



Radiofrequency Radiation Exposures to Children in Schools  
Comments to the Maryland Children's Environmental Health and Protection Advisory Council  
On the Children's Health and Radiofrequency Exposures Report

This document contains comments to the [Draft WiFi Report](#) to be discussed by the Council on September 19, 2016.

**What radiofrequency radiation (RF) exposures are children receiving while in schools?**

RadioFrequency exposure to children is cumulative (it adds up over time), involuntary (they are unaware and have no choice) and comes from multiple transmitters in the current classroom environment. Children spend most of their time at home and in schools and that is why school exposures are a critical area of exposure for children.

The school environment is unique in that it has a *high density* of radio frequency transmitters in a *small* space. Sources of radiofrequency radiation in classrooms include WLAN access points, cell phones, fitness trackers, wearables *and* wireless tablets, laptops, computers, clickers, mouse, printer, virtual reality and gaming devices. Many schools have a cell tower on school land with radiation coming into classrooms through windows which face the antennas. In addition, some schools have wireless security systems, speakers, paging systems and video cameras. **None of these exposures existed in classrooms a mere decade ago.** They represent a new daily exposure for children.

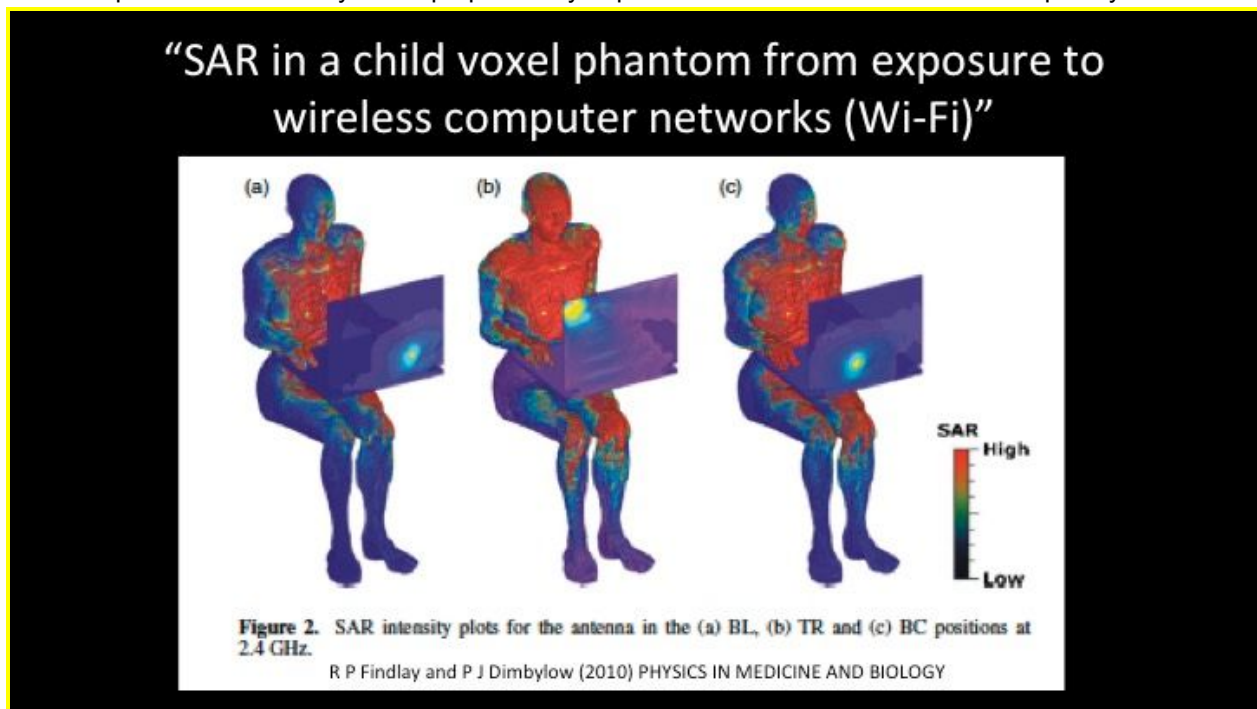
As an example, a classroom of 30 middle/high school children may have radiation from 31 wireless laptops, 31 cell phones, one high density access point, a wireless printer, 30 wireless class clickers, at least ten fitbits or wearable fitness monitors (connecting to the student's cell phone continuously) *at a minimum*. Even preschool and kindergarten children use [wireless tablets daily](#). Younger grades often utilize wireless tablets with a wireless keyboard and by third grade many have cell phones in pockets.

Children are absorbing the highest radiofrequency radiation from **near field** exposures- meaning the transmitting devices nearest to them such as their cell phones and the wireless computer they are using **and** the devices in use by students sitting nearest to them. Children receive **far field** exposure from devices in use across the room, the Wi-Fi access point mounted on the ceiling and any outside transmitters such as a nearby cell tower.

### Wi-Fi radiation is not low.

Wi-Fi exposures are erroneously described as “low” because such descriptions are comparing power density levels or SAR measurements to FCC exposure regulations. Indeed, the measurements are low in comparison to FCC regulations or to International guidelines. However, it is all a matter of perspective. In fact, *extremely low levels* of radiofrequency radiation have been shown to have adverse effects. [Please see the Bioinitiative 2012 Chart showing examples of published research showing health effects at such low levels of radiofrequency radiation.](#)

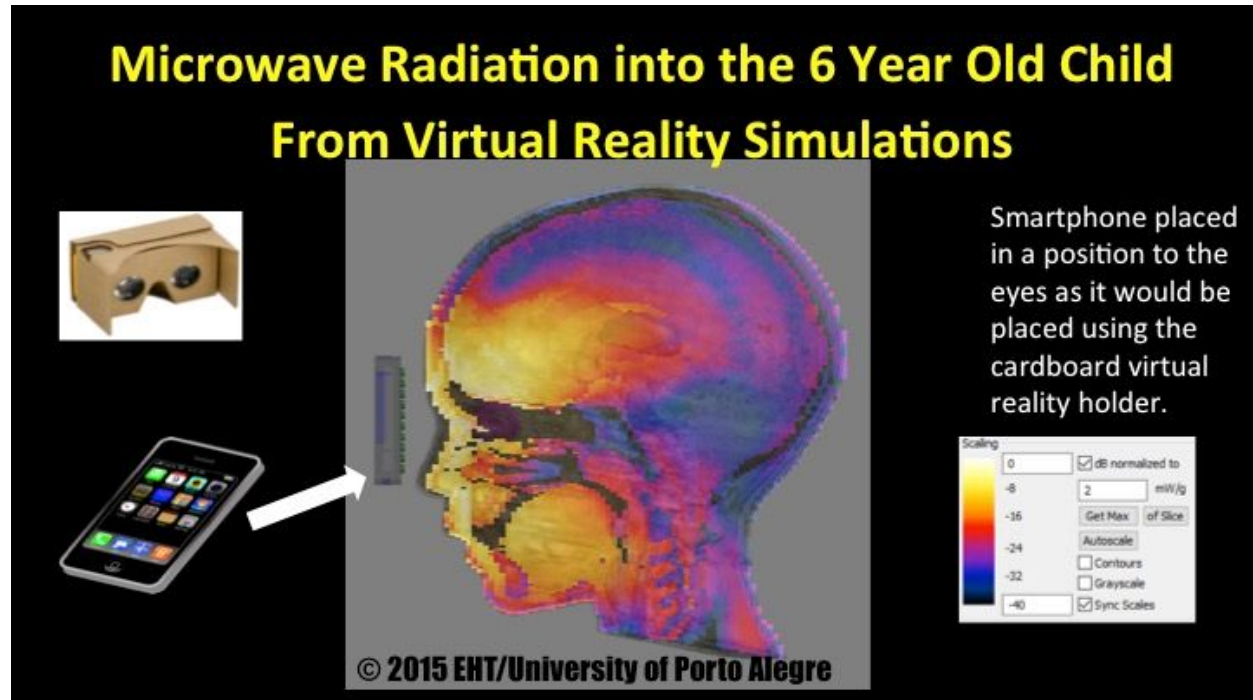
For example, the slide below shows SAR intensity and how the SAR varies depending on the location of the transmitting antennae. The authors clarify how measurements are well below thermally based limits. Thermally based limits **do not consider** biological impacts which occur at non-thermal levels. Wi-Fi radiation penetrates the body and laptops clearly expose the head and chest to radiofrequency radiation.



### Virtual reality technology in Classrooms is a growing exposure

Virtual reality field trips -whereby transmitting smartphones are placed in cardboard to the eyes of children- are becoming an increasingly classroom experience and this technology exposes children’s eyes and brain to cell phone radiation **in the near field**. Last year Google brought this technology to Maryland schools as a special one time event and this year Google is making the technology more available to *schools so they can go on regular “virtual” field trips*. Please see this example of

radiofrequency exposure from a smartphone mounted in a cardboard virtual reality case as is used in many Maryland schools last year and learn more about [this scientific imaging here](#).



### Variables Impacting Children's Actual Exposures

The amount of radiation a child absorbs is different for each child. Wireless radiation penetrates the body differently depending on the size and unique anatomy of the child. However, research has shown that children absorb proportionately more radiation than adults. "When electrical properties are considered, a child's head's absorption can be over two times greater, and absorption of the skull's bone marrow can be ten times greater than adults " ([Gandhi et al 2011](#)).

Coverage affects a child's exposure. If the signal is poor in a room, the device increases power to connect. So if a cellphone has only one bar, it will put out significantly more power than if the user has all bars. Likewise, if a tablet or laptop is used wirelessly in an area of spotty coverage, the emissions are higher because more power is used to connect the laptop to the router or access point.

Building construction and room furniture can have a significant impact on total exposure because building materials reflect radiofrequency differently. For example, if a student is working at a desk facing a row of metal cabinets, radiation will be reflected *back* at the child likely increasing exposure to the child.

Due the complex high density electromagnetic environment in schools, any discussion of children's RF-EMF exposures in schools must consider *not just* exposures from Wi-Fi access points, *but also* exposures from *all the other devices in use* in the room such as laptops, tablets and cell phones *in addition to nearby base stations*.

Radiofrequency exposures in schools constitutes involuntary exposure for children. Parents and staff need to be fully informed of these exposures just as they are for pesticide applications on school grounds.

### What health outcomes are linked to radiofrequency exposure?

Scientists are in agreement that radiofrequency radiation (non-ionizing radiation) at high levels can have a heating effect which is damaging to health because the heat damages tissue, causing blindness sterility and other health issues. Current government FCC exposure limits are set to protect against this effect *only* despite research showing a myriad of *other* serious adverse effects from low *non-heating* levels of radiofrequency radiation.

*“Whereas peer reviewed research has demonstrated adverse biological effects of wireless EMF including single and double stranded DNA breaks, creation of reactive oxygen species, immune dysfunction, cognitive processing effects, stress protein synthesis in the brain, altered brain development, sleep and memory disturbances, ADHD, abnormal behavior, sperm dysfunction, and brain tumors;”- [California Medical Association Wireless Resolution 2014](#)*

Recently a report was released from The National Toxicology Program (NTP) on the largest ever animal study on cell phone RF radiation and cancer finding an increased incidence of glioma and malignant schwannoma in the heart. Thus, the research showing increased cancer risk in humans has significantly strengthened since the IARC 2011 classification as new research has been published in addition to the NTP study which repeatedly shows a significant association after long term RF radiation exposure in addition to tumour promotion after exposures at low levels.

This document will first detail issues related to the *heating effects* of radiofrequency radiation exposures and then detail issues related to the *non-heating* effects with special emphasis on children.

**School children are not adequately informed nor protected from heating effects of radiofrequency radiation and are using devices in violation of FCC instructions.**

In order to ensure that wireless devices do not cause hazardous heating of tissue, they are pre-market tested for radiofrequency emission levels at various distances mimicking use at a distance from the body. Every device has instructions in the safety manual stating that “in order to meet FCC limits” the cell phone or laptop must be held at a minimum of this distance away from the body. For example, many cell phones are tested at about half an inch and laptops at about 8 inches. However school children are using cell phones, laptops and other wireless tech in classes for classwork **unaware of these distances.**

**Typical student mobile device use use violates FCC instructions.** Children are carrying cell phones in pockets and bras and resting cell phones on their laps as they text or scroll the internet. Laptops are used on laps as children sit cross legged on the floor. Such common practices are seen everywhere, yet they are actually in violation of the FCC instructions and could result in non compliance with FCC radiofrequency limits. In other words, children (and staff) could be getting radiofrequency exposures *far higher* than FCC limits.

### **Examples of the FCC Instructions**

**Samsung 3G Laptop:** “Usage precautions during 3G connection : Keep safe distance from pregnant women’s stomach or from lower stomach of teenagers. Body worn operation: Important safety information regarding radiofrequency radiation (RF) exposure.To ensure compliance with RF exposure guidelines the Notebook PC must be used with a minimum of 20.8 cm antenna separation from the body.”

**Blackberry Bold 9930:** “Keep the BlackBerry device at least 0.59 in. (15 mm) from your body

(including the abdomen of pregnant women and the lower abdomen of teenagers) when the BlackBerry device is turned on and connected to the wireless network.”

**iPhone 4:** " To be sure that human exposure does not exceed the FCC guidelines, always follow these instructions... keep iPhone at least 15 mm (5/8 inch) away from the body, and only use carrying cases, belt clips, or holders that do not have metal parts and that maintain at least 15 mm (5/8) inch separation between the iPhone and the body." To view the information on your iPhone go to Settings > General > About > Legal > RF Exposure.

#### **HP Chromebook 14 G4**

“WARNING! Exposure to Radio Frequency Radiation: The radiated output power of this device is below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact is minimized during normal operation of tablet PCs and notebook computers...To avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antennas should not be less than 20cm.

“...Mobile devices are transmitters designed to be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.” [FCC, BULLETIN 65, 1997](#)

Environmental Health Trust has many more examples of FCC instructions at [the EHT website Page on Fine Print.](#)

Schools have a duty of care to the students and should inform students and staff about these instructions to assure the devices- used as classroom tools- are not exposing students to radio frequency radiation *that exceed FCC limits.*

#### **Adverse health effects have been shown to occur at radiofrequency levels below FCC limits.**

Peer reviewed research has demonstrated a myriad of adverse biological effects from wireless radiation including reproductive damage, DNA breaks, creation of reactive oxygen species, immune dysfunction, stress protein synthesis in the brain, altered brain development, sleep disturbances, cognitive changes, behavioral issues and increased brain tumors.

These effects have occurred at wireless radiation exposure levels hundreds of times lower than presently legal international limits. These effects have occurred *after* exposure to devices that are government approved and legally sold to the public.

In 2016, Dr. Martha Herbert a Harvard pediatric neurologist spoke at the [Pediatric Academic Societies](#) detailing the mechanisms by which EMF/RFR stresses cells, damages cell membranes, damages mitochondria, and can impact brain health. “Given how much we have already learned about the subtle biological, cellular and electrical impacts of EMF/RFR, we need to update our out-of-date regulations to take into account of how exquisitely vulnerable we now know we are.” ([See her slides here](#)). At this professional symposium Yale Chief of Obstetrics Dr. Hugh Taylor discussed risks of cell phone radiation to pregnant women ([See his slides here](#)) and Environmental Health Trust’ Dr. Devra Davis detailed how children were more vulnerable to radiofrequency radiation ([See her slides here](#)). Please see the Appendix for a short compilation on research for several of these health endpoints.

Several recent scientific studies have significantly added to the weight of evidence showing carcinogenic effects at non-heating radio frequency power levels.

- 2016 Results from the [National Toxicology Program](#) study found a carcinogenic effect with a dose response at non-thermal levels in male rats exposed for two years.
- 2015 Results of a replication study [Tumor promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans](#), published in *Biochemical and Biophysical Research Communications*, Lerchl et al. replicated an [earlier experiment](#) that found that weak cell phone signals can promote the growth of tumors in mice.
- 2014 Results from a French study [Mobile phone use and brain tumours in the CERENAT case-control study](#), published in *Occup Environ Med*, found a statistically significant association in the heaviest users when considering life-long cumulative duration for meningiomas and number of calls for gliomas.

### **Newer Technology Could be More Dangerous - Even at Seemingly “Low” Power Levels.**

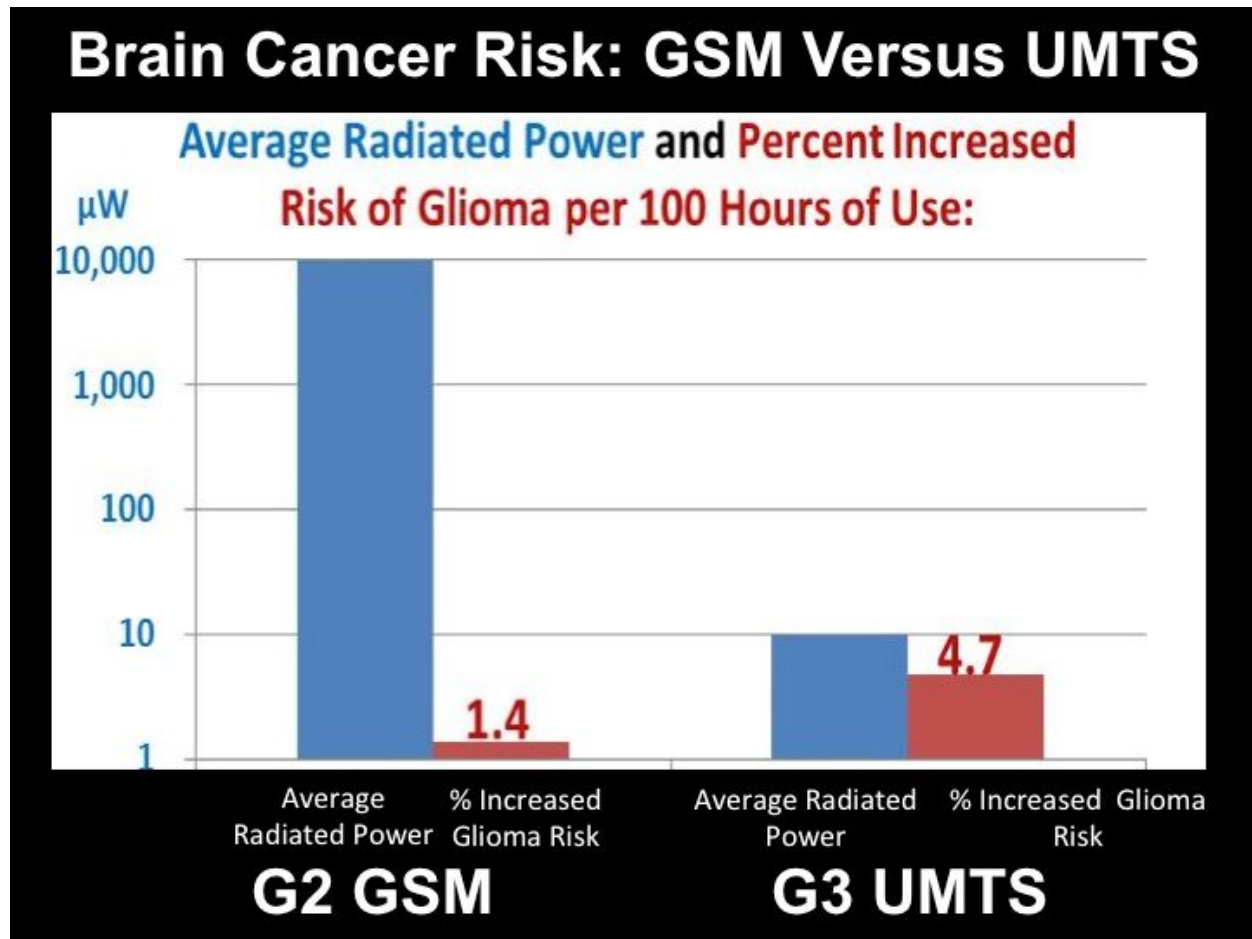
Many schools have responded to wireless health concerns by taking power density measurements. Usually, the schools find radiofrequency levels in classrooms to be “well below” FCC limits and then school policymakers decide to keep wireless systems with the flawed assumption that radiation levels below FCC limits is equivalent to “safety”. This is flawed reasoning. Meeting FCC limits *does not* ensure safety.

In fact significant research suggests *low* power may not mean *low* risk. Several studies show adverse health effects at radiation levels thousands of times lower than FCC limits. [The Bioinitiative 2012 RF Color Charts](#) summarize many studies at specific power levels that report biological effects and are relevant to compare with exposures from cell towers, WI-FI, ‘smart’ wireless utility meters, wireless laptops, baby monitors, cell phones and cordless phones.

As a recent example, consider the recent research that compares 2G (GSM technology) to 3G (UMTS-talk, text, and data- Smartphone technology). People usually assume, the more power you absorb, the higher the risk. However, when scientists reviewed the first ever paper that looks at brain cancer risk by type of phone used- 2 or 3 G- they came to [a stunning conclusion](#). The *lower* power 3G UMTS phones had a higher glioma (a type of brain cancer) risk than the *higher* power 2G GSM phones. Although 3G technology has up to 1000 less power, this technology shows a more than three times for glioma in comparison to 2G. These differences speak to the complexity of understanding wireless communication exposures and how various signal characteristics, such as modulation and waveform



must be considered *in addition to power density*.



Pulsed microwaves have been shown to be more biologically active than continuous radiation of the *same* frequency and *same* power level (Pall 2013). Radiofrequency radiation reports that only document average power density in school buildings and compare the levels to FCC limits are **not** the best way to measure the safety of the electromagnetic environment. Compliance with FCC limits *does not mean* that children are safe in school.

### **FCC radio frequency exposure limits are inadequate to protect children.**

Children are not adequately protected by outdated FCC radiofrequency exposure limits for two reasons. First, FCC regulations are not based on up to date science that considers childrens unique anatomy and vulnerability to radiofrequency. Instead FCC regulations are based on research and test methods that employ an adult male model.

Stem cells are more active in children and research shows that microwaves impact stem cells stronger than other cells.

*“The strongest microwave effects were always observed in stem cells. This result may suggest both significant misbalance in DSB repair and severe stress response. Our findings that stem cells are most sensitive to microwave exposure and react to more frequencies than do differentiated cells may be important for cancer risk assessment and*

*indicate that stem cells are the most relevant cellular model for validating safe mobile communication signals.”*

Markovà et al in [Microwaves from Mobile Phones Inhibit 53BP1 Focus Formation in Human Stem Cells More Strongly Than in Differentiated Cells: Possible Mechanistic Link to Cancer Risk.](#)

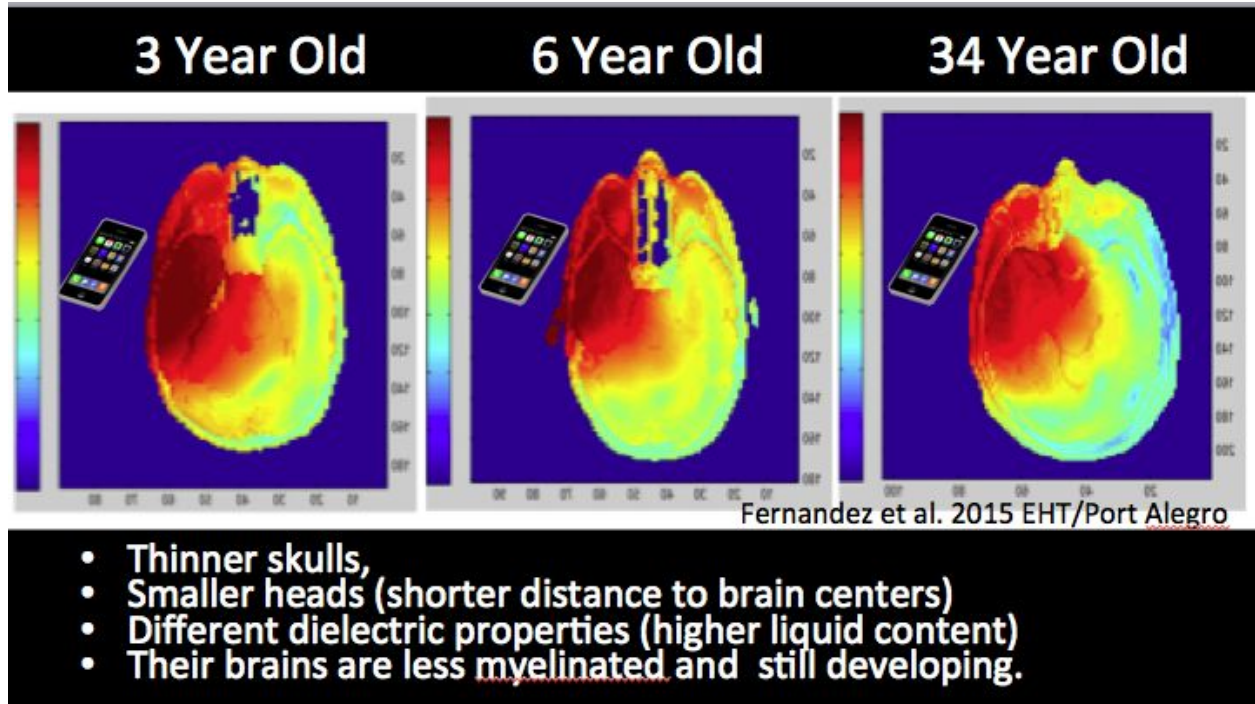
See below an example of the large head model used for device certification. Children have thinner skulls and more water in their tissues resulting in deeper RF absorption, yet their anatomy is not considered when such a model is utilized.



Second, the FCC has not reevaluated FCC exposure limits since 1996 when they were set based on research from a 1986 Report. Therefore, FCC regulations on human exposure to radiofrequency are out of date **by three decades.**

See these images pulled from research from a peer-reviewed paper published in the IEEE/Access entitled "[Dosimetric Simulations of Brain Absorption of Mobile Phone Radiation: the relationship between psSAR and age](#)" by Professors Claudio Fernandez and Alvaro de Salles at Federal Universities of Brazil and Devra Davis of Environmental Health Trust detailing how sophisticated computer imaging can simulate exposures of children's brains to cell phones showing children's increased RF exposure.

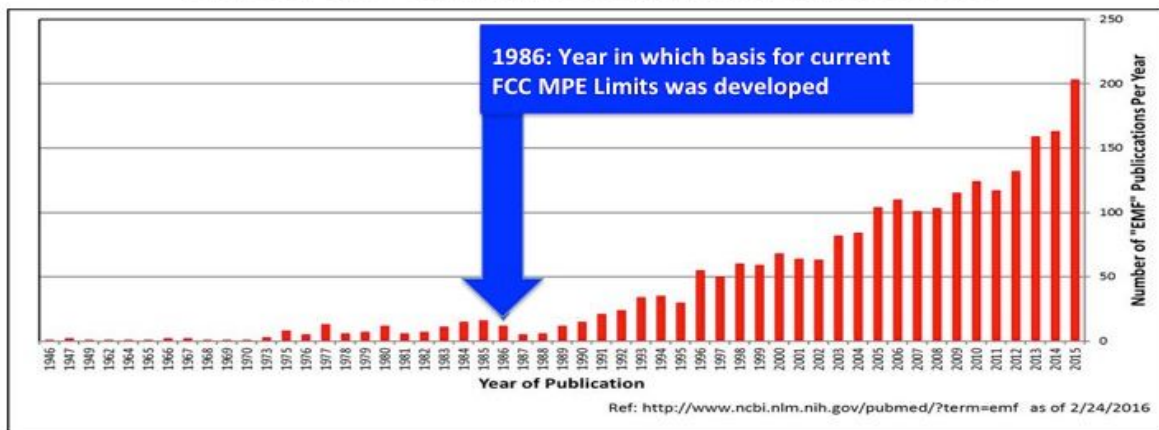




In the slide below please note the amount of published research (as found in Pub med) since 1986 on radiofrequency radiation.

### FCC RF Human Exposure Levels are Outdated/Based on 1986 Research

Number of "EMF" Publications Per Year on NIH's Pubmed Database



FCC exposure limits are primarily based on 1986 National Council on Radiation Protection and Measurement (NCRP) Report No. 86 "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields" available at <http://www.ncrppublications.org/Reports/086>.

**US government and other expert groups have repeatedly stated that FCC limits are outdated, not based on current science and have failed to consider effects on children.**

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, and testing requirements may not identify maximum exposure in all possible usage conditions."*

### **The FCC opened an inquiry on their outdated human exposure limits in 2013.**

In response to the GAO Report, the FCC opened a proceeding in 2012 to explore whether it should change its radiofrequency exposure standards stating, "we specifically seek comment as to whether our current limits are appropriate as they relate to device use by children." Over 900 submissions have been made to the FCC. To access these papers go to the FCC's web site for [Proceeding Number 13-84](#). To date no actions have been taken by the FCC or any other Federal agency since 2013. In other words, nothing has changed since 1996 and no review has been completed. Instead, documents have simply been submitted. It could take years before the agency takes action and actually reviews the submitted documents.

*"In the Inquiry we ask whether any precautionary action would be either useful or counterproductive, given that there is a lack of scientific consensus about the possibility of adverse health effects at exposure levels at or below our existing limits. Further, if any action is found to be useful, we inquire whether it could be efficient and practical."* -The FCC in 2013

### **Several agencies and health organizations have raised concerns about FCC limits.**

- **The Department of the Interior** states that *"The electromagnetic radiation standards used by the Federal Communications Commission (FCC) continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today."* Read [The 2014 Letter](#).
- **The 2008 National Academy of Sciences (NAS) Report, [Identification of Research Needs Relating to Adverse Health Effects of Wireless Communication](#)**, was tasked to identify any inadequacies in the research upon which the current US Radiofrequency radiation (RF) safety guidelines are based. The NAS Report found numerous inadequacies in that research record. The report found significant research gaps in regards to children and identified a priority research area to be to "characterize exposure of juveniles, children, pregnant women, and fetuses, both for personal wireless devices (e.g., cell phones, wireless personal computers, [PCs] and for RF fields from base station antennas including gradients and variability of exposures, the environment in which devices are used, and exposures from other sources, multilateral exposures, and multiple frequencies."
- **The American Academy of Pediatrics** has repeatedly called on the government to update its regulations stating that "Current FCC standards do not account for the unique vulnerability and use patterns specific to pregnant women and children." [Read their letter to the FCC in 2013 here](#).
- **The California Medical Association** passed a Wireless Resolution that states :  
*Whereas scientists are increasingly identifying EMF from wireless devices as a new form of environmental pollution with a growing body of peer reviewed scientific evidence finding significant adverse health and biologic effects on living organisms with exposure to low levels of non-ionizing microwaves currently approved and used in wireless communication, and*  
*Whereas peer reviewed research has demonstrated adverse biological effects of wireless EMF including single and double stranded DNA breaks, creation of reactive oxygen species, immune dysfunction, cognitive processing effects, stress protein synthesis in the brain, altered brain development, sleep and memory disturbances, ADHD, abnormal*

behavior, sperm dysfunction, and brain tumors; and...[Resolved, That CMA support efforts to implement new safety exposure limits for wireless devices to levels that do not cause human or environmental harm based on scientific research.](#) [Read it here](#) . [Read a magazine article on their resolution here.](#)

- **The LA School District Uses a RF-EMF Exposure Threshold 10,000 Less Than the FCC Limits:** The OEHS supported a precautionary threshold level that is 10,000 times lower than the current Federal Communications Commission standard. Read the RF Report the LA School District Used to recommend a cautionary exposure level. If the FCC limits are “not outdated” then why would they do this? [RADIOFREQUENCY \(RF\) EVALUATION REPORT Use of Wireless Devices in Educational Settings](#)

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

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

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

“The FCC [is not a health and safety agency](#), we defer to other organizations and agencies with respect to interpreting the biological research necessary to determine what levels are safe.”

-[The Federal Communications Commission in 2013](#)

**Scientific authorities and expert groups worldwide have recommended reducing radiofrequency exposures.**

#### **The EMF Scientists Appeal**

- In May 2015, a group of over 200 scientists from 39 nations who have authored more than 2,000 articles on this topic appealed to the United Nations to address “the emerging public health crisis” related to cell phones and other wireless devices. These scientists state that “the ICNIRP guidelines do not cover long-term exposure and low-intensity effects, and are “insufficient to protect public health.”
- They state that “the various agencies setting safety standards have failed to impose sufficient guidelines to protect the general public, particularly children who are more vulnerable to the effects of EMF.” See the International EMF Scientist Appeal at <https://emfscientist.org>.

#### **The French National Agency of Health Security of Food, Environment and Labour**

- 2016 “[Radiofrequency Exposure and the Health of Children](#)” Report recommends reducing exposures to young children and strengthening regulations to ensure “sufficiently large safety margins” to adequately protect the health of young children.
- [2013 French Agency for Food, Environmental and Occupational Health & Safety Report](#) recommends hands free phones, SAR labeling, and “limiting the population’s exposure to radiofrequencies... especially for children and intensive users, and controlling the overall exposure that results from relay antennas.”

#### **Canadian Parliament Standing Committee on Health of the House of Commons "Radio Frequency Electromagnetic Radiation and the Health of Canadians"**

- This [June 2015 Canadian Parliament Report](#) has 12 recommendations including “That the Government of Canada develop an awareness campaign relating to the safe use of wireless

technologies, such as cell phones and Wi-Fi, in key environments such as the school and home to ensure that Canadian families and children are reducing risks related to radiofrequency exposure.”

#### **The Council of Europe Resolution 1815:**

- In 2011 The Parliamentary Assembly of the Council of Europe issued [The Potential Dangers of Electromagnetic Fields and Their Effect on the Environment](#). A call to European governments to “take all reasonable measures” to reduce exposure to electromagnetic fields “particularly the exposure to children and young people who seem to be most at risk from head tumours.”  
*“For children in general, and particularly in schools and classrooms, give preference to wired Internet connections, and strictly regulate the use of mobile phones by schoolchildren on school premises.” [Read Resolution 1815](#)*

#### **The Vienna Medical Association**

The Vienna Medical Association has issued Guidelines on Reducing RF radiation. [Vienna Medical Association Guidelines](#) include : “Make calls at home and at work via the fixed corded (not wireless) network - Internet access via LAN cable (eg via ADSL, VDSL, fiber optic) no Radiation, is fast and secure data transfer. Constant radiation emitters like DECT cordless telephones, WLAN access points, data sticks and LTE Home base stations (Box, Cube etc.) should be avoided!”

#### **The World Health Organization’s International Agency for Research on Cancer**

- The WHO/IARC classified all radiofrequency electromagnetic fields as “possibly carcinogenic to humans”. [Read the IARC Monograph](#). [The Lancet article](#) indicates how this applies to all radio frequency electromagnetic fields including Wi-Fi.

#### **Swiss Physicians for the Environment**

"the risk of cancer for this type of [wireless] radiation is similar to that of the insecticide DDT, rightfully banned... From the medical point of view, it is urgent to apply the precautionary principle for mobile telephony, WiFi, power lines, etc." [Read the Swiss Physicians Letter here](#).

#### **The American Academy of Environmental Medicine**

"Adverse health effects, such as learning disabilities, altered immune responses, headaches, etc. from wireless radio frequency fields do exist and are well documented in the scientific literature. Safer technology, such as using hard-wiring, must be seriously considered in schools for the safety of those susceptible individuals who may be affected by this phenomenon. " Read the [The American Academy of Environmental Medicine's Open Letter to the Superintendents of the School Districts of the United States](#)

#### **International Society of Doctors for the Environment and Irish Doctors Environmental Association**

- These Societies have made the following recommendations: Avoid Wi-Fi in home or work if possible, particularly in schools or hospitals and Use wired technology whenever possible.
- “Because of the potentially increased risks for the foetus, infants and young children due to their thinner more permeable skulls and developing systems, particularly the immune and neurological systems, based on the precautionary principle and on the mounting evidence for harm at the sub-cellular level, we recommend that EMR exposure should be kept to a minimum.”
- [Read the Statement Here](#).

## **Bioinitiative Working Group**

In a [Letter to Education Super Highway CEOs](#) the Co-Editors of the Bioinitiative Report Cindy Sage and David Carpenter sent a letter on behalf of the Bioinitiative Working Group to the CEO's on the health risks of wireless infrastructure in US schools stating:

*"WiFi in schools, in contrast to wired internet connections, will increase risk of neurologic impairment and long-term risk of cancer in students. Corporations cannot avoid responsibility simply by asserting compliance with existing legal, but outdated and inadequate FCC public safety limits. Today, corporations that deal with educational technology should be looking forward and helping school administrators and municipal leaders to access safe, wired solutions."* [Read the Letter to Education Super Highway CEOs](#), [Click here to go to the Bioinitiative 2012 Report](#).

## **The BabySafe Project Joint Statement**

- As of August 2016 over 200 physicians, scientists and public health professionals from around the world have signed onto this Project "to express their concern about the risk that wireless radiation poses to pregnancy and to urge pregnant women to limit their exposures."
- "We call on our elected leaders to support such research and to advance policies and regulations that limit exposures for pregnant women. We call on industry to implement and explore technologies and designs that will reduce radiation exposures until such research is carried out."
- The BabySafe Project Lists ["Ten Ways to Reduce Your Wireless Exposure"](#) which includes "Whenever possible, connect to the internet with wired cables". See the Project Website at <http://www.babysafeproject.org/>

## **What are the policy options to protect children from this risk?**

Over a dozen countries officially recommend that cell phone radiofrequency radiation is *reduced* for children and they have enacted policy that protects children.

Haifa Israel has installed Corded connections in all schools and the country of Israel officially recommends wired connections in schools. France has banned Wi-Fi in kindergartens and the Wi-Fi must be turned OFF in schools as the default setting. Belgium has banned cell phones for young children and Wi-fi is prohibited in Ghent.

Several countries have detailed public information on how the public can reduce exposure to cell phones, computers and other wireless devices. Around the world, many private schools are removing the wireless. Please see the Appendix for a full list of International Policy which can serve as useful examples to governments on policy options.

## ***Solutions for schools exist at each level at which radiofrequency exposures are created.***

These RF exposures are occurring due to choices made by school policymakers in three ways:

**Purchasing:** The school decided to purchase a wireless technology system W-LAN plus laptops and/or tablets for internet connectivity and classroom instruction.

**Policy:** Many schools are creating and passing a Bring Your Own Device Policy allowing a myriad of wireless in the classroom in addition to school issued devices.

**School cell tower leasing agreements:** School land is increasingly seen as a choice spot to place cell towers because schools are in need of extra funds. Some schools have monopole towers erected (for example, next to ball fields) and other schools have cell antennae directly mounted on buildings. Sometimes cell antennae are mounted near schools and the school is not



directly a decisionmaker but can be a part of the decision making process by commenting on the proposed towers.

#### **Reductions in exposure can occur from actions at each of these levels:**

**Purchasing:** Schools internet connectivity needs can be met by choosing Low EMF technology such as corded connections in the classrooms.

**Policy:** Schools can develop mobile device policy that minimizes children's exposures such as keeping tablets on tables, not laps, and ensuring cell phones are powered off during classes. .

**Leasing agreements:** Schools can choose not to lease to cell tower companies where radiation beams will be angled into children's play areas or into classrooms through windows facing the tower.

#### **Recommendations to the Department of Health**

The Department of Health should advise the public on ways to reduce radiofrequency exposure from cell phones and wireless devices, with special emphasis on protecting children. For example, the Connecticut Department of Health issued **specific recommendations to reduce exposure stating**, *"It is wise to reduce your exposure to radiofrequency energy from cell phones whenever possible."* [Read the Connecticut Department of Public Health Cell Phone Q and A about Cell phones here.](#)

The Department of Health should create and maintain a webpage with information on how to reduce exposure, just as the [Connecticut Department of Health](#) and [San Francisco](#) and [Burlingame](#) in California have done.

Note: The governments of France, Belgium, Canada, Austria, the United Kingdom (UK) , India, Australia, Germany, Switzerland, Israel, Finland, Greece, Russia, Switzerland, Cyprus, Singapore, Turkey and the Council of Europe all have online [public resources](#) specifically recommending that children's exposure should be reduced or minimized, and governments provide resources detailing how the public can reduce exposure to radiofrequency radiation. As the UK ministry states, *"Government advice is to be on the safe side and limit mobile phone use by children."*

Countries such such as France, Israel, Germany, and the state and local governments of Ghent Belgium, Navarra, Vitoria, and the Basque Parliament of Spain, South Tyrol Borgofranco d'Ivrea, Piemonte and Turin Italy, specifically recommend against Wi-Fi or have outright banned Wi-Fi in daycare centers, kindergartens and/or schools. When the plan to remove Wi-Fi from all Haifa Israel schools was announced, Haifa Mayor Yona Yahav was quoted stating, *"When there is a doubt, when it comes to our children, there is no doubt."*

**The Department of Health should provide resources that inform doctors and other clinicians about advising patients how to reduce exposure *and* how to clinically assess Radiofrequency (RF) exposure during patient visits.** The Department of Health can create a Factsheet for Parents and a Factsheet for Clinicians that includes interview questions to ask during patient visits.

**The Department of Health should provide information to obstetricians and gynecologists so they can** provide information to patients about how to reduce exposures during clinic visits. Please see [the BabySafe Project](#) for examples of resources to share with pregnant women.

#### **Recommendations to Schools**



## **Reduce Radiofrequency Field Technology ALARA (As Low As Reasonably Achievable)**

In order to reduce classroom RF exposures schools should install Low RF-EMF technology and reduce radiofrequency radiation exposures according to ALARA (As Low As Reasonably Achievable) principles.

To reduce children's RF exposure in classrooms, schools can:

- Install corded (non-wireless) LAN systems in classrooms so that teacher and student computers (portable and desktop) connect to the internet without RF radiation exposures.
- Install corded (not cordless) telephones in all classrooms for voice communication and security.
- Choose non-wireless options for all other technology communication such as printers, security, mouse, keyboard, video cameras, HVAC, speakers, headphones, microphones and other accessories.
- Include information on FCC fine print warnings in the Bring Your Own (Mobile) Device (BYOD) Policy.
- Provide adaptors and accessories for personal devices so that devices can be used without radiation emissions in classrooms when needed as classroom tools.
- Post reminder notices in classrooms instructing device users to turn off Wi-Fi, Bluetooth, and any other wireless settings on devices and accessories that connect non-wirelessly (even if they are purses or bags).
- Prohibit cell towers near and on school buildings and grounds.

## **Partial RF Reduction Measures in Schools**

The following measures are not fully protective but only provide a *partial* reduction in radiation exposure. *However, fully wired (non-wireless) systems will eliminate the RF exposure from school technology. With partial or half-measures, children will continue to be exposed to significant RF radiation emitted by wireless devices and by all the building's access points (which transmit radiation continuously) whether exposed as users or bystanders.*

- Ensure all computers, tablets and laptops are used on a table and NOT on a student's lap.
- Ensure students' heads and bodies are at maximum distance from all wireless devices (e.g., children should not lie on the floor with their heads inches from the laptop screen, nor should the lid of the computer behind them be near their back or head.)
- Install a switch for the teacher to turn Wi-Fi routers and access points OFF in classrooms when not in use.
- Plan for wireless download of applications and content onto devices to occur *outside of* school hours. Therefore during the school day the device will be fully loaded and the device's Wi-Fi antennae (and WiFi router or access point) can be turned off while children are using devices.
- Allow students who want to avoid RF to use ethernet and other corded connections for their computers. Most classrooms *already* have an ethernet port on the wall to plug into. (Note: if a child is using an ethernet connected computer but is sitting in close proximity to a child on Wi-Fi or is sitting in front of a child using WiFi then the ethernet using child will still be getting radiation exposures from the nearby WiFi users in addition to the Wi-Fi access point.)
- Ensure that the wireless antennas are always OFF on BYOD Devices.

*Note: In several school districts some grades use digital devices in most of their academic classrooms and, thus, partial halfway reductions such as "turn it off when not in use" will have minimal impact as the devices are "in use" for several hours each day. Therefore, the most effective means to reduce exposure for maximum protection is to ensure the school infrastructure is 100% hardwired with ethernet connections.*

## **Educational Curriculum for Schools**

- Teach student and teachers *why* and *how* to reduce radiation exposure from technology devices as part of digital citizenship curriculum for students and for staff training.
- Offer educational workshops for parents to learn how to decrease RF exposures at home.
- Post RF reduction “Best Practices” in every classroom.

### **Manufacturer's Instructions in Cell Phones and Wireless Devices**

As digital devices are used as classroom tools, the Department of Education should ensure that students and staff are aware of the FCC instructions for devices they use.

- Students and staff should be informed that wireless devices emit RF radiation and that the device manual specifies separation distances that are necessary between persons and emitting machines in order to avoid exposure that exceeds FCC guidelines.
- Students need to be aware that most laptop instructions specify the separation distance must be at least 20cm (approximately 8 inches) and most cell phone instructions specify a distance under an inch (depending on the make and model). Most districts have (or are moving towards) a Bring Your Own Device Policy, so a variety of models are in use in classrooms.

**Please note that the Queensland Department of Education, Training and Employment** issued [Your Guide to Safe Technology](#), a guide that informs students that *all wireless devices emit low levels of electromagnetic radiation and students should follow the manufacturer’s usage guideline.*

### **Recommendations to the General Assembly**

The General Assembly should consider:

- Funding a public health education initiative on electromagnetic radiation and health.
- Right To Know Legislation requiring that the public is clearly informed that cell phones and “wireless” devices emit radiofrequency radiation and how the public can reduce exposure.
- Legislation that reduces RF exposures to the public with special consideration for child care centers, schools, community centers, municipal buildings and hospitals and other healthcare settings.

### **APPENDIX**

- I. Letters from the American Academy of Pediatrics on Children and Radiofrequency Radiation.
- II. Summary of International Policy Actions on Reducing Wireless Exposures to Children
- III. Sampling of Research on RF-EMF and Health
- IV. US Government Documents on RF Radiation Showing Federal Agency Concerns Over Lack of Protections for Children.

**The American Academy of Pediatrics Supports the Right To Know About These Safety Instructions and specifically details these concerns to Congress in 2012 and again to the Federal Communications Commission in 2013 as seen in the attached letters.**



August 29, 2013

The Honorable Mignon L. Clyburn  
Acting Commissioner Federal Communications Commission  
445 12th Street SW  
Washington, DC 20054

The Honorable Dr. Margaret A. Hamburg Commissioner  
U.S. Food and Drug Administration  
10903 New Hampshire Avenue Silver Spring,  
MD 20993

Dear Acting Chairwoman Clyburn and Commissioner Hamburg:

The American Academy of Pediatrics (AAP), a non-profit professional organization of 60,000 primary care pediatricians, pediatric medical subspecialists, and pediatric surgical specialists dedicated to the health, safety and well-being of infants, children, adolescents, and young adults appreciates this opportunity to comment on the Proposed Rule "Reassessment of Exposure to Radiofrequency Electromagnetic Fields Limits and Policies" published in the Federal Register on June 4, 2013.

In the past few years, a number of American and international health and scientific bodies have contributed to the debate over cell phone radiation and its possible link to cancer. The International Agency for Research on Cancer (IARC), part of the United Nations' World Health Organization, said in June 2011 that a family of frequencies that includes mobile-phone emissions is "possibly carcinogenic to humans." The National Cancer Institute has stated that although studies have not demonstrated that RF energy from cell phones definitively causes cancer, more research is needed because cell phone technology and cell phone use are changing rapidly. These studies and others clearly demonstrate the need for further research into this area and highlight the importance of reassessing current policy to determine if it is adequately protective of human health.

As radiation standards are assessed, the AAP urges the FCC to adopt radiation standards that:

- Protect children's health and well-being. 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.
- Reflect current use patterns. The FCC has not assessed the standard for cell phone radiation since 1996. Approximately 44 million people had mobile phones when the standard was set; today, there are more than 300 million mobile phones in use in the United States. While the prevalence of wireless phones and other devices has skyrocketed, the behaviors around cell phone uses have changed as well. The number of mobile phone calls per day, the length of each

call, and the amount of time people use mobile phones has increased, while cell phone and wireless technology has undergone substantial changes. Many children, adolescents and young adults, now use cell phones as their only phone line and they begin using wireless phones at much younger ages. Pregnant women may carry their phones for many hours per day in a pocket that keeps the phone close to their uterus. Children born today will experience a longer period of exposure to radio-frequency fields from cellular phone use than will adults, because they start using cellular phones at earlier ages and will have longer lifetime exposures. FCC regulations should reflect how people are using their phones today.

- Provide meaningful consumer disclosure. The FCC has noted that it does not provide consumers with sufficient information about the RF exposure profile of individual phones to allow consumers to make informed purchasing decisions. The current metric of RF exposure available to consumers, the Specific Absorption Rate, is not an accurate predictor of actual exposure. AAP is supportive of FCC developing standards that provide consumers with the information they need to make informed choices in selecting mobile phone purchases, and to help parents to better understand any potential risks for their children. To that end, we support the use of metrics that are specific to the exposure children will experience.

The AAP supports the reassessment of radiation standards for cell phones and other wireless products and the adoption of standards that are protective of children and reflect current use patterns. If you have questions, please contact Clara Filice in the AAP's Washington Office at 202/347-8600.

Sincerely,



Thomas K. McInerney, MD FAAP  
President

American Academy of Pediatrics  
DEDICATED TO THE HEALTH OF ALL CHILDREN™



December 12, 2012

The Honorable Dennis Kucinich  
2445 Rayburn House Office Building  
Washington,  
DC 20515

Dear Representative Kucinich:

On behalf of the American Academy of Pediatrics (AAP), a non-profit professional organization of 60,000 primary care pediatricians, pediatric medical subspecialists, and pediatric surgical specialists dedicated to

the health, safety and well-being of infants, children, adolescents, and young adults, I would like to share our support of H.R. 6358, the Cell Phone Right to Know Act.

The AAP strongly supports H.R. 6358's emphasis on examining the effects of radiofrequency (RF) energy on vulnerable populations, including children and pregnant women. In addition, we are pleased that the bill would require the consideration of those effects when developing maximum exposure standards. Children are disproportionately affected by environmental exposures, including cell phone radiation. The differences in bone density and the amount of fluid in a child's brain compared to an adult's brain could allow children to absorb greater quantities of RF energy deeper into their brains than adults. It is essential that any new standards for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded through their lifetimes.

In addition, the AAP supports the product labeling requirements in H.R. 6358. These standards will ensure consumers can make informed choices in selecting mobile phone purchases. They will also enable parents to better understand the potential dangers of RF energy exposure and protect their children.

On July 24, the U.S. Government Accountability Office (GAO) published a report on federal cell phone radiation exposure limits and testing requirements. The GAO noted that the Federal Communications Commission's (FCC) most recent data indicates that the number of estimated mobile phone subscribers has grown from approximately 3.5 million in 1989 to approximately 289 million at the end of 2009. Cell phone use behaviors have also changed during that time. The quantity and duration of cell phone calls has increased, as has the amount of time people use mobile phones, while cell phone and wireless technology has undergone substantial changes. Many more people, especially adolescents and young adults, now use cell phones as their only phone line, and they begin using wireless phones at much younger ages.

Despite these dramatic changes in mobile phone technology and behavior, the FCC has not revisited the standard for cell phone radiation exposure since 1996. The current FCC standard for maximum radiation exposure levels is based on the heat emitted by mobile phones. These guidelines specify exposure limits for hand-held wireless devices in terms of the Specific Absorption Rate (SAR), which measures the rate the body absorbs radiofrequency (RF). The current allowable SAR limit is 1.6 watts per kilogram (W/kg), as averaged over one gram of tissue. Although wireless devices sold in the United States must ensure that they do not exceed the maximum allowable SAR limit when operating at the device's highest possible power level, concerns have been raised that long-term RF energy exposure at this level affects the brain and other tissues and may be connected to types of brain cancer, including glioma and meningioma.

In May 2011, the International Agency for Research on Cancer (IARC), the United Nations' World Health Organization's (WHO) agency promoting international cancer research collaboration, classified RF energy as "possibly carcinogenic to humans." In addition, the National Cancer Institute has stated that although studies have not definitively linked RF energy exposure from cell phones to cancer, more research is required to address rapidly changing cell phone technology and use patterns.

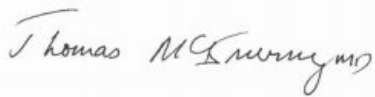
This and other research identified by the GAO demonstrates the need for further research on this issue, and makes clear that exposure standards should be reexamined. The GAO concluded that the current exposure limits may not reflect the latest research on RF energy, and that current mobile phone testing requirements may not identify maximum RF energy exposure. The GAO proposed that the FCC formally reassess its limit and testing requirements to determine whether they are effective. The AAP commends the activities proposed under H.R. 6358, as they would address this research gap and improve consumer knowledge and safety. Establishing an expanded federal research program as the basis for exposure

standards will ensure that consumer protections incorporate the latest research. Currently, the National Institute of Health (NIH), the only federal agency the GAO identified as directly funding research on this topic, provided approximately \$35 million from 2001 to 2011. Given this previous funding level, the AAP supports the \$50 million per fiscal year for seven years that H.R. 6358 would authorize.

The AAP appreciates your recognition of the need for new research and standards for mobile phone radiation, and is pleased to support H.R. 6358.

For further assistance, please do not hesitate to contact Sonya Clay, Assistant Director, Department of Federal Affairs, at 202-347- 8600 or [sclay@aap.org](mailto:sclay@aap.org).

Sincerely,



Thomas K. McInerney, MD, FAAP  
President

**These letters can be accessed online:**

**American Academy of Pediatrics Letter to the FCC**

<http://apps.fcc.gov/ecfs/document/view?id=7520941318>

**American Academy of Pediatrics Letter to Congress**

<http://nebula.wsimg.com/b625b7cc6847a58ab1b7f25d326802d2?AccessKeyId=045114F8E0676B9465FB&disposition=0&alloworigin=1>

**CNN: Sanjay Gupta discusses the Fine Print Safety Instructions**

<https://www.youtube.com/watch?v=HF6O8NDaQXY>

**Consumer Reports November 2015 recommends that consumers be aware of instructions**

<http://www.consumerreports.org/cro/smartphones/cell-phone-radiation>

**The Today Show November 2015: Pediatricians on cell phone FCC distances**

<http://www.today.com/health/pediatricians-new-warning-limit-childrens-exposure-cellphones-t535>

[41](#)

## **II. Summary of International Policy Actions On Reducing Wireless Exposures to Children France:**

[2016 The French National Agency of Health Security of Food, Environment and Labour Report](#)

recommends regulatory changes to ensure "sufficiently large safety margins" to protect the health of young children. "ALL wireless devices, including tablets, cordless phones, remote controlled toys, wireless toys, baby monitors and surveillance bracelets, should be subjected to the same regulatory obligations as cell phones."



[National Legislation “Law on sobriety, transparency, information and consultation for exposure to electromagnetic waves” passed in 2015.](#) WiFi Banned in Nursery Schools: WIFI and Wireless devices will be banned in “the spaces dedicated to home, to rest and activities of children under 3 years”. WiFi on “OFF” as Default to Minimize Exposures in Schools: In elementary schools, WIFI routers should be turned off when not in use. Schools Will be Informed: The school board should be informed when new tech equipment is being installed.

### **Belgium**

Cell phones and cell phone ads are banned for young children and SAR labeling on phones is mandatory. Official government recommendations to reduce exposures are on the government website. Some municipalities have banned wifi in school for young children.

### **Spain**

Several municipalities have passed resolutions urging the removal of wireless networks in schools and public places and recommending a precautionary approach with children and information campaigns to educate the public.

### **Canada**

The health agency offers “practical advice” to reduce exposure to children. The Parliament issued a Radiofrequency Report recommending action to protect public health. [Canadian Parliament Standing Committee on Health of the House of Commons issued a report "Radio Frequency Electromagnetic Radiation and the Health of Canadians"](#)

### **Australia**

The Australian Radiation Protection and Nuclear Safety Agency has issued a 2015 [Fact Sheet](#) titled How to Reduce exposure from mobile phones and other wireless devices. ARPANSA recommends that parents encourage their children to limit their exposure stating that “It is recommended that, due to the lack of sufficient data relating to children and their long term use of mobile phones, parents encourage their children to limit their exposure by reducing call time, by making calls where reception is good, by using hands-free devices or speaker options, or by texting.” [Read it HERE.](#)

### **Italy**

In 2015, the Italian State Parliament of South Tyrol voted to [allow the application of the precautionary principle](#) mandating the state government to: To replace existing wireless networks whenever possible with networks that emit less radiation at schools, preschools, hospitals, nursing homes, and other public facilities. [The Supreme Court](#) ruled a man’s brain tumor was caused by his cell phone use.

### **Israel**

The Ministry of Health states “Precautions should be strictly enforced with regard to children, who are more sensitive to developing cancer. The Israeli Government created the public education webpage National Information Ctr for Non-Ionizing Radiation. The Israeli Ministry Of Education has issued guidelines limiting WiFi and cell phone use in schools and officially recommends wired networks in schools. The Ministry of Health published [Environmental Health in Israel 2014](#) which states that “Precautions should be strictly enforced with regard to children, who are more sensitive to developing cancer.” and that “wireless communication networks in schools be reduced.” The Health Ministry recommends “sensible use of cellular and wireless technology, including: considering alternatives like landline telephones, use of a speaker while talking on a cellphone, and refraining from installing the base

of wireless phones in a bedroom, work room, or children's room." The Report states that "Findings in Israel clearly indicated a link between cellphone use for more than 10 years and the development of tumors in the salivary glands, particularly among people who held the telephone on the same side where the tumor developed and individuals in the highest category of exposure (heavy use in rural areas)." Linda S. Birnbaum, Director, USA National Institute of Environmental Health Sciences and National Toxicology Program wrote in the Israeli Report final chapter that, "If some of the studies turn out to be harbingers of things to come, we may have major health consequences from the nearly ubiquitous presence of wireless equipment."

Haifa (Israel's third largest city) removes Wi-fi from all schools. Haifa Mayor Yona Yahav said that the city would replace the wireless network with a wired connection that will provide safer options to students." [Read the news article here.](#) This action occurred after [this news report aired.](#)

### **Switzerland**

The Switzerland Federal Office for the Environment has issued specific guidelines to reduce exposure and has created factsheets for the public. The Governing Council of Thurgau Canton recommends for schools "to forgo the use of wireless networks when the structural makeup of a given school building allows for a wired network." The Switzerland Federal Office for the Environment FOEN has [a webpage on Wi-Fi](#) which states "caution should be exercised primarily when using devices held close to the body, such as laptops, PDAs and Internet telephones.." and gives recommendations on how to reduce exposure including turning the Wi-Fi off when not in use, installing the access point one metre away from places where you work, sit or rest for long periods of time and keeping laptops off laps. The Switzerland Federal Office for the Environment FOEN has [a webpage on Cell Phones](#) which details ways to reduce mobile phone radiation. FOEN also has additional EMF factsheets on various EMF sources including on [baby monitors](#) where they state that "it is advisable to reduce the infant's exposure to emissions as far as possible."

### **Germany**

The Federal Office for Radiation Protection provides tips for reducing radiation exposure to smartphones, tablets and wireless devices and several states recommend wired rather than wireless installations in schools. "Since long term effects could not be sufficiently examined up to now the Federal Office for Radiation Protection (BfS) recommends to keep exposures to these fields as low as reasonably achievable." [Read the precautionary advice here.](#) The FORP recommends landline phone instead of mobile phone base stations and that schools should not connect wirelessly to the internet. [Read a 2015 statement here.](#)

### **Austria**

The Public Health Department of Salzburg Region recommends against wireless in schools. No Wi-Fi in Salzburg Schools and many schools are Wi-Fi free. The [Austrian Medical Society](#) has issued cell phone safety guidelines. Austria's "Highest Health Council of the Ministry of Health" has a [brochure](#) with advice to reduce exposure to cell phone radiation. It states that since the long term research is still not completed, it is advisable to take simple precautions to reduce exposure.

### **India**

2012 The Ministry of Communications and Information Technology issued [new EMF guidelines](#) with new Exposure Limits lowered to 1/10 of the ICNIRP level, and SAR labeling on phones. [Official cell phone radiation guidelines](#) Precautionary Guidelines for mobile users. [Municipal Corporation of Greater Mumbai](#), the civic body that governs the capital city of [Mumbai](#) in [Maharashtra](#) (India's richest municipal organization) in 2016 in its new policy on mobile towers, no longer allows cell towers on

playgrounds, recreational grounds, gardens and parks. [Read news article](#). 2013: [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.” Two hundred and four mobile towers installed on the school premises of Rajasthan have been removed in compliance. Read a [Document prepared by Dr. Sharma, Sr. Deputy Director of the Indian Council of Medical Research on Indian Research Studies](#).

### **Russia**

The Russian National Committee on Non-Ionizing Radiation Protection has issued strong recommendations to reduce exposure to children and issued several reports. [The Russian National Committee on Non-Ionizing Radiation Protection](#) in ELECTROMAGNETIC FIELDS FROM MOBILE PHONES: HEALTH EFFECT ON CHILDREN AND TEENAGERS has repeatedly [warned](#) about electromagnetic radiation impacts on children and recommended WiFi not be used in schools.

### **United Kingdom**

The UK National Health Service has changed its advice. In 2011 it offered specific [Recommendations](#) to reduce cell phone radiation exposure to children. [Read the 2011 recommendations](#) which stated, “Children are thought to be at higher risk of health implications from the use of mobile phones. This is because their skulls and cells are still growing and tend to absorb radiation more easily. It is recommended that children use mobile phones only if absolutely necessary.” Then, the National Health service changed the public advice text. Now they state: “If there are any health risks from the use of mobile phones, children might be more vulnerable because their bodies and nervous systems are still developing. Research carried out to date hasn't supported a link between mobile phone use and childhood cancers such as leukaemia. However, if you have any concerns, you can lower your child's exposure to radio waves by only allowing them to use mobile phones for essential purposes and keeping calls short.” [Read the new text here](#).

### **Cyprus**

“Be Precautionary and reduce exposure to phones, Wi-Fi and other wireless devices,” states the Cyprus Government’s National Committee on Environment and Child Health (ECH). [See the Commission’s EMF brochure](#) on reducing the risks to children from exposure to the Non Ionizing Radiation (mobile phones, Wi-Fi, tablets, etc.) which specifically addresses not just cell phones but all wireless devices. The Cyprus National Committee on Environment and Child Health created a short PSA for citizens about children and wireless radiation. Watch the video translated into english here <https://www.youtube.com/watch?v=996vzcCYCnE>

### **Finland**

The Radiation and Nuclear Safety Authority officially recommends reduced radio frequency exposure for children ([since 2009](#)) and [details advice to reduce exposure](#) to the public. “In particular, children’s unnecessary exposure should be avoided as their life-long exposure will be longer than that of those who begin using mobile phone as adults and as only scant research exists on health effects to children.”

### **Singapore**

Singapore’s National Environmental Agency specifically [advises precautions for the public](#) to reduce exposure while further research is being carried out. Below is the exact text found on the [Frequently asked Questions About Radiation Protection](#).

### **Taiwan**

In 2015 the government Updated their [Protection of Children and Youths Welfare and Rights Act](#) to ban cell phones for young children: Complete ban on children under the age of two from using electronic devices such as iPads, televisions and smartphones. Parents can be fined NT\$50,000 (about \$1600 US Dollars)

### **Namibia**

Namibia's atomic energy review report states that current so called "safety" standards DO NOT protect citizens from long term health effects.

- "ICNIRP guidelines do not guarantee adequate protection against the long term effects of exposure, such as increased risk of cancer. " -Republic of Namibia:Atomic Energy Board: [The Atomic Energy Review](#)

### **Turkey**

The Ministry of Health has issued [public information brochures](#) that recommend limiting exposure especially for pregnant women and children (Pregnant women and children (under 16) are more vulnerable and they should use the phone only when necessary, Prefer speaker or headset, Decrease time on phones, Use low SAR phone, Keep phone away from the body, Keep phones out of baby and children's bedroom, Turn phone off when you sleep or keep it one meter away from bedside.) In addition the Ministry is developing regulation on prohibiting phone use for children. The [EMF in schools is monitored](#) and the public can get measurements on EMF levels from cell towers and schools at a national site. [A Project funded by Ministry of Internal Affairs](#), accomplished by Temkoder (Prevention, Measurement of Electromagnetic Pollution and Training Organization) resulted in secondary school student training in the safer usage of cellular phones.

### **Greece**

The Greek government website materials recommend reducing cell phone radiation to children under 16 and they inform citizens of non-ionizing radiation power levels in their community. The Q and A on RF radiation states the following text about children. [Read it here on page 32 and 33](#)

*Even though it hasn't been proven conclusively that children are more sensitive/reactive than adults to exposure to radiation, nevertheless, the direct/pointed recommendation of international organizations is that children be discouraged from [literally translated, learn not to trust] using cell phones. The above statement is supported by the following:*

1. *Up to about the age of 16, the nervous system of the human body is in the process of development. Consequently, it's totally possible (although not conclusively proven by relevant scientific research) that up until this age, human being are more sensitive to any number of factors/elements/determinants.*
2. *Younger people have more years ahead of them than older persons during which the long –term effects of mobile phones can be manifested.*
3. *Environmental factors/elements have a greater general impact on the health of children than on the health of adults.*

### **United States**

Legislation has been introduced at the state and national level. Some Communities have issued proclamations, resolutions and started initiatives to inform the public of wireless health issues.

2014: The Connecticut Department of Public Health has issued specific recommendations to reduce exposure to cellphone radiation. It is notable that the Department has provided information more in depth than the CDC, EPA and FDA in detailing 7 steps on how people can reduce exposure. Furthermore, the Department states "It is wise to reduce your exposure to radiofrequency energy from cell phones whenever possible." [Read the Connecticut Department of Public Health Cell Phone Q and A about Cell phones here.](#)

2016: Onteora School District in New York State USA: District adopts "Best Practices with Wi-Fi" [Read the April 20, 2016 Meeting Minutes Page 2.](#) "Turn off the device when not in use and at the end of each day. If device is to stay on, turn Wi-Fi off when not in use. Always place device on a solid surface. Viewing distance should be a minimum of 12 inches from the screen. Staff was asked by the Principals to post this in areas that contain computers and devices. They are reminding staff to follow it."

2015: [Ashland Public Schools, Mass \(USA\)](#): The District has passed "Best Practices" to turn the WiFi off when not in use and keep devices away from the body [Download Slides](#). [Video of parent who initiated this](#). [Video of school board member](#) discussing the process. [Read Magazine article on Ashland's Decision Here](#).

2014 California, Berkeley: [May 12, 2015 Berkeley Adopted the Cell Phone "Right to Know" Ordinance on a Unanimous Vote](#). Berkeley is the first city in the nation to require cell phone retailers to provide those who purchase a new phone an informational fact sheet which informs buyers to read the user manual to learn the cell phone's minimum separation distance from the body. The text states:

"The City of Berkeley requires that you be provided the following notice:

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

2014 New York: [Wireless Router Labeling in all Suffolk Public buildings](#): 12/2014 The Suffolk County Legislature passed legislation to require all county buildings to post notices that wireless routers are in use such as, "Notice: Wireless technology in use." The resolution, sponsored by Legis. William Spencer (a physician), warns that every wireless device emits radio frequency radiation or microwave radiation. It notes that studies "that have looked at the effects of low-level RFR radiation on human cells and DNA have been inconclusive." [Read Press Release](#).

2014 Maryland, Greenbelt: [The Greenbelt Maryland City Council voted unanimously on November 24, 2014](#) to do the following:

1. Alert citizens about the fine print warnings and possible health risks of cell phones and wireless devices By sharing the Environmental Health Trusts 10 Steps to Safe Tech and Doctors Advice on Cell Phones Brochure in City health fairs and city centers.
2. To send the FCC Chairman a letter urging the adoption of "radiation standards that will protect human health and safety."
3. To oppose cell towers on school grounds and write a letter to the local school board and County Executive.

2012 Wyoming: Jackson Hole issued a [Proclamation of Cell Phone Awareness](#)

2012 Florida: Pembroke Pines, passed Resolution [3362](#) expressing the City's "Urgent Concerns" about Wireless Radiation and Health and which encourages citizens to read their manuals and presents information on how to reduce exposure by using a headset or speakerphone. Jimmy Gonzalez, an attorney who had developed brain cancer after heavy cell use, initially petitioned the Commission. [Watch the Video of his powerful testimony here.](#)

2010 California, San Francisco: [Cell Phone Radiation \(How to Reduce Exposures\)](#) Webpage launched. Answers on [how to reduce exposures](#) to cell phone radiation. The City developed a poster, factsheets and display stickers with public health information.

2010 California: Burlingame California City has cell phone safety [guidelines](#) .

2010 Maine, Portland: October declared "Cell Phone Awareness Month"

### **Research showing Children's Increased Radiofrequency Exposure**

Fernandez-Rodriguez, C.E.; De Salles, A.A.A.; Davis, D.L., "[Dosimetric Simulations of Brain Absorption of Mobile Phone Radiation—The Relationship Between psSAR and Age.](#)" in Access, IEEE , vol.3, no., pp.2425-2430, 2015 doi: 10.1109/ACCESS.2015.2502900

Morris, R.D.; Morgan, L.L.; Davis, D.L., "[Children Absorb Higher Doses of Radio Frequency Electromagnetic Radiation From Mobile Phones Than Adults.](#)" in Access, IEEE , vol.3, no., pp.2379-2387, 2015 doi: 10.1109/ACCESS.2015.2478701

Gandhi OP, Morgan LL, De Salles AA, Han YY, Herberman RB, Davis DL. (2012). [Exposure limits: the underestimation of absorbed cell phone radiation, especially in children.](#) Electromagn Biol Med. 31(1), 3451.

Redmayne M, Johansson O. [Radiofrequency exposure in young and old: different sensitivities in light of age-relevant natural differences.](#) Rev Environ Health. 2015 Dec 1;30(4):323-35. doi: 10.1515/reveh-2015-0030.

Gandhi, Om. [Yes the Children are more exposed to radio-frequency energy from mobile telephones than adults.](#) IEEE Spectrum. PP(99):1. Jun 23, 2015.

Christ A, Gosselin MC, Christopoulou M, Kühn S, Kuster N. [Age-dependent tissue-specific exposure of cell phone users.](#) Phys Med Biol. 55(7):1767-1783, 2010.

de Salles, A. A., Bulla, G., Rodriguez, C. E. (2006). [Electromagnetic absorption in the head of adults and children due to mobile phone operation close to the head.](#) Electromagn. Biol. Med 25(4):349–360.

Wart, A. Hadjem, M.F. Wang and I. Bloch, "[Analysis of RF exposure in the head tissues of children and adults](#)" Physics in Medicine and Biology, Vol.53, pp. 3681-3695, 2008

Kühn S, Jennings W, Christ A, Kuster N. [Assessment of induced radio-frequency electromagnetic fields in various anatomical human body models.](#) Phys Med Biol. 54(4):875-890, 2009.



## Selected Research on Radiofrequency Impacts on Health

### CANCER

- 1.F. Barnes and B. Greenenbaum, "[Some Effects of Weak Magnetic Fields on Biological Systems: RF fields can change radical concentrations and cancer cell growth rates.](#)" in *IEEE Power Electronics Magazine*, vol. 3, no. 1, pp. 60-68, March 2016.
- 2.Coureau et al., (2014). [Mobile phone use and brain tumours in the CERENAT case-control study.](#) *Occup Environ Med.* 71(7), 514-22.
- 3.Lerchl et al., (2015) [Tumor promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans.](#) Biochemical and Biophysical Research Communications, Available online 6 March 2015.
- 4.Morgan LL, Miller AB, Sasco A, Davis DL, [Mobile phone radiation causes brain tumors and should be classified as a probable human carcinogen \(2A\) \(review\).](#) *Int J Oncol.* 2015 May;46(5):1865-71. Epub 2015 Feb 25.
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- 2014: U.S. [Department of the Interior Letter \(2014\) on FCC Guidelines](#)
- 2002 [EPA Letter on the RF Exposure Limits ONLY protecting from Heating Effects](#)
- 2008: National Academy of Sciences (NAS) Report, [Identification of Research Needs Relating to Adverse Health Effects of Wireless Communication](#).
- 2003: [Interagency Radio Frequency Workgroup 2003 Letter from EPA Norbert Hankin on Additional Concerns about RF Exposure Guidelines](#)
- 1999: [Radio Frequency Interagency Workgroup Concerns About RF Exposure Gregory Lotz NIOSH Letter](#)
- 1995: [EPA Letter to the FCC on Development of Guidelines](#) by the EPA- they were never finished. .
- 1984: [US Science Advisory Board Letter that recommends that the EPA develop radiation protection guidance to protect the public](#) (Note: the EPA standards were never issued.)
- 1983: [EPA: Biological Effects Of RadioFrequency Radiation](#)

