

**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 |

COMMENTS OF FIBERTOWER SPECTRUM HOLDINGS, LLC

FiberTower Spectrum Holdings, LLC (FiberTower) hereby submits comments in response to the Notice of Proposed Rulemaking of the Federal Communications Commission (Commission) in the above-captioned proceeding.¹ FiberTower firmly supports the Commission’s “aim to facilitate access to spectrum, develop a flexible spectrum policy, and

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.

encourage wireless innovation.”² Flexible use in the millimeter wave (mmWave) bands will drive innovation and is paramount to U.S. competitiveness as momentum grows toward the launch of 5G services, particularly on the high-frequency bands at issue in this proceeding. Providing incumbent mmWave licensees with the ability to flexibly develop backhaul and broadband wireless access solutions will enhance global competitiveness and provide U.S. consumers with a key platform for ultimately receiving 5G services.

It is thus imperative that the Commission use this proceeding to accord Upper Microwave Flexible Use Service (UMFUS) licensees the flexibility to respond to developments in technology, industry standards, and business cases for 5G in order that the U.S. wireless industry maintain its leadership role in the global market. To accomplish this goal, the Commission should: (1) Adopt its proposal to launch the UMFUS and allow for innovative, flexible use in the mmWave bands; (2) include the 24 GHz band in the UMFUS, as it is empirically proven as more than capable of supporting vital 5G services and would leverage the global development work already undertaken and available in that band, which can be applied to 5G; (3) adopt UMFUS service rules that appropriately balance the protection needs of incumbent licensees with the flexibility needed to continue development and innovation of mmWave technologies and services; and (4) take steps necessary to ensure the security, resiliency, and marketability of services in the UMFUS.

I. THE COMMISSION SHOULD ADOPT ITS PROPOSAL TO CREATE THE UPPER MICROWAVE FLEXIBLE USE SERVICE, MODIFIED TO INCLUDE SPECTRUM THAT WILL MAXIMIZE THE BENEFITS TO THE U.S. ECONOMY AND SUPPORT OF 5G.

A. The Commission Should Issue County-Sized Geographic Licenses That Grant Mobile Operating Rights to Existing 28 GHz and 39 GHz Licensees.

In the NPRM, the Commission proposes to “authorize mobile operations in the 27.5–28.35 GHz band (28 GHz band) and the 38.6–40 GHz band (39 GHz band) with county-sized

² *Id.* at para. 3.

geographic area licenses. These bands could be suitable for deployment of high-capacity, high-throughput small cells as part of mobile broadband deployments. At the same time, we propose rules that would provide licensees with the flexibility to conduct fixed and/or mobile operations.”³

FiberTower embraces the proposal to provide incumbent wide-area licensees county-sized UMFUS licenses, and urges the Commission to adopt this proposal without delay. Many incumbent licensees have spent years researching and developing innovative ways to bring mmWave spectrum to market. Providing incumbents flexible use rights in the 28 and 39 GHz bands will leverage these long-standing and ongoing efforts in a way that ensures mmWave products and services that respond to market demand are available upon launch of the UMFUS. Moreover, granting these incumbents county-based UMFUS licenses that recreate their current geographic service areas will allow them to continue this important development work while also providing uninterrupted fixed services to their current customers during and after the UMFUS transition.

B. The Commission Should Move Swiftly to Provide Flexible Use Optionality to the Licensed 24 GHz Band to Benefit U.S. Consumers and to Leverage Inherent Competitive Advantages.

The U.S. wide-area licensed 24 GHz band is located at 24.25-24.45 and 25.05-25.25 GHz. In the NPRM, the Commission proposed to exclude the 24 GHz band from the UMFUS, but asked if there were “circumstances under which this band could be successfully used for the type of mobile systems, or other systems, contemplated for the mmW bands.”⁴ The answer is yes.

³ *Id.* at paras. 4; *see also id.* at paras. 38, 39, 89, 91 and 106. *See also* Letter from Maggie McCready, Vice President, Federal Regulatory and Legal Affairs, Verizon, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177, ET Docket No. 15-105 (filed Dec. 18, 2015) (“Mr. McAdam emphasized the importance to the US economy and US consumer of the Commission acting quickly to make the spectrum bands above 24 GHz available for mobile broadband. Verizon agrees with the Commission’s primary proposal to grant flexible use rights to existing terrestrial licensees in the 28 GHz and 39 GHz bands and to auction the FCC held licenses. Mr. McAdam asked for the Commission to move quickly to adopt an order and to make this spectrum available for 5G deployments.”).

⁴ NPRM at para. 62.

As an initial matter, the exclusively licensed wide-area mmWave bands in the U.S. are 24 GHz, 28 GHz, and 39 GHz. Providing UMFUS optionality for the 24 GHz band, in addition to the 28 GHz and 39 GHz bands proposed in the NPRM, will harmonize all the wide-area, exclusively-licensed millimeter wave bands and further the goal of driving broadband wireless innovation. In addition to the efficiencies gained by harmonizing the service rules applicable to the wide-area mmWave bands, the 24 GHz band itself carries a number of characteristics that make it well-suited for inclusion in the UMFUS.

First, this band enjoys a plethora of manufacturers. This is due to its proximity to: (1) globally harmonized 24.25-27.5 GHz bands⁵ and (2) to point-to-point licensed and unlicensed markets, respectively located at 23 and 24 GHz. Those manufacturers' energies should not be denied to the U.S. market and instead should be leveraged to develop leading UMFUS services for U.S. consumers.

Second, the licensed 24 GHz band featured some of the first successful point-to-multipoint (PMP) mmWave operations in the U.S. PMP base stations share many of the same characteristics of the future 5G mobile base stations. This similarity includes and is not limited to the usage of sector antennas to deliver high-capacity connections to large numbers of transceivers located in the sector.

Third, the 24 GHz band comprises a 400 MHz block of spectrum. While it is not as large as some other higher frequency blocks contemplated for UMFUS usage in this proceeding, it is important to note that:

- Gigabit and multi-gigabit solutions are easily accommodated within the 24 GHz band;⁶

⁵ For example, WRC-19 Agenda Item 1.13 seeks to consider 24.25-27.5 GHz as an International Mobile Telecommunications (IMT) band. Relatedly, the licensed U.S. 24 GHz (24.25-24.45 and 25.05-25.25 GHz) band overlaps with the fixed 25-26 GHz band that is heavily utilized in Europe, Asia and elsewhere.

⁶ See Montgomery County, MD, Montgomery County Business Innovation Network, Atlantech Online, and FiberTower *UltraGig Ribbon Cutting* (published Aug. 5, 2015) (*Ultragig Ribbon Cutting*), available at

- Portable PMP systems are already in market at 24 GHz;⁷
- Mobile usage has already been successfully tested in the U.S. at 24 GHz;⁸ and
- Speeds of 23.5 Gbps have already been achieved in a test setting over 400 MHz of spectrum at 24 GHz.⁹

Moreover, services at 24 GHz, unlike mmWave bands located in higher frequencies, can provide both critical 5G access, and also small cell backhaul connectivity, over longer distances due to the band's inherent propagation advantages. For example, there will be numerous deployment scenarios whereby it is infeasible or uneconomical to deploy multiple higher band mmWave small cells and 5G base stations to cover a specified area that can otherwise be serviced by a single 24 GHz base station.

II. SERVICE RULES IN THE UMFUS MUST BALANCE INCUMBENT PROTECTION WITH THE FLEXIBILITY TO CONTINUOUSLY DEVELOP INNOVATIVE 5G TECHNOLOGIES AND SERVICES.

A. Any Flexible Use in the mmWave Bands Must Protect Incumbent Fixed Service Operations.

Incumbent licensees are the current nexus through which customers, equipment developers, and laboratories meet to develop small cell and macro backhaul and 5G solutions. It is important to protect and encourage their operations in a stable environment, and also to leverage their ongoing research and development work in these bands as widespread deployment of 5G draws near. FiberTower supports maintaining the Part 101 border interference protections, and the Power Flux Density (PFD) limit protections for wide-area licensees. This includes the requirement to (1) coordinate with neighboring co-channel licensees, (2) coordinate with international border neighbors, and (3) maintaining a “soft-segmentation” policy for 37.5-40.0

(Continued from previous page) _____
<http://static1.squarespace.com/static/53ad732ee4b06e52f1ceda08/t/56325921e4b00c21ad0b69c1/1446140193248/FiberTower+ultraGig+Presentation+FINAL.pdf> (last accessed Jan. 26, 2016).

⁷ *Id.*

⁸ *Id.*

⁹ See IEEE Microwave Theory & Techniques Society, NTT Presentation, June 2014, Orlando, Florida.

GHz Fixed Satellite Service (FSS) operations until and if empirical data directs otherwise.¹⁰

FiberTower also supports the basic concept that incumbent licensees who choose to do so may maintain and grow operations in line with the existing Part 101 standards.

B. The UMFUS Service Rules Should Maintain the 39 GHz Channel Plan, yet Allow the Spectrum to Be Utilized Flexibly.

FiberTower supports maintaining the existing 39 GHz channel plan,¹¹ as long as innovation-friendly flexibility is allowed. To strike this necessary balance, the Commission should (1) allow licensees to exchange licenses with other licensees within a market in order to achieve larger (or smaller) contiguously held spectrum as needed, and (2) allow licensees to operate FDD or TDD¹² within a channel or a subset of a channel, as such licensees can operate cleanly without causing harmful interference to co-channel or adjacent-channel neighbors by following the existing coordination protocols and can also open new markets within that license channel through partitioning and/or disaggregation.¹³

C. FSS Operational Proposals in the Wide-Area Licensed UMFUS Bands Must Follow Interference Rules Long Established Through Empirical Data.

It is best to provide a wide-area licensee with options for accommodating different technologies with that licensee's borders. FiberTower agrees that 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

¹⁰ See NPRM at paras. 39, 121, 283. As for FSS operations, it is advised that the soft segmentation policy remain in place until and unless it is proven in publicly accessible test beds and trial networks that no harmful interference will result to fixed service (FS) and UMFUS operations from higher powered FSS activity. In other words, maintain a power flux density (PFD) limit that is 12 dB lower than that at the 40-42.5 GHz band. This soft segmentation is also required to protect existing point-to-point (PTP) and point-to-multipoint (PMP) operations in the 24 GHz band, let alone any future UMFUS operations in the 24 GHz band. As for U.S. operations near the Canadian and Mexican borders, the long-standing border coordination policies have proven supportive of future growth balanced with protections for all involved parties. Absent data that proves otherwise, it appears useful to not alter the distances from the border for prospective installations that mandate coordination.

¹¹ NPRM at para. 113.

¹² *Id.* at para. 267.

¹³ With the introduction of higher orders of modulation it may not always necessary to utilize an entire 50 MHz channel pair to reach a desired amount of throughput in every market. Accordingly, portions of a channel can be partitioned or disaggregated for separate or complementary uses. For example, (i) a paired 20 MHz sub-channel may be useful to another user when only a paired 30 MHz channel is needed by the existing licensee, or (ii) two TDD systems could operate independently on the upper and lower, respectively, sections of a channel pair.

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.¹⁴ Any proposed changes to PFD limits should undergo publicly accessible realistic trials that are reviewable by FS, UMFUS and FSS operators and licensees.

III. THE COMMISSION SHOULD ADOPT MEASURES THAT LEVERAGE THE POSITIVE CHARACTERISTICS OF THE UMFUS BANDS.

A. The mmWave Bands Can Provide Vital Physical Network Diversity to Mission-Critical Networks, and the Commission Should Leverage These Capabilities.

The deployment of small cells, FirstNet, and 5G provides an opportunity to deploy effective security features throughout networks. The Commission recognizes this opportunity in the context of its responsibilities,¹⁵ and seeks “comment on how to ensure that effective security features are built into key design principles for communications devices and networks that will use these bands.”¹⁶

Government networks, commercial mobile networks, and other networks require physically-diverse backhaul infrastructure if they are going to operate in times of man-made or natural disaster. This, in turn, requires compliance with physically-diverse network standards such as those contained in Section 414 of the Consolidated Appropriations Act of 2005.¹⁷ The

¹⁴ See *supra* n.3. See also NPRM at para. 108.

¹⁵ The FCC is tasked with critical infrastructure protection responsibilities. “The Federal Communications Commission, to the extent permitted by law, exercises its authority and expertise to partner with DHS and the Department of State, as well as other Federal departments and agencies and SSAs as appropriate, to: (1) identify and prioritize communications infrastructure; (2) identify Communications Sector vulnerabilities and work with industry and other stakeholders to address those vulnerabilities; and (3) work with stakeholders, including industry, and engage foreign governments and international organizations to increase the security and resilience of critical infrastructure within the Communications Sector and facilitate the development and implementation of best practices promoting the security and resilience of critical communications infrastructure on which the Nation depends.” U.S. Department of Homeland Security, National Infrastructure Protection Plan 2013: Partnering for Critical Infrastructure Security and Resilience, at 45 (2013), available at <http://www.dhs.gov/sites/default/files/publications/National-Infrastructure-Protection-Plan-2013-508.pdf> (last accessed Jan. 27, 2016).

¹⁶ NPRM at para. 4. See also *id.* at para. 257.

¹⁷ See Consolidated Appropriations Act of 2005, Pub. L. No. 108-447, 118 Stat. 2809, 3260.

wide-area licensed spectrum bands at 24 GHz and above are in prime position, with their large capacity and quick deployment capabilities, to provide the required diversity infrastructure to supplement existing networks that may currently be "single-threaded" when it comes to last mile or middle mile connectivity.¹⁸

B. The Commission's UMFUS Policies Should Promote Secondary Markets Transactions to Ensure Robust Utilization and Development of the Spectrum.

Secondary market options such as spectrum partitioning, spectrum disaggregation, and spectrum leasing should continue to be supported within the proposed UMFUS Part 30.¹⁹ As the Commission correctly notes in the NPRM, promoting flexibility by allowing partitioning and disaggregation will "facilitate the efficient use of spectrum by enabling licensees to make offerings directly responsive to market demands for particular types of services, increasing competition by allowing new entrants to enter markets, and expediting provision of services that might not otherwise be provided in the near term."²⁰ In view of the ongoing development and emergence of mmWave products and services, promoting these secondary market partitioning and/or 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."²¹

Similarly, allowing spectrum leasing in the newly created UMFUS will "promote more efficient, innovative, and dynamic use of the spectrum, expand the scope of available wireless services and devices, enhance economic opportunities for accessing spectrum, and promote

¹⁸ See *UltraGig Ribbon Cutting* at 3, 13-14. Also, the need for individually-powerable, physically-diverse communications infrastructure remains a key U.S. challenge. See generally Cristina Maza, *The Pentagon's Plan to Defend The Power Grid Against Hackers*, The Christian Science Monitor (published Jan. 25, 2016), available at <http://www.csmonitor.com/World/Passcode/2016/0125/The-Pentagon-s-plan-to-defend-the-power-grid-against-hackers?cmpid=gigya-mail> (last accessed Jan. 26, 2016).

¹⁹ NPRM at paras. 225, 231.

²⁰ *Id.* at para. 225.

²¹ *Id.*

competition among providers.”²²

Given the policy advantages provided by such a flexible approach, and the fact that permitting secondary markets transactions is consistent with the Commission’s goals of allowing for the market-based development of innovative uses and technologies in the UMFUS, the Commission should adopt its proposal to allow spectrum partitioning, disaggregation, and leasing.

C. Full Duplex Connectivity Is Not Always Required to Support mmWave Deployment Scenarios and Should Not Be Mandated.

The flexible use rights granted in the UMFUS should support allowing the licensee to decide when to deploy full duplex versus other configurations, in keeping with the requirements of the particular deployment scenario facing that licensee.²³ In other words, there is no need to mandate full duplex deployments in each and every case. For example, a self-healing backhaul ring that connects small cells may well require full duplex connectivity. Alternatively, a transport or access network that connects say, a city hall to municipal buildings throughout a town may require that broadcasts and other information emanating from that particular city hall requires more bandwidth than the traffic flowing back. Thus, the customer may define requirements that are full duplex or asynchronous and it would be beneficial to have the flexibility to respond to those requirements.

D. Unified Performance Metrics for the Varying Services that Will Be Supported in the UMFUS Must Provide the Flexibility Needed to Allow for Ongoing Innovation.

The Commission finds that it may be efficient to establish a uniform performance metric for fixed, mobile and satellite services in the UMFUS bands.²⁴ FiberTower agrees, provided that such a metric (i) understands and calibrates to market demand, and (ii) incentivizes the cultivation of innovation and market research and development. In the NPRM, the Commission

²² *Id.* at para. 231.

²³ *Id.* at para. 261.

²⁴ *Id.* at paras. 198-199.

proposes performance requirements for the UMFUS that would require the licensee to show at renewal that it provides coverage and offers service to at least 40% of the population in each county-based license area (in the case of point-to-point microwave operations, the population in a defined “keyhole” between customer service points determines the population served).²⁵ The Commission further proposes to apply existing Part 101 renewal criteria to incumbent 28 and 39 GHz licensees whose current authorizations expire before March 1, 2021.²⁶ Alternatively, the Commission seeks comment on approaches to performance requirements that include a regime whereby a UMFUS licensee would pay an auction price, adjusted for inflation, every five years or return the license,²⁷ and another pursuant to which the portions of a licensee’s service area that are unbuilt after five years would automatically become available for sharing by other users.²⁸

Because optionality provides more paths to success, FiberTower supports the Commission’s primary recommendations, as well as the alternatives as performance measures by which license renewal could be granted. In keeping with the Commission’s recognition that mmWave services are in a “nascent state” and the precise business cases UMFUS licensees will support in bands at and above 24 GHz are still developing, the Commission should closely monitor market developments in the mmWave bands and stand ready to reassess and reconfigure the performance measures applicable to the UMFUS if such steps are needed to bring the Commission’s rules into better alignment with developing market realities.

E. 5G Mobile Service Radii May Sometimes Cover Miles Instead of Meters, and the Commission Should Not Set Power Limits That Constrain Developing Technologies and Use Cases.

In the NPRM, the Commission states that in many 5G mmWave use cases, the base

²⁵ *Id.* at paras. 207.

²⁶ *Id.* at para. 213.

²⁷ *Id.* at para. 215.

²⁸ *Id.* at paras. 209-11.

station radii may reach only 200-300 meters, or less.²⁹ However, ‘reach studies’ routinely issued by fixed service manufacturers show that significant capacity can sometimes be distributed over many miles in certain markets at, or below, 39 GHz. In view of the potential value of services delivered over these longer distances, the Commission should not artificially limit 5G mobile base station power limits to levels below those at which existing PMP base stations are allowed to operate. PMP base stations and future 5G mobile base station share many functional equivalencies. Of course, future 5G base station operators or current PMP base station operators can voluntarily limit their power output to achieve smaller radii and higher spectrum reuse in congested areas. Additionally, any power limits must always accommodate common sense, empirically-produced, human exposure standards.

The proposal to double power limits in rural areas is useful.³⁰ It is also important to consider that there are numerous use cases in which deployments in urban areas need to achieve distances possible at this higher power limit, without which they will be rendered technically or economically infeasible. Likewise, there are many cases in rural settings where base station radii only need to cover areas that are less than a few hundred meters. Additional data from manufacturers and operators and test bed operators would be useful to assist in filling out these potential use cases and informing the Commission as to the power levels needed to support valuable use cases while preventing interference.

IV. CONCLUSION

For the foregoing reasons, the Commission should adopt its proposal to launch the UMFUS in the mmWave bands and should include the 24 GHz band in the new service. Doing so will bring to market vast swaths of spectrum, operating under uniform service rules, to provide much-needed capacity to relieve the spectrum crunch and harness market energies

²⁹ *Id.* at para. 264.

³⁰ *Id.* at para. 266.

