

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

Petition for Declaratory Ruling Regarding)
Treatment of Rulemakings and Waivers)
Related to New Equipment and Services at)
Frequencies Above 95 GHz)

RM Number _____

PETITION FOR DECLARATORY RULING

OF

IEEE-USA

1 July 2013

SUMMARY

IEEE-USA respectfully urges the Federal Communications Commission (FCC) to issue a declaratory ruling that petitions or applications related to technologies and services in the frequency spectrum above 95 GHz be classified presumptively as “a new technology or service” in the context of the terms of Section 7 of the *Communications Act of 1934*, as amended.¹ Under Section 7, such new technologies or services are entitled to an FCC review shot clock of 12 months, and the burden is placed on opponents to show that the new technologies or services are not in the public interest.

At present, no FCC service rules address *any* applications or services that utilize spectrum above 95 GHz. The only use permitted for this portion of the spectrum is with experimental licenses—a regulatory consequence of the current limitation. Such limitation precludes private-sector capital investment necessary for developing long-term commercial opportunities. The consequences create major uncertainties that inhibit both innovations in the short-term and long-term public and private benefits to society.

Clearly, the implication of Section 7 is to eliminate the regulatory uncertainties associated with Commission decisions for new technologies, such as those above 95 GHz (e.g., misclassification, time delays). IEEE-USA’s request to eliminate or reduce the consequent barrier to market entry will stimulate the innovation and capital investment for research and development necessary for eventual introduction to the commercial marketplace. In turn, stimulating innovation and capital investment will expedite numerous applications, by utilizing this relatively unused portion of the spectrum. It will also advance the goals of Section 1 of the *Communications Act of 1934*, as amended.

¹ 47 U.S.C. § 157

I. BACKGROUND

A. IEEE-USA

IEEE-USA is a unit of the Institute of Electrical and Electronics Engineers, Inc., a transnational engineering society. Created in 1973 to support the public policy interests of IEEE, and the professional advancement of 205,000 U.S. IEEE members, IEEE-USA is primarily supported by annual assessments of IEEE's U.S. members.²

As outlined in the IEEE Bylaws, IEEE-USA's mission is to recommend policies and implement programs specifically intended to serve and benefit the members, the profession, and the public in the United States, in appropriate professional areas of economic, ethical, legislative, social and technology policy concern. Its vision is to serve U.S. IEEE members as the best resource for achieving professional success and support, as well as providing an effective voice on policies that promote U.S. prosperity.

B. Above 95 GHz Perspectives

1. Present Situation

At present, the Commission's Table of Allocations extends up to 275 GHz, and generally parallels the provisions of the International Telecommunications Union (ITU) above 95 GHz. In almost all bands above 95 GHz, federal government allocations and non-federal government allocations under FCC jurisdiction are co-primary. However, the Commission's radio service rules end at 95.0 GHz, an upper limit reached on October 16, 2003 in the Report and Order of Docket 02-146.³ While the Commission provides for experimental radio uses under Part 5 of its rules on any radio frequency, such an experimental authorization limits the scope and ability to

² <http://ieeusa.org/about/>

³ *Ibid.* 47 C.F.R. §97.301 permits Amateur Radio Service use at 122.25-123, 134-141, 241-250, and above 275 GHz. 47 C.F.R. §18.301 permits Industrial, Scientific, and Medical (ISM) use, e.g. microwave ovens, body scanners or RF heat sealers, at 122.5 and 245 GHz. However, neither of these provisions allow the sale of and use of communications equipment to/by non-amateur licensees, or unlicensed users.

access markets for innovative radio products and services due to the requirements of Sections 5.51, 5.111, and 5.113 that limit Part 5 licenses to valid experiments and prevent normal marketing.⁴

IEEE-USA believes that this lack of service rules inhibits market entry for new and innovative technology and applications above 95 GHz. It also inhibits the acquisition of private sector funds for the research/development/testing necessary to move technology from technical journals into the commercial marketplace. FCC Commissioner Pai affirmed these limitations, when he stated:

(D)elays at the Commission have substantial real-world consequences: new technologies remain on the shelves; capital lies fallow; and entrepreneurs stop hiring; or even worse, reduce their workforce, as they wait for regulatory uncertainty to work itself out. The FCC has long had a reputation in Washington as an agency that moves too slowly.⁵

It should be noted that previous FCC actions to lessen barriers to innovative technology have been commercially successful, and resulted in numerous products and services, such as Wi-Fi and Bluetooth, technologies in the 60 GHz band, and technologies in the 70/80 GHz band.⁶

2. Above 95 MHz Technology Applications and Progress

Technology above 95 GHz is being developed and will be ripe for commercial exploitation soon. For example, on 19 December 2011, IEEE-USA presented a public seminar at the FCC: *Terahertz Technology: The Next Frontier for Radio*--with speakers from Sandia National Laboratories, CalTech Jet Propulsion Laboratory and AT&T Labs Research-Shannon Labs. This seminar explored the feasibility of new technology above 100 GHz.⁷

⁴ 47 C.F.R. §§5.51, 111, 113

⁵ Remarks of Commissioner Ajit Pai, “*Unlocking Investment and Innovation in the Digital Age: The Path to a 21st-Century FCC*”, Carnegie Mellon University, Pittsburgh, PA, 18 July 2012 (http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-315268A1.pdf)

⁶ FCC Dockets 81-413, 94-124, and 02-146

⁷ Parts of this seminar are archived at <http://techchannel.att.com/play-video.cfm/2012/1/19/Conference-TV-Terahertz-Technology:-Terahertz-Wireless-Communication1>

Another unit of the IEEE, the Microwave Theory and Techniques Society (MTT) has been publishing a regular journal on terahertz technology, *IEEE Transactions on Terahertz Science and Technology*,⁸ for more than two years.

A 2011 technical journal article⁹ by several authors from Battelle Memorial Institute described novel technology “to generate and modulate millimeter-wave carrier frequencies between 90 GHz and 100 GHz at data rates in excess of 10 GB/s.” While the article focused on satellite downlinks, the technology has obvious applications for terrestrial links for broadband telecommunications backhaul of a few kilometers, where installed fiber optics is not available.

On 3 January 2013, the Defense Advanced Research Projects Agency (DARPA) published a Broad Agency Announcement (BAA) entitled “100 GB/s RF Backbone (100G).”¹⁰ The vision of this program is to provide “fiber-optics-equivalent RF Backbone” with a capacity of 100 GB/s. The requested research includes the following tasks:

- High Order Modulation at Millimeter-wave Frequencies
- Spatial Multiplexing at Millimeter-wave Frequencies
- Efficient Power Amplification at Millimeter-wave Frequencies
- Conformal Antennas at Millimeter-wave Frequencies
- Multifunction Millimeter-wave Trade Study
- 100G Networking Trade Study
- 100G Waveform Development
- Efficient Signal Processing

The DARPA 100G Program seeks to develop technology that will work on terrestrial links over 50 km. While the DARPA announcement does not give a specific frequency for the

⁸ <http://mtt.org/terahertz.html> (1 terahertz = 1000 GHz)

⁹ R. W. Ridgway, D. W. Nippa S. Yen, T. J. Barnum, “Design of a 10-Gb/s satellite downlink at millimeter-wave frequencies,” *Proc. SPIE*, 7936, 79360H (2011)

¹⁰ DARPA Broad Agency Announcement, 100 Gb/s RF Backbone (100G), Strategic Technology Office, January 3, 2013, “BAA”(https://www.fbo.gov/index?s=opportunity&mode=form&id=4619343645998c46a527ff5b7ae2a755&tab=core&_cview=1); Proposer’s Day briefing at www.darpa.mil/WorkArea/DownloadAsset.aspx?id=2147486179

systems being sought, the BAA discusses “between 70 GHz and 120 GHz” in several places.¹¹

Early DARPA-funded R&D lead to both today’s Internet and the feasibility of monolithic microwave integrated circuits (MMICs)¹² that are key to today’s small affordable cellular technology above 1 GHz, as well as the 60-95 GHz technology that has been previously authorized by the FCC in Dockets 94-124 and 02-146. Such DARPA-funded research has been the precursor of breakthrough technologies subsequently regulated by the FCC.

A review of the FCC’s experimental licensing database shows 13 current licenses above 95 GHz¹³. Almost all of these licensees appear to be military contractors, whose funding and applications differ from commercial developers, especially in the short-run. Nevertheless, practical trial applications of above 95 GHz technology are beginning to appear in the commercial marketplace outside the United States. For example, in a demonstration at the 2008 Beijing Olympics a Japanese-developed 120 GHz system collected HDTV video feeds to a central location.¹⁴

More recently, a Singapore government-financed research laboratory announced a novel 135 GHz antenna technology that “can support wireless speed of 20 GB/s—more than 3 times faster than the fastest present day Wi-Fi.”¹⁵

We note, however, a lack of field trials and prototype equipment in the United States to date, and believe that capital formation issues related to FCC regulation are a likely factor.

¹¹ See BAA at p. 15

¹² Defense Advanced Research Projects Agency, MMIC Briefs, January 1993, AD A-260914 (<http://www.dtic.mil/dtic/tr/fulltext/u2/a260914.pdf>)

¹³ A few, perhaps three, of these may be data entry errors of experiments that are actually at lower frequencies.

¹⁴ Akihiko Hirata, *et al.*, Transmission Trial of Television Broadcast Materials Using 120-GHz-band Wireless Link, *NTT Technical Review*, Vol. 7 No. 3 (Mar. 2009), p. 1-5 (https://www.ntt-review.jp/archive/ntttechnical.php?contents=ntr200903sf3.pdf&mode=show_pdf%3Cbr%20/%3E)

¹⁵ A*STAR’s Institute of Microelectronics (Singapore), “A*STAR’s IME DEVELOPS SMALLEST ANTENNA THAT CAN INCREASE WIFI SPEED BY 200 TIMES” (28 August 2012) (https://www.ime.a-star.edu.sg/files/news/Final%20mmWave%20Antenna%20Technology_IME%20technical%20release_28Aug2012.pdf)

3. Available Regulatory-Administrative Incentives

Section 7 of the Act creates a one year (or less) path, from proposal to adoption of new technologies and services. By making a declaratory ruling that proposals to the Commission for new technologies and services above 95 GHz will be treated presumptively as new technologies and services under Section 7, the FCC will encourage commercial development and innovation by greatly decreasing regulatory uncertainty. Presently, the only certainty is that an experimental use of above-95 GHz technology is eligible for experimental licensing. There is no path to post-experimental use.

Section 7 was added on 8 December 1983¹⁶ but has rarely, if ever, been used by the Commission. Its terms provide:

§ 157. New technologies and services

(a) It shall be the policy of the United States to encourage the provision of new technologies and services to the public. Any person or party (other than the Commission) who opposes a new technology or service proposed to be permitted under this chapter shall have the burden to demonstrate that such proposal is inconsistent with the public interest.

(b) The Commission shall determine whether any new technology or service proposed in a petition or application is in the public interest within one year after such petition or application is filed. If the Commission initiates its own proceeding for a new technology or service, then such proceeding shall be completed within 12 months after it is initiated.

Favorable consideration of this Declaratory Ruling Request will demonstrate the Commission is a willing to move quickly on new service proposals above 95 GHz, and consider them on their merits in a timely way.¹⁷

¹⁶ Pub. L. 98–214, § 12, 8 Dec. 1983, 97 Stat. 1471;

¹⁷ The Commission has acknowledged the general terms of Section 7 on a few occasions. For example in Docket 98-94, which ultimately adopted a policy statement to facilitate experiments with technologies subject to regulation under Title II of the Act, the Commission acknowledged in both the *NOI* and the *Policy Statement* the statutory language that "the policy of the United States is to encourage the provision of new technologies and services to the public." In the ultra-wideband NPRM, it stated: "We note that Section 7 of the *Communications Act of 1934*, as amended, requires the Commission "to encourage the provision of new technologies and services to the public." Accordingly, we conclude that the Commission should develop reasonable regulations that will foster the development of UWB technologies, while continuing to protect radio services against interference." *NPRM*, Docket 98-153, May 10, 2000, at para. 8 (http://transition.fcc.gov/Bureaus/Engineering_Technology/Notices/2000/fcc00163.txt)

Consistent with this position, Commissioner Pai has stated:

“The Commission should make the deployment of new technologies and new services a priority, resolving any concerns about them within a year.”¹⁸

In his address at Carnegie-Melon University, Commissioner Pai also pointed out the underlying problem of “regulatory uncertainty” in communications technology:

“After all, just think about how uncertainty affects you in your life. If you were looking for land on which to build a new house, for example, would you purchase a plot if the zoning board refused to tell you whether you could build the house? Probably not. As someone put it to me recently, “Regulatory uncertainty is business uncertainty.” And when businesses are uncertain, they, like you or I, are hesitant to invest. It’s therefore no surprise that billions of dollars of capital are staying on the sidelines in the communications industry.”¹⁹

Apparently, the only other statement available from a commissioner on the issue of Section 7 is from Commissioner Ness in 1999, where she said:

“Section 7 of the *Communications Act of 1996(sic)* sets the development of new technologies as national policy. And, as stewards of the spectrum, the Commission has an obligation to the American public to ensure that the process yields the essential information needed to make good spectrum management decisions in a reasonable timeframe.”²⁰

4. IEEE-USA and Section 7

IEEE-USA previously contacted the Commission to request more active use of Section 7, to facilitate the development of innovative technology in the United States. In its 18 April 2011 letter to the FCC, it made several suggestions on how the Commission could expedite the deliberation of new technologies.²¹ The 2011 letter compared the lack of any Commission guidance on how Section 7 issues would be treated, with the Commission’s *“Informal Timeline for Consideration of Applications for Transfers or Assignments of Licenses or Authorizations*

¹⁸ Commissioner Pai, *op cit.*, at p. 5

¹⁹ Commissioner Pai, *op cit.* at p. 4

²⁰ Commissioner Susan Ness, Remarks Before the 1999 International Ultra-Wideband Conference, 29 September 1999 (http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-12-154A1.pdf).

²¹ Letter from IEEE-USA to FCC Chair Genachowski, 18 April 2011 (<http://www.ieeeusa.org/policy/policy/2011/041811.pdf>)

Relating to Complex Mergers,”²² and an “*Informal Guideline for Section 10(c) Forbearance Petitions*,”²³ and suggested that similar guidelines be developed for Section 7 issues that have a statutory time limit.

5. Federal Government Frequency Sharing Issues

At present, some co-primary federal government use of this spectrum may exist, under the auspices of the National Telecommunications and Information Administration (NTIA), pursuant to its authority under Sections 305 and 902 of the Act,²⁴ since all spectrum allocations above 95 GHz are shared between federal and nonfederal users.²⁵ The very nature of these frequencies, however, greatly facilitates much easier sharing than at lower frequencies, due to high-path loss resulting from atmospheric absorption, as well as the small, very directional, antennas made possible by very small wavelengths.²⁶ As a result of these factors, interference is much less likely at lower frequencies. And NTIA has previously used this observation to introduce an unprecedented direct coordination system, to speed coordination of non-government licenses in its Web Based Frequency Coordination for the lower adjacent 70/80/90 GHz bands.²⁷ It should be noted that the language of Section 7(a) appears to apply to both NTIA and FCC. Section 305 of the Act exempts the President’s authority over federal spectrum users, delegated to NTIA in Title IX of the Act, from the provisions of Section 301 and 303, but not from all sections of the Act.

²² <http://www.fcc.gov/transaction/timeline.html>

²³ <http://www.fcc.gov/wcb/cpd/forbearance/timeline.html>

²⁴ 47 U.S.C. §§305,902 (NTIA rarely makes specific frequency assignments for federal government users public, although the allocations are contained in the FCC Allocation Table. Therefore it cannot be said with certainty whether such assignments exist above 95 GHz, based on publicly available information.)

²⁵ 47 C.F.R. §2.106

²⁶ FCC/Office of Engineering and Technology, *Millimeter Wave Propagation: Spectrum Management Implications*, OET Bulletin No. 70 (July 1997)

(http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet70/oet70a.pdf) At such frequencies, gases in the atmospheric actually absorb power from radio transmissions, much as water in a microwave oven absorbs radio power. This absorption is in addition to the path loss mechanisms at lower frequencies resulting in much higher total path losses than at lower frequencies--although the details depend on specific frequencies--since they are related to resonances of molecules in the atmosphere.)

²⁷ <http://freqcoord.ntia.doc.gov/index.aspx>

In view of NTIA’s interest in the use of commercial off-the-shelf (COTS) technology for federal wireless systems, and the Commerce Department’s mission to promote “job creation, economic growth, sustainable development, and improved standards of living for all Americans,”²⁸ it is expected that NTIA would be supportive of facilitating the introduction of new technology for non-government users in the bands above 95 GHz, as they have been in lower bands.

II. DECLATORY RULING REQUEST

Pursuant to Section 303(r) of the Act²⁹ and Section 1.2 of the Commission's rules,³⁰ IEEE-USA respectfully petitions the Commission to issue a Declaratory Ruling on a narrow issue, with significant implications: that requests for rulemaking or waivers dealing with frequencies above 95 GHz be presumed to be “a new technology or service,” within the context of Section 7 of the *Communications Act of 1934*, as amended.

Presently, no FCC service rules above 95 GHz exist, therefore no licenses other than experimental licenses are subject to the terms of Part 5 of the Commission’s Rules. Consequently, technology for bands above 95 GHz face regulatory uncertainty, and an expected regulatory delay that is difficult to quantify. These issues are real disincentives for the capital formation that is necessary for technology development above 95 GHz. The result creates barriers to commercial market entry, depriving s the public and private sectors of the benefits of new and innovative technologies. This Request is supported by the information presented above.

²⁸ Department of Commerce Mission Statement (<http://www.commerce.gov/about-department-commerce>)

²⁹ 47 U.S.C. §303(r)

³⁰ 47 C.F.R. §1.2

Implementing Section 7 is not a perfect solution, nor is this section a perfect piece of legislation. For example, while Section 7(a) is relatively clear, in Section 7(b) it is not clear what activities are required within the one-year deadline to determine whether a proposal is in the public interest. However, Section 7 remains an integral part of the *Communications Act of 1934*, as amended, and the basic intent of Congress is clear.

It has been nearly 30 years since section 7 was adopted. While many of the technological advances in that period may have raised questions of whether they qualified as “new technology”; and many wireless innovations may have raised difficult conflicts with incumbent licensees; the case for technology at frequencies greater than 95 GHz is now much simpler, and is quite clear. There is not, and cannot be, commercial production technology subject to FCC jurisdiction above 95 GHz, while the lack of service rules above 95 GHz imposes real regulatory barriers to such technologies’ implementation in a free market system. Further, there are no FCC incumbents in this spectrum. The case of federal incumbents and co-primary federal government allocations is much simpler than at lower bands, as has been shown in NTIA’s agreement with the Commission for “licensing light” rules for 71-76, 81-86, and 92-95 GHz,³¹ and simplified online coordination of applicants.³²

Specific Request for Content of Ruling

IEEE-USA requests that the Commission make a Declaratory Ruling--that new applications for the use of technology above 95 GHz:

- a) Presumptively qualify as "new technology" under Section 7
- b) Are subject to the opponents' burden test of Section 7(a)
- c) Are subject to the Section 7(b) one-year timeframe for determining whether the proposal is in the public interest.

³¹ 47 C.F.R. 101.1501,1513

³² 47 C.F.R. 101.1523

IEEE-USA also proposes that the Commission make a Declaratory Ruling that it will interpret the requirement of Section 7(b) as follows: After receipt of a petition for rulemaking, or the issuance of an NOI or NPRM on its own motion, the Commission must, within one year, determine whether the subject matter is a new technology or service, subject to Sec. 7. And if it finds in the affirmative, the Commission must, within that one year, adopt rules that enable provision of the new technology or service.

Should the Commission not agree with this interpretation of Section 7(b), we ask that it clarify what its interpretation of this long-standing statute is. Such clarification of this statute, intended by Congress to facilitate technological innovation, will remove the uncertainty that presently impedes capital formation for innovative technology, and deployment of such technology in the regulated spectrum.

III. CONCLUSION

Section 7 is a provision of the *Communications Act* that has been overlooked for almost 30 years. Technology and services for frequencies greater than 95 GHz are on the verge of commercial practicality. IEEE-USA urges the Commission to make a Declaratory Ruling that such technology and services qualify as “new” under Section 7, and are entitled to the provisions of both Sections 7(a) and 7(b).

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