ATTORNEYS AT LAW

SWANKIN & TURNER

DAVID A. SWANKIN
JAMES S. TURNER, P.C.
BETSY E. LEHRFELD, P.C.
CHRISTOPHER B. TURNER, P.C.

SUITE 101 1400 16TH STREET, N.W. WASHINGTON, D.C. 20036 TEL. 202 462-8800 FAX 202 265-6564

September 9, 2016

Howard Symons, Esq., FCC General Counsel
Bruce Romano, Esq., Associate Chief (Legal), Office of Engineering & Technology (OET)
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Letter of Inquiry re. Representations on FCC Website

Dear Mssrs. Symons and Romano,

On behalf of the National Institute for Science, Law and Public Policy and the Environmental Health Trust, I am writing to ask the Federal Communications Commission (FCC) to consider whether its existing cell phone exposure limits are adequately enforced. Specifically, why do the FCC's Statements[1] regarding a maximum human tissue psSAR of 1.6 W/kg from a cell phone not match the values from the FCC-specified test methods, which allow a possible psSAR of as high as 2.08 W/kg?

Test standards for phones have not changed since they were introduced two decades ago, in 1996, although the uses and users today are radically different. The ubiquitous nature of these exposures makes it that much more important that the FCC's exposure limits be enforced. My clients estimate as many as 75% of cell phones in use today could be over the FCC limit due to the above concern, as well as several additional issues described below.

Regarding the FCC's practices and procedures to assure the safety of Radiofrequency Radiation (RFR)-emitting cell phones on the market, we present here four (4) areas of concern and 12 specific questions related to them which are summarized at the end of this letter:

I. **Many cell phones on the market have a "peak spatial Specific Absorption Rate" (psSAR) potentially higher than 1.6 W/kg, the FCC's stated exposure limit for the general public. This arises**

[1] https://www.fcc.gov/general/cell-phones-and-specific-absorption-rate and https://www.fcc.gov/general/specific-absorption-rate-sar-cellular-telephones

because the IEEE methodology[2] for assessing psSAR includes a ±30% margin of error (uncertainty factor).

As currently implemented, allowing this margin of error potentially exposes cell phone users to radio frequency radiation (RFR) above the FCC's 1.6 W/kg exposure limit. In fact, any phone with a psSAR of greater than 1.231 W/kg with the 30% margin of error can effectively exceed the approved limit of 1.6 W/kg.

My clients recommend that the FCC correct its website[3] to state clearly that many cell phones, in fact, may be over the FCC's 1.6 W/kg psSAR limit, and potentially as high as 2.08 W/kg based on this IEEE allowed margin of error.

Several examples of cell phones currently on the market that can exceed 1.6 W/kg are provided in **Exhibit A** to illustrate the concern that the FCC's stated psSAR limit underestimates true psSAR exposures to cell phone users.

The discussion in **Exhibit A** also raises the question of whether the FCC should be certifying cell phones for sale in the first place in instances where the measured psSAR is greater than 1.231 W/kg.[4]

Clarification is requested as to whether the FCC's 1.6 W/kg psSAR limit accounts for the IEEE ±30% factor in some manner of which we are not aware. Please provide documentation.

Clarification is also requested about proximity sensors intended to reduce radiation from cell phones and other wireless transmitting devices (WTDs). Many people use phones, laptops, iPads and similar devices right up against their body, or with their hands on the device continually, so it is essential the public be aware of how proximity sensors work, whether the technology is effective, or not, at reducing the power of devices to be compliant with the FCC 1.6 W/kg limit, and within what distance from the body the proximity sensors are activated.

II. Concerns exist regarding the adequacy of the FCC's oversight of the pre-market cell phone psSAR assessment process as well as regarding the FCC's post-market psSAR surveillance.

---

[2] IEEE 1528-2013, IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques.

[3] https://www.fcc.gov/general/radio-frequency-safety-0

[4] In newer phones that integrate multiple antennae, where a psSAR of 1.662 is also allowed (a 3.9% increase), the FCC ought not certify cell phones where the measured psSAR is greater than 1.195 W/kg to be within the FCC 1.6 W/kg limit, since the psSAR could rise 33.9%.

For example:

a) Manufacturing Variability

All manufacturing processes have inherent variability, which means the resultant psSAR for a given cell phone model will vary from unit to unit. Manufacturing variability or tolerance variations might be as high as ±10-20%.[5] My clients wish to know 1) if the FCC has considered manufacturing variability impacts and their potential to increase the psSAR of a cell phone, and 2) what specific surveillance activity the FCC undertakes to assess the impacts on psSAR from manufacturing variability with regard to cell phones on the market.

b) Post Market Surveillance

Telecommunication Certification Bodies (TCBs), which issue Grants of Certification for compliance with FCC Rules & Regulations, are required to submit an Annual Report of their post-market surveillance activities for each calendar year to the FCC by January 31 of the following year."[6] My clients wish to know the scope and extent of these surveillance activities. Please send me two examples of TCB Annual Reports on post-market surveillance activities and findings for the years 2014 and 2015.

c) Initial psSAR Testing of New Phones

Testing laboratories assess the psSAR of cell phones on behalf of cell phone manufacturers before a phone is on the market, and then Telecommunication Certification Bodies (TCBs) issue Grants of Certification for compliance with FCC Rules & Regulations. TCB Accreditation is excluded for "spread spectrum devices."[7] Yet there is no information on what entity regulates devices utilizing spread spectrum techniques, for example as used in Bluetooth and Wi-Fi, which are now commonly integrated into cell phones. As almost all modern cell-phone handsets include Wi-Fi, Bluetooth and 3G/UMTS (w-CDMA) spread-spectrum modulation, please explain how the FCC regulates spread-spectrum technology in cell phones and wireless transmitting devices (WTDs).

Also, are a TCB and the "testing laboratory" allowed to be within the same company, and are wireless transmitting device manufacturers allowed to be testing laboratories and/or TCBs? Since these sorts of allowances

---

[5] When added to the potential for up to +30% IEEE-allowed margin of error, this could bring the psSAR of a phone to levels in excess of the IEEE-allowed +30% (and potentially much higher if the tolerance variation were +20%, for example).

[6] TCB Market Surveillance, June 26, 2015, Section (3), page 2. 610077 D01 TCB Post Market Surveillance v06r01

[7] TCB Program Roles and Responsibilities, July 31, 2015, Table 1—TCB Scope of Accreditation. 641163 D01 TCB Programs Roles and Resp. V03.

could lead to conflicts of interest, my clients wish to know what procedures are implemented to assure full independence in the accreditation process in such cases.

III. Concerns exist regarding the adequacy of the FCC's current psSAR safety limits in the context of the common use of cell phones by children today.

The IEEE 1528-2013 Standard says several times that the psSAR is applicable for the "heads of a significant majority of persons," implicitly recognizing that the psSAR is not applicable for a minority of heads. The International Agency for Research on Cancer (IARC), in its 2011 Lancet-Oncology article *"Carcinogenicity of radiofrequency electromagnetic fields"*, where it explained its declaration that radiofrequency radiation was a Group 2B 'Possible Human Carcinogen' stated, "When used by children, the average RF energy deposition is two times higher in the brain and up to ten times higher in the bone marrow of the skull, compared with mobile phone use by adults."[8]

When the IEEE exposure guidelines were developed in the 1990s, and later updated in 2005, it was not envisioned that children, or even infants, would be placing cell phones to their heads (or, for that matter, that iPads would be used in neonatal intensive care units.[9]).

Given the well-established greater absorption of cell phone radiation in children, and the fact that cell phone manufacturers do not presently offer cell phone models with a low psSAR for children, my clients wish to know how well the FCC considers its present guidelines to protect children.

IV. Clarification is requested regarding the respective roles of the FCC and FDA with regard to cell phone safety and regulation.

The methodology required by the FCC in the cell phone certification process to assess the "Specific Absorption Rate" (psSAR) uses the Specific Anthropomorphic Mannequin, or SAM. SAM is an estimation of radiation absorption in the head alone, and for a large man.

The liquid within SAM absorbs the average radiation of the many different tissues (approximately 40) within the adult head. As noted in Section III, above, the bone marrow in children's skulls absorbs up to 10-fold more radiation than adults. Thus, using average adult absorbency is inadequate for children's heads.

---

[8] Baan et al. WHO International Agency for Research on Cancer Monograph Working Group. Carcinogenicity of radiofrequency electromagnetic fields. Lancet Oncol. 2011 Jul;12(7):624-6.

[9] https://www.cedars-sinai.edu/About-Us/News/News-Releases-2013/iPads-help-new-moms-bond-with-their-infants-in-the-Neonatal-Intensive-Care-Unit.aspx (accessed 17 April 2016)

The SAM mannequin psSAR assessment methodology has additional limitations. It cannot measure radiation exposure to children or smaller adults, nor other body tissues, such as the breast, when cell phones are placed in bras or shirt pockets, or to testicles when cell phones are placed in men's or boys' pants pockets.[10]

My clients note that at the Food and Drug Administration's Center for Devices and Radiological Health (CDRH), when assessing radiation exposure in implantable medical devices, a finite-difference, time-domain (FDTD) computer simulation, coupled to MRI-based models of different human being sizes and ages, referred to as the "Virtual Family,"[11] is used to determine the psSAR within tissue. This FDTD methodology is said to be inherently superior to SAM, as it can assess radiation absorption in any number of tissues, account for a range of different body sizes, assess psSAR in children and the elderly, and is approved by the FCC as a psSAR assessment methodology.

Without using the FDTD methodology, my clients wish to know how the FCC presently determines that the psSAR levels in the body tissues (e.g., breasts, eyes, testicles, etc.) are within the FCC 1.6 W/kg limit.

My clients also wish to understand what role the FDA's expertise in measuring radiation absorption currently plays, or should be playing, in establishing cell phone safety. The FCC says it relies on the safety expertise of the FDA, but it is our understanding the FDA does not review the safety of cell phones and wireless-transmitting devices, as it would new drugs or medical devices. My clients would like clarity on what the interaction is between the FCC and FDA on matters related to cell phone and WTD safety, and where exactly responsibility for assuring that devices conform to the 1.6 W/kg psSAR limit resides.

Mssrs. Symons and Romano, the above issues raise questions about FCC effectiveness on the subject of cell phone and wireless regulation. My clients are concerned that the FCC is not enforcing its own exposure limit.

We look forward to a dialogue on these subjects, beginning with specific responses from the FCC to the 12 questions raised in this letter by October 21, 2016, or earlier.

---

[10] The SAM methodology also cannot measure radiation absorption in the eyes, or the interactions of the cell phone radiation with worn metal, such as earrings, metal eyeglasses, dental braces, metal tooth fillings, wire frame bras, and metal piercings, common in teenagers, all of which can increase radiation absorption.

[11] The FDA substantially funded the development of the Virtual Family based on MRI scans of actual humans. Family members include men and women, boys and girls of various ages, and pregnant women at 1, 5 and 9 months of gestation.

Summarized below is a recap of the 12 areas of inquiry:

1. Clarification is requested as to whether the FCC's 1.6 W/kg psSAR limit accounts for the IEEE ±30% uncertainty factor. Please include documentation.

2. Should the FCC be certifying cell phones for sale in instances where the measured psSAR is greater than 1.231 W/kg, since, with the IEEE ±30% uncertainty factor, a cell phone's psSAR could otherwise rise above the 1.6 W/kg limit to as high as 2.08 W/kg?[12]

3. What proximity sensors are required for phones, laptops, iPads and similar devices and how are they implemented? Do they reduce the psSAR so it is within the FCC 1.6 W/kg limit if the device is used on the lap or within the 20 cm distance allowed in certification testing? Do the sensors work when a person's hands are continually on a laptop while typing? Details on FCC proximity sensor requirements for manufacturers, status of industry's implementation of proximity sensors, and the FCC's psSAR compliance and efficacy monitoring are requested.

4. What specific surveillance activity does the FCC undertake to assess the impacts on psSAR from manufacturing variability (which can add another 10-20% to the psSAR)?

5. What is the scope and extent of TCB post-market surveillance activities? I am requesting two examples of TCB Annual Reports on post-market surveillance activities and findings for the years 2014 and 2015.

6. As TCB Accreditation is excluded for 'spread spectrum devices', and since 'spread spectrum' technology is used in most modern cell phones and wireless transmitting devices, please explain what entity regulates 'spread spectrum' technology?

7. If testing laboratories can be within the same company as the TCB, what steps are taken to assure full independence and no conflicts of interest in the cell phone accreditation process?

8. Given greater absorption of cell phone radiation in children, and the fact that cell phone manufacturers do not presently offer cell phone models with a low psSAR for children, how well does the FCC consider its present guidelines protect children?

---

[12] In the case of newer phones with multiple antennae, where the psSAR could potentially rise 33.6% (considering the allowance for the psSAR to be 1.662 W/kg in cases of phones with simultaneous transmissions plus the +30% IEEE allowed uncertainty factor), where the psSAR could otherwise rise as high as 2.14 W/kg, the FCC should not be certifying cell phones for sale in instances where the psSAR is greater than 1.195 W/kg.

9. Since the SAM (Specific Anthropomorphic Mannequin) method of assessing the psSAR is an estimation of cell phone radiation in the head alone, as absorbed in a large man, and does not account for radiation absorbed in other body tissues, or amounts absorbed in people of smaller sizes and different ages, as the FDTD ("Finite Difference Time Domain") methodology can assess, how does the FCC presently determine the psSAR levels in body tissues beyond the head?

10. Between the FCC and the FDA, where exactly does responsibility for assuring cell phones and all other forms of WTDs conform to the 1.6 W/kg psSAR limit reside?

11. In what ways does the FCC rely on the expertise of the FDA if the FDA does not actually review the safety of cell phones and WTDs like it would a drug or medical device?

12. In the interest of safety, should the FDA's expertise in assessing radiation absorption using FDTD computer simulation be utilized to assess psSAR absorption given that it is vastly superior to the SAM methodology used presently by the FCC?

We very much look forward to your timely reply.

Sincerely,

James S. Turner, Esq.

cc: Tom Wheeler, FCC Chairman
Ajit Pai, FCC Commissioner
Mignon Clyburn, FCC Commissioner
Michael O'Rielly, FCC Commissioner
Jessica Rosenworcel, FCC Commissioner

cc: Dr. Robert M. Califf, MD, Commissioner, Food and Drug Administration

Exhibit A

Inquiry to the Federal Communications Commission Dated September 9, 2016

Whereas the FCC purports to certify that cellphones and other wireless transmitting devices (WTDs) will not exceed the "peak spatial Specific Absorption Rate" for any 1 gram of tissue, $psSAR_{1g}$, exposure limit $psSAR_{1g}$=1.6 W/kg (where W is the power in Watts and kg is the weight of any one gram of tissue in kilograms).

And whereas the FCC requires the use of the Institute of Electrical and Electronic Engineers (IEEE) document IEEE 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques" to determine the measured $psSAR_{1g}$.

And whereas IEEE 1528-2013, on pdf page 197, states "With *proper preparation and execution* of a SAR measurement according to the protocols in this recommended practice, the target expanded measurement uncertainty for all uncertainty components in Table 9 and Table 10 should be less than ± 30% (+1.14 dB, -1.55 dB) for peak spatial-average SAR values in the range from 0.4–10 W/kg."

Given there is no information to the contrary within the required IEEE 1528-2013 document, it would appear the FCC should state that a certified cell phone may exceed 1.6 W/kg psSAR because there is an IEEE-allowed ±30% uncertainty factor as well as a small increase allowed in cases of phones with multiple antennae. [13]

Examples Highlighting psSARs Potentially Over the FCC Limit:

Apple iPhone 6 and iPhone 6 Plus

For example, in a recent post by Joel Moskowitz, PhD, Director and Principal Investigator, Center for Family and Community Health at UC Berkeley, Dr. Moskowitz lists Apple's FCC submissions for Apple iPhone 6 and iPhone 6 Plus SAR Levels. (http://www.saferemr.com/2015_09_01_archive.html). As you can see below, a ±30% uncertainty factor in measuring the spatial peak (psSAR) value in both of these Apple cellphones, when operating with simultaneous transmissions (from multiple antennas), would result in the SAR far exceeding the 1.662 W/kg SAR limit in these instances:

[13] Note that IEEE 1528-2013 also allows $psSAR_{1g}$ value as high as 1.662 W/kg when there are simultaneous transmissions from multiple antennae, for example, in newer phones.

1. Apple, Inc. "BCG-E2816A by Apple Inc. for Cellular Phone with Bluetooth and WLAN Radios." Report No. 14U17673-S1C submitted to FCC. Aug 15, 2014.

iPhone 6 SAR Levels in Watts per kilogram (W/kg)

Head = 1.18
Body-worn Accessory = 1.18
Wireless Router (Hotspot) = 1.18
Simultaneous Transmissions (Head) = 1.51
Simultaneous Transmissions (Body) = 1.58

Assuming a 30% psSAR increase based on the aforementioned uncertainty factor in IEEE 1528-2013, the reported psSAR of 1.51 W/kg at the Head in the iPhone 6 example in the case of simultaneous transmissions would rise to **psSAR 1.96 W/kg**, and the Body psSAR would rise from 1.58 W/kg to **psSAR 2.05 W/kg**, both above the FCC's $psSAR_{1g}$=1.662 W/kg limit.

2. Apple, Inc. "BCG-E2817A by Apple Inc. for Cellular Phone with Bluetooth and WLAN Radios." Report No. 14U17676-S1C submitted to FCC. Aug 15, 2014.

iPhone 6 Plus SAR Levels in Watts per kilogram (W/kg)

Head = 1.18
Body-worn Accessory = 1.19
Wireless Router (Hotspot) = 1.19
Simultaneous Transmissions (Head) = 1.59
Simultaneous Transmissions (Body) = 1.54

In the case of the iPhone 6 Plus, assuming a 30% increase based on the aforementioned uncertainty factor in IEEE 1528-2013, the reported psSAR at the Head of 1.59 W/kg in the case of simultaneous transmissions would rise to **psSAR 2.07 W/kg**, and the Body psSAR of 1.54 W/kg would rise to **psSAR 2.00 W/kg**, both above the FCC's $psSAR_{1g}$=1.662 W/kg limit.

Top 10 Highest SAR Phones

As another example, looking also at the ***Top 10 Highest SAR Phones*** as reported by the Environmental Working Group (EWG) in 2011, shared on CNN.com at that time[14], all phones on this list would also be above the 1.6 W/kg psSAR exposure limit were the ±30% uncertainty factor applied:

EWG Reported Top 10 Highest Radiation Level Phones (2011):

1. **Motorola Bravo (AT&T):** 1.59 W/kg
2. **Motorola Droid 2 (Verizon Wireless):** 1.58 W/kg

[14] CNN coverage of the Environmental Working Group list (2011) of *Top 10 Highest SAR Phones* http://www.cnn.com/2011/TECH/mobile/06/01/cell.phones.radiation.levels/ [accessed on 4/8/16]

3. **Palm Pixi (Sprint):** 1.56 W/kg
4. **Motorola Boost (Boost Mobile):** 1.55 W/kg
5. **Blackberry Bold (AT&T, T-Mobile):** 1.55 W/kg
6. **Motorola i335 (Sprint):** 1.55 W/kg
7. **HTC Magic (T-Mobile):** 1.55 W/kg
8. **Motorola W385 (Boost Mobile, U.S. Cellular, Verizon Wireless):** 1.54 W/kg
9. **Motorola Boost i290 (Boost Mobile):** 1.54 W/kg
10. (tie) **Motorola DEFY (T-Mobile); Motorola Quantico (U.S. Cellular, MetroPCS); Motorola Charm (T-Mobile):** 1.53 W/kg

Assuming the ±30% uncertainty factor from IEEE 1528-2013 is applied, the SAR on the above phones could increase to a range between **1.99 W/kg to 2.07 W/kg**, well above the FCC SAR limit of $psSAR_{1g}$=1.6 W/kg (or above the 1.662 W/kg in cases of simultaneous transmissions).[15]

Other Phones

Finally, while the SAR database on which the Top 10 Rankings were based is no longer maintained for the public by EWG, a look at the SAR of some current cellphones, and an iPad, paints the very same picture, reinforcing the question we are raising to the FCC about the accuracy of its representation that cell phones on the market today meet the FCC's psSAR limit of 1.6 W/kg (or 1.662 W/kg in cases of simultaneous transmissions):

Should the FCC be certifying cell phones or WTDs for sale in instances when the measured $psSAR_{1g}$>1.231 W/kg ?[16]

Other Cellphone and WTD psSAR Examples[i] in Watts per kilogram (W/kg)

Nextel (Sprint) i355 Phone $psSAR_{1g}$
Head = 1.53 W/kg
*Head = **1.99W/kg** with 30% increase based on uncertainty factor*

iPhone 5, models A1428, A1429 psSAR (W/kg)
(Apple Inc., Report Number: 11U14136-7A1, Sept. 6, 2012, page 360)
Simultaneous Transmissions (Head) = 1.82[ii] W/kg

[15] These values would be even higher if any of the above phones have simultaneous transmission capability.
[16] Or, certifying cell phones or WTDs for sale in instances where the measured $psSAR_{1g}$>1.195 W/kg in phones with multiple antennae where the psSAR can be as high as 1.662 W/kg..

Simultaneous Transmissions (Head) ***= 2.37 W/kg*** *with 30% increase based on uncertainty factor.*

iPad Pro, Models A1653 and A1584 psSAR (W/kg)
Body =1.19 W/kg, but with no distance from the body stated. These devices are often used on the lap of a sitting child.

We note that the FCC's certification testing allows a 20 cm distance from the body. If the stated distance were 10 cm, the SAR in the above example would increase by approximately 4-fold:
Body ~ 4.76 W/kg at 10 cm
Body ~ ***6.19 W/kg*** *at 10 cm with 30% increase based on the IEEE 1528-2013 uncertainty factor.*

The above examples make clear there could be a heretofore unrecognized error in the process presently used to certify cellphones and WTDs, where the ± 30% uncertainty factor in IEEE 1528-2013 is not taken into account in calculating a devices' SAR, resulting potentially in large number of cellphones and WTDs on the market today that exceed the FCC's $psSAR_{1g}$=1.6 W/kg safety limit.

We request the FCC please provide clarification on whether or not the existing FCC exposure limit for cell phones and WTDs includes the above referenced 30% uncertainty factor, or not, and if so, we request the FCC please provide full documentation supporting this.

References

[i] From Mobile Manufacturers Forum (MMF) SAR Tick website (http://sartick.com/) except the Apple iPhone 5, models A1428, A1429 which was taken from an FCC submission 9/6/12.

[ii] With simultaneous transmission of the Wi-Fi 2.4 GHz and LTE (VOIP) band antennae; SPLSR (SAR to Peak Location Ratio) = 0.107. Though the FCC allows the SAR to be >1.6 W/kg provided the SPLSR is <0.04 [KDB 447498 D01 General RF Exposure Guidance v05], in this example with the SPLSR = 0.107 there is a clear violation of the FCC's regulations).