

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of:)
)
Expanding Flexible Use In Mid-Band Spectrum) GN Docket No. 17-183
Between 3.7 and 24 GHz)
)

REPLY COMMENTS OF AT&T SERVICES, INC.

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AT&T Services, Inc., on behalf of the subsidiaries and affiliates of AT&T Inc. (collectively, “AT&T”), hereby submits the following reply to comments in response to the Federal Communications Commission’s (“Commission” or “FCC”) *Notice of Inquiry* (“Mid-Band NOI”) in the above-captioned proceeding.¹ AT&T broadly supports the need for allocating additional spectrum for licensed broadband mobile use and, as noted in our initial comments, we applaud the FCC for taking steps to ensure that additional spectrum is available to accommodate future demand. However, the record demonstrates that significant challenges remain to ensure that reallocation or sharing of spectrum in the candidate bands does not inhibit the important services that currently occupy those bands. Based on the lack of fully developed technical studies or assessments alleviating these concerns, AT&T believes it is necessary to undertake substantial record development, including additional analysis and modeling, before the FCC moves forward with a *Notice of Proposed Rulemaking* in this proceeding.

¹ *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183, Notice of Inquiry, 32 FCC Rcd 6373 (2017) (*Mid-Band NOI*).

I. INTRODUCTION AND SUMMARY

AT&T historically has supported new and innovative uses of spectrum and, in particular, the allocation of sufficient spectrum resources to meet explosive consumer demand for mobile broadband services. This support, however, has been contingent upon the completion of rigorous investigation, exploration, and analysis, as well as the presentation of well-formed proposals on reallocating or sharing that protect any incumbent users. While AT&T continues to believe that certain segments of the mid-band hold potential for reallocation to licensed broadband services, as the record currently stands, there is a lack of evidence on reallocation or compatibility that would support moving forward to the next stage of this proceeding.

AT&T agrees with Cisco's observation that "the first step in considering whether to open the band to [a new use] is to determine the incumbent emissions environment, and project how new transmitters could be introduced without harming those with superior spectrum rights. That engineering analysis and modeling must come first in order to engage the core of the debate."² Although Cisco made the statement in reference to introducing unlicensed devices into the 6 GHz band, this principle is equally applicable to any reallocation where new entrants seek to occupy spectrum being used by incumbents. Indeed, Cisco is not alone in this view—other parties also recognize the importance that thorough engineering analyses and mitigation proposals play in enabling the FCC to ensure that new operations in the proposed bands do not cause harmful interference or other interruption to incumbent services.³

² See Comments of Cisco Systems, Inc., at 2 (Cisco Comments).

³ See, e.g., Comments of Comsearch at 5; Comments of the Mid-Band Spectrum Coalition at 4, 14; Comments of NCTA – The Internet and Television Association at 4 (NCTA Comments); Comments of Nokia at 3, 16 (Nokia Comments); Comments of the Satellite Industry Association, at 34-35 (SIA Comments).

Some of these parties encouraged the FCC to solicit such information through the NPRM process. AT&T believes, however, that it is vital for this work to be undertaken sooner and in an NOI setting in order to ensure that any proposals outlined in an NPRM are fully developed, workable, and based on concrete evidence. AT&T, for its part, has attempted to characterize the requirements and interference resilience of the systems it uses in both the C-Band and in the 6 GHz bands, but there has been no actual interference analyses to suggest the compatibility of new services with existing uses. Instead, many parties have offered blithe suggestions of compatibility that fail to form a sufficient basis for the FCC to develop the rules and requirements necessary to initiate a rulemaking proceeding. As Cisco recognizes, the burden of proof should fall on proponents of flexible uses to advance mechanisms to implement their desired outcomes.⁴

AT&T's initial comments cautioned that reallocation or sharing of the candidate bands faced significant challenges, including preserving incumbents' ability to leverage the technical characteristics unique to these bands and the fact that these bands are densely populated and serve important societal purposes. Though the NOI process has already provided a great deal of important information regarding the particular uses of certain bands, the record demonstrates that additional research is warranted into, for example, the number of users of each type that require accommodation. Only then will it be feasible to begin considering if—and how—new users could be accommodated within a framework that holds incumbents harmless in the process.

⁴ Cisco Comments at 2.

II. ALTHOUGH SEVERAL KEY COMMUNICATIONS SYSTEMS OPERATE IN THE 3.7-4.2 GHZ BAND, FLEXIBLE LICENSED USE IN THIS BAND WARRANTS CONSIDERATION VIA FURTHER RECORD DEVELOPMENT

The *Mid-Band NOI* recognized a number of existing uses of spectrum in the 3.7-4.2 GHz band, including provision of Fixed Satellite Service (FSS) broadband Internet service to consumers and television programming to cable headends; Broadcasting-Satellite Service (BSS) television programming to over 30 million households; and terrestrial Fixed Service (FS) point-to-point microwave links used for a variety of purposes.⁵ As AT&T discusses below, the record demonstrates that systems utilizing this spectrum would be potentially harmed by the flexible reallocation of this spectrum and such users, in fact, may be unable to operate if reallocated to alternative bands. Even still, however, AT&T believes that flexible uses in the C-Band may be acceptable as long as the FCC and proponents comprehensively address the significant issues that remain.

A. The 3.7-4.2 GHz Band Provides Unique Services That Are Critical To Several Industries

As the FCC observed, a number of critical services currently operate in the 3.7-4.2 GHz band, including public safety communications, on-board plane and ship communications, and networks coordinating railroad movements, regulation of electric grids, and control of natural gas and oil pipelines.⁶ There are, however, other uses of the C-Band that are equally vital for the public and for which continued, unimpeded operation is essential.

As AT&T and others document, services in the C-Band spectrum play a vital role in restoring communications to areas affected by natural disasters, particularly where infrastructure has been damaged or destroyed and is inoperable. The recent hurricanes in the Gulf Coast and

⁵ *Mid-Band NOI*, 32 FCC Rcd at 6376, para. 8.

⁶ *Id.*

Caribbean demonstrate that timely and reliable communications during natural disasters are vital to ensuring the safety of residents in these areas. As the Satellite Industry Association notes, “C-band capacity is already in use to re-establish connectivity in Puerto Rico and other islands in the Caribbean affected by hurricanes Irma and Maria, and discussions are under way to expand C-band recovery service to the U.S. Virgin Islands.”⁷ Public safety officers and government officials also rely on the C-Band to provide lines of communications into the affected areas in order to facilitate clean up and rebuilding efforts. AT&T’s disaster response teams utilize C-Band systems in order to facilitate this restoration work, as the low cost and generally ample capacity in the band is crucial to bringing communications back on-line expeditiously.⁸

In addition to restoring services during and after natural disasters, the C-Band provides critical backup restoration in the event of transponder loss or damage. For example, SES explains that its services in the C-Band are used to “satisfy customer demand for service reliability and continuity” and that, under certain arrangements, the company “is obligated to immediately make available restoration capacity in the event of an outage affecting the customer’s primary transponder or satellite.”⁹ Additionally, SIA observes that “in the event of an outage affecting the primary transponder or satellite, [content providers] are guaranteed replacement capacity on another transponder or spacecraft.”¹⁰

C-Band services also play a vital role in ensuring connectivity in extremely rural locations, such as Alaska. GCI echoed AT&T in noting that the C-Band is particularly critical for

⁷ SIA Comments at 13.

⁸ However, as noted in Section C, C-Band capacity currently is exhausted for Puerto Rico given massive restoration efforts underway.

⁹ Comments of SES Americom, Inc. at 3-4 (SES Comments).

¹⁰ SIA Comments at 26-28.

operators in Alaska that “face significant and unique challenges in providing telecommunications services to the state, including limited satellite coverage, increasing capacity, and interference issues.”¹¹ GCI explains that it uses 3.7 GHz spectrum to deliver “critical and important services via 2G and LTE-over-Satellite data services, among other technologies that GCI uses to provide services to its customers via the C-Band” that “could result in life-threatening situations” if interrupted.¹² AT&T similarly uses C-Band spectrum to deliver basic PSTN telecommunications for remote villages in Alaska, which often is the only communications infrastructure available to the local communities. Finally, C-Band services provide crucial connections not only for consumer services in Alaska, but also for critical “missile warning, space surveillance, space control, and satellite command and control” capabilities.¹³

The C-Band also plays an important role in content distribution. As ACA describes, “the C-band is the only method by which [many ACA members] receive cable programming, as alternative conduits are unavailable, inadequate or inefficient and would have to be paid for by the cable operators themselves, burdening further the finances of rural businesses counting every penny to make ends meet. Thus, lessening the primary protection of satellite operations across the band would have a hugely disruptive impact on the video programming distribution industry.”¹⁴ The Content Companies explain that the C-Band “literally forms the backbone of the entire infrastructure for delivering all premium video content to American consumers, regardless of whether they ultimately view programming over-the-air via broadcast stations or

¹¹ Comments of General Communication, Inc. at 6 (GCI Comments).

¹² *Id.*

¹³ SIA Comments at 10.

¹⁴ Comments of the American Cable Association at 2 (ACA Comments).

via a subscription to a cable, telco, satellite, or over-the-top television service.”¹⁵ Thus, any failure of or interference to these services caused by new uses in the band would deprive consumers of “access to the most important news, the most popular entertainment, and the most exciting live sports programs—no matter what technology the consumer uses to access video.”¹⁶

B. The Technical Characteristics of the 3.7-4.2 GHz Cannot Be Replicated Through Alternative Media or Alternative Bands

AT&T notes that there are certain technical characteristics unique to the C-Band that may make reallocation of the important services located in the band impractical or impossible. Both the FCC and commenters observe a number of technical characteristics that make the C-Band ideal for providing the type of services highlighted above.

The FCC has recognized that C-Band spectrum “propagation characteristics allow for greater service reliability compared to other bands, especially in adverse weather conditions.”¹⁷ GCI notes that it invested “significant resources . . . in developing and deploying its FSS services over this band” in large part because of these characteristics and the “continued access to this spectrum.”¹⁸ Even proponents of new use in the C-Band acknowledge that its propagation characteristics make it well-suited to deliver certain services.¹⁹ Because of these propagation

¹⁵ Comments of the Content Companies at 2-3.

¹⁶ *Id.*

¹⁷ *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959, 4047, para. 292 (2015).

¹⁸ GCI Comments at 3-4.

¹⁹ Comments of CompTIA at 2; Comments of CTIA at 6; Comments of the GSM Association at 4; Comments of Huawei Technologies Co., Ltd. at 8; Joint Comments of Intelsat License LLC and Intel Corporation at 12 (Intelsat/Intel Joint Comments); Nokia Comments at 4; Comments of Qualcomm Incorporated at 4 (Qualcomm Comments); Comments of Verizon at 14, 20 (Verizon Comments).

characteristics, the National Spectrum Management Association explains that it would be necessary to move incumbent users “to frequencies with comparable propagation characteristics to their current allocations” but that there “appears to be insufficient FCC spectrum available for such a relocation.”²⁰ Verizon too acknowledges that relocation of services in the C-Band will be challenging because “viable bands will be limited based on required link distances and propagation losses.”²¹

Because of these propagation characteristics, C-Band spectrum can be used to deliver services to a wide range of areas. For example, C-Band spectrum can be used to transmit and receive signals to any point in the United States, making it easier for rural providers to serve their customers in areas terrestrial systems may not be reach. ACA underscores this point by stating that any “reduction in interference protection . . . would completely vitiate the competitive choices that programmers have today for delivering their programming to headends.”²² The propagation characteristics of the C-Band also make it resistant to signal fade due to weather phenomena such as fog, particles, or rain. This is particularly important for cable and IP video transmission, since signal quality and uptime are critical issues. As the Fixed Wireless Coalition states, “[s]pectrum is not fungible. The physics of radio waves dictate that long links must use low frequencies. Higher frequencies experience greater free-space attenuation; frequencies above about 10 GHz see additional attenuation from ‘rain fade.’”²³

²⁰ Comments of the National Spectrum Management Association at 9-10 (NSMA Comments).

²¹ Verizon Comments at 20.

²² ACA Comments at 2-3.

²³ Comments of the Fixed Wireless Coalition at 3 (FWC Comments).

C. While Opportunities for Flexible Use and Minimizing the Impact of Some C-Band Operations Exist, Some Significant Issues Must Be Addressed

Though many important services operate in the C-Band, AT&T agrees with the FCC that additional, flexible uses may be possible in this band. AT&T believes, however, that further data is needed in order to address the potential impact of any such uses on incumbents operating in the 3.7 to 4.2 GHz band.

As AT&T and other commenters note, there are significant issues with the FCC's current registration database for the C-Band. For example, there are many non-operational earth stations in the C-Band that are registered, but no longer warrant interference protection.²⁴ At the same time, however, commenters also demonstrate that a number of unregistered, but fully operational, TV Receive-Only (TVRO) stations are in use in the C-Band.²⁵ Similarly, there are transceivers protected on a "full band, full arc" basis that do not require such protection, but as AT&T and others have pointed out, many other transceivers do require the flexibility to repoint or retune regularly that the FCC's policy affords.²⁶ AT&T therefore reiterates its call for the FCC to audit the C-Band registration database by considering the following actions:

- Announcing that the Commission will be conducting a "refresh" of the C-Band database and allowing a period of time for operators who previously did not register to do so;

²⁴ Commissioner O'Rielly underscores the issue with the current FCC database by acknowledging that "a good number of earth stations are only on paper. Perhaps, as many as thirty percent simply don't exist or are no longer functional." See Commissioner Michael O'Rielly, *A Mid-band Spectrum Win in the Making*, FCC BLOG (July 10, 2017, 2:30 PM), <https://www.fcc.gov/news-events/blog/2017/07/10/mid-band-spectrum-win-making>.

²⁵ Comments of the Eternal Word Television Network at 2-3; Comments of the National Association of Broadcasters at 2-3; NCTA Comments at 3; Comments of the North American Broadcasters Network at 2-3.

²⁶ GCI Comments at 3-4

- Confirming that the active registrations in the database are current and correct, including requiring confirmation from registrants that their earth stations remain operational and are identified by accurate coordinates;
- Notifying all C-Band registrants of their obligation to cancel earth station registrations that are no longer used, while providing an amnesty period for licensees to update such records and allow the registrations to be removed from the database;
- Collecting additional operational data from C-Band earth station licensees—including the last time their earth stations were operational, the amount of bandwidth used, and the satellites with which they have communicated in the past license term—to ensure that registrations in the database are active and fully in use; and
- Requiring licensees to justify continued protection on a “full band, full arc” basis by, for example, indicating how often their antenna has been repointed, either within a specific time period or over its lifetime, and reporting the portion of the 500 MHz band they have used within a specified time period.

These measures would make the C-Band registration database a comprehensive, reliable source of information detailing use of the band. As Motorola Solutions suggests, there might be some potential to use methods developed in the 3.55-3.7 GHz band to prevent interference and protect incumbent users; however, as Motorola Solutions observes, a necessary part of these methods is an active registration database that is up-to-date, accurate, and “fully tak[es] into account antenna patterns, pointing angles, and receiver filter responses in aggregate interference computations.”²⁷

Rather than adopt a one-size-fits-all approach, any potential solution for flexible use of the C-Band must recognize the realities of incumbent operators in the band. Consequently, the FCC must update the C-Band registration database before moving forward with any potential rule proposals. As iHeartMedia observes, “[w]ithout a current, accurate assessment of the widespread, but unregistered, use of the 3.7-4.2 GHz band, any decisions by the Commission as to the feasibility of additional uses of this spectrum will risk serious disruption to the country’s

²⁷ Comments of Motorola Solutions Inc. at 2 (MSI Comments).

communications infrastructure, and the information, entertainment and sports programming relied upon by the public.”²⁸

AT&T further agrees that there may be opportunities to enhance the potential for flexible use, such as relocating C-Band receivers to rural locations and using fiber optic transmission. In keeping with the FCC’s general policies that require new licensees to fund incumbent relocation, however, AT&T does not believe a suitable mechanism has been proposed to compensate incumbents in order to maximize the utility of the band. For example, ACA observes that many of its rural members do not have access via fiber to a transit provider, and that the “cost of deploying fiber to a headend from the nearest transit provider could easily run to millions of dollars . . . depending on the distance and the terrain that the fiber would have to traverse.”²⁹

If the FCC allows flexible deployment in the 3.7-4.2 GHz band, the agency should also address accommodation of highly important temporary facilities for restoration needs, like cells on wheels (COWs) or cells on light trucks (COLTs). Carriers like AT&T have used such facilities, which are interconnected with its network using C-Band spectrum, to provide communications in areas recently affected by hurricanes, such as Puerto Rico, where the overwhelming restoration demands quickly exhausted available C-Band capacity. At a minimum, flexible use would have to give way in the event of temporary fixed usage such as these facilities or some spectrum must be set aside and dedicated for these purposes. To the extent that commenters advocate for moving these services out of the C-Band, AT&T believes the burden should be on those parties to provide evidence of suitable capacity in other bands to accommodate these services.

²⁸ Comments of iHeartMedia + Entertainment at 4.

²⁹ ACA Comments at 16.

D. To the Extent that Some Licensed Operations Can Seemingly Be Accommodated in the 3.7-4.2 GHz Band, the FCC Has Transition Mechanisms Designed To Facilitate Rapid New Entry While Preserving Incumbent Rights

AT&T's view that sharing potential exists in the C-Band has been echoed by Intelsat and Intel in their comments. Particularly, Intelsat and Intel suggest that the FCC should encourage a private solution under which FSS satellite operators, in conjunction with potential terrestrial mobile users, would develop a "centralized clearing mechanism" to consolidate satellite operations in the C-Band, freeing up spectrum and alleviating any interference concerns.³⁰ As part of this approach, the FCC would amend the Table of Allocation to clarify "that the terrestrial mobile C-Band operations would be contingent upon a showing that the applicant had coordinated with primarily affected satellite operators."³¹

Though this may be a workable solution, other commenters worry that introducing "co-frequency, co-coverage terrestrial options poses significant challenges, particularly in the downlink band."³² The FCC also has several proven mechanisms for transitioning use of spectrum, including both incentive auctions and conventional auctions coupled with relocation requirements, which have also been supported by commenters. For example, Ericsson proposes that "an overlay auction could be conducted where winning bidders compensate fixed incumbents to move out of the band."³³

Given these other concerns and potential options, there is some question as to whether pursuing a private solution as suggested by Intel and Intelsat has significant benefits over

³⁰ Intelsat/Intel Joint Comments at 6.

³¹ *Id.* at 7.

³² SES Comments at 2

³³ Comments of Ericsson at 10.

existing regulatory mechanisms. Regardless of whether any re-banding is undertaken as a government or private initiative, however, it is clear that a necessary precondition of such action is addressing the continued needs and protection rights of incumbents.

III. THERE IS NO TECHNICAL EVIDENCE IN THE RECORD SUPPORTING THE ABILITY OF UNLICENSED TECHNOLOGIES TO SHARE WITH EXISTING FIXED MICROWAVE USES IN THE 6 GHZ BANDS

The *Mid-Band NOI* observes that the 5.925-6.425 GHz band is heavily used for FS, with more than 27,000 licenses issued for point-to-point operations in the band, while operations in the 6.425-7.125 GHz band consists of over 23,000 licenses providing FS, FSS and Mobile Service.³⁴ Additionally, the *Mid-Band NOI* recognizes that the bands support a number of critical services, including public safety backhaul for police and fire dispatch, coordination of railroad movements, control of natural gas and oil pipelines, regulation of electric grids, and backhaul for commercial wireless traffic.³⁵ Because incumbent users rely heavily on this band to provide these critical services, AT&T and numerous other commenters are concerned with the lack of record evidence suggesting that new unlicensed uses would be able to coexist with existing microwave services.

A. The Record Shows that Critical Facilities and Services Are Supported by the 6 GHz Microwave Bands

At the outset, AT&T notes that an overwhelming number of commenters object to using the 6 GHz band for unlicensed services due to the potential interference those uses would cause for integral public safety and critical infrastructure operations. Both the National Public Safety Telecommunications Council (NPSTC) and the Association of Public Safety Communications Officials International (APCO) echo AT&T's concerns over interference with essential fixed

³⁴ *Mid-Band NOI*, 32 FCC Rcd at 6381-82, para. 25, 6384-85, paras. 32-35.

³⁵ *Id.*

microwave links for public safety and other critical operations. Specifically, NPSTC observes that it would be difficult for proponents of spectrum sharing to guarantee that “no impact” to the reliability of critical fixed microwave links would occur, and that if any potential interference is underestimated “catastrophic results could occur for public safety and the public it serves.”³⁶ Moreover, APCO contends that allowing wireless broadband use in the 6 GHz band “could be detrimental to public safety communications” and that “any spectrum sharing or interference protection techniques for use in public safety bands must undergo substantial testing and be proven effective in advance.”³⁷

Other commenters also express concern about the potential interference with public safety operations. For example, the City of Mesa, Arizona explains that it was “unconvinced interference mitigation technologies are reliable enough to avoid interference that could have potentially catastrophic results to citizens and First Responders” and thus requests that the FCC not allow flexible uses in the 6 GHz band “until independent laboratory and field trial testing can be performed.”³⁸ Similarly, other localities joined with the Government Wireless Technology & Communications Association to oppose “any ‘sharing’ of the 6 GHz band in which their microwave links exist” because “[i]ncreasing the opportunities for mobile interference within the band is an unnecessarily high risk.”³⁹ Finally, both Globalstar and Verizon express concern that introducing mobile broadband users into the 5.925-6.425 GHz band would cause

³⁶ Comments of the National Public Safety Telecommunications Council at 6-7.

³⁷ Comments of APCO International at 3.

³⁸ City of Mesa Comments on Flexible Use of 5925-6425 MHz and 6425-7125 MHz bands at 2.

³⁹ Comments of Los Angeles County, California; the City and County of Denver, Colorado; the City of Kansas City, Missouri; Ozaukee County, Wisconsin; and the Government Wireless Technology & Communications Association at 4.

interference with their existing services that are provided to public safety personnel and first responders.⁴⁰

In addition to public safety, commenters worry about the potential for interference with critical infrastructure operations, such as the provision of energy and electricity. As Duke Energy observes, the 6 GHz band “is the only remaining band available to utilities that provides the propagation needed to communicate over long distances from point to point.”⁴¹ Because “Smart Grid and other modernization efforts are driving the need for more bandwidth,” Duke has invested significantly in microwave communications systems, and any relocation to accommodate new users in the band would necessarily be borne by Duke’s ratepayers.⁴² Southern Company similarly states that sharing between mobile devices and point-to-point microwave would be problematic, as “mobile operations create a dynamically changing spectrum environment, and thus are incompatible with fixed operations, absent special technical and/or operational requirements on the mobile systems.”⁴³

Lower Colorado River Authority (LCRA) also expresses significant concern about “the potential for risk of harmful interference to existing point-to-point operations,” given that “utilities simply cannot risk interference to their systems.”⁴⁴ Likewise, Tucson Electric Power Company strongly opposes expansion of the 6 GHz band for any additional uses that would “directly threaten TEP’s ability to effectively communicate throughout its service area” and

⁴⁰ Comments of Globalstar Inc. at 12-13; Verizon Comments at 21-22.

⁴¹ Comments of Duke Energy at 4.

⁴² *Id.* at 4-5.

⁴³ Comments of Southern Company Services, Inc. at 4-7.

⁴⁴ Comments of Lower Colorado River Authority at 4.

prevent the company from “reliably provid[ing] electric service.”⁴⁵ Finally, the Utilities Technology Council and the Edison Electric Institute jointly comment that utilities will need to expand capacity in the 6 GHz bands “in order to support increasing demand from smart grid and other applications,” and that “congestion and interference from new entrants would make it more difficult for utilities to increase the capacity of their existing systems.”⁴⁶

Additionally, as AT&T and other commenters note, the 6 GHz microwave bands are essential components of telecommunications networks, and wireless networks in particular, and reliance on these bands will continue to increase with the introduction of 5G and continued network densification.⁴⁷ As CenturyLink explains, relocating services currently using the 6 GHz band to a higher frequency would involve “significant additional cost for additional infrastructure (towers, additional antennas and radios, and supporting plant including power supply and protective shelters for equipment), property agreements (tower land leases and access road easements), regulatory filings (additional tower structure registrations and antenna licenses), spectrum coordination, and maintenance.”⁴⁸ Moreover, as NSMA observes, “[d]igital point-to-point microwave systems used for telecommunications are often engineered for extremely low outages” that “requires significant investment in the equipment, using redundant hardware, large antennas, high performance filters, high powered transmitters and often tall towers.”⁴⁹ Thus, any

⁴⁵ Comments of Tucson Electric Power Company at 4.

⁴⁶ Comments of the Utilities Technology Council and Edison Electric Institute at 6-12.

⁴⁷ Comments of CenturyLink at 2-3 (CenturyLink Comments);

⁴⁸ CenturyLink Comments at 2-3.

⁴⁹ NSMA Comments at 12.

[l]oss of quality of these networks would seriously impact the safety and quality of life of many American citizens.”⁵⁰

As the record demonstrates, there are significant concerns regarding the FCC’s proposal to share use of the 6 GHz microwave bands. Of primary importance are the interference issues that could potentially delay or otherwise inhibit the critically important services that currently operate in the bands. Additionally, as a number of commenters note, use of the 6 GHz bands will only continue to increase in the near future, as more bandwidth is used to support new and innovative delivery of critical services. The combination of potential interference with increased exhaustion of capacity creates a situation where the FCC will likely have to look elsewhere.

B. AT&T and other Commenters Have Documented that 6 GHz Microwave Systems Cannot Identify, Tolerate, or Remediate Interference from Unlicensed Sources

AT&T previously explained that the technical aspects of providing point-to-point microwave services make it extremely susceptible to interference. Because point-to-point microwave paths typically use very high gain antennas oriented at horizontal, or near horizontal elevations, the area within the boresight of the antenna is typically very large. As a result, the surface area where potential interferers may be located covers many square miles.⁵¹ Any mobile operation within the reception area of the microwave receiver likely will cause interference to the microwave system.

⁵⁰ *Id.* at 5.

⁵¹ When coordinating microwave links in the 6 GHz band, interference potential is assessed at distances up to 125 in all directions and 250 miles in the main beam. *See* Coordination Contours For Terrestrial Microwave Systems, National Spectrum Managers Association, Recommendation WG 3.90.026 (Apr. 1992); available at: <http://nsma.org/wp-content/uploads/2016/05/WG3.90.026.pdf> (last visited Nov. 15, 2017).

Moreover, as NSMA observes, point-to-point microwave systems are often engineered for extremely low outages, so any interference caused by the addition of new services into the 6 GHz bands would undoubtedly hinder this reliability.⁵² Generally, fixed service microwave operations are unable to monitor links for interference, but even if any interference were to be detected, there would be no way to locate or identify the interfering mobile station in order to stop the interference from occurring.⁵³ Moreover, service would be degraded because “the effects of short-term interference are not distinguishable from fading,” so “even if adaptive modulation is employed, the link will reduce the complexity of its modulation, thus restricting maximum traffic flow.”⁵⁴ Finally, NSMA observes that “[m]icrowave systems are most vulnerable to interference when the signal is faded to just above the receiver threshold due to propagation anomalies” but that “interference occurring when the signal is faded is much more likely to cause errors and can substantially affect availability.”⁵⁵

C. Repeated Assertions that Unlicensed Technologies Can Co-Exist with Narrow Beam Fixed Services Is No Substitute for Technical Analysis

Many proponents of freeing the 6 GHz bands for unlicensed use simply assert that unlicensed devices will be able to operate in these bands with little to no interference issues for incumbent users, or provide suggestions for co-existence that have no technical underpinnings. These commenters fail to provide the requisite substantive, technical analysis to demonstrate how this purported symbiotic relationship would actually succeed. In particular, there has been absolutely no data entered into the record addressing the impact of an unlicensed device on a

⁵² NSMA Comments at 12.

⁵³ *Id.* at 10-11.

⁵⁴ *Id.* at 11.

⁵⁵ *Id.*

microwave link, much less the impact of multiple interferers on microwave systems in the band and how aggregate interference could be controlled by even a database-driven sharing mechanism.

For example, Qualcomm contends that “opening the band to unlicensed access does not require any undue restrictions on incumbent operations.”⁵⁶ Despite recognizing that “the type and amount of incumbent use across the 5.925-7.125 GHz band is not uniform,” Qualcomm states that it is an incumbent provider’s responsibility to “ensure the information in the FCC’s ULS database is and remains accurate” in order to guarantee its protection.⁵⁷ Qualcomm’s assertions ignore the many technical issues described above, as well as the fact that new entrants are responsible for ensuring that incumbents are protected from interference, not vice versa.

The Dynamic Spectrum Alliance further claims that the FCC’s Part 15 rules are sufficient to allow unlicensed technologies to share spectrum with incumbents.⁵⁸ Other than an assertion that unlicensed services will comply with these rules, however, DSA offers no technical evidence as to *how* unlicensed services will comply. DSA provides some cursory recognition of the technical aspects of fixed point-to-point services and the fact that incumbents have had to develop coordination systems, but offers nothing more than general assertions that unlicensed services “can fit in the gaps left by P2P operations.”⁵⁹

Motorola Solutions supports “database-driven (SAS) controlled general authorized access to the bands” and notes that public safety and critical infrastructure “users should be granted automatic registration in protection databases, and must have a means to rapidly report and

⁵⁶ Qualcomm Comments at 8.

⁵⁷ *Id.* at 9.

⁵⁸ Comments of the Dynamic Spectrum Alliance at 14.

⁵⁹ *Id.* at 16-18.

resolve interference within minutes.”⁶⁰ Motorola Solution’s proposal, however, lacks detail as to how incumbent users in the band would be able to resolve any interference issues. Similarly, the Bluetooth Special Interest Group believes “that technical rules can be developed to protect the primary licensed users” of the 6 GHz bands, but proposes no solutions and offers no technical analysis to support this claim.⁶¹

Finally, T-Mobile declares that “the Commission should ensure that there is a firm technical foundation on which to conclude that unlicensed operations will not cause harmful interference to primary operations and should adopt appropriate technical and operational limits to protect the significant number of incumbent users and primary operations in the band.”⁶² T-Mobile provides no technical evidence for the FCC to determine this question, however.

D. To the Extent Capacity Exists In the 7.125-8.4 GHz Bands, a Viable Solution May Be to Reallocate Users in those Bands to the 6 GHz Microwave Bands, Rather than Vice-Versa

AT&T has observed that other mid-band spectrum not identified in the *Mid-Band NOI* may be suitable for the types of flexible uses contemplated by the Commission. For example, there appear to be some sub-bands between 7.125-8.4 GHz with uses that are comparable to the types of uses within the 6 GHz microwave bands. Additionally, though this band currently is allocated for shared Federal/non-Federal uses, there are far fewer licensees in this band than in the 6 GHz microwave bands.

⁶⁰ MSI Comments at 3-4.

⁶¹ Comments of the Bluetooth Special Interest Group, Inc. at 2.

⁶² Comments of T-Mobile at 17 (T-Mobile Comments).

T-Mobile suggests that the FCC examine this band to determine whether it is suitable for reallocating C-Band licensees.⁶³ AT&T, however, believes a more practical and financially viable approach may be to reallocate compatible 7.125-8.4 GHz band users to the upper 6 GHz microwave band. This would free up additional mid-band spectrum for the same type of flexible use the Commission currently is considering for the other bands, without having to disturb the over 50,000 licensees issued for operations in the 6 GHz bands.

IV. THERE IS NO RECORD BASIS FOR MODIFYING THE EXISTING RULES GOVERNING FLEXIBLE USE OF THE 12.2-12.7 GHZ BANDS

Though the FCC did not specifically designate the 12.2-12.7 GHz band for comment in this proceeding, some commenters raised the band for potential consideration. AT&T notes that this band is the subject of a pending petition for rulemaking on which the FCC has not yet acted.⁶⁴ AT&T continues to believe that this band is not suitable for flexible use, as the FCC's well-established rules for the band allow only specific uses in order to protect incumbent licensees.

A. The Commission already has adopted regulations permitting broad, flexible use of 12.2-12.7 GHz band consistent with protecting existing operations in the band

The FCC established rules for the 12.2-12.7 GHz band over 15 years ago in order to allow MVDDS providers to share the band with NGSO FSS operators on a co-primary basis, and with incumbent Broadcast Satellite Service (BSS) providers on a non-harmful interference basis.⁶⁵ The FCC later imposed power limits on MVDDS operations, basing its decision in part

⁶³ *Id.* at 3.

⁶⁴ See Petition of MVDDS 5G Coalition for Rulemaking, RM-11768 (filed April 26, 2016).

⁶⁵ See *Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, First Report and Order and Further Notice of Proposed Rulemaking, 16 FCC Rcd 4096 (2000).

on Congressionally-mandated research finding that interference with Direct Broadcasting Satellite (DBS) service downlinks could be avoided as long as MVDDS operated within certain limits.⁶⁶ The FCC also prohibited mobile and aeronautical operations, reasoning that “DBS would receive interference and the NGSO FSS allocation would be complicated by permitting” such operations in this band.⁶⁷

Any changes to the specific rules and limitations established by the FCC to allow for terrestrial mobile services would unnecessarily put a large number of DBS customers at risk of receiving degraded services. As the FCC observed in 2002, allowing the provision of two-way services in the band “would unnecessarily complicate the sharing scenario” and “significantly raise the potential for instances of interference among the operations.”⁶⁸ That reasoning continues to hold true today, as the physical properties of the band have not changed. AT&T further notes that MVDDS licensees have well-defined parameters under which they can operate; to the extent that no real deployments have occurred, this is because licensees have not been able to ensure the protection of DBS customers.

B. The MVDDS Coalition has shown no new evidence suggesting that watershed technical changes have occurred that would warrant revisiting the technical sharing criteria that exist

The MVDDS Coalition argues that “there is no justification to maintain the onerous and byzantine set of restrictions on antenna locations and transmitter power levels that continue to govern terrestrial services in the 12 GHz Band.”⁶⁹ AT&T notes, however, that the Coalition has

⁶⁶ *Multichannel Video Distribution and Data Service*, Memorandum Opinion and Order and Second Report and Order, 17 FCC Rcd 9614, 9691-92, para. 198 (2002).

⁶⁷ *Id.* at 9668, para. 136.

⁶⁸ *Id.* at 9668, para. 137.

⁶⁹ Comments of the MVDDS 5G Coalition at 3 (MVDDS Comments).

not presented any evidence that would support amending the rules established by the FCC to protect incumbent DBS users.

The Coalition's petition for rulemaking on this issue relied on a "Coexistence Study" to provide evidence that MVDDS and DBS licenses could share the 12.2-12.7 GHz band without harmful interference to DBS.⁷⁰ The Coalition relies on this same study in this proceeding.⁷¹ As AT&T previously explained, the study examined three very specific scenarios that fail to provide a full and clear picture as to how MVDDS two-way services would operate across the band.⁷² Even within these discrete, controlled scenarios, the study showed areas of potential interference.⁷³ Further, the study included some erroneous baseline assumptions that may have affected its outcome, so it is possible that even more interference may occur than the study suggests.⁷⁴

AT&T does not support revisiting the current FCC rules and believes that mobile use in the 12.2-12.7 GHz band is antithetical to the scheme developed by the FCC in order to protect DBS users. To the extent an MVDDS licensee seeks to utilize a new technology in the band or provide a service that does not comply with the existing rules, it may pursue a waiver with the FCC supported by an independent technical analysis.⁷⁵

⁷⁰ See Petition of MVDDS 5G Coalition for Rulemaking, RM-11768 (filed April 26, 2016).

⁷¹ MVDDS Comments at 7-8.

⁷² Reply Statement of AT&T Opposing Petition for Rulemaking, RM-11768, at 1-2 (filed June 23, 2016).

⁷³ *Id.* at 2.

⁷⁴ *Id.*

⁷⁵ *Id.* at 2-3.

V. THE FCC SHOULD CONTINUE TO WORK WITH NTIA AND OTHER INCUMBENTS TO INCREASE FLEXIBLE USE IN OTHER BANDS BELOW 24 GHZ

There are a number of mid-band spectrum sub-bands currently allocated for either Federal use or shared Federal and non-Federal use that may be suitable for flexible use. Combined efforts between the FCC and NTIA to identify additional bands that may be suitable to be transferred for use by non-government entities, or, at the very least, shared use with non-government entities ultimately will be beneficial to consumers. As AT&T previously identified, over 70 percent of mid-band spectrum is allocated either exclusively to Federal use or shared between Federal and non-Federal uses. AT&T encourages the FCC to work together with NTIA to determine the types of uses and users in these bands and whether this spectrum could support additional uses without causing interference to those already existing systems.

For example, the FCC should consider mid-band spectrum not specifically identified in the *Mid-Band NOI* that may be suitable for flexible use. As described above, the spectrum at 7.125-8.4 GHz appears to have some sub-bands with uses that are comparable to the types of uses within the 6 GHz microwave bands. The FCC may want to consider whether it is more feasible to consider introducing licensed or unlicensed mobile broadband technologies into those bands as an alternative to the 6 GHz microwave bands.

VI. CONCLUSION

AT&T understands, and the record here clearly demonstrates, that there is overwhelming interest in opening up alternative sources of spectrum to accommodate new and dynamic services. AT&T historically has supported attempts to satisfy this continuing hunger for new spectrum, but cautions the FCC against running headlong into a decision in this proceeding simply because of this demand. As in past proceedings, before proposing rules for new uses of this spectrum, the FCC must carefully consider whether the mid-band spectrum identified here is

the most suitable for new, flexible uses by undertaking or soliciting thorough, independent technical studies and analyses to ensure that incumbent users in these bands are not harmed.

Respectfully submitted,

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