Reykjavik Appeal on wireless technology in schools

We, the signers, are concerned about our children's health and development in schools with wireless technology for teaching. A vast amount of scientific studies have shown considerable medical risks with long-term exposure to Radiofrequency Radiation **(**RFR) from wireless devices and networks well below the recommended reference levels from the International Commission on Non-Ionizing Radiation Protection (ICNIRP). We ask the authorities to take their responsibility for our children's future health and wellbeing.

In May 2011 the International Agency for Research on Cancer (IARC) at WHO classified RFR as a Group 2B carcinogen, i.e., 'possibly' carcinogenic to humans. Since then more scientific studies on exposure to RFR in humans, animals and biological material have strengthened the association of an increased risk for cancer, especially brain tumors. Several laboratory studies have shown mechanistic effects in carcinogenesis such as oxidative stress, down regulation of mRNA and DNA damage with single strand breaks. The IARC cancer classification includes all sources of RFR. The exposure from mobile phone base stations, Wi-Fi access points, smart phones, laptops and tablets can be long-term, sometimes around the clock, both at home and at school. For children this risk may be accentuated because of a cumulative effect during a long lifetime use. Developing and immature cells can also be more sensitive to exposure to RFR. No safe level of this radiation has been determined by any health agency and therefore we have no safety assurances.

Besides the cancer risk, RFR may also affect the blood-brain barrier to open and let toxic molecules into the brain, hurt neurons in hippocampus (the brain centre for memory), down or up regulate essential proteins in the brain engaged in the brain's metabolism, stress response and neuro-protection and affect neurotransmitters. Sperms exposed to Wi-Fi have been seen with more head defects and DNA damage. RFR can increase oxidative stress in cells and lead to increase of pro-inflammatory cytokines and lower capacity to repair DNA single and double strand breaks.

Cognitive impairments in learning and memory have also been shown. Results from the OECD's PISA performance surveys in reading and mathematics show decreasing results in countries that have invested most in introducing computers in school. Multitasking, too many hours in front of a screen, less time for social contacts and physical activities with risk for aches in neck and back, overweight, sleep problems, and information technology (IT)-addiction are some of the known risks and side effects of IT. They stand in marked contrast to the often claimed, but largely unproven possible benefits.

We ask the school authorities in all countries to acquire knowledge about the potential risks of RFR for growing and developing children. Supporting wired educational technologies is a safer solution than potentially hazardous exposures from wireless radiation. We ask you to follow the ALARA (As Low As Reasonably Achievable) principle and Council of Europe Resolution 1815 to take all reasonable measures to reduce exposure to RFR.

Practical rules for schools concerning children and wireless technology.

- No wireless networks in preschool, kindergarten and schools.
- A hard wired direct cable connection is recommended to each classroom for the teacher to use during lessons.
- Prefer wired telephones for personnel in preschool, kindergarten and schools.
- Prefer cabled connection to Internet and printers in schools and turn off Wi-Fi settings in all equipment
- Prefer laptops and tablets that can be connected by cable to Internet.
- Students should not be allowed to use cell phones in schools. They can either leave them at home or the teacher collects them in turned off mode before first lesson in the morning.

Children, Screen time and Wireless Radiation – International Conference
Reykjavik February 24, 2017

Signed by

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Appendix for further reading.

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2020 Consensus Statement of UK and International Medical and Scientific Experts and Practitioners on Health Effects of Non-Ionising Radiation (NIR)

Author: Dr. Erica Mallery-Blythe. Release date: 10/11/2020.
(Signed by groups representing over 3,500 medical doctors)

On Behalf of:
Physicians' Health Initiative for Radiation and Environment (PHIRE)
British Society for Ecological Medicine (BSEM)

Endorsed by further Medical Groups:
Alborada Foundation (Spain)
American Academy of Environmental Medicine (AAEM)
Australian College of Nutritional and Environmental Medicine (ACNEM)
European Academy for Environmental Medicine (EUROPAEM)
Italian Association of Doctors for the Environment (ISDE Italia)
Kompentenzinitiative (Germany)
National Association of Environmental Medicine (NAEM USA)
Ralf Meyer Akademie Komplementarmedizin

Endorsed by Scientific Groups:
EM Radiation Research Trust (RRT)
Environmental Health Trust (EHT)
International EMF Alliance (IEMFA)
International Guidelines on Non-Ionising Radiation (IGNIR)
Oceania Radiofrequency Scientific Advisory Association (ORSAA)

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2020 Consensus Statement of UK and International Medical and Scientific Experts and Practitioners on Health Effects of Non-Ionising Radiation (NIR)

The statement reflects the consensus from the most recent independent expert global forums [1,2,3,4,5,6] on the acute and chronic health effects resulting from Radiofrequency Radiation (RFR) exposure.

The statement clarifies the medical community's serious concerns surrounding the deployment of 5G and the continued use of RFR in public spaces.

Urgent action is required to protect the health of humans and wildlife.

Public Health Crisis:

1. RFR has been proven to damage biological systems at intensities below ICNIRP* guidelines.
2. Public exposure to RFR is already harmful and will rise with the deployment of 5G.
3. Exposure is unavoidable, contravening the Human Rights Act for those who do not consent.
4. Multiple international governmental health advisory groups are biased by conflicts of interest.

*ICNIRP: International Commission on Non-Ionising Radiation Protection

Required Urgent Actions:

1. Immediate moratorium on 5G, wireless smart metering and any other new RF emissions.
2. Establishment of public safety limits to be biologically protective against adverse health effects.
3. Withdrawal of Wi-Fi, wireless phone and other RFR emissions from within / near all schools.
4. Designation of low NIR* areas to protect those who are unwell or do not consent to exposure.
5. Education programmes to inform medical professionals about NIR related illnesses / effects.
6. A zero tolerance approach to industrial influence on public health policy and assured exclusion of those with conflicts of interest from official advisory bodies.

*NIR: Non-Ionising Radiation.

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Introduction

During the last four decades, there has been an exponential increase in ambient radiofrequency radiation (RFR) that continues to rise at an unprecedented rate. In addition, the increases occupy an unnatural portion of the frequency spectrum and now reach intensities of up to 10^{18} (quintillion) times higher than natural, background levels of RFR (see Figure 1 below).

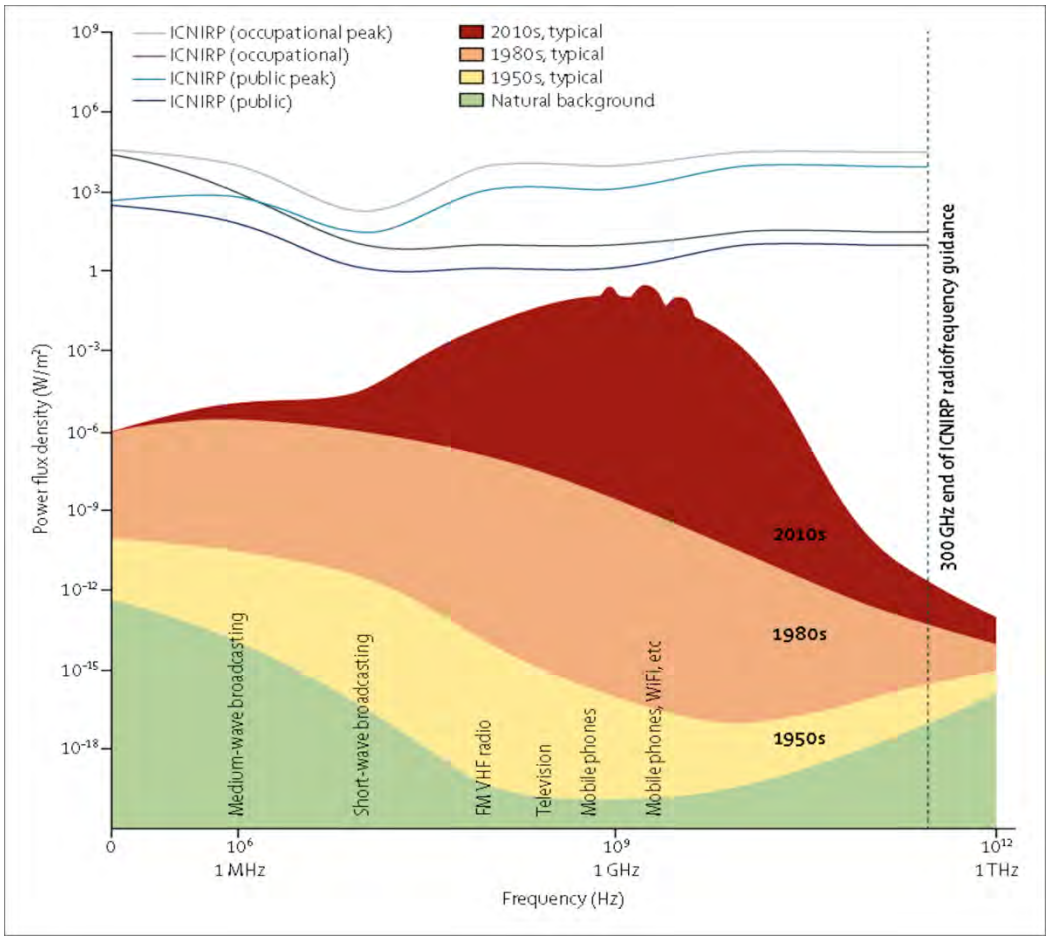

Figure 1: Typical maximum daily exposure to radiofrequency electromagnetic radiation from man-made and natural power flux densities in comparison with International Commission on Non-Ionizing Radiation Protection safety guidelines
Permission: Alasdair Philips, Powerwatch (https://www.powerwatch.org.uk). Published: Bandara P, Carpenter D (2018). 'Planetary electromagnetic pollution: it is time to assess its impact'. *The Lancet Planetary Health;* Vol 2, Issue 12.[110]

RFR is emitted by mobile phones, base stations, Wi-Fi enabled routers and computers, cordless land line phones, security systems, fitness watches, baby monitors, many other modern devices including wearable tech, internally emitting devices and products advertised for use close to foetuses or newborn babies. 5G will include higher frequencies transmitted by directional phased array antennas which have not been pre-market safety tested under realistic conditions in combination with existing emissions. Additionally the planned Internet of Things (IoT) will lead to higher cumulative exposures. International independent experts agree that this evolution is not safe for deployment.[7,8] Existing emissions have already been shown to damage biological systems within lifelike exposure parameters.[9-12] Detrimental effects include increased cancer risk, increase in harmful free radicals, genetic damage, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans.[7] The addition of higher frequencies and overall increased exposures are therefore predicted to cause further health damage.[13,14]

The following pages summarise some of the evidence supporting our concerns.

Background

1) Cancer risk noted from human epidemiological research corroborated by largest new animal studies:

In 2011, the World Health Organisation (WHO) via the International Agency for Research on Cancer (IARC) classified RFR as Group 2B 'Possibly carcinogenic to humans'.[15] Glioblastoma Multiforme (GBM), an associated rapidly progressive fatal brain cancer, and acoustic neuroma, satisfy the Bradford Hill criteria for causation from RFR exposure based on human epidemiological studies.[16] Human epidemiological evidence has continued to accumulate since.[17-23] In 2018 the highly credible US National Toxicology Program (NTP) published findings from the largest animal study so far conducted,[24,25] declaring the evidence for carcinogenesis 'clear' and putting pressure on IARC to urgently reassess and elevate RFR to Group 1 'Known Human Carcinogen'.[26,27] Furthermore, the large-scale Ramazzini Institute study,[28] which used far field radiation designed to emulate base station type RF emissions, was published shortly afterwards and independently confirmed promotion of carcinogenesis in cells of glial derivation. Legal authorities continue to validate the causal link between RFR and tumours.[29] Incidence rates for these kinds of brain tumours are rising in the UK,[30] Netherlands,[31] Australia,[32] and USA.[33,34]

2) Global medical, scientific, political and ethical warnings are escalating:

Accompanying this warning from WHO / IARC are warnings from numerous international medical doctors groups,[8,35-43] scientific panels,[9-11,44-55] and governmental bodies.[56-66]

3) Enough valid research has been conducted to justify action to protect against health effects:

Many hundreds of peer-reviewed scientific papers have now been published demonstrating biological effects occurring in response to exposure to NIR at a range of frequencies. It should be noted that modulations to RF communications fall within the Extremely Low Frequency (ELF) range. It remains unclear whether it is the RF or ELF frequencies that are most bioactive, but that academic question does not need to be answered at this point in order to be clear that the technology is not safe, as both existing and proposed emissions contain both portions of the spectrum integrated in this way. The evidence base for certain types of biological interference is extremely strong. In excess of 90% of publications noted oxidative stress, both in vitro and vivo (animal studies).[67] Oxidative stress can damage multiple biological systems and is implicated in many diseases of high public health importance such as Alzheimer's, cancer, cardiovascular disease and infertility.

4) ICNIRP 'safety' guidelines are not protective:

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines (devised in 1998) only avoid acute, thermally induced (tissue heating) effects).[68] They do not protect against chronic effects, or the copiously documented non-thermal, low intensity effects of NIR, which can occur several hundred thousand times below current ICNIRP guidelines.[9] Additionally, non-compliance with these guidelines has been demonstrated.[69,70] Concerns regarding conflicts of interest have also been raised.[71,72] Analysis of proposed 5G emissions has shown that the exposure limits "tolerated by ICNIRP may lead to permanent tissue damage even after short exposures".[73] Their updated guidelines[74] address this issue but actually allow higher overall cumulative exposures and hence concerns persist.[75] They have been shown to make "extensive incorrect and misleading statements" in important literature appraisals[76] and various independent expert research groups have suggested evidence-based replacement guidelines.[9,77,78,94]

5) A growing global movement to protect citizens by authorities has begun:

Some countries have chosen to adopt safety limits orders of magnitude below ICNIRP guidelines based on scientifically observed biological effects. Furthermore, some, such as France,[61] have already banned or restricted Wi-Fi in certain child education settings. Others, such as Cyprus, have government-led, targeted public information campaigns and medical statements published to better inform and educate their citizens.[65] These important steps are overdue in the UK and public health agencies are currently failing in their duty to safeguard and inform the UK population regarding the proven hazards of these emissions.

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6) Health authority guidance is often out of date, biased and inaccurate:

Resources from advisory groups including Public Health England (PHE) and WHO, are lacking appraisal of the latest research regarding this fast-moving subject. Additionally, there are often conflicts of interest within such groups and many of their public statements do not stand up to scientific scrutiny.[71,76] Specifically, the Advisory Group on Non-Ionising Radiation (AGNIR) report of 2012 that was used to construct current UK policy is out of date and has been found to be "inaccurate", "biased" and "misleading".[79] The group has disbanded but, nonetheless, the report is still being used to inform current policy.[80]

7) Sensitive sub-groups are neglected:

Age, gender, genetics, Electromagnetic Hypersensitivity (EHS) (see below) and co-morbidities may all affect individual vulnerability. Pregnant females and their foetuses are also especially vulnerable.

Children are more vulnerable due to multiple factors:[81] It is noteworthy that brain tumours have overtaken leukaemia as a leading cause of cancer death in young people.

a) Children absorb more radiation:
   - The brain of a child (age 5-8yrs) can absorb 2x the radiation of an adult.[82]
   - Exposure in bone marrow can be up to 10x greater than an adult.[83]

b) Outcomes in children may be worse as:
   - Children have systems which are still developing.
   - Children have a longer time ahead for latent effects to manifest.

There is inconsistent advice regarding radiation exposure for children in the UK. The Chief Medical Officers (CMO) state that: "Children and young people under 16 should be encouraged to use mobile phones for essential purposes only".[84] This advice is also underpinned by a medical doctors' appeal (signed by more than 1,000 physicians)[40] stating "Children below the age of 8 should not use cell phones and cordless phones; children and adolescents between the ages 8 and 16 should also not use cell phones or only use them in the case of an emergency".
However, this advice has never been effectively communicated to the public and children are still encouraged to use RFR emitting tablets, computers and numerous other wireless devices (sometimes including mobile phones) in school. The same caution should apply for tablets and other similar RFR sources as their maximum Specific Absorption Rates (SARs) are comparable and in some cases higher.

Additionally, these devices are often held near to sensitive areas such as the reproductive organs. Wi-Fi shares the same carcinogenic status as other forms of RFR under the IARC classification and is also "an important threat to human health" in numerous ways, additional to its carcinogenicity.[85] Hard wired alternatives should clearly be implemented in schools.[86,60-65]

Those with Electromagnetic Hypersensitivity (EHS) are also acutely vulnerable:
EHS is a multisystem medical condition characterised by physical symptoms associated with anthropogenic NIR exposure. Similar constellations of symptoms may also be seen in the general population in cases of relatively high exposure.

Some have suggested a 'nocebo response' (symptoms induced by fear of exposure) as the mechanism behind the reaction. This explanation does not withstand scientific scrutiny. EHS is proven to be a physical response under blinded conditions,[87,88] biomarkers are being identified,[89] and mechanisms that may explain the reaction are evolving.[90-93]

Advice from multiple international medical doctors groups and governmental bodies is to decrease exposures in order to relieve symptoms (also see point 2 above). Additionally, guidelines for EHS diagnosis and management have been peer-reviewed and published which make clear that the mainstay of medical management is avoidance of anthropogenic NIR.[94-96] Disability and compensation cases for those with EHS are already being won and will continue to escalate.

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8) Human Rights:

There are clear human rights violations, particularly for vulnerable groups.[97] In essence many of these also apply to any individual who does not consent to exposure in their home, place of work or public building and yet is being given no choice. People all over the world are making their unwillingness to be exposed abundantly clear via protests, letters,[98] and where there is resource, legal actions.[70,99-103]

At its core, this is an issue of consent and there can be no defensible argument for forcibly exposing those who do not consent. That is a breach of the Nuremburg Code as well as numerous Human Rights. The 'Rights of a Child' and unborn child are currently also being contravened by these exposures and parents who strive to protect their children currently have no avenue to achieve this without complete public isolation. Indeed, they may even be unable to prevent their children's exposures in their own property given the penetration of NIR over large distances and through walls.

There are adults and children who have severe acute symptoms and in some cases they can prove life threatening. Additionally, the extreme measures some are forced to take to avoid exposures (such as primitive camping for example) can also lead to lack of access to medical care, social support, isolation from basic necessities such as food, water and shelter and to hostile exposures such as extremes of temperature.

It is noteworthy also that as individuals prove they have been harmed by RFR exposures, which is certainly already happening,[29] there is also likely no insurance coverage, which enhances the injustice of this situation. Following in-depth analysis of the scientific literature and thorough risk assessment, underwriters consider risks of RFR to be "high impact".[104] Governmental and other public bodies could therefore be forced to 'self insure'. This would present the very unethical situation that the taxpayer could ultimately pay for health damages incurred by exposures that they never consented to and in many cases actively refused.

9) Precautionary Principle and public Health:

The application of the Precautionary Principle[105] has been called for over many years, by multiple credible, professional organisations and most recently by the European Parliament.[66] This is now crucial in order to protect both public health and the economy given the already apparent escalating health and social care costs. RFR has been proven to damage biological systems at levels well below those claimed to be safe within the ICNIRP guideline levels. Public exposures to existing levels of RFR are already harmful and will rise substantially with the deployment of 5G.[106,107]

In truth, we are now beyond the point of precaution and protection of vulnerable groups is an emergency. RFR has been repeatedly shown to cause widespread, multisystem health detriment,[67] and effects on the immune system have been demonstrated in some peer-reviewed published studies.[108]

Given the extraordinary pressure on public health provision in 2020, the simple measure of halting further RFR exposures via 5G is a reasonable and proportionate measure in order to optimise the biological resilience of the population.

Given the current planetary environmental crisis and impact of electromagnetic fields also on the health of wildlife,[109-111] and with higher 5G frequencies affecting insects in particular,[112] it is not just protection of human health from harmful effects of anthropogenic radiation which constitutes an emergency but actually that of all global life.

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Conclusion

The short-sighted reason given for the race to deploy 5G is economic growth. This argument is fallacious given that a physically and mentally unhealthy community will never be able to fulfil their true potential for economic growth and productivity. Even small impairments to certain health parameters can equate to very large public health detriment when large numbers of individuals are affected. In this case the entire population will be affected and this could therefore have highly damaging implications both for the overall health of nations and, consequently, for their economies.

There need to be sincerely progressive remedies to facilitate technological evolution in ways which are not damaging to biological systems, and these can only be pursued once the current science is honestly appraised and medically ethical solutions are actively sought. Right here and right now, hard wired alternatives present a safer, sustainable and accessible path forward.

We the undersigned state that the above 'Urgent Action Points' must be addressed immediately by the UK Government and other governments internationally, in order to prevent avoidable human injury, disease, deaths and potentially irreversible environmental damage. Citizens must retain the right not to be exposed against their will. Where prevention of harm may have already failed we also request clear communication to the public regarding who is responsible and liable for health damages. We request a response from Public Health England and Her Majesty's Government to clarify accountability and the measures which will be taken to address the above 'Urgent Action Points' within 28 days of receipt of this communication.

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International Appeal: Scientists call for protection from non-ionizing electromagnetic field exposure

An introduction to the International EMF Scientist Appeal

The current issue of the European Journal of Oncology contains a document the "International EMF Scientist Appeal" (EMFscientist.org) that addresses the concerns of 215 scientists from 40 nations about the adverse health effects on the human population exposed to non-ionizing electromagnetic fields (EMF) from extremely-low frequency to radiofrequency. The Appeal has been submitted to the United Nations, to two of its sub-agencies, the World Health Organization (WHO) and the United Nations Environmental Programme (UNEP), and to all UN Member Nations.

We note that the overall weight of evidence reported in peer-reviewed, scientific studies strongly supports greater precautionary measures be taken to reduce or eliminate EMF exposure.

Coordinating and Advisory Committee for the "International EMF Scientist Appeal" (Martin Blank, Magda Havas, Elizabeth Kelley, Henry Lai, and Joel Moskowitz). We can be reached through Elizabeth Kelley at info@EMFscientist.org.

To: His Excellency Ban Ki-moon, Secretary-General of the United Nations;
Honorable Dr. Margaret Chan, Director-General of the World Health Organization; Honorable Achim Steiner, Executive Director of the U.N. Environmental Programme; U.N. Member Nations

Summary. We are scientists engaged in the study of biological and health effects of non-ionizing electromagnetic fields (EMF). Based upon peer-reviewed, published research, we have serious concerns regarding the ubiquitous and increasing exposure to EMF generated by electric and wireless devices. These include–but are not limited to–radiofrequency radiation (RFR) emitting devices, such as cellular and cordless phones and their base stations, Wi-Fi, broadcast antennas, smart meters, and baby monitors as well as electric devices and infra-structures used in the delivery of electricity that generate extremely-low frequency electromagnetic field (ELF EMF).

Scientific basis for our common concerns

Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being

in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life.

These findings justify our appeal to the United Nations (UN) and, all member States in the world, to encourage the World Health Organization (WHO) to exert strong leadership in fostering the development of more protective EMF guidelines, encouraging precautionary measures, and educating the public about health risks, particularly risk to children and fetal development. By not taking action, the WHO is failing to fulfill its role as the preeminent international public health agency.

Inadequate non-ionizing EMF international guidelines

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.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) established in 1998 the "Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)" (1). These guidelines are accepted by the WHO and numerous countries around the world. The WHO is calling for all nations to adopt the ICNIRP guidelines to encourage international harmonization of standards. In 2009, the ICNIRP released a statement saying that it was reaffirming its 1998 guidelines, as in their opinion, the scientific literature published since that time "has provided no evidence of any adverse effects below the basic restrictions and does not necessitate an immediate revision of its guidance on limiting exposure to high frequency electromagnetic fields (2). ICNIRP continues to the present day to make these assertions, in spite of growing scientific evidence to the contrary. It is our opinion that, because the ICNIRP guidelines do not cover long-term exposure and low-intensity effects, they are insufficient to protect public health.

The WHO adopted the International Agency for Research on Cancer (IARC) classification of extremely low frequency electromagnetic field (ELF EMF) in 2002 (3) and radiofrequency radiation (RFR) in 2011 (4). This classification states that EMF is a *possible human carcinogen (Group 2B)*. Despite both IARC findings, the WHO continues to maintain that there is insufficient evidence to justify lowering these quantitative exposure limits.

Since there is controversy about a rationale for setting standards to avoid adverse health effects, we recommend that the United Nations Environmental Programme (UNEP) convene and fund an independent multidisciplinary committee to explore the pros and cons of alternatives to current practices that could substantially lower human exposures to RF and ELF fields. The deliberations of this group should be conducted in a transparent and impartial way. Although it is essential that industry be involved and cooperate in this process, industry should not be allowed to bias its processes or conclusions. This group should provide their analysis to the UN and the WHO to guide precautionary action.

Collectively we also request that:

1. children and pregnant women be protected;
2. guidelines and regulatory standards be strengthened;
3. manufacturers be encouraged to develop safer technology;
4. utilities responsible for the generation, transmission, distribution, and monitoring of electricity maintain adequate power quality and ensure proper electrical wiring to minimize harmful ground current;
5. the public be fully informed about the potential health risks from electromagnetic energy and taught harm reduction strategies;
6. medical professionals be educated about the biological effects of electromagnetic energy and be provided training on treatment of patients with electromagnetic sensitivity;
7. governments fund training and research on electromagnetic fields and health that is independent of industry and mandate industry cooperation with researchers;

8. media disclose experts' financial relationships with industry when citing their opinions regarding health and safety aspects of EMF-emitting technologies; and
9. white-zones (radiation-free areas) be established.

The list of signatories and their affiliations is available at EMFscientist.org

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The Honorable Elizabeth Warren
United States Senator for Massachusetts
309 Hart Senate Office Building
Washington, DC 20510

Dear Senator Markey and Senator Warren;

A recent Chicago Tribune investigation as well as published research on cell phone radiation has revealed that some of the most popular smartphones being used by consumers today could emit up to 5 to 11 times as much radiation as permitted under current FCC radiation exposure guidelines, despite claims by manufacturers that these phones meet all FCC requirements for safety.[1] [2] ,
These tests have repeatedly found that when phones are tested close to the body, regulatory limits are exceeded. The FCC and FDA have been informed but have not taken action.

Cell phones are not tested the way we use them today, such as in a shirt pocket or touching the body. Instead, the cell phone testing protocol prescribed by the FCC more than two decades ago and still in use today allows a separation distance between the phone and body. This constitutes an unrepresentative and irrelevant user scenario, producing radiation results that are not only inaccurate but also result in untested levels of radiation exposure for consumers. Yet manufacturers are not required to test phones in body contact positions before placing them on the market. Radiation levels of cellphones tested close to the body exceed FCC legal limits.

Considering that the outdated FCC testing protocol is based on the exposure of a 220-pound man, this is especially concerning for children and young adults, who are among the most active users of cell phones. Pediatricians have long called for an update to this outdated cell phone test

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2 Gandhi, O. P. (2019). Microwave Emissions From Cell Phones Exceed Safety Limits in Europe and the US When Touching the Body. IEEE Access, 7, 47050-47052.

method noting that children's cell phone radiation absorption can be 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[1].

We call on you and the Committees of which you are Chairs to conduct immediate hearings on the accuracy, reliability and appropriateness of cell phone safety testing, so that the FCC can update and improve its testing procedures to protect the health and safety of all U.S. citizens.

Jerome A. Paulson, MD, FAAP
Professor Emeritus
of Pediatrics and of Environmental & Occupational Health
George Washington University School of Medicine and Health Sciences and George Washington University Milken Institute School of Public Health

Ron Melnick, PhD
Senior Toxicologist and Director of Special Programs in the Environmental Toxicology Program at the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health, now retired.

David O. Carpenter, MD
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Department of Oncology, Faculty of Medicine and Health,
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President of the french Society of environmental medicine (ISDE-France)

[1] American Academy of Pediatrics, Letter to FCC Commissioner Mignon Clyburn and FDA Commissioner Margaret Hamburg April 29 2013 and American Academy of Pediatrics Letter to the FCC, July 12, 2012.

Executive director of the European Cancer and Environment Research Institute (ECERI), Brussels

Cindy Russell MD
Physicians for Safe Technology

Tori Jetler MD

Devra L. Davis PhD, MPH
President, Environmental Health Trust
Visiting Professor of Medicine, Hebrew University Hadassah Medical Center

Patricia J Wood
Executive Director
Grassroots Environmental Education
Visiting Scholar, Adelphi University College of Nursing and Public Health

Theodora Scarato
Executive Director, Environmental Health Trust

L. Lloyd Morgan
Senior Science Fellow, Environmental Health Trust

September 27, 2019

The Honorable Anna Eshoo
United States Representative for California
202 Cannon House Office Building
Washington, D.C. 20515

Dear Representative Eshoo;

A recent Chicago Tribune investigation as well as published research on cell phone radiation has revealed that some of the most popular smartphones being used by consumers today could emit up to 5 to 11 times as much radiation as permitted under current FCC radiation exposure guidelines, despite claims by manufacturers that these phones meet all FCC requirements for safety.[1] [2],
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HARVARD MEDICAL SCHOOL

Martha R. Herbert, Ph.D., M.D.
Assistant Professor, Neurology
Director, TRANSCEND Research Program
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MASSACHUSETTS GENERAL HOSPITAL

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9 September 2016

District Office
200 Douglas Street
Petaluma, California 94952

Dear Petaluma City School District,

I am a pediatric neurologist and neuroscientist on the faculty of Harvard Medical School and on staff at the Massachusetts General Hospital. I am Board Certified in Neurology with Special Competency in Child Neurology, and Subspecialty Certification in Neurodevelopmental Disorders. I have an extensive history of research and clinical practice in neurodevelopmental disorders, particularly autism spectrum disorders. I have published papers in brain imaging research, in physiological abnormalities in autism spectrum disorders, and in environmental influences on neurodevelopmental disorders such as autism and on brain development and function.

A few years ago I accepted an invitation to review literature pertinent to a potential link between Autism Spectrum Disorders and Electromagnetic Frequencies (EMF) and Radiofrequency Radiation (RFR). I set out to write a paper of modest length, but found much more literature than I had anticipated to review. I ended up producing a 60 page single spaced paper with over 550 citations. It is available at http://www.bioinitiative.org/report/wpcontent/uploads/pdfs/sec20_2012_Findings_in_Autism.pdf and it was published in a revised and somewhat shortened form in two parts in the peer reviewed indexed journal Pathophysiology (2013).

More recently I published an article entitled “Connections in Our Environment: Sizing upElectromagnetic Fields,” in Autism Notebook Spring 2015 edition. In this article I describe how here is a whole series of problems at the cellular, sub-cellular and metabolic levels and immune levels that have been identified in autism. And interestingly, for every single one of those problems, there’s literature about how EMFs can create those kinds of problems.

The argument I made in these articles is not that EMF is proven to cause autism, but rather, that EMF can certainly contribute to degrading the physiological integrity of the system at the cellular and molecular level – and this in turn appears to contribute to the pathogenesis/causation not only of autism but of many highly common chronic illnesses, including cancer, obesity, diabetes and heart

UNIVERSITY AT ALBANY
State University of New York

Institute for Health and the Environment
WHO Collaborating Center in Environmental Health

12 September 2017

All School Board Members
Hempfield School District

Dear Sirs/Madams:

I am a public health physician who has been involved in issues related to electromagnetic fields (EMFs) for several decades. I served as the Executive Secretary for the New York Powerline Project in the 1980s, a program of research that showed that children living in homes with elevated magnetic fields coming from powerlines suffered from an elevated risk of developing leukemia. After that project was completed I served as the spokesperson for New York State on issues related to both power line and radiofrequency EMFs. I served as Director of the Wadsworth Laboratory of the New York State Department of Health, as well as Dean of the School of Public Health at the University at Albany/SUNY. I have edited two books on effects of EMFs, ranging from low frequency fields to radiofrequency/ microwave radiation, or the kind emitted by WiFi routers, cell phones, neighborhood antennas or cell towers and wireless computer equipment. I served as the co-editor of the BioInitiative Report 2012 (Bioinitiatve.org), a comprehensive review of the literature showing biological effects at non-thermal levels of exposure, much of which has since been published in the peer-reviewed journal, *Pathophysiology* (attached). Also, I served on the President's Cancer Panel that examined radiation exposures as they relate to cancer risk, in 2009. Thus, this is a subject which I know well, and one on which I take a public health approach rooted in the fundamental principle of the need to protect against risk of disease, even when one may not have all the information that would be desirable.

There is clear and strong evidence that intensive use of cell phones increases the risk of brain cancer, tumors of the auditory nerve and cancer of the parotid gland, the salivary gland in the cheek by the ear. The WHO's International Agency for Research on Cancer has classified the radiation from both cell phones and cell towers as a Class 2B "Possible Carcinogen" in 2011. Cell towers use similar radio-frequency radiation as cell phones (in the 1.8 to 5.0 GHz range). The difference between a cell phone and a cell tower environment, however, is that while the cell phone is used only intermittently, and at higher power, a cell tower environment is continuous, serving many people at the same time. Cell towers direct their beam in all directions, such that anyone nearby is continuously exposed to radiofrequency radiation. While the intensity is much less than one would receive holding a cell phone to your head, the emissions from a cell tower are continuous. Thus the aggregate exposure over time coming from being close to a cell tower can be very significant. A child in a school with a nearby cell tower will be exposed every moment he or she is at school. Thus there is a particular concern when a cell tower is place near to a school.

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disease.. Please see this article on page 24-25 at the linkhttp://virtualpublications.soloprinting.com/publication/?i=252361

In fact, there are thousands of papers that have accumulated over decades –and are now accumulating at an accelerating pace, as our ability to measure impacts become more sensitive – that document adverse health and neurological impacts of EMF/RFR. Children are more vulnerable than adults, and children with chronic illnesses and/or neurodevelopmental disabilities are even more vulnerable. Elderly or chronically ill adults are more vulnerable than healthy adults.

Current technologies were designed and promulgated without taking account of biological impacts other than thermal impacts. We now know that there are a large array of impacts that have nothing to do with the heating of tissue. The claim from WiFi proponents that the only concern is thermal impacts is now definitively outdated scientifically.

Radiofrequency electromagnetic radiation from WiFi and cell towers can exert a disorganizing effect on the ability to learn and remember, and can also be destabilizing to immune and metabolic function. This will make it harder for some children to learn, particularly those who are already having learning or medical problems in the first place. And since half of the children in this country have some kind of chronic illness, this means that a lot of people are more vulnerable than you might expect to these issues.

Powerful industrial entities have a vested interest in leading the public to believe that EMF/RFR, which we cannot see, taste or touch, is harmless, but this is not true. Please do the right and precautionary thing for our children.

I urge you to opt for wired technologies in Petaluma City School District classrooms, particularly for those subpopulations that are most sensitive. It will be easier for you to make a healthier decision now than to undo misguided decisions later.

Thank you.

Sincerely yours,

Martha Herbert, PhD, MD

ARIEL UNIVERSITY

September 08, 2017

The Honorable Jerry Brown
Governor, State of California
c/o State Capitol, Suite 1173
Sacramento, CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities

Honorable Governor Brown,

I have recently learned of proposed Bill SB 649 regarding the streamlining of small cell wireless facilities.

As a member of the Physics department of Ariel University, and before that the Hebrew University of Jerusalem, I have studied the subtle effects of electromagnetic radiation on biology and biological materials. I have published more than 50 articles in the field of Dielectrics (the study of the interaction of materials with radio waves), including many on the interaction of cellular frequencies with biological materials such as proteins and blood. My last article investigated the interaction of 5G electromagnetic radiation with human skin.[1] One could argue that I have a certain amount of expertise.

In light of our work and a growing number of publications showing the frequency range of 5G can have serious biological effects, we believe that current efforts to accelerate the implementation of 5G should be delayed until additional studies are made to assess the critical impact on human health.

It is not for me to lecture to elected officials on how cities should develop technologically, nor is it for me to try and stop the juggernaut that is the cellular industry. However, I would like to point out to you important information on the possible public health implications of the explosion in unregulated cellular phone and wireless device use.

The term "health" has never featured too heavily in the lexicon of the Cellular Industry. It has been assumed, conveniently, that any possible effects on the human anatomy from the use of cell phones would be only mild heating. And that this is something that the body could easily deal with. As a consequence, the governing safety limits were set in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) based on the premise that if radiofrequency radiation limits protected human tissue from overheating, then the public was adequately protected. They considered that the effect to humans would at most cause the agitation of water inside cellular tissues that would dissipate as heat, similar to what a microwave oven does, but at far lower energies.

The trouble is that our knowledge has progressed in the last 19 years and we now understand that the interaction of microwave energy and our tissues is far more subtle. There is increasing evidence of non-thermal biological consequences arising from our interaction with cellular phone radiation. A few examples; in 2014 a team from the University of Exeter, UK published a report linking the effect of

[1] Betzalel, Noa, Yuri Feldman and Paul Ben Ishai. "The Modeling of the Absorbance of Sub-THz Radiation by Human Skin." *IEEE Transactions on Terahertz Science and Technology* PP.99 (2017): 1-9. doi: 10.1109/TTHZ.2017.2736345.

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Ariel 40700, Israel

cellular phones on declining sperm quality.[2] They based their research on over 1492 subjects from around the world. In 2009, Columbia University showed that radio frequencies were leading to stress in living cells.[3] This in turn seriously affects their ability to perform, as particular cellular pathways were disrupted. Further evidence along this direction was provided by a group from the University of Rennes.[4] I can add plenty more examples, but I think that it is summed up by a recent public announcement. Advisors to the World Health Organization International Agency for Research on Cancer (WHO/IARC), themselves well versed in radio frequencies and in cancer, have publicly stated that evidence has been met to classify cellular radiation as meeting scientific criteria for a Group 1 carcinogenic agent to humans.[5,6]

As I said above, it is not my job and neither is it realistic for me to stop the placing of thousands of antennas throughout your state. But it is my job to point out the health hazard to you before you make such a momentous decision.

Yours sincerely

Dr. Paul Ben Ishai
Department of Physics
Ariel University

CC
Tom Dyer, Chief Deputy Legislative Affairs Secretary

[2] Adams, J.A., et al. "Effect of mobile telephones on sperm quality: a systematic review and meta-analysis." *Environment International* 70 (2014): 106-12. doi: 10.1016/j.envint.2014.04.015.

[3] Blank, M. and R. Goodman. "Electromagnetic fields stress living cells." *Pathophysiology* 16.2-3 (2009): 71-8. doi: 10.1016/j.pathophys.2009.01.006.

[4] Habauzit, Denis, et al. "Transcriptome analysis reveals the contribution of thermal and the specific effects in cellular response to millimeter wave exposure." *PloS One* 9.10 (2014): e109435.

doi: 10.1371/journal.pone.0109435

[5] "Cancer Expert Declares Cell Phone and Wireless Radiation As Carcinogenic to Humans." Environmental Health Trust (2017). https://ehtrust.org/cancer-expert-declares-cell-phone-wireless-radiation-carcinogenic-humans/

[6] Carlberg, Michael and Lennart Hardell. "Evaluation of Mobile Phone and Cordless Phone Use and Glioma Risk Using the Bradford Hill Viewpoints from 1965 on Association or Causation." BioMed Research International 2017 (2017): 9218486. doi: 10.1155/2017/9218486.

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June 26, 2017

The Honorable Cecilia Agular-Curry, Chair
Assembly Local Gov't Commission
Room 157, 1020 N Street
Sacramento, CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities - -OPPOSE

Dear Chair Agular-Curry:

Environmental Working Group (EWG) opposes SB 649 by Senator Hueso. This bill would make the installation of small cell wireless facilities, such as those used to facilitate 5G networks, ministerial rather than discretionary at the local government level.

The health impacts of cellular transmissions have been debated more and more passionately the last ten years because there are studies that raise real concerns about the effects of radio frequency (RF) energy or radiation on humans. This is why EWG sponsored two bills by former Senator Leno (SB 1212 in 2010 and SB 932 in 2011) that would have required sellers of cell phones to inform consumers that minimizing exposure to cell phone radiation is prudent and in fact recommended by cell phone manufacturers in their included manuals.

Studies on the health impacts of cell phones and their transmission infrastructure are continuing. As new information becomes available, local government ought to be able to use it to help guide their decision-making, including locational issues such as proximity to homes, school, and hospitals. EWG believes that allowing cities and counties to weigh the potential impacts of transmission networks before permits are issued for their construction is essential and SB 649 would prevent them from doing so. And, if more definitive health concerns arise, state law would have to be changed in order to give local governments the flexiblity to do their due diligence.

For these reasons, we must oppose SB 649 and urge a "no" vote in the Local Government Committee.

Sincerely,

Bill Allayaud

Bill Allayaud
California Director of Government Affairs
Environmental Working Group

cc: Senator Hueso

Alliance of Nurses for Healthy Environments

June 26, 2017

The Honorable Cecilia Agular-Curry,
Chair Assembly Local Gov't Commission
Room 157, 1020 N Street Sacramento,
CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities - - OPPOSE

Dear Chair Agular-Curry:

I am a Professor of Public Health at the University of San Francisco and a Board Member of the national Alliance of Nurses for Healthy Environments. I am very concerned about moving forward with expanding the use of small-scale wireless technologies at the same time that there is mounting evidence of the potential for health risks from the associated radio frequency energy and radiation, particularly to children. The Alliance of Nurses for Healthy Environments ascribes to the precautionary principle as it applies to human health. We firmly believe that early warnings in the scientific literature should be heeded and that our policy development should reflect the synthesis of the best and latest scientific evidence.

At this point in time, we oppose SB 649 and believe that we need an exhaustive review of the science before we allow significant expansion of small cell wireless facilities, such as those to facilitate 5G networks. The results of the literature review should inform our policies. We must be sure that vulnerable populations such as pregnant women and young children will not be unduly harmed from their proximity to unnecessary radio frequency energy. It is important that we continue to examine what constitutes a safe distance and how we can continue to pivot when more information becomes available. We are concerned that the passage of SB 649 will entrench us in a policy for which we have insufficient assurances and which, if passed, will require the burden of effort to reverse.

For these reasons, we oppose SB 649 and urge a "no" vote in the Local Government Committee.

Thank you for considering our concerns.

Sincerely,

Barbara Sattler, RN, MPH, DrPH, FAAN
Board Member

Columbia University, College of Physicians and Surgeons
Department of Physiology and Cellular Biophysics

Board Member
Los Angeles Unified School District,
Board of Education

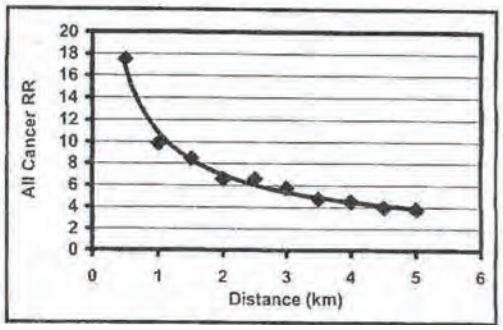
Re: Health effects of cell tower radiation

As an active researcher on biological effects of electromagnetic fields (EMF) for over twenty five years at Columbia University, as well as one of the organizers of the 2007 online Bioinitiative Report on the subject, I am writing in support of a limit on the construction of cell towers in the vicinity of schools.

There is now sufficient scientific data about the biological effects of EMF, and in particular about radiofrequency (RF) radiation, to argue for adoption of precautionary measures. We can state unequivocally that EMF can cause single and double strand DNA breakage at exposure levels that are considered safe under the FCC guidelines in the USA. As I shall illustrate below, there are also epidemiology studies that show an increased risk of cancers associated with exposure to RF. Since we know that an accumulation of changes or mutations in DNA is associated with cancer, there is good reason to believe that the elevated rates of cancers among persons living near RF towers are probably linked to DNA damage caused by EMF. Because of the nature of EMF exposure and the length of time it takes for most cancers to develop, one cannot expect 'conclusive proof' such as the link between helicobacter pylori and gastric ulcer. (That link was recently demonstrated by the Australian doctor who proved a link conclusively by swallowing the bacteria and getting the disease.) However, there is enough evidence of a plausible mechanism to link EMF exposure to increased risk of cancer, and therefore of a need to limit exposure, especially of children.

EMF have been shown to cause other potentially harmful biological effects, such as leakage of the blood brain barrier that can lead to damage of neurons in the brain, increased micronuclei (DNA fragments) in human blood lymphocytes, all at EMF exposures well below the limits in the current FCC guidelines. Probably the most convincing evidence of potential harm comes from living cells themselves when they start to manufacture stress proteins upon exposure to EMF. The stress response occurs with a number of potentially harmful environmental factors, such as elevated temperature, changes in pH, toxic metals, etc. This means that ***when stress protein synthesis is stimulated by radiofrequency or power frequency EMF, the body is telling us in its own language that RF exposure is potentially harmful.***

There have been several attempts to measure the health risks associated with exposure to RF, and I can best summarize the findings with a graph from the study by Dr. Neil Cherry of all childhood cancers around the Sutro Tower in San Francisco between the years 1937 and 1988. Similar studies with similar results were done around broadcasting antennas in Sydney, Australia and Rome, Italy, and there are now studies of effects of cellphones on brain cancer. The Sutro tower contains antennas for broadcasting FM (54.7 kW), TV (616 kW) and UHF (18.3 MW) signals over a fairly wide area, and while the fields are not uniform, and also vary during the day, the fields were measured and average values estimated, so that one could associate the cancer risk with the degree of EMF exposure.



The data in the figure are the risk ratios (RR) for a total of 123 cases of childhood cancer from a population of 50,686 children, and include a 51 cases of leukaemia, 35 cases of brain cancer and 37 cases of lymphatic cancer. It is clear from the results that the risk ratio for all childhood cancers is elevated in the area studied, and while the risk falls off with radial distance from the antennas, as expected, it is still above a risk ratio of 5 even at a distance of 3km where the field was 1μW/cm^2. This figure is what we can expect from prolonged RF exposure. In the Bioinitiative Report, we recommended 0.1μW/cm^2 as a desirable precautionary level based on this and related studies, including recent studies of brain cancer and cellphone exposure.

As I mentioned above, many potentially harmful effects, such as the stress response and DNA strand breaks, occur at nonthermal levels (field strengths that do not cause a temperature increase) and are therefore considered safe. It is obvious that the safety standards must be revised downward to take into account the nonthermal as well as thermal biological responses that occur at much lower intensities. Since we cannot rely on the current standards, it is best to act according to the precautionary principle, the approach advocated by the European Union and the scientists involved in the Bioinitiative report. In light of the current evidence, the precautionary approach appears to be the most reasonable for those who must protect the health and welfare of the public and especially its most vulnerable members, children of school-age.

Sincerely yours,

Martin Blank, Ph.D.
Associate Professor of Physiology and Cellular Biophysics

Karolinska Institutet
Department of Neuroscience
Experimental Dermatology Unit

Stockholm, December 8, 2015

To:
MCPS CEO Dr. Andrew Zuckerman [Andrew_Zuckerman@mcpsmd.org]
MCPS Superintendent Mr. Larry Bowers [Larry_Bowers@mcpsmd.org]
MCPS Chief Technology Officer Mr. Sherwin Collette [Sherwin_Collette@mcpsmd.org]
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cc:
Montgomery County Council [county.council@montgomerycountymd.gov]

Dear Madame or Sir,

My name is Olle Johansson, and I am an associate professor, heading the Experimental Dermatology Unit at Sweden's Karolinska Institute in the Department of Neuroscience. I understand you have recently made public pronouncements regarding the safety of Wi-Fi. As a neuroscientist who has been studying the biophysical and epidemiological effects of electromagnetic fields (EMFs) for over 30 years, I believe this designation is short-sighted.

Wireless communication is now being implemented in our daily life in a very fast way. At the same time, it is becoming more and more obvious that the exposure to electromagnetic fields not only may induce acute thermal effects to living organisms, but also non-thermal effects, the latter often after longer exposures. This has been demonstrated in a very large number of **non-ionizing radiation** studies and includes cellular DNA-damage, disruptions and alterations of cellular functions like increases in intracellular stimulatory pathways and calcium handling, disruption of tissue structures like the blood-brain barrier, impact on vessel and immune functions, and loss of fertility. Whereas scientists can observe and reproduce these effects in controlled laboratory experiments, epidemiological and ecological data derived from long-term exposures in well-designed case-control studies reflect this link all the way from molecular and cellular effects to the living organism up to the induction and proliferation of diseases observed in humans. It should be noted that we are not the only species at jeopardy; practically all animals, plants and bacteria may be at stake. Although epidemiological and ecological investigations as such never demonstrate causative effects, due to the vast number of confounders, they confirm the relevance of the controlled observations in the laboratories.

Many times since the early 1980s I have pointed out that the public's usage of cell phones has become the largest full-scale biological and medical experiment ever with mankind, and I was also the first person to firmly point out that this involuntary exposure violates the Nuremberg Code's principles for human experimentation, which clearly states that voluntary

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consent of human subjects is absolutely essential. Among many effects seen, the very serious one is the deterioration of the genome. Such an effect - if seen in a food item under development or in a potential pharmaceutical drug - immediately would completely ban it from further marketing and sale; genotoxic effects are not to be allowed or spread. For these reasons above, we, scientists, can not accept that children undergo an enormous health risk for their present and future, by being exposed to WI-FI in kindergardens or schools (even if the WI-FI masts/routers are not in the children's classroom). The precautionary principle has to be respected. Furthermore, when men place cell phones in their front pocket, or laptops on their laps, it should be noted that experimental studies have demonstrated that after similar exposures there is a decrease in sperm count as well as in the quality of sperm, which is a phenomenon that could affect society's overall ability to procreate in the future. Experiments in mice point to that it may be true already in 5 generations time.

Many other states including France, Russia, Israel and Germany, have employed various precautionary steps and their responses (including labelling cell phones and other transmitting devices with SAR ratings, discouraging the use of cell phones and other wireless gadgets by children, warning parents of the risks, and removing or restricting WiFi in schools and replacing it with hard-wired ethernet) as a result of the *WHO/IARC classification of radiofrequency electromagnetic radiation in 2011 as a Class 2B carcinogen as well as the earlier classification of power-frequent magnetic fields in 2001 also as a Class 2B carcinogen*, the information summarized in the Bioinitiative Reports of 2007 and 2012, and the other considerable international and independent research and reviews, that show adverse biological effects from electromagnetic fields, including heart palpitations, headaches, skin rashes, damage to DNA, mental health effects, impaired concentration, decreased problem-solving capacity, electrohypersensitivity, etc., are about to set a new standard for educational quality with due respect to children's and staff's health.

In the case of "protection from exposure to electromagnetic fields", it is thus of paramount importance to act from a prudence avoidance/precautionary principle point of view. Anything else would be highly hazardous. Total transparency of information is the key sentence here, as I believe the public does not appreciate having the complete truth revealed years after a certain catastrophe already has taken place. For instance, it shall be noted, that today's recommended values for wireless systems, such as the SAR-values, are just recommendations, and not safety levels. Since scientists observe biological effects at as low as 20 microWatts/kg, can it truly be stated that it is safe to allow irradiation of humans at SAR 2 W/kg, or at 100,000 times stronger levels of radiation?

IMBALANCED REPORTING

Another misunderstanding is the use of scientific publications (as the tobacco industry did for many years) as 'weights' to balance each other. But one can NEVER balance a report showing a negative health effect with one showing no effect. This is a misunderstanding which, unfortunately, is very often used both by the industrial representatives as well as official authorities to the detriment of the general public. True balance would be reports showing negative health effects against *exact replications* showing no or positive effects. However, this is not what the public has been led to believe.

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NEED FOR INDEPENDENT RESEARCH

In many commentaries, debate articles and public lectures - for the last 20-30 years – I have urged that completely independent research projects must be inaugurated immediately to ensure our public health. These projects must be entirely independent of all types of commercial interests; public health can not have a price-tag! It is also of paramount importance that scientists involved in such projects must be free of any carrier considerations and that the funding needed is covered to 100%, not 99% or less. This is the clear responsibility of the democratically elected body of every country.

WHO/INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC), 2011

Very recently (in Lyon, France, May 31, 2011) the WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency electromagnetic fields as possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer. This should be added to the previous (2001) 2B classification of power-frequent (ELF) electromagnetic fields – emitted at high levels from handheld gadgets, such as eReaders and mobile phones – as a risk factor for childhood leukemia. Given the 2001 very close votes (9 to 11) for moving it to 2A and all the new knowledge that has accumulated since 2001, today the association between childhood leukemia and power-frequent (ELF) electromagnetic fields would definitely be signed into the much more serious 2A ("probably carcinogenic") category. So, the 'red flag' is – unfortunately – flying very high.

INVOLUNTARY EXPOSURE

According to Article 24 of the UNICEF's Child Convention "children have the right to … a clean and safe environment, and information to help them stay healthy". We must all ensure that this article never is violated. This is about our social responsibility, and is very much a public health issue.

In summary, electromagnetic fields may be among the most serious and overlooked health issues today, and having these fields checked and reduced/removed from schools and kindergardens may be essential for health protection and restoration, and is a must for persons with the functional impairment electrohypersensitivity as for children who are more fragile (cf. Belyaev I, Dean A, Eger H, Hubmann G, Jandrisovits R, Johansson O, Kern M, Kundi M, Lercher P, Mosgöller W, Moshammer H, Müller K, Oberfeld G, Ohnsorge P, Pelzmann P, Scheingraber C, Thill R, "EUROPAEM EMF Guideline 2015 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses", Rev Environ Health 2015; 30: 337–371). In addition, as recently discussed in a think-tank group here in Stockholm, it is very important to constantly educate oneself and participate in the general debate and public discussions to keep the information build-up active. Thus, it is of paramount importance to keep the "kettle boiling", never blindly trusting or accepting given 'facts', but only read and think for yourself and for your loved ones. Only so you can arrive at a genuinely working precautionary principle.

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The latency for development of cancer after exposure to radiofrequency radiation is long, often up to 20 years for brain cancer. Thus the effects of exposing children will not be seen immediately but they will be elevated risk of cancer for many years to come.

Unfortunately cancer is not the only disease of concern. Radiofrequency electromagnetic fields are well documented to reduce male fertility. The last thing one wants for boys in an elementary school is to have them grow up and not be able to reproduce. Furthermore and more immediately there is increasing recognition of the fact that some people, including children, are exceptionally sensitive to electromagnetic fields, and show the syndrome of electro-hypersensitivity. This is characterized by headache, 'brain fog' and reduced ability to learn, often accompanied by nausea and gastrointestinal and cardiovascular symptoms. This is certainly not something that one wants to have occur, even if only in some students, in a school where they come to learn.

Placement of cell towers should be as far as possible from any place where humans are present. Certainly having a cell tower near to an elementary school is dangerous to the health of every child attending the school.

Yours sincerely,

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4 August, 2016

Dear Petaluma City Schools;
Superintendent Gary Callahan and Board of Trustees

Regarding: Wireless technology should not be used in schools or pre-schools due to health risks for children and employees

We have been asked to declare our opinion about wireless technology in schools by parents that are concerned about their children.

Based on current published scientific studies, we urge your administration to educate themselves on the potential risks from wireless technologies in schools, and to choose wired teaching technologies. The well-being and educational potential of children depends on it.

High-speed connectivity to schools is important but it can be a wired connection instead of Wi-Fi. Wireless classroom infrastructure and wireless devices for schoolchildren should be avoided for these reasons:

- Wireless radiofrequency (RF) radiation emissions were classified as a Possible Human Carcinogen (group 2B) by the World Health Organization International Agency for Research on Cancer (IARC) in May 2011. One of the signers, Dr Hardell, was part of the evaluation group.
- The IARC classification holds for *all forms of radio frequency radiation* including RF-EMF emissions from wireless transmitters (access points), tablets and laptops.
- Epidemiological studies show links between RF radiation exposure and cancer, neurological disorders, hormonal changes, symptoms of electrical hypersensitivity (EHS) and more. Laboratory studies show that RF radiation exposure increases risk of cancer, abnormal sperm, learning and memory deficits, and heart irregularities. Foetal exposures in both animal and human studies may result in altered brain development in the young offspring, with disruption in learning, memory and behaviour.
- Recently a report was released from The National Toxicology Program (NTP) under the National Institutes of Health (NIH) in USA on the largest ever animal study on cell phone RF radiation and cancer (http://biorxiv.org/content/biorxiv/early/2016/05/26/055699.full.pdf). An increased incidence of glioma and malignant schwannoma in the heart was found. Interestingly our research group and others have in epidemiological studies shown that persons using wireless phones (both mobile phones and cordless phones; DECT) have an increased risk for glioma and acoustic neuroma. Acoustic neuroma or vestibular schwannoma is the same type of tumour as the one found in the heart, although benign.
- The research showing increased brain cancer risk in humans *has strengthened* since the IARC 2011 classification as new research has been published which repeatedly shows a significant association after RF radiation exposure. In addition, tumour

promotion studies have now been replicated showing cancer promotion after exposures at low levels.

- It is our opinion and that of many colleagues that the current IARC cancer risk classification should move to an *even higher* risk group. The carcinogenic effect has been shown in human and animal studies. Several laboratory studies have shown mechanistic effects in carcinogenesis such as oxidative stress, down regulation of mRNA, DNA damage with single strand breaks.
- In summary RF radiation should be classified as Carcinogenic to Humans, Group 1 according to the IARC classification. This classification should have a major impact on prevention.

The evidence for these statements is based on hundreds of published, peer-reviewed scientific studies that report adverse health effects at levels much lower than current ICNIRP and FCC public safety limits. Compliance with government regulations does not mean that the school wireless environment is safe for children and staff (especially pregnant staff).

As researchers in cancer epidemiology and RF radiation exposures, we have published extensively in this area and it is our opinion that schools should choose wired Internet connections. Multiple epidemiological research studies show that exposures equivalent to 30 minutes a day of cell phone use over ten years results in a significantly increased brain cancer risk.

What will be the health effect for a child exposed all day long in school for 12 years? Wireless networks in schools result in full body low level RF radiation exposures that can have a cumulative effect on the developing body of a child. No safe level of this radiation has been determined by any health agency and therefore we have no safety assurances. Cancers can have long latency periods (time from first exposure until diagnosis) and it will take decades before we know the full extent of health impacts from this radiation. The statistics and effects will be borne by the children you serve.

Wi-Fi in schools, in contrast to wired Internet connections, will increase risk of neurologic impairment and long-term risk of cancer in students. Promoting wireless technology in schools disregards the current health warnings from international science and public health experts in this field.

We recommend that your school district install wired Internet connections and develop curriculum that teaches students at all ages safer ways to use their technology devices. If cell phones and other wireless devices are used in the school curriculum (as many schools are now doing with Bring your Own Device Policy) then there should be educational curriculum in place and well posted instructions in classrooms so that the students and staff use these devices in ways that reduce exposure to the radiation as much as possible.

Supporting wired educational technologies is the safe solution in contrast to potentially hazardous exposures from wireless radiation.

Respectfully submitted

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CONCLUSION

In conclusion, wireless systems, such as Wi-Fi routers or cell towers, and their electromagnetic fields, can not be regarded as safe in schools, but must be deemed highly hazardous and unsafe for the children as well as for the staff.

I encourage governments and local health and educational bodies to adopt a framework of guidelines for public and occupational EMF exposure that reflect the Precautionary Principle. As noted, the Precautionary Principle states when there are indications of possible adverse effects, though they remain uncertain, the risks from doing nothing may be far greater than the risks of taking action to control these exposures. The Precautionary Principle shifts the burden of proof from those suspecting a risk to those who discount it — as some nations have already done. Precautionary strategies should be based on design and performance standards and may not necessarily define numerical thresholds because such thresholds may erroneously be interpreted as levels below which no adverse effect can occur.

Some 100 years back, we learned the hard lessons of ionizing radiation and the need for strict health protections – now we must openly face the possibility that we must take a seat in life's school and learn again. This time it is about non-ionizing radiation.

Based on all of the above, I strongly urge you to reconsider your public stance on the safety of Wi-Fi, cell towers, and similar systems in schools as their non-ionizing radiation emissions very likely are hazardous and unsafe for students, staff and teachers.

With my very best regards
Yours sincerely
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A summary of current U.S. and international regulations on microwaves related to cell towers

Prepared By
Dr. Joshua Dennis Booth, PhD
July 2017

I am writing this report as a knowledgeable voice for the School Board, parents, and residents of the East Hempfield school district with regard to the placement of cellular towers at Rohrerstown Elementary School and Centerville Middle School. My knowledge comes from my experience with EMP-Microwave radiation, as outlined in the Personal Background section at the end of this document. I'm also a resident of the Hempfield School District community: both a parent concerned about health issues and a homeowner concerned about property value. The numbers used here for comparison are those given for the Rohrerstown Elementary Tower at the zoning board hearing on June 19th, 2017. This report is outlined as follows. First, I give an overview of the current U.S. laws and agencies related to microwaves, cellular tower, and other common microwave devices. Second, I provide an overview of non-U.S. laws related to microwaves. The second section serves to demonstrate the most important message of this report by showing the outdated nature of U.S. regulation, and why we should be concerned about these towers being at the distance and magnitude that is being proposed by the tower's developers.

Section 1, Background, Current U.S. regulation for key microwave devices.
In this section, I provide background about both microwaves in general and cell technology. Microwaves are electromagnetic waves that vary in frequency between 300 MHz (i.e., near Radio) to 300 GHz (i.e., near infrared). At ~70-100 MHz the body maximally absorbs energy and at 3,000 MHz the energy is concentrated at the body surface. This is why there are regulations about things like radio towers but not standard household lights. Cell towers use frequency between 900MHz to 1900MHz. These waves can also vary in strength too, and this is the real issue that will be addressed in the report. In order to accommodate these variables, a measurement of power density is often used. Here, we will use the units of uw/cm2 for all examples as this is the unit given to use by the cellular tower developers, though other areas use other units. Note, the Federal Communication Commission (FCC), which is responsible for microwave regulation in the US, uses a different unit of mw/cm2 for their Maximum Permissible Exposure (MPE)[1]. Their proposed tower will have a power density of a maximum of 3.6uw/cm2. I note as someone that has done the calculations myself that this maximum is slightly higher than what most likely will be the power density on day one. This view was also shared by the cell tower developers at the zoning hearing. However, this density may increase in the future without notice if they sell broadcasting to other cell vendors or place higher wattage/gain equipment. More importantly, the **duration of exposure** is one of the largest issues up for debate in research. For students, this would be the whole time they are on campus for class and activities: seven school years, from K to 6th grade.

Let us first address the FCC and the current standards set forth by the FCC for cellular towers. The FCC is an independent agency formed in 1934 to regulate interstate communications. The FCC is funded entirely by regulatory fees paid by radio, cell, cable, television, and satellite companies for access to certain bandwidth in areas [4]. They have most notably been in the news

of late because of concerns of net neutrality in which internet companies may sell user's data. The only health concerns they regulate are those related to radio waves. The first standards were issued by the nonprofit American National Standards Institute (ANSI) in 1982. This was one year before the first commercially available cell phone was approved by the FCC in 1983. It took until 1985, when the FCC finally adopted the ANSI standard of 1982. This standard was issued in a maximum absorption of 4Watts/kilogram. In 1992, ANSI/IEEE revised the 1982 standards. These revisions considered a larger frequency and restricted environmental radio frequency exposure. They also added the concepts of "controlled" and "uncontrolled" environments. Here the "controlled" is a location where "there is exposure that may be incurred by persons who are aware of the potential for exposure…" (e.g., work environments) [5]. More important, they started to consider the duration of a single exposure: the "controlled" being an average of 6 minutes and "uncontrolled" being an average of 30 minutes. Note they do not make mention of time between these exposures but only the average exposure for a length of time. Though the FCC was given notice of these changes in 1992, the FCC only made full requirements in mid 1996. These standards state that the "controlled" power density in the 30-300 MHz should be less than 1,000 uW/cm2. The "uncontrolled" standard is 200 uW/cm2 [5]. Cell towers must only follow the "controlled" standard as they are a known structure that can be avoided [5]. Though groups have lobbied to change this standard, **the standard has not been updated for the past twenty-one years**. One government agency that has spoken up about this is the United States Department of Interior. This department wrote a formal letter in 2014 pointing out that the FCC regulation is outdated, and the department believes that the frequency limits are already having a negative impact on animals in the environment [8]. Recent updates to the FCC consumer website recommend MPE be 580 uW/cm2, but this value has not been updated in their human exposure manuals [3].

Microwaves have transformed the way we live in today's world, and cell technology is only one area in which microwave research is being conducted and regulated. Therefore, it makes sense to understand microwaves being regulated and studied in other areas, e.g., microwave ovens, full body airport scanners, and WiFi routers.

Microwaves were first researched by the radiation given off of vacuum tubes, and were aimed at radar search. By chance, an engineer named Percy Spencer working for Raytheon Corporation was exposed without knowing possible side effects to microwaves. The microwaves ended up melting food in his pocket, and the microwave oven was born. Years after the first microwave ovens were made available for use, the Radiation Control for Health and Safety Act of 1968 limited the amount of microwaves that could leak from the device to 10,000 uW/cm2 at 5cm (~1.97 inches) away from the oven. Two years later, this was reduced to 1,000 uW/cm2 at 5cm by the U.S. Bureau of Radiological Health (i.e., a limit similar to FCC's human exposure manual), and only 5,000 uW/cm2 over the device's whole lifespan [9] (up to 10 years)! This lifespan limit is only three years greater than what a student would be exposed to over the whole time from grades K-6. In fact, **the power density of the proposed Rohrerstown Elementary campus tower would be similar to having a child sit at about 12 feet away from a running 600 Watt Microwave oven all day, every school day for seven years**. However, we should note that the frequency of a microwave oven is much higher, i.e., about 2450 MHz.

Body scanners at airports are the most recent area where microwaves have cropped up in daily life. Most of the first-generation body scanners were "back-scatter" type that used low dose of x-rays [10,11]. These have actively been replaced by new millimeter scanners that use microwaves. These new millimeter scanners expose the person to approximately .01uW/cm2 to .6 uW/cm2 at various frequencies inside the microwave frequency spectrum for less than 6 seconds [11]. Despite the very low exposure and removal of detailed body images, passengers may opt for a pat-down, and **young children are not required to be scanned**. This demonstrates TSA wanting to take reasonable health precautions for the general public.

The most common place where we find microwaves is as radiation from WiFi routers. These devices are located in almost all places from coffee shops to doctor offices. Currently, the only regulation that the FCC has placed on such devices is a maximum strength as not to disrupt others and not allowing for signal blockers[1,2]. These devices have frequency 2400 MHz band that is close to a microwave oven. Note that this is why your microwave oven may interrupt your WiFi router at times. These devices have high power density in close range, but the power density reduces by the square of the distance resulting in low power density far away. For example, at about a tenth of an inch from the device, the power density is about 2.65 uW/cm2. At about 3.3 feet away, the power density is only .24 uW/cm2. **The proposed tower at Rohrerstown Elementary School will have a power density that is about 1.4x stronger than such a router, the equivalent of having a child with about one-and-a-half live WiFi routers directly beside them every school day for seven years. Imagine placing one and a half powered-on WiFi routers under your child's pillow every school night for seven years. Given the health concerns regarding microwaves, this is not likely an action you would choose to take.**

Section 2, Current Non-US regulations.

In this section, I provide an overview of the regulations on microwaves and cell towers in other modernized countries. Through these examples, I demonstrate that the U.S.'s twenty-one-year-old protection standards lag behind those more recently updated in other countries. Moreover, we have seen in the previous section that the FCC has been slow to update its protection standards even when pressured by large groups of engineers and scientists like ANSI and IEEE. Here we will see the more proactive approach that other countries are taking to protect their residents with regard to microwave public health.

I first point out the World Health Organization (WHO) that sets forth protection standards in hopes that all countries will adhere to a minimal standard of 900 uW/cm2 for cellular towers. The FCC's 1996 standard lags behind the World Health Organization's protection standard by 100 uW/cm2. Our neighbor Canada's protection standard is now 300 uW/cm2 in developed areas. The FCC exceeds this protection standard by 3.33x! Next, two countries that I will point out are Russia and China. I selected these two countries because of their history of lack of environmental and health safety regulations. Both countries have a maximum MPE of 10 uW/cm2 [12]. This value represents 100x less radiation than allowed by the FCC. Though the proposed cell tower at Rohrerstown Elementary School would be allowed by this standard, it would already be 36% of the maximum. If the proposed tower is placed without regulation from the school, the proposed tower's power density could easily exceed this limit with new

equipment or selling access to other cell providers. As we move into Europe, the regulation limits become even greater. The cause of the lower limits in Europe is because of research coming from the Precautionary Principle expressed by most countries [7], the BioInitative reports [13], and the European Union Science and Technology Options Assessments (STOA) of 2001. The BioInitative report of 2012 recommends an extremely low power density of .0006 uW/cm2, and the STOA recommending a maximum of .01 uW/cm2. It is important to note that almost no country or cell towers meet these recommendations. However, the WHO- International Agency for Research of Cancer (IARC) has classified radio frequency electromagnetic as a **possible carcinogenic to humans** based on studies related to the development of malignant types of brain cancer in humans from cell phone use in 2011 [6]. These items are almost completely ignored by US regulation committees at this time, even though millions of dollars in damages from both the land owners and cell tower owners have been paid out all over Europe. If these reports become allowable by U.S. courts, the school district itself may be open to lawsuits. Mountainous countries, such as Switzerland, Lichtenstein, and Luxembourg, have set current rules at 9.5 uW/cm2 [12], and are currently reviewing lowering limits more. More populated countries have set even lower standards on a single frequency, such as Italy's regulation of .1 uW/cm2. Other major countries like Germany and France are securing health in a different manner. While France does allow for power density between 455-955 uW/cm2 (i.e., lower by as much as 2x the U.S.'s 1996 standard), they have put laws on where towers may be placed. By law in France, no cell towers may be placed on school property. Moreover, any citizen may have their home evaluated for cell tower radiation, and the public must be informed in order to vote if a tower should be placed [14,15]. India's Supreme Court in 2013 upheld that cell towers are a hazard to life, and the removal of all cell towers at schools, colleges, hospitals, and playground in the state of Rajasthan [16]. Other countries are following these steps as the Council of Europe recommended banning all cell phones from schools.

While TSA is about on par with body scanners as other governments, other countries have been far more protective about WiFi devices. In 2015, France has banned the use of WiFi in Nursery schools (i.e., children less than 3 years old). WiFi in schools with children up to age 11 years old may only be turned on for activities that need WiFi, and must be turned off when not in use [14,15]. Though not law, The Russian National Committee on Non-Ionizing Radiation officially recommended that WiFi should not be used in school in 2011 [18]. The Israeli Ministry of Education has issued guidelines banning WiFi in classroom prior to 1st grade and limiting use similar to France up to third grade [17]. **Recalling from last section, the proposed tower will have the same power density of about 1 and ½ standard WiFi routers next to the child's head. It seems that if we should be limiting WiFi in the classroom to when we need it, we should not, in essence, be strapping it to the head of a child.**

Recommendation.

As a resident of the East Hempfield and a member of the science community, I recommend taking precautions for our children from microwave exposure. This includes not situating a tower at Rohrerstown Elementary School or Centerville Middle School. For a more in-depth look at cell phones, policy, and current research, I recommend reading [7] in its full, and paying attention to the sections on children.

Personal Background of Joshua Dennis Booth:
I hold a BS in Applied Mathematics, MS in Computational Mathematics, and PhD in Computer Science and Engineering. I previously advised CDC/NIOSH as a Biostatistician intern while focusing on statistical databases. I was a Post Graduate Researcher for The Department of Energy's Sandia National Laboratories in Albuquerque New Mexico. There I worked in the department of scalable algorithms providing scalable linear solver solutions to large scale simulations for circuits, sold mechanics, and EMP-Microwave based applications. I have published work related to large numeric solvers, power systems, and low voltage computing algorithms. I am currently an Assistant Professor of Computer Science at Franklin & Marshall College. I am a member of SIAM, ACM, and IEEE.

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September 13, 2017

Regarding the placement of cellular phone towers on school property in the Hempfield School District, I am concerned regarding the unknown effects of this amount of electromagnetic radiation so close to children. Numerous countries have placed limits on placement of these towers near schools. Some have banned them completely. The science is still evolving and there is some early evidence to suggest that the developing brains of children are at greater risk as they absorb much more of this electromagnetic radiation than adults. Industry support of studies showing no significant harm is worrisome. In reviewing other contracts Verizon has made with schools to place towers on their property, the $1000-$2000 per year a school may gain to their budget does not (in my opinion) make a significant reduction in school debt such that this would be worth the potential harm to children.

I worry the Hempfield School District is taking an unknown risk regarding the health of the children and families they serve for minimal financial benefit.

Perhaps working with families and business leaders to come up with alternative means of generating revenue for the district would be a safer and financially greater solution to the issue of decreased school district revenue and increased costs.

James A. Rochester, MD, FAAFP

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www.worknetoccupationalmedicine.com

Martin Pall, PhD

August 7, 2017

Dear California Legislators,

I am Dr. Martin Pall, Professor Emeritus of Biochemistry and Basic Medical Sciences at Washington State University. I am a published and widely cited scientist on the biological effects of electromagnetic fields and speak internationally on this topic. I am particularly expert in how wireless radiation impacts the electrical systems in our bodies. I have published 7 studies showing there exists exquisite sensitivity to electromagnetic fields (EMFs) in the voltage sensor in each cell, such that the force impacting our cells at the voltage sensor has massive impact on the biology on the cells of our bodies [1-7]. These papers are discussed in over 360,000 web sites which can be easily found by Googling (Martin Pall electromagnetic). I received my PhD at Caltech, one of the top scientific institutions in the world.

EMFs act by activating channels in the membrane that surrounds each of our cells, called voltage-gated calcium channels (VGCCs). The EMFs put forces on the voltage sensor that controls the VGCCs of about 7.2 million times greater than the forces on other charged groups in our cells [4,6,7]. This is why weak EMFs have such large biological effects on the cells of our bodies! EMFs works this way not only on human and diverse animal cells [1-7] but also in plant cells [7] so that this is a universal or near universal mechanism of action.

Thousands of published studies show biological and health effects from electromagnetic fields. We now know the mechanism that can explain these effects. The mechanism is a function of the electromagnetics of each cell—not solely about heating effects from the radiation (on which present FCC guidelines are based).

This new understanding [1-7] means we can debunk the claims of the wireless industry that there cannot be a mechanism for effects produced by these weak EMFs. The 20 years plus of industry propaganda claims are false. Rather the thousands of studies showing diverse health impacts of these EMFs can be explained. We now have a mechanism, one that is supported by both the biology and the physics, both of which are pointing in exactly the same direction. I am sending as a separate document a list of 134 reviews, each of which provides from 12 to over a thousand individual citations showing health impacts of low intensity EMFs, EMFs that the telecommunications industry claims cannot have such effects. **These 134 reviews and thousands of primary scientific papers they cite show that the industry propaganda has no scientific support whatsoever.**

The consensus among independent scientists on this is further confirmed by the 2015 (and later) appeal made to the United Nations and member states, stating that the current EMF safety guidelines are inadequate because they do not take into consideration non-thermal effects. This was signed by 225 scientists from 41 countries, each of whom had

published peer reviewed studies on EMF health effects – a total of 2,000 papers published in this area by the signers, a substantial fraction of the total publications in this area.

According to industry, the forces electromagnetic fields place on electrically-charged groups in the cell are too weak to produce biological effects. However, the unique structural properties of the voltage-gated calcium channel (VGCC) protein can, it turns out, explain why the force on a cell's voltage sensor from low-intensity EMFs are millions of times stronger than are the forces on singly-charged groups elsewhere in the cell.

It would be a disaster for the health of Californians to be exposed to the antennas envisioned in SB.649. The State of California would be making a grave mistake to proceed with supporting the commercial interests of the wireless industry with this legislation. **Legislators would best pause to understand the gravity of the biological effects, and the ramifications for physical and mental health, as well as consequences from continual damage to human DNA, and learn the facts from scientists who are independent of the wireless industry, not from the industry lobbyists who have a gigantic conflict of interest.**

VGCC activation in cells produced by low intensity EMFs can explain long-reported findings that electromagnetic fields and a wide range of biological changes and health effects. The first 6 of these (see below) were well documented 46 years ago in the U.S. Office of Naval Medical Research report, published in 1971 [8]. The others that follow have been extensively documented subsequently in the peer-reviewed scientific literature:
1) Various neurological/neuropsychiatric effects, including changes in brain structure and function, changes in various types of psychological responses and changes in behavior.
2) At least eight different endocrine (hormonal) effects.
3) Cardiac effects influencing the electrical control of the heart, including changes in ECGs, producing arrhythmias, changes that can be life threatening.
4) Chromosome breaks and other changes in chromosome structure.
5) Histological changes in the testes.
6) Cell death (what is now called apoptosis, a process important in neurodegenerative diseases).
7) Lowered male fertility including lowered sperm quality and function and also lowered female fertility (less studied).
8) Oxidative stress.
9) Changes in calcium fluxes and calcium signaling.
10) Cellular DNA damage including single strand breaks and double strand breaks in cellular DNA and also 8-OHdG in cellular DNA.
11) Cancer which is likely to involve these DNA changes but also increased rates of tumor promotion-like events.
12) Therapeutic effects including stimulation of bone growth.
13) Cataract formation (previously thought to be thermal, now known not to be).
14) Breakdown of the blood-brain barrier.
15) Melatonin depletion and sleep disruption.

They may be low intensity but with regard to the VGCCs, electromagnetic fields can have a tremendously powerful impact on the cells of our bodies. Furthermore, published studies showing that calcium channel blocker drugs block or greatly lower biological effects from electromagnetic fields confirm there is a VGCC activation mechanism that is causing various effects. Higher frequency electromagnetic fields from 5G technologies on the horizon pose even greater biological concern than those to which we are exposed today. We should be moving, instead, to wired technologies at every opportunity, based on what we know in science today, not expanding and supporting the proliferation of wireless.

I want to make several additional points very clear:

1. The Physics and the Biology are both pointing in the same direction. Both show that EMFs act primarily via activating the VGCCs in the cells of our bodies.
2. DNA damage known to be produced by these EMFs occur in human sperm and may also occur in human eggs, leading to large increases in mutation in any children born. It is thought that an increase in mutation frequency of 2.5 to 3-fold will lead to extinction because of accumulation of large numbers of damaging mutations. We may already be over this level, and if so, simply continuing our current exposures will lead to eventual extinction. Further increases in exposures will be more rapidly self-destructive.
3. Pulsed EMFs are, in most cases, more biologically active and therefore more dangerous than are non-pulsed (continuous wave) EMFs. All cordless communication devices communicate via pulsations, because it is the pulsations that carry the information communicated. All the industry claims of safety are based on a theory (only thermal effects) that was known to be wrong back in 1971 [8] – and that was before many thousands of additional studies were published providing massive confirmation that industry claims are false.
4. The industry is trying to move to much higher frequencies because these much higher frequencies allow much higher pulsations and therefore much higher transmission of information. However, these higher pulsation rates make these ultra-high devices vastly more dangerous. This is part of the reasons why it is so important to vote down SB.649.
5. None of our wireless communication devices are ever tested biologically for safety – not cell phone towers, not cell phones, not Wi-Fi, not cordless phones, not smart meters and certainly not 5G phones, or radar units in cars – before they are put out to irradiate an unsuspecting public.
6. The telecommunications industry has corrupted the agencies that are supposed to be regulating them. The best example of this is that the FCC which regulates EMFs in the U.S. is a "captured agency", captured by the industry it is supposed to regulate, according to an 8 chapter document published by the Edmond J. Safra Center for Ethics at Harvard University [9]. Is it any wonder, therefore, that the industry keeps touting that their devices are within the safety guidelines set by the FCC?

I urge you to do the right thing on behalf of the health of Californians and future generations. Please let me know if I can provide further information. (503) 232-3883.

Sincerely,
Martin Pall, PhD (Caltech, 1968)
Professor Emeritus of Biochemistry and Basic Medical Sciences
Washington State University

Citations:

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July 26, 2017

The Honorable Ben Hueso
Member of the California State Senate
Room 4035, State Capitol
Sacramento, CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities - OPPOSE

Dear Senator Hueso:

Environmental Working Group (EWG) respectfully opposes your SB 649, which would make the installation of small cell wireless facilities, such as those used to facilitate 5G networks, ministerial rather than discretionary at the local government level.

The health impacts of cellular transmissions have been debated for over ten years because there are studies that raise real concerns about the effects of radio frequency radiation on humans. This is why EWG sponsored two bills by former Senator Leno, SB 1212 (2010) and SB 932 (2011) that would have required sellers of cell phones to inform consumers to minimize exposure to cell phone radiation by reading the manual that comes with the phone, as this is in fact recommended by cell phone manufacturers in their included manuals.

Studies on the health impacts of cell phones and their transmission infrastructure are continuing, but there is already adequate existing sound science for government to proceed with caution on the roll-out of the new technology. In particular, the results of the $25 million National Toxicology Program study (2016) that showed tumors in rats caused by a typical amount of heavy cell phone use are to be reckoned with. And, most of the past science has analyzed older cellular technology like 2G and 4G, so we are moving into uncharted waters with 5G with its different wavelengths and energy levels.

Local governments must be able to evaluate science and respond to the wishes of their citizens and neighborhoods before permits are issued for this technology and SB 649 short-circuits that process. This includes important decisions about locating the technology near homes, schools, and hospitals. We simply cannot rely upon the word of the FCC (in terms of safety standards) to protect the health of Californians.

For these reasons, EWG will be urging a "no" vote for the Assembly floor. We will be writing a separate letter to the Assembly Appropriations Committee on fiscal concerns.

Sincerely,

Bill Allayaud
California Director of Government Affairs
Environmental Working Group

August 15, 2017

The Honorable Cecilia Aguiar-Curry
Chair, Assembly Local Government Committee
State Capitol Building, Room 5144
Sacramento, CA 95814

SB 649 (Hueso)- Wireless Telecommunications Facilities- OPPOSE

Chair Aguiar-Curry,

On behalf of the undersigned, we write to register our opposition to SB 649 (Hueso) which would prohibit local discretionary review of "small cell" wireless antennas , including equipment collocated on existing structures or located on new "poles, structures, or non-pole structures," including those within the public right-of-way and buildings. The proposal preempts adopted local land use plans by mandating that "small cells" be allowed in all zones as a use by-right, including all residential zones. Because of this, this proposal essentially provides a CEQA exemption for installation of these facilities, undermining the ability for communities to comment and register their concerns associated with previously mentioned installation. These "small cell" installations not only can cause an aesthetic blight, but can release levels of radiation that we don't yet know conclusively the health impacts they can impose of humans, especially developing bodies and minds of children. These small cell boxes could pop up anywhere: grocery stores, outside school, playgrounds, communal places, with no requirement to mitigate effects or understand potential environmental and health hazards.

For these reasons, we urge your "no" vote in committee.

Thank you,

Jena Price, Legislative Affairs Manager
California League of Conservation Voters

Kyle Jones, Legislative Associate
Sierra Club California

Jane Williams, Executive Director
California Communities Against Toxics

Devra Davis, PhD MPH FACE
P.O. Box 58
Teton Village, WY 83025

Jackson Hole Town Council
PO Box 1687
Jackson, WY 83001

Re: Conditional Use Permit: 55' tall Wireless Communications Tower at 275 N. Willow Street.

Dear Jackson Hole City Council,

I am writing in regards to the request for a Conditional Use Permit to Allow a 55' tall Wireless Communications Tower at 275 N. Willow Street. I want to inform you of some critically important facts that may have escaped your attention, and I hope that this will persuade you to reconsider approval of the tower.

1. **According to federal law, any permitted tower can eventually become 20 feet or 20% higher than the original permit with no community input.**

A tower includes multiple antennas. Section 6409 (a) (1) of the ''Middle Class Tax Relief and Job Creation Act of 2012'' says that once a Communication tower is approved and installed for one communications provider, any other communications provider may not be denied application to install their antenna on that tower if the dimensions of the tower are not substantially changed. Unfortunately, "substantially changed" is not defined in the Law and the FCC defines substantially changed as an increase in height of more than 20 feet or more than 20%, whichever is larger (the 20 ft-20% rule). The FCC also says that the tower width can be extended to 40 feet. If a community objects I understand that the community would have to provide evidence to support that objection.

Is Jackson Hole comfortable allowing the tower to go up 20 more feet (that is to 75') and expand in width to 40' with no community input? How will this affect the view from the Town's iconic southwest elk antler arch?

2. **The tower location would expose the children at the nearby Teton County Recreation Center, Timber Ridge Academy, Jackson Elementary School to increased levels of radiofrequency radiation.**

Some cities and nations are curtailing in-building wireless exposures—and moving to wired connections rather than wireless—because of growing health concerns, i.e., Haifa, Israel, France and India. The Council Agenda packet noted, "One key feature of the new cell site will be providing strong in-building

coverage...Strong in-building coverage is often the most difficult goal to attain because of the degradation of the Radio Frequency (RF) signal through the building itself."

Has the community considered that the signal will not only go though the buildings, as the Applicant notes, but also through our bodies—and that several technology-sophisticated nations are generally promoting wired connections within schools?

A number of nations, including Israel and France, are taking steps to reduce exposures, especially to children and pregnant teachers, as growing evidence indicates that there are health risks with such exposures.

3. **Federal Law governing towers prohibits considering health and safety issues, but the Council should be aware that a number of federal agencies are requesting that the FCC strengthen their outdated FCC regulations that do not protect human health and the welfare of migratory animals.**

On February 7, 2014 the U.S. Department of Interior stated in a letter to the National Telecommunications and Information Administration:

> "The second significant issue associated with communication towers involves impacts from non-ionizing electromagnetic radiation emitted by these structures. Radiation studies at cellular communication towers were begun circa 2000 in Europe and continue today on wild nesting birds. Study results have documented nest and site abandonment, plumage deterioration, locomotion problems, reduced survivorship, and death (e.g., Balmori 2005, Balmori and Hallberg 2007, and Everaert and Bauwens 2007). Nesting migratory birds and their offspring have apparently been affected by the radiation from cellular phone towers in the 900 and 1800 MHz frequency ranges -- 915 MHz is the standard cellular phone frequency used in the United States. However, the electromagnetic radiation standards used by the ***Federal Communications Commission (FCC) continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today.***"

Regulations dictate, "The communication tower shall cause no damage or disturbance to human life or wildlife as a result of radiation or electromagnetic fields." Currently the applicant states that the tower's emissions would adhere to standards for radiation exposure set by the FCC. However, FCC standards may soon change as a result of new experimental research from a $25 million study by the U.S. National Toxicology Program finding rare tumors of the brain and heart in animals exposed to wireless radiation comparable to that of cell phones.

Outdated FCC regulations are currently under review. (See NOI #13-84, "Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies 2013"). In 2012, the Government Accountability Office (GAO) published their report "Exposure and Testing Requirements for Mobile Phones Should Be Reassessed" that calls on the FCC to "formally reassess and, if appropriate, change its current RF energy (microwave) exposure limit," and "The Federal Communications Commission's (FCC) RF energy exposure limit may not reflect the latest research…."

The newly released multi-year study by The National Toxicology Program at the National Institutes of Health found a causal relationship between RF in cell phone frequencies and malignant brain cancers (glioma) as well as benign nerve tumors (schwannomas) of the heart in male rats. The study was designed to test the scientific basis on which current US radiofrequency exposure limits are based. The results of carcinogenicity show that current FCC limits are based on outdated and now invalid assumptions. The results detailed in the Report of Partial findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation indicate that non-ionizing radiation does have adverse effects at non-heating levels. As FCC limits only protect against heating effects, and do not account for other biological effects such as carcinogenicity, stronger protection is needed, which means the limit will be lowered.

In May 2015, over 200 scientists from 39 nations, who have authored more than 2,000 articles on electromagnetic fields, appealed to the United Nations to address "the emerging public health crisis" related to wireless radiation. These scientists state, "the ICNIRP guidelines do not cover long-term exposure and low-intensity effects" and are "insufficient to protect public health." They also state, "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.)

4. **It would be against the law in many jurisdictions and countries to erect a cell tower so close to schools.** In India, the Supreme Court of India upheld the High Court of the State of Rajasthan decision to remove all cell towers from the vicinity of schools, hospitals and playgrounds because of radiation "hazardous to life." The Los Angeles Unified School District has established a precautionary radiofrequency threshold level that is 10,000 times lower than the current FCC standard, and the District does not allow cell towers near schools.

5. **Environmental impacts: Cell tower compounds bring hazardous materials on site.** Tower compounds store hazardous materials on site such as banks of lead acid batteries, diesel generators and diesel fuel tanks. In several counties, these sites are considered Hazmat areas.

The Jackson Hole Council Agenda notification states (on page 32 of 112), "The proposed tower will not create any significant odors, noises, light, or pollution." and "Atlas Tower does not anticipate there will be any environmental conditions created by our proposed use," however, I did not see it noted what type of backup power systems these telecommunications companies will use? Cell tower diesel generators are usually turned on and tested weekly, meaning diesel fumes and exhaust are emitted into the air and the cumulative impact is considerable in terms of diesel emissions. In addition, the tanks must be refueled periodically, bringing diesel laden trucks into the area and pumping fuel into the tanks.

6. **Cell towers do and can catch fire and fall.** The Applicant states the tower would "collapse not topple," yet many cell towers have fallen over despite the best intentions of structural engineers. Towers also catch on fire. As an example, last year, a cell tower at Virginia Heritage High School caught fire and started leaning over. What of the Ohio Football field tower fire or the Oregon School cell tower that caught fire and "seared bushes" below?

I respectfully urge you to reconsider approval of this tower and to institute a systematic review of tower siting policies in light of this new information. I and other experts who work with Environmental Health

Trust would be pleased to advise on this matter further. In light of these concerns, I urge that this tower not be built at this time at this location.

Respectfully submitted,

Devra Davis, PhD MPH FACE
ddavis@ehtrust.org
www.EHTrust.org
Visiting Professor, Hebrew University Hadassah Medical School and Ondokuz Mayis Medical School

Further information here:

American Academy of Pediatrics 2013 letter to the FCC on children's vulnerability to RF and the importance of updating current radio frequency exposure standards.

2014 Letter from the U.S. Department of Interior states, "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."

2002 Letter from Norbert Hankin of the EPA about the FCC guidelines states that children, pregnant women and the elderly were not considered in the regulations and that the regulations were to protect against hearing damage only and did not consider long-term chronic exposure.

2008 Report: National Academy of Sciences Report "Identification of Research Needs Relating to Adverse Health Effects of Wireless Communication."

Letter to the FCC by Dr. De-Kun Li, MD, PhD, MPH on the Inadequacy of FCC guidelines

Why the FCC Must Strengthen Radiofrequency Radiation Limits in the U.S. by Joel M. Moskowitz, Ph.D., Director Center for Family and Community Health, The UC Berkeley Prevention Research Center, School of Public Health, University of California, Berkeley November 5, 2013

Alster, Norm. Captured agency: How the Federal Communications Commission is dominated by the industries it presumably regulates. Cambridge, MA: Edmund J. Safra Center for Ethics, Harvard University. 2015.

No more Falling workers: February 2014, OSHA Alert about cell tower deaths

Failure to Regulate Antennas and the Lack of FCC Monitoring of Compliance with FCC RF Safety Policies The EM Radiation Policy Institute to the FCC in 2013

The World Health Organization's monograph on RF radiation as a Possible Human Carcinogen in 2011

List of cell Tower Fires and Collapse compiled by Dr. David Stupin.

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June 28, 2017

The Honorable Cecilia Aguiar-Curry
Chair of the Local Government Committee
1020 N Street, Room 157
Sacramento, CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities — OPPOSE

Dear Chair Aguiar-Curry:

As a nonprofit research and policy organization dedicated to identifying and reducing environmental health hazards, Environmental Health Trust (EHT) writes to advise you of serious scientific grounds to reject SB 649 as advanced by Senator Hueso. I have personally served as an expert advisor to the California Department of Health as well as the San Francisco and Berkeley City governments on matters relevant to this bill. EHT has been honored to work with California government and scientists for over a decade. At the invitation of the Israel Institute for Advanced Study of the Hebrew University of Jerusalem, EHT recently organized and chaired an Expert Forum on Wireless Radiation and Health, bringing together scientists and engineers from more than ten high tech nations. Reflecting these efforts, EHT provides independent scientific research and advice on avoidable environmental health hazards to local, state and national governments.

SB 649 will pave the way for widespread introduction of 5G microwave wireless radiation frequency (RF) that has never been tested for its impact of public health or the environment. Other RF microwave radiation such as that used by cellphones and other wireless devices has been classified as a 'possible carcinogen' by the International Agency for Research on Cancer in 2011 and more recently dubbed a 'probable carcinogen,' by expert researchers looking at newer information in 2015.[1, 2, 3] In addition, this bill could result in the loss of hundreds of millions of dollars in local revenue, as the San Francisco Chronicle noted today.

By ignoring growing scientific evidence of harm, the bill effectively will ensure the widespread exposures of millions of Californians to an agent that growing numbers of scientists and nations consider a serious

[1] World Health Organization. "IARC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans," WHO, Press Release, no. 208, 2011.
[2] IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. "Non-ionizing radiation, Part 2: Radiofrequency electromagnetic fields." *IARC Monographs On The Evaluation of Carcinogenic Risks to Humans*, vol. 102, pt. 2, 2013.
[3] Morgan, L. Lloyd, et al. "Mobile phone radiation causes brain tumors and should be classified as a probable human carcinogen (2A)." *International Journal of Oncology,* vol. 46, no. 5, 2015, 1865-71.

health threat. Recently, studies have found that the frequencies which will be used in 5G and other future technologies can have harmful effects[4], as Dr. Cindy Russell, Vice President of Community Health for the Santa Clara Medical Association noted.[5] As articulated in their state Constitution, California cities and counties have a duty to protect the health and safety of their residents.

EHT has a longstanding history of research and policy advice to state, local and national governments regarding strategies to reduce disease and promote health by avoiding environmental health hazards. Our organization opposes the broad scale installation of untested wireless antennas and associated electrical equipment close to humans and through critical wildlife habitat and corridors. Both federal and local zoning controls are needed to assure that cellular equipment are installed to avoid significant and serious safety threats of electrical shock, fire, and radio frequency (RF) microwave radiation exposures, as well as chronic impacts on public health and the environment.

Consistent with public health concepts of preventing harm by reducing exposure to suspected carcinogens, EHT opposes the usurpation and preemption of local authority that will allow federal and state authorities to place what state reports of the bill indicate can be thirty thousand new radiating 5G cell antennas on city and county utility, light poles, and other right of ways in close proximity to city and county workers, children, residents and visitors. In some cases towers will need to be sited every 100 feet with antennas at a height of 30 feet or less. Local authority and duty should not be overridden by preemptive federal or state policies such as SB 649 which disregards scientific evidence on this matter as outlined below.

Regarding potential health risks from RF a number of corporations advise their shareholders that they face serious risks from RF. For instance, Crown Castle's 2016 10-K ANNUAL REPORT, states that,

> *"If radio frequency emissions from wireless handsets or equipment on our wireless infrastructure are demonstrated to cause negative health effects, potential future claims could adversely affect our operations, costs or revenues. The potential connection between radio frequency emissions and certain negative health effects, including some forms of cancer, has been the subject of substantial study by the scientific community in recent years. We cannot guarantee that claims relating to radio frequency emissions will not arise in the future or that the results of such studies will not be adverse to us...If a connection between radio frequency emissions and possible negative health effects were established, our operations, costs, or revenues may be materially and adversely affected. We currently do not maintain any significant insurance with respect to these matters."*

Most wireless companies from AT&T to Nokia to T Mobile to Verizon Wireless have issued similar warnings to their shareholders.

Regarding public health impacts, recently released research findings from the premiere test program of the National Institute of Environmental Health Sciences (NIEHS) add to the body of scientific evidence

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[4] Feldman, Yuri, et al. "Human Skin as Arrays of Helical Antennas in the Millimeter and Submillimeter Wave Range." *Physical Review Letters*, vol. 100, no. 128102, 2008.

[5] Russell, Cindy. "A 5G Wireless Future: Will it give us a Smart Nation or Contribute to an Unhealthy One?" Santa Clara Bulletin, Jan./Feb. 2017.

indicating that RF microwave radiation can be harmful. The 10 year $25 million NIEHS National Toxicology Program's Studies of the Toxicology and Carcinogenicity Cell Phone Radiation reports that RF produced increases rates of highly malignant very rare tumors: gliomas of the brain and schwannomas of the heart.[6] These experimental findings are consistent with human studies showing increased rates of gliomas and acoustic neuromas (schwann cells) among humans exposed to cell phone radiation. In addition to increased cancers, the NTP study also reported that prenatally exposed animals produced offspring with lower birth weight and evidence of direct genetic damage.

Since the 2011 WHO/IARC classification, the peer reviewed research connecting microwave exposure to cancer has significantly strengthened. In 2015, a study replicated a 2010 experiment that found that weak cell phone signals significantly promote the growth of tumors in mice, and that toxic chemical exposures combine with RF to more than double the tumor response.[7,8] The Ramazzini Institute is engaged in similar research with RF that is 1000 less than the NTP exposures—set to mimic radiation exposure levels caused by network equipment (e.g., cell tower antenna emissions).

Consistent with the NTP findings, the Ramazzini Institute team report significantly lower litter weights, as presented at the January 2017 Conference on Wireless and Health at Israel Institute for Advanced Study, Hebrew University of Jerusalem.[9] Findings of effects at such low levels is indication of the capability of low level electromagnetic radiation exposure to result in biological effects.

Other studies finding serious increased risk of glioma in regular cell phone users are of special relevance. In 2014, a French national study linked higher cell phone exposure to increased glioma in cell phone users.[10] A newly published research report in the *American Journal of Epidemiology* finds that Canadians who have used cell phones for 558 hours or more have more than a doubled risk of brain cancer.[11] Previous published re-analysis of the multi country Interphone study data has found stronger positive associations to glioma risk among long term users and heavy users and a statistically significant association between where tumors were located and how much radiation an individual received from their phone.[12,13]

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[6] Wyde, Michael, et al. "Report of Partial findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats (Whole Body Exposure)." *bioRxiv,* no. 055699, 2016.

[7] Lerchl, Alexander, et al. "Tumor promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans." *Biochemical and Biophysical Research Communications,* vol. 459, no. 4, 2015, pp. 585-90.

[8] Tillmann, Thomas, et al. "Indication of cocarcinogenic potential of chronic UMTS-modulated radiofrequency exposure in an ethylnitrosourea mouse model." *International Journal of Radiation Biology,* vol. 86, no. 7, 2010, pp. 529-41.

[9] Belpoggi, Fiorella. "Recent findings on wireless radiation and health from the Ramazzini Institute could reinforce the NTP results." *Conference on Wireless and Health*, 2017.

[10] Coureau, Gaëlle, et al. "Mobile phone use and brain tumours in the CERENAT case-control study." *Occupational Environmental Medicine,* vol. 71, no. 7, 2014, pp. 514-22.

[11] Momoli, F., et al. "Probabilistic multiple-bias modelling applied to the Canadian data from the INTERPHONE study of mobile phone use and risk of glioma, meningioma, acoustic neuroma, and parotid gland tumors." *American Journal of Epidemiology*, 2017.

[12] Turner, Michelle C., et al. "Investigation of bias related to differences between case and control interview dates in five INTERPHONE countries." *Annals of Epidemiology,* vol. 26, 12, 2016, pp. 827-32.

More recently, research carried out by physicists in Israel and others have shown that the higher millimeter wave frequencies to be used in 5G applications uniquely interacts with sweat ducts of the human skin which can then function as antennas to amplify signals. This work extends studies first produced in 1986.[14] The potential long-term impact of such stimulation on precancerous skin growths should be evaluated carefully, including potential super-growth of bacteria.[15] A lecture by Paul Ben-Ishai, PhD, and published research on this issue can be found on the 2017 Conference website.[16, 17, 18]

Cancer is not the only health concern presented by wireless devices and infrastructure. Impacts on reproduction and brain development have also been repeatedly reported in the peer reviewed literature in addition to a myriad of other adverse effects.[19, 20, 21, 22]

In light of these developments showing growing evidence of the biological impact of RF, it is imperative that new infrastructure and 5G not be introduced widely into commerce at this time. The State of California needs to critically consider the potential impact of massive new and possibly carcinogenic wireless exposures to their population. Before introducing additional untested wireless technology into the environment, it is necessary to:

- model exposures to infants, children and pregnant women;
- conduct experimental tests on exposures' impacts on wildlife; and
- evaluate impacts on human systems through in vitro and in vivo toxicology

In 2015, the International EMF Scientist Appeal, now signed by over 225 scientists from 41 nations, was submitted to the Secretary-General of the United Nations, the Director-General of the World Health Organization and U.N. Member Nations urging the development of more protective guidelines for EMF (including RF-EMF), encouraging precautionary measures, and calling for education of the public about

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[13] Grell, Kathrine, et al. "The intracranial distribution of gliomas in relation to exposure from mobile phones: analyses from the INTERPHONE study." *American Journal of Epidemiology*, vol. 184, no. 11, 2016, pp. 818-28.
[14] Gandhi OP, Riazi A. "Absorption of millimeter waves by human beings and its biological implications." *IEEE Transactions on Microwave Theory and Techniques*, vol. 34, no. 2, 1986, pp. 228-235.
[15] Soghomonyan D, K. Trchounian and A. Trchounian. "Millimeter waves or extremely high frequency electromagnetic fields in the environment: what are their effects on bacteria?" Applied Microbiology and Biotechnology, vol. 100, no. 11, 2016, pp. 4761-71.
[16] Feldman, Yuri and Paul Ben-Ishai. "Potential Risks to Human Health Originating from Future Sub-MM Communication Systems." *Conference on Wireless and Health*, 2017.
[17] Hayut, Itai, Paul Ben Ishai, Aharon J. Agranat and Yuri Feldman. "Circular polarization induced by the three-dimensional chiral structure of human sweat ducts." *Physical Review E*, vol. 89, no. 042715, 2014.
[18] Feldman, Yuri, et al. "Human Skin as Arrays of Helical Antennas in the Millimeter and Submillimeter Wave Range." *Physical Review Letters*, vol. 100, no. 128102, 2008.
[19] Adams, Jessica A., et al. "Effect of mobile telephones on sperm quality: a systematic review and meta-analysis." *Environment International,* 70, 2014, pp. 106-112.
[20] Deshmukh, P.S., et al. "Cognitive impairment and neurogenotoxic effects in rats exposed to low-intensity microwave radiation." *International Journal of Toxicology*, vol. 34, no. 3, 2015, pp. 284-90.
[21] Aldad, T.S., et al. "Fetal Radiofrequency Radiation Exposure From 800-1900 MHz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice." *Scientific Reports,* vol. 2, no. 312, 2012.
[22] Sonmez, O.F., et al. "Purkinje cell number decreases in the adult female rat cerebellum following exposure to 900 MHz electromagnetic field." *Brain Research,* vol. 1356, 2010, pp. 95-101.

health risks, particularly risks to children and fetal development.[23] Most recently, the EMF Scientists have submitted Comments to the FCC asking the FCC to critically consider the potential impact of the 5th generation wireless infrastructure on the health and safety of the U.S. population before proceeding to deploy this infrastructure.

California firefighters have lobbied to protect themselves and successfully received exemption on health grounds from the installation of these cell towers. Similarly cities and counties should be given the needed local controls to protect their citizens from the health and safety risks of these installations. As currently envisioned, transmitters can be placed in close proximity to bedrooms and schools without consideration of the health of their occupants. Research is critically needed to evaluate the public health and environmental impacts of proposed wireless facilities before deployment.

Worldwide, governments are acting to minimize exposures to children as they are most vulnerable. For example, the Supreme Court of India upheld the High Court of the State of Rajasthan's decision to remove all cell towers from the vicinity of schools, hospitals and playgrounds because of radiation "hazardous to life." In Chile, the 2012 "Antennae Law" prohibits cell antennae/towers in "sensitive areas".[24] Please learn more about international policy actions such as these in our online briefing.[25]

The assumption that all wireless technology is safe has been shown through recent studies to be incorrect. EHT strongly opposes the widespread installation of 5G antennas and towers and believes that the state should move forward on its commitment to support the installation of fiber optic cables buried in the ground to every business, home, school, and hospital in California. We urge the state not to ignore this evidence of harm from RF. Please vote "no" vote on SB 649 and uphold the rights of local government to protect public health and the environment.

Sincerely,

Devra Davis, PhD, MPH
Fellow, American College of Epidemiology
Visiting Prof. Hebrew Univ. Hadassah Medical Center & Ondokuz Mayis Univ. Medical School
Associate Editor, *Frontiers in Radiation and Health*
President, Environmental Health Trust

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[23] Blank, M., et al. "International Appeal: Scientists call for protection from non-ionizing electromagnetic field exposure." *European Journal of Oncology,* vol. 20, no. 3/4, 2015, pp. 180-2.

[24] "New communications antenna law in Chile." *Communications Law: Newsletter of the International Bar Association Legal Practice Division*, vol. 20, no. 1, 2013, pp. 14-16.

[25] "International Policy Briefing: Cautionary Policy on Radiofrequency Radiation Actions by Governments, Health Authorities and Schools Worldwide." Environmental Health Trust, 2017.

The Health Argument against Cell Phones and Cell Towers

The biomedical evidence showing that the radiofrequency radiation emitted by cell phones and cell towers is harmful to health continues to grow. This document summarizes the health argument against cellular technology, whatever the benefits of that technology may be. You may wish to inform yourself about these arguments for any of several reasons:

- You use a cell phone.
- You encourage, or do not discourage, the use of cell phones by family members.
- You live in, or are contemplating moving into, a community close to a cell tower.
- Your school, college, fire station, or police station is considering permitting the installation of a cell tower on its property.
- Your community is considering permitting the installation of cellular repeaters, small-cell towers, or even full cell towers within its jurisdiction.

Below, I introduce myself, provide evidence of the harmfulness of cellular radiation, and show that U.S. Government is not protecting us from harm and is unlikely to do so in the near future. That means that we must protect ourselves and our families at the individual and the community levels while working toward protective action by governments at the local, state, and Federal levels.

Who am I?

I am a retired U.S. Government career scientist (Ph.D., Applied Physics, Harvard University, 1975). During my Government career, I worked for the Executive Office of the President of the United States, the National Science Foundation, and the National Institute of Standards and Technology. For those organizations, respectively, I addressed Federal research and development program evaluation, energy policy research, and measurement development in support of the electronics and electrical-equipment industries and the biomedical research community. I currently interact with other scientists and with physicians around the world on the impact of electromagnetic fields on human health.

Evidence of harm

I present below key evidence, and associated references, that the exposure of humans to radiofrequency radiation, and specifically cellular radiation, is harmful to health.

In 2016, the National Toxicology Program, at the National Institutes of Health, linked cellular radiation to brain and heart tumors.

The National Toxicology Program (NTP), at the National Institutes of Health (NIH), just published the "Partial Findings" of a $25 million multi-year study of the impact of cellular radiation on health. The U.S. Food and Drug Administration "nominated" this NTP study. The NTP indicated that this is the largest and most complex study ever conducted by the NTP.

[1] Ronald M. Powell, Ph.D., USA, email ronpowell@verizon.net, web site https://www.scribd.com/document/291507610/.

The NTP study exposed each of six separate groups of male rats to one of the six possible combinations of three different levels of cellular radiation and two different modulation formats. The modulation format is the method used to impress information on the cellular signal. A separate seventh group of male rats was used as a "control", that is, for comparison, and was protected from exposure to any cellular radiation.

The NTP study found a "likely" causal relationship between exposure to cellular radiation and the occurrence of malignant (cancerous) brain tumors (glioma) and malignant nerve tumors (a form of schwannoma) of the heart in the male rats:

> The rates of occurrence of brain glioma in the male rats ranged from 0 to 3.3 percent for the six groups exposed to radiation. The mean rate of occurrence was 2.0 percent across all six groups.[2]
>
> The rates of occurrence of heart schwannoma in the male rats ranged from 1.1 to 6.6 percent for the six groups exposed to radiation. The mean rate of occurrence was 3.5 percent across all six groups.[3]
>
> The seventh group of male rats, which was used as a control and which was protected from exposure to any cellular radiation, experienced no instances of brain glioma or heart schwannoma.

The NTP considered its findings so important to public health that it issued the "Partial Findings" (May 2016) prior to completing the full study. The NTP then presented those findings at an international conference (BioEM2016, June 2016) attended by 300 scientists from 41 countries. The NTP characterized the motivation for the early release of the "Partial Findings" this way:

> "Given the widespread global usage of mobile communications among users of all ages, even a very small increase in the incidence of disease resulting from exposure to RFR [radiofrequency radiation] could have broad implications for public health. There is a high level of public and media interest regarding the safety of cell phone RFR and the specific results of these NTP studies."

You can learn more about this study from the following references:

> **Reference:** NTP's brief description of its study. National Toxicology Program: Cell Phones. (http://ntp.niehs.nih.gov/results/areas/cellphones/index.html)
>
> **Reference:** NTP's published "Partial Findings" of the study. Michael Wyde, Mark Cesta, Chad Blystone, Susan Elmore, Paul Foster, Michelle Hooth, Grace Kissling, David Malarkey, Robert Sills, Matthew Stout, Nigel Walker, Kristine Witt, Mary Wolfe, and John Bucher, Report of Partial Findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats (Whole Body Exposure), posted June 23, 2016. (http://biorxiv.org/content/biorxiv/early/2016/06/23/055699.full.pdf)
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> **Reference:** Informative discussion of the NTP study. Environmental Health Trust, Frequently Asked Questions about the U.S. National Toxicology Program Radiofrequency Rodent Carcinogenicity Research Study. (http://ehtrust.org/science/facts-national-toxicology-program-cellphone-rat-cancer-study)

[2] In the "Partial Findings" reference cited above, the mean (average) rate of occurrence for malignant glioma in male rats was determined from Table 1 on page 13 as follows: (3 + 3 + 2 + 0 + 0 + 3)/(90 + 90 + 90 + 90 + 90 + 90) = 2.0 percent.
[3] In the "Partial Findings" reference cited above, the mean (average) rate of occurrence for malignant heart schwannoma in male rats was determined from Table 3 on page 15 as follows: (2 + 1 + 5 + 2 + 3 + 6)/(90 + 90 + 90 + 90 + 90 + 90) = 3.5 percent.

Reference: Announcement of the BioEM2016 presentation. Results of NIEHS' National Toxicology Program GSM/CDMA phone radiation study to be presented at BioEM2016 Meeting in Ghent, 05 June 2016 — 10 June 2016 Ghent University, Belgium.
(http://www.alphagalileo.org/ViewItem.aspx?ItemId=164837&CultureCode=en)

Reference: Viewgraphs presented by Michael Wyde, Ph.D., NTP study scientist, at BioEM2016 Meeting, Ghent, Belgium, June 8, 2016. NTP Toxicology and Carcinogenicity Studies of Cell Phone Radiofrequency Radiation.
(http://ntp.niehs.nih.gov/ntp/research/areas/cellphone/slides_bioem_wyde.pdf)

In September 2017, the NTP presented further findings from its study of the impact of cellular radiofrequency radiation on the DNA of both mice and rats. The NTP found the following:

"These results suggest that exposure to RFR [radiofrequency radiation] has the potential to induce measurable DNA damage under certain exposure conditions."

Reference: Abstract of data presented at the annual meeting of the Environmental Mutagenesis and Genomics Society, Raleigh, North Carolina, September 9-13, 2017. SL Smith-Roe and others, Evaluation of the Genotoxicity of Cell phone Radiofrequency Radiation in Male and Female Rats and Mice Following Subchronic Exposure.
(https://ehtrust.org/national-toxicology-program-finds-cell-phone-radiation-induces-dna-damage/)

Further findings from the NTP are promised for 2018.

The NTP study reinforces the classification of radiofrequency radiation, including cellular radiation, as a possible human carcinogen, made by the International Agency for Research on Cancer of the World Health Organization in 2011.

In its "Partial Findings" the NTP noted that its study reinforces a decision made by the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO) in 2011. That decision classified radiofrequency radiation, including specifically cellular radiation, as a Group 2B carcinogen (possible carcinogen for humans). This classification was based on the increased risk of brain cancer (glioma) and acoustic neuroma (a form of schwannoma). [4]

Reference: Announcement of the IARC classification. International Agency for Research on Cancer**,** IARC Classifies Radiofrequency Electromagnetic Fields as Possibly Carcinogenic To Humans, Press Release No. 208, 31 May 2011.
(http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf)

Reference: Full report on the IARC classification. IARC Monographs: Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, Volume 102, 2013.
(http://monographs.iarc.fr/ENG/Monographs/vol102/mono102.pdf)

The findings of the NTP study, in combination with the findings of other studies conducted since 2011, have greatly increased the likelihood that the IARC will raise its classification of radiofrequency radiation to

[4] The Mayo Clinic describes acoustic neuroma here: http://www.mayoclinic.org/diseases-conditions/acoustic-neuroma/basics/definition/CON-20023851.

Group 2A (probable carcinogen for humans) or even to Group 1 (known carcinogen for humans) in the near future.

In 2015, hundreds of international scientists appealed to the United Nations and the World Health Organization to warn the public about the health risks caused by electromagnetic fields (EMF), including radiofrequency radiation and, specifically, cellular radiation.

As of January 29, 2017, 224 scientists from 41 nations have signed an international appeal first submitted to the United Nations and to the World Health Organization in May 2015. These scientists seek improved protection of the public from harm caused by the radiation produced by many wireless sources, including "cellular and cordless phones and their base stations, Wi-Fi, broadcast antennas, smart meters, and baby monitors" among others. Together, these scientists "have published more than 2000 research papers and studies on EMF." They state the following:

> "Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life."
>
> **Reference:** Welcome to EMFscientist.org.
> (https://www.emfscientist.org)
>
> **Reference:** International EMF Scientist Appeal: Scientists call for Protection from Non-ionizing Electromagnetic Field Exposure, May 15, 2015 (updated October 10, 2016).
> (https://www.emfscientist.org/index.php/emf-scientist-appeal)
>
> **Reference:** International Scientists Petition U.N. to Protect Humans and Wildlife from Electromagnetic Fields and Wireless Technology.
> (https://www.emfscientist.org/images/docs/International_EMF_Scientist_Appeal_Description.pdf)

In 2012, the BioInitiative Working Group published the most comprehensive of the recent analyses of the international biomedical research, showing a multitude of biological effects from exposure to radiofrequency radiation, including cellular radiation, at levels below the current exposure guidelines set by the Federal Communications Commission (FCC).

The health risks posed by the expanding use of radiofrequency radiation in wireless devices are not limited to cancer, as devastating as that consequence is. The broad range of health effects was extensively reviewed in the BioInitiative Report 2012. This 1479-page review considered about 1800 peer-reviewed biomedical research publications, most issued in the previous five years. The BioInitiative Report 2012 was prepared by an international body of 29 experts, heavy in Ph.D.s and M.D.s, from 10 countries, including the USA which contributed the greatest number of experts (10). The report concluded the following:

> "The continued rollout of wireless technologies and devices puts global public health at risk from unrestricted wireless commerce unless new, and far lower exposure limits and strong precautionary warnings for their use are implemented."

Reference: BioInitiative Working Group, Cindy Sage, M.A. and David O. Carpenter, M.D., Editors, BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation, December 31, 2012.
(http://www.bioinitiative.org)

The BioInitiative Report 2012 documented, in its "RF Color Charts", examples of eight categories of biological effects that occurred at levels below the current exposure guidelines set by the FCC:

- stress proteins, heat shock proteins, and disrupted immune function
- reproduction and fertility effects
- oxidative damage, reactive ion species (ROS), DNA damage, and DNA repair failure
- disrupted calcium metabolism
- brain tumors and blood-brain barrier
- cancer (other than brain) and cell proliferation
- sleep, neuron firing rate, electroencephalogram (EEG), memory, learning, and behavior
- cardiac, heart muscle, blood-pressure, and vascular effects.

These biological effects were attributed to "Radiofrequency Radiation at Low Intensity Exposure" from "cell towers, Wi-Fi, wireless laptops, and smart meters".

Reference: See the "RF Color Charts", accessed from the left column of the web page below.
(http://www.bioinitiative.org)

The U.S. Government is not protecting us.

The radiation exposure guidelines of the FCC do not protect us because they are outdated and based on a false assumption.

The current radiation exposure guidelines of the FCC were adopted in 1996, 20 years ago. Those guidelines are based primarily on an analysis by the National Council on Radiation Protection and Measurements (NCRP) which was published in 1986, 30 years ago. That was many years before the emergence of nearly all of the digital wireless devices in use today.

"The FCC-adopted limits for Maximum Permissible Exposure (MPE) are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP) in 'Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,' NCRP Report No. 86, Sections 17.4.1, 17.4.1.1, 17.4.2 and 17.4.3. Copyright NCRP, 1986, Bethesda, Maryland 20814...."

Reference: Federal Communications Commission, Office of Engineering & Technology, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, OET Bulletin 65, Edition 97-01 (August 1997). See the last paragraph on page 64.
(http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf)

Those exposure guidelines have not been substantially changed since that analysis in 1986. They are based on the *thermal assumption* that the only harm that radiofrequency radiation can cause is due to tissue heating. This thermal assumption has been thoroughly disproved since, as biological effects have been found to occur

at levels of radiation below, and even far below, those that cause significant tissue heating. Such lower levels are commonly referred to as *nonthermal* levels. The result is that many authorities now consider the FCC's current exposure guidelines as entirely outdated and much too high (that is, much too permissive) to protect the public.

The evidence disproving the thermal assumption is based on the broadened understanding of the biological effects of radiofrequency radiation made possible by thousands of peer-reviewed papers published by international biomedical scientists since 1986. The BioInitiative Report 2012 is the most recent comprehensive review of that research and provides many examples of bioeffects occurring at nonthermal radiation levels, as described above. Further, the new study by the National Toxicology Program, also described above, added to the evidence disproving the thermal assumption. That study exposed rats to levels of radiation below those that cause significant heating, and both above and below the FCC's current exposure guidelines as well. Yet, even below the FCC's current exposure guidelines, the male rats still developed malignant brain cancer (glioma) and malignant tumors (schwannomas) of the nerves of the heart.
The shortcomings of the FCC's exposure guidelines are described in detail in the following reference:

> **Reference:** Outdated FCC "Safety" Standards: The Five Fallacies of the Electromagnetic Radiation Exposure Limits.
> (http://ehtrust.org/policy/fcc-safety-standards/)

The FCC is not a credible source for exposure guidelines because it lacks health expertise and because it is too heavily influenced by the wireless industries that it is supposed to regulate.

The FCC lacks the health expertise required for developing health-related radiation exposure guidelines. Further, the FCC seems more interested in assuring compatibility among electronic systems than in assuring the compatibility of electronic systems with human, animal, and plant life. Since the exposure guidelines relate to health, it would make more sense for them to be developed by an agency with health expertise, such as the Environmental Protection Agency (EPA).

In addition, the FCC lacks the impartiality required to be a source of credible guidelines. The FCC is too heavily influenced by the wireless industries that the FCC is supposed to regulate. The FCC has acted in partnership with the wireless industries by permitting wireless radiation levels far higher than the biomedical research literature indicates are necessary to protect human health. The success of the wireless industries in capturing the FCC, the committees in the U.S. Congress that oversee the FCC, and the Executive Branch is detailed in a recent monograph from the Center for Ethics at Harvard University.

> **Reference:** Norm Alster, Captured Agency: How the Federal Communications Commission is Dominated by the Industries It Presumably Regulates (2015).
> http://ethics.harvard.edu/news/new-e-books-edmond-j-safra-research-lab

As an example of that capture, President Obama, in 2013, appointed Thomas Wheeler, as the Chairman of the FCC. At that time, Mr. Wheeler was the head of the CTIA – The Wireless Association, which is the major lobbying organization for the wireless industries. This is the infamous "revolving door".

The FCC's decision to fast-track Fifth Generation (5G) cellular technology without prior study of its health impact demonstrates the FCC's disinterest in the public health.

On July 14, 2016, the FCC adopted new rules that would promote fast-tracking the expansion of cellular service to new and higher frequencies as part of the Fifth Generation (5G) of cellular technology. This decision will open selected frequency bands above 24 gigahertz (GHz) and up to 71 GHz. At the same time, the FCC has requested comment on opening even higher frequencies, possibly above 95 GHz.

> **Reference:** FCC Takes Steps to Facilitate Mobile Broadband and Next Generation Wireless Technologies in Spectrum above 24 GHz: New rules will enable rapid development and deployment of next generation 5G technologies and services.
> (http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0714/DOC-340301A1.pdf)

> **Reference:** Fact Sheet: Spectrum Frontiers Rules Identify, Open Up Vast Amounts of New High-Band Spectrum for Next Generation (5G) Wireless Broadband.
> (http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0714/DOC-340310A1.pdf)

All five commissioners of the FCC, including Chairman Thomas Wheeler, approved this expedited move to 5G. No commissioner called for evaluating the health impact before proceeding with 5G, despite the recent findings of the National Toxicology Program at NIH that cellular radiation likely causes tumors. Nor did even one commissioner express any interest in, or concern about, the impact of this new technology on public health. Rather, the FCC's emphasis was on the billions of dollars to be made by proceeding to implement 5G as rapidly as possible, with a minimum of regulatory interference, to assure an international competitive position.

In contrast to the FCC's disinterest in the impact of 5G on the public health, extensive written comments from individual members of the public and from many interested organizations raised a host of health concerns that were totally ignored in the FCC's presentations.

> **Reference:** July 2016 Open Commission Meeting addressing "Spectrum Frontiers" and "Advancing Technology Transitions".
> (https://www.fcc.gov/news-events/events/2016/07/july-2016-open-commission-meeting)

> **Reference:** The FCC Approves 5G Millimeter Wave Spectrum Frontiers. Includes excerpts from selected comments provided to the FCC by individuals and organizations that expressed concern about the health impact of the FCC's plan for 5G.
> (http://ehtrust.org/policy/fcc-approves-5g-millimeter-wave-spectrum-frontiers/)

> **Reference:** Comments on FCC Docket 14-177, Spectrum Bands above 24 GHz. All of the comments submitted to the FCC about the key docket leading to the implementation of 5G.
> (https://www.fcc.gov/ecfs/search/filings?proceedings_name=14-177&sort=date_disseminated,DESC)

U.S. Government agencies, and U.S. medical organizations, have disputed the validity of the FCC's exposure guidelines.

U.S. Government agencies, as well as U.S. medical organizations, have disputed the validity of the FCC's thermal exposure guidelines, maintaining that they are outdated and need to be updated to provide adequate protection of human beings, including children and seniors as well as other vulnerable groups.

U.S. Environmental Protection Agency

The Environmental Protection Agency (EPA) would be a better agency than the FCC to entrust with setting radiofrequency radiation exposure guidelines because the EPA has both health expertise and environmental responsibilities. The EPA is often cited by the FCC, and by the wireless industries, as one of the agencies that the FCC has *consulted* about the FCC's exposure guidelines, as if to increase the credibility of those guidelines. However, the fact that the EPA has *explicitly disputed* the validity of those guidelines is consistently omitted from those FCC citations.

Specifically, in 2002, the EPA addressed the limitations of the thermal exposure guidelines of the FCC, and the similar guidelines of private organizations, including the Institute of Electrical and Electronics Engineers and the International Commission on Non-Ionizing Radiation Protection:

> "The FCC's current exposure guidelines, as well as those of the Institute of Electrical and Electronics Engineers (IEEE) and the International Commission on Non-ionizing Radiation Protection, are thermally based, and do not apply to chronic, nonthermal exposure situations…. The FCC's exposure guideline is considered protective of effects arising from a thermal mechanism but not from all possible mechanisms. Therefore, the generalization by many that the guidelines protect human beings from harm by any or all mechanisms is not justified."
>
> "Federal health and safety agencies have not yet developed policies concerning possible risk from long-term, nonthermal exposures. When developing exposure standards for other physical agents such as toxic substances, health risk uncertainties, with emphasis given to sensitive populations, are often considered. Incorporating information on exposure scenarios involving repeated short duration/nonthermal exposures that may continue over very long periods of time (years), with an exposed population that includes children, the elderly, and people with various debilitating physical and medical conditions, could be beneficial in delineating appropriate protective exposure guidelines."
>
> **Reference:** Letters from Frank Marcinowski, Director, Radiation Protection Division, EPA, and Norbert Hankin, Center for Science and Risk Assessment, Radiation Protection Division, EPA, to Janet Newton, President, the EMR Network, with copies to the FCC and the IEEE, dated July 16, 2002. (http://www.emrpolicy.org/litigation/case_law/docs/noi_epa_response.pdf)

In summary, the EPA makes the following points: (1) the FCC 's thermal exposure guidelines do *not* protect against all harm, only the harm caused by too much heating; (2) the FCC's thermal exposure guidelines do *not* apply to "chronic, nonthermal exposure", which is the type of exposure generated by cell towers and many other wireless devices; and (3) when new FCC guidelines are developed for chronic nonthermal exposures, they must accommodate "children, the elderly, and people with various debilitating physical and medical conditions" because those groups are not accommodated now.

U.S. Food and Drug Administration

The Food and Drug Administration (FDA) is also often cited by the FCC, and by the wireless industries, as one of the agencies that the FCC has consulted about exposure guidelines. But the FDA is the agency that "nominated" the NTP study of the possible health effects of cellular radiation, in part because of the FDA's uncertainty about the validity of the FCC's exposure guidelines:

> "Currently cellular phones and other wireless communication devices are required to meet the radio frequency radiation (RFR) exposure guidelines of the Federal Communications Commission (FCC),

which were most recently revised in August 1996. The existing exposure guidelines are based on protection from acute injury from thermal effects of RFR exposure, and may not be protective against any non-thermal effects of chronic exposures."

Reference: Nominations from FDA's Center from [for] Device[s] and Radiological Health, Radio Frequency Radiation Emissions of Wireless Communication Devices (CDRH), Executive Summary, as attached to transmittal letter from William T. Allaben, Ph.D., FDA Liaison, to Dr. Errol Zeiger, Coordinator, Chemical Nomination and Selection, National Toxicology Program, May 19, 1999,[5] (http://ntp.niehs.nih.gov/ntp/htdocs/chem_background/exsumpdf/wireless051999_508.pdf)

The FDA's wisdom in nominating the NTP study was well justified by the NTP's publication of the "Partial Findings" described above. Those findings demonstrated both that the FCC's exposure guidelines are not protective and that the thermal assumption on which those guidelines are based is invalid.

U.S. Department of the Interior

In 2014 the Department of the Interior (Fish and Wildlife Service) also addressed the limitations of the FCC's thermal exposure guidelines. The Department of the Interior was motivated by the multiple adverse effects of electromagnetic radiation on the health, and the life, of birds, particularly in connection with cell towers. The Department of the Interior stated the following:

"However, the electromagnetic radiation standards used by the Federal Communications Commission (FCC) continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today."

Reference: Letter from Willie R. Taylor, Director, Office of Environmental Policy and Compliance, Office of the Secretary, United States Department of the Interior, to Mr. Eli Veenendaal, National Telecommunications and Information Administration, U.S. Department of Commerce, dated February 7, 2014.
(https://www.ntia.doc.gov/files/ntia/us_doi_comments.pdf)

American Academy of Environmental Medicine

The American Academy of Environmental Medicine (AAEM), which trains physicians in preparation for Board Certification in Environmental Medicine, states the following:

"The AAEM strongly supports the use of wired Internet connections, and encourages avoidance of radiofrequency such as from WiFi, cellular and mobile phones and towers, and 'smart meters'."

"The peer reviewed, scientific literature demonstrates the correlation between RF [radiofrequency] exposure and neurological, cardiac, and pulmonary disease as well as reproductive and developmental disorders, immune dysfunction, cancer and other health conditions. The evidence is irrefutable."

"To install WiFi in schools plus public spaces risks a widespread public health hazard that the medical system is not yet prepared to address."

[5] This date and the referenced URL were changed when this superior reference was posted, at my request, by the NTP/NIEHS/NIH.

Reference: American Academy of Environmental Medicine, Wireless Radiofrequency Radiation in Schools, November 14, 2013.
(http://www.aaemonline.org/pdf/WiredSchools.pdf)

American Academy of Pediatrics

The American Academy of Pediatrics (AAP), whose 60,000 doctors care for our children, supports the development of more restrictive standards for radiofrequency radiation exposure in order to better protect the public, particularly the children. In a letter to the Federal Communications Commission (FCC) and the Food and Drug Administration (FDA), dated August 29, 2013, the AAP states the following:

> "Children are not little adults and are disproportionately impacted by all environmental exposures, including cell phone radiation. Current FCC standards do not account for the unique vulnerability and use patterns specific to pregnant women and children. It is essential that any new standard for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded throughout their lifetimes."

Reference: American Academy of Pediatrics, letter dated August 29, 2013 addressed to The Honorable Mignon L. Clyburn, Acting Commissioner, Federal Communications Commission, and The Honorable Dr. Margaret A. Hamburg, Commissioner, U.S. Food and Drug Administration.
(http://apps.fcc.gov/ecfs/document/view?id=7520941318)

After reviewing the "Partial Findings" from the new study by the National Toxicology Program at the National Institutes of Health, described above, the American Academy of Pediatrics cautioned parents about the use of cell phones by their children:

> "In light of the findings, the Academy continues to reinforce its recommendation that parents should limit use of cell phones by children and teens."

Reference: American Academy of Pediatrics, AAP responds to study showing link between cell phone radiation, tumors in rats, May 27, 2016.
(http://www.aappublications.org/news/2016/05/27/Cancer052716)

The Telecommunications Act of 1996, in combination with the FCC's exposure guidelines, empowers the wireless industries to mandate the exposure of the public to levels of radiofrequency radiation already found harmful to health.

The Telecommunications Act of 1996 bars state and local governments from objecting to the placement of cell towers on environmental/health grounds unless the FCC's exposure guidelines would be exceeded. Specifically, the Act states the following:

> "No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's [FCC's] regulations concerning such emissions."

Reference: Telecommunications Act of 1996, Section 704 Facilities Siting; Radio Frequency Emission Standards, page 117.
(http://transition.fcc.gov/Reports/tcom1996.pdf)

This Act, in combination with the FCC's permissive exposure guidelines, strips state and local governments of the right to protect their own residents from levels of radiofrequency radiation already shown to be harmful to health. In effect, this Act transfers to the wireless industries the right to ***mandate*** the exposure of the public, including those most vulnerable to harm, to radiofrequency radiation without the need for further governmental action. State and local governments can still resist, but to do so they must confront this Act which is designed to frustrate their success. Even so, some governments do heroically resist and some do succeed.

Protecting ourselves and our families

We can act on our own to protect ourselves and our families, but only partially.

Instead of increasing our exposure to cellular radiation, and to the radiation from other digital wireless devices, we can decrease our exposure and improve our chances for good health. Desirable steps in this direction include the following:

- Reduce or stop the use of cell phones. Reserve them for emergencies or other essential uses.
- Replace cordless telephones with corded telephones.
- Establish wired (Ethernet) interconnections between routers and the wireless devices that the routers support. Then turn off the wireless capabilities, such as Wi-Fi and Bluetooth, of them all.
- "Opt out" of the wireless smart meter on your residence, if your state or local electric power company permits. Many states, but not all, have an opt-out provision.
- Alert family members about the health risks posed by wireless devices, particularly for vulnerable groups such as pregnant mothers, unborn children, young and teenage children, adult males of reproductive age, seniors, the disabled, and anyone with a chronic health condition. Everyone is vulnerable, but these groups are more so.

  Reference: For more information on reducing radiation at home, please see Ronald M. Powell, Ph.D., How to Reduce the Electromagnetic Radiation in Your Home, which is document (10) on the following list.
  (https://www.scribd.com/document/291507610/)

We can obtain better protection if we work together.

We can contribute our efforts to the hundreds of new organizations that are emerging nationwide to raise awareness about the health risks posed by the radiation exposure from wireless devices in homes, in the workplace, in schools, and in public places, especially where children are present. Through the Internet, look for organizations that address the intersection of health with cell phones, cordless phones, Wi-Fi, smart meters, and wireless desktop computers, laptops, and tablets. These wireless devices are the principal sources of radiofrequency radiation in the home.

Take care for our children. Today's adults grew up in an environment with much less radiofrequency radiation than exists today. Today's children are not so lucky. To have the same chance at a healthy life, they need a lot of help. Unfortunately, the levels of radiofrequency radiation in our environment are rising exponentially as

governments and wireless industries continue to promote, and even mandate, the exposure of the public to ever higher levels of radiofrequency radiation, with no limit in sight. That means that many of our children will become chronically ill, and many will die, while still young adults. This is a tragedy in the making. To stop it will require greatly increased awareness of the problem and serious political action at multiple levels of government. That is no small task, but we all can help. We can join with others to become a part of the solution for ourselves and our families, but especially for our children and our grandchildren.

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August 18, 2017

To whom it may concern,

I urge in the strongest terms that you vigorously oppose California SB 649.

If this bill passes, many people will suffer greatly, and needlessly, as a direct result.

This sounds like hyperbole. It is not.
My research group at UC San Diego alone has received hundreds of communications from people who have developed serious health problems from electromagnetic radiation, following introduction of new technologies. Others with whom I am in communication, have independently received hundreds of similar reports. Most likely these are a tip of an iceberg of tens or perhaps hundreds of thousands of affected person. As each new technology leading to further exposure to electromagnetic radiation is introduced – and particularly introduced in a fashion that prevents vulnerable individuals from avoiding it – a new group become sensitized to health effects. This is particularly true for pulsed signals in the radiowave and microwave portion of the spectrum, the type for which the proposed bill SB 640 will bypass local control.

Mechanisms by which health effects are exerted have been shown to include oxidative stress (the type of injury against which antioxidants protect ,see optional section below), damage to mitochondria (the energy producing parts of cells), damage to cell membranes[1, 21], and via these mechanisms, an impaired "blood brain barrier"[3-5] (the blood brain barrier defends the brain against introduction of foreign substances and toxins; additionally, disruption can lead to brain edema[6]), constriction of blood vessels and impaired blood flow to the brain[7], and triggering of autoimmune reactions[8, 9]. Following a large exposure, that depresses antioxidant defenses, magnifying vulnerability to future exposures, some persons no longer tolerate many other forms and intensities of electromagnetic radiation that previously caused them no problem, and that currently cause others no problem. But this group deserves – nay needs -- the right to be able to avoid these exposures.

Affected individuals not only experience "symptoms" that "merely" cause them distress and suffering, when they are exposed – symptoms like headaches[10, 11], ringing ears[10, 11] and chest pain[10] from impaired blood flow, heart rhythm abnormalities[10, 11], and inability to sleep[10, 11]. These symptoms arise from physiological injury. Moreover, **many experience significant health problems that can include seizures[11], heart failure, hearing loss[12-14] and severe cognitive impairment[11, 15].** The mechanisms involved are those also involved in development and progression of neurodegenerative conditions including Alzheimer's disease[16].

Fully half who were employed when their problems developed lost their job because of the problem, among participants of a survey we conducted. They reported that their condition had cost them up to 2 million dollars to date. Many had lost their homes. A number became homeless, and have swelled the ranks of so-called "EMF refugees"[17-19]. Among those affected, many were previously high functioning individuals – engineers, doctors, lawyers. The best and the brightest are among those whose lives – and ability to contribute to society –will be destroyed. High profile individuals with acknowledged electrohypersensitivity include, for instance, Gro Harlem Brundtland – the former 3-time Prime Minister of Norway and former Director General of the World Health Organization[20]; Matti Niemela, former Nokia Technology chief[21]; as well as the wife of Frank Clegg[22], who formerly headed Microsoft Canada and is current head of Canadians for Safe Technology[23].

Each new roll-out of electromagnetic technology for which exposure is obligatory, swells the ranks of those who develop problems with electromagnetic fields (EMF).- particularly following a significant exposure to pulsed radiowave-microwave radiation, and particularly when people have no ability to avoid it.

Many state that they didn't give credence to the problem (if they had heard of it at all) **until they themselves fell prey to it.**

This is not a psychologically driven condition. Multiple objective physiological changes reflecting mechanisms of injury have been shown in persons with this condition[24, 25].

The role for oxidative stress, that has been shown in innumerable studies (below)**, is affirmed by evidence of a link of this condition to genetic variants in antioxidant defenses**, that are less avid in defending against oxidative stress[307]. People cannot manipulate their genes, to produce such an outcome by suggestibility.

An analysis by a University of Washington researcher showed that most studies funded by industry reported failure to show physiological effects. However, most studies without such industry bias affirmed effects. This is redolent of findings shown in medicine[26], regarding which the former editor in chief of the BMJ (the British Medical Journal), Richard Smith, noted, based on findings of a study, "This {result} suggests that, far from conflict of interest being unimportant in the objective and pure world of science where method and the quality of data is everything, it is the main factor determining the result of studies."[27]. So where articles deny injury from nonionizing radiowave-microwave radiation, there is commonly a stake aligned with financial benefit from such denial.

Those who are affected are in desperate need of *protection* by our elected officials. They need creation of safe spaces and housing, and roadways to allow travel, not removal of any prospect of one; protection of local rights to make decisions - **not removal of any recourse or ability to avoid what injures them**. They are far more strongly in need of protections than a great many protected classes – their problems arose due to actions of others, against which they were given no control – *and can be reversed,* in most cases, if the assault on them is rolled back. Through no fault of their own, and in some cases against their will (e.g. before opt out was permitted with smart meters), they were subjected to an

exposure that has altered their lives as they knew them, and forced them – needlessly - to the margins of society.

Let our focus be on safer, wired and well shielded technology – not more wireless.

This legislation, if passed, and the resulting unrestricted roll-out of this technology, will predictably and directly injure and disable a new group, and add depth of suffering to those already affected.

In other spheres we abridge freedoms to protect the vulnerable few. We require that every schoolchild be vaccinated, supposedly to protect the vulnerable few who may not respond effectively to a vaccine. The need to protect the vulnerable group is deemed to be so great that it justifies the decision to abridge individual rights.

In contrast, this bill seeks to abridge individual freedoms, and local rights, in the service of *harming* a vulnerable group, and creating a new one.
(The common factor appears to be that in both cases, the direction is aligned with a powerful industry that influences political decisions.)
Luckily, no abridgment of individual rights and freedoms is required to protect,t here.

If any group can opt out (such as, I understand, firefighters*)[28]; **then *every* group deserves that equal right**. Others should not be second class citizens, subject to fewer protections.

It would go far to helping this cause if anyone complicit in promoting or passing the legislation (and then after that, *their* families) were required to be the first subjected, for a substantial test period, to the *greatest* amount of exposure that anyone *else* (and their families) may be subjected to, when new policies of this type are rolled out. It will still not do them equal damage; because they may not represent the vulnerabilities that others will have; but such a policy might help them to think twice. *That* is a bill I would strongly endorse.

Most who are now affected – were not, until they were. This may become you – or your child or grandchild. Moreover, if you have a child, or a grandchild, his sperm, or her eggs (all of which she will already have by the time she is a fetus in utero), will be affected by the oxidative stress damage created by the electromagnetic radiation, in a fashion that may affect your future generations irreparably.

It was noted above that, among survey completers, fully half of those who were employed at the time they developed electrosensitivity, lost employment *due to* this problem. (This may understate the scope of the tragedy, since this most-affected group may be least likely to be able to respond to an online survey.) **Many who previously had no problem navigating in the world are now restricted from access to basic services** like hospital care, post offices and libraries because of these problems. With each new introduction of technology that exposes many to yet a new nondiscretionary source of electromagnetic radiation, particularly (but not exclusively) that which emits pulsed radiation in the radiowave-microwave part of the spectrum, a new group of people are affected; and the suffering of those who are already affected increases greatly.

Please, defend the public and our future. Protect the rights of the individual and the locality, against a form of incursion that will lead to serious harm to some – and set a terrible precedent. **Vote no on California SB 649**, and urge that everyone else do the same.

Sincerely,

Beatrice Alexandra Golomb, MD, PhD
Professor of Medicine
UC San Diego School of Medicine

*****Comment on the fire fighter exemption:"The legislature granted an exemption from SB 649 to the firefighters who requested it for health reasons. Throughout California firefighters have long complained of often disabling symptoms from cell towers on their stations. Cities frequently rent out space on fire stations to add to city revenue. …Symptoms experienced by the firefighters have included neurological impairment including severe headache, confusion, inability to focus, lethargy, inability to sleep, and inability to wake up for 911 emergency calls. Firefighters have reported getting lost on 911 calls in the same community they grew up in, and one veteran medic forgot where he was in the midst of basic CPR on a cardiac victim and couldn't recall how to start the procedure over again…Prior to the installation of the tower on his station, this medic had not made a single mistake in 20 years. A pilot study (2004) of California firefighters showed brain abnormalities, cognitive impairment, delayed reaction time, and lack of impulse control in all 6 firefighters tested (https://ecfsapi.fcc.gov/file/7022117660.pdf). This study led to the overwhelming passage of Resolution 15 by the International Association of Firefighters in Boston in August 2004. Res. 15 called for further study and was amended to impose a moratorium on the placement of cell towers on fire stations throughout the US and Canada."[15, 28]
Clearly, others who experience similar problems also deserve protections.

Optional – More on the Science

There is a robust literature showing that electromagnetic radiation, including in nonionizing frequencies, and at *levels*[29, 30] *below* those that are cause thermal effects (heating) – causes physiological effects, injury, and cell death –not only in humans but many animals and plants[3, 7, 31-49]. Unsurprisingly, industry has sought – against the tide of evidence to the contrary - to maintain that radiation must be ionizing or heating to cause injury.

Scores or hundreds of studies show that radiation, including specifically radiowave-microwave spectrum radiation, and including low-level exposure, can impair antioxidant defenses, increase "oxidative stress" (free radical injury) and damage mitochondria, the energy producing parts of cells[1, 2, 34, 50-6930, 70-104105-13646, 137-171]. These effects occur with ionizing and nonionizing radiation, at thermal and subthermal levels. (Indeed, much or most of the damage by ionizing radiation, and radiation above the thermal limit, occurs by mechanisms also documented to occur without ionization, and below the thermal limit.) These

mechanisms cohere with the mechanisms documented to play a role in symptoms and health conditions that are reported in those who are electrosensitive – extending to seizures[172-176], heart failure[177-184] and cognitive decline[5, 32, 57, 108, 185-195].

These mechanisms have known involvement in induction of **brain cancer, metabolic diseases like obesity and diabetes, autism, autoimmune disease, and neurodegenerative conditions**, conditions that have exploded. In each case these have been linked, or presumptively linked, in some studies to electromagnetic radiation[8, 9, 16, 34, 196-219].

Such radiation also has effects on sperm[33, 100, 220-228]; and the DNA of sperm[229] (consistent with recent news reports of marked recent declines in sperm counts and function)..

Such radiation also has toxic effects in pregnancy[230], to the fetus and subsequent offspring[231-235] including at low levels[236], and is tied to developmental problems in later life, including attention deficit and hyperactivity[31, 235-241]. It is critical to defend pregnant women (and eggs of girls who may at a later time become pregnant) from exposures with such toxicity.

Electromagnetic radiation across much or most of the spectrum (not excluding visible light) has been shown to depress levels of melatonin[40, 72, 242-252]**,** which is best known for its role in sleep (and indeed, impaired sleep is the most consistent symptom in affected individuals[10, 11]).

Melatonin is in fact a critical antioxidant that defends the body against harm from *many* toxic exposures[253-266] **including electromagnetic radiation itself** [61, 66, 67, 82, 101, 107, 118, 121, 138, 144, 151, 204, 249, 267-284]**- reducing the oxidative stress** that is implicated in cancer, metabolic diseases like obesity and diabetes, autism, autoimmune disease, bipolar disorder and neurodegenerative conditions, and that also plays a role in heart attack and stroke[9, 285-329330-343].

Radiation, and specifically radiation in the radiowave-microwave portion of the spectrum can also depress levels of other critical antioxidant systems that also defend the body against chemical, radiation, and other sources of injury. These other antioxidant systems include the glutathione system, superoxide dismutase and catalase[81, 102, 115, 116, 233, 344-358] - which are also involved in defending against health problems.

This suggests that depression of antioxidant defenses due to electromagnetic radiation may magnify risk of chemically induced health effects (and depression of antioxidant systems due to some chemicals may amplify risk of harm from electromagnetic radiation). Indeed just such effects have been reported[359, 360].

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July 6, 2017

VIA PRIORITY MAIL and/or HAND DELIVERY and/or EMAIL

Assemblymember Marc Levine
5135 State Capitol
Sacramento, CA 95814

Re: Mass casualties are likely in District 10 from passage of SB 649

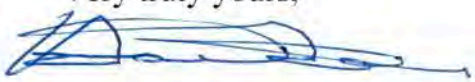
Dear Assemblymember Levine,

Senate Bill 649, a decision now before you, will likely result in mass fatalities in your District including children, who due to skull development levels and other factors, are more subject than adults to the effects of the carcinogenic cellular radiation which will saturate the homes in your District if this Bill is passed. Like you, I distain inflammatory phases as such are so often deployed by emotionally over-loaded people with incomplete capture of the facts and science. Yet, directly relevant to SB 649, the Toxicology Program of our federal National Institutes of Health has shown through their $25 million study, as announced on May 27, 2016, that cellular wireless radiation affects human tissue via non-thermal means and the formation of glioma, the cancer cell which results in glioblastoma (the brain cancer that kills people). Brain cancer killed four of my colleagues and friends which is what led me several years ago into dedication to our work educating consumers about smartphone proximity through www.greenswan.org. SB 649 is not about smart phone proximity but the constant radiation from the 50,000 towers from SB 649 presents a moral necessity to oppose this Bill. SB 649, now pushed by an industry which makes huge donations and contributions, is being advocated to wirelessly supplant cable as a main means of delivering TV, et al. Senate Bill 649 should be stopped in its tracks in order to protect the residents of your District. At the very least, SB 649 should be put on hold pending further study, as our federal Senate decided regarding the federal version of the same Bill, called S-19, pending further study.

As a trial lawyer, I have specialized in engineering and scientific proof civil cases since 1983. As nearly as I can tell I've personally handled approximately 1,600 civil cases, including certified class actions like the Chevron aviation gasoline matter (new engines for 1647 aircraft), the Mobil Oil AV-1 matter (overhauled or replaced engines for 850 aircraft, mostly twins), and I served as part of the plaintiffs' team in the Yuba Flood Cases, which after far too long settled against the State for $423 million, as well as many hundreds of other cases, some of them also involving large groups of plaintiffs. I am not important, or by contemporary standards wealthy. Like you, I want facts, not hot-headed opinion from

some alarmist. Rather, our opposition to SB 649 is not grounded in emotion, but strongly grounded in science. If this Bill is allowed to be passed by our Assembly and is then signed into law, mass Crimes Against Humanity will likely result due to radiation exposure, ***as you are hereby notified and warned***. Dated May 23, 2017, a 14 page submission on this subject was made to the already-overworked Senate Appropriations Committee, which presentation was composed of a detailed and annotated letter over my signature and supported by a Declaration under Penalty of Perjury by Mr. Paul McGavin. Paul and I are mere two of the large of California residents who, like representatives of cities and counties, oppose SB 649. Rather than taking up your time with more of my own words, and having given you this legal Notice of the likely consequences from the passage of SB 649, I respectfully advise you of said letter submitted to Senate Appropriations to your attention, and hereby incorporate that May 23rd Appropriations letter herein by this reference as though more fully set forth. Copies of that letter and Declaration should be immediately available to you from Senator Lara's office if you so request. I note in closing the additional factor that if SB 649 becomes law in California, the State will face ruinous financial loss from the resulting ADA complaints, all as set forth in that incorporated letter. **A selection of sources for your study is listed below**. Thank you.

Very truly yours,



Harry V. Lehmann

A small selection of articles and sources related to non-ionizing radiation and health:

https://ehtrust.org

http://scientists4wiredtech.com

http://scientists4wiredtech.com/2017/03/rfr-hazards/

https://www.niehs.nih.gov/news/newsletter/2016/6/science-highlights/cellphones/index.htm

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

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https://www.wsj.com/articles/cellphone-boom-spurs-antenna-safety-worries-1412293055

http://www.latimes.com/business/la-fi-cellphone-5g-health-20160808-snap-story.html