

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

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

COMMENTS OF DYNAMIC SPECTRUM ALLIANCE

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INTRODUCTION AND SUMMARY

The Dynamic Spectrum Alliance (“DSA”)¹ applauds the Federal Communications Commission’s (“FCC” or “Commission”) decision to identify new mid-band spectrum to meet the nation’s growing demand for wireless broadband. This effort comes at a fortuitous time, because state-of-the-art spectrum sharing techniques stand ready to facilitate more efficient use of these bands. In recent years, the Commission has used sharing to extract previously untapped value from underused bands. For example, the Commission addressed the underutilization of the television bands, where there are channels in every community where broadcasters do not operate, by authorizing unlicensed use in the television white spaces.² The Commission also addressed the underutilization of the 3.5 GHz band, by adopting rules that use sharing technology to drive investment.³ Those rules allow for truly dynamic spectrum sharing that coordinates users in real time and adjusts the amount of spectrum available depending on service demand at any given moment—and sharing will give American consumers and businesses access to more value from

¹ The Dynamic Spectrum Alliance is a global, cross-industry alliance focused on increasing dynamic access to unused radio frequencies. The membership spans multinational companies, small- and medium-sized enterprises, academic, research, and other organizations from around the world, all working to create innovative solutions that will increase the utilization of available spectrum to the benefit of consumers and businesses alike. A full list of DSA members is available on the DSA’s website at www.dynamicspectrumalliance.org/members/.

² See *FCC Establishes Rules for Unlicensed Operations in the TV and the 600 MHz Bands*, Report and Order, FCC 15-99, 30 FCC Rcd. 9551 (2015).

³ See Comments of the Dynamic Spectrum Alliance, GN Docket No. 12-354 (filed July 24, 2017).

the mid-band frequencies discussed in the Notice of Inquiry (“NOI”).⁴ The Commission’s efforts will therefore support growing demand for robust wireless connectivity.⁵

DSA believes that spectrum sharing must be the “new normal” for FCC wireless policy. The demand for wireless services is so great that the last generation of spectrum policy tools will never be able to provide consumers and innovators with the resources they need to support economic growth.

Sharing mechanisms can meet this challenge by addressing the following inefficiencies that plague today’s spectrum market. First, in any given band, no application, service, protocol, or provider is capable of using all of the spectrum, in all locations, at all times across an entire license area. Without sharing, spectrum will necessarily go unused at some time and in some places.⁶ Today, the overwhelming majority of spectrum is idle most of the time, in most of the world— even in the densely-populated, developed market of Singapore, spectrum utilization rates are only about 6.5 percent.⁷ Second, no single licensee, business strategy, or solution is capable of developing, supporting, and deploying sufficient infrastructure at the capacity needed to meet the demands of all users across a full license area. Meeting Americans’ wireless connectivity needs has required hundreds of billions of dollars of investment from a diverse array of operators using

⁴ See Initial Comments of Dynamic Spectrum Alliance at 2, GN Docket No. 14-177, IB Docket Nos. 15-256 and 97-95, WT Docket No. 10-112, (filed Sept. 30, 2016).

⁵ *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd. 6373, ¶ 37 (2017).

⁶ See generally Report to the President Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth, Executive Office of the President, President’s Council of Advisors on Science and Technology, July 20, 2012 https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf (“PCAST Report”).

⁷ H. Sama Nwana, *The Future of Spectrum Policy*, Apr. 27, 2016, http://dynamicspectrumalliance.org/wp-content/uploads/2016/05/Keynote-Address_H-Nwana.pdf.

different technologies.⁸ Third, clearing spectrum to make way for new exclusive uses has proven costly and time consuming—and resulted in painful delays that have stymied economic development; frustrated regulators, policy makers, and vendors; and resulted in higher costs. The National Telecommunications and Information Administration (“NTIA”) concluded in 2012 that, “clearing just one 95 MHz band by relocating existing Federal users to other parts of the spectrum would take 10 years, cost some \$18 billion, and cause significant disruption to incumbent users.”⁹ And lengthy FCC auction processes add to this delay. After Congress authorized the Incentive Auction, it took five years to design and complete the auction. We are still years from realizing the resulting gains to wireless broadband access.

Underlying these limitations is one frustrating fact: when real-world utilization is considered, spectrum is not actually scarce. Increasing the use of sharing techniques to improve rates of spectrum utilization will make more spectrum resources available and help solve the problem of false scarcity.

DSA therefore calls on the Commission to undertake its effort in the mid-band by recognizing that sharing is the only reasonable path forward to increased utilization by both new and incumbent users. Successful techniques for spectrum sharing are not free, but when compared against the cost of *not* sharing—excluding prime bands from consideration, lost opportunity costs because of decades of delay, complex rule making, and the market cost and errors guaranteed

⁸ See, e.g., CTIA, *Fostering 21st Century Wireless Connectivity: Key Spectrum & Infrastructure Issues for Policymakers*, White Paper, 2-3 (2017) <https://www.ctia.org/docs/default-source/default-document-library/ctia-white-paper-infrastructure.pdf>.

⁹ See PCAST Report at vi.

whenever the government picks winners in the marketplace—the costs of sharing solutions are small.

The NOI presents a perfect opportunity for the Commission to implement dynamic sharing to quickly open the 3.7-4.2 and 6 GHz bands to greater utilization while protecting incumbents. Specifically, DSA recommends that the Commission issue a Notice of Proposed Rulemaking (“NPRM”) that:

- Proposes to authorize more intensive and dynamically shared access to the 3.7–4.2 GHz band and to update the licensing database for this band;
- Proposes to permit unlicensed operations from 5.925 to 7.125 GHz using sharing mechanisms to protecting incumbents and generate new economic growth and consumer benefits; and
- Determines that authorizing a new licensed service in this band would cause greater displacement for incumbents, and cause greater delay, while not producing additional value.

Finally, while the 3.7-4.2 GHz and 6 GHz bands should be the Commission’s first priorities, DSA supports the Commission’s decision to take a holistic view of entire mid-band. It is essential that the Commission begin the process of identifying new target bands beyond these two bands now, in order to ensure a pipeline of new opportunities is available as spectrum needs continue to skyrocket.

COMMENTS

I. THE POTENTIAL FOR EXPANDING SHARED ACCESS TO THE 3.7–4.2 GHZ BAND.

DSA fully supports the authorization of more intensive and dynamically shared access to the 3.7–4.2 GHz band. While there is widespread and important use of the 3.7–4.2 GHz band by the Fixed Satellite Service (“FSS”), most of the band’s 500 megahertz of capacity lies fallow in most local areas across the country. Earth station registrations in the 3.7–4.2 GHz licensing database greatly overstate both the extent and protection needs of FSS earth station deployments. Updating FSS earth station registrations with complete and accurate location, frequency use, and other information to enable dynamic sharing is a prerequisite to more efficient utilization of the band and an action the Commission should expeditiously undertake.

Commenting on the Fixed Wireless Communications Coalition’s (“FWCC”) Coordination Petition, DSA stated that, “[w]hile clearing and repurposing underutilized spectrum has been useful in past circumstances, the timescale for such reallocations is lengthy, and finding suitable spectrum for relocated systems is increasingly difficult.”¹⁰ As a result, whether or not the 3.7–4.2 GHz band is reallocated long-term, updating the licensing database and employing dynamic coordination techniques can improve utilization of the band in the short-term while protecting incumbent FSS and Fixed Service (“FS”) operations from harmful interference.

¹⁰ See Comments of Dynamic Spectrum Alliance, RM-11778, at 2 (filed Jan. 10, 2017).

A. The 3.7–4.2 GHz Band is Extremely Underutilized.

The record developed this year in two related proceedings demonstrates that the 3.7–4.2 GHz band is extremely underutilized.¹¹ The primary cause of this underutilization is the existing “full band, full arc” coordination policy for FSS that dates back to the 1960s. FSS earth stations are licensed to use all 500 megahertz of the band, even though individual earth stations typically use only a small portion of the band. For example, the Broadband Access Coalition (“BAC”) Petition notes that while 975 receive-only C-Band earth stations licensed to the Associated Press (“AP”) are authorized to reserve the entire 3.7-4.2 GHz range of spectrum, the AP’s website indicates that it uses “only a single, 23-megahertz satellite transponder” for each of these earth stations.¹² This means that as much as 477 megahertz of spectrum in the area around AP’s earth stations is likely not in use.

The FWCC Petition similarly explains how “full band, full arc” reservations for FSS earth stations excessively protect earth stations in not just the frequencies they use, but across the entire band and at all elevation angles. This needlessly precludes the coordination and licensing of FS links or any other new use that could be coordinated under Part 101 or some future, more dynamic sharing mechanism approved by the Commission. DSA agrees with FWCC, BAC and other

¹¹ See Fixed Wireless Communications Coalition, Inc., Petition for Rulemaking, Request for Modified Coordination Procedures in Bands Shared Between the Fixed Service and the Fixed Satellite Service Petition for Rulemaking, RM-11778, at 1-7 (filed Oct. 11, 2016) (“FWCC Petition”); Petition of the Broadband Access Coalition for a Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission’s Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3700-4200 MHz Band, Petition for Rulemaking, RM-11791, at 16-17, 21-24 (filed June 21, 2017) (“BAC Petition”).

¹² BAC Petition at 20 & n. 42. The NOI notes that geostationary orbit FSS satellites “typically have 24 transponders, each with a bandwidth of 36 megahertz received by one or more earth stations.” NOI at ¶ 14.

commenters that this policy leaves large portions of the band needlessly fallow, “violat[ing] core principles of spectrum management and policies against warehousing.”¹³

In addition, the record in these proceedings show that FSS registration data includes a substantial share of earth stations that were never deployed or no longer exist. In reply comments filed in response to the BAC Petition, Alphabet Access states that its analysis of approximately 4,000 earth station registrations, “confirms BAC’s findings: 29% of these registered earth stations have either been removed or were never installed.”¹⁴ In addition, a substantial share of the remaining 71 percent of registrations list inaccurate location data, “undermining the protections afforded by registration, and unnecessarily limiting operations in other areas.”¹⁵

B. The Commission Should Act Immediately to Clean Up the 3.7–4.2 GHz Licensing Database.

Because the FSS licensing database does not currently provide complete or up-to-date information on unused spectrum in the 3.7–4.2 GHz band, the Commission should not wait for the resolution of this proceeding to improve the accuracy of earth station registration data. Commenters including the Utilities Telecom Council, the National Spectrum Management Association, and Alphabet Access agree with FWCC and BAC that FSS earth station registration data grossly overestimates the usage of spectrum in the band due to the overbroad protections of “full band, full arc” licensing, outdated information in the database, and other inaccuracies.¹⁶ Even

¹³ FWCC Petition at 2.

¹⁴ Reply Comments of Alphabet Access at 3, RM-11791, (filed Aug. 22, 2017) (“Alphabet Access Reply Comments”). *See also* BAC Petition at 20.

¹⁵ *Id.*

¹⁶ *See, e.g.*, Comments of the Utilities Technology Council, RM-11791, at 3-4 (filed Aug. 7, 2017); Comments of the National Spectrum Management Association, RM-11791, at 2 (filed Aug. 7, 2017); Comments of the Fixed Wireless Communications Coalition, RM-11791, at 2 (filed Aug. 7, 2017); BAC Petition at 21-24.

the Satellite Industry Association, which generally opposed the BAC Petition, agreed in its filing that, “a clean-up of the Commission’s International Bureau Filing System (“IBFS”) database containing earth station licensing and registration information is appropriate to ensure its ongoing accuracy and completeness.”¹⁷

Accordingly, DSA urges the Commission to act expeditiously to update the IBFS database so that the agency can determine which earth station licenses should remain in effect,¹⁸ the accurate location of operating earth stations, and the frequencies and orbital slots that are in actual use by each earth station.¹⁹ A clear picture of the actual spectrum usage and protection requirements of FSS earth stations is a critical first step and prerequisite to authorizing additional uses of the band. The coordination of more intensive and dynamic sharing of the band will benefit from a more automated and granular Part 101 coordination system through a simple spectrum management database, or possibly even an extension of the Spectrum Access System that will soon be deployed to manage access to the adjacent 3.5 GHz band (and which also protects FSS earth stations from adjacent channel interference).

C. The Commission Should Leverage Dynamic Spectrum Sharing Techniques to Enable More Intensive Use of the Band.

Although the 3.7–4.2 GHz band is grossly underutilized on a capacity basis, extensive FSS deployments are spread across the band. As the NOI noted, approximately 48 satellites currently use the band to downlink real-time video and data to approximately 4,700 registered earth stations

¹⁷ Opposition of Satellite Industry Association, RM-11791, at 8 (filed Aug. 7, 2017).

¹⁸ The Commission’s rules provide that: “A station authorization shall be automatically terminated . . . upon: (c) The removal or modification of the facilities which render the station not operational for more than 90 days . . .” 47 C.F.R. § 25.161(c).

¹⁹ Accurate geographic location and orbital slot information can also be used to derive the angle and azimuth of the earth station, information that can also potentially increase the degree of coordinated spectrum sharing.

nationwide.²⁰ This suggests that the incumbent FSS licensees will continue to operate on the band and require interference protection for years to come. Although the Commission is likely to receive proposals that anticipate a long-term transition that clears FSS licensees off all, or at least part, of the 3.7–4.2 GHz band, these claims at this point are merely wishful thinking with no evidence or confidence. The FSS industry has used this band for 50 years, primarily for video distribution, and although the video business is undergoing significant change, current FSS users have not indicated a willingness or desire to move away from the FSS services they have relied upon. In any case, DSA believes it is not necessary to wait until the adoption and implementation of such a transition to begin achieving greater utilization of the band on a shared basis. Adoption of elements of the dynamic sharing techniques already developed for the adjacent CBRS band will allow for actual new broadband service deployment in the 3.7-4.2 GHz band within the next few years, something that will never be possible using a band clearing or exclusive licensing approach.

Options to improve utilization of the band by employing dynamic spectrum sharing techniques are proposed in the pending BAC Petition aimed at expanding, and ultimately automating, Part 101 coordination to enable expanded point-to-point (“P2P”) and point-to-multipoint (“P2MP”) deployments, respectively. The FWCC and BAC proposals both aim to identify and coordinate use of the fallow spectrum in the band to improve broadband service across the country, especially in rural and other underserved areas where high-capacity wireline service is too costly to deploy or where consumers lack a competitive alternative.²¹

DSA is not taking a position at this time on any specific proposal to achieve more intensive and flexible use of the underutilized 3.7–4.2 GHz band. The FWCC and BAC proposals both aim

²⁰ NOI at ¶ 14.

²¹ See BAC Petition at 10-15.

to identify and coordinate use of the fallow spectrum in the band to improve broadband service across the country, especially in rural and other underserved areas where high-capacity wireline service is too costly to deploy or where consumers lack a competitive alternative. The BAC Petition proposes the Commission rely initially on Part 101 coordination to enable expanded P2P and P2MP deployments in the band and subsequently initiate a process to automate Part 101 coordination through a multi-stakeholder industry process, including the satellite industry.²² DSA believes that dynamic sharing solutions offer the potential for more intensive utilization and flexible use of the underutilized 3.7–4.2 GHz band and FCC should explore use of dynamic options in an NPRM.

To these ends, the Commission should also consider options that include applying principles from the already-developed CBRS framework into at least a portion of the 3.7–4.2 GHz band, thereby facilitating more flexible, intensive and immediate sharing of the band for wireless broadband services. DSA believes dynamic sharing in this band with fixed incumbents would be far less complex and fully protect them with a much simpler database mechanism than in the 3.55-3.7 GHz band. Further, based on the work done in the CBRS band, deployment of services using dynamic access technology will be far faster than any other spectrum management approach, thus delivering the greatest spectrum efficiency and economic value in the shortest time.

II. THE COMMISSION SHOULD AUTHORIZE UNLICENSED USERS TO SHARE THE 6 GHZ BAND.

DSA strongly supports rules to permit use of 5.925-7.125 GHz (the “6 GHz band”) for unlicensed wireless broadband.²³ The Commission has made strides in promoting unlicensed

²² See BAC Petition at 33.

²³ DSA believes that this should be treated as a single band by the FCC because many of the same license holders, end-users, and end-uses are in both the upper and lower portions of the band.

access, as part of its long-standing commitment to a balanced licensed/unlicensed spectrum policy through its CBRS, 64-71 GHz band, and White Spaces decisions. As the NOI recognizes, however, urgent action is needed in the critical mid-band. With 802.11ac now shipping in widely distributed consumer devices, and 802.11ax moving rapidly towards deployment, Americans have begun to demand wider gigabit-capable bandwidths. These standards require wider bandwidths²⁴ in order to allow consumers' Wi-Fi to keep up with the unprecedented gigabit connection speeds that DOCSIS 3.1 and fiber are bringing into their homes. Without access to the 6 GHz band, addressing this spectrum and connectivity need is impossible.

Wi-Fi users already experience interference and slow speeds during the peak busy hour across the country. In fact, a 2017 study by Qualcomm found that, without access to additional spectrum, wireless networks of tomorrow will lack the spectrum resources needed to preserve even today's level of service, much less be able to support the future advances we know will emerge.²⁵ Similarly, Quotient Associates has found that the United States will require at least an additional 540 MHz of spectrum to accommodate the demand expected in 2025; if new technologies require additional spectrum and the DFS bands continue not to operate at full capacity, the shortfall could reach 1,588 megahertz.²⁶ Considering that existing unlicensed bands constitute roughly 540 megahertz of usable spectrum, this shortfall necessitates at least doubling, and perhaps increasing

DSA also believes that enabling unlicensed use across the entire 1200 megahertz of spectrum will better enable unlicensed devices to minimize aggregate interference to incumbent receivers.

²⁴ The new Wi-Fi standards of 802.11ac and 802.11ax will deliver Gigabit level speed using more multi-user MIMO, high-density modulation, and wider RF bandwidth (up to 160 MHz).

²⁵ Rolf de Vegt et al., *A Quantification of 5 GHz Unlicensed Band Spectrum Needs*, QUALCOMM TECHNOLOGIES, INC. (2017).

²⁶ Steve Methley and William Webb, *Wi-Fi Spectrum Needs Study*, 26, Final Report, QUOTIENT ASSOCIATES LTD. (Feb. 2017).

by more than four-fold, available spectrum for unlicensed technologies. This is particularly important now that the Commission has announced that it will not open the U-NII-2B band for unlicensed broadband operations. Industry had been preparing for this band since the Commission issued its 2013 NPRM on the U-NII bands.²⁷

The FCC should therefore issue an NPRM that, as discussed below: (1) recognizes that the 6 GHz band is ideal for unlicensed use because of its position adjacent to existing 5 GHz unlicensed bands; (2) seeks comment on specific sharing techniques that protect incumbents; and (3) finds that creating a new licensed service in the band, either by clearing incumbents or conducting an underlay auction, is not feasible.

A. The 6 GHz Band is Ideal for Unlicensed Use.

The 6 GHz band is proximate to today's core 5 GHz Wi-Fi bands. Consequently, semiconductor and device manufacturers can rapidly add the 6 GHz band to an existing Wi-Fi ecosystem, speeding availability of new technology, allowing greater efficiency, and reducing costs. This is the case because the 6 GHz band shares propagation characteristics with the existing unlicensed bands, which will enable manufacturers to adapt existing products for use in the 6 GHz spectrum and to develop new systems quickly and affordably. Similar propagation also ensures affordability because the budgeting processes of enterprises, educational institutions, hospitals, service providers, and other operators of large multi-radio managed systems are based on 5 GHz radio density that translates directly to 6 GHz. Furthermore, industry standards bodies have already recognized the great potential for a 5 GHz/6 GHz unlicensed ecosystem, and are well

²⁷ *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, Notice of Proposed Rulemaking, 28 FCC Rcd. 1769 (2013).

underway with efforts to extend the next version of their standards to encompass the new band.²⁸ FCC action that allows industry to maximize economies of scale in this way will result in the unlicensed technologies utilizing the band becoming productive far more quickly, rapidly contributing to the nation's economic growth. Analysts already predict that in 2017 alone, unlicensed technologies will contribute \$547 billion in economic value and nearly \$50 billion to the GDP.²⁹ Opening the band to unlicensed use would address the key challenge for Wi-Fi technologies—the need for a reliable spectrum pipeline—allowing these technologies to increase capacity and make even greater contributions to the economy in the future.

B. Unlicensed Can Provide Necessary Protections for Incumbents Across the Band.

The 6 GHz band is home to a diverse group of incumbents with differing protection needs. Fixed P2P links use the 5.925-6.425 and 6.525-7.125 GHz bands. FSS Earth station uplinks operate throughout the band, with the exception of the 6.425-6.525 GHz band reserved for exclusive use by Mobile Broadcast Auxiliary Service (“BAS”), Cable Television Relay Service (“CARS”), Local Television Transmission Service (“LTTS”), and Operational-Fixed Microwave Service (“OFS”). Mobile BAS and CARS users also operate in the 6.875-7.125 GHz band. These incumbents, however, leave large geographic areas and wide frequency ranges completely unused, and, as a result, the band is not producing as much value for the country as it could. Twenty years ago, this incumbent environment would have made FCC action to free unused 6 GHz resources

²⁸ See IEEE, *P802.11ax PAR Modification*, Abstract, Jul. 12, 2017, available at <https://mentor.ieee.org/802.11/dcn/17/11-17-0913-02-00ax-par-modification-to-support-6-ghz-band.docx>.

²⁹ Raul Katz, *Assessment of the Future of Economic Value of Unlicensed Spectrum in the United States*, 39–40 & Table 19, TELECOM ADVISORY SERVICES, LLC (2014).

difficult. Today, however, because of advances in sharing and the wide recognition of the ability of unlicensed technologies to share bands with spectral and geographic gaps, we can do better.

Unlicensed technologies can share spectrum with incumbents under the FCC's Part 15 rules.³⁰ Under these rules, unlicensed operations may not cause harmful interference to any licensed service, and must accept any harmful interference caused by a licensed service. Moreover, while licensed services must coordinate with each other when introducing new links, a Part 15 operation may not assert coordination rights with a licensed service, and must accept new interference when an incumbent expands or changes its network. These features would ensure that unlicensed operations do not abridge the rights of existing licensees and that incumbents may continue to grow their networks organically. Unlicensed technologies have a strong track record of using these rules to create economic value by sharing spectrum with a wide variety of incumbents. Furthermore, there are no federal incumbents in 6 GHz, making the introduction of services such as Wi-Fi even easier.

The FCC can add special sharing requirements within the Part 15 framework to address particular interference environments. Because of today's wide range of mitigation technologies and techniques—which the FCC has employed in multiple bands to permit sharing—technical rules can be designed to prevent harmful interference to incumbent services, while still allowing unlicensed technologies to access the 6 GHz band when or where they would not interfere with licensees. The 6 GHz band is a particularly attractive frequency range for such techniques. This is the case because incumbents in the band generally use highly directional equipment outdoors, and mostly operate at high power levels. Unlicensed technologies, led by Wi-Fi, operate at lower

³⁰ While Part 15 already allows some unlicensed activity in the 6 GHz band, the FCC permits power levels that are so low that use of Wi-Fi devices and other commercial technologies are not possible. 47 C.F.R. §§ 15.1–.717.

power and are mostly indoors, especially for high-bandwidth-demand applications such as video streaming. Outdoors, consumers are more likely to access lower-bandwidth applications with unlicensed devices, including navigation, messaging, and social networking. Outdoor enterprise and service provider deployments that may generate more load are carefully engineered, with high quality antennas and highly trained professional installer communities. This combination of technologies and use cases presents an excellent opportunity for sharing.

At the same time, the 6 GHz band's incumbents operate in different ways and in different parts of the band. As a consequence, a one-size-fits-all sharing approach is not appropriate. The Commission should consider sharing techniques based on the protection requirements of each incumbent and on the ability of unlicensed operations to deploy these techniques in a cost effective and scalable manner that enables the broadest number of use cases while protecting incumbents. DSA therefore recommends that the Commission seek comment on a wide variety of techniques rather than proposing the use of any one technique in the NPRM. Incumbents and unlicensed innovators can then use the NPRM process to identify the optimal mitigation techniques for each portion of the band, and thereby address each class of incumbent, as discussed in the following paragraphs.

Fixed Satellite Service. Real world experience demonstrates that terrestrial unlicensed operations pose little interference risk to FSS uplinks. This is the case because of antenna directionality and the locations of FSS installations. For example, in the neighboring 5.9 GHz band, the Commission authorized the deployment of terrestrial Dedicated Short Range Communications (“DSRC”) alongside extended C-Band operations because, as NTIA explained, “the maximum effective radiated power (“ERP”) values from such stations are directed at space,

and not toward the terrestrial surface.”³¹ In response to this finding, as the Commission recognized, “no commenters question[ed] the spectrum sharing feasibility of FSS operations and DSRC operations,”³² and the FCC permitted the sharing. The Commission reached a similar conclusion in designing its new U-NII-1 rules. In U-NII-1, the Commission determined that Wi-Fi operations could coexist with Globalstar’s Mobile Satellite Service (“MSS”) operations, which, “communicate with mobile end-user devices via spot beams using the Lower Big LEO band at 1.61-1.618725 GHz for the uplink and using the Upper Big LEO band at 2.4835-2.5 GHz for the downlink.”³³ Globalstar’s licensed operations could be protected, the Commission found, by limits on Wi-Fi EIRP, which could be achieved by, “reducing antenna gain in the upward direction, or by limiting the transmitter power, or a combination of the two.”³⁴ There have been no public reports of interference from Wi-Fi to Globalstar in the years since that decision, despite the deployment of hundreds of thousands of outdoor Wi-Fi access points.

Fixed Point-to-Point. P2P operations in the 6 GHz band, which are primarily used for carrier backhaul, public safety, utilities, and cooperatives, are tightly circumscribed

³¹ See *Amendment of Parts 2 & 90 of the Comm’n’s Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Serv. for Dedicated Short Range Commc’ns of Intelligent Transp. Servs.*, Report and Order, 14 FCC Rcd 18,221, ¶ 15 (1999) (“DSRC Order”); Frank H. Sanders, *Measured Occupancy of 5850-5925 MHz and Adjacent 5-GHz Spectrum in the United States*, DEP’T OF COMMERCE, NTIA Report 00-373 (Dec. 1999).

³² DSRC Order ¶ 15.

³³ *Revision of Part 15 of the Comm’n’s Rules to Permit Unlicensed National Information Infrastructure (U-N-II) Devices in the 5 GHz Band*, First Report and Order, 29 FCC Rcd. 4127, ¶ 23 (2014).

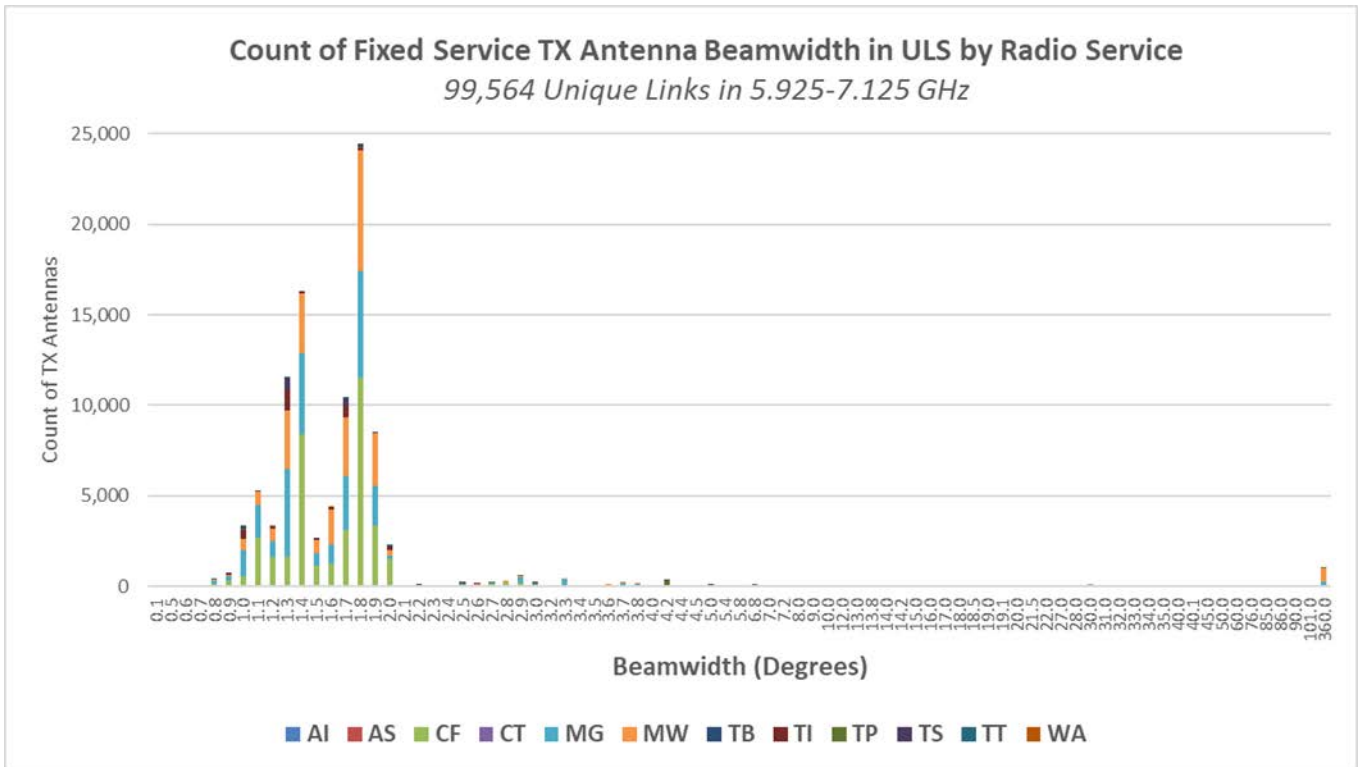
³⁴ *Id.* ¶ 37.

geographically, presenting strong opportunities for location-based sharing.³⁵ Common carrier use of the band appears to be fairly static, or even declining as companies replace backhaul links with fiber. The public safety and microwave business pool appears to be growing. These shifts, however, occur over months—not weeks or days—simplifying sharing. These operations also leave areas of the country without any P2P links at all in particular channels. And when links are not renewed, sharing would allow unlicensed services to quickly fill the gap, ensuring that valuable spectrum does not lay fallow.

The types of antennae used for P2P links also facilitate sharing. P2P antennae overwhelmingly employ beamwidths of 2 degrees or less under Part 101 rules, with a review of

³⁵ See *Amendment of Part 101 of the Comm'n's Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses and to Provide Additional Flexibility to Broadcast Auxiliary Serv. and Operational Fixed Microwave Licenses*, Report and Order, Further Notice of proposed Rulemaking, and Memorandum Opinion and Order, 26 FCC Rcd. 11,614 ¶ 9 (2011) (“Part 101 Amendment Report and Order”). The 5.925-6.425 GHz and 6.525-6.875 GHz bands are heavily used for fixed point to point microwaves, especially in urban areas. The 6.875-7.125 GHz band is used for fixed BAS and has more recently been opened for Part 101 Fixed Point-to-Point Use.

ULS showing a median value of 1.6 degrees. Such antennae rapidly attenuate the energy operating outside of the main beam, limiting interference to small, identifiable geographic areas.



These high-powered and highly directional operations have required incumbents to develop systems to coordinate with each other. Strategies for sharing with unlicensed services could build on that coordination, because sharing mechanisms could use data currently used for intra-service sharing to ensure unlicensed devices do not cause harmful interference to P2P receivers. At the same time, these highly localized, high-energy services are already heavily used in dense urban areas and additional links and tighter packing is becoming infeasible.³⁶ But the introduction of a

³⁶ Frequency coordination among incumbents in these areas requires considerable effort, and leads to the need for a larger number of links to use the highest grade antennas. *See* Comsearch, <https://comsearch.com/how-class-4-antennas-can-boost-microwave-wireless-backhaul-performance/>.

complementary lower-power technology that can fit in the gaps left by P2P operations, can still drive more intensive use, even in urban corridors, and certainly in the rural and suburban areas where P2P operations leave many holes.

Mobile. Mobile services in the 6 GHz band are primarily used for public safety, BAS, and CARS. These services, which use a wide variety of equipment with diverse operating characteristics, use their bands less intensely, and, because many of these operations are designed to facilitate temporary live television events or newsgathering functions, are often not transmitting at all.³⁷ Recognizing this, the FCC decided to open 6875-7125 sub-band for fixed use in 2011.³⁸ Mobile to FS sharing shows that it is clearly possible to share with mobile uses, and lower-power unlicensed operations will do so even more easily than can FS links.

C. Exclusively Licensing Any Portion of the 6 GHz Band for Mobile Broadband is Not Feasible.

DSA is committed to advocating for protection of the incumbent users in the 6 GHz band, while at the same time recognizing the value of expanding use of spectrum resources to innovative new technologies. Dynamic sharing arrangements between existing licensees and unlicensed operations would allow both incumbent *and* new services to flourish. Clearing and auctioning this band, which its FS incumbents heavily use, however, would create far more challenges and produce fewer benefits.

Clearing incumbents from the band and conducting an auction would be expensive, time consuming, and (thanks to unlicensed sharing solutions) unnecessary.³⁹ Furthermore, adding a new licensed service to the band without clearing, for example through an underlay auction, would

³⁷ Part 101 Amendment Report and Order, ¶ 9.

³⁸ *Id.*

³⁹ *See, e.g.,* Steven Brill, *The \$47 Billion Network That's Already Obsolete*, *The Atlantic* (Sept. 2016) (describing the years of delay in standing up FirstNet).

also be problematic. This is particularly true with regard to protecting high-power, outdoor FS operations, which are concentrated in urban areas. Fully protecting FS and other incumbents would so severely limit underlay operations and locations that new licenses would generate little auction revenue or public benefit. In fact, the coordination contour that applies to a single prospective Part 101 licensee in the 6 GHz band could extend 200 miles from the transmitting end of the transmitter and 125 miles in radius around the transmitter.⁴⁰ This means that the coverage and/or quality of service of any new licensed service would be significantly undermined throughout the country where there could be new Part 101 licensees, and the need to protect a new mobile licensed service would undermine growth and change of current FS licensees' operations. In addition, adding additional licensees to the band would exacerbate the challenges of an already difficult coordination system, greatly restricting incumbents from expanding their FS services due to the need to coordinate with a new licensed mobile service. An unlicensed designation allows the Commission and incumbents to avoid these problems, and would result in efficient and intensive use of the band.

III. THE COMMISSION SHOULD MAINTAIN A BALANCED SPECTRUM POLICY AS IT CONSIDERS BANDS BEYOND THE 3.7-4.2 GHZ AND 6 GHZ BANDS.

The NOI invites comment on the broad range of bands between 3.7 and 24 GHz.⁴¹ DSA believes that the Commission was right to focus its immediate efforts on optimizing use of the 3.7-4.2 and 6 GHz bands, which represent the best near-term opportunity for expanding mobile broadband uses of the bands covered by the NOI. At the same time, DSA supports this holistic review of the mid-bands, which have a variety of propagation characteristics and existing users

⁴⁰ See Chris Hardy & Greg Macey, COMSEARCH, *Recent Regulatory Changes Affecting the Broadcast Auxiliary Spectrum, What You Need to Know* 9 & fig. 7 (2003), <http://www.sbe3.net/auxhardypaper.pdf>.

⁴¹ NOI ¶ 37.

that should be carefully considered on a case-by-case basis. Beginning that process now is essential in order to ensure a pipeline of new spectrum opportunities is available as spectrum demand continue to skyrocket.

As the Commission moves forward with the additional bands suggested by commenters in this docket, it should ensure that it maintains the balanced spectrum policy that the Commission has worked hard in recent years to achieve. To that end, the Commission should reject calls for “gigahertz parity” in the mid-bands—a concept that reflects a misunderstanding of wireless engineering principles.⁴² The bands considered in the NOI are not interchangeable; each band has unique propagation characteristics that govern its use. Moreover, exclusively licensed and shared spectrum have different value to consumers and operators. Operators that share spectrum on a non-interference basis by definition use those bands alongside other users and competing technologies, resulting in reduced access and duty cycles.

CONCLUSION

As demand for wireless broadband grows, but without available greenfield spectrum, dynamic sharing solutions have become critical to effective spectrum policy. The FCC, through its efforts in TVWS and CBRS, has already led the world in developing dynamic sharing approaches to spectrum management. The critical and urgent near-term need for mid-band

⁴² See *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, et al*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd. 8041, ¶ 130 (2016); see also CTIA, Opposition to Petitions for Reconsideration, GN Docket No. 14-177, RM-11664, WT Docket No. 10-112, IB Docket Nos. 15-256 and 97-95 (filed Feb. 24, 2017); see also T-Mobile USA Inc., Opposition to Petitions for Reconsideration, GN Docket No. 14-177, RM-11664, WT Docket No. 10-112, IB Docket Nos. 15-256 and 97-95 (filed Feb. 24, 2017); see also Competitive Carriers Association, Opposition to Petitions for Reconsideration, GN Docket No. 14-177, RM-11664, WT Docket No. 10-112, IB Docket Nos. 15-256 and 97-95 (filed Feb. 24, 2017).

spectrum for broadband services identified by the Commission in its mid-band NOI, requires technical and regulatory solutions that can start to deliver services within the next few years, not a decade or more from now. Old approaches to spectrum management, based largely on band clearing and exclusive licensing, are ill-equipped to deliver on this requirement. Historic regulatory models will leave far too much spectrum unutilized and take a decade or more to deliver services. They would enable the Commission to deliver a press release, rather than drive economic growth.

The mid-band spectrum addressed by the NOI instead offers the perfect opportunity to further advance sharing techniques that protect incumbent services while encouraging rapid and intensive use of these important bands. The Commission should seize that opportunity and move quickly toward an NPRM that proposes (1) to authorize shared access to the 3.7–4.2 GHz band and update the licensing database; (2) to permit unlicensed operations in the 6 GHz band; and (3) to *not* authorize a new licensed service in the 6 GHz band.

Respectfully submitted,



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