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 AT&T

William L. Roughton, Jr.
Michael Goggin
Gary L. Phillips
David Lawson
1120 20th Street, N.W.
Suite 1000
Washington, DC 20036
(202) 457-2040
Counsel for AT&T Services, Inc.

February 26, 2016

TABLE OF CONTENTS

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 AT&T

I. INTRODUCTION & SUMMARY

AT&T Services Inc. ("AT&T"), on behalf of the subsidiaries and affiliates of AT&T Inc. (collectively, "AT&T"), hereby submits the following reply comments in response to the Federal Communications Commission's ("Commission") Notice of Proposed Rulemaking ("*NPRM*") in

the above captioned proceeding.[1] The *NPRM* sets forth a number of service rules that would authorize mobile operations in certain spectrum bands above 24 GHz, also known as the millimeter wave ("mmW") bands. Importantly, the *NPRM's* proposed regulatory framework arises in the context of the Commission's efforts to facilitate fifth generation ("5G") wireless services.[2] As the record in this proceeding reveals, the time is ripe to begin moving in earnest towards crafting spectrum policies that will cement the United States' leadership role in the 5G revolution. There is widespread support for allocating the mmW bands for flexible use and commenters agree that this high-frequency spectrum has the potential to serve as a launch pad for transformative 5G deployments.

Indeed, the mmW spectrum that the Commission proposes to unleash for mobile uses in this proceeding will help foster a thriving ecosystem for the next generation of wireless services. But this high frequency spectrum is not a stand-alone solution to the spectrum crunch confronting wireless providers. To this end, the Commission should not lose sight of the pressing need for spectrum below 6 GHz. As the opening round of comments confirms, industry aspires to deliver an ambitious vision of 5G services to consumers. Wireless visionaries expect 5G services to utterly transform everyday life into a seamless connected experience, from cars, to homes, to cities, and beyond. To bring these advancements to life, however, additional spectrum below 6 GHz will be essential. Without it, wireless coverage and capacity will falter, stifling 5G innovation and jeopardizing our nation's leadership role as the mobile revolution moves forward.

---

1 *In the Matter of Use of Spectrum Bands Above 24 GHz For Mobile Radio Services,* Notice of Proposed Rulemaking, FCC 15-138 (Oct. 23, 2015) ("*NPRM*").

2 *See In the Matter of Use of Spectrum Bands Above 24 GHz For Mobile Radio Services et al.*, Notice of Inquiry, FCC 14-154, at ¶ 1 (Oct. 14, 2014) ("*NOI*").

AT&T continues to believe that the Commission can most effectively support 5G advancement by adopting a regulatory approach rooted in the basic principles that are guiding the development of 5G systems. In particular, the record confirms that the 5G regulatory framework will need to facilitate integrated network design; encourage technological advancements; contemplate unique services; account for diverse use cases and geographies; assign wide channel bandwidths; and, maintain international harmony where possible. Together with these guideposts, the Commission should prioritize simplicity in its regulatory approach, rejecting calls to adopt burdensome and complex sharing mechanisms and interoperability mandates. Further, the Commission should encourage competition and efficiency in the mmW bands by auctioning available spectrum and fostering a dynamic secondary market. A regulatory approach characterized by these concepts and principles will help ensure a vibrant wireless ecosystem suitable for next generation deployments.

As it considers the 28 GHz, 37 GHz, 39 GHz, and 64-71 GHz bands, the Commission should develop service rules that account for the unique features of each band as well as the key principles overriding 5G development. In the 28 GHz band, the Commission should authorize mobile operations and auction available spectrum pursuant to proven competitive bidding procedures. To ensure that spectrum is put to its highest and best use, in the 37 GHz band, the Commission should decline to adopt the hybrid licensing paradigm. As the record makes clear, the hybrid licensing proposal is riddled with complexities and costs that would thwart the commercial viability of the band. To avoid stripping the 37 GHz band of its intrinsic value, the Commission should combine it with the 39 GHz band, applying the same service rules throughout the combined 37/39 GHz band. The 3 GHz of contiguous spectrum available in the combined band would provide an ideal opportunity for licensing the large channel blocks 5G

deployments will require. Finally, the Commission should allocate at least a portion of the 64-71 GHz band for exclusive, licensed uses. Licensing a segment of this band would provide innovators with a stable environment in which to experiment with novel 5G services.

AT&T applauds the Commission for launching this proceeding and jumpstarting the movement toward next generation services and technologies. The steps the Commission takes today will impact our global leadership role in wireless innovation tomorrow. By developing a regulatory environment consistent with the principles AT&T has advocated in this proceeding, the Commission will ensure 5G's ultimate success and affirm the United States' position as a key 5G luminary.

II. THE RECORD REFLECTS OVERWHELMING SUPPORT FOR ALLOCATING THE MMW BANDS FOR FLEXIBLE USE, INCLUDING MOBILE BROADBAND SERVICES

A number of commenters have joined AT&T in commending the Commission for its proposal to authorize flexible uses, including mobile services, in the mmW spectrum bands.[3] In allocating the mmW bands for mobile uses, the Commission takes an important step toward facilitating the next generation of wireless technology. 5G systems will encompass a "network of networks," leveraging a range of different spectrum types to achieve lightning-speed data rates and unprecedented reliability.[4] Historically, the high-frequency mmW bands have been

---

[3] *See, e.g.*, Comments of CTIA®, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 4-5 (Jan. 28, 2016) ("CTIA Comments"); Comments of Verizon, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 2 (Jan. 28, 2016) ("Verizon Comments"); Comments of Qualcomm Incorporated, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 6-7 (Jan. 27, 2016) ("Qualcomm Comments").

[4] Comments of AT&T, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 2 (Jan. 28, 2016) ("AT&T Comments").

considered unsuitable for mobile applications.[5] Recent technological advancements, such as innovative beamforming techniques, however, may unlock the mmW bands' potential for mobile uses.[6] With these technological improvements, the mmW spectrum may be particularly "well suited to serve as supplementary channels for delivering ultra-high data rates and expand[ing] capacity."[7]

But while the mmW bands will be an important piece of the 5G puzzle, spectrum below 6 GHz will remain essential. As commenters have noted, the mmW bands are not a "stand-alone solution;" rather, this high-frequency spectrum will serve as a complement to existing (and future) low-frequency mobile allocations.[8] The mmW bands may help enhance capacity, but spectrum below 6 GHz will be a critical component of 5G network coverage.[9] Accordingly, commenters agree that examining opportunities to reallocate spectrum below 6 GHz for mobile broadband use should remain one of the Commission's top priorities.[10]

---

5 *NPRM* ¶ 5.

6 *Id.*

7 CTIA Comments at 6.

8 *NPRM* ¶ 8. As the Commission notes, technical challenges still must be resolved to leverage the mmW bands to support mobile uses. *See id.* ¶ 212. With the suitability of this spectrum for mobile uses still in a "nascent state," *id.*, AT&T believes that the mmW spectrum that the Commission allocates for mobile uses should not count toward the 500 MHz of spectrum the President has directed the FCC to unleash for mobile broadband use. *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-unleashingwireless-broadband-revolution

9 *See* Comments of CTIA at 7 ("[S]pectrum below 3 GHz will remain necessary to provide consumers with network coverage, and medium band spectrum (3 to 24 GHz) will be needed to supplement capacity and coverage for 5G services.").

10 *See, e.g.*, Comments of Samsung Electronics America, Inc. and Samsung Research America, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112,

A. Commenters Agree That Several Key Principles Are Driving The Development of 5G Systems

5G standards-setting processes are just beginning. But as AT&T explained in its initial comments, several fundamental principles have already emerged to propel the development of 5G systems forward.[11] The record confirms the prevalence and importance of these core guidelines and makes clear that next generation services will thrive if spectrum policies are rooted in 5G system requirements. By incorporating the foregoing central tenets into its regulatory framework, the Commission will help ensure 5G's ultimate success.

Integrated Network Design. As Qualcomm has observed, 5G networks will "work in conjunction with today's 4G, 3G, LTE-Unlicensed, and Wi-Fi investments through a new network architecture."[12] Thus, commenters have made clear that the 5G environment will need to facilitate and encourage integrated network designs.[13] To do this, the Commission's regulatory framework should foster efficient and practical network coordination so that operators can bring diverse network concepts together.

Revolutionary Technologies. Commenters agree that mmW spectrum policies will need to facilitate new and innovative technologies.[14] To be sure, the mmW bands show promise for

---

IB Docket No. 97-95, at 3 (Jan. 26, 2016) ("Samsung Comments"); Comments of Nokia, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95 at 13 (Jan. 27, 2016) ("Nokia Comments"); CTIA Comments at 4-5.

[11] *See* Comments of AT&T at 5-11.

[12] Qualcomm Comments at 4.

[13] *See, e.g.*, Nokia Comments at 7 (describing 5G as a "new paradigm" that will "weav[e] together the networks, data, and device technologies"); Qualcomm Comments at 4.

[14] *See* Comments of the National Cable & Telecommunications Association, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 2 (Jan. 28, 2016) ("NCTA Comments"); CTIA Comments at 5-6.

mobile uses, but further technological advancements are needed before the spectrum will be able to support mobile services.[15] Leveraging the spectrum bands above 24 GHz for mobile uses will require advanced technologies, including new beamforming techniques, high-order multiple input, multiple, output ("MIMO"), and multi-band carrier aggregation. Thus, "it is critically important" for 5G's development that the Commission's regulatory framework "encourage [the] development of millimeter wave technology."[16]

Game-Changing Services. Commenters have outlined an ambitious vision of the 5G ecosystem, replete with remarkable new services that will change the way consumers think of wireless mobility.[17] From robots to unmanned vehicles to telemedicine and beyond, the record reveals that 5G promises to develop services that could not be imagined with traditional wireless technology today.[18] To achieve this vision, 5G services will need a regulatory environment that prioritizes flexibility and simplicity.

Varying Geography & Use Cases. Undoubtedly, 5G's numerous use cases will eventually span both urban and rural geographies. A critical first building block for 5G systems

---

15 *See* CTIA Comments at 6 ("[T]here remain significant challenges in putting these frequencies to use.").

16 Qualcomm Comments at 15.

17 *See, e.g.*, Verizon Comments at 1 ("U.S. consumers will benefit from a vast array of 5G applications and new classes of wearables and sensors that will spur the emergence of a fully-connected society and a turbo-charged the Internet of Things."); Qualcomm Comments at i (explaining that 5G will support "new devices, like robots, unmanned vehicles, and different industrial machines, as well as innovative applications in areas such as healthcare, energy, and smart cities"); Samsung Comments at 6-7 (predicting that 5G will make the IoT a reality, supporting a variety of machine-to-machine services including wireless metering, mobile payments, smart grid monitoring, and telemedicine).

18 *See, e.g.*, Qualcomm Comments at i; Nokia Comments at 7-8; CTIA Comments at 3-4.

in the mmW bands, however, will likely be small cell deployments in dense urban areas.[19] At the same time, initial 5G use cases may support backhaul and fixed broadband wireless operations. Consistent with the diversity of these initial deployments, there may at first be variances in 5G urban and rural use cases. The Commission's regulatory approach should account for these variables and maintain a close nexus between anticipated 5G use cases and spectrum policy choices. Doing so will ultimately yield innovative 5G applications nationwide.

Wide Channel Bandwidth. 5G will require large swaths of contiguous spectrum to thrive.[20] That is why access to the large contiguous spectrum blocks in the mmW bands is so attractive.[21] Wide spectrum channels of at least 200 MHz will enhance system performance and deliver the ultra-high throughputs required to meet projected data demand growth.[22] To this end, band plans should assume that time division duplex ("TDD") operations will "predominate" mobile operations in the mmW bands with channel sizes of at least 200 MHz needed.[23]

International Harmonization. The record crystallizes the benefits associated with preserving international harmonization as 5G is developed and deployed. Indeed, the 5G

---

19 *See* CTIA Comments at 6 (noting that the mmW bands "work well" for providing "capacity via small cells . . . particularly in densely populated areas"); Comments of T-Mobile USA, Inc., GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 3 (Jan. 27, 2016) ("T-Mobile Comments").

20 *See, e.g.*, Nokia Comments at 15-21; Samsung Comments at 12 (stating that wide channel bandwidths are necessary to provide the "significant performance gains" expected with 5G services); CTIA Comments at 21-22.

21 *NPRM* ¶ 20 (acknowledging large spectrum channels will be required to leverage the mmW bands for mobile use).

22 *See* Qualcomm Comments at 11; AT&T Comments at 9-10.

23 *See* Qualcomm Comments at 15; Nokia Comments at 25; CTIA Comments at 28 (noting initial standards work points to TDD as the "likely technology choice" for mobile services in the mmW bands).

transformation will extend far beyond the United States. Maintaining international harmonization where possible will promote efficiency, incentivize investment, and streamline coordination issues.[24] It will also facilitate the availability of 5G services around the globe. With these important benefits, commenters agree that the Commission should develop a regulatory framework that reflects global spectrum allocations and licensing approaches.[25]

B. The Commission Should Prioritize Simplicity And Foster Certainty In The mmW Bands

The Commission should resist calls to overly complicate this proceeding with burdensome and untested licensing approaches. In this early phase of 5G development, the Commission should be careful to avoid adopting complex policies that could strand investment. To this end, the Commission should promote simplicity and adhere to the 5G principles AT&T and others have articulated in this proceeding.[26] By doing so, the Commission will create certainty for prospective licensees and spur investment in developing innovative mmW technologies.

With these important goals in mind, AT&T believes the Commission should decline to mandate cumbersome interoperability requirements. Market-driven forces are the most efficient means of achieving interoperability objectives while promoting investment and experimentation. As a matter of course, market forces will likely require interoperability within the multiple mmW bands. But there is no comparable market requirement for interoperability between different technologies and imposing such an artificial mandate would only stifle innovation and increase

---

[24] *See* Samsung Comments at 15-16 (extolling the benefits of international harmonization as a key spectrum policy goal).

[25] *See id.*; Nokia Comments at 9; CTIA Comments at 9.

[26] *See supra* Part II.A.

costs.[27] Consumers may even be deprived of devices that become too expensive to deploy. The Commission should simply allow standards-setting processes to achieve a natural level of interoperability as devices are developed and deployed.

To further encourage deployments in the mmW bands, the Commission should reject "use-it-or-share-it" approaches in the spectrum above 24 GHz. As AT&T and others have noted, spectrum sharing mechanisms have not been tested.[28] Nor have such systems been proven to effectively manage interference coordination. If anything, implementing a "use-it-or-share-it" system would compound 5G deployment obstacles. The engineering required to leverage these mmW bands for mobile uses will already be challenging. The Commission's requirements should not add more layers of complexity. Ultimately, the uncertainties inherent in untested sharing systems would deter investment—a result that would stymie 5G development before it even really begins.[29] Put simply, the "stakes are too high" for sharing experimentation in the mmW bands.[30]

Finally, AT&T agrees with commenters that the Commission should defer its consideration of bi-directional sharing issues between Federal and non-Federal services.[31] Addressing these issues would inject unnecessary complexity into this proceeding and could cause delay. As CTIA has noted, NTIA's Commerce Spectrum Management Advisory

---

27 *See* Verizon Comments at 17-18; CTIA Comments at 30-31.

28 *See* Samsung Comments at 22-23 (calling on the Commission to "limit the experiment of this new [sharing] methodology . . . until it demonstrates its feasibility").

29 *See* Nokia Comments at 20 ("Interested parties may be discouraged to buy access to the spectrum if they may be asked to share it.").

30 Verizon Comments at 20; *see also* CTIA Comments at 27 (arguing that licensees should not be subject to additional sharing requirements).

31 *See* CTIA Comments at 34.

Committee ("CSMAC") has already engaged a subcommittee in studying bi-directional sharing issues and is expected to provide recommendations later this year.[32] When it comes to developing 5G solutions, time is of the essence. Rather than delaying the important movement toward freeing the mmW for mobile uses, the Commission can and should address these issues in a subsequent proceeding.

C. A Robust Secondary Market Will Promote Investment And Innovation In The mmW Bands

The Commission should encourage competition and ensure efficient spectrum use in the mmW bands through competitive bidding procedures and secondary market rules. As an initial matter, the Commission should auction available mmW spectrum. Using the Commission's proven competitive bidding procedures will ensure that spectrum is allocated to operators positioned to deploy it promptly and productively. In turn, licensees should be permitted to partition, disaggregate, and lease spectrum to meet market demands. Fostering a thriving secondary market and enabling dynamic leasing arrangements will help ensure that spectrum "is put to use by those that value it the most."[33]

The flexibility inherent in a robust secondary market will encourage investment and innovation in the mmW spectrum. At this time, it is unclear what services and technologies will ultimately flourish in the mmW bands, making business planning particularly challenging. Granting licensees the flexibility to acquire or divest spectrum as technology and business plans coalesce will go a long way toward providing industry the assurance it needs to confidently invest in the mmW bands.[34]

---

32 *Id.*

33 T-Mobile Comments at 9.

34 *See* Verizon Comments at 14.

The Commission should also decline to adopt band-specific spectrum holding limits. Although there are high hopes for putting the mmW spectrum bands to mobile use, as the Commission notes, there is still no basis to conclude that the spectrum is suitable for providing mobile services "in the same manner as other spectrum bands."[35] Imposing spectrum aggregation caps while the mmW frequencies are still being studied would be premature and arbitrary. Further, as commenters have made clear, it is the substantial amount of available spectrum that makes the mmW frequencies attractive.[36] Operators will use wide channel bandwidths to deliver the ultra-high data rates and low latencies expected to characterize next generation services. Adopting spectrum aggregation caps would undermine this potential and threaten the commercial viability of the spectrum.

III. THE RECORD SUPPORTS DEVELOPING A REGULATORY FRAMEWORK THAT REFLECTS KEY 5G PRINCIPLES IN EACH MMW BAND

As the record in this proceeding confirms, the mmW bands hold great promise for facilitating the transition to next generation wireless services. To ensure that this spectrum achieves its full potential, however, AT&T believes that the Commission should craft a simple and flexible regulatory framework that reflects the core principles governing 5G system development. In each mmW band, the Commission should consider whether its proposed approach is designed to boost investment and innovation in nascent 5G technologies and services.

---

35 *NPRM* ¶ 192.

36 *See, e.g.*, Verizon Comments at 14; CTIA Comments at 21-22.

A. 28 GHz Spectrum

The record reveals strong support for authorizing mobile operations in the 28 GHz band as part of a new Upper Microwave Flexible Use Service ("UMFUS").[37] As commenters have explained, flexible license rights will be particularly useful in this band because fixed and mobile services can coexist effectively.[38]

Moreover, AT&T believes that the Commission can address the concerns of satellite operators by granting fixed satellite service ("FSS") licensees co-primary status in the band for existing earth stations.[39] In addition, FSS licensees should be free to negotiate with UMFUS licensees to add additional earth stations on mutually agreeable terms.[40] The Commission should enable and encourage FSS, incumbent Local Multipoint Distribution Service ("LMDS") and newly authorized UMFUS licensees to negotiate agreements with one another to facilitate interference protection. The Commission's secondary market policies may also be an effective

---

[37] *See, e.g.*, CTIA Comments at 14-15; T-Mobile Comments at 9; Samsung Comments at 11; Nokia Comments at 9; Qualcomm Comments at 6.

[38] *See, e.g.*, CTIA Comments at 15; Comments of ViaSat, Inc., GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-5, at 1 (Jan. 28, 2016) ("ViaSat Comments") (noting that earth station facilities can "coexist with the new mobile wireless services that the Commission proposes to introduce").

[39] *See* AT&T Comments at 12-13. While AT&T supports granting incumbent FSS licensees with individually licensed earth stations co-primary status, mobile services in the FSS, should not be given the same treatment. Such an approach is consistent with the status quo and properly acknowledges the technical difficulties associated with coordinating mobile operations across large geographic areas. *See id.*

[40] It should be noted that interested parties in the satellite and terrestrial broadband industries have been engaged in discussions regarding the interference environment and possible co-existence deployment scenarios in this band. It is possible that a mutually agreeable set of parameters or conditions could be defined whereby co-primary FSS earth station expansion could occur without negotiation. To the extent that occurs, accommodations made for satellite use that preclude mobile deployment should be credited towards the mobile carrier's build-out obligations.

means of ameliorating interference concerns and allowing for FSS expansions as licensees could enter into post-auction partition agreements or leasing arrangements designed to manage interference concerns.

Band Plan. The 28 GHz band is currently licensed as a single 850 MHz block.[41] AT&T believes the Commission should enable multiple licensees to operate in the band.[42] To do so, the Commission should partition the 28 GHz band into three 200 MHz and a 250 MHz channel blocks. Spectrum not currently in use by an incumbent LMDS licensee should promptly be made available for auction.

Incumbent Rights. In evaluating whether spectrum is currently in "use," the Commission should assess incumbent operations and the actual spectrum being utilized in market deployments as of a recent date certain, such as the date the Commission released the *NPRM*. Incumbent LMDS licensees should receive modified licenses commensurate with their existing spectrum footprints and usage. An incumbent LMDS licensee should receive authorizations for a sufficient number of channels to accommodate their existing use within each Partial Economic Area ("PEA") covered by their present license.[43] Moreover, incumbent operations should be retuned, where possible, to ensure that an incumbent that is using 80 MHz of spectrum in its licensed area does not retain all 850 MHz merely due to arbitrary and inefficient transmitter spacing. Rather, in such a case, the incumbent's operations should be compressed as much as practicable so that spectrum does not lie fallow.

---

41 *NPRM* ¶ 116.

42 *See* T-Mobile Comments at 10-11 (arguing that the Commission should "create opportunities when it auctions the spectrum for more than one licensee to hold that spectrum").

43 As explained below, AT&T believes that PEAs represent the appropriate base geographic unit for the 28 GHz band.

All remaining unused channel blocks should be made available for auction. In doing so, the Commission could consider granting incumbent LMDS licensees bidding credits based on the value of the operational assets they are relinquishing, or as a percentage credit reflecting their rights in the region once existing uses have been consolidated. Such an approach strikes the appropriate balance between preserving existing licensee's operations and ensuring that spectrum is put to efficient use.[44] Auctioning unused 28 GHz spectrum would also prevent an unfair windfall to LMDS licensees whose newly authorized flexible use licenses will suddenly be of much higher value.

License Areas. Several commenters expressed concern with the Commission's proposal to license the 28 GHz band on a county-basis.[45] County-based licenses, the record confirms, would be unduly burdensome for both the Commission to administer and licensees to manage.[46] Aside from creating unnecessary administrative complexities, county-level licenses would be ill-suited for anticipated 5G use cases like backhaul, smart grids, unmanned vehicles, and telemedicine, which will eventually span wide geographic areas.[47] Rather than stifling potential 5G use cases and escalating interference coordination issues by selecting county-based licensing,

---

[44] Although AT&T agrees that incumbent LMDS licensees should be able to use their licenses for mobile services, LMDS incumbents should also be held to substantial service requirements to ensure that valuable spectrum does not lie fallow.

[45] *See, e.g.*, Verizon Comments at 10-11 ("County-level licenses . . . would impose substantial burdens on licensees"); Qualcomm Comments at 7-8; T-Mobile Comments at 10; Nokia Comments at 18; Comments of 4G Americas, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 6-7 (Jan. 26, 2016) ("4G Americas Comments").

[46] *See, e.g.*, Verizon Comments at 10-11; T-Mobile Comments at 10.

[47] *See* Nokia Comments at 18.

the Commission should allocate licenses in the 28 GHz band with a broader geographic scope than counties.

PEAs, for example, may be an appropriate base geographic unit.[48] Established for the upcoming incentive auction, PEAs comprise 416 service areas throughout the United States.[49] Implementing a broader geographic area licensing unit like PEAs "will help draw investment to . . . new services" and "will best support" projected 5G use cases.[50] And to the extent that a licensee's business model does not support providing service throughout an entire PEA, the licensee could partition, disaggregate, or lease the unused portion of its license.

Performance Requirements. Commenters generally agree that the Commission will have to reimagine its approach to performance requirements in the new 5G environment.[51] Neither geographic nor population coverage performance metrics will be appropriate for the mmW bands.[52] Indeed, geographic and population based performance requirements were designed to assess the use of traditional macro cell deployments designed to enhance network coverage. The mmW spectrum, on the other hand, will likely be used primarily to add to network capacity.[53] And, as commenters have explained, with mmW spectrum's short-range propagation characteristics, initial mmW deployments will likely consist of backhaul, fixed broadband

---

48 *See* 4G Americas Comments at 6-7 (endorsing the use of PEAs in the mmW bands).

49 *Wireless Telecommunications Bureau Provides Details About Partial Economic Areas*, GN Docket No. 12-268, Public Notice, DA 14-759 (rel. June 2, 2014). By contrast, there are currently 3,143 counties. *NPRM* ¶ 110.

50 4G Americas Comments at 7.

51 *See, e.g., id.* at 10 ("We believe that an entirely new and more appropriate metric will need to be developed for mmW deployments to better capture the level of spectrum utilization.").

52 *See* CTIA Comments at 23-25.

53 *See id.*

wireless, and small cells in places like stadiums or office buildings where population is low.[54] Further, unlike traditional wireless deployments, some 5G mmW deployments may focus on a new target audience: machines. As such, performance metrics based upon population or geographic coverage are inherently ill-suited to the mmW bands.

To the extent the Commission believes it must adopt performance requirements at this time, AT&T agrees that a flexible "substantial service" approach may be appropriate, particularly if coupled with safe harbors designed to account for the nascent stage of 5G development. Ultimately, however, the Commission will need to think creatively about how best to measure performance in the mmW bands.[55] With a diverse range of 5G services and applications undergoing development, flexibility will be key to any successful performance requirements.[56] The Commission could, for example, consider exploring performance metrics based upon access points or usage. These kinds of approaches, flexibly applied, may account for the myriad different deployments and use cases 5G systems may contemplate.

Transmission Power Limits. The *NPRM* proposes Effective Isotropic Radiated Power ("EIRP") limits for base stations of 1640 watts (62 dBm) with a scaling factor of 100 MHz.[57] In rural areas, the NPRM proposes a base station EIRP limit of 3280 watts (65 dBm), with a scaling

---

54 *See* 4G Americas Comments at 9-10; *see also* Verizon Comments at 19 (explaining that performance requirements will need to account for uses at stadiums or industrial parks "where people do not live").

55 In the 28 GHz band, the Commission should consider granting licensees that lease spectrum to Earth Stations credit toward performance requirements and license renewal. Such an approach would encourage efficient spectrum use and help ensure that FSS operators have sufficient access to mmW spectrum.

56 *See* Verizon Comments at 19 (emphasizing flexibility because "no one can know what use cases will emerge, let alone how to measure the scope of operators' deployments of new technologies in these bands").

57 *See NPRM* ¶¶ 274-75.

factor of 100 MHz.[58] As some commenters have noted, the proposed power limits are more restrictive than those in other mobile bands because the power will be spread over the mmW bands' much wider bandwidth.[59]

AT&T generally supports the Commission's power limit proposals, but submits that industry and the Commission should continue to work together to study the potential benefits of allowing higher powers for 5G system throughput.[60] In some cases, however, higher power levels may make co-existence with satellite incumbents more difficult. AT&T believes that power limits in the mmW bands should strike a balance between the potential benefits of permitting higher powers with the complexities posed to co-existence. To this end, AT&T continues to work with the Satellite Industry Association ("SIA") to explore coexistence issues and examine possible power limits.

The record in this proceeding reveals support for creating a new category of user equipment with higher power limits than mobile devices but lower power limits than base stations.[61] Such an approach would be consistent with the variety of diverse use cases and equipment expected to proliferate in the 5G ecosystem. Use cases for this new category of user

---

58 *See id.*

59 *See, e.g.*, CTIA Comments at 2-30; Verizon Comments at 16.

60 *See* Nokia Comments at 26-27 (suggesting that higher power limits may improve the throughput performance for indoor user equipment where the system is path loss limited).

61 *See, e.g.*, Nokia Comments at 27; Comments of Ericsson, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 13 (Jan. 26, 2016) ("Ericsson Comments").

equipment could include, for example, customer premises equipment for wireless broadband and user equipment built into vehicles.[62]

B. 37 GHz Spectrum

Band Plan. The record makes clear that the Commission should not adopt a hybrid licensing scheme in the 37 GHz band.[63] The *NPRM's* complex hybrid proposal would impair service deployments, escalate interference challenges, and increase costs. With these challenges and uncertainties, commenters agree that adopting the hybrid approach would discourage investment in the 37 GHz band.[64]

Rather than experimenting with a hybrid licensing regime, the Commission should combine the 37 GHz band with the 39 GHz band and license the spectrum on a flexible-use basis.[65] The combined bands should be subject to the same technical and service rules, with licenses allocated in 200 MHz channels. Unifying the 37 GHz and 39 GHz bands presents a unique opportunity to unleash 3 GHz of contiguous spectrum for mobile uses. This is precisely the kind of spectrum access that will help make the mmW bands suitable for supporting 5G services. Further, such a large swath of contiguous spectrum would promote economies of scale and encourage innovation. The Commission should not squander this opportunity by isolating

---

62 *See* Samsung Comments at 19 (noting that Samsung is actively engaged in developing a proposed power level classification for customer premise equipment).

63 *See* Comments of T-Mobile at 12-13; Nokia Comments at 16-17; Verizon Comments at 7-8; CTIA Comments at 15-17; AT&T Comments at 15-16; NCTA Comments at 13-14.

64 *See, e.g.*, CTIA Comments at 17; NCTA Comments at 14; T-Mobile Comments at 12 ("[I]t would be very difficult for licensees to justify the investment in this band if indoor use was excluded").

65 *See* Nokia Comments at 16; Verizon Comments at 7; CTIA Comments at 16-17.

the 37 GHz band and implementing an untested licensing regime.[66] At most, the Commission should dedicate one 200 MHz channel nationwide to property owners' indoor use cases.

License Areas. As with the 28 GHz band, issuing county-based licenses in the combined 37/39 GHz band would be problematic. Aside from the administrative difficulties inherent in managing small, county-based licenses, issuing licenses on such a small scale will make it difficult for providers to secure licenses that match their current coverage footprints.[67] AT&T believes the Commission should consider licensing the combined bands by a larger geographic unit (*e.g.* PEAs). Such an approach strikes the appropriate balance between "facilitating access to spectrum by both large and small providers" and "promoting investment in and rapid deployment of new technologies."[68]

License Terms. To encourage investment and innovation in the combined 37/39 GHz band, the Commission should assign licenses with terms of at least ten years.[69] Developing the technology and deploying the infrastructure needed to leverage the mmW bands for mobile uses will require substantial capital investments.[70] Reasonably long initial license terms coupled with renewal expectancies will provide potential investors with sufficient certainty that they will be able to recoup their investments.

---

66 *See* Qualcomm Comments at 8 (noting that combining the bands would "be a much more effective way to realize . . . deployment efficiencies" in the mmW bands).

67 *See* T-Mobile Comments at 10.

68 *NPRM* ¶ 109.

69 5G standards-development has just begun. Depending how these processes unfold, it may be appropriate to consider extending initial license terms beyond ten years so that initial investments are not stranded.

70 *See* Verizon Comments at 10.

Performance Requirements. Performance requirements in these frequencies should be tailored to account for the unique attributes of the deployment paradigms that ultimately take hold in the band. As with the 28 GHz band, developing reasonable performance requirements will be challenging. In the beginning, it may be sensible to require licensees to simply submit a report detailing what its deployments are likely to look like. With a greater understanding of anticipated deployment models, the Commission would be better positioned to craft reasonable performance metrics that preserve operational flexibility.

Transmission Power Limits. For the same reasons AT&T generally supports the Commission's proposed power limits for the 28 GHz band, AT&T agrees that the proposals may be appropriate for the combined 37/39 GHz band.[71] While higher power limits may lead to some benefits for throughput performance, they may also complicate co-existence efforts with incumbents. Accordingly, AT&T believes further study is needed to determine whether the benefits of higher power limits outweigh the challenges to co-existence.

C. 39 GHz Spectrum

Band Plan. As AT&T and countless other commenters have explained, combining the 37 GHz and the 39 GHz bands and subjecting them to the same rules would be the best way to spark investment and innovation in the mmW spectrum.[72] With 3 GHz of contiguous spectrum, the Commission's licensing framework could support multiple licenses with bandwidths of 200 MHz or more, creating highly attractive licenses to support 5G deployments. Offering several licenses of this size would facilitate prompt deployment of new technologies and move the

---

71 *See NPRM* ¶¶ 274-75.

72 *See supra*, Part III.B.

development of 5G services forward. Further, with so much contiguous spectrum available, the Commission may consider allocating a portion of the combined band for unlicensed operations.

Incumbent Rights. Like the 28 GHz band, the Commission should allow incumbent LMDS licensees to use their licenses for mobile services. However, to ensure that spectrum is put to its best and highest use, the Commission should auction spectrum in the band that is not currently in use pursuant to competitive bidding procedures.[73] Incumbent operations should be retuned, where possible, to free additional spectrum for auction and facilitate productive spectrum use. This approach will ensure that the Commission reaches its goals of facilitating 5G services and promoting efficient coexistence between multiple technologies and uses.[74]

License Areas. The 39 GHz band is currently licensed by Economic Area ("EA"), with 14 paired blocks of 50 x 50 MHz channels.[75] With only 176 EAs covering the country, AT&T agrees that a smaller geographic licensing area unit may be appropriate. At the same time, the record makes clear that a county-based licensing approach would raise significant coordination issues for key 5G use cases. As a result, the Commission should strike a middle ground and assign licenses in this spectrum with a reasonably sized geographic area unit such as PEAs.

License Terms & Performance Requirements. AT&T believes that the 39 GHz band should be subject to the same license terms and performance requirements as the 37 GHz band. As discussed above, licensees would benefit from the certainty inherent in long initial license terms and renewal expectancies. This is particularly true where, as here, technology is still being developed to put the spectrum to use. For the same reason, performance requirements will need

---

73 *See supra*, Part III.A

74 *NRPM* ¶ 1-2.

75 *Id.* ¶ 35.

to prioritize operational flexibility, acknowledging the range of unique mmW deployments and technologies that may arise.

D. 64-71 GHz Spectrum

Band Plan. Although the NPRM proposes allocating all of the 64-71 GHz spectrum for unlicensed uses, the record reveals strong support for issuing exclusive use licenses in at least a portion of this spectrum.[76] In particular, the Commission should make the 64-66 GHz band available for unlicensed use and issue exclusive-use licenses in the 67-71 GHz band. This balanced approach would still reserve a sizable block of spectrum for unlicensed operations, particularly when combined with the existing unlicensed 57-64 GHz band. At the same time, licensing the 67-71 GHz band would be consistent with international efforts in the 66-76 GHz bands. Further, dedicating a portion of the 64-71 GHz band for licensed use will promote a common equipment scheme throughout the band, which in turn, may aid the development of the unlicensed band segment.[77]

License Areas & Performance Requirements. Generally, AT&T believes issuing county-based licenses will raise serious interference coordination challenges and create unnecessary administrative burdens. To the extent the Commission wishes to experiment with a county-based licensing approach, however, doing so in the 64-71 GHz band may be appropriate. Performance requirements, however, should not be imposed if the Commission pursues such an approach. Imposing performance requirements on a county basis would only multiply administrative burdens for both the Commission and licensees. Indeed, licenses may well hold hundreds of county-based authorizations, making build-out verifications difficult, if not impossible.

---

[76] *See, e.g.*, T-Mobile Comments at 14-15; CTIA Comments at 17-19; Nokia Comments at 17-18.

[77] *See* T-Mobile Comments at 14-15.

IV. CONCLUSION

AT&T applauds the Commission for proposing flexible use rules that would authorize certain mmW spectrum bands for important mobile uses. The Commission's successful spectrum policies have cemented the United States as the leader in 4G wireless technologies and services. To secure the nation's leadership role for the next generation of services, the Commission should adopt a regulatory framework consistent with the fundamental principles AT&T has outlined in this proceeding. By adhering to these core concepts and championing regulatory simplicity, the Commission will foster a stable regulatory environment that allows investment and innovation to flourish.

Respectfully submitted,

By: /s/ *William L. Roughton Jr.*
William L. Roughton, Jr.
Michael Goggin
Gary L. Phillips
David Lawson
1120 20th Street, N.W.
Suite 1000
Washington, DC 20036
(202) 457-2040
Counsel for AT&T Services, Inc.

Dated: February 26, 2016