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August 9, 2019

Marlene H. Dortch Secretary
Federal Communications Commission 445 12th Street, SW
Washington, DC 20510

Re: Notice of Ex Parte Communication, ET Dockets No. 13-84, 18-21

Dear Ms. Dortch:

The mmWave Coalition, ("mmWC") wishes to enter in Docket 13-84 its proposal, previously filed in Docket 18-21, that the Commission's RF safety limits in § 1.1310 be extended from the present upper limit of 100 GHz, adopted in 1996, to a new upper limit of 300 GHz as most other industrialized countries have already done.

mmWC is a group of companies and university researchers interested in promoting practical uses of spectrum above 95 GHz. The current membership is listed in the Appendix.

Until the March 15, 2019 *First Report and Order* ("*1stR&O*") in Docket 18-21 the Commission only had minor provisions for authorizing transmitters above 95 GHz dealing with small bands for Industrial, Scientific and Medical (ISM) uses and in the Amateur Radio Service. The new Docket 18-21 rules are much broader in scope. The *1stR&O* states

"(W)e take steps to provide new opportunities for innovators and experimenters to push those boundaries even further, and to develop new equipment and applications for spectrum between 95 GHz and 3 THz. These frequencies — long considered to lie at the outermost horizons of usable radio spectrum — are becoming increasingly well-suited for the development and deployment of new active communications services and applications. The rules we adopt in this First Report and Order will permit enhanced experimental licensing and unlicensed applications within this spectrum band as well as advance our overall commitment to identify and make available unused and underused spectrum regardless of the frequency range."

The absence of any quantitative RF safety limits creates several problems that could impact the intent of the Commission to stimulate innovation and economic growth with this bold action.

The existing RF safety standard in § 1.1310 covers all bands from 300 kHz to 100 GHz. However, it is based on an IEEE standard¹ that covers up to 300 GHz. Other countries have covered up to 300 GHz.² A Health Canada survey³ found limits up to 300 GHz in place in EU, UK, Australia and Russia.

While much lower frequencies used in equipment near humans raise complex issues of Specific Absorption Rate (SAR) measurements and limits, the long-standing provisions of § 1.1310(a) require SAR consideration only below 6 GHz, far below the band in question here. The reason for this is the well-known phenomenon that higher frequencies do not penetrate appreciably materials with the electromagnetic parameters similar to human tissue. So, the only interaction is at the surface level.⁵ So no SAR limit is needed above 6 GHz and only a Maximum Permissible Exposure (MPE) limit as in § 1.1310(e) is necessary. The Commission may wish to consider in the future “rise in temperature” on the surface of a human as a future metric for exposure limits due to the complexity of multi-element antennas within near field distances of a few centimeters or less.⁶

mmWC has raised this issue in timely comments in Docket 18-21⁷ but they have not yet been addressed by the Commission in that proceeding. This issue has also been raised in Docket 13-84 in two *ex parte* filings by Marcus Spectrum Solutions LLC⁸ starting in 2014 as well as its 2016 comments in Docket 14-177 that were crossfiled in Docket 13-84.⁹ No objections to extending the upper limits of § 1.1310 to 300 GHz have ever been filed in response to any of these earlier filings dating back almost 5 years.

We understand that the proposals in Docket 13-84 deal with many complex and sometimes controversial issues. We believe that this issue is much simpler and noncontroversial, especially in view of the precedents in other countries. The lack of any action on this noncontroversial

¹ IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” ANSI/IEEE Std C95.1-1992

² EU-OSHA, Directive 2013/35/EU - electromagnetic fields, 26 June 2013; Health Canada, Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz, (https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/consult/2014/safety_code_6-code_securite_6/final-finale-eng.pdf)

³ Health Canada, RF Toolkit–BCCDC/NCCEH, Section 13, Radiofrequency Safety Guidelines and Standard (<http://www.bccdc.ca/resource-gallery/Documents/Guidelines%20and%20Forms/Guidelines%20and%20Manuals/EH/EH/Section13Final106062013.pdf>)

⁵ T. Wu, T.S. Rappaport and C. Collins, “Safe for Generations to Come: Considerations of Safety for Millimeter Waves in Wireless Communications,” by *IEEE Microwave Mag.* 2015 Mar; 16(2): p. 65–84. (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4629874/>); T. Wu, T. S. Rappaport, C. M. Collins, “The Human Body and Millimeter-Wave Wireless Communication Systems: Interactions and Implications,” 2015 *IEEE International Conference on Communications (ICC)*, Jun. 2015 (<https://arxiv.org/ftp/arxiv/papers/1503/1503.05944.pdf>)

⁶ *Ibid.*

⁷ Comments of mmWC, Docket 18-21 May 2, 2018 at p. 11-12

⁸ *ex parte* filing of Marcus Spectrum Solutions LLC, Docket 13-84, August 22, 2014;
ex parte filing of Marcus Spectrum Solutions LLC, Docket 13-84, October 18, 2014;

⁹ Comments of Marcus Spectrum Solutions LLC, Docket 14-177, September 30, 2016

issue may frustrate the Commission's goals in the *1stR&O*. We urge the Commission to proceed with a timely notice and comment proposal on this narrow issue to further its goals of promoting technical innovation and national competitiveness.

cc: Julius Knapp

/s/ Prakash Moorut

Prakash Moorut
Chair of Steering Group
mmWave Coalition

Appendix

Current Membership of mmWave Coalition

- [American Certification Body, Inc.](#)
- [Azbil North America Research and Development, Inc.](#)
- [Global Foundries, Inc.](#)
- [Keysight Technologies](#)
- [National Instruments](#)
- [Nokia Corporation](#)
- [NSI-MI Technologies](#)
- [Nuvotronics, Inc.](#)
- [NYU WIRELESS](#)
- [Oorvo, Inc.](#)
- [RaySecur](#)
- [VEGA Americas](#)
- [Virginia Diodes, Inc.](#)