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January 16, 2015

BY ELECTRONIC FILING

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Re: Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, GN Docket No. 14-177; Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band, RM-11664

Dear Ms. Dortch:

The National Cable & Telecommunications Association (NCTA) hereby submits a revised version of its January 15, 2015 comments filed in the above referenced proceedings. The corrected version, attached to this document, now contains a signature for the filer as required by 47 C.F.R. § 1.52.

Respectfully submitted,

/s/ Rick Chessen

Rick Chessen

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
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	RM-11664

COMMENTS OF THE NATIONAL CABLE & TELECOMMUNICATIONS ASSOCIATION

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COMMENTS OF THE
NATIONAL CABLE & TELECOMMUNICATIONS ASSOCIATION

I. INTRODUCTION AND SUMMARY.

The National Cable & Telecommunications Association (NCTA) welcomes the Commission's notice of inquiry on the use of frequencies above 24 GHz for advanced mobile services.[1] Called the "millimeter wave" bands, these frequencies have long been used for limited line-of-sight operations with limited coverage. As the *NOI* notes, new research suggests that these bands can now be much more intensively used to help meet the growing demand for mobile services.

NCTA member companies have invested heavily to build some of the largest wireless broadband networks in the country. Together, our companies operate nearly 10 million indoor and outdoor access points across the United States. As consumer demand for wireless broadband

[1] *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services; Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band*, GN Docket No. 14-177, RM-11664, Notice of Inquiry, 29 FCC Rcd 13020 (2014) (*NOI*).

continues to increase, however, the Commission and network operators will have to work together to make better use of our spectrum resources, especially through Commission action to improve efficiency, permit sharing, and allow more regulatory flexibility.

The millimeter wave bands have the potential to support high capacity and high data rates with very low latency, and could serve as an important complement to existing, lower-frequency licensed and unlicensed bands. Well-designed Commission rules that permit the use of these bands for licensed and unlicensed wireless broadband services therefore hold the promise of improving efficiency in historically underutilized frequencies.

The development of robust, spectrum-efficient networks in these bands will require not only creative engineering and technology solutions, but also innovative licensing approaches. In many cases, unlicensed or creative hybrid licensing frameworks may result in the highest and best use of such bands because unlicensed technologies can permit sharing in situations where licensed technologies cannot. Using politeness protocols and a growing toolbox of interference mitigation techniques like antenna-design constraints, exclusion zones, and power limitations, unlicensed users already successfully and efficiently share a wide variety of frequencies, while providing protection for incumbent operations. The Commission should therefore propose permitting unlicensed or hybrid access on a shared basis wherever possible in future proceedings concerning the use of millimeter wave bands, to both protect incumbent operations and provide access for unlicensed consumer services.

Exploring unlicensed use in these bands will not reduce the pressing need for near-term unlicensed access to lower-frequency bands—most importantly the 5 GHz bands—because of the limitations of the millimeter wave bands, and the time needed to undertake these

proceedings. But NCTA commends the Commission for beginning work now to build the foundation for the next generation of wireless broadband through this *NOI*.

II. THE COMMISSION SHOULD EXPLICITLY PROPOSE TO PERMIT UNLICENSED OPERATIONS IN FUTURE PROCEEDINGS CONCERNING INDIVIDUAL BANDS ABOVE 24 GHZ.

In the *NOI*, the Commission seeks comment on what types of licensing mechanisms will be most appropriate for mobile services above 24 GHz.[2] In particular, it asks whether the Commission should auction exclusive spectrum rights, use non-exclusive licensing with frequency coordination, authorize Part 15 unlicensed operations, or adopt a hybrid licensed-unlicensed framework.[3] A balanced spectrum policy approach that uses a mix of these options for different frequency bands will yield the most overall utility. However, unlicensed and hybrid licensing approaches would be particularly well-suited to at least some of the spectrum bands identified in the *NOI*.

The Commission notes that the licensing system ultimately adopted "must 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."[4] Unlicensed technologies maximize efficient spectrum use and can also protect incumbents from harmful interference. In bands unencumbered by incumbent operations, unlicensed users share intensely and efficiently among themselves using politeness protocols. Unlicensed users also operate alongside many types of incumbents while protecting them from harmful interference, including by transmitting where and when other operators do not.

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[2] *Id.* at 13045-48, ¶¶ 88-101.

[3] *Id.*

[4] *Id.* at 13045, ¶ 89.

Moreover, unlicensed bands offer far lower barriers to entry than other licensing approaches, encouraging innovation and competition. In the bands above 24 GHz new wireless broadband technologies are still developing. Authority to operate unlicensed technologies will ensure that a far larger and more diverse set of innovators can harness these frequencies to experiment and design efficient and innovative ways to use this challenging environment than would a narrow set of traditional licensees.

A. Sharing Can Increase Efficiency and Intensity of Use While Protecting Incumbents.

As the Commission,[5] Congress,[6] and the White House[7] have recognized, sharing-focused spectrum policy—including enabling more unlicensed spectrum use—is key to maximizing the efficient use of this scarce national resource. This is because unlicensed technologies use spectrum very efficiently. Unlicensed operations are designed to be tolerant of more interference noise than many other technologies, and sophisticated listen-before-talk communications

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[5] *Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, ET Docket Nos. 04-186 and 02-380, Second Memorandum Opinion and Order, 25 FCC Rcd 18661, 18662, ¶ 1 (2010) ("This type of 'opportunistic use' of spectrum has great potential for enabling access to other spectrum bands and improving spectrum efficiency."); Federal Communications Commission, *Connecting America: The National Broadband Plan*, at XII (2010), *available at* http://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf (recommending that the U.S. Government "[e]xpand opportunities for innovative spectrum access models by creating new avenues for opportunistic and unlicensed use of spectrum and increasing research into new spectrum technologies").

[6] *Cf.* Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat. 156, at Sections 6406 (providing for expanded unlicensed use of the 5 GHz band), 6407 (providing for unlicensed use of the 600 MHz guard bands) (Feb. 22, 2012).

[7] *Expanding America's Leadership in Wireless Innovation*, Memorandum for the Heads of Executive Departments and Agencies, 78 Fed. Reg. 37,431, 37,434 (June 14, 2013); President's Council of Advisors on Science and Technology, *Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth* at 2-3, 78 (2012), *available at* http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf.

protocols allow unlicensed users to operate where and when other spectrum users do not. Because unlicensed networks are designed to share with other unlicensed users and licensees, they are also effective in protecting incumbent operations. These characteristics give the Commission a powerful tool when faced with frequencies that are not well suited to an auction because of channel size, adjacent-band neighbors, or needed power limits—or an underutilized band that is used by hard-to-relocate incumbents.

Where the Commission permits unlicensed operations, any user of certified equipment may transmit, subject to specific technical rules. Because users must assume that they will share every channel, the protocols for unlicensed equipment—Wi-Fi, for instance—have sharing capabilities built into their DNA. Furthermore, over time, unlicensed innovators have devised powerful methods of sharing spectrum not only amongst themselves, but with licensed primary users. For instance, in the 5 GHz U-NII-1 band, unlicensed users successfully share spectrum with Mobile Satellite Service (MSS) feeder link operations using an antenna-design restriction. Outdoor unlicensed devices operating in this band use a special antenna pattern that requires lower power operations above a certain elevation angle in order to protect MSS transmissions between Earth and the satellite.[8]

The Commission asks whether it can authorize mobile use while simultaneously protecting MSS feeder links in the 29.1-29.25 MHz band,[9] radioastronomy in the 42 GHz band,[10]

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[8] 47 C.F.R. § 15.407(a)(1)(i). To share with radar in the 5 GHz U-NII-2 bands, unlicensed devices use Dynamic Frequency Selection (DFS), a mitigation technique that requires unlicensed users to check for radar-occupied channels before transmitting, to listen for government radar signals while transmitting, and to vacate a channel to make way for radar when necessary. *Id.* § 15.407(h)(2).

[9] *NOI*, 29 FCC Rcd. at 13037, ¶ 55.

[10] *Id.* at 13041, ¶ 69.

and a variety of federal and non-federal, fixed, satellite, and radioastronomy operations in the 70/80 GHz bands.[11] An unlicensed approach in these bands would greatly facilitate sharing with these incumbents, and the Commission should explore permitting Wi-Fi in these bands where it can do so without causing harmful interference to incumbents.

The Commission has also inquired whether it should allow secondary unlicensed operations in bands that it allocates to licensed mobile services.[12] Not only can mitigation techniques used by unlicensed innovators protect licensed mobile services, the unique properties of millimeter wave spectrum also make these bands prime candidates for secondary unlicensed operations. Radio signals in millimeter wave spectrum have limited propagation.[13] While this makes for significant technical challenges in achieving the coverage necessary for the provision of wireless broadband over large geographic areas, it also means that the possibilities for spectrum re-use will be greater than in lower frequencies. As the Commission notes, network operators—including licensed users—will likely use millimeter wave frequencies to strategically deploy small cells that will complement lower-frequency operations.[14] The range of these small cells will necessarily be somewhat limited because of propagation and atmospheric absorption, likely leaving vast swaths of territory unserved by licensed operations. For this reason, a "keep-what-you-use" approach to licensing that permits unlicensed operations outside licensees'

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[11] *Id.* at 13043-44, ¶ 82.

[12] *Id.* at 13046, 13048, ¶¶ 95, 101.

[13] *Id.* at 13031, ¶ 35.

[14] *Id.* at 13032-3, ¶ 41; *see also* Letter from Brian Hendricks, Head of Technology Policy and Government Relations, Nokia, to Marlene H. Dortch, Secretary, Federal Communications Commission, GN Docket No. 14-177, Attachment *Spectrum Developments in Europe* at 3, Attachment *5th Generation (5G) of Communication Networks* at 2 (filed Dec. 12, 2014).

coverage areas is well-suited to the millimeter wave bands.[15] The Commission should therefore not only designate some bands above 24 GHz for unlicensed use, it should also always consider whether it can permit secondary unlicensed operations in bands allocated to licensed providers of advanced mobile services.

B. Access to Unlicensed Bands Above 24 GHz Governed by Reasonable Technical Rules Would Facilitate Future Development of Cable Wi-Fi.

NCTA's members have deployed millions of indoor and outdoor Wi-Fi hotspots that allow their customers to stay connected not only in their homes and offices, but in public spaces, and while travelling. Consumer demand for Wi-Fi access continues to surge, and cable network operators have seen enormous growth in the use of these new and innovative networks. Bands above 24 GHz present intriguing opportunities for unlicensed wireless networking, including for easing congestion in existing unlicensed bands, and NCTA and its members are very interested in exploring the use of millimeter wave spectrum for cable Wi-Fi.

Cable Wi-Fi networks have experienced very strong growth as more and more cable customers use this unique service to stay connected. NCTA's members are responding to this increased demand with further investment in their Wi-Fi network deployments. Cablevision's Optimum Wi-Fi network now offers more than one million Wi-Fi hotspots.[16] Comcast's XFinity WiFi network reached more than eight million hotspots at the end of 2014.[17] Time Warner Cable (TWC) has more than doubled its number of Wi-Fi access points from 30,000 to 70,000 in

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[15] *See NOI*, 29 FCC Rcd at 13046, ¶ 95.

[16] Cablevision, *Optimum: Find Wi-Fi Hotspots*, https://www.optimum.net/internet/hotspots/ (last visited Jan. 5, 2015).

[17] Comcast, *Comcast Voices: CES Shows Us How to Live a Connected Life* (Jan. 8, 2015), http://corporate.comcast.com/comcast-voices/ces-2015.

the last year, while Bright House and Cox each offer access to more than 250,000.[18] These numbers reflect enormous growth in just the three years since cable operators first began to offer this service. For example, in the fourth quarter of 2014, Cablevision's Optimum Wi-Fi had approximately 1 billion customer sessions. More than one million Optimum customers use Wi-Fi each month, using an average of more than 5 gigabytes of data each. Similarly, at the end of 2014, TWC Wi-Fi surpassed 500,000 monthly users, initiating over 25 million Wi-Fi sessions each month while transmitting more than 345 terabytes of data. In 2014, Comcast Xfinity WiFi customers initiated 125 million Wi-Fi sessions each month on average, transmitting more than 12,000 terabytes of data (which is approximately equal to streaming 5 million HD movies every month). In 2014, Comcast saw a 700 percent uptick in Xfinity WiFi customer sessions over 2013.

Cable Wi-Fi is not the only unlicensed technology experiencing rapid expansion. Cisco predicts that globally, Wi-Fi traffic will grow three-fold from 2013 to 2018, and that 60.8 percent of all Internet traffic will travel over Wi-Fi in 2018.[19] Unlicensed spectrum bands in the United States must not only support this enormous growth in Wi-Fi traffic, but must also meet growing demand for Bluetooth (including for use in most wearable wireless devices),[20] machine-to-

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[18] Bright House Networks, *Bright House Networks WiFi: Internet that Goes Where You Go*, http://brighthouse.com/shop/internet/wifi.html (last visited Jan. 5, 2015); Cox Communications, *CableWiFi FAQs: What Is CableWiFi?*, http://www.cox.com/residential/internet/wifi-hotspots.cox (last visited Jan. 5, 2015).

[19] Cisco, *Visual Networking Index Global – Network Connections*, *available at* http://www.cisco.com/web/solutions/sp/vni/vni_forecast_highlights/index.html (last visited Jan. 15, 2015) (follow link and select "Network Connections").

[20] Dave Bursky, *Wearable Technologies Meet Bluetooth Low Energy*, SYSTEMS DESIGN ENGINEERING COMMUNITY (Apr. 25, 2014), http://chipdesignmag.com/sld/blog/2014/04/25/wearable-technologies-meet-bluetooth-low-energy/.

machine communications, RFID, and other technologies. As a result of this explosive growth, congestion in the existing unlicensed bands, particularly 2.4 GHz, is already causing spectrum exhaustion in some high-traffic areas, reducing Wi-Fi performance for consumers.[21]

High-frequency unlicensed spectrum could play an important future role in easing Wi-Fi network congestion and meeting skyrocketing consumer demand. NCTA envisions that Wi-Fi network operators could use bands above 24 GHz to offload some of the traffic in the core 2.4 GHz and 5 GHz bands to these high-throughput, high-capacity frequencies. As the Commission notes in the *NOI*, technology in the millimeter wave bands promises very high throughput and capacity that could support a whole host of devices, even in high-traffic urban areas, stadiums, and other event venues.[22] Access to unlicensed spectrum above 24 GHz therefore has the potential to help address unlicensed congestion and facilitate the expansion of cable Wi-Fi networks, while bringing millimeter-wave technology to more consumers.

C. Unlicensed Access to Frequencies Above 24 GHz Will Foster New Innovations with Attendant Economic Benefits.

Not only will unlicensed bands above 24 GHz support expanded cable Wi-Fi networks, they will also encourage the development of new and innovative unlicensed technologies. Unlicensed bands are already home to technologies that generate billions of dollars every year for the U.S. economy. The Commission should designate an appropriate amount of spectrum above 24 GHz for unlicensed use to ensure that unlicensed network operators and innovators have access to the next frontier of wireless networking. With access to additional spectrum, unlicensed technologies can continue to produce these enormous economic benefits for the

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[21] Rob Alderfer, *WiFi Spectrum: Exhaust Looms*, CABLELABS at 11-12, (May 2013) (included as Attachment A to NCTA's comments in ET Docket No. 13-49, filed May 28, 2013).

[22] *NOI*, 29 FCC Rcd at 13023, 13024, ¶¶ 7, 10.

country. But without a long-term plan for how to improve unlicensed spectrum resources, investors and innovators will not have the spectrum resources to maintain Wi-Fi's contribution to the economy.

The Commission's decision to designate frequencies for unlicensed use has led to great leaps in innovation and attendant economic benefits. The growth of the unlicensed economy has been astonishing, and all forecasts point to rapid expansion in the next several years, assuming access to adequate spectrum. A recent study by Raul Katz concludes that in 2013, unlicensed spectrum bands in the United States generated an economic surplus of $222 billion and contributed $6.7 billion to Gross Domestic Product (GDP).[23] In a follow-up study, Katz concluded that by 2017, the value of unlicensed spectrum to the U.S. economy will more than double, generating $547 billion in economic surplus and contributing $49.78 billion to GDP annually, provided that sufficient additional unlicensed spectrum is made available to support increasing demand.[24] This last point is key—unlicensed spectrum holds great potential for generating billions of dollars more each year for the U.S. economy, but only if unlicensed spectrum designations are sufficient to support skyrocketing demand and the development of new technologies. Accordingly, to encourage the kind of innovation that has made the 2.4 GHz and 5 GHz bands a great success, the Commission must also ensure adequate unlicensed spectrum designations at the frontier above 24 GHz.

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[23] Raul Katz, *Assessment of the Economic Value of Unlicensed Spectrum in the United States*, at 8-9, 11-13 (Feb. 2014), *available at* http://www.wififorward.org/wp-content/uploads/2014/01/Value-of-Unlicensed-Spectrum-to-the-US-Economy-Full-Report.pdf.

[24] Raul Katz, *Assessment of the Future Economic Value of Unlicensed Spectrum in the United States*, at 4 (Aug. 2014), *available at* http://www.wififorward.org/wp-content/uploads/2014/01/Katz-Future-Value-Unlicensed-Spectrum-final-version-1.pdf.

III. SPECTRUM ABOVE 24 GHZ WILL BE A WELCOME ADDITION TO, BUT NOT A REPLACEMENT FOR, ACCESS TO UNLICENSED SPECTRUM IN LOWER FREQUENCIES.

NCTA has filed in a variety of the Commission's open spectrum proceedings, advocating for unlicensed access to low-, medium-, and high-frequency spectrum.[25] Although NCTA believes that access to high-frequency spectrum will play an important role in the Wi-Fi networks of the future, it will not replace the immediate need for additional medium- and low-band spectrum—the primary drivers of unlicensed broadband connectivity. The viability of mobile services above 24 GHz almost certainly will "depend[] on having complementary access to mobile services in lower frequency bands."[26]

Together, spectrum bands of various frequencies form a strong network, with excellent coverage, throughput, and resistance to interference. With access to fewer frequencies, a network will be less diverse and capable. NCTA encourages the Commission to continue to view high-frequency spectrum as "a supplementary component within an architecture that will continue to use lower frequencies."[27] NCTA therefore applauds the Commission's efforts to keep abreast of the mobile technology developments of the future—including in millimeter wave spectrum—while still moving forward to provide the critical low- and mid-band connectivity that unlicensed users need today at 5 GHz and in other bands.

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[25] *See, e.g.*, Comments of the National Cable & Telecommunications Association, ET Docket No. 13-49 (filed May 28, 2013); Comments of the National Cable & Telecommunications Association, GN Docket No. 12-268 (filed Jan. 25, 2013); Comments of the National Cable & Telecommunications Association, WT Docket No. 12-354 (filed Feb. 20, 2013).

[26] *NOI*, 29 FCC Rcd at 13027, ¶ 17.

[27] *See id.* at 13029, ¶ 27.

IV. CONCLUSION.

New technology and standards using millimeter wave spectrum above 24 GHz have the potential to substantially improve licensed and unlicensed wireless networks. To maximize the use of these frequencies, the Commission should explicitly propose to permit unlicensed operations in a variety of bands above 24 GHz because: (1) unlicensed users are well-positioned to share with incumbents and new mobile licensees; (2) the millimeter wave bands have the potential to help existing networks meet growing demand and ease congestion; and (3) new unlicensed frequencies will foster new innovations and generate value for the U.S. economy. NCTA commends the Commission for its forward-thinking *NOI*, and its simultaneous efforts to designate and preserve unlicensed spectrum in lower frequencies.

Respectfully submitted,

/s/ Rick Chessen

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