulin stainings, TEMS, and SEMs studies indicated EMFs would create hepatocytes with fibrotic bands, severe steatohepatitis, vacuolizations, swollen and extremely electron-dense mitochondria, reduced invisible cristae, crystalized mitochondria with degenerated cristae, myelin-like figures, macrophages engulfing adjacent cells, dentated nuclei, nuclei with irregular envelopes, degenerated hepatocytes, abnormal lipid accumulations, lipid droplets pushing hepatocytes’ nuclei to the corner of the cells, abundant cellular infiltrations cellular infiltrations inside sinusoid and around central veins, disrupted reticulin plexus, and release of chromatin into cytosol, with partially regular water layers, and attributed cell damage to elevated free radical induced cell membrane disruptions*” [5].

Although it is of great interest to characterize the changes in development associated with ASCs, it is also difficult to do in human beings because at present diagnosis is not possible until at least 2–3 years after birth. By now there have been a lot of prospective studies of infants at high risk for autism, but the in vivo brain imaging and electrophysiology data from these studies is only starting to be published, and so the for now the main sources of information are still inference backwards from post-mortem or imaging data, and animal models, both of which have clear limitations. Thus it is impossible to seek precise parallels here between what we know about the development of ASCs compared with the impacts of EMF/RFR exposures.

Nevertheless it is of real concern that such exposures have elicited some of the brain tissue changes that have been documented in ASCs, both in early development and subsequently. Already noted above is the question of whether high exposures of neonates to monitoring equipment may affect the melatonin levels of neonates [32]; these exposures also impact heart rate variability [258]. There are no studies yet on infants exposed to baby surveillance monitors or DECT wireless phones. However there are good laboratory testing studies yielding actual measurements of these devices that conclude: “*Maximum incident field exposures at 1 m can significantly exceed those of base stations (typically 0.1–1 V/m). At very close distances the derived or reference exposure limits are violated for baby surveillance monitors and DECT phones. Further, the authors conclude that, based on very strictly controlled laboratory testing of everyday devices like baby monitors and some cordless phones (W)orse case peak spatial SAR values are close to the limit for the public or uncontrolled environments, e.g., IEEE 802.11b and Bluetooth Class I*” [176].

Even exposure of the fetus to laptop computer wireless emissions through the pregnant mother's use of this device on her lap may involve induction of strong intracorporeal electric current densities from the power supply possibly even more than the device itself [177].

2.1.4.4. Brain blood flow and metabolism. Cerebral perfusion and metabolism abnormalities have been identified in close to two dozen papers studying autistic cohorts. Cerebral perfusion refers to the quantity of blood flow in the brain. Abnormal regulation of cerebral perfusion is found in a range of severe medical conditions including tumors, vascular disease and epilepsy. Cerebral hypoperfusion has also been found in a range of psychiatric disorders [178]. Neurocognitive hypotheses and conclusions, as well as localization of perfusion changes, have been heterogeneous across these papers. Hypoperfusion or diminished metabolism has been identified in frontal regions [179–184], temporal lobes [179,181,183–190], as well as a variety of subcortical regions including basal ganglia [181,188,189], cerebellum [188], limbic structures [184,191] and thalamus [188,189,191]—i.e. in a widely distributed set of brain regions. Possibly because virtually all of these studies were oriented toward testing neuropsychological rather than pathophysiological hypotheses, there were no probes or tests reported to unearth the tissue level alterations that might be underlying these reductions in blood flow in these brains.

While a large number of animal studies have documented blood–brain barrier (BBB) abnormalities from EMF/RFR exposures, only a few PET studies have been performed evaluating EMF exposure effects upon brain glucose metabolism. Volkow et al. performed PET scans both with and without EMF exposure (50 min of GSM-900 with maximum SAR of 0.901 W/kg), and the participants were blinded to the exposure situation [192]. A 7% increase in metabolism in the exposure situation compared to controls was identified regionally on the same side of the head as where the mobile phone was placed. The strength of the E-field from the phones correlated positively with the brain activation, which the authors hypothesized was from an increase in brain neuron excitability. A subsequent smaller study by Kwon et al. demonstrated not increased but decreased brain ^{18}F FDG uptake after GSM-900 exposure [193].

Many possible mechanisms could be involved in the metabolic and perfusion abnormalities identified, ranging from altered neuronal activity that was hypothesized in the Volkow et al. [192] ^{18}F FDG PET study to narrowing of vascular lumen in the setting of reduced perfusion. Underlying tissue pathophysiology-based phenomena could influence the measurable metabolism and perfusion abnormalities, via mechanisms such as excitotoxicity, cell stress response, constriction of capillary lumen by activated astrocytes, volume effects of vascular extravasation, subtle alterations in blood viscosity due to immune or oxidative stress-associated blood chemical changes, with other possibilities

as well. Differences in findings between papers could relate at least in part to study design and nonlinearity issues.

2.1.5. Electrophysiology perturbations

At this stage the argument we hit a key pivot point, where we look at how the alterations in molecular, cellular and systems physiological function, which occur in the brain as well as in the body, impact the transduction into the electrical signaling activities of the brain and nervous system. Certainly the cells and tissues whose physiological challenges we have already discussed provide the material substrate for the electrical activity. Although ASC behaviors are influenced by many factors, they must in principle be mediated through nervous system electrophysiology.

If the cells responsible for generating synapses and oscillatory signaling are laboring under cellular and oxidative stress, lipid peroxidation, impaired calcium and other signaling system abnormalities, then mitochondrial metabolism will fall short, all the more so because of the challenges from the immune system which in turn be triggered to a major extent by environment. How well will synaptic signals be generated? How well will immune-activated and thereby distracted glial cells be able to modulate synaptic and network activity? [194–197].

At present we are in the early stages of being able to formulate these questions well enough to address them empirically. We do know that microglial activation can impact excitatory neurotransmission mediated by astrocytes [198]. We do know that the cortical innate immune response increases local neuronal excitability and can lead to seizures [199,200]. We do know that inflammation can play an important role in epilepsy [201]. We know less about lower levels of chronic or acute pathophysiological dysfunction and how they may modulate and alter the brain's electrophysiology.

2.1.5.1. Seizures and epilepsy. EEG signals in ASCs are abnormal on a variety of levels. At the most severe level, EEGs show seizure activity. Although less than 50% of people with ASCs clearly have seizures or epilepsy a much larger number have indications of epileptiform activity, and an even larger percent have subclinical features that can be noted by a clinical epileptologist though not necessarily flagged as of clinical concern. In addition to the association of some severe epilepsy syndromes (e.g. Landau Kleffner, tuberous sclerosis) with autism, the risk of epilepsy is substantially higher in people with ASCs than in the general population, with a large subset of these individuals experiencing seizure onset around puberty, likely in relation to aberrations in the dramatic and brain-impactful hormonal shifts of that phase of life. Epileptic seizures can be both caused by and cause oxidative stress and mitochondrial dysfunction. Seizures can cause extravasation of plasma into brain parenchyma [202–206] which can trigger a vicious circle of tissue damage from albumin and greater irritability, as discussed above. Evidence suggests that if a BBB is already disrupted, there

will be greater sensitivity to EMF/RFR exposure than if the BBB were intact [207,208], suggesting that such exposures can further exacerbate vicious circles already underway.

The combination of pathophysiological and electrophysiological vulnerabilities has been explored in relation to the impact of EMF/RFR on people with epilepsy. EMF/RFR exposures from mobile phone emissions have been shown to modulate brain excitability and to increase interhemispheric functional coupling [209,210]. In a rat model the combination of picrotoxin and microwave exposure at mobile phone-like intensities led to a progressive increase in neuronal activation and glial reactivity, with regional variability in the fall-off of these responses three days after picrotoxin treatment [211], suggesting a potential for interaction between a hyperexcitable brain and EMF/RFR exposure.

One critical issue here is nonlinearity and context and parameter sensitivity of impact. In one study, rat brain slices exposed to EMF/RFR showed reduced synaptic activity and diminution of amplitude of evoked potentials, while whole body exposure to rats led to synaptic facilitation and increased seizure susceptibility in the subsequent analysis of neo-cortical slices [212]. Another study unexpectedly identified enhanced rat pup post-seizure mortality after perinatal exposure to a specific frequency and intensity of exposure, and concluded that apparently innocuous exposures during early development might lead to vulnerability to stimuli presented later in development [213].

2.1.5.2. Sleep. Sleep involves a profound change in brain electrophysiological activity, and EEG abnormalities including disrupted sleep architecture figure in sleep challenges in ASCs. Sleep symptoms include bedtime resistance, sleep onset delay, sleep duration and night wakings; and sleep architecture can involve significantly less efficient sleep, less total sleep time, prolonged sleep latency, and prolonged REM latency [214,215], with these sleep problems being worse in children with ASCs who regressed than in those who did not regress into their autism [215]. EEG abnormalities have also been associated with EMF/RFR exposure, including disrupted sleep architecture as well as changes in sleep spindles and in the coherence and correlation across sleep stages and power bands during sleep [216,217].

Sleep disturbance symptoms are also common in both situations. Insomnia is commonly reported in people who are chronically exposed to low-level wireless antenna emissions. Mann and Rosch reported an 18% reduction in REM sleep, which is key to memory and learning functions in humans [321]. In ASCs sleep difficulties are highly pervasive and disruptive not only to the affected individual but also to their whole family due to the associated problems such as noise (e.g. screaming at night) and the need for vigilance.

The multileveled interconnections involved in the modulation of sleep exemplify the interconnectedness of the many levels of pathophysiology reviewed here: “*Extracellular ATP associated with neuro- and glio-transmission, acting via purine type 2 receptors, e.g., the P2X7 receptor, has a role*

in glia release of IL1 and TNF. These substances in turn act on neurons to change their intrinsic membrane properties and sensitivities to neurotransmitters and neuromodulators such as adenosine, glutamate and GABA. These actions change the network input-output properties, i.e., a state shift for the network” [218]. With disturbance simultaneously at so many of these levels, it is not surprising that sleep dysregulation is nearly universal in ASCs, and common in the setting of EMF/RFR exposures.

2.1.5.3. Quantitative electrophysiology. While clinical reading of EEG studies is done visually, a growing number of studies are examining EEG and MEG data using digital signal processing analysis to find not only epilepsy, but also abnormalities in the power spectrum, i.e. the distribution of power over the different frequencies present, with some studies showing impaired or reduced gamma-and activity [219–221] and others showing reduction of spectral power across all bands [222] while still others showed increased high-frequency oscillations [223]. Abnormalities in coherence and synchronization between various parts of the brain have been found [224–226], comparable to abnormal functional connectivity measured by fMRI [227] but measurable with higher temporal resolution using EEG or MEG [228–232]. Several studies have identified reduced complexity and increased randomness in EEGs of people with ASCs [233,234], as well as an increase in power but a reduction in coherence [229,235]. Some electrophysiological metrics are emerging as potential discriminators between brain signal from individuals with ASCs and those who are neurotypical, such as a wavelet-chaos-neural network methodology applied to EEG signal [236] and reduced cross-frequency coupling [237].

EMF/RFR also has impacts at levels of brain function measurable by these techniques. At various frequencies and durations of exposure it has been noted to impact alpha and beta rhythms [238], to increase randomness [170,239], to alter power, to modulate interhemispheric synchronization [240], to alter electrical activity in brain slices [241] and to alter the patterns of coordination (spectral power coherence) across the major power bands [242]. Bachman et al. [243] showed statistically significant changes in EEG rhythms and dynamics occurred in between 12% and 20% of healthy volunteers [243]. In children, exposures to cell phone radiation have resulted in changes in brain oscillatory activity during some memory tasks [97,102].

2.1.5.4. Sensory processing. Symptomatic level issues with sensory processing are highly prevalent in ASCs and can include hypersensitivity to external stimuli, hyposensitivity to internal sensations and difficulty localizing sensation including pain, and difficulty processing more than one sensory channel at one time [244–246]. There is now electrophysiological evidence of abnormalities at early (brainstem) stages of sensory processing, as well as in later stages of processing that occur in the cortex [247]. Some studies have

shown lower and some longer latencies of response to an auditory stimulus [247]. Domains of perception where the performance of people with ASCs is superior to that of neurotypical individuals have been identified [248]. *“It is ... probable that several mechanisms and neuronal abnormalities, most likely at multiple levels (from single neurons through to inter-area connections), all contribute to varying degrees to the abnormal sensory processing observed in ASD. It is also likely that no single mechanism is unique to one sensory modality, which is why we see such a widely distributed range of abnormalities across modalities”* [247].

It is also possible that the mechanisms may not simply be neural—they may also be modulated by glial, metabolic, immune, perfusional and other physiological processes by common underlying cellular abnormalities, and by physical properties as well. Yet there are few studies focusing upon the interface of tissue pathophysiology with electrophysiology.

Kenet et al. demonstrated environmental vulnerability of sensory processing in the brain by the exposure of rat dams to noncoplanar polychlorinated biphenyls (PCBs), during gestation and for three subsequent weeks of nursing [247]. The rat pups showed normal hearing sensitivity and brainstem auditory responses, but their tonotopic development of the primary auditory cortex was grossly distorted [249]. This study may be particularly relevant for EMF/RFR exposures, as Pessah, a co-author on this Kenet et al. [249] paper, was cited earlier as documenting how the noncoplanar PCBs used in this experiment target calcium signaling as do EMF/RFR exposures—i.e. they both converge upon a common particularly critical cellular mechanism [250,251].

2.1.5.5. Autonomic dysregulation. Although there are a fair number of negative studies regarding the impact of EMF/RFR exposure on the autonomic nervous system, increased HRV and autonomic disturbances have been documented [252–256]. Buchner and Eger [257], in a study in rural Germany of the health impacts of exposures from a new base station yielding novel exposure to EMF/RFR, saw a significant elevation of the stress hormones adrenaline and noradrenaline during the first six months with a concomitant drop in dopamine, with a failure to restore the prior levels after a year and a half. These impacts were felt by the young, the old and the chronically ill, but not by healthy adults [257].

Neonate vulnerability was documented by Bellieni et al. [258] who found that heart rate variability is adversely affected in infants hospitalized in isolettes or incubators where ELF-EMF levels are in the 0.8 to 0.9 μ T range (8 to 9 mG). Infants suffer adverse changes in heart rate variability, similar to adults [258]. This electromagnetic stress may have lifelong developmental impacts, based on a study showing that in-utero beta 2 agonist exposure can potentially induce a permanent shift in the balance of sympathetic-to-parasympathetic tone [259].

Meanwhile clinical observation and a growing body of literature support a major role for stress in ASCs [260–263],

with variability amongst individuals in the severity of the stress response but a tendency to have high tonic sympathetic arousal at baseline [264–269].

The impact of EMF/RFR exposure can also be greatly influenced by the stress system status of the individual being exposed. Tore et al. sympathectomized some of his rats before exposure to GSM, to simulate cell phone exposure [207,208]. Sympathectomized rats, which were in a chronic inflammation-prone state, had more prominent albumin leakage than sham-exposed rats. However in the sympathectomized rats who were exposed to GSM, albumin leakage was greatly increased, to levels resembling those observed in positive controls after osmotic shock. Salford et al. [99] suggest that *“...more attention should be paid to this finding, since it implicates that the sensitivity to EMF-induced BBB permeability depends not only on power densities and exposure modulations, but also on the initial state of health of the exposed subject”* [99].

The interconnection between stress and brain connectivity (or coherence) in ASCs is brought out by Narayanan et al. in a pilot study testing the impact of the beta blocker propranolol on brain functional connectivity measured using functional MRI [270]. A fairly immediate increase in functional connectivity was noted from propranolol—but not from nadolol which has the same vascular effects but does not cross the BBB. Propranolol decreases the burden of norepinephrine, thereby reducing the impact of stress systems on brain processing, and the authors interpreted these effects as creating an improvement of the brain's signal-to-noise ratio [271], allowing it to utilize and coordinate more remote parts of its networks. This suggests that stressors such as EMF/RFR, by adding biologically non-meaningful noise to the system, might have the opposite effects, degrading coherent integration.

2.2. De-tuning of the brain and organism

2.2.1. Electromagnetic signaling, oscillation and synchrony are fundamental, and vulnerable

While electrophysiological activity is an intrinsic property of the nervous system, electromagnetic signaling is a vital aspect of every cell and of molecular structure.

All life on earth has evolved in a sea of natural low-frequency electromagnetic (EM) fields. They originate in terrestrial and extraterrestrial sources. The ever-growing use of electric power over the last century has sharply modified this natural environment in urban settings. Exposure to power-frequency fields far stronger than the natural environment is now universal in civilized society. [272]

Adey published some of the earliest scientific studies on the “cooperativity” actions of cells in communication. Studies showing us that the flux of calcium in brain tissue and immune cells is sensitive to ELF-modulated radiofrequency fields is actually telling us that some of the most fundamental properties of cells and thus of our existence can be modulated by EMF/RFR. *“...in first detection of environmental*

*EM fields in tissues, there appears to be a general consensus that the site of field action is at cell membranes. Strands of protein are strategically located on the surface of cells in tissue, where they act as detectors of electrical and chemical messages arriving at cell surfaces, transducing them and transmitting them to the cell interior. The structural basis for this transductive coupling by these protein strands is well known. Through them, cell membranes perform a triple role, in **signal detection, signal amplification, and signal transduction to the cell interior***” [272].

Oscillation is also a universal phenomenon, and biological systems of the heart, brain and gut are dependent on the cooperative actions of cells that function according to principles of non-linear, coupled biological oscillations for their synchrony, and are dependent on exquisitely timed cues from the environment at vanishingly small levels [273,274]. The key to synchronization is the joint actions of cells that co-operate electrically - linking populations of biological oscillators that couple together in large arrays and synchronize spontaneously according to the mathematics described for Josephson junctions (Brian Josephson, the 1993 Nobel prize winner for this concept). This concept has been professionally presented in journal articles and also popularized in a book by Prof. Steven Strogatz, a mathematician at Cornell University who has written about ‘sync’ as a fundamental organizing principle for biological systems [274,275]. “*Organisms are biochemically dynamic. They are continuously subjected to time-varying conditions in the form of both extrinsic driving from the environment and intrinsic rhythms generated by specialized cellular clocks within the organism itself. Relevant examples of the latter are the cardiac pacemaker located at the sinoatrial node in mammalian hearts and the circadian clock residing at the suprachiasmatic nuclei in mammalian brains. These rhythm generators are composed of thousands of clock cells that are intrinsically diverse but nevertheless manage to function in a coherent oscillatory state. This is the case, for instance, of the circadian oscillations exhibited by the suprachiasmatic nuclei, the period of which is known to be determined by the mean period of the individual neurons making up the circadian clock. The mechanisms by which this collective behavior arises remain to be understood*” [274].

The brain contains a population of oscillators with distributed natural frequencies, which pull one another into synchrony (the circadian pacemaker cells). Strogatz has addressed the unifying mathematics of biological cycles and external factors disrupt these cycles. Others have discussed how this also applies to mitochondria: “*Organisation of mitochondrial metabolism is a quintessential example of a complex dissipative system which can display dynamic instabilities. Several findings have indicated that the conditions inducing instabilities are within the physiological range and that mild perturbations could elicit oscillations. Different mathematical models have been put forth in order to explain the genesis of oscillations in energy metabolism. One model considers mitochondria as an organised network of*

oscillators and indicates that communication between mitochondria involves mitochondrial reactive oxygen species (ROS) production acting as synchronisers of the energy status of the whole population of mitochondria. An alternative model proposes that extramitochondrial pH variations could lead to mitochondrial oscillations” [276].

Mitochondrial dysfunction is important in ASCs but is usually conceptualized in purely biochemical terms without mentioning any oscillatory dimension to mitochondrial activity; it is conceivable that the interplay between biochemistry and oscillation could figure significantly in the mechanisms of impact of EMF/RFR in ASCs.

The field of bioelectromagnetics has studied exposure to very low levels of electromagnetic frequencies. Exposures can alter the magnetokinetics of the formation of a chemical bond, shifting the rate and amount of product produced [272].

Not just chemical reactions but synchronous biological oscillations in cells (pacemaker cells) can be disturbed and disrupted by artificial, exogenous environmental signals, which can lead to desynchronization of neural activity that regulates critical functions (including metabolism) in the brain, gut and heart and circadian rhythms governing sleep and hormone cycles [277]. Buzsaki in his book *Rhythms of the Brain* says “*rhythms can be altered by a wide variety of agents and that these perturbations must seriously alter brain performance*.” [273].

Disturbance can get increasingly disruptive as more damage occurs and more systems are thrown out of kilter and out of cooperativity. One can think of the kindling model in which repeated induction of seizures leads to longer and more severe seizures and greater behavioral involvement. The combination of disruptive and stimulatory effects of biologically inappropriate EMF/RFR exposures could contribute to disruption of synchronized oscillation and cooperativity at a myriad of levels but particularly in the brain, and this may contribute to the loss of coherence and complexity in the brain in autism, as well as dysregulation of multiple other bodily systems. Strogatz points out that there are many more ways of being desynchronized than of being synchronized [274] (which may relate to ASC’s great heterogeneity). It has even been suggested that autism itself could be due to brain desynchronization [278].

2.2.2. Behavior as an “emergent property”

From a pathophysiological point of view one might hypothesize that a brain with greater indications of oxidative stress along with immune activation and mitochondrial dysfunction might generate different oscillatory activity than a brain in which those pathophysiological features were absent. From this vantage point it would make sense to propose that the compromised whole body health status of at least many with ASCs would make it harder for them to maintain the resilience of their brain cells and brain activities in the face of potentially disruptive exposures. Yet the investigation of how this might occur remains a largely unexplored frontier. But

from the point of view of making sense of the brain impact of environmental challenges – including but not limited to EMF-RFR – this investigation is crucial.

The pathophysiological perspective that guides this review would suggest a move away from considering the behavioral manifestations of ASCs as core, intrinsic, ‘hard-wired traits.’ *Instead behaviors may be better understood as ‘outputs’ or emergent properties – what the brain and body produce – when their physiological attributes are altered* in these fashions for whatever reasons—be they genetic, environmental or many combinations of both [279–284]. Sleep and consciousness have also been considered ‘emergent properties’ [285,286]. Brain oscillatory activity is critical for organizing behavior, and it arises from cells and subcellular features that are shaped by the environment and can act differently based on their functional status as well as on account of external sensory or psychosocial stimuli.

In particular, (a) brain oscillatory activity is intimately connected with underlying cellular, metabolic and immune status, (b) EMF/RFR is capable of perpetrating changes at each of these levels, and (c) problems at each of these levels can make other problems worse. And as mentioned earlier, EMF/RFR and various toxicants can co-potentiate damage [287–294], amplifying ‘allostatic load’.

Put together, all of this implies that the combination of these EMF/RFR impacts may quite plausibly significantly contribute both to how ASCs happen in individuals and to why there are more reported cases of ASCs than ever before (1200–1500% increase in reported cases over the past 15–20 years, with studies showing that a substantial portion of this increase (45–65%) cannot be written off as artifact and may well represent true increases [295,296]).

The hopeful side of this framing of the problem comes from moving beyond the increasingly anachronistic idea that autism is determined overwhelmingly by genetic code about which we can do little or nothing. An emerging model that explains much more of what we now know frames ASCs as the dynamic, active outcomes of perturbed physiological processes – again, more like a chronic but changeable ‘state’ than a ‘trait.’ In the latter model, one is empowered – and motivated – to strongly reduce exposures and to make aggressive constructive environmental changes – particularly in diet and nutrition, given their protective potency discussed above [297]. In this way ‘allostatic load’ can be reduced, physiological damage can be repaired, homeostasis can be restored and resilience and optimal function can be promoted.

3. Implications

3.1. Exposures and their implications

Several thousand scientific studies over four decades point to serious biological effects and health harm from EMF and RFR [298,299]. These studies report genotoxicity, single- and double-strand DNA damage, chromatin condensation, loss

of DNA repair capacity in human stem cells, reduction in free-radical scavengers (particularly melatonin), abnormal gene transcription, neurotoxicity, carcinogenicity, damage to sperm morphology and function, effects on behavior, and effects on brain development in the fetus of human mothers that use cell phones during pregnancy. Cell phone exposure has been linked to altered fetal brain development and ADHD-like behavior in the offspring of pregnant mice [83].

3.1.1. Exposures have outpaced precautions

There is no question that huge new exposures to EMF/RFRs have occurred over the past few decades. As discussed extensively in the BioInitiative 2012 update [299], there is much concern that regulations to date have been based on a very limited sense of the pertinent biology, and particularly that limiting concern to thermal impacts is no longer valid since there is a wealth of evidence by now that non-thermal impacts can be biologically very powerful. Only in the last two decades have exposures to RFR and wireless technologies become so widespread as to affect virtually every living space, and affect every member of societies around the world. Even as some disease patterns like brain tumors from cell phone use have become ‘epidemiologically visible’, there are no comprehensive and systematic global health surveillance programs that really keep up to report EMF/RFR health trends [300].

The deployment of new technologies is running ahead of any reasonable estimation of possible health impacts and estimates of probabilities, let alone a solid assessment of risk. However, what has been missing with regard to EMF/RFR has been an acknowledgement of the risk that is demonstrated by the scientific studies. There is clear evidence of risk, although the magnitude of the risk is uncertain, and the magnitude of doing nothing on the health effects cost to society is similarly uncertain. This situation is very similar to our history of dealing with the hazards of smoking decades ago, where the power of the industry to influence governments and even conflicts of interest within the public health community delayed action for more than a generation, with consequent loss of life and enormous extra health care costs to society. [301].

3.1.2. The population’s exposure has increased

The very rapid global deployment of both old and new forms of emerging wireless technologies in the last two decades needs aggressive evaluation from a public health perspective, given the range of physiological impacts described in Section 2.

In the United States, the deployment of wireless infrastructure (cell tower sites) to support cell phone use has accelerated greatly in the last decades. The Cellular Telephone Institute of America (CTIA) estimated that in 1997 there were only 36,650 cell sites in the US; but increased rapidly to 131,350 in June 2002; 210,350 in June 2007 and 265,561 in June 2012 [302,303]. About 220,500 cell sites existed in 2008 [303–305]. These wireless facilities for cellular phone voice

and data transmission produce RFR over broad areas in communities and are an involuntary and unavoidable source of whole-body radiofrequency radiation exposure. Other new RFR exposures that did not exist before are from WI-FI access points (hotspots) that radiate 24/7 in cafes, stores, libraries, classrooms, on buses and trains, and from personal WI-FI enabled devices (iPads, tablets, PDAs, etc).

Not surprisingly, the use of cell phones has a parallel growth trend. In the late 1980s and early 1990's, only a few percent of the US population were cell phone users. By 2008, eighty-four percent (84%) of the population of the US owned cell phones. CTIA reports that wireless subscriber connections in the US increased from 49 million in June 1997 to 135 million in June 2002 to 243 million in June 2007 to 322 million in June 2012 [302,303]. This represents more than a 100% penetration rate in the US consumer market, up from just a few percent in the early 1990's. The number of wireless subscribers in June 1997 was 18%; in June 2002 it was 47%; in June 2007 it was 81% and in June 2012 it was 101%.

The annualized use of cell phones in the US was estimated to be 2.23 trillion minutes in 2008 and 2.296 trillion minutes in 2010 [303]. There are 6 billion users of cell phones worldwide in 2011 up from 2.2 billion in 2008 and many million more users of cordless phones.

The number of US homes with *only* wireless cell phones has risen from 10.5% in 2007 to 31.6% in June of 2012 [302,303]. There are no statistics for June 1997 nor for June 2002, since landline (non-wireless) phone use predominated. The shift to wireless communications, more minutes of use, and reliance on cell and cordless phones rather than corded phones is an extremely revealing measure of new EMF and RFR exposures for both adults and children.

The prevalence of autism has risen in parallel from one (1) in 5000 (1975) to 1 in 2500 (1985) to 1 in 500 (1995) to 1 in 250 (~2001) to 1 in 166 (~2004) to 1 in 88 (~2008) to 1 in 50 (~2013). All reflected birth cohorts born earlier^{1,2}. Further research into autism prevalence studies have debunked the initial contention that higher numbers could be explained away by better diagnosis and broadening of diagnostic criteria³⁻⁶.

3.1.3. Infants, children and childbearing families are highly exposed and vulnerable

The spread of cell towers in communities, often placed on pre-school, church day-care, and school campuses, means that young children may have hundreds of thousands of times higher RFR exposures in home and school environments than existed even 20–25 years ago. In addition, the nearly universal switch to cordless and cell phones, and away from corded landline phones, means that people are experiencing close and repetitive exposures to both EMF and RFR in the home [306]. Wireless laptops and wireless internet in schools, and home offices and for homework mean even more chronic exposures to RFR, a designated IARC 2B Possible Human Carcinogen [307,308]. The great utility of handheld devices as communication aids and engaging sources of information

and satisfaction for people on the autism spectrum may come with a concerning biologically harmful underbelly.

Exposures prior to conception or during pregnancy and infancy can come from faulty wiring, proximity to power lines, or high-frequency transients from a proximate transformer on a utility pole. Sources of pulsed RFR inside the home include an electronic baby monitor in the crib, a wireless router in the next room, a DECT phone that pulses high emissions of RFR on a continuous basis 24/7, or conversion to all compact fluorescent bulbs that produce significant 'dirty electricity' for occupants due to low-kilohertz frequency fields on electrical wiring and in ambient space. Sick and vulnerable infants in neonatal intensive care units are heavily exposed from being surrounded by equipment, with negative metabolic and autonomic consequences documented [32,258].

Wireless phones and laptops exposures produce extremely low frequency pulses from the battery of the wireless device [301,306,309] and the exposures to pulsed radiofrequency microwave radiation when the wireless device is transmitting or receiving calls and emails.

Especially since EMF/RFR exposures are already classified as IARC 2B Possible Human Carcinogens, we should be actively investigating these sources of damage to DNA that could reasonably result in 'de novo mutations' but also be aware that common environmental exposures from EMF and RFR might play a role in the higher rates of concordance for autism (ASD) among twins and siblings.

Researchers also should be aware that common environmental exposures from EMF and RFR might play a role in the higher rates of autism (ASD) among twins and siblings, not solely because of maternal use of wireless devices during pregnancy and paternal sperm exposure to wireless devices peri-conception; but also because such oxidative damage to DNA can occur at levels introduced into the world of the fetus, and young developing infant and child via baby surveillance monitoring devices in the crib and wireless devices in the home. The deployment of technologies poses risks to human fertility and reproduction capacity, to the fetus, to children and adults [301].

3.1.4. ASC risk and genomic damage to future generations

Barouki and Grandjean make a persuasive case that public health interventions are critically needed in early childhood development to prevent adult diseases that appear decades later [310]. Although they do not include EMF or RFR but only chemicals, they do say that physiological stressors, which EMF and RFR certainly have been established, should be reduced during critical development windows. They say: "*The current pandemic of non-communicable diseases and the increased prevalence of important dysfunctions demand an open interrogation of why current interventions appear insufficient. We now know that disease risk can be induced very early in the life course and that it is modifiable by*

nutrients and environmental chemical exposures (along with drugs, infections, and other types of stresses)” [310].

Public health interventions are warranted now to protect the genetic heritage of humans, as well as the other stocks of genetic material in wildlife and plants in the face of what appears to be on-going impairment of these genomes. The risk of genomic damage for future generations is sufficiently documented to warrant strong preventative action and new public safety limits that observe EMF/RFR levels shown to cause adverse effects.

3.1.5. De-tuning the organism

Genetic mutations may lead to cancer and other diseases in the present and future generations, but the exposures that are capable of creating genotoxic impacts also compromise physiological function. Even genotoxicity can have not only specific but also non-specific effects due to molecular inefficiencies, misfolded proteins, and cellular debris [311,312].

In the setting of autism, a baby gestated or developing as a neonate in a milieu with excessively elevated EMF/RFR exposures is vulnerable to interference with the normal development processes, including the organization of information and experience in the brain. This baby's environment also often includes nutritional insufficiencies (processed denatured pesticide-laden food low in antioxidants, minerals and essential fatty acids essential to cellular protection). The baby's gestational period may have been complicated by the mother's own health issues such as conditions like obesity and diabetes [313] which converge upon on inflammation, oxidative stress and other common forms of physiological dysregulation. The exquisite 'tuning up' of the brain and body as it develops will integrate and respond to the environmental inputs it receives, and is particularly sensitive to environmental miscues (whether chemical like endocrine disruptors, EMF/RFR which can be both chemically and electromagnetically disruptive, or other environmental conditions whether hostile or nurturing). To the extent that the baby is burdened with more disorganized or hostile cues than nurturing and organizing cues, that baby may lose resiliency and become more physiologically vulnerable –perhaps approaching a tipping point into decompensation such as autistic regression or development of other chronic disease processes.

From a systems point of view, the phenomenon of 'autistic regression' can be understood as occurring after an accumulation of multisystem signaling interference leading to a tipping point of loss of some vital systems synchronization and increase in randomization. EMF/RFR exposures could plausibly contribute both to this vulnerability and to the decompensation/desynchronization process – as could other stressors such as infection, toxicity, acute stress. The vulnerability, then, is the 'allostatic load' – the total burden of stressors pressing toward disorganization. The tipping point may come in a variety of ways; but upon investigation one is likely to find that unless a stressor is severe, the trigger most proximally associated with the decompensation is likely to

be the 'straw that breaks the camel's back' laid atop a prior accumulation of 'allostatic load.'

3.2. Conclusions and recommendations

The case has been made that ASCs involve physiological challenges at multiple levels, and that these challenges are paralleled in the physiological impacts of EMF/RFR exposure. Evidence has also been presented to suggest that the many levels of damage and degradation of physiological and functional integrity are profoundly related to each other. Although autism spectrum conditions (ASCs) are defined by problems with behavior, communication, social interaction and sensory processing, under the surface they also involve a range of disturbances of underlying biology that find striking parallels in the physiological impacts of electromagnetic frequency and radiofrequency radiation exposures (EMF/RFR). At the cellular and molecular level many studies of people with ASCs have identified oxidative stress and evidence of free radical damage, evidence of cellular stress proteins, as well as deficiencies of antioxidants such as glutathione. Elevated intracellular calcium in ASCs can be associated with genetic mutations but more often may be downstream of inflammation or chemical exposures. Cell membrane lipids may be peroxidized, mitochondria may function poorly, and immune system disturbances of various kinds are common. Brain oxidative stress and inflammation as well as measures consistent with blood–brain barrier and brain perfusion compromise have been documented. Changes in brain and autonomic nervous system electrophysiology can be measured and seizures are far more common than in the population at large. Sleep disruption and high levels of stress are close to universal. In parallel, all of these phenomena have also been documented to result from or be modulated by EMF/RFR exposure. Moreover, some people with ASCs have de novo mutations (that their parents do not have), and EMF/RFR exposures could contribute to this due to their potential genotoxicity. EMF/RFR exposure during pregnancy may send spurious signals to developing brain cells during pregnancy, altering brain development during critical periods, and may increase oxidative stress and immune reactivity that can increase risk for later developmental impairments, with further disruption later in development increasing risk, physiological dysregulation and severity of outcome.

All of this does not prove that EMF/RFR exposures cause autism, but it does raise concerns that they could contribute by increasing risk, and by making challenging biological problems and symptoms worse in these vulnerable individuals. Placed alongside the dramatic rise in reported cases of ASCs [333], that parallels the dramatic rise in deployment of wireless technologies, a strong case can be made for aggressively investigating links between ASCs and EMR/RFR, and minimizing exposures for people with autism as well as families preconceptionally, during pregnancy, and around infants and children at home, at school, and in health care centers and hospitals.

These arguments have implications for how we understand what ASCs ‘are’ and how they work, including an appreciation that it may be the physiological disturbance is what actually generates the ‘autism’ on a moment-to-moment basis—and that these physiological disturbances are profoundly driven by environmental insults. These implications call upon us to take the environmental contribution very seriously, which involves on the one hand a sobering appreciation of the vast array of exposures that can contribute to risk via perturbed development and physiological degradation, and on the other hand a sense that there are powerful things we can do to reduce risk and improve the situation.

3.2.1. Change our deployment of EMF/RFR

The deployment of RFR from wireless technologies has incredible momentum, and it has made many things easier and many other things possible for the first time. On the other hand this momentum can interfere with setting up the technology in a fashion truly respectful of biological tolerances. *“There is no question that global implementation of the safety standards proposed in the Bioinitiative (2007) Report, if implemented abruptly and without careful planning, have the potential to not only be very expensive but also disruptive of life and the economy as we know it. Action must be a balance of risk to cost to benefit. The major risk from maintaining the status quo is an increasing number of cancer cases, especially in young people, as well as neurobehavioral problems at increasing frequencies. The benefits of the status quo are expansion and continued development of communication technologies. But we suspect that the true costs of even existing technologies will only become much more apparent with time. Whether the costs of remedial action are worth the societal benefits is a formula that should reward precautionary behavior”* [301].

3.2.2. Encourage precautions right now based on present knowledge

Physicians and health care workers should raise the visibility of EMF/RFR as a plausible environmental factor in clinical evaluations and treatment protocols. Reducing or removing EMF and wireless RFR stressors from the environment is a reasonable precautionary action given the overall weight of evidence.

- Children with existing neurological problems that include cognitive, learning, attention, memory, or behavioral problems should as much as possible be provided with wired (not wireless) learning, living and sleeping environments,
- Special education classrooms should aim for ‘no wireless’ conditions to reduce avoidable stressors that may impede social, academic and behavioral progress.
- Adaptations to preserve the attractive design innovations of technologies such as tablet computers in a ‘no wireless’ environment should be developed.

- All children should reasonably be protected from the physiological stressor of significantly elevated EMF/RFR (wireless in classrooms, or home environments).
- School districts that are now considering all-wireless learning environments should be strongly cautioned that wired environments are likely to provide better learning and teaching environments, and prevent possible adverse health consequences for both students and faculty in the long-term.
- Monitoring of the impacts of wireless technology in learning and care environments should be performed with sophisticated measurement and data analysis techniques that are cognizant of the non-linear impacts of EMF/RFR and of data techniques most appropriate for discerning these impacts.
- There is sufficient scientific evidence to warrant the selection of wired internet, wired classrooms and wired learning devices, rather than making an expensive and potentially health-harming commitment to wireless devices that may have to be substituted out later, and
- Wired classrooms should reasonably be provided to all students who opt-out of wireless environments.

Broader recommendations also apply, related to reducing the physiological vulnerability to exposures, reduce ‘allostatic load’ and build physiological resiliency through high quality nutrition, reducing exposure to toxicants and infectious agents, and reducing stress [297], all of which can be implemented safely based upon presently available knowledge.

3.2.3. Build an environmentally physiologically centered research program in ASCs as a platform for investigating the EMR/RFR-ASC linkage

This review has been structured around the physiological parallels between ASCs and the impacts of EMF/RFR. What is missing from the autism research agenda is some cross-study of these two bodies of research evidence. To do this we will need both a recognition of the importance of these risks, and a collaborative multi-site research program centered around a “middle-out” physiological approach [314] that can transcend the limits of the gene-brain-behavior agenda that has dominated ASC research, by incorporating this now clearly limited approach into a broader framework [315]. This still dominant gene-brain-behavior approach has been based on an expectation of linear mapping across the levels on which it focuses, but instead the systems involved appear to be much more complex. The middle-out approach is an emerging more inclusive framework in systems biology that can incorporate complexity and nonlinear, multi-scale modeling [316–320]. The physiological levels largely left out in the gene-only approach are critically important to helping people with ASCs because they will help not only with understanding how environment impacts function but also with identifying leverage points.

3.2.4. Take the evidence as a call to action

Both EMF and RFR exposures are already classified as IARC Group 2B Possible Human Carcinogens. The substantial scientific literature on EMF and RFR effects on DNA, on immune and blood–brain barrier disruption, on stress proteins, on circadian rhythms and hormone dysregulation, and on cognition, sleep, disruption of neural control and altered brainwave activity all argue for reduction of exposures now, and better coordinated research in these areas. The evidence is sufficiently documented to warrant strong preventative action and new public safety limits that observe EMF/RFR levels shown to cause adverse effects.

All relevant environmental conditions should be given weight in defining and implementing prudent, precautionary actions to protect public health, including EMF and RFR. Evidence is sufficient to add EMF/RFR prominently to the list of exposures that can degrade the human genome, and impair normal development, health and quality of our physiology. With the rising numbers people with ASCs and other childhood health and developmental disorders, we cannot afford to ignore this component of risk to our children and vulnerable populations. When the risk factors are largely avoidable or preventable, ignoring clear evidence of large-scale health risks to global populations poses unnecessary and unacceptable risks. Taking this evidence as a call to action will be challenging and disruptive in the short term, but constructive in the longer term as we learn to use EMF/RFR in healthier ways.

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Leslee Cooper Comments, Sep. 3, 2013

FCC 13-39

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Reassessment of Federal Communications	)	ET Docket No. 13-84
Commission Radiofrequency Exposure Limits and)	
Policies)	
)	
Proposed Changes in the Commission's Rules	)	ET Docket No. 03-137
Regarding Human Exposure to Radiofrequency)	
Electromagnetic Fields)	
)	

To: Office of the Secretary
Federal Communications Commission
Washington, DC 20554

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September 3, 2013

AFFIDAVIT OF LESLEE COOPER

State of New York]

Ulster County]

I, Leslee Cooper, attest that my statements are true to the best of my knowledge.

Comment round for FCC ET Docket No. 013-84 and ET Docket No. 03-137

1. My name is Leslee Cooper. My address is 58 Mohonk Road, High Falls, 12440
2. I am a self-employed marketing consultant who works from the above address. I have been using computers on the job since 1983 and at home since 1988. I began using the internet frequently since 1995. I currently have a home business with four desktop computers, two laptops, three phone lines and everything is completely WIRED and grounded - no wireless at all, by my choice. Both my home and office have no wireless routers, no cordless phones, no Bluetooth, no Smartphone, no Smart TV, etc. I choose to install no wireless devices in the environment under my control because I have also been researching the issue of EMF and RF since I began using computers in 1983.

My review of the most recent scientific research as well as my empirical experience has convinced me that continuous pulsing microwave radio frequency at 2.4 GHz, particularly Smart Meters, are the most harmful, damaging RF/EMF radiation that has come into our home, office and school environment to date. Pulsing microwave radio frequency has significant negative health effects for most people, not just for the so-called electro-sensitive population. See numerous attached peer-reviewed studies on the effects of exposure to 2.4 GHz radio frequency.

3. The safety levels for radio frequency microwave in the United States need to be significantly decreased to bring them in line with the strictest and lowest standards of other scientifically advanced nations that acknowledge biological effects, such as, for example, Russia. Russia and other nations, such as Italy, Switzerland base their limits on studies of cumulative negative biological effects of RF exposure, such as damage to the blood brain barrier, DNA, antibodies, lymphocytes, fetal tissue, cells, and all sorts of vital physiological

functions. See attached documents named Russian-RF-Standards-2012-11.pdf;
2P6b_0157.pdf

4. Smart Meters need to be recalled and investigated due to reports of serious technical flaws that are causing injury as well as reports that these meters frequently exceed the current excessively high FCC standards. See attached document entitled
Assessmt_RF_microwave_smart_meter.pdf

5. This proceeding requires a NEPA assessment due to many personal reports from U.S. citizens of harm and injury traced to radio frequency exposure at allowable levels and/or due to environments where the radiation levels probably already exceed the current allowable FCC levels due to unregulated installations and cumulative effects. Under NEPA, “federal officials are required to assume the responsibility that the Congress recognized . . . as the obligation of all citizens: to incorporate the consideration of environmental factors into the [federal] decision-making process.” *Env’tl. Def. Fund v. Tenn. Valley Auth.*, 468 F.2d 1164, 1174 (6th Cir. 1972). Officials comply with NEPA “primarily by [conducting] an [EIS] for any ‘major Federal action significantly affecting the quality of the human environment.’” *Burkholder v. Peters*, 58 F. App’x 94, 96 (6th Cir. 2003) (quoting 42 U.S.C. § 4332(2)(C)).

6. Physical harm from microwave radio frequency comes quickly and without warning and radio frequency levels needs to be reduced immediately. I ask for a moratorium on the sales and installation of Smart Meters and all new spectrum, transmitting utility meter installation, as well as installation of additional base stations for wireless service while new lower levels go into effect.

7. Reports of physical harm to American citizens by radiofrequency microwave in the public and general environment must be considered in the complete record of these proceedings. Re: a federal agency's responsibility to protect the environment and U.S. citizens (*Scenic Hudson v. Federal Power Commission*) said:

1. If the Commission is properly to discharge its duty in this regards, the record on which it bases its determination must be complete. The petitioners and the public at large have a right to demand this completeness. It is our view, and we find, that the Commission has failed to compile a record which is sufficient to support its decision. The Commission has ignored certain relevant factors and failed to make a thorough study of possible alternatives . . .

. . . the public is entitled to know on the record that no stone has been left unturned."

8. I call on the FCC, Congress, and the EPA to review all emerging science, to investigate citizen's complaints of harm, and to investigate a **possible connection between increased immunological and neuroendocrinological diseases and increased cumulative levels of radio frequency radiation in our environment.**

My family, myself, my neighbors have already experienced physical harm and because we cannot yet remove Smart Meters to stop or limit our exposures, we are suffering serious disease today and day after day. These are diseases that we did not have before the Smart Meters arrived and, in many cases, our doctors are saying that our conditions are rare or atypical.

When I purchased this home in 2008, I didn't understand that my water meter was already a "Smart" meter that emits pulsing microwave RF 24/7 constantly. In 2009, my local gas and electric company began to replace my surrounding neighbor's mechanical analog electric meters with pulsing microwave radio frequency Smart Meters without notice and without informed consent. Smart Meters are not approved devices in New York. In addition, New York State utilities claim that they are not using Smart Meters, but RF testing devices show that New York RF meters are pulsing on and off at high levels all day long - in many cases, at levels that exceed even the current RF standards. See attached document about Smart Meters in California entitled Assessmt_RF_microwave_smart_meter.pdf

Reports of Injury

8a. My neighbors across the street have two Smart Meters on their home. Exposure began when they moved in five years ago, but increased significantly in the last three years when the Smart Meters proliferated in our neighborhood. This family has developed the following medical conditions in the past two years: woman under 40 diagnosed with atypical Glaucoma, man under fifty diagnosed with atypical Grave's disease, child under four had benign tumor surgically removed. All have sleep disorders and agitation. None of these conditions were pre-existing and there is no family history on these.

8b. My neighbors next door have two Smart Meters in their home - first Smart Meter went in at the end of 2007, second in 2011...the wife now has a heart murmur and palpitations, is pre-diabetic, the husband has immune system irregularities. Their doctor can not figure out

what is wrong and why they are not responding to treatment. No such medical history was present prior to 2007.

8c. My neighbor moved in four years ago. They have two Smart Meters, male under sixty years old has had two strokes - one two years ago and one one year ago.

8d. My home has one Smart Meter on my home and, as I explained, no other wireless technology. Please note that our Smart Meter is a water meter that emits spikes of radiation that is lower than the spike RF levels from a standard GE Smart Meter). In the past three years, I have been diagnosed with microscopic colitis, heart palpitations, red blood cell irregularities, memory loss, TMJ, and sleep disorders and my husband has developed tinnitus, hearing loss and memory loss. We both turned fifty years old in this house.

8e. Worst of all, my 83 year old mother had a standard Smart Meter for electricity installed on her house and all of her neighbors' houses a few years ago. Her neighbors' Smart Meters are very close (<20 feet) and those meters are pointing right into my mother's bedroom and livingroom windows where she spends most of her time. My mother was fine (no neurological symptoms) until those meters went in. Now, the neurologists have diagnosed her with what they say is a very rare inflammatory brain disease called cerebral amyloid angiitis. She has big holes in her brain and has lost a lot of neurological function. The doctors say this is NOT typical of Alzheimers, but -- for all we know -- the increases in Alzheimers, Parkinson's, MS, ADHD, or even diabetes could be due to constant exposures to the always-on wireless RF technologies, such as the Smart Meters and DECT phones. We need to be investigating the rise in these diseases and any possible connections with RFRs.

9. Time averaging of the microwave RF radiation is misleading and fraudulent and should not be permitted. Our utility company told my neighbor that his Smart Meter only radiates RF less than one hour per day. Obviously, they were using Time Averaging for exposure but their statement is clearly false and deceptive. Their Smart meters pulse to high levels several times every minute day and night, 24/7. I repeat, time averaging is deceptive and fraudulent and should not be permitted.

10. FCC states in paragraph 109 of its document that the costs of regulation are a concern and are being weighed against the benefits to the consumer. This calls attention to the fact that FCC is not a health agency and is not the appropriate body to be assessing and regulating

such an immense and widespread environmental and health safety issue. The risks of radiofrequency in our environments extends beyond regulation of media, competition, homeland security, etc. This proceeding, which relates to environmental safety and public health, needs to be referred to Congress and the EPA.

I thank the FCC for seriously considering my comments and the comments of all members of the public and I ask the FCC to follow its mandate to represent and serve the public interest and our common good.

Respectfully submitted by

Leslee Cooper

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September 3, 2013