

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of)	
)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services)	GN Docket No. 14-177
)	
Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands)	ET Docket No. 95-183 (Terminated)
)	
Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz Bands)	PP Docket No. 93-253 (Terminated)
)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band)	RM-11664
)	

To: The Commission

**COMMENTS OF THE CONSUMER
ELECTRONICS ASSOCIATION**

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January 15, 2015

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EXECUTIVE SUMMARY

The *Notice of Inquiry* (“*NOI*”) is an important first step in identifying and accommodating potential new uses for the millimeter wave (“mmW”) bands above 24 GHz, including for the provision of Fifth Generation (“5G”) wireless services and for other evolving and innovative uses. Given the scarcity of available spectrum in the lower bands traditionally used for mobile services, CEA members and others have been exploring the possibility of meeting the most localized portion of the growing demand for such services by employing new technology to facilitate the use of mmW bands. The initial results of this recent work have been promising. Moreover, while the *NOI* particularly discusses opening the mmW band to mobile broadband services, the Commission should not lose sight of the fact that the mmW bands also are proving to hold great promise for meeting a wide range of other service needs, including backhaul, other point-to-point applications, unlicensed wireless cable replacement, satellite and aerial broadband, and other services.

CEA applauds the FCC for issuing the *NOI* as a forum for developing a complete record on the current and potential future uses of the mmW bands and the technical and regulatory issues raised by those various uses. CEA proposes the following guiding principles as the Commission explores, and ultimately considers new rules, for the mmW bands:

- 5G mobile broadband is critical to the next generation of innovation, but it also is important to accommodate the wide range of other uses for which the mmW bands are appropriate.
- Technical neutrality and upholding the Commission’s commitment to not define, standardize, or specify the characteristics of mmW services are crucial.
- The Commission must continue to be an active facilitator in the development of technologies utilizing the mmW bands, including working at a pace commensurate with industry developments.
- The Commission should continue to encourage and participate in global harmonization, including offering the Commission’s experience with spectrum sharing, and promoting intelligent allocation for multiple uses without losing sight of incumbents.
- Service rules and licensing regimes should reflect the best use of the mmW bands in light of the physical characteristics of the spectrum and the developing technology.
- Any new spectrum allocations and service rules should be crafted to minimize interference while maximizing utility, and should be designed to work synergistically with complementary or equivalent services in lower bands.

These principles can help CEA's members meet the ever-increasing demand for high-speed wireless connectivity.

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To: The Commission

**COMMENTS OF THE CONSUMER
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The Consumer Electronics Association (“CEA”)¹ respectfully submits these comments in response to the Commission’s *Notice of Inquiry* (“*NOI*”) soliciting input on the potential for use

¹ CEA is the principal U.S. trade association of the consumer electronics and information technologies industries. CEA’s more than 2,000 member companies lead the consumer electronics industry in the development, manufacturing and distribution of audio, video, mobile electronics, communications, information technology, multimedia, and accessory products, as well as related services, that are sold through consumer channels. Ranging from giant multi-national corporations to specialty niche companies, CEA members cumulatively generate more than \$223 billion in annual factory sales and employ tens of thousands of people in the United States.

of the millimeter wave (“mmW”) spectrum above 24 GHz for the provision of mobile radio services.²

INTRODUCTION

The demand for mobile broadband service has grown dramatically over the past few years, and will continue to expand exponentially for the foreseeable future. To meet that demand, industry has invested billions of dollars to extract additional capacity from the spectrum that is presently available for mobile broadband. And, in cooperation with the National Telecommunications and Information Administration (“NTIA”) and industry, the FCC has already commenced dramatic initiatives to free additional spectrum for mobile broadband through techniques such as the relocation of incumbents and the introduction of new technologies to promote sharing. As the wireless and consumer electronics industries have turned their attention to the development of standards for Fifth Generation (“5G”) mobile services, it has become clear that while the new, lower band mobile spectrum now starting to enter the pipeline will be of critical import in meeting demand, the provision of 5G-level service will require use of additional frequency bands. This is particularly critical in those places where traffic demands will be highest (such as dense urban areas, airports, convention centers, arenas, etc.).

Given the scarcity of available spectrum in the lower bands traditionally used for mobile services, CEA members and others have been exploring the possibility of meeting localized demand by employing innovative new technology to facilitate the use of mmW bands above 24 GHz. As recognized by the FCC’s Technological Advisory Council (“TAC”), although the

² *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Notice of Inquiry, 29 FCC Rcd 13020 (2014) (“*NOI*”).

mmW bands historically were viewed as unsuitable for mobile services due to propagation limitations, the initial results of this recent work have been promising.³ While most of the focus of the *NOI* is on opening the mmW band to expansion of existing mobile broadband services, the Commission should not lose sight of the fact that the mmW bands hold great promise for meeting a wide range of other service needs, including backhaul, other point-to-point applications, unlicensed wireless cable replacement, satellite and aerial broadband, and other services.⁴

Thus, CEA applauds the FCC for issuing the *NOI* as a forum for developing a complete record on the current and potential future uses of the mmW bands and the technical and regulatory issues raised by those various uses. CEA submits these comments to update the Commission on the efforts of its members to explore the use of the mmW bands and to suggest some basic principles that should guide the Commission's consideration of the mmW bands.

DISCUSSION

I. THE MMW BANDS SHOW PROMISE FOR MEETING THE GROWING DEMAND FOR MOBILE BROADBAND

The last several years have seen phenomenal growth in the demand for mobile broadband services. In 2013 alone, mobile data traffic grew 77 percent in North America.⁵ Already, 65 percent of mobile devices and connections are “smart,” meaning they have advanced computing

³ See FCC TAC Meeting (Presentation of Brian Markwalter, CEA, Spectrum Frontiers Workgroup, at 8:20-35:30, Sept. 23, 2014) (last visited Jan. 6, 2015), available at <http://www.fcc.gov/events/techno-logical-advisory-council-meeting-9232013>; *NOI*, 29 FCC Rcd at 13022 ¶ 5.

⁴ *NOI*, 29 FCC Rcd at 13022 ¶ 5.

⁵ Cisco, Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2013–2018, at 4 (Feb. 5, 2014) (“Cisco VNI”), available at http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.pdf.

and multimedia capabilities and 3G connectivity, at a minimum.⁶ A CEA study confirmed that smartphones have become the primary device for taking pictures (78 percent), recording videos (74 percent), getting directions (69 percent), reading e-books (62 percent), listening to music (59 percent) and playing games (39 percent).⁷ Likewise, the study found that the vast majority of smartphone owners use their devices to access websites (85 percent) and email (89 percent).⁸ Tablet owners also eagerly use their devices to browse the Web (92 percent), check email (83 percent), and watch videos (66 percent).⁹

With consumers demanding higher speeds for more data-intensive applications and with the emergence of the Internet of Things, this growth is projected to continue unabated for the foreseeable future.¹⁰ North American mobile data traffic is expected to surge to nearly 3 million terabytes of data in 2018 – a compound annual growth rate (“CAGR”) of 50% – on the heels of an average of 12 percent CAGR growth in mobile devices and connections from 2013 to 2018.¹¹

⁶ *Id.* at 8.

⁷ Press Release, CEA, Smartphone, Tablet Owners Reduce Time Using – But Few Eliminate – Standalone Devices, According to CEA Study (Apr. 24, 2013), <http://www.ce.org/-News/News-Releases/Press-Releases/2013-Press-Releases/Smartphone,-Tablet-Owners-Reduce-Time-Using-%E2%80%93-But.aspx>.

⁸ *Id.*

⁹ *Id.*

¹⁰ *See, e.g.*, FCC, FCC-TAC Internet of Things Working Group Forecast Data, Table FCC.1 – Extended Forecasts – Internet Connectable Devices – Installed Base (TAC Meeting, Dec. 4, 2014), <http://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting12414/FCCTAC-IOT-Working-Group-IOT-Forecast-Data-Final.xlsx>.

¹¹ Cisco VNI at 34, 7.

To connect 50 billion devices – the number of devices that will be in use by 2020 – a network would need a capacity that is at least 1,000 times the capability that exists today.¹²

To help meet this challenge, industry is moving in earnest towards 5G, which will be comprised of a variety of connected networks utilizing a wide range of frequency bands. Although industry groups have yet to develop a 5G standard, several organizations are sketching out a framework with the following requirements: (1) high availability and reliability; (2) faster downloads and connectivity; (3) simultaneously connected devices with always-on access to the Internet; (4) lower battery consumption; (5) better coverage; and (6) lower latencies, all at an affordable cost.¹³ Initial work has set expectations high. For example, Huawei predicts that 5G will be 100 times faster than the fastest 4G LTE standard now available.¹⁴ Likewise, twenty-four carriers, system makers, and research groups including Alcatel-Lucent, Ericsson, France Telecom, Huawei, Intel, Nokia Solutions and Networks, and Telecom Italia published a draft proposal that called for 5G networks to provide a capacity 1,000 times higher than 2010 networks.¹⁵

The mobile and consumer electronics industries have demonstrated that the growing demand has created a pressing need for more spectrum capable of supporting 5G mobile

¹² Murray Slovick, *5G: The Mobile Tech of 2020*, CEA i3 (Nov./Dec. 2014) (“Slovick”), available at <http://cdn.coverstand.com/25838/232265/711ba5485b2b1c66036f89c895b2-baecbaa98e91.23.pdf>; Comments of Qualcomm Inc., GN Docket No. 14-28, at 5-6 (July 15, 2014) (“[W]ireless data usage has been doubling annually over the past several years, and if this trend continues for the next ten years, the level of usage in a decade will be more than 1000 times today’s level.”).

¹³ Slovick at 25.

¹⁴ *Id.* at 23.

¹⁵ *Id.*

broadband applications.¹⁶ Thanks to the FCC's recognition that more spectrum means better and more innovative wireless services and devices, more jobs, and a stronger U.S. economy, efforts are underway to repurpose federal spectrum, relocate certain commercial incumbents, and revise FCC rules to make existing allocations more viable for mobile broadband service.¹⁷ As suggested by the *NOI*, those efforts at freeing spectrum below the mmW bands should continue in parallel with this proceeding.¹⁸ While the mmW bands hold promise for meeting demand in heavily congested areas, the superior propagation characteristics of lower bands means these lower bands remain absolutely necessary to meet growing demand. Indeed, spectrum flexibility will be vital for 5G: the next generation will involve multiple spectrum bands, with the network employing the most appropriate frequencies for the best delivery of a particular service.¹⁹

¹⁶ See, e.g., Erik Dahlman, *et al.*, *5G Radio Access*, at 3, ERICSSON REVIEW (June 18, 2014), available at http://www.ericsson.com/res/thecompany/docs/publications/ericsson_review/-2014/er-5g-radio-access.pdf (“to fulfill long-term traffic demands, and perhaps even more important, to enable the very wide transmission bandwidths needed to provide multi-Gbps data rates efficiently, the range of operation for next-generation wireless access needs to be extended into higher frequencies above 10GHz”); Huawei Technologies Co., LTD., *5G: A Technology Vision*, at 5 (2013), available at <http://www.huawei.com/5gwhitepaper> (“freeing up additional spectrum will also be required to support thousand-fold capacity increases by 2020 – and even higher increases looking forward to 2040 and beyond.”).

¹⁷ See, e.g., *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6567 (2014); *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, 29 FCC Rcd 4273 (2014) (“3.5 FNPRM”); *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, First Report and Order, 29 FCC Rcd 4127 (2014) (“5 GHz Report and Order”); NTIA, Fourth Interim Progress Report on the Ten-Year Plan and Timetable and Plan for Quantitative Assessment of Spectrum Usage (June 2014), available at http://www.ntia.doc.gov/files/ntia/publications/fourth_interim_progress_report_final.pdf (describing efforts to either free up or share government held spectrum in for wireless broadband use).

¹⁸ *NOI*, 29 FCC Rcd at 13021 ¶ 2 (“This proceeding is not a substitute for our efforts to make additional lower frequency spectrum available for mobile services, but rather is a supplement to those efforts.”).

¹⁹ Slovic at 25.

Therefore, “We look up. Way, way, up.”²⁰ As the TAC and *NOI* recognize, promising work is taking place to evaluate the use of the mmW bands for mobile broadband.²¹

- Samsung has successfully tested an advanced MIMO antenna system in its 5G lab trials using a new adaptive array transceiver with 64 antenna elements, achieving data speeds of 1 Gbps over distances of up to 2 kilometers using the 28 GHz spectrum band. The antenna for 5G mobile will likely be an electronically steered, phased array system composed of radiating elements, each with a phase shifter. A phased array antenna electronically steers transmit and receive beams without physically moving the antenna array, which increases the antenna’s responsiveness and capacity. Beams are formed by shifting the phase of the signal emitted from each radiating element, to provide constructive or destructive interference so as to steer the beams in the desired direction.
- Ericsson has demonstrated the ability to establish reliable wireless links at 5.8 GHz and at 28 GHz by combining multiple reflected signals. Ericsson has conducted a test that achieved a connection speed of 5 Gbps over the air.
- Intel is developing technology, based on the IEEE 802.1ad WiGig standard, that will use the 30-40 GHz and 60 GHz bands to provide, among other things, small cell backhaul and access for 5G deployments.
- Theodore Rappaport of NYU is actively engaged in mmW band propagation measurements.²² He has found that “at least at 28, 38, 60 and 72 GHz, the channel really will support cellular, mobile, personal communications indoors and

²⁰ *NOI*, 29 FCC Rcd at 13053 (Statement of Commissioner Jessica Rosenworcel).

²¹ *See, e.g.*, FCC TAC, Summary of Meeting at 8, Spectrum Frontier Working Group Presentation at Slide 5 (Sept. 23, 2013) (“TAC September Summary”) (review of several ongoing projects in the 30-40 GHz bands), available at <http://transition.fcc.gov/bureaus/oet/tac/-tacdocs/meeting92313/TACMeetingSummary9-23-13.pdf>; *NOI*, 29 FCC Rcd at 13024-25 ¶¶ 11-12.

²² Theodore S. Rappaport, *et al.*, *Millimeter Wave Mobile Communications for 5G Cellular: It Will Work!*, IEEE ACCESS (May 29, 2013), available at <http://ieeexplore.ieee.org/stamp/-stamp.jsp?arnumber=6515173>.

outdoors,”²³ and that the well-known path loss issues at mmW can be partially offset by modern antenna technologies.²⁴

- Nokia Solutions and Networks and the NYU WIRELESS research center jointly conducted in April 2014 the 5G Summit at New York University Polytechnic School of Engineering, where frequencies from 3-100 GHz were considered for possible 5G use.²⁵
- METIS (Mobile and Wireless Communications Enablers for the 2020 Information Society) of Europe is helping to lay the foundation of 5G. METIS is coordinated under the auspices of the Seventh Framework Programme for research and development (FP7).

In short, CEA agrees that “[t]he overall picture that emerges from these developments is a potential coalescence of technologies that could lead to the emergence of a new and radically more capable generation of wireless mobile service” in the mmW bands.²⁶

II. THE FCC SHOULD BE GUIDED BY CERTAIN BASIC PRINCIPLES WHEN CONSIDERING USAGE OF THE MMW BANDS

As the Commission explores new uses for the mmW bands, CEA submits several guiding principles, as touchstones of rules and policies to encourage investment and innovation.

²³ Tammy Parker, *NYU Wireless’ Rappaport envisions a 5G, millimeter-wave future*, FIERCEWIRELESSTECH (Jan. 13, 2014), <http://www.fiercewireless.com/tech/special-reports/nyu-wireless-rappaport-envisions-5g-millimeter-wave-future>.

²⁴ Sijia Deng, et al., *Small Wavelengths – Big Potential: Millimeter Wave Propagation Measurements for 5G*, MICROWAVE JOURNAL (Nov. 13, 2014), available at <http://www.micro-wavejournal.com/articles/23274>.

²⁵ See Press Release, NYU Polytechnic School of Engineering, NSN, NYU WIRELESS Host First Brooklyn 5G Summit (Apr. 15, 2014), <http://engineering.nyu.edu/press-release/2014/04-/15/nsn-nyu-wireless-host-first-brooklyn-5g-summit>.

²⁶ *NOI*, 29 FCC Rcd at 13025 ¶ 13.

A. *5G MOBILE BROADBAND IS CRITICAL TO THE NEXT GENERATION OF INNOVATION, BUT IT IS ALSO IMPORTANT TO ACCOMMODATE THE WIDE RANGE OF OTHER USES FOR WHICH THE MMW BANDS ARE APPROPRIATE.*

As identified by the TAC and *NOI*, many of the mmW bands are already allocated, in use or being explored for uses other than mobile broadband service. CEA members have deployed parking assistance, blind spot detection, collision avoidance, and automatic cruise control using radar in the 28 GHz/79 GHz bands.²⁷ The mmW bands at 24 GHz, 28 GHz, 39 GHz and 70-80-90 GHz are being used to provide important backhaul, satellite, and other point-to-multipoint services that should not be foreclosed under new rules. Further, today broadband is being provided to approximately 1.5 million North American consumers using satellite located in the 28 GHz band, and the V band is looked to as an expansion band for broadband and other satellite uses.

As it considers the issues raised by the *NOI*, the FCC must accommodate a wide range of interests in the mmW bands, including incumbents, potential mobile broadband service providers, and other potential users of the mmW spectrum. While the *NOI* mostly focuses on identifying mmW spectrum for licensed mobile broadband services, the Commissions should not foreclose the wide range of licensed and unlicensed uses for which the mmW bands are appropriate.²⁸ Rather, the FCC should provide adequate protection to incumbents that are

²⁷ FCC TAC, Summary of Meeting at 13, Spectrum Frontier Working Group Presentation at Slide 8 (June 13, 2013) (review of mmW applications), available at [http://transition.fcc.gov-bureaus/oet/tac-/tacdocs/meeting61313/TAC-meeting-summary-6-13-13.pdf](http://transition.fcc.gov/bureaus/oet/tac-/tacdocs/meeting61313/TAC-meeting-summary-6-13-13.pdf).

²⁸ In some cases, respecting the wider range of appropriate uses may call for innovative approaches to addressing interference. For example, the 25.05-25.25 GHz band is used for Fixed Satellite Service (“FSS”) Earth-to-space feeder links for the 17/24 GHz Broadcast Satellite Service (“BSS”). These feeder links will generate localized interference with mobile uses. Care must be taken to avoid foreclosing future earth stations. For example, mobile service could be made secondary to FSS feeder links associated with BSS in the band and mobile uses predating

(continued on next page)

already utilizing the mmW bands, as well as to promote their expansion of services, while facilitating the widest possible range of future uses.²⁹

B. TECHNICAL NEUTRALITY AND UPHOLDING THE COMMISSION'S COMMITMENT TO NOT DEFINE, STANDARDIZE, OR SPECIFY THE CHARACTERISTICS OF MMW SERVICES ARE CRUCIAL.

Looking ahead to the next generation of mobile broadband, CEA applauds the FCC for committing to not attempt to define, standardize or specify the characteristics of 5G service.³⁰

The Commission noted that “we believe flexibility will spur investment in communication services and systems and technology development” and its technology neutral stance with respect to prior generations of mobile service has promoted technical innovation and a robust, competitive market.³¹ There is no reason for the Commission to abandon its reliance on the marketplace particularly where, as here, technology development is in its early stages.

(footnote continued)

any future FSS feeder link earth stations be required to accept interference from those stations. Or, a number of predefined existing FSS feeder link sites could be grandfathered and future FSS feeder link sites could be geographically restricted to avoid the type of dense urban area for which mmW is expected to be particularly suited.

²⁹ Early filings in this docket agree that uses other than mobile should be permitted in the mmW bands. *See, e.g.*, Response of Bluwan SA to FCC Notice of Enquiry, GN Docket No. 14-177, at Section 1.1 (Dec. 16, 2014) (“commercialization of mobile radio access networks, and associated devices is not practical in the short term, and recommends allocation of these bands for the backhaul of heterogeneous networks, or fixed wireless access deployments in areas where the deployment of fiber optic last mile networks is economically or geo-demographically unachievable.”).

³⁰ *See NOI*, 29 FCC Rcd at 13021 ¶ 3.

³¹ *See, e.g., Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands*, Report and Order, 18 FCC Rcd 25162, 25168 ¶ 14 (2003).

C. *THE COMMISSION MUST CONTINUE TO BE AN ACTIVE FACILITATOR IN DEVELOPMENT OF TECHNOLOGIES UTILIZING THE MMW BANDS, INCLUDING WORKING AT A PACE COMMENSURATE WITH INDUSTRY DEVELOPMENTS.*

To encourage marketplace development, the FCC must continue to play an active role as facilitator in the further development of the technologies utilizing the mmW bands. The FCC should work at a pace *commensurate* with industry developments. Waiting to issue a Notice of Proposed Rulemaking until industry is ready to deploy mmW technologies risks foreclosing opportunities. Consumer demand is growing too fast to have such a reactive approach and its associated delay. At the same time, given the rapid pace of development, the unique nature of the bands and the wide variety of anticipated uses, the FCC should refrain from foreclosing options too soon. Thus, the FCC should continue to employ the TAC, workshops, and the other vehicles available to it to keep abreast of developments and to inform its decision so as to act promptly when opportunities to facilitate new and innovative uses arise.

D. *THE COMMISSION SHOULD CONTINUE TO ENCOURAGE AND PARTICIPATE IN GLOBAL HARMONIZATION.*

In addition, the FCC should continue to encourage global harmonization by expanding its efforts to include the mmW bands.³² International harmonization is crucial to enabling the most efficient deployment of next generation technology. As Commissioner Clyburn recently noted, “[r]egional and global coordination and harmonization are key to getting the greatest possible

³² The goal of the FCC’s *Best Practice for National Spectrum Management* is “to harmonize global spectrum management policies, to the extent practicable, by harmonizing practices among national administrations.” FCC, *Best Practice for National Spectrum Management*, <http://www.fcc.gov/encyclopedia/best-practices-national-spectrum-management> (last visited Jan. 6, 2015). Best Practice #10 is “[h]armonizing, as far as practicable, effective domestic and international spectrum policies....” *Id.*

benefit out of available spectrum.”³³ There are, for example, numerous initiatives underway to develop 5G around the world.³⁴ We can achieve faster, better results by leveraging these initiatives. Therefore, as suggested by the TAC, the United States must work in parallel with the International Telecommunications Union (“ITU”) to identify spectrum in the mmW bands for mobile and other emerging services where necessary, carefully weighing the use of these bands for existing services.³⁵

Specifically, an ITU-R Agenda Item for the WRC-18/19 conference should be developed at the WRC-15 conference that is appropriately tailored. There is currently wide support for an agenda item to identify spectrum for 5G mobile services, but the focus has been on spectrum below 6 GHz.³⁶ The discussion within the ITU should not be limited to terrestrial mobile broadband, as there will be need for spectrum for other services, including backhaul, other point-to-point applications, unlicensed wireless cable replacement, satellite and aerial broadband, and other services that may require or benefit from international harmonization. Therefore, the WRC-18/19 agenda item also should deal with identifying additional spectrum for IMT and other service needs above 6 GHz, taking into account the technical and operational characteristics of these systems, improvements and projected improvements of technologies, and the need for appropriate sharing mechanisms to protect incumbents.

³³ FCC, Remarks of Commissioner Mignon L. Clyburn, 4th Annual Americas Spectrum Management Conference, at 5 (Nov. 13, 2014), available at [http://transition.fcc.gov/Daily - Releases/Daily_Business/2014/db1113/DOC-330471A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db1113/DOC-330471A1.pdf).

³⁴ See, e.g., Slovic at 22-23 (noting 5G initiatives in Europe, Japan, and South Korea); *NOI*, 29 FCC Rcd at 13023-24 ¶ 9.

³⁵ TAC September Summary at 12, Spectrum Frontier Working Group Presentation at Slide 9.

³⁶ WRC-12, Resolution 233, *Studies on frequency-related matters on International Mobile Telecommunications and other terrestrial mobile broadband applications* (Geneva, 2012), http://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000A0011PDFE.pdf.

In addition, to inform further efforts to promote the mmW bands globally and domestically, the FCC should embrace the TAC proposal for a workshop with industry experts on enabling technologies and global harmonization to identify next steps and challenges.³⁷

E. SERVICE RULES AND LICENSING REGIMES SHOULD REFLECT THE BEST USE OF THE MMW BANDS, CONSIDERING THE PHYSICAL CHARACTERISTICS OF THE SPECTRUM AND THE DEVELOPING TECHNOLOGY.

Domestically, service rules and licensing regimes should reflect the best use of the mmW bands and the developing technology. As identified by the TAC, the physics of the mmW bands present “ample technical challenges.”³⁸ For example, both heavy rain and foliage can significantly reduce signal penetration and strength.³⁹ As one of the components of the next generation of mobile broadband, the mmW spectrum can serve a supplemental role for service providers in urban areas, and it may have a role to play in service models that reach less densely populated areas as well.⁴⁰ To the extent mmW spectrum is licensed, build-out or other performance requirements should reflect the strengths and weaknesses of these spectrum bands. That is, the realities of the band should dictate both the geographic scope of licenses and performance requirements. The shorter waves in the mmW bands require a much greater density of base stations – density that would be present in urban areas – than mobile broadband at the lower spectrum bands. Reliance on the marketplace and physics, rather than ungrounded regulatory requirements, will lead to the best uses of the available spectrum.

³⁷ *Id.*

³⁸ FCC TAC, Summary of Meeting at 60, Spectrum Frontier Working Group Presentation at Slide 5 (Dec. 9, 2013), available at <http://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting-12913/TACMeetingSummary12-9-13.pdf>.

³⁹ *Id.* at 61, Spectrum Frontier Working Group Presentation at Slide 6.

⁴⁰ See *NOI*, 29 FCC Rcd at 13024-25 ¶ 11.

F. ANY NEW SPECTRUM ALLOCATIONS AND SERVICE RULES SHOULD BE CRAFTED TO MINIMIZE INTERFERENCE WHILE MAXIMIZING UTILITY.

The Commission should accommodate the entire range of possible uses for the mmW bands, providing a variety of licensed, unlicensed, and hybrid approaches. As identified in the recent Incentive Auction, 3.5 GHz, and 5 GHz proceedings,⁴¹ licensed, unlicensed, and hybrid approaches can all encourage innovation and investment when paired with the appropriate rules. CEA supports the principles underlying the innovative real-time, database driven sharing regimes being proposed in the 3.5 GHz band. CEA's members are participating in that proceeding to do the work needed to create what Chairman Wheeler calls the "innovation band."⁴² It is important to remember, though, that sharing technology is still nascent. CEA cautions that anything more than basic sharing for the mmW bands requires more experience by the FCC and industry.

⁴¹ See generally *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*, Notice of Proposed Rulemaking, 29 FCC Rcd 12248 (2014); *3.5 FNPRM*, 29 FCC Rcd 4273; *5 GHz Report and Order*, 29 FCC Rcd 4127.

⁴² *3.5 FNPRM*, 29 FCC Rcd 4273, 4354 (Statement of Chairman Tom Wheeler).

CONCLUSION

CEA's members are working diligently to ensure that the ever-increasing consumer demand for high-speed wireless connectivity is met. The mmW spectrum holds promise as a part of the solution to meeting that demand, and CEA looks forward to working with the Commission to fully evaluate and take advantage of the opportunities presented by the mmW bands.

Respectfully submitted,

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