

**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
)	
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5- 28.35 GHz and 37.5-40 GHz Bands)	IB Docket No. 15-256
)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band)	RM-11664
)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services)	WT Docket No. 10-112
)	
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations)	IB Docket No. 97-95

REPLY COMMENTS OF FIBERTOWER SPECTRUM HOLDINGS, LLC

FiberTower Spectrum Holdings, LLC (FiberTower) hereby replies to the comments filed in response to the Notice of Proposed Rulemaking of the Federal Communications Commission (Commission) in the above-captioned proceeding.¹ FiberTower urges the Commission to:

¹ *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, et al.*, GN Docket No. 14-177, *et al.*, Notice of Proposed Rulemaking, 81 Fed. Reg. 1802 (2015) (NPRM). All citations contained herein are to the January 13, 2016 Federal Register publication of the NPRM.

- 1) Harmonize the wide-area, exclusively licensed millimeter wave (mmW) bands at 24 GHz, 28 GHz, and 39 GHz for flexible use²;
- 2) Make clear that flexible use licenses will allow the licensees to use TDD, FDD, or other technologies as equipment development and market demands dictate;
- 3) Expand the established wide-area, exclusively licensed bands at 24 GHz, 28 GHz and 39 GHz into larger channel blocks.
- 4) Avoid any delay from the creation of larger channel blocks to the ongoing flexible use of existing wide-area licenses in the 24 and 39 GHz bands. Those bands already support gigabit and multi-gigabit fixed services under the current channel block scheme and can be used today for more robust portable and mobile applications;
- 5) Allow incumbent and new licensees to work with each other to migrate, partition or disaggregate spectrum so that the market can dictate the most efficient license sizes;
- 6) Maintain the established, effective protections for terrestrial licenses from satellite interference to ensure that flexible use licensees are able to exploit the full reach of their licenses;
- 7) Promote mmW backhaul as a policy priority so that 5G and broadband access services are able to densify at a rate that responds to market developments;
- 8) Mandate long-established core network security protocols that have been neither widely nor uniformly implemented; and
- 9) Finalize license area sizes, confirming that counties will be either the license size or the building blocks upon which larger license areas are based.

Ample support exists in the record for all the above positions and the Commissions should adopt them quickly to provide the United States with a platform for establishing global leadership in the fast developing, inextricably intertwined, and economically critical mmW and 5G industries.

I. THE COMMISSION SHOULD HARMONIZE THE 24 GHZ, 28 GHZ, AND 39 GHZ BANDS FOR FLEXIBLE USE.

Broad support exists for harmonizing the three wide-area, exclusively-licensed, mmW bands at 24 GHz,³ 28 GHz,⁴ and 39 GHz⁵. The 2015 World Radio Conference resulted in the

² The Upper Microwave Flexible Use Service (UMFUS or flexible use) has been identified as a license authorization that allows the terrestrial licensee to operate fixed, portable and/or mobile services within the service area.

³ See Letter from Jeffrey A. Marks, Government Relations, Nokia to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177 *et al.*, Attachment 1 at 2 (filed Feb. 18, 2016) (Nokia Feb. 18 Ex Parte).

clear identification of the 24 GHz and 39 GHz bands for 5G and other terrestrial broadband uses.⁶ The U.S., Japan, Korea and other countries have also identified the 28 GHz band for 5G.

II. THE UMFUS SERVICE RULES SHOULD PROVIDE LICENSEES THE FLEXIBILITY TO USE TDD, FDD, OR OTHER TECHNOLOGIES IN DEPLOYING THEIR SERVICES.

Frequency division duplex (FDD) and time division duplex (TDD) operations and equipment have long been established in the U.S. 24 GHz band.⁷ Licensees can, and have, deployed both technologies. As licensees strive to respond to their customers' needs and to pursue the best available technologies to serve those needs, they are best positioned to determine when and where to deploy a particular technology within the boundaries of their license areas. In addition, much of the latest market-ready TDD and FDD technology is globally available and is being used to develop the next generation of wireless services in an attempt to gain a leadership position in the global race to 5G. The Commission should therefore ensure that any rules it adopts for the UMFUS provide U.S. licensees with the flexibility to determine whether their operations are best supported by TDD, FDD, or future technologies, as long as those technologies comply with interference and RF exposure rules. Doing so will allow licensees to respond to customer needs and market developments, as well as allow for the type of innovation in the mmW bands that will ensure the U.S.'s continued leadership in the global wireless marketplace.

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⁴ See Letter from William H. Johnson, Senior Vice President, Federal Regulatory and Legal Affairs, Verizon to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177 *et al.* (filed Feb. 17, 2016) (Verizon Feb. 17 Ex Parte).

⁵ *Id.*

⁶ The 2015 World Radio Conference (WRC-15) output included agenda items recommending the 24.25-27.5 GHz and 37-40.5 GHz bands for 5G development. Both of those bands include the current U.S. 24 GHz and 39 GHz wide-area, exclusively licensed, fixed wireless bands.

⁷ FDD equipment is currently available from Ericsson, Bridgewater, Dragonwave, Ceragon, Nokia (formerly ALU), SAF Tehnika and many others. With regard to TDD, JRC has long made TDD point-to-point and point-to-multipoint equipment available in the U.S. and Canada.

III. THE COMMISSION SHOULD INCREASE THE SIZE OF LICENSE BLOCKS IN THE 24 GHZ, 28 GHZ, AND 39 GHZ BANDS TO FACILITATE THE CONTINUED DEVELOPMENT OF MULTI-GIGABIT SERVICES.

FiberTower supports the development of larger spectrum blocks in the UMFUS, as doing so will provide more opportunity for broadband delivery in the mmW bands. This will accelerate the gigabit and multi-gigabit solutions that already exist in the 24-40 GHz bands, and ensure that mmW spectrum bandwidth delivery continues its track record of performance innovation.⁸

WRC-15 identified the 24.25-27.5 GHz and 37.0-40.5 GHz bands for 5G and other terrestrial broadband uses. This provides strong validation that the global development of these bands for 5G and related backhaul and access services is well underway. The U.S. should swiftly move to (i) identify the existing 24 GHz (24.25-24.45; 25.05-25.25) and 39 GHz (38.6-40.0 GHz) bands for flexible use and (ii) expand 24 GHz and 39 GHz in the U.S. to incorporate those blocks identified through the WRC-15 process. Nokia has identified further developing the 24 GHz block to include 24.25-29.5 GHz, which FiberTower also supports.⁹

However, if establishing these larger blocks in the wide-area licensed bands cannot be implemented swiftly, the Commission should not delay in establishing the UMFUS for the existing 24 GHz, 28 GHz and 39 GHz incumbent licensees, as any delay in providing these licensees flexible use rights will further forestall customers' ability to access innovative services and put the U.S. further behind in the race to 5G. The incumbent licensees are already driving advancements in equipment development and customer deployments, and they will further

⁸ See Comments of FiberTower Spectrum Holdings, LLC, GN Docket No. 14-177 *et al.*, at 4-5 (filed Jan. 28, 2016); *see also* Montgomery County, MD, Montgomery County Business Innovation Network, Atlantech Online, and FiberTower UltraGig Ribbon Cutting (published Aug. 5, 2015), *available at* <http://static1.squarespace.com/static/53ad732ee4b06e52f1ceda08/t/56325921e4b00c21ad0b69c1/1446140193248/FiberTower+ultraGig+Presentation+FINAL.pdf> (last accessed Feb. 26, 2016).

⁹ See Nokia Feb. 18 Ex Parte, Attachment 1 at 11.

harness domestically and globally available products, services and knowledge to drive innovation and U.S.-based leadership in the mmW bands as soon as flexible use rules are enacted.

Thus, the creation of larger channel blocks must not delay offering UMFUS status to existing wide-area licensees. If delay is a factor, the Commission should decouple the two concepts and swiftly move forward with UMFUS status for incumbents.

IV. THE COMMISSION SHOULD CONTINUE TO ALLOW INCUMBENT LICENSEES TO WORK WITH EACH OTHER TO MIGRATE, PARTITION OR DISAGGREGATE SPECTRUM TO CREATE MARKET-BASED LICENSE SIZES (AND OFFER THE SAME OPPORTUNITY TO FUTURE LICENSEES).

Long-standing and well-considered FCC processes exist for partitioning, aggregating/disaggregating and exchanging spectrum licenses on the secondary market.¹⁰ FCC-certified coordinators are available and serve as strong allies in maintaining interference free deployments.¹¹ Furthermore, as FiberTower has previously noted, in view of the ongoing development of mmW products and services, promoting these secondary market partitioning and disaggregation transactions would wisely “leave the decision of determining the correct size of licenses to the licensees and the marketplace, which is consistent with the flexible approach to licensing these bands that [the Commission] proposed in this NPRM.”¹² In keeping with its goal of providing maximum flexibility to licensees in the UMFUS, the Commission should adopt its proposal to allow partitioning, disaggregation, and leasing of UMFUS licenses on the secondary market.

V. THE COMMISSION SHOULD MAINTAIN ESTABLISHED AND EFFECTIVE PROTECTIONS FOR TERRESTRIAL LICENSES FROM SATELLITE

¹⁰ *Id.* at 2.

¹¹ Coordinators such as Comsearch, Micronet, UTC, API and others have long been trusted to coordinate carrier-grade, municipal government, industrial, and utility network deployments in the fixed wireless bands.

¹² NPRM at para. 225.

OPERATIONS TO ENSURE THAT CONSUMERS HAVE FULL ACCESS TO 5G, MACRO AND SMALL CELL BACKHAUL, AND HIGH-CAPACITY FIXED WIRELESS ACCESS SERVICES.

The existing satellite power flux density (PFD) limits in the 39 GHz bands were established precisely to protect the deployments of high-density fixed services. Established coordination processes between the Part 101 services and the Fixed Satellite Service (FSS) have worked well in the 39 GHz band. The ultra-low latency requirements and the relative brittleness of digital signals in the mmW bands, combined with the need to densely deploy terrestrial mmW services for both backhaul and broadband access, leave no room for increased satellite power levels or increased satellite earth stations/terminals outside the existing rule structure. Future high-density mobile services, whose base stations will operate on principles almost identical to fixed service point-to-multipoint base stations,¹³ demand the same protections from harmful interference.¹⁴

As a result, if an FSS provider seeks to operate in a wide-area licensed band like 24 GHz, 28 GHz or 39 GHz, then that provider should first (1) acquire the terrestrial license within that operational area, and (2) any space-to-earth operations must fit within known “soft segmentation” PFD limits so as not to restrict and harm neighboring high density terrestrial operations.¹⁵ Any proposed changes to PFD limits should undergo publicly accessible realistic trials that are reviewable by FS, UMFUS, and FSS operators and licensees.

Some commenters contend that “[w]hile the wireless industry is in the early stages of exploring services and business models that harness millimeter wave technologies, a decade of research and

¹³ See IEEE Microwave Theory & Techniques Society, May 2015, Phoenix, AZ; IEEE Microwave Theory & Techniques Society, June 2014, Orlando, Florida.

¹⁴ See Comments of the Satellite Industry Association, GN Docket No. 14-177 *et al.*, at 13-15 (filed Jan. 28, 2016); Comments of Verizon, GN Docket No. 14-177 *et al.*, at 24-25 (filed Jan. 28, 2016) (SIA Comments); *see also* Jeff John Roberts, *Meet ‘Starry,’ a Radical New Internet Service from the Founder of Aereo*, FORTUNE (published Jan. 27, 2016), available at <http://fortune.com/2016/01/27/starry-wireless-internet/> (last accessed Feb. 26, 2016).

¹⁵ See, e.g., FiberTower Comments at 3, n.3.

development in Ka-band satellite technologies has already yielded substantial deployments of innovative and high-capacity broadband services.”¹⁶ This characterization of the wireless industry is factually incorrect. As amply noted in the record, a robust ecosystem of fixed wireless equipment makers and licensees has long existed and is already well entrenched and continues to innovate and deploy services. Moreover, new entrants, such as Starry, Inc., are on the record as ready to deploy new high-density fixed service models in markets throughout the U.S.¹⁷ Finally, Verizon has stated that it is heavily invested in mmW 5G, is conducting tests, and is ready to deploy 5G services in the U.S. in 2017.¹⁸

VI. THE COMMISSION SHOULD PRIORITIZE MMW BACKHAUL BECAUSE IT IS VITAL TO ALLOWING 5G AND BROADBAND ACCESS SERVICES TO DENSIFY AT A RATE COMMENSURATE WITH DEMAND AND TECHNOLOGICAL DEVELOPMENT.

In establishing the UMFUS and examining additional mmW bands that may be used to support flexible uses, the Commission must keep in mind the backhaul needs of the emerging 5G networks. As Nokia points out, mmW backhaul will be “essential for the delivery of mobile broadband.”¹⁹ Any band plan or service rules that fail to account for backhaul needs and ensure the availability of sufficient spectrum to address these needs “could inadvertently create a bottleneck for the very mobile broadband traffic [the Commission] seeks to accommodate with the new spectrum.”²⁰ With sufficient backhaul capacity available, carriers will be able to densify their 5G networks in the mmW spectrum at a rate that reflects market demand. To avoid artificially constraining this densification, the Commission should prioritize mmW backhaul in setting policy in the UMFUS bands and beyond.

¹⁶ SIA Comments at i.

¹⁷ See Roberts, *Meet ‘Starry,’ supra*; see also Starry Spectrum LLC, ELS File No. 0016-EX-PL-2016.

¹⁸ See Verizon Feb. 17 Ex Parte.

¹⁹ Comments of Nokia, GN Docket No. 14-177 *et al.*, at 14 (filed Jan. 27, 2016).

²⁰ *Id.*

VII. IN THE UMFUS, THE COMMISSION SHOULD EMBRACE LONG-ESTABLISHED CORE NETWORK SECURITY PROTOCOLS THAT HAVE NOT BEEN WIDELY OR UNIFORMLY IMPLEMENTED.

It is long-established that mission-critical networks must operate with physically-diverse backhaul and power systems.²¹ Carrier-grade and government-grade fixed wireless backhaul and broadband access systems possess unique security attributes in that they can be deployed in a manner whereby they cannot be disrupted by, for example, backhoe digging (which is common in construction), purposeful malfeasance,²² or flooding.²³ Those same advantages can be applied to future mmW broadband access, as well as macrocell and small cell backhaul networks.

The planned 5G networks will be a critical infrastructure element in the next generation Internet of Things. 5G networks will support energy networks, emergency services, homeland security, the stock markets, food production and distribution, transportation and other mission-critical services—and reliance on 5G will only increase in the event of a man-made or naturally-occurring outage in one of those critical services.²⁴

²¹ See FiberTower Comments at 7-8, nn.15-18.

²² See, e.g., Patrick Chu, *Somebody keeps cutting the Bay Area's fiber-optic cables, and the FBI wonders why*, SAN FRANCISCO BUSINESS TIMES (published Jan 19, 2016), available at <http://www.bizjournals.com/sanfrancisco/blog/2016/01/fiber-optic-cable-attacks-fbi-super-bowl-att.html> (last accessed Feb. 25, 2016); see also, Drew Fitzgerald, *Attacks on Fiber Networks in California Baffle FBI*, WALL STREET JOURNAL (published Aug. 12, 2015), available at <http://www.wsj.com/articles/attacks-on-fiber-networks-in-california-baffle-fbi-1439417515> (last accessed Feb. 25, 2016).

²³ See, e.g., Brian X. Chen, *F.C.C. Seeks Ways to Keep Phones Alive in a Storm*, NEW YORK TIMES BITS BLOG (published Feb. 5, 2013), available at http://bits.blogs.nytimes.com/2013/02/05/f-c-c-revisits-communications-failures-after-hurricane-sandy/?_r=0 (last accessed Feb. 25, 2016).

²⁴ See, e.g., Letter from Kelley A. Shields, Director, Government Affairs and Public Policy, Ericsson to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177 *et al.*, at 5 (filed Feb. 22, 2016) (“5G networks will serve an even more central role as critical infrastructure ...[this includes] electrical power, mobile telephony and more at the same time....[thus in anticipation of times when other core infrastructures fail it is critical] to strengthen certain security functional areas. Attack resistance needs to be a design consideration when defining new 5G protocols.”).

VIII. THE COMMISSION MUST FINALIZE UMFUS LICENSE AREA SIZES AND CONFIRM THAT COUNTIES WILL BE EITHER THE LICENSE SIZE OR THE BUILDING BLOCKS UPON WHICH LARGER LICENSE AREAS ARE BASED.

County boundaries are well-established and rarely change. As such, county mapping services and other county-based resources already exist in the marketplace to be readily harnessed. Providing county-based licenses—or larger licenses whose buildings blocks are counties—reduces planning complexity between the 24, 28 and 39 GHz bands and provides economic benefits and strategic continuity. The Commission should therefore adopt its proposal to issue county-sized licenses to incumbents and new licensees in the UMFUS. If, however, the Commission elects to adopt larger license areas, it should do so by basing those license areas on collections of counties, which may provide many of the same benefits that individual county-sized licenses would.

IX. CONCLUSION

5G and related mmW development are critical to the U.S. economy. U.S. leadership in the crucial 5G market rests in no small part on swiftly establishing development-friendly principles, many of which were well outlined in the NPRM. As Chairman Wheeler put it, “In the competitive mobile marketplace, standing still means falling behind. We need to be looking to the future of wireless. We need to be looking at 5G.”²⁵ The principles outlined by FiberTower above will help ensure that the U.S. maintains its leadership in the global wireless marketplace.

For the foregoing reasons, the Commission should adopt its proposal to launch the UMFUS and do so in a manner which will:

- 1) Harmonize the wide-area, exclusively licensed mmW bands at 24 GHz, 28 GHz, and 39 GHz for flexible use;
- 2) Make clear that flexible use licenses will allow the licensees to use TDD, FDD, or other technologies as equipment development and market demands dictate;

²⁵ NPRM, 30 FCC Rcd 11878, 12006 (Statement of Chairman Wheeler).

