

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

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

REPLY COMMENTS OF CTIA

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CTIA submits these reply comments in response to the Commission’s *Mid-Band NOI* examining new opportunities in spectrum bands between 3.7 and 24 GHz (“mid-band spectrum”) for flexible-use wireless services.¹

I. INTRODUCTION AND SUMMARY.

The initial comments in this proceeding offer two fundamental – and not necessarily inconsistent – themes. First, commenters agree that mid-band spectrum is essential to fuel wireless broadband innovation and to support U.S. leadership in the evolution to 5G. And second, commenters recognize that mid-band frequencies support important services.

The record also shows that there are ways to balance these two perspectives. In particular, the Commission should issue a Notice of Proposed Rulemaking (“NPRM”) that considers how to repurpose mid-band frequencies for flexible uses while ensuring existing service needs are met. Specifically, the Commission should:

¹ *Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd 6373 (2017) (“*Mid-Band NOI*” or “*NOI*”); see also *Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, Order, DA 17-1024 (WTB rel. Oct. 18, 2017) (extending the reply comment deadline until November 15, 2017).

- Examine how the 3.7-4.2 GHz band can be repurposed for flexible use, taking into account the nature and extent of existing Fixed Satellite Service (“FSS”) and Fixed Service (“FS”) uses and options to give those services a path forward to succeed. CTIA and many other commenters, including the largest C-band satellite operator, identify several possible ways to open the band for flexible use, including limiting FSS operations to a subset of the band or relocating antennas out of identified geographic areas. These commenters offer up a pragmatic view that repurposing the 3.7-4.2 GHz band *can* happen;
- Explore whether unlicensed operations can co-exist with incumbent point-to-point operations in the 5.925-6.425 GHz (“Lower 6 GHz”) band, subject to a showing of ample interference protection based on a comprehensive, engineering-based study; and
- Work with the National Telecommunications and Information Administration (“NTIA”) to make the 7.125-8.4 GHz band a shared band available for non-federal use – including point-to-point microwave operations.

By taking these steps, the Commission can begin the process of unleashing more spectrum for wireless broadband in the mid-range bands where it is needed to provide both capacity and coverage, particularly given the spectrum’s advantageous propagation characteristics that will enable broad coverage with fewer facilities than high-band frequencies. As the *NOI* correctly recognizes, exploring opportunities in mid-band frequencies could “further our goal of establishing comprehensive, sound, and flexible spectrum policies,” “enable[e] innovations and investment to keep pace with technological advances,” and “maintain[] U.S. leadership in deployment of next-generation services in the long term.”² Quick action in this proceeding will be necessary stay ahead of the global competition, as our competitors across the world, including Brazil, the European Union, Russia, South Korea, China, and Japan, are moving forward with 5G in mid-band spectrum.

² *NOI*, 32 FCC Rcd at 6374 ¶ 2.

II. THE RECORD REFLECTS THAT MID-BAND SPECTRUM HOLDS GREAT PROMISE FOR FLEXIBLE-USE SERVICES, AND THAT INCUMBENT OPERATIONS PROVIDE IMPORTANT SERVICES.

A. Commenters Recognize That Mid-Band Spectrum Holds Strong Potential for Expanded Flexible Broadband Use.

As discussed below, industry stakeholders confirm that mid-band spectrum affords opportunities for expanded flexible broadband use. The 3.7-4.2 GHz band in particular offers a unique blend of capacity and coverage and has the potential to advance American leadership in wireless. Commenters also express interest in considering the possibility of unlicensed operations in the 5.925-6.425 GHz band, but in a manner that avoids interference to existing services.

The record demonstrates that the 3.7-4.2 GHz band holds promise for mobile broadband and is a key to U.S. leadership in next-generation wireless. Commenters confirm that the 3.7-4.2 GHz band offers “promising attributes”³ for wireless broadband in a 5G world. These include advantageous propagation characteristics, enabling broad coverage with fewer facilities;⁴ 500 megahertz of contiguous spectrum, providing wider channels and more significant throughput;⁵ and adjacency to the 3.5 GHz band (3550-3700 MHz), affording the benefit of adjacent flexible-use allocations and the potential to share equipment components

³ QUALCOMM Incorporated (“Qualcomm”) at 4. Unless otherwise noted, all references herein to a party’s comments refer to comments submitted on or prior to October 2, 2017, in GN Docket No. 17-183.

⁴ See CTIA at 6; Intel Corporation (“Intel”) at 3; Nokia at 4; Qualcomm at 4; T-Mobile USA, Inc. (“T-Mobile”) at 3, 9-11; Verizon at 14.

⁵ See CTIA at 6; Qualcomm at 4; T-Mobile at 3, 9-11; Verizon at 14.

across bands.⁶ As one commenter notes, “this spectrum offers very good operating range” and “can support service inside buildings and to rural areas of the country,” while “provid[ing] opportunities for sharing equipment components across bands” that will “keep[] device costs low.”⁷

In addition, commenters also stress the importance of this band to maintain U.S. global competitiveness. Countries around the world are already working to develop 5G in the 3 GHz band, including Brazil, the European Union, Russia, China, South Korea, and Japan,⁸ and the 3.7-4.2 GHz band has the potential to help the U.S. stay apace and maintain its wireless edge.⁹ As the record shows, “a strong mid-band spectrum platform for wireless broadband is imperative for U.S. leadership on 5G and to spur a new wave of innovation.”¹⁰ Moreover, global harmonization of the 3 GHz bands will drive a robust equipment market and fuel 5G, benefitting U.S. consumers of mobile broadband goods and services.¹¹ Indeed, “[s]pectrum harmonization helps to achieve economies of scale, enables global roaming, reduces equipment design complexity and improves spectrum efficiency” – all of which “reduce[] costs for consumers.”¹²

⁶ See CTIA at 6-7; Information Technology Industry Council (“ITI”) at 4; Nokia at 4; Qualcomm at 4; T-Mobile at 3, 9-11; Verizon at 14.

⁷ Qualcomm at 4-5.

⁸ See CTIA at 7; Federated Wireless at 7; Mid-Band Spectrum Coalition at 10-11.

⁹ See CTIA at 7; Ericsson at 5-6; Federated Wireless, Inc. (“Federated Wireless”) at 7; ITI at 5; Verizon at 14; *see also* Ericsson at 5.

¹⁰ Ericsson at 5.

¹¹ See Huawei Technologies Co., Ltd. (“Huawei”) at 8-9; Nokia at 4-5; T-Mobile at 7-10; Verizon at 1, 14; *see also* CTIA at 7.

¹² Nokia at 5; *see also* Ericsson at 5.

The record reflects interest in exploring non-interfering unlicensed uses in the 5.925-6.425 GHz band. A number of commenters also express interest in investigating the potential to permit unlicensed operations in the 5.925-6.425 GHz band,¹³ though many commenters condition their support on the development of “rules that provide adequate protections to incumbent and future microwave deployments in the band.”¹⁴ Some commenters note that the band’s proximity to the popular 5 GHz Unlicensed National Information Infrastructure (“U-NII”) bands could allow for integration with and expansion of the existing 5 GHz unlicensed ecosystem.¹⁵ That is, by leveraging existing economies of scale and avoiding the complexity and cost of designing for different bands, 5.925-6.425 GHz products could be brought to market more rapidly and cost-effectively.¹⁶

B. Commenters Also Note That Mid-Band Spectrum Supports Important Operations That Must Be Taken into Account.

The record indicates that the 3.7-4.2 GHz band and the 5.925-6.425 GHz band support important operations that must be taken into account as the Commission pursues options for expanding flexible use in mid-band spectrum.

¹³ See All Points Broadband *et al.* (“All Points Broadband”) at 10-18; Broadcom Ltd. (“Broadcom”) at 1-2, 9-10; Charter Communications, Inc. (“Charter”) at 2-3; Cisco Systems, Inc. at 2; CTIA at 15-16; Dynamic Spectrum Alliance (“DSA”) at 2-3; Ericsson at 9; Alphabet Access and Google LLC (“Google/Alphabet”) at 2, 12-13; Hewlett Packard Enterprise Company at 9; Intel at 1; ITI at 4-5; Microsoft Corporation (“Microsoft”) at 9-12; Mid-Band Spectrum Coalition at 4; NCTA – The Internet & Television Association (“NCTA”) at 5; Qualcomm at 1, 6-9; T-Mobile at 17; Verizon at 21; Wi-Fi Alliance at 2; Wireless Broadband Alliance at 12.

¹⁴ See, e.g., Verizon at 21.

¹⁵ See Broadcom at 1-2, 9-10; Wi-Fi Alliance at 7.

¹⁶ See Mid-Band Spectrum Coalition at 11-12.

The 3.7-4.2 GHz band is used by FSS to deliver content, among other uses. As commenters note, the 3.7-4.2 GHz band is used by FSS to distribute programming and other content to broadcasters and cable, Direct Broadcast Satellite (“DBS”), and communications provider headends for transmission to viewers.¹⁷ Indeed, the band “is one of the principal distribution mechanisms for video content owners to transmit programming to [Multichannel Video Programming Distributors].”¹⁸ Some commenters also note that operators use FSS operations in the band during disaster recovery,¹⁹ and, in Alaska, to provide backhaul for basic telephone service and for broadband and video communications.²⁰ In addition, the 3.7-4.2 GHz band is used to support some fixed point-to-point common carrier and/or private operational fixed microwave links,²¹ although these FS uses are declining.²² According to the *NOI*, FS use of the band has been in a “steep decline over the past 20 years as common carriers migrated to fiber or other FS bands.”²³

While these FSS and FS services are important, that does not mean that they need to be delivered over the same spectrum and in the same way that they have historically been delivered.

¹⁷ See AT&T Services, Inc. (“AT&T”) at 5; Walt Disney Company *et al.* (“Content Companies”) at 1; National Association of Broadcasters (“NAB”) at 2-3; NCTA at 3; National Public Radio, Inc. at 4; Sirius XM Radio Inc. at 5.

¹⁸ AT&T at 5.

¹⁹ AT&T at 8; Satellite Industry Association at 13.

²⁰ General Communication, Inc. at 2-11; AT&T at 8-9.

²¹ See Fixed Wireless Communications Coalition (“FWCC”) at 6; *NOI*, 32 FCC Rcd at 6379 at ¶ 15.

²² See CTIA at 9; T-Mobile at 14-15; *NOI*, 32 FCC Rcd at 6379 ¶ 15.

²³ *NOI*, 32 FCC Rcd at 6379 ¶ 15.

Rather, as discussed below,²⁴ the Commission should consider how to repurpose the spectrum for flexible use while ensuring existing service needs can be met.

The Lower 6 GHz band is used by FS to provide backhaul and other services.

Commenters observe that the 5.925-6.425 GHz band is heavily but efficiently used for FS point-to-point microwave links, and that these licenses support a variety of important services. For example, the band is heavily used by commercial wireless networks to provide backhaul,²⁵ and this use is expected to “grow significantly with 5G and the continued densification of networks.”²⁶ The band is also used by communications networks for disaster recovery;²⁷ by railroads to support train movements;²⁸ by utilities to support control of natural gas and oil pipelines and electric grids;²⁹ and by public safety to support police and fire vehicle dispatch.³⁰ The record indicates that the band remains a critical component of communications networks because it can be rapidly deployed where fiber is not an option, it is relatively unaffected by rain fade, and (unlike fiber) it is not at risk of cable cuts.³¹ Not surprisingly, then, commenters

²⁴ See *infra* Section III.

²⁵ See AT&T at 12-15; CTIA at 16; T-Mobile at 16-17; United States Cellular Corporation (“USCC”) at 2-4; *NOI*, 32 FCC Rcd at 6381-82 ¶ 25; see also Verizon at 21.

²⁶ AT&T at 14.

²⁷ *Id.*

²⁸ See *NOI*, 32 FCC Rcd at 6381-82 ¶ 25.

²⁹ See Southern Company Services, Inc. (“Southern”) at 2-3; Utilities Technology Council and Edison Electric Institute (“UTC/EEI”) at 1-3, 6-7; *NOI*, 32 FCC Rcd at 6381-82 ¶ 25.

³⁰ See Motorola Solutions, Inc. (“Motorola”) at 3; National Public Safety Telecommunications Council (“NPSTC”) at 1, 3, 4-6, 9; *NOI*, 32 FCC Rcd at 6381-82 ¶ 25.

³¹ See AT&T at 14; see also USCC at 3-4.

recognize that with these services comes the concomitant need to ensure a “stable” and “interference-free” operating environment for these important operations.³²

As discussed below,³³ the Commission should consider whether the introduction of unlicensed operations in the 5.925-6.425 GHz band can be achieved in a way that does not cause harmful interference to FS operations in the band.

III. THE COMMISSION SHOULD CONSIDER HOW TO REPURPOSE MID-BAND FREQUENCIES FOR FLEXIBLE USE WHILE ENSURING THAT EXISTING SERVICE NEEDS CAN BE MET.

A. The FCC Should Move Quickly to Identify the Level and Extent of Use in the 3.7-4.2 GHz Band.

The record highlights concerns about the accuracy of FCC records regarding the extent of use of the 3.7-4.2 GHz band.³⁴ For example, “there are a vast number of Lower C-Band receive-only (“RO”) earth stations that are registered in the FCC’s databases, and therefore are entitled to interference protection, that may not actually be in use.”³⁵ Indeed, according to one analysis, “approximately one-third of IBFS-registered C-band FSS sites *or more* do not require protection because they either do not exist or are not in operation.”³⁶ Accordingly, to best ensure the efficient use of spectrum and fully understand what repurposing would entail, the Commission should act expeditiously to open a window and set a prompt deadline for existing 3.7-4.2 GHz FSS and FS licensees to identify (i) whether they are operating and, if so, (ii) where they are

³² Verizon at 21; USCC at 3; *see* T-Mobile at 17.

³³ *See infra* Section III.

³⁴ *See* AT&T at 9-11; Google/Alphabet at 2, 4-5; iHeartMedia + Entertainment, Inc. at 1, 3-4; Verizon at 16.

³⁵ AT&T at 10.

³⁶ Google/Alphabet at 4-5.

operating, and (iii) what frequencies they are using. The Commission should launch this process immediately and conduct it quickly, as it does not need to be linked to issuance of the NPRM.

B. The FCC Should Launch an NPRM to Explore Proposals to Repurpose the 3.7-4.2 GHz Band While Ensuring That Existing Services Have a Path to Proceed.

Numerous commenters support the initiation of a rulemaking to explore proposals to repurpose the 3.7-4.2 GHz band for licensed terrestrial use. For example, the Mid-Band Spectrum Coalition and its signatories Apple, Broadcom, Cisco, Comsearch, CTIA, Ericsson, Hewlett-Packard Enterprise, Intel, Google and Alphabet Access, Nokia, Samsung, T-Mobile, Verizon, ITI, and the Wi-Fi Alliance, as well as Huawei, Microsoft, and Qualcomm, all support an NPRM exploring options to repurpose the 3.7-4.2 GHz band for wireless broadband.³⁷ As one commenter explains, “[t]he 3.7-4.2 GHz band is a prime candidate for mobile deployment,” and the Commission should promptly launch an NPRM that “explore[s] all opportunities to designate the band for flexible use.”³⁸ Indeed, “use of the band for wireless broadband is an important element for the establishment of the highest performing 5G networks globally, supporting both the development of a vibrant device eco-system and the cost-effective evolution of mobile networks from existing 4G technologies to new air interfaces.”³⁹

³⁷ See CTIA at 2; Ericsson at 5-7, 11; Huawei at 3-5, 11; Microsoft at 2; Mid-Band Spectrum Alliance at 4; Qualcomm at 4, 17; T-Mobile at 1, 7-13; Verizon at 13-14, 20; *see also* AT&T at 9 (noting that “there may be opportunities for sharing the Lower C-Band with terrestrial operations”).

³⁸ Ericsson at 5-7, 11.

³⁹ Huawei at 5.

Notably, Intelsat – the largest FSS C-band operator – identifies multiple paths forward to open the 3.7-4.2 GHz band for flexible use. In a filing with Intel, Intelsat states that it “anticipates that FSS operators will be able to clear some spectrum in top geographic areas, including dense urban areas, if market forces prove this is the highest and best use of the spectrum.”⁴⁰ In particular, Intelsat asserts that it may be possible to “coordinate the relocation of certain [FSS] customers on a geographic area-by-geographic area basis to a subset of frequencies in the 3700-4200 MHz band, thus freeing up well-defined portions of the band for terrestrial mobile use within the geographic area.”⁴¹ Likewise, it may be possible to “relocate [FSS] antennas outside the geographic area and make use of wired or wireless alternatives, *e.g.*, using fiber to bring the transmission back inside the area from the earth station facility.”⁴² Intelsat also mentions other options, including that “[e]arth stations with difficult migration circumstances could be protected via negotiated exclusion zones and/or shielding,” and “[s]atellite operators would be compensated for the expenses incurred in this process via the mobile license transaction proceeds.”⁴³ Several of the options Intelsat identifies are consistent with the potential solutions that CTIA and others identified in initial comments.⁴⁴ In sum, Intelsat offers a pragmatic view that repurposing the 3.7-4.2 GHz band *can* happen.

⁴⁰ Intelsat License LLC and Intel Corporation (“Intelsat/Intel”) at 7.

⁴¹ Intelsat/Intel at 16-17.

⁴² Intelsat/Intel at 17.

⁴³ Intelsat/Intel at 17.

⁴⁴ See *e.g.*, CTIA at 10-13; Verizon at 16-19.

Commenters also call on the FCC to reexamine the “full band, full arc” frequency coordination procedures for FSS receive earth stations.⁴⁵ That coordination policy was adopted in the 1960s and permits FSS earth stations to coordinate across the entire frequency band, and over the entire geostationary arc, regardless of how little spectrum the earth stations plan to use and how few satellites they plan to access.⁴⁶ As a result, FSS earth station licensing is highly inefficient, and interference protection is overly restrictive, because many earth station licensees are protected for much more spectrum than they use.⁴⁷ This allows spectrum to lie fallow in many areas,⁴⁸ and warrants revisiting the prudence of the existing “full band, full arc” coordination policy. Indeed, Intelsat’s comments indicating that some FSS operations can be relocated to a subset of the band or outside of certain geographic areas essentially confirm that “full band, full arc” FSS protection leads to inefficient spectrum use.⁴⁹

C. The FCC Should Investigate Whether Unlicensed Operations Can Enter the 5.925-6.425 GHz Band While Protecting Existing Fixed Microwave Services.

While the record indicates broad interest in the 5.925-6.425 GHz band for unlicensed services,⁵⁰ it also confirms the FCC must proceed cautiously.⁵¹ Thus, the Commission should

⁴⁵ See Broadband Access Coalition (“BAC”) at 8; CTIA at 13-14; Ericsson at 7-8; FWCC at 5-6; UTC/EEI at 5, 12-14; *see also* AT&T at 11 (recognizing that while full band, full arc protection can be beneficial in some case, there are “undoubtedly narrower uses of the band that do not require full band, full arc reservations”).

⁴⁶ See CTIA at 9.

⁴⁷ See BAC at 6-7; DSA at 5-6; Microsoft at 3; Nokia at 9; UTC/EEI at 5, 12-14.

⁴⁸ See BAC at 6-7; DSA at 5-6.

⁴⁹ See *supra* notes 41-42 and accompanying text.

⁵⁰ See *supra* note 13.

⁵¹ See T-Mobile at 17 (recognizing that while operations under Part 15 are on a non-interference basis, the Commission should “ensure that there is a firm technical foundation on which to

only move forward and consider the introduction of unlicensed operations if, after a comprehensive engineering-based study is conducted, it determines that existing microwave services are fully protected and able to deploy additional links in the band in the future.⁵²

Contrary to some claims,⁵³ in this case, the Commission's Part 15 rules do not in and of themselves provide sufficient assurance that new unlicensed operations will protect fixed microwave.⁵⁴ Given the many important existing uses of these bands, the Commission must ensure before any unlicensed services are introduced that (i) they will not cause harmful interference to FS incumbents and (ii) incumbents can continue to deploy additional links in the band. Thus, while unlicensed operations under Part 15 may not cause harmful interference to licensed operations and may not claim protection from those operations, 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

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").

⁵² See AT&T at 13-17; CenturyLink, Inc. at 1; Charter at 3; CTIA at 15-16; Ericsson at 9; Motorola at 3; NAB at 10; NCTA at 9; NPSTC at 6; Southern at 4-6; T-Mobile at 17; USCC at 2-4; Verizon at 21; *see also* Broadcom at 1 ("The 6 GHz band plays an important role for fixed point-to-point services, which remain dynamic and productive The Commission should therefore ensure that any action it takes in the 6 GHz band protects incumbents and is consistent with future growth in these services.").

⁵³ See All Points Broadband at 10.

⁵⁴ See Motorola at 3 (explaining that general Part 15 access, without more, should not be allowed, due to the "lack of control of unlicensed equipment once fielded").

appropriate technical and operational limits to protect the significant number of incumbent users and primary operations in the band.”⁵⁵

To date, no studies have been introduced into the record demonstrating techniques that can mitigate the potential for harmful interference to incumbent services. The Commission should therefore require proponents of unlicensed services in the band to submit detailed studies showing that any new unlicensed operations can protect incumbent services, taking into account methods that could be used to ameliorate the potential for harmful interference.⁵⁶ If such studies are completed successfully, the Commission should “adopt[] rules that provide adequate protections to incumbent and future microwave deployments in the band.”⁵⁷

D. The FCC Should Work with NTIA to Make the 7.125-8.4 GHz Band Available for Shared Non-Federal Use.

CTIA agrees with commenters who urge the Commission to work with NTIA to examine whether the 7.125-8.4 GHz band can be converted to a shared band that would enable non-federal point-to-point microwave operations,⁵⁸ consistent with the 2010 petition for rulemaking

⁵⁵ T-Mobile at 17.

⁵⁶ See CTIA at 15-16; Nokia at 15-16; T-Mobile at 16-17; *see also* Google/Alphabet at 13 (“The NPRM should seek detailed studies that examine the compatibility of any new services with the incumbent fixed and fixed-satellite services, as well as methods that could be used to mitigate the potential for harmful interference.”); Mid-Band Spectrum Coalition at 4, 12-13 (“5.925-6.425 GHz [should] be proposed for unlicensed use, subject to the requirement for a detailed engineering analysis and mitigation proposals”); NCTA at 10 (“[D]etailed sharing proposals, interference analysis, and testing, if appropriate, remain necessary precursors to authorizing unlicensed devices to share 6 GHz with incumbent users”).

⁵⁷ Verizon at 21.

⁵⁸ See AT&T at 18-19; Ericsson at 10; FWCC at 14 n.32; T-Mobile at 3, 21.

filed by Fixed Wireless Communications Coalition (“FWCC”).⁵⁹ Today, the 7.125-8.4 GHz band is allocated to federal use,⁶⁰ but it may not be fully utilized and could be an excellent growth band for point-to-point microwave operations.⁶¹ CTIA therefore encourages the Commission to work with NTIA to adopt a non-federal allocation in the 7.125-8.4 GHz band that would permit commercial point-to-point deployment. As FWCC explained in its petition, because the band already has a federal fixed allocation, coordination with incumbent fixed links is relatively straightforward.⁶² Indeed, there is a proven track-record of successful sharing between federal and non-federal FS users in other bands, including 932-935 MHz and 941-944 MHz.⁶³

IV. CONCLUSION.

As set forth above, the Commission should launch a rulemaking to explore ways to enable the repurposing of key swaths of mid-band spectrum for flexible use, while providing

⁵⁹ See FWCC, Petition for Rulemaking, Amendment of Parts 2 and 101 of the Commission’s Rules to Provide for Federal and Non-Federal Sharing in the 7125-8500 MHz Band, RM-11605 (Mar. 16, 2016) (“FWCC 2010 Petition”).

⁶⁰ See 47 C.F.R. § 2.106.

⁶¹ See FWCC 2010 Petition at 4-5.

⁶² See FWCC 2010 Petition at 7-8. The 7.125-8.5 GHz band is also shared with several federal satellite services (uplink and downlink). But as FWCC explains, “[t]he issues of frequency coordination between the Fixed Service and each of these services are well understood in the technical community, so that sharing can be accomplished without harmful interference.” *Id.* at 8.

⁶³ See *Establishment of Service and Technical Rules for Government and non-Government Fixed Service Usage of the Frequency Bands 932-935 MHz and 941-944 MHz*, Second Report and Order, 4 FCC Rcd 2012 (1989) (establishing procedures for sharing in the 932-935 and 941-944 MHz bands among fixed federal and fixed non-federal usage on a co-primary basis); NTIA, MANUAL OF REGULATIONS AND PROCEDURES FOR FEDERAL RADIO FREQUENCY MANAGEMENT, ch. 4.3.14 (Sept. 2015 Rev.) (“Channeling Plan for Assignments in the Fixed Service in the Bands 932.4-935 MHz and 941.4-944 MHz”).

incumbent services with a continued path to success. A rulemaking will help continue to meet consumer demand for wireless broadband, promote competition, and help ensure a vibrant, innovation-based mobile economy. CTIA also encourages the Commission to continue to identify additional bands to fill the spectrum pipeline to ensure the United States remains the world leader in wireless.

Respectfully submitted,

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