

**Before the  
NATIONAL TELECOMMUNICATIONS  
AND INFORMATION AGENCY  
Washington, D.C. 20230**

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| In the Matter of                            | ) |                        |
|   | ) |                        |
| Development of a National Spectrum Strategy | ) | Docket No. 230308-0068 |
|   | ) |                        |
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**COMMENTS OF WI-FI ALLIANCE**

Wi-Fi Alliance<sup>1/</sup> submits these comments in response to the Request for Comments<sup>2/</sup> in the above-captioned proceeding regarding the development and implementation of a National Spectrum Strategy for the United States (“NSS”). Wi-Fi Alliance applauds the efforts of the National Telecommunications and Information Agency (“NTIA”) to develop the NSS, which can help ensure that the United States continues to make available the spectrum resources that are central to Americans’ connectivity requirements. In doing so, NTIA must recognize the vital role of Wi-Fi in the communications infrastructure and incorporate strategies to make additional spectrum available for Wi-Fi. That should include consideration of new and innovative spectrum sharing techniques that will provide access to spectrum for unlicensed devices while preserving access by Federal users to their assigned spectrum. In order to achieve these results, NTIA

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<sup>1/</sup> Wi-Fi®, the Wi-Fi logo, the Wi-Fi CERTIFIED logo, Wi-Fi Protected Access® (WPA), WiGig®, the Wi-Fi ZONE logo, the Wi-Fi Protected Setup logo, Wi-Fi Direct®, Wi-Fi Alliance®, WMM®, and Miracast® are registered trademarks of Wi-Fi Alliance. Wi-Fi CERTIFIED™, Wi-Fi Protected Setup™, Wi-Fi Multimedia™, WPA2™, Wi-Fi CERTIFIED Passpoint™, Passpoint™, Wi-Fi CERTIFIED Miracast™, Wi-Fi ZONE™, WiGig CERTIFIED™, Wi-Fi Aware™, Wi-Fi HaLow™, the Wi-Fi Alliance logo and the WiGig CERTIFIED logo are trademarks of Wi-Fi Alliance.

<sup>2/</sup> *Development of a National Spectrum Strategy* Request for Comments, National Telecommunications and Information Administration, 88 Fed. Reg. 16244 (2023) (“Request for Comments”).

should continue to engage with stakeholders like Wi-Fi Alliance throughout the development and implementation of the NSS.

## **I. INTRODUCTION**

Wi-Fi Alliance is a global, non-profit industry association of over 900 leading companies devoted to connecting everyone and everything everywhere. Since 1999, Wi-Fi Alliance has enabled worldwide adoption of Wi-Fi technology by certifying interoperability for thousands of Wi-Fi products each year. Today, annual Wi-Fi device shipments exceed 4 billion while Wi-Fi Alliance certifies more than 4,000 new products every year. Importantly, Wi-Fi is the predominant technology for delivering internet connectivity, including most mobile wireless traffic.<sup>3/</sup> With rapidly expanding array of Wi-Fi products and services, Wi-Fi Alliance membership continues to grow and now includes entities that develop technology, as well as companies in the consumer electronics, automotive, Internet of Things (“IoT”), healthcare, and telecommunications sectors, among others.

Wi-Fi Alliance applauds NTIA’s efforts to develop an NSS and appreciates the opportunity to contribute to that development, including by participating in NITA’s NSS Listening Session in Washington D.C. on March 30, 2023. The NSS will be a valuable tool in NTIA’s effort to manage current and future spectrum use. The Department of Defense (“DoD”) recently initiated a proceeding to develop an Electromagnetic Spectrum Strategic Roadmap.<sup>4/</sup> NTIA is the Congressionally-designated manager of spectrum for all Federal entities.<sup>5/</sup>

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<sup>3/</sup> In fact, each subsequent generation of cellular networks has increasingly relied on Wi-Fi, and that is expected to continue. Fifth Generation (“5G”) wireless technology was developed to account for Wi-Fi use, and so 5G network architecture supports Wi-Fi as one of its elements.

<sup>4/</sup> See *Next-Generation Electromagnetic Spectrum Strategic Roadmap*, Request for Information, Notice ID 632369514 (published Jan. 17, 2023) (“DoD EMS Roadmap RFI”).

<sup>5/</sup> See National Telecommunications and Information Administration Organization Act, 47 U.S.C. § 902 (1992).

Accordingly, Wi-Fi Alliance urges NTIA to coordinate its efforts with DoD to develop a government-wide spectrum management plan for *all* Federal users so that DoD’s Roadmap is consistent with the NSS.<sup>6/</sup>

As NTIA observes, access to spectrum is critical to enable the U.S. to continue to lead the world in advanced technology and enhance the Nation’s national and economic security.<sup>7/</sup> Wi-Fi is key to achieving these goals because it is able to provide affordability, sustainability, interoperability, and security better than other wireless technologies.<sup>8/</sup> Each day, hundreds of millions of Americans rely on Wi-Fi to connect billions of devices. But, as with any wireless technology, Wi-Fi depends on access to radiofrequency spectrum and lack of spectrum access threatens its performance and functionality. Accordingly, the U.S. must continue to ensure that there is sufficient spectrum to support the rapidly growing demand for Wi-Fi. This can be accomplished through spectrum sharing – Wi-Fi has already demonstrated its ability to coexist with and protect other co- and adjacent-band spectrum users. But as the demand for spectrum access, from both commercial and Federal users, continues to intensify, conventional spectrum management approaches that are centered on static spectrum segmentation must be reassessed.<sup>9/</sup>

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<sup>6/</sup> Wi-Fi Alliance notes that DoD intends to “[i]dentify opportunities to promote advanced forms of spectrum sharing between military and commercial systems.” *See* DoD EMS Roadmap RFI; *Policy and Procedures for Management and Use of the Electromagnetic Spectrum*, Department of Defense Instruction, No. 4650.01 at 4(g) (Jan. 9, 2009) (directing DoD to “consider sharing the spectrum with other Federal agencies and with commercial users”). Wi-Fi Alliance is similarly encouraged that NTIA and DoD both emphasize the need to identify additional spectrum for sharing to meet the ever increasing demand for spectrum access. *See* Request for Comments, 88 Fed. Reg. at 16246; DoD EMS Roadmap RFI.

<sup>7/</sup> *See* Request for Comments, 88 Fed. Reg. at 16245.

<sup>8/</sup> *Wi-Fi@: Affordable Connectivity for All*, WI-FI ALLIANCE, [https://www.wi-fi.org/download.php?file=/sites/default/files/private/Wi-Fi\\_Affordability\\_Highlights\\_202303.pdf](https://www.wi-fi.org/download.php?file=/sites/default/files/private/Wi-Fi_Affordability_Highlights_202303.pdf) (last visited Apr. 2, 2023).

<sup>9/</sup> *See Wi-Fi Alliance 2022 Wi-Fi Trends*, WI-FI ALLIANCE <https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-2022-wi-fi-trends> (last visited Feb. 17, 2023) (discussing the increased “demand for high quality Wi-Fi and more efficient, reliable connectivity in phones, tablets, and access

These conventional approaches result in inefficient spectrum use at a time when the U.S. needs to maximize spectrum use.<sup>10/</sup> Static spectrum segmentation necessarily produces inefficiencies because spectrum-based applications rarely require continuous or constant access to spectrum. When that access is not required, the spectrum remains unused while other connectivity requirements in the same geographic area go unfulfilled or under-fulfilled.

In contrast, spectrum sharing implemented under an appropriate regulatory framework with innovative spectrum access techniques will promote increased spectrum utilization while protecting Federal incumbents – often without requiring any modification to Federal operations. As discussed further below the Federal Communications Commission (“FCC”) recently adopted a number of innovative spectrum sharing techniques that optimize spectrum utilization in a manner that provides incumbent networks necessary and reliable regulatory protection from interference. While taking into account unique characteristics and requirements of Federal users, NTIA should leverage these proven coexistence techniques to expand spectrum access for Wi-Fi, which is urgently needed by U.S. consumers, businesses, and institutions.

## **II. THE NATIONAL SPECTRUM STRATEGY SHOULD ENSURE THAT THERE IS SUFFICIENT SPECTRUM AVAILABLE FOR WI-FI**

Wi-Fi is a ubiquitous and essential technology. Eighty-five percent of U.S. broadband subscribers have Wi-Fi capability at home, and mobile users connect to the internet through Wi-

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points”); Paul Brodsky, *Internet Traffic and Capacity Remain Brisk*, TELEGEOGRAPHY BLOG (Sept. 1, 2023), <https://blog.telegeography.com/internet-traffic-and-capacity-remain-brisk> (“Global internet bandwidth rose by 28% in 2022, continuing the return to ‘normal’ from the pandemic-generated bump of 2020.”).

<sup>10/</sup> Cf. *Promoting Efficient Use of Spectrum through Improved Receiver Interference Immunity Performance*, ET Docket 22-137, Notice of Inquiry, FCC 22-29 ¶ 35-36 (2022) (explaining that the “[c]ontinuous growth and high demand for spectrum-based services” in the U.S. market warrants the exploration of “policy tools that can harness new technologies and promote expanded and efficient spectrum use”).

Fi over cellular networks more than 55 percent of the time.<sup>11/</sup> Wi-Fi delivers more than half of all the internet’s traffic and supports an ever-expanding variety of bandwidth-intensive applications, like virtual, augmented, and extended-reality, wearables, artificial intelligence, telehealth, industrial automation, IoT, and 3D-video.<sup>12/</sup> Instead of wide area, macrocell networks, these next generation use cases will rely on local area, short-range networks, such as Wi-Fi, which is designed for more data traffic, more devices, more applications, and much lower latency.<sup>13/</sup> Moreover, Wi-Fi is the predominant connectivity solution in public spaces like smart-cities, libraries, schools, hospitals, sports venues and more, as well as for residential users and business enterprises.<sup>14/</sup>

With the NSS, NTIA has an immediate opportunity to recognize the centrality of Wi-Fi to Americans’ connectivity requirements. NTIA’s mission under the Infrastructure Investment and Jobs Act is to deliver broadband connectivity to the entire country.<sup>15/</sup> In furtherance of that objective, NTIA administers grant programs for the development and use of broadband, including deployment.<sup>16/</sup> Enabling Wi-Fi in conjunction with ongoing fiber and satellite

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<sup>11/</sup> See *Global Economic Value of Wi-Fi® 2021 – 2025*, WI-FI ALLIANCE, at 11 (Sept. 2021) [https://www.wi-fi.org/download.php?file=/sites/default/files/private/Global\\_Economic\\_Value\\_of\\_Wi-Fi\\_2021-2025\\_202109.pdf](https://www.wi-fi.org/download.php?file=/sites/default/files/private/Global_Economic_Value_of_Wi-Fi_2021-2025_202109.pdf) (“Value of Wi-Fi Report”).

<sup>12/</sup> See Value of Wi-Fi Report at 16.

<sup>13/</sup> See *Wi-Fi® Industry Leaders Offer Insights About the Year Ahead*, WI-FI ALLIANCE (Jan. 30, 2023) <https://www.wi-fi.org/beacon/the-beacon/wi-fi-industry-leaders-offer-insights-about-the-year-ahead> (explaining that will bring gigabit speeds, extremely low latency, and high capacity to more crowded, dense public areas such as education campuses and healthcare facilities”).

<sup>14/</sup> See Value of Wi-Fi Report at 12.

<sup>15/</sup> See *NTIA’s Role in Implementing the Broadband Provisions of the 2021 Infrastructure Investment and Jobs Act*, National Telecommunications and Information Administration – Broadband USA, <https://broadbandusa.ntia.doc.gov/news/latest-news/ntias-role-implementing-broadband-provisions-2021-infrastructure-investment-and> (last visited Apr. 2, 2023); Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021).

<sup>16/</sup> See *Grants*, National Telecommunications and Information Administration, <https://ntia.gov/category/grants> (last visited Apr. 2, 2023).

broadband deployments will therefore deliver versatile and extremely affordable connectivity, making Wi-Fi an ideal force multiplier for connectivity.<sup>17/</sup> Given the well-documented challenges of serving remote communities,<sup>18/</sup> it is vital that each broadband connection is put to the most efficient use and distributed as widely as possible. Wi-Fi can help achieve that. For example, in June 2020, at the height of the COVID-19 pandemic, the city of McAllen, Texas installed 1,000 Wi-Fi access points to provide free wireless internet to 43 percent of the area. This service was crucial to delivering online education during the height of the pandemic and transformed the city's ability to connect.<sup>19/</sup>

In addition to meeting the Nation's connectivity needs efficiently and as part of broadband solutions, Wi-Fi provides billions of dollars in economic value and cost savings; in 2021, Wi-Fi Alliance found that the total economic value provided by Wi-Fi in the United States is nearly \$1 trillion.<sup>20/</sup> Thanks in part to the new allocation of 1200 megahertz in the 6 GHz band, by 2025 the value generated by Wi-Fi is expected to grow by more than half to \$1.58 trillion.<sup>21/</sup> This contribution to GDP will generate 720,000 jobs in the U.S. over the same period.<sup>22/</sup>

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<sup>17/</sup> See *Wi-Fi@: Affordable Connectivity for All*, WI-FI ALLIANCE, [https://www.wi-fi.org/download.php?file=/sites/default/files/private/Wi-Fi\\_Affordability\\_Highlights\\_202303.pdf](https://www.wi-fi.org/download.php?file=/sites/default/files/private/Wi-Fi_Affordability_Highlights_202303.pdf) (last visited Apr. 2, 2023).

<sup>18/</sup> See *New NTIA Data Show Enduring Barriers to Closing the Digital Divide, Achieving Digital Equity*, NTIA <https://ntia.gov/blog/2022/new-ntia-data-show-enduring-barriers-closing-digital-divide-achieving-digital-equity> (last visited Apr. 2, 2023).

<sup>19/</sup> See *Wi-Fi@: Affordable Connectivity for All*, WI-FI ALLIANCE, [https://www.wi-fi.org/download.php?file=/sites/default/files/private/Wi-Fi\\_Affordability\\_Highlights\\_202303.pdf](https://www.wi-fi.org/download.php?file=/sites/default/files/private/Wi-Fi_Affordability_Highlights_202303.pdf) (last visited Apr. 2, 2023).

<sup>20/</sup> See *Value of Wi-Fi Report* at 11.

<sup>21/</sup> See *Value of Wi-Fi Report* at 11.

<sup>22/</sup> See *The Economic Value of Wi-Fi: A Global View (2021-2025)*, TELECOM ADVISORY SERVICES, at 31 (Feb. 2021), <https://www.wi->

The many benefits associated with Wi-Fi deployment and adoption highlighted above depend on access to sufficient radiofrequency spectrum. Lack of spectrum threatens Wi-Fi performance and functionality; without enough bandwidth Wi-Fi, like any other wireless service, cannot provide the fast and reliable connectivity that Americans demand. The NSS should therefore promote access to spectrum for Wi-Fi technology and devices.

### **III. THE SPECTRUM PIPELINE SHOULD IDENTIFY BANDS FOR FUTURE WI-FI USE ON A NONINTERFERENCE BASIS WHILE PRIORITIZING FEDERAL OPERATIONS**

#### *The Need for More Spectrum for Wi-Fi.*

The Request for Comments seeks input on the national spectrum requirements a spectrum pipeline should be designed to address, and which bands are best suited for particular purposes.<sup>23/</sup> NTIA should consider the need for additional Wi-Fi spectrum when designating spectrum for the spectrum pipeline. As noted above, Wi-Fi already delivers the majority of U.S. internet traffic, which continues to increase.<sup>24/</sup> And just as the percentage of internet traffic carried by Wi-Fi increases, the total volume of traffic will also increase, meaning that additional spectrum resources will be required just to maintain the necessary quality of service and performance.<sup>25/</sup>

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[fi.org/download.php?file=/sites/default/files/private/The\\_Economic\\_Value\\_of\\_Wi-Fi-A\\_Global\\_View\\_2021-2025.pdf](https://www.fcc.gov/document/download.php?file=/sites/default/files/private/The_Economic_Value_of_Wi-Fi-A_Global_View_2021-2025.pdf).

<sup>23/</sup> See Request for Comments, 88 Fed. Reg. at 16245.

<sup>24/</sup> See Value of Wi-Fi Report at 12.

<sup>25/</sup> See *Wi-Fi Alliance 2022 Wi-Fi Trends*, WI-FI ALLIANCE <https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-2022-wi-fi-trends> (last visited Apr. 2, 2023) (discussing the increased “demand for high quality Wi-Fi and more efficient, reliable connectivity in phones, tablets, and access points”); Paul Brodsky, *Internet Traffic and Capacity Remain Brisk*, TELEGEOGRAPHY BLOG (Sept. 13, 2022), <https://blog.telegeography.com/internet-traffic-and-capacity-remain-brisk> (“Global internet bandwidth rose by 28% in 2022, continuing the return to ‘normal’ from the pandemic-generated bump of 2020.”).

The new technologies and use cases described above, though efficient, are bandwidth-intensive and will further drive increased future demand for spectrum resources. The latest generation of Wi-Fi, Wi-Fi 6E, takes advantage of wider channel bandwidths to deliver greater speeds, more capacity and lower latency; Wi-Fi 6E can utilize up to 14 additional 80 megahertz channels or seven 160 megahertz channels in the 6 GHz band for spectrum-intensive applications like high-definition video streaming and virtual reality.<sup>26/</sup> The next generations of Wi-Fi, Wi-Fi 7, will continue this trend with the capability of supporting a maximum throughput of at least 30 gigabits per second and utilizing even wider 320 megahertz channels.<sup>27/</sup> As with previous generations, Wi-Fi 7 will be compatible with the legacy Wi-Fi ecosystem. To maximize spectral efficiency while minimizing equipment costs and complexity, NTIA should consider addressing Wi-Fi spectrum requirements with spectrum blocks that are adjacent to existing unlicensed allocations. That will provide an opportunity to create wide channels and enable faster speeds with lower latency. In this regard, Wi-Fi Alliance notes that IEEE recently identified 7125-7250 MHz spectrum as necessary for IEEE 802 technologies.<sup>28/</sup> Wi-Fi Alliance recognizes that there is existing Federal use of spectrum adjacent to bands in which Wi-Fi currently operates.<sup>29/</sup> But,

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<sup>26/</sup> See *Discover Wi-Fi: Wi-Fi CERTIFIED 6*, WI-FI ALLIANCE, <https://www.wi-fi.org/discover-wi-fi/wi-fi-certified-6> (last visited Apr. 2, 2023).

<sup>27/</sup> See *Who We Are: Current Work Areas, Wi-Fi 7*, WI-FI ALLIANCE, <https://www.wi-fi.org/who-we-are/current-work-areas#Wi-Fi%207>.

<sup>28/</sup> See *IEEE Position Statement on Spectrum Allocation and Management Document Draft*, IEEE P802.18, IEEE RADIO REGULATORY TECHNICAL ADVISORY GROUP (Mar. 16, 2023), <https://mentor.ieee.org/802.18/dcn/23/18-23-0015-18-ISUS-isus-clean-version-of-spectrum-statement.pdf> (last visited Apr. 17, 2023).

<sup>29/</sup> See 47 C.F.R. § 2.106 (allocating the 7 GHz band for various Federal uses); Michael Calabrese, *NTIA Studying Sharing in 7.125-8.4 GHz Band; Controversy Expected*, *New America*, NEW AMERICA (Oct. 2, 2019), <https://www.newamerica.org/oti/in-the-news/ntia-studying-sharing-7125-84-ghz-band-controversyexpected/> (“The 7 GHz band is underutilized, but . . . it would be extremely difficult to clear federal users from large contiguous portions of it[.]”).



as explained below, Wi-Fi is uniquely capable of sharing spectrum without impacting the operation of incumbent users, producing a spectrum win-win.

***Spectrum Sharing Can Help Meet Those Needs.***

NTIA asks about limiting the definition of spectrum sharing to circumstances requiring incumbent users to vacate, compress, or repack some of their operations.<sup>30/</sup> That definition is too narrow and discounts the potential for even less disruptive forms of spectrum sharing. Instead, the definition of spectrum sharing should include circumstances where Federal agency incumbents can continue to operate unaffected by the introduction of new spectrum users that operate on an unprotected, non-interference basis. Wi-Fi is capable of that kind of sharing, including with Federal users. Wi-Fi is adaptable and is designed to share spectrum with licensed or Federal users who have primary rights to use the spectrum because its low power operations can exist where incumbent users operate at significantly higher power.<sup>31/</sup>

This type of sharing is particularly effective when incumbent operations are outdoors, as many Federal operations are, because Wi-Fi operations can be restricted to indoor-only operations. This is especially true because Americans need broadband wireless connectivity for work, school, entertainment, telemedicine, industrial automation, IoT and a myriad of other primarily indoor uses.<sup>32/</sup> These connectivity demands can be addressed by low-power devices

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<sup>30/</sup> See Request for Comments, 88 Fed. Reg. at 16246.

<sup>31/</sup> See, e.g., *Part 15 Subpart E U-NII 6 GHz General Guidance Bands 5, 6, 7, 8*, FCC Office of Engineering and Technology Laboratory Division Publication, Knowledge Database (May 20, 2022) [https://apps.fcc.gov/kdb/GetAttachment.html?id=4iuZjuFgWiNypCLVpSN3cQ%3D%3D&desc=987594%20D01%20U-NII%206GHz%20General%20Requirements%20v01r03&tracking\\_number=277034](https://apps.fcc.gov/kdb/GetAttachment.html?id=4iuZjuFgWiNypCLVpSN3cQ%3D%3D&desc=987594%20D01%20U-NII%206GHz%20General%20Requirements%20v01r03&tracking_number=277034) (“The contention-based protocol can allow multiple users to share the same spectrum among low-power indoor access points, subordinates, and clients.”).

<sup>32/</sup> See *Wi-Fi® Industry Leaders Offer Insights About the Year Ahead*, WI-FI ALLIANCE (Jan. 30, 2023) <https://www.wi-fi.org/beacon/the-beacon/wi-fi-industry-leaders-offer-insights-about-the-year-ahead>; Value of Wi-Fi Report at 14.

restricted to indoor use, while minimizing interference risks to incumbent users – including Federal users – by combining several interference mitigation methods:

- *Limit on device transmit power.* This method protects incumbent operations with a mandatory limit on an unlicensed device’s transmit power. Limiting a device’s maximum transmit power effectively controls unwanted energy at the incumbent receiver.
- *Mandatory implementation of contention-based protocol.* Wi-Fi incorporates features that maximize spectrum utilization while preserving flexibility to accommodate current and future spectrum users. Self-coordinating, multi-channel Wi-Fi networks share spectrum using an energy detect contention-based protocol based on a “listen-before talk” spectrum access scheme, also known as Carrier Sense Multiple Access with Collision Avoidance (“CSMA/CA”) protocol. This protocol ensures equitable spectrum access and protects other operations in a shared frequency band. With the CSMA/CA implementation, before initiating any transmission, a Wi-Fi device listens to the radio medium and, only if the medium is idle, the station may transmit; otherwise, the device must wait until the active transmission is complete before transmitting. This allows Wi-Fi technologies to coexist with incumbent as well as future priority deployments in different bands.
- *Indoor-only device operations.* This method shields incumbent operations from unlicensed transmissions through building structures and other obstacles. Indoor transmissions are significantly attenuated when passing through building walls, particularly at higher frequencies. The effectiveness of this mitigation technique will continue to increase with improvements in the energy efficiency of buildings across the

U.S.<sup>33/</sup> And indoor-only constraints have already been effectively implemented by FCC requirements (*i.e.*, requiring that devices cannot be weather resistant, must have an integrated antenna and cannot have the ability to connect to other antennas, and cannot be capable of operating on battery power). The FCC imposed similar regulations in the 5.850-5.895 GHz, limiting use to indoor-only operations.<sup>34/</sup> And in 2020, the FCC determined to allow unlicensed operations across the entire 6 GHz band, but limited some of those operations to indoor use employing a contention based protocol at low power levels.<sup>35/</sup>

***Mechanism to Fund Federal Users for Sharing with Unlicensed Technologies.***

As NTIA suggests, more can be done to encourage and facilitate the pursuit of more robust Federal and non-Federal spectrum sharing arrangements.<sup>36/</sup> One reason that sharing of Federal spectrum, in the manner described above, may be limited today, is that the Commercial Spectrum Enhancement Act only allows Federal entities to be reimbursed for relocation or sharing with FCC auction licensees through funds generated from the auction of the repurposed or shared spectrum.<sup>37/</sup> There is no similar mechanism to fund Federal users for sharing with unlicensed technologies because that spectrum is not auctioned. While it is true that spectrum auctions raise money for the Treasury, designating spectrum for unlicensed use also produces

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<sup>33/</sup> Energy efficient buildings use treated windows and other features that further block emissions.

<sup>34/</sup> See 47 C.F.R. §§ 15.403, 15.407(a)(3)(ii).

<sup>35/</sup> Although some operations in the 6 GHz band are limited to indoor use, the FCC also permitted standard power unlicensed operations in the U-NII-5 and U-NII-7 sub-bands to operate outdoors through the use of an AFC system to protect incumbents from harmful interference. See *Unlicensed Use of the 6 GHz Band*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852, ¶¶ 22, 99 (2020) (“6 GHz Report and Order”); 47 C.F.R. § 15.407(a)(4), (d).

<sup>36/</sup> See Request for Comments, 88 Fed. Reg. at 16246.

<sup>37/</sup> See 47 U.S.C. § 923(g)(2).

significant economic benefits for U.S. taxpayers, as demonstrated above. Although Wi-Fi Alliance expects there to be little to no cost to Federal users associated with sharing spectrum with non-Federal unlicensed users, a mechanism to ensure that Federal users are compensated for any costs they may incur can serve to protect Federal users and to build trust between Federal and non-federal spectrum interests. NTIA should therefore urge Congress to consider legislation that would dedicate some portion of Spectrum Relocation Fund resources to reimburse Federal entities' cost of research, development, one-time equipment modifications, and other activities that will lead to greater Federal spectrum sharing with unlicensed devices.

***International Harmonization.***

Finally, as NTIA suggests, international harmonization is critical to creating a robust global marketplace.<sup>38/</sup> An internationally consistent regulatory landscape helps create broad markets for U.S. manufacturers and promotes competition that drives innovation for U.S. consumers. Wi-Fi Alliance is deeply invested in international interoperability; one of its main functions is to certify that Wi-Fi products are interoperable worldwide.<sup>39/</sup> But the U.S. must be a world *leader*, as it was in designating the 6 GHz band for Wi-Fi. NTIA's NSS should not merely adhere to other countries' decisions when it is not in the best interest of the U.S. to do so.<sup>40/</sup> Continuing to lead internationally will ensure the primary U.S. economic and technological position it enjoys today.

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<sup>38/</sup> See Request for Comments, 88 Fed. Reg. at 16246.

<sup>39/</sup> *Who We Are: Current Work Areas, Wi-Fi 7*, WI-FI ALLIANCE, <https://www.wi-fi.org/who-we-are/current-work-areas#Wi-Fi%207> (last visited Apr. 2, 2023).

<sup>40/</sup> See *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Memorandum Opinion and Order, 32 FCC Rcd 10988, ¶ 192, n.518 (noting that “the benefits of global harmonization are not limited to situations where all regions have identical spectrum allocations”).

#### **IV. NTIA SHOULD CONTINUE TO ENGAGE WITH STAKEHOLDERS LIKE WI-FI ALLIANCE AS IT DEVELOPS AND IMPLEMENTS THE NATIONAL SPECTRUM STRATEGY**

NTIA seeks input on how to conduct long-term spectrum planning, including “with whom and at what cadence should NTIA coordinate as part of such process.”<sup>41/</sup> Wi-Fi Alliance should be included in any future long-term planning efforts. It is uniquely well positioned to inform Federal planners about future technology and associated spectrum needs. While Wi-Fi Alliance is not itself a standards-setting body, it works closely with IEEE and can provide useful information regarding the latest Wi-Fi technology and how that technology may translate to future use cases and spectrum requirements.<sup>42/</sup> Wi-Fi Alliance’s unique position between standards-setting bodies like the IEEE and end users means that it has a valuable and novel perspective on the challenges and opportunities for the future use of spectrum.

As NTIA notes, the Federal government has, and is currently employing, multiple spectrum-focused engagements to promote trust, transparency, and communication among Federal, industry, and other stakeholders.<sup>43/</sup> Part of the responsibility of those entities should be to ensure that all sectors of the spectrum ecosystem are considered and included in those efforts.

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<sup>41/</sup> See Request for Comments, 88 Fed. Reg. at 16246.

<sup>42/</sup> See Edgar Figueroa, *IEEE and Wi-Fi Alliance®: Synergy Driving Wi-Fi® Success*, WI-FI ALLIANCE (Jan. 18, 2021) <https://www.wi-fi.org/beacon/edgar-figueroa/ieee-and-wi-fi-alliance-synergy-driving-wi-fi-success> (“IEEE members, Wi-Fi Alliance® members, and Wi-Fi users are participants in a virtuous cycle that steadily solidified Wi-Fi in daily life.”).

<sup>43/</sup> See Request for Comments, 88 Fed. Reg. at 16247; see also *Technological Advisory Council (TAC)*, FCC, <https://www.fcc.gov/general/technological-advisory-council> (last visited Apr. 2, 2023) (explaining that the TAC is comprised of a diverse array of leading industry experts that helps the FCC identify areas of innovation and develop); *Commerce Spectrum Management Advisory Committee (CSMAC)*, NTIA <https://www.ntia.gov/category/csmac> (last visited Apr. 4, 2023) (explaining the CSMAC brings together spectrum policy experts, appointed as “Special Government Employees,” from outside the Federal government to offer their perspective on how to enable new technologies and services); *2022 NTIA Spectrum Policy Symposium: A New Era for U.S. Spectrum Management & Coordination – September 19, 2022*, NTIA (Sept. 21, 2022) <https://ntia.gov/other-publication/2022/2022-ntia-spectrum-policy-symposium> (explaining that annual Spectrum Policy Symposium is the principal forum for the Executive Branch to assess technology and policy trends in the wireless industry).

That may mean affirmative attempts to engage with representatives of all spectrum users, like Wi-Fi Alliance.

## **V. NTIA SHOULD LEVERAGE INNOVATIVE SPECTRUM SHARING TECHNIQUES TO PROMOTE THE EFFICIENT USE OF SPECTRUM**

NTIA asks about the categories of new or emerging technologies that could help ensure continued U.S. leadership through innovation.<sup>44/</sup> As noted above, spectrum sharing has already been successfully employed to permit the use of Wi-Fi and other technologies. The several generations of Wi-Fi demonstrate how sharing techniques have evolved and will continue to evolve. Wi-Fi was and is the technology that most successfully employs the contention-based protocol known as “listen-before-talk” – a fundamental and effective sharing technique. Listen-before-talk techniques like Dynamic Frequency Selection are interference mitigation measures that enable Wi-Fi to effectively protect Federal radar systems in the 5 GHz bands.<sup>45/</sup> But other sharing techniques have since been developed, including those that permit the use of television band “white space” devices and citizens band radio service (“CBRS”) devices. In both the white spaces and CBRS, devices are required to access a database system that determines the available frequencies at a device’s location prior to operation and may transmit only on frequencies that the database system indicates are available for use.<sup>46/</sup> The CBRS band employs automated frequency coordinators, known as Spectrum Access Systems, which coordinate operations between and among users in different access tiers.<sup>47/</sup>

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<sup>44/</sup> See Request for Comments, 88 Fed. Reg. at 16247.

<sup>45/</sup> See generally, *Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, Report and Order, 29 FCC Rcd 4127 (2014).

<sup>46/</sup> See 47 C.F.R. §§ 15.711(c)(2), 96.39(c), 96.59(a).

<sup>47/</sup> See *Promoting Investment in the 3550-3700 MHz Band*, Report and Order, 33 FCC Rcd 10598 ¶ 3 (2018).

Similarly, the FCC is in the process of authorizing automated frequency coordination system operators that will permit standard-power access to portions of the 6 GHz band.<sup>48/</sup> The FCC authorized standard-power operations in the U-NII-5 and U-NII-7 bands (5.925-6.425 GHz and 6.525-6.875 GHz, respectively) with similar power levels as permitted for unlicensed portions of the 5 GHz band, provided that those operations are under the control of an AFC system to protect incumbent fixed microwave operations.<sup>49/</sup> Wi-Fi Alliance has been a leader in the design, development, and testing of AFC systems and devices.<sup>50/</sup> And the FCC has conditionally approved Wi-Fi Alliance to be an AFC system operator.<sup>51/</sup> Unlicensed sharing in the 6 GHz band is a potent example of how new spectrum sharing techniques can promote access and innovation without affecting incumbent operations. It is also an example of U.S. leadership on the international stage, as the Canadian regulator has recently announced that it will permit AFC systems to share the 5.925-6.875 GHz band under similar conditions to those adopted by the FCC.<sup>52/</sup> Innovative spectrum access techniques should therefore be a major component of the NSS, building on these shared access models to promote more intensive use of spectrum wherever possible.

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<sup>48/</sup> See *6 GHz Report and Order* (opening the 6 GHz band for unlicensed use); *OET Announces Conditional Approval for 6 GHz Band Automated Frequency Coordination Systems*, Public Notice, DA 22-1146 (rel. Nov. 2, 2022) (“AFC Conditional Approval Public Notice”).

<sup>49/</sup> See *6 GHz Report and Order* ¶ 22.

<sup>50/</sup> See Wi-Fi Alliance AFC Device Under Test (“DUT”) Compliance Test Plan, v0.0.1, <https://www.wi-fi.org/file/afc-specification-and-test-plans>; Wi-Fi Alliance AFC DUT Test Vectors, v0.0.1 <https://www.wi-fi.org/file/afc-specification-and-test-plans>; Wi-Fi Alliance AFC System Under Test (“SUT”) Compliance Test Plan, v1.1, <https://www.wi-fi.org/file/afc-specification-and-test-plans>; Wi-Fi Alliance AFC System Under Test (“SUT”) Compliance Test Vector Requests, Tranche One, v1.4, <https://www.wi-fi.org/file/afc-specification-and-test-plans>.

<sup>51/</sup> See AFC Conditional Approval Public Notice.

<sup>52/</sup> See *Application Procedures for Automated Frequency Coordination System Administrators (AFCSAs)*, CPC-4-1-02, Issue 1 (Dec. 20, 2022).

Efforts to promote sharing should build on these recent successes. Wi-Fi Alliance supports NTIA’s continued development of incumbent informing capabilities (“IIC”),<sup>53/</sup> but NTIA should permit its efforts to be informed by the systems already in place and currently being developed. As described above, entities like Wi-Fi Alliance have deep experience in the development and operation of spectrum sharing mechanisms across a variety of spectrum bands.<sup>54/</sup> Those systems, like the AFC system that Wi-Fi Alliance is currently developing and testing, can be adjusted to permit sharing between Federal and non-Federal entities without necessarily requiring the independent, parallel development of IIC.

## **VI. THE NATIONAL SPECTRUM STRATEGY SHOULD INCLUDE BAND-SPECIFIC TIMELINES TO GUIDE IMPLEMENTATION**

NTIA seeks comment on the actions that can be taken over the next year or two to ensure the successful execution of the National Spectrum.<sup>55/</sup> In the coming months, NTIA should identify particular spectrum bands that can be designated for non-Federal use and the methods by which those bands can be made available, including through shared use. Wi-Fi Alliance specifically recommends that NTIA consider extending the existing unlicensed allocation at 5925-7125 MHz (*i.e.*, to above 7125 MHz). As discussed above, large, contiguous blocks of spectrum will permit the larger channels needed to deliver next generation use cases like virtual, augmented, and extended-reality, wearables, AI, telehealth, industrial automation, the IoT, and 3D-video.<sup>56/</sup>

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<sup>53/</sup> See Request for Comments, 88 Fed. Reg. at 16247; Michael DiFrancisco et al., *Incumbent Informing Capability (IIC) for Time-Based Spectrum Sharing* (2021), [https://www.ntia.gov/sites/default/files/publications/iic\\_for\\_time-based\\_spectrum\\_sharing\\_0.pdf](https://www.ntia.gov/sites/default/files/publications/iic_for_time-based_spectrum_sharing_0.pdf) (last visited Apr. 2, 2023).

<sup>54/</sup> See n.50, *supra*.

<sup>55/</sup> See Request for Comments, 88 Fed. Reg. at 16247.

<sup>56/</sup> See Value of Wi-Fi Report at 16.



The NSS should include concrete, specific objectives for the allocation and deployment of spectrum. In situations where incumbents are required to make limited improvements to their equipment to accommodate sharing, NTIA should set clear guidelines and assist incumbents to make the required changes on schedule. By ensuring that expectations are clear, NTIA can promote the trust between spectrum users that is necessary to facilitate long-term sharing relationships between Federal and commercial.

## **VII. CONCLUSION**

Maximizing access to spectrum for commercial operations while preserving unconstrained spectrum access for important U.S. government functions should be a core principle of the NSS. No technology delivers connectivity to more Americans than Wi-Fi and it is critical that the NSS ensure that there will continue to be enough spectrum allocated not only for Wi-Fi today but for Wi-Fi generations to come. NTIA should consider an expansive view of spectrum sharing that takes full advantage of the latest advances in technology like the AFC systems that are under development in the 6 GHz band. NTIA should continue to engage with stakeholders like Wi-Fi Alliance as the NSS is put into action.

Respectfully submitted,

*/s/ Alex Roytblat*

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**WI-FI ALLIANCE**

Alex Roytblat

Vice President

Worldwide Regulatory Affairs

aroytblat@wi-fi.org