

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 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
)	

COMMENTS OF CTIA – THE WIRELESS ASSOCIATION®

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COMMENTS OF CTIA – THE WIRELESS ASSOCIATION®

I. INTRODUCTION AND SUMMARY

CTIA – The Wireless Association® (“CTIA”) respectfully submits these comments in response to the Commission’s Notice of Inquiry (“*NOI*”), which seeks comment on the suitability of frequency bands above 24 GHz for mobile services. The Commission’s desire to examine the use of higher frequencies, sometimes referred to as millimeter wave (mmW) bands, for mobile use arises in the context of efforts to begin developing technical standards for Fifth Generation (5G) mobile services.¹

¹ *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, Amendment of the Commission’s Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands, Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz Bands, Petition For Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band, Notice of Inquiry, FCC 14-154 (Oct. 17, 2014) (“NOI”).*

CTIA and its members applaud the Commission for launching this proceeding to investigate the potential opportunities for using mmW bands to accelerate the deployment of novel 5G services. As explained in further detail below, CTIA believes that the Commission should:

- Use an exclusive use licensing framework as much as practicable. Exclusive use licensing has proven to attract investment in mobile broadband while also sparking wide-spread innovation. Where spectrum is not easily used for mobile wireless services, it could be made available on an unlicensed basis.
- Adopt out-of-band emission (“OOBE”) rules that are technology neutral and do not penalize carriers for using wider bandwidth technologies. Establishing technology neutral rules will encourage a wide variety of services and technologies throughout the spectrum.

The demand for wireless broadband is soaring to new heights as smartphone subscriptions increase and new data-rich technologies are unveiled. The cornerstone to propelling wireless growth and innovation into the next generation of services will be clearing additional spectrum for mobile services. Spectrum above 24 GHz offers an important opportunity to help complement wireless services by increasing capacity. Spectrum below 3 GHz, however, will still be critical to providing consumers with adequate network coverage. Thus, while CTIA strongly supports the Commission’s efforts to allocate additional high frequency spectrum for mobile broadband services, the Commission should not lose sight of the paramount goal of freeing much-needed additional spectrum below 3 GHz for mobile services.

By taking the steps noted above, the Commission can maximize the possible uses of spectrum above 24 GHz and encourage greater productivity and efficiency in spectrum use. Moreover, a carefully crafted regulatory framework characterized by the proposals advanced by CTIA in these comments will help to quickly infuse wireless networks with additional capacity while also promoting the rapid deployment of 5G services for consumers.

As the record in this proceeding continues to develop, CTIA and its members look forward to working with the Commission and interested stakeholders to craft a regulatory framework that enables intensive use of spectrum above 24 GHz for “innovative and flexible commercial uses.”²

II. CTIA SUPPORTS COMMISSION EFFORTS TO ALLOCATE ADDITIONAL SPECTRUM FOR MOBILE BROADBAND SERVICES

As the Commission has observed, “usage of [America’s] wireless networks is skyrocketing, dramatically increasing demands on both licensed and unlicensed spectrum—the invisible infrastructure on which all wireless networks depend.”³ By any metric, wireless broadband usage in the United States continues to explode in popularity, causing a surge in wireless broadband data demand. Smartphone subscriptions serve as a primary driver of mobile data traffic growth, and studies suggest that the current trend of explosive data demand brought on by the rise in smartphones is unlikely to slow. In the United States, 172 million Americans reported owning a smartphone as of June 2014, with an additional 93 million Americans owning a tablet.⁴ Smartphone subscriptions globally reached 2.7 billion in 2014, with an expected

² *Id.* ¶ 15.

³ *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Notice of Proposed Rulemaking, FCC 12-118, at ¶ 1 (Sept. 28, 2012) (“Incentive Auction NPRM”).

⁴ comScore, *The State of the Mobile Industry* (Sept. 2014), available at <https://www.comscore.com/Insights/Presentations-and-Whitepapers/2014/The-State-of-the-Mobile-Industry>. The number of active wireless-connected tablets is also steadily growing, with tablet connections in the U.S. growing 86 percent between 2010 and 2013. CTIA – The Wireless Association®, *Wireless Industry Survey*, available at http://www.ctia.org/docs/default-source/Facts-Stats/ctia_survey_ye_2013_graphics-final.pdf?sfvrsn=2. The number of tablet users is expected to surpass 1 billion in 2015. See eMarketer, *Tablet Users to Surpass 1 Billion Worldwide in 2014* (Jan. 2015), available at <http://www.emarketer.com/Article/Tablet-Users-Surpass-1-Billion-Worldwide-2015/1011806?ecid=PR1000>

annual growth rate of 15 percent over the next five years.⁵ Further, Ericsson predicts that smartphone subscriptions will hit 6.1 billion by 2020.⁶ The trend is simple: consumers are uniformly choosing mobile communications devices capable of supporting increasingly data-rich applications.

In addition to the growth in smartphone subscriptions, new wireless innovations on the horizon offer endless opportunities, but often require extra bandwidth capacity. The Internet of Things (IoT), for example, offers the potential to transform our daily lives by making a dynamic ecosystem of connected devices possible.⁷ With the IoT, interconnected devices promise to revolutionize everything from energy efficiency, healthcare, and industrial operations, to everyday personal tasks. Although these types of innovative developments present a new and exciting frontier of wireless technology, they will place additional strains on wireless networks. The potential for IoT applications is still growing, but will be limited by wireless signal strength and bandwidth capacity.

The proliferation of mobile broadband devices and development of revolutionary wireless technologies have brought a sharp increase in mobile broadband traffic and consumer data demand. Every day, Americans already are using more than 8.8 billion MB of data.⁸ All signs

⁵ Ericsson, Ericsson Mobility Report: On the Pulse of the Networked Society at 6 (Nov. 2014) (“Ericsson Mobility Report”), *available at* <http://www.ericsson.com/res/docs/2014/ericsson-mobility-report-november-2014.pdf>

⁶ *Id.*

⁷ See CTIA – The Wireless Association®, Mobile Cybersecurity and the Internet of Things, at 3-6 (2013), *available at* <http://www.ctia.org/docs/default-source/default-document-library/ctia-iot-white-paper.pdf>

⁸ CTIA – The Wireless Association®, Facts & Infographics (Dec. 9, 2014), *available at* <http://www.ctia.org/resource-library/facts-and-infographics/archive/infographic-americans'-data-usage-equals-247-trips-around-the-world-every-minute>

point to this growth continuing unabated.⁹ Indeed, projections indicate that the steady rise in smartphone subscriptions will “result in an 8-fold increase in [mobile data] traffic by the end of 2020.”¹⁰ A recent Cisco report confirms that the continued expansion of consumer data demands is not a passing phenomenon. According to the report, mobile data traffic grew 81 percent in 2013 alone.¹¹ Moreover, worldwide mobile data traffic is expected to reach 15.9 exabytes per month by 2018—a 61 percent increase from data demands in 2013.¹² Likewise, Nokia has released projections showing mobile data volume growing up to 1000-fold by 2020 as a result of the sheer number of subscribers and the amount of data they use.¹³

With the surge in wireless broadband data demand, it is clear that “[t]he United States is facing a critical need for more terrestrial broadband spectrum.”¹⁴ To this end, the President has

⁹ See Qualcomm, Rising to Meet the 1000x Mobile Data Challenge at 2 (2012), available at <https://www.qualcomm.com/media/documents/files/rising-to-meet-the-1000x-mobile-data-challenge.pdf> (explaining that mobile data traffic is exploding and industry is preparing for a 1000x increase).

¹⁰ Ericsson Mobility Report at 12; *see also id.* at 11 (explaining that data traffic grew around 60 percent over the past year).

¹¹ Cisco, Cisco Visual Networking Index: Forecast and Methodology: 2013-2018 at 3 (Jun. 2014), available at http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.pdf.

¹² *Id.* Cisco’s projection uses traffic on licensed spectrum alone, taking into account offload of other wireless traffic onto unlicensed spectrum. Accordingly, Cisco’s projection reflects the pressure placed solely on licensed spectrum. *See id.* at 5 (“The portion of mobile data traffic that has migrated from the fixed network is subtracted from the fixed forecast, and the amount of mobile data traffic offloaded onto the fixed network through dual-mode devices and femtocells is added back to the fixed forecast.”).

¹³ Nokia Solutions and Networks, How Can Mobile Networks Deliver 1000 Times More Capacity By 2020? (Oct. 1, 2013), available at <http://networks.nokia.com/news-events/insight-newsletter/articles/how-can-mobile-networks-deliver-1000-times-more-capacity-by-2020>

¹⁴ Comments of Alcatel-Lucent, GN Docket No. 12-268, at 5 (Jan. 25, 2013) (“Alcatel-Lucent Incentive Auction Comments”).

directed the Commission, together with NTIA, to make clearing additional spectrum for commercial mobile wireless service a top priority.¹⁵ Faced with an imminent consumer need for access to additional mobile spectrum, CTIA believes that the Commission should continue to take a leadership role in identifying ways to clear spectrum to support wireless broadband data. Left unaddressed, available wireless spectrum will be inadequate to meet escalating consumer demands.¹⁶

As the Commission has recognized, frequency bands above 24 GHz are potentially suitable for advanced mobile services. Traditionally, the prevailing view has been that mobile services in higher frequency bands—such as bands above 24 GHz—were infeasible because radio waves at such frequencies travel in straight lines and could only provide line-of-sight service.¹⁷ Recently, however, technology advances are paving the way for the use of spectrum above 24 GHz as a complement to spectrum used for mobile broadband. Some of CTIA’s members have been able to use spectrum bands above 24 GHz for important backhaul purposes. Further, developments in antenna technology have been instrumental in facilitating the movement towards the use of higher frequency bands for advanced mobile services. For example, the use of Multiple-Input Multiple-Output (“MIMO”) antenna schemes and adaptive beam-forming may help overcome “some of the challenging propagation characteristics of mmW

¹⁵ See The White House, Presidential Memorandum: Unleashing the Wireless Broadband Revolution, Memorandum for Heads of Executive Departments and Agencies (Jun. 28, 2010), available at <http://www.whitehouse.gov/the-press-office/presidential-memorandum-unleashing-wireless-broadband-revolution>.

¹⁶ See Theodore S. Rappaport et al., *Millimeter Wave Mobile Communications for 5G Cellular: It Will Work!*, at 1 (May 29, 2013), available at <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6515173> (“The rapid increase of mobile data growth and the use of smartphones are creating unprecedented challenges for wireless service providers to overcome a global bandwidth shortage”).

¹⁷ *NOI* ¶ 5.

bands and could increase efficiency, allow for higher data rates, and provide reasonable coverage for mobile broadband services.”¹⁸ Indeed, studies suggest that these innovative antenna technologies may help leverage frequencies above 24 GHz for cellular services.¹⁹

Although recent technological innovations have increased the suitability of spectrum bands above 24 GHz for mobile services, putting these frequencies to use for mobile services will still pose significant challenges. Fundamentally, “radio signals in bands above 24 GHz propagate over short distances, and the atmospheric absorption of those bands further restricts coverage.”²⁰ With these characteristics, bands above 24 GHz will not be capable of supporting a seamless wireless experience for consumers alone. Instead, spectrum bands above 24 GHz are best suited to serve as supplementary channels for delivering ultra-high data rates and expanding capacity in densely populated areas.

CTIA agrees with the Commission that this proceeding should not serve as “a substitute” for “efforts to make lower frequency spectrum available for mobile services.”²¹ For consumers to have a seamless 5G mobile experience, networks will need access to frequency bands above 24 GHz *and* frequency bands below 3 GHz. Frequency bands above 24 GHz will help improve capacity in densely populated areas experiencing network congestion. However, making spectrum above 24 GHz available for mobile use will not replace the growing need for additional spectrum below 3 GHz. Indeed, spectrum below 3 GHz will still be necessary to provide

¹⁸ *Id.* ¶ 18.

¹⁹ See, e.g., Wonil Roh et al., *Millimeter-Wave Beamforming As An Enabling Technology For 5G Cellular Communications: Theoretical Feasibility and Prototype Results*, IEEE Communications Magazine, at 106-107 (Feb. 2014), available at http://ehm.kocaeli.edu.tr/dersnotlari_data/saldirmaz/GSM_dersi/Proje/5G/06736750.pdf

²⁰ *NOI* ¶ 35.

²¹ *Id.* ¶ 2.

consumers with network coverage. To this end, a broad coalition of mobile ecosystem leaders have called for additional spectrum below 3 GHz to help sustain the United States' position as a global leader in wireless.²² To be sure, freeing up spectrum below 3 GHz will be a critical component of supporting continued wireless growth and advancing the deployment of 5G services.

III. TO ENSURE THAT SPECTRUM IS PUT TO ITS HIGHEST AND BEST USE, THE COMMISSION SHOULD MAKE BANDS ABOVE 24 GHz AVAILABLE ON A LICENSED, EXCLUSIVE USE BASIS

Ensuring the availability of exclusive, licensed use spectrum must remain a key focus of the Commission's spectrum policy. For the frequency bands above 24 GHz to flourish, the Commission must establish a stable regulatory environment that will promote investment and deployment. The Commission has recognized the value that exclusive, licensed spectrum bands offer, noting that such bands are often the most intensively used, serving as a "runway" for the launch of innovative services.²³ Congress has also acknowledged the value of exclusive use licensing, directing NTIA in reallocating spectrum to "give priority to options involving reallocation of the band for *exclusive non-Federal use*."²⁴ Creating an environment with certainty, predictability, and transparency through exclusive use licensing will be key to

²² See Letter to the Honorable Fred Upton, Chairman, House Committee on Energy & Commerce, et al., from CTIA – The Wireless Association®, 4G Americas, Consumer Electronics Association, High-Tech Spectrum Coalition, Information Technology Council, Telecommunications Industry Association, and Wireless Broadband Coalition, at 2 (Sept. 12, 2012), *available at* <http://www.4gamericas.org/documents/120912%20Mulit%20Assoc%20Call%20for%20More%200Licensed%20Spectruml.pdf> ("More cleared, paired, internationally-harmonized spectrum allocations below 3 GHz are needed and needed soon.").

²³ Federal Communications Commission, CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN, at 84 (Mar. 16, 2010) ("NBP").

²⁴ 47 U.S.C. § 923(j) (emphasis added).

promoting investment and fostering efficiency throughout the higher frequency bands. Without the inherent certainty in licensees' spectrum rights that comes with exclusive use licensing, investment in the new bands of spectrum may be hindered and innovation may ultimately be stifled.²⁵ In short, spectrum sharing is not a substitute for cleared spectrum that is licensed on an exclusive use basis.

With these principles in mind, CTIA believes that the Commission should seek to use exclusive use licensing for bands above 24 GHz as much as practicable. Exclusive use licensing “strike[s] the right balance between the benefits of competition, on the one hand, and the efficiencies of scale and scope that justify investments of capital and expertise.”²⁶ Moreover, such a framework would “assign rights in a way that maximizes the utility of the spectrum, minimizes the potential for interference among co- and adjacent-channel users, and allows flexibility for licensees to meet the needs of their end users.”²⁷ Exclusive use licensing also will result in maximizing much-needed upfront investment and further research and development (“R&D”) by commercial operators, manufacturers, developers, and others. Further encouraging this additional R&D will increase the likelihood of realizing the full innovation potential of these bands for 5G mobile broadband services. Put simply, exclusive use licensing is widely recognized as the highest and best use of spectrum and is instrumental in attracting investment in

²⁵ See Reply Comments of AT&T, GN Docket No. 12-354, at 13 (Aug. 15, 2014) (“AT&T 3.5 GHz Reply Comments”); Comments of Ericsson, GN Docket No. 12-354, at 7 (Jul. 14, 2014) (extolling the benefits of “stable, reserved frequency assignments” to promoting wireless broadband development).

²⁶ *NOI* ¶ 88.

²⁷ *Id.* ¶ 89.

mobile broadband.²⁸ Although exclusive use licensing has proven to be the best way to ensure that spectrum is put to its most efficient use, as new technologies unfold, there may be complementary roles for other licensing frameworks as well. Unlicensed spectrum also has an important role to play in the wireless ecosystem, and where spectrum is not easily used for mobile wireless services, it could be made available on an unlicensed basis. To this end, CTIA looks forward to working closely with the Commission to assess different proposals and think creatively about how to approach licensing in spectrum bands above 24 GHz as the record in this proceeding develops.

IV. PROPOSALS FOR OUT-OF-BAND EMISSION RULES SHOULD NOT PENALIZE TECHNOLOGIES USING LARGE BANDWIDTHS

Developing mobile services using bands above 24 GHz will undoubtedly raise numerous technical questions. CTIA and its members stand ready to help the Commission address these issues as the record in this proceeding continues to develop. At the outset, however, CTIA notes that the Commission should adopt technical rules that are technology neutral. In particular, the Commission should not adopt out-of-band emission (“OOBE”) rules that penalize technologies that utilize larger bandwidths.

In recent years, a number of parties have noted that the Commission’s current OOBE rules “inadvertently discriminate against broadband systems that use wider bandwidths.”²⁹ For

²⁸ See, e.g., Comments of AT&T, GN Docket No. 12-354, at 8-9 (Jul. 14, 2014) (“AT&T 2014 3.5 GHz Comments”); Letter from CTIA – The Wireless Association® to Thomas E. Wheeler, Chairman, Federal Communications Commission, et al., GN Docket No. 09-51; WT Docket No. 13-135, at 24 (Nov. 13, 2013).

²⁹ Reply Comments of Ericsson, Inc., WT Docket No. 10-271, at 3 (Feb. 22, 2011) (“Ericsson Biennial Review Reply Comments”); see also *In the Matter of Amendment of the Commission’s Rules Governing Radiated Power Limits in the Cellular Radio Service Frequency Bands*, Petition for Expedited Rulemaking and Request for Waiver of AT&T Inc., RM-11660, at 10 (Feb. 29, 2012); Comments of CTIA – The Wireless Association®, WT Docket No. 12-357, at 8 (Feb. 6, 2013) (“CTIA AWS H Block Comments”) (suggesting that, in light of technological

example, the Commission’s rules base attenuation requirements on the designated bandwidth of the carrier.³⁰ As a result, wider band technologies must satisfy more stringent OOB requirements than technologies that use narrower bandwidths. As Ericsson has detailed, “[t]here is no inherent reason for requiring licensees employing broader channel-width to have significantly greater attenuation of OOB in the same adjacent 1 MHz of spectrum.”³¹ Indeed, the Commission’s OOB rules should be flexible enough to encourage innovation and “accommodate as wide a variety of services as possible.”³²

Adopting OOB rules that do not unfairly penalize carriers using larger bandwidths is particularly important in the context of mmW bands, where the Commission is contemplating service delivered “through multiple, widely-spaced frequency bands.”³³ Technology continues to evolve toward wider bandwidth utilization, such as Long Term Evolution (“LTE”) because of performance and efficiency advantages.³⁴ As we stand ready to launch the movement toward novel 5G services, the Commission should ensure that licensees have the flexibility to experiment with wider-bandwidth technologies without penalty. The Commission’s rules should seek to foster—not frustrate—flexible, innovative uses of the spectrum.

advancements, additional testing must be done to determine whether out-of-band emissions limits should be updated).

³⁰ See 47 C.F.R. 27.53(h)(1); (h)(3).

³¹ Ericsson Biennial Review Reply Comments at 6.

³² *NOI* ¶ 15.

³³ *Id.* ¶ 7.

³⁴ See Ericsson Biennial Review Reply Comments at 3.

V. CONCLUSION

CTIA and its members appreciate the Commission's forward-looking vision in launching this proceeding to investigate the suitability of new bands of spectrum for mobile broadband use. While this proceeding is another step in a series of commendable efforts to make additional spectrum available for mobile broadband, CTIA reminds the Commission that spectrum above 24 GHz will not replace the need to identify and clear spectrum below 3 GHz for exclusive use licensing. To ensure that the spectrum above 24 GHz reaches its full potential, CTIA submits that the Commission should seek to use exclusive use licensing as much as practicable and avoid adopting OOB rules that penalize technologies that utilize larger bandwidths.

Further, by adopting OOB rules that are technology-neutral, the Commission will help encourage innovative uses of the spectrum. CTIA and its members look forward to working closely with the Commission and interested stakeholders throughout this proceeding to ensure that the spectrum bands above 24 GHz are put to their highest and best use.

Respectfully submitted,

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