



# **Mobile & Wireless Forum**

September 7, 2018

Marlene H. Dortch  
Secretary Federal Communications Commission  
445 12th Street, S.W.  
Washington, D.C. 20554

Re: Notice of Ex Parte Submission  
ET Docket No. 13-84

Dear Ms. Dortch:

The Mobile & Wireless Forum is a global trade association of manufacturers committed to addressing, among other things, issues related to RF exposure, including product testing requirements and type approvals worldwide.<sup>1</sup> To that end, the MWF has been participating in the FCC Notice of Inquiry (NOI) proceeding concerning the US RF exposure standard.<sup>2</sup> The MWF is on record<sup>3</sup> in the proceeding as actively supporting an update from the SAR limits defined in

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<sup>1</sup> The MWF is an international association of telecommunications equipment manufacturers with an interest in mobile or wireless communications, including the evolution to 5G and the Internet of Things. Established to support research into the health and safety of radio frequency electromagnetic fields, the MWF has worked with national and international health agencies to support research on RF and health. Further information on the MWF can be found on our website ([www.mwfai.org](http://www.mwfai.org)).

<sup>2</sup> FCC Docket No. 13-84, Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies (Released March 29, 2013).

<sup>3</sup> On 1 January 2017, the Mobile Manufacturers Forum (MMF) changed its name to the Mobile & Wireless Forum. Our filings in response to the FCC Docket No. 13-84 were originally made as the Mobile Manufacturers Forum as we then were.

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the outdated standards still referenced in the US Code of Federal Regulations.<sup>4</sup> This submission is intended to update that position to reference – and emphasize – the imminent release of the updated ICNIRP Guidelines<sup>5</sup> and of the updated IEEE C95.1 Standard.<sup>6</sup> As more fully described below, the updates to these standards reflect the current state of the science of the safety of RF exposure and are of significant importance to the advancement of millimeter-wave 5G technology.

MWF recognizes that the role of the FCC does not extend to the interpretation of health effects of radiofrequency energy, which is the purview of the Food and Drug Administration (FDA).<sup>7</sup> Provided the FDA has not called out a health concern with regard to the updated standard, therefore, it is incumbent upon the FCC to adopt new exposure regulations supported by science rather than retain regulations based on scientifically outdated standards. Given that maintenance of the current regulations will continue to impose uncompetitive limits on 5G technology vis-a-vis the rest of the world, the adoption of an updated standard is not only in keeping with the FCC's initiative for U.S. leadership in 5G but is driven by it.<sup>8</sup>

Technology has advanced substantially since the FCC 2013 NOI. The exposure guidelines currently referenced in the CFR (ANSI/IEEE Std C95.1-1992<sup>9</sup> and NCRP Report No. 86 -1986<sup>10</sup>) were developed based on contemporary science and eventually adopted by the FCC in 1996<sup>11</sup> to be applied, amongst other things, to First (1G) and Second Generation (2G) devices. Third Generation (3G) devices and networks long since have given way to Fourth Generation (4G) devices and networks. Fifth Generation (5G) devices and networks with increased bandwidth and ubiquitous usage for the Internet of Things stand on the cusp. Meanwhile, evolving

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<sup>4</sup> 47 CFR 1.1310 - Radiofrequency radiation exposure limits.

<sup>5</sup> International Commission on Non-Ionizing Radiation Protection. *Draft ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (100 kHz to 300 GHz)*. July 2018.

<sup>6</sup> Participants in the standards process anticipate release of the standard in the October-November timeframe.

<sup>7</sup> 21 CFR §1000.15, "Examples of electronic products subject to the Radiation Control for Health and Safety Act of 1968".

<sup>8</sup> See note 13 and accompanying text, *infra*.

<sup>9</sup> ANSI/IEEE Std. C95.1, *IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz* (1992).

<sup>10</sup> National Council on Radiation Protection and Measurements. *Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields*. NCRP Report No. 86 (1986).

<sup>11</sup> See Report and Order, ET Docket 93-62, FCC 96-326, adopted August 1, 1996, 61 Federal Register 41006, 11 FCC Rcd 15123 (1997). The FCC initiated this rule-making proceeding in 1993 in response to the 1992 revision by ANSI of its earlier guidelines for human exposure.

scientific knowledge led to the 1998 ICNIRP Guidelines<sup>12</sup> and the 2005 IEEE Standard revision<sup>13</sup>, which included substantially different SAR metrics and associated limits that supersede the earlier limits. Indeed, it should be underscored that the SAR metrics and limits by NCRP were never reaffirmed and thus clearly became outdated after the subsequent scientific reviews leading to ICNIRP 1998 and then IEEE 2005.

With the advent of 5G technology and millimeter wave 5G devices, the need to update the standard has now reached urgent proportions. The industry's ability to deliver devices to fulfill the promise of 5G is at risk and will be significantly curtailed if the FCC continues to utilize regulations based on the 1991 C95.1 standard. In particular, the limits on time averaging and the maximum permissible averaging area must be updated to reflect current science. The first tranche of millimeter-wave 5G devices are currently in the pipeline for late 2018. Those devices are expected to be able to be approved and marketed pursuant to guidance currently in place at the FCC Lab, although their performance is likely to be capped. However, a second wave of devices – including mobile devices –planned for 2019<sup>14</sup> will need to utilize the full parameters of the millimeter-wave specific guidance set out in the pending 2018 IEEE Standard in order to offer optimum 5G performance.<sup>15</sup>

Currently, the two major RF exposure standards in use globally --- the IEEE Standard and the ICNIRP Standard – are undergoing substantial updates and revisions. The revised IEEE C95.1 Standard, which reaffirms the SAR limits in IEEE 2005 is expected to be released in late 2018; the draft ICNIRP Standard has been fully prepared and released for comment.<sup>16</sup> Since 2005, the two standards have been aligned as to SAR limits of 2.0 W/Kg averaged over 10 grams of tissue. This alignment is compelling given the different approaches as to the makeup of the two standards committees: IEEE takes a democratic approach and permits participation by any qualified professional<sup>17</sup> while ICNIRP imposes restrictions on participation by requiring that

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<sup>12</sup> *ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHz)*. Health Physics; 74 (4):494-522; 1998.

<sup>13</sup> IEEE-SA Standards Board, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz (2005)

<sup>14</sup> Companies have announced they are working on mobile 5G devices and are targeting 2019. See, e.g., “Verizon ‘s First 5G Mobile Device. It’s A Snap”, <https://www.lightreading.com/mobile/5g/verizons-first-5g-mobile-device-its-a-snap!/d/d-id/745125> (Aug. 2, 2018); “Sprint and LG Will Release a Smartphone in the First Half of 2019” <https://www.theverge.com/circuitbreaker/2018/8/14/17689028/sprint-lg-5g-smartphone-early-2019-announcement-mobile-networking> (August 14, 2018).

<sup>15</sup> See note 14 infra for such guidance in the ICNIRP Draft Guidelines. Per the participants in the IEEE proceeding, the IEEE standard will contain similar provisions.

<sup>16</sup> *Infra* at §A.

<sup>17</sup> The IEEE website uses the following definition: “Professional membership is open to individuals who by experience give evidence of competence in an IEEE designated field. The designated fields are: Engineering, Computer Sciences and Information Technology, Physical

participants not have any employment or other interests that may be seen as an appearance of a conflict of interest with the public good.<sup>18</sup> ICNIRP does view public health officials as qualified members, and many, such as Sharon Miller of the FDA, have public health positions.<sup>19</sup>

Importantly for approval of 5G millimeter-wave devices, both updated standards define suitable exposure metrics and limits for such devices and thus provide meaningful templates for updating FCC requirements.

### **A. The Proposed 2018 ICNIRP Guidelines Are Open for Public Comment**

The revised ICNIRP Guidelines were released to the public on 11 July 2018 for a 90-day comment period ending on October 9.<sup>20</sup> These draft Guidelines clearly contemplate the use of 5G spectrum and set out new requirements for RF exposure compliance at higher, 5G millimeter-wave frequencies.<sup>21</sup> More specifically, the Guidelines include an MPE averaging area

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Sciences, Biological and Medical Sciences, Mathematics, Technical Communications, Education, Management, and Law and Policy.”

<https://www.ieee.org/membership/join/index.html#qualifications-and-dues>.

<sup>18</sup> The ICNIRP website states: “The Commission membership consists of a Chairperson, Vice-Chairperson and up to 12 members. Commission members are independent experts in the scientific disciplines relevant to non-ionizing radiation protection (biology, epidemiology, physics, bio-physics, medicine). In carrying out their voluntary work for the Commission they do not represent either their countries of origin or their institutes. ICNIRP members are required to declare any personal interests in relation to their activities for ICNIRP. Members' declarations of personal interests are available below along the member's profile.” [www.icnirp.com](http://www.icnirp.com).

<sup>19</sup> <https://www.icnirp.org/en/about-icnirp/commission/index.html>.

<sup>20</sup> ICNIRP, “GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC, 7 MAGNETIC AND ELECTROMAGNETIC FIELDS 8 (100 kHz TO 300 GHz)” (Draft Guidelines)

<https://www.icnirp.org/en/activities/public-consultation/consultation-1.html>

<sup>21</sup> *Id.* at §5.1.4:

LOCAL TRANSMITTED POWER DENSITY (>6 GHz – 300 GHz)

As described in Section 4.3.3.1.2, the guidelines take a transmitted power density of 200 W m<sup>2</sup>, averaged over 6 minutes and either 4 cm<sup>2</sup> (>6 to 30 GHz) or 1 cm<sup>2</sup> (>30 to 300 GHz) surface area of the body, within the >6 to 300 GHz range, as the local exposure corresponding to the operational adverse health effect threshold for both the Head and Torso, and Limb regions (5 and 2 °C local temperature elevation in Type-1 and Type-2 tissue respectively). As per the local SAR restrictions, a reduction factor of 2 was applied to this threshold for occupational exposure to account for scientific uncertainty, as well as differences in both thermal baselines and thermoregulation ability across the population. This results in a basic restriction for occupational exposure of 100 W m<sup>-2</sup>. As the general public cannot be expected to be aware of these exposures and thus to mitigate risk, a reduction factor of 10 was applied, which reduces the general public basic restriction to 20 W m<sup>-2</sup>.

of 4 cm squared from 6 GHz to 30 GHz over a time averaged period of six minutes.<sup>22</sup> Countries adopting this state-of-the-art document will be well-positioned for approval of 5G devices operating at these millimeter-wave frequencies. Conversely, failure to adopt the revised ICNIRP Guidelines or their IEEE counterpart is likely to result in reduced 5G millimeter-wave device capabilities for products in the United States.

ICNIRP very recently saw the need to issue a statement concerning the significance of the results of two studies on RF exposure: National Toxicological Project's study and a second study on radiofrequency exposure.<sup>23</sup> ICNIRP analyzed the studies and, importantly, concluded they do not impact the exposure limits set out by the standard: "Overall, based on the considerations outlined below, ICNIRP concludes that these studies do not provide a reliable basis for revising the existing radiofrequency exposure guidelines."<sup>24</sup> Thus, ICNIRP sees no scientific obstacle from these recent studies to its current exposure limits or to its pending updates to millimeter-wave limits.

#### **B. The Pending IEEE Standard Is the Second Updated Version Since the FCC's SAR Limits Were Defined and Fully Supersedes Those Limits**

The scientific basis of the 2005 IEEE Standard is reflected in the analysis set out in its voluminous Rationale<sup>25</sup> and the broad swath of the scientific literature it covers.<sup>26</sup> The result was an update of the SAR limits that essentially harmonized the IEEE Standard's limits with those in the 1998 ICNIRP Guidelines.<sup>27</sup>

Thus, the 2005 IEEE Standard set out its basis for being a superior standard to the earlier 1991 version. At the present time, it is in the process of yielding to even more current and accurate procedures and soon will be superseded by a state of the art version of the standard once the 2018 Standard is published. The revisions, among other items, will address the exposure limits for millimeter-wave 5G devices and, therefore, are essential for development of a robust 5G marketplace.

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<sup>22</sup> *Id.*

<sup>23</sup> ICNIRP, "ICNIRP Note on Recent Animal Carcinogenesis Studies", <https://www.icnirp.org/cms/upload/publications/ICNIRPnote2018.pdf> (Sep. 4, 2018). The second study is identified in the Note as Ramazzini Institute (Falcioni et al. 2018).

<sup>24</sup> *Id.*

<sup>25</sup> Note 10, *supra*, Annex C at 78-139.

<sup>26</sup> Note 10, *supra*, Annex F at 152-227.

<sup>27</sup> Notably, the general public SAR limit was revised from 1.6 W/Kg averaged over one gram of tissue to 2.0 W/Kg averaged over ten grams, and the occupational SAR limit was revised from 8 W/Kg averaged over one gram to 10 W/Kg averaged over ten grams.

The 2005 IEEE standard brought forward the scientific analysis of the experts on RF exposure and revised the exposure limits accordingly.<sup>28</sup> Indeed, the IEEE expressly pointed out that the earlier version of C95.1 no longer constituted a relevant basis for an exposure standard and had been supplanted by the later risk assessment:<sup>29</sup>

***A.1.3 Complete reassessment of the technical rationale***

*IEEE Std C95.1-1991 (and the 1999 Edition) was based on research published before 1986. Research has continued since 1986; a reevaluation of the RF biological effects database was therefore performed. A new risk assessment based on the results of this reevaluation was undertaken. Attempts were made to include and to evaluate all of the relevant literature in the database.*

(It bears noting that the updated IEEE levels were the same as the levels adopted in 1998 by the International Commission on Non-Ionizing Radiation Protection, or ICNIRP, which means that these exposure levels had already been in use internationally for two decades.)

The FCC has advocated that the U.S. be a leader in the implementation of 5G. Such leadership cannot be advanced under the requirements of a 26-year old standard designed prior to the conception of the technology it is being called upon to regulate. In fact, the U.S. exposure regulation no longer represents a science-based standard; instead, it is predicated on two moribund sets of guidance: the 1991 IEEE Standard and the 1986 NCRP Standard.<sup>30</sup> Per the General Accountability Office's report of 2012<sup>31</sup> it is the responsibility of the FCC to rectify that issue and update its regulations to reflect current science for RF exposure limits.

Although the 2018 IEEE Standard is not yet publicly available, its provisions are known to the RF expert participants, which includes FCC staff. Those provisions include exposure limits for high millimeter devices that provide essential guidance for manufacturers of 5G devices. Absent such guidance, the approval process will remain at its current level – ad hoc, protracted, and without the predictability needed for rational product introduction and marketing to consumers. Such a process cannot meet the FCC's goal of a robust 5G marketplace that leads the world, in fact the research firm Analysys Mason has just published a report that states that China now leads the U.S. in 5G readiness.<sup>32</sup>

**C. The FCC Must Update Its Regulations Rather Than Rely on the Superseded 1991 IEEE Standard.**

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<sup>28</sup> Note 9, *supra* at 4.2.1. Notably, the SAR standard was revised from 1.6 W/Kg averaged over one gram of tissue to 2.0 W/Kg averaged over ten grams of tissue.

<sup>29</sup> Note 10, *supra*, Annex A.

<sup>30</sup> Notes 10 and 7, *supra*.

<sup>31</sup> U.S. Government Accountability Office, *Exposure and Testing Requirements for Mobile Phones Should Be Reassessed*, GAO-12-771 (July 2012)

<sup>32</sup> <https://www.techradar.com/au/news/china-has-narrow-lead-over-us-in-5g-race>.

Given the increasing acceleration of the pace of telecommunications technology, and the reliance of wireless telecommunications companies and consumers on the FCC to do its part to keep the U.S. in the forefront of such technology, the FCC is now faced with a choice: act to update to the latest applicable standards or continue to lag in 5G leadership. The MWF strongly urges the FCC to reject further use of its outdated and superseded standard, to embrace the pending ICNIRP and IEEE standards, and to adopt an FCC Standard that reflects current science and will help establish and maintain U.S. 5G leadership.

Respectfully Submitted,

/s/ Charles Eger

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